Equilateral turnout at end of double track at Pershing

Double to Single Track With CTC

Ample capacity for present 20 trains daily, and foreseeable increase in volume, is accomplished by installing traffic control signaling, including power switches on remaining track—Equilateral turnouts permit moves at normal train speeds

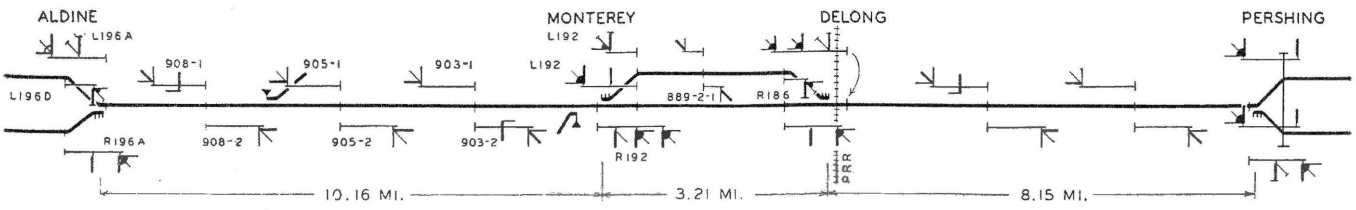
ON 21.8 MILES BETWEEN Aldine, Ind. and Pershing, the Erie has converted double track to single track with traffic control. This is the first of a series of such changes on this division of 248 miles between Marion, Ohio and Hammond, Ind. The Pershing-Aldine section was dealt with first because the rail in one track was due for renewal. Other sections ranging from 20 miles to 40 miles or more will be changed to single track when rail renewals are due. Therefore, the following explanations of track arrangement and new signaling on the Aldine-Pershing section are representative of practices that will be applied on the remainder of this 248 mile division as rapidly as practicable.

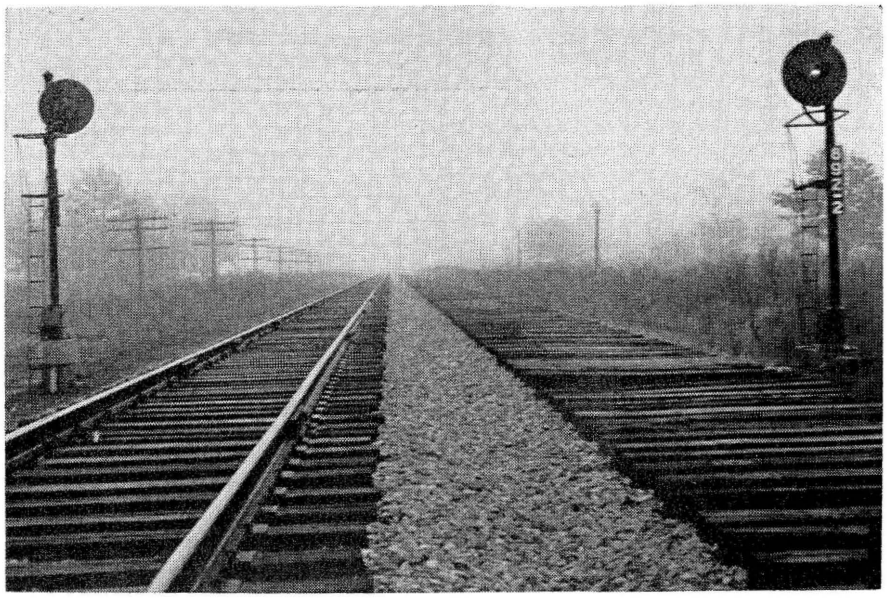
On this territory, material and labor to replace old rail with new 115 lb. rail, including joints and fastenings now costs about $30,000 per mile of track. In addition to operating advantages, considerable savings result through reduced maintenance costs with each mile of main track eliminated, with further economies realized through the re-use elsewhere, or sale of usable material released.

High Speed Diverging Moves

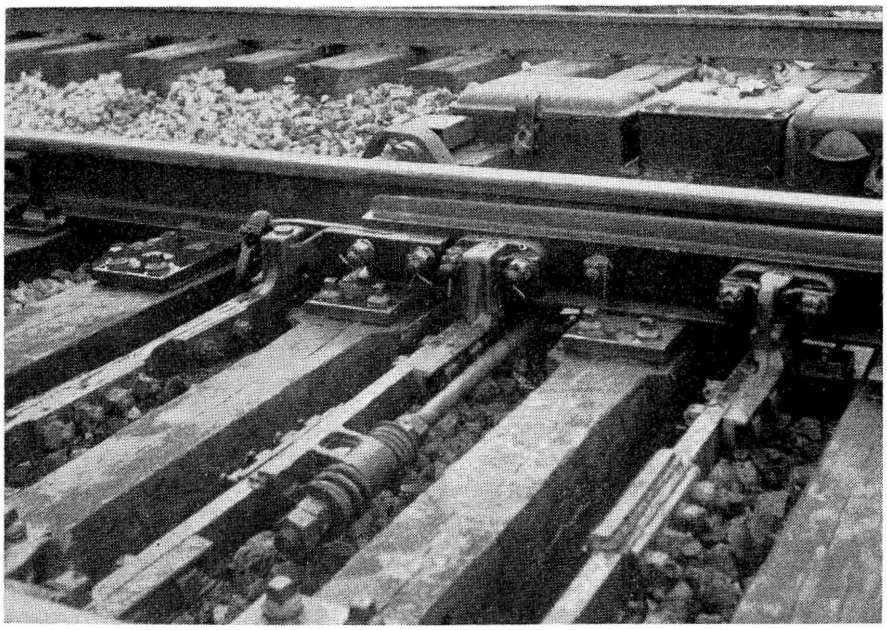
In the past, many railroads have frowned on the practice of changing to single track on sections no longer than 20 miles, because of the necessity to reduce speeds of some trains when making diverging moves over turnouts at ends of double track. The Erie has eliminated this objection by using equilateral turnouts including No. 24 frogs and 29 ft. curved Samson points, so that trains go from double to single track or vice-versa at normal maximum speeds for the division—50 mph for freight trains and 75 mph for passenger trains. Operation of trains through No. 24 equilateral turnouts at these speeds has been proven to be satisfactory on similar installations which the Erie has had in service for more than two years in eastern New York State. The facts are that the diverging move is so smooth that no coffee is spilled from the cups on the tables in the diners.

The traffic on this division includes 6 passenger trains and 10 through freight trains daily, as well as two local freights daily except Sunday. Counting extras, an average of about 20 trains are operated daily. In general the grades and curvature are light on the entire 248 miles between Marion and Hammond. Throughout the Rochester-Aldine section, the railroad traverses level terrain, with rolling grades ranging up to 0.26 per cent. Curves are few and range up to 1 deg. On the 10 miles from Monterey to Aldine the line is tangent. Between Monterey and Pershing, 11.8 miles, there are

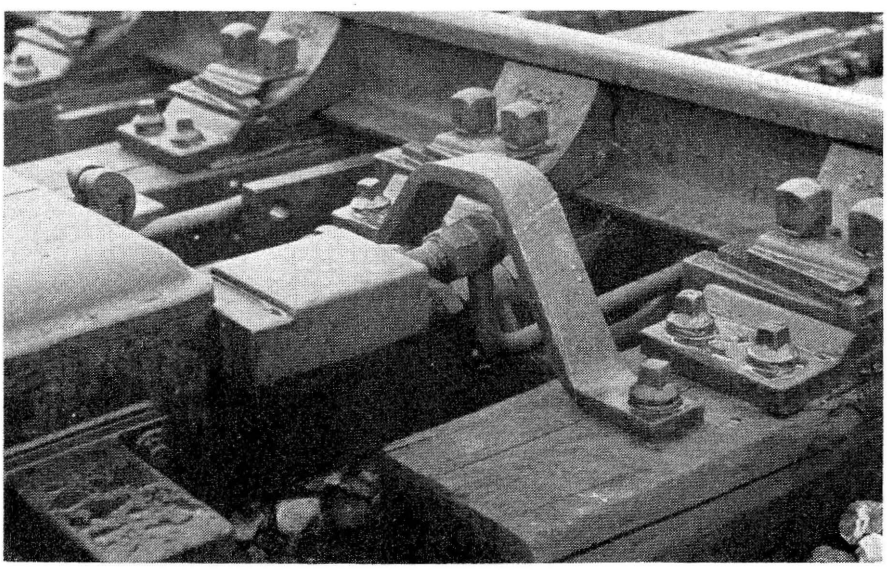




One track now serves in place of two



Springs each side of basket prevent excessive strain



The ¾-in. by 3-in. iron guard protects detector rod connection

three 1 deg. curves, one 30 min. and one 20 min.

On the previous double track, semaphore automatic block signaling was in service for single-direction, right-hand running. At Rochester, Ind. the Erie is crossed by a north-and-south branch line of the Nickel Plate Road, this crossing being protected by an interlocking. In order to have a place to stop a train on either main track, both main tracks were left in place through Rochester and on west to the new east end of single track at Pershing, which is 3.6 miles west of the railroad crossing at Rochester. The single track extends 21.8 miles to Widener road, 1 mile east of Main street in Aldine.

At Delong, which is about half way between Pershing and Aldine, the Erie is crossed by a north-and-south branch line of the Pennsylvania. A mechanical interlocking at this crossing formerly included four derails and two crossovers on the Erie. When changing to single track, the derails and crossovers were eliminated, thereby reducing the interlocking to signal protection for the crossing.

Starting just west of this crossing, the Erie left the old westbound track in place for 3.2 miles to serve as a siding with a power switch and signals at each end.

High Green Aspect

Referring to plan, when switch 195 is positioned for an eastbound train on the eastward track to be routed to the single track, high signal R196 can be controlled to display green over red, and the approach signal, 912-2 displays green. When the switch is lined to route a westbound train from the single track to the westbound main track, signal L196 can be controlled to display green over red, and the approach signal 908-1 displays green. Thus these "high green" aspects authorize the train to proceed at normal speed. If an eastbound train is being operated against the current of traffic on the westbound main, and the switch is set to route the train to the single track, the eastward dwarf signal 196 can be controlled to display the green aspect.

Speed Signaling on Siding

The turnouts at the ends of the sidings are No. 20 with 30 ft. points so that trains can enter or depart safely at speeds up to 30-40 mph., and of special interest, the signaling is arranged to direct enginemen to bring their trains up to and through these turnouts at 30 mph. The siding

is equipped with track circuits for control of signals, and a pair of intermediate signals are located at the mid-point on this siding. With the siding unoccupied (refer to plan), if the switch at the west end of the siding is reversed for an approaching eastbound train to enter the siding, signal R192 displays red-over-green-over-red, and the approach signal 903-2 displays yellow-over-green. These aspects direct the enginemen to reduce speed to 30 mph and enter the siding, at that speed. The eastward intermediate signal on the siding, 899-2-1, will be displaying yellow, which is the approach aspect directing him to reduce speed and proceed prepared to stop short of the leave-siding signal R186.

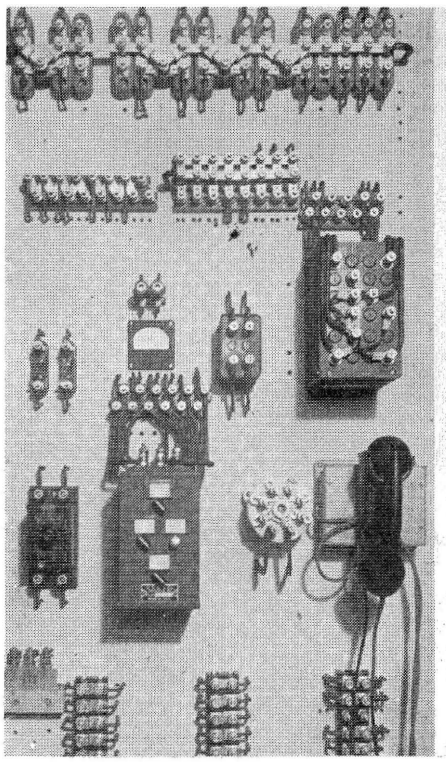
If the rear of this train is east of the signal 899-2-1, a second train of the same eastward direction can be directed to enter the siding. In this instance, with the west switch reversed, signal R192 can be cleared to display red-over-yellow over-red which directs engineman to be prepared to stop at next signal. The approach signal 903-2 displays yellow over green which directs the engineman of this second train to reduce speed to 30 mph and proceed. The aspect red-over-red-over-yellow on signal R192 directs the engineman to enter the siding prepared to stop short of train or obstruction. When any train is occupying any part of a siding, a signal cannot be cleared to direct a train of the opposite direction to enter the siding.

The electric switch machines are the Style M3 with 24 volt d.c. motors. To make sure that the mid section of the length of the switch points are moved over when the switch is operated, a "helper," consisting of a 1-in. pipe connection, extends from the throw rod through cranks to a switch rod 21 ft. from the points. The switch rods and head rods are the MF and MJ' vertical type made by the Ramapo Ajax Division of the American Brake Shoe Company.

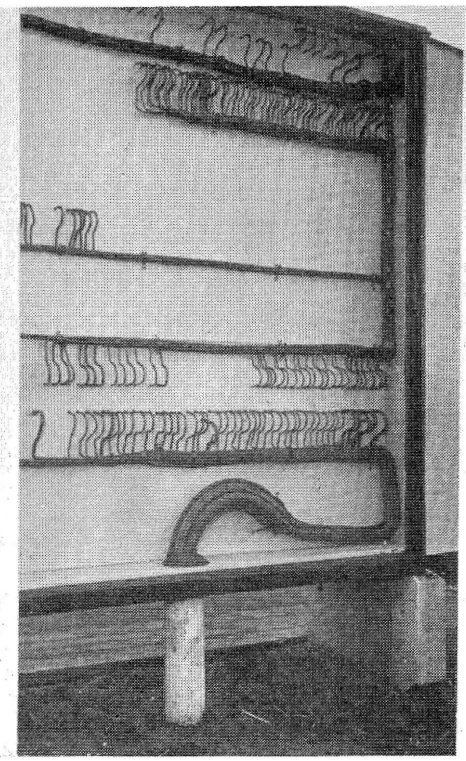
Each power switch is equipped with a propane gas-fired switch heater for melting snow. These switch heaters were furnished by The Rails Company. At each end of double track and each siding switch there is a 1,000-gal. tank to supply propane gas for the heater. These heaters are turned on or off by controls sent on the CTC code line from the dispatcher's control machine. These controls are transmitted on an existing step in the line coding system. A special feature of power switches on the Erie is the use of coil springs on the operating rod and one pair at either side of the switch adjustment basket. The purpose of the springs, one pair for normal and one pair for reverse, is to provide a cushion so that the mechanism can complete its full-stroke operation without producing excessive strain on the switch point, or connecting rods, under slightly varying conditions of adjustment.

The spring on each side of the adjustment bracket really consists of two coils, one inside the other. The outside diameter of the inside coil is 2$\frac{5}{16}$ in. and the inside diameter of the outside coil is 2$\frac{3}{8}$ in. The cross section of the outside springs is $\frac{7}{16}$ in. in diameter. The nuts are adjusted to hold the springs within approximately $\frac{1}{4}$ in. of being fully compressed, so that if one of the springs should break, less than $\frac{1}{4}$ in. slack would occur. None of the springs purchased under the present specification have broken, and many have been in service for several years.

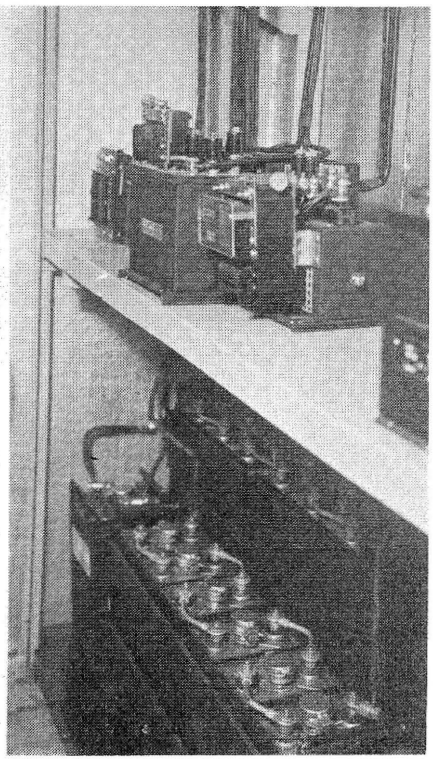
The line code system is the Union 504B time code type. If either of the wires of the d.c. code line becomes open, so that the dispatcher knows that operation is not proper, he calls a maintainer who grounds one of the code wires at the end code location. He also throws a special lever on his machine which connects one of the wires at the office to ground. If this does not complete a circuit to operate the code line, he throws this special lever the other way which removes the office ground from one wire and grounds the other. If this does not complete the circuit, the maintainer removes his ground and places it on the other line, which should complete the circuit to operate the code line. The dispatcher may have to try his switch in both positions after the maintainer has changed his ground from one line to the other. Thus the system can be made to work until the maintainers find the fault and correct it.



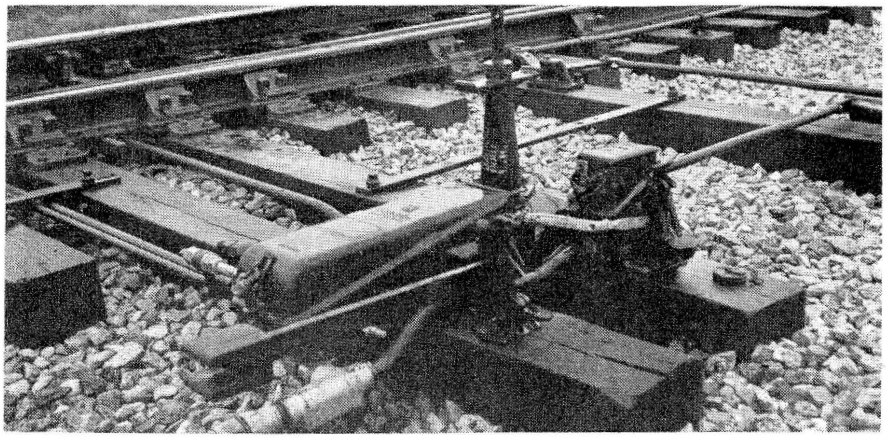
Control levers in each house



Cables enter rear of case



Batteries are charged by rectifiers



A new stand at hand-throw switches

If the code line is torn down by a storm, a maintainer or operator is sent to each power switch layout where he can control the power switch and signals by means of levers on a small panel which is on the board on the rear wall in the concrete instrument house.

Each signal maintainer has a portable telephone set that he may connect to the code line, and by "voice calling" he operates a relay and lights a lamp on the dispatcher's panel. There is no method of calling the portable phones at field stations. However, if maintainers or inspectors are to make a check, they agree on the time at which they will connect their phones to the code line to talk to each other.

Pole Line Construction

The traffic control line codes are on a line circuit consisting of two No. 8 Copperweld wires. The 440-volt a.c. power distribution is on two No. 8 copper wires. Local signal line circuits are on No. 10 Copperweld wire. All these wires have braided weatherproof covering.

The 440-volt line is fed in sections at Pershing, Delong and Aldine. The power service transformers at feeds are rated at 3 kva. The 440/120 volt line transformers at ends of sidings and ends of double track are rated at 0.5 kva; at intermediate signals, 0.15 kva; and at highway crossing signal locations, 0.25 kva.

At each end of double track or end of siding, the switch machine is operated by a set of 18 cells of Edison B4H storage battery. Twelve of these cells also feed the code equipment. A separate set of 6 cells of A6H storage battery feeds the local line circuits. At each intermediate signal a set of 14 cells of 1000 ah Edison primary battery feeds line circuits and serves as standby feed for the signal lamps if the a.c. fails.

The track circuits are the d.c. normally-energized type, using 2-ohm relays, except for detector circuits which use 4 ohm quick-acting relays. Each track circuit is fed by three cells of 500 ah Edison primary battery, except that one cell of Edison storage battery is used on each detector track circuit. The signal lamps are the double-filament type, 13 3.5 watts, and are normally fed at 7.2 volts from the low-voltage transformer.

Lightning Protection is Difficult

The soil in this territory is sandy loam, which gives a high resistance to ground, except after heavy rains. To secure ground resistance connections of 15 ohms or less, 8-ft. rods, coupled end-to-end, were driven to depths of 40 ft. These were ⅝-in. Copperweld rods. At some locations, five of these 40-ft. rods were required to bring resistance to ground under 15 ohms. The readings were made with a Biddle ground tester. The lightning arresters on the code line are the Raco 485-1 and WRRS rare gas 0265HD. The arresters on the local signal line circuits are Raco 300-6.

Locks on Hand-Throw Switches

The main track switches leading to house tracks and spurs are operated by Style 21 hand-throw switch and lock stands with electric locks on the lever in the normal position. A pipe from each stand operates a derail at clearance on the turnout. The locks at Delong interchange and spurs at Leiters and Monterey are controlled by levers in the dispatcher's machine. For a move from a spur to the main track, if the approach section is unoccupied, the dispatcher sends a control which is effective at once to release the lock. If an approach section is occupied (as for example by standing cars) the conductor uses his switch key in a key controller at the switch. This holds the main track signals at red, and after expiration of a time period, the lock is released.

The spurs at Bass Lake and Ora are seldom used, and therefore local automatic control, including time and approach control, was applied at these locks.

Constructed by Railroad Forces

This signaling project was planned and installed by Erie signal department forces. Construction work was handled by three crews each with a foreman. One crew worked in a temporary shop at Huntington, Ind. where the cases were wired. A second crew at Rochester worked west, and a third crew at North Judson, worked east.

Highway trucks, equipped with an "A" frame at the rear, and a power winch, were used to haul the cases, and set them in place at the field locations. A Ditch-Witch machine was used to dig trenches for the buried cable. This machine will dig a trench 6 in. wide and 36 in. deep for about 800 ft. in 5 hours.

The instrument houses at power switch locations are the pre-cast sectional concrete type. The sections were erected with the aid of the "A" frame derrick and winch on the rear of the 2-ton highway truck. At the location where each house is to be erected, a layer of crushed rock, such as used for track ballast, is laid about 1 ft. thick, on the ground in the area to be covered by the house and about 2 ft. beyond in all directions. Then the precast concrete floor slabs are laid on this crushed rock. This practice, which has proved to be satisfactory where ground conditions are favorable, eliminates the work of setting foundations. Likewise the signal foundations are the pre-cast sectional concrete type. These foundations and houses were made by the Permacrete Products Corp., Columbus, Ohio.

The cable from the cases to bootleg outlets at the rail is No. 9 single conductor. Raco bootlegs are used with stranded ⅝-in. conductor to ⅝-in. plugs in the web of the rail. A coating of Rust-Oleum is applied to all the surfaces of each insulated rail joint as a means of reducing wear and preventing corrosion.

This signaling project was planned and constructed by Erie forces under the direction of W. S. Storms, general superintendent communications and signals. The major items of signal equipment were furnished by the Union Switch & Signal Division of Westinghouse Air Brake Company.