CTC Moves

Top—Dispatcher controls the switches and signals at ends of sidings. Center—Passenger train leaves siding after meet

REDUCED OPERATING EXPENSES and a considerable time savings in getting trains over the road are resulting from the installation of centralized traffic control on 52 mi. of single track and 10 mi. of double track between Needmore Yard (North Dayton) and Erie Jct., (Lima, Ohio). This is part of the line from Cincinnati to Toledo, at which point the B&O has facilities for unloading coal for lake shipment and loading iron ore for rail shipment.

Coal Moves North, Iron Ore Moves South

The Dayton-Lima subdivision is part of the north-south trunk line from which other lines branch off to steel mills and coal fields. At Dayton, the Wellston subdivision leads off the north-south line to the east through Chillicothe, Ohio to Portsmouth. At Chillicothe and Portsmouth, connections are made with the Norfolk & Western, which delivers West Virginia coal to the B&O for shipment to Toledo. Northbound coal from Kentucky is received at Cincinnati. The B&O receives iron ore at Toledo, and delivers it to steel mills at Middletown and Portsmouth. The Dayton-Lima section handles all these coal and ore movements, which are concentrated during the months of Great Lakes shipping, April to November. During 1953 the B&O handled almost 5,000,000 tons of coal and iron ore over this line. These movements are made in extra trains, in addition to the 19 regularly scheduled trains operating over the subdivision.

The line from Dayton to Lima is slightly rolling with curvature and grades so slight as to generally not affect speed restrictions. The maximum curvature is 4 deg. near Troy, and the maximum grade is 0.68 near Botkins. Maximum permissible speed for passenger trains and freight trains is 70 m.p.h. and 50 m.p.h., respectively. The B&O crosses the New York Central at Wapakoneta and Troy, and the Pennsylvania at Piqua Jct. Three passenger trains, and one mail express train run each way daily over the subdivision. Seven merchandise trains are operated daily; four northbound and three southbound. Two local switch runs operate each way daily, making a total of 19 regularly scheduled trains daily. Coal and iron ore are usually moved in trainloads, being run as extra trains, and there may be as many as 20 of these trains daily during the summer months of peak movements. Thus the traffic over the line is from 19 trains up to 40 or 50 trains daily.

Improved Train Operation

Centralized traffic control has enabled the dispatcher to more effectively plan his moves; make greater utilization of track capacity; and keep all trains moving, particularly during periods of peak traffic. This has been especially important during the summer months of heavy coal and iron ore shipments. Coal and ore are handled in 100-150 car trains averaging 7,000 tons each, hauled by 2-unit diesel-electric locomotives.

Formerly train movements between Dayton and Lima were authorized by time table and train orders. Absolute permissive block signaling was in service. An absolute block with traffic was maintained between

Heavy Trains

Piqua Jct. and Kirkwood, requiring cooperative action of the operators to clear signals for train movements between stations. Hand-throw switches were in service at the ends of passing sidings, thus requiring trains to stop when entering and leaving the sidings. In addition, the Kirkwood-Swanders 10-mi. double track section was signaled for right-hand running only. Coal and ore trains often had to "take siding" to allow regularly scheduled trains to pass. Meets between regularly scheduled trains occur five times daily on double-track sections of the line, and four times daily in single-track territory. Added to these regularly scheduled meets are those to be made with extra trains, which may add as many as 10 or more meets daily. Prior to CTC, the dispatcher invariably had to side track a coal train for a regularly scheduled train. These meets incurred considerable delay to the coal trains.

Now delays and stops have been practically eliminated because the dispatcher can control the switches and signals at passing tracks. Also, the 10-mi. double-track Kirkwood-Swanders section has been signaled for reverse running on either track, thereby enabling the dispatcher to run faster trains around slower ones traveling in the same direction, without stopping either of them. For example, merchandise trains can run around coal and ore trains, or passenger trains around freight trains.

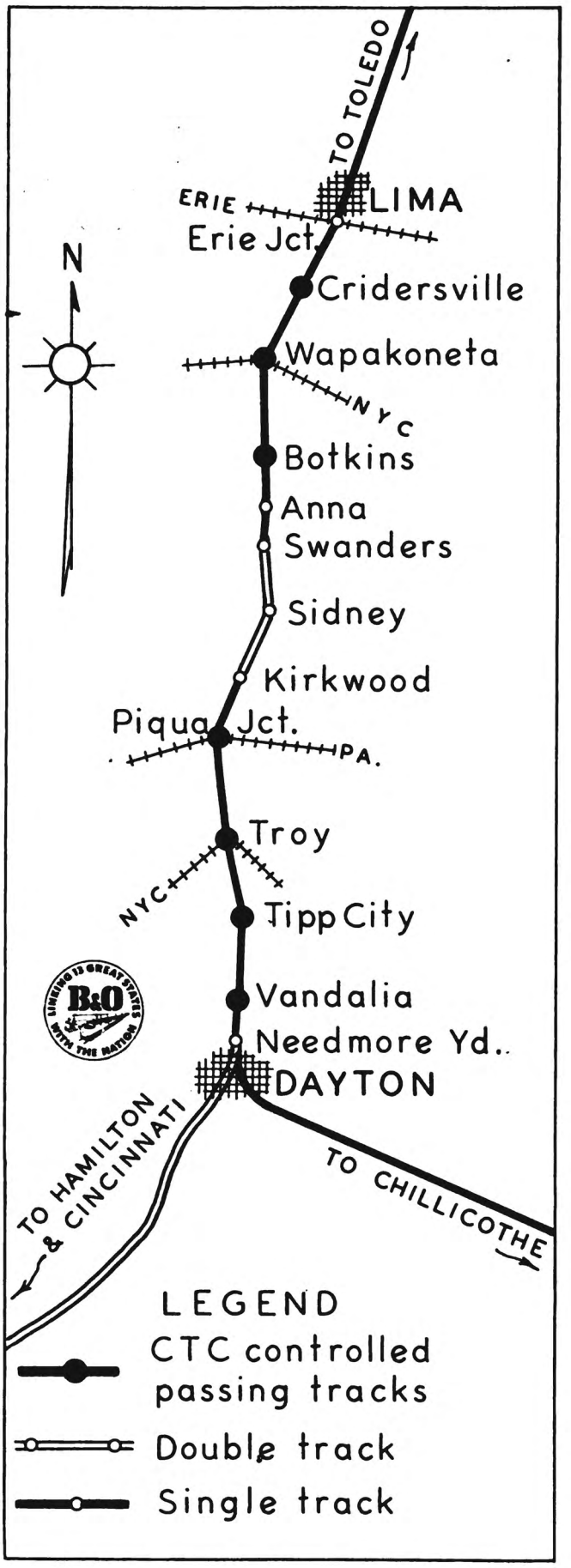
Important savings in time per trains and gross ton miles per hour crew time have been made by the CTC. Regularly scheduled merchandise trains are being operated over the line in less time than was formerly required, and the movement of coal and iron ore trains is likewise being handled in less time than previously.

Dispatcher is at Dayton

The CTC control machine is in the dispatcher's office in the B&O freighthouse in Dayton. The machine has the conventional track model diagram with indication lamps, levers for switches and signals, and a 24-pen train graph. At the right end of the machine, a telephone selector panel and loudspeaker was built into the machine, which the dispatcher uses to call the various stations along the line. A loudspeaker in the left end of the machine can be connected by means of a jack box to either the message or the dispatcher's telephone line, enabling anyone in the room to hear conversations on these lines.

One feature on this machine is the use of red power off-indication lamps for each code location. Such a lamp is lighted each time an indication is sent in from that location. If the power should fail, the red light is lighted continuously accompanied by the sounding of a buzzer. The buzzer is silenced by pressing a push-button incorporated in the lamp receptacle. In-line-of track indicating lamps are white for regular track sections, and red for OS detector sections. A toggle below each siding on the track-model diagram is for the maintainer's call; and when raised, lights a lamp on the track-side of the bungalow at the corresponding siding.

The CTC territory begins north of the entrance to Needmore Yard, and ends just south of the passing siding at Erie Junction, Lima. The switches and signals



Between Kirkwood and Swanders, 10 mi. of double track are signaled for train moves in either direction on each track

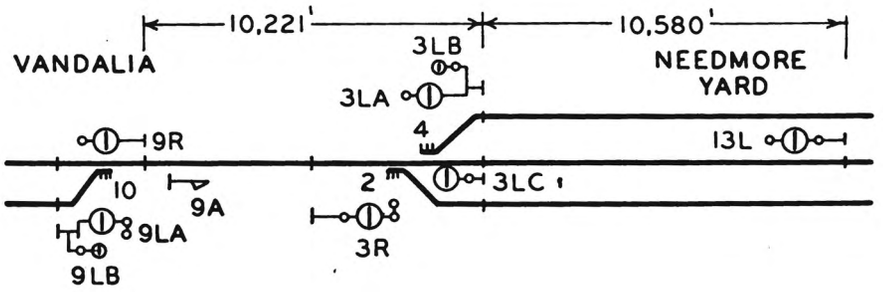
at the entrance to Needmore Yard are remote controlled from the North Dayton interlocking; and the Erie Junction interlocking operator remote controls the switch and signals at the south end of the siding at Erie Junction.

Cooperation Gets Trains In and Out of CTC Territory

Traffic control levers on the CTC control machine are 63A at the north end and 9A at the south end. When the operator at Needmore Yard, for example, has a northbound train ready to leave, he calls the dispatcher and asks for traffic north. If there are no conflicting moves, the dispatcher moves lever 9A to the right and establishes traffic north. The operator can then clear signal 3LA, 3LB or 3LC and the train can proceed. In somewhat the same manner before signal 9LA or 9LB can be cleared, traffic lever 9A must be moved to the left and traffic coded south. This procedure applies for directing train movements between CTC territory and Needmore Yard, N. Dayton on the south, and also Erie Junction, Lima on the north. The single stroke bell used for OS detection, is also used to inform the dispatcher when a train enters CTC territory.

Dispatcher and Local Control Of Railroad Crossings

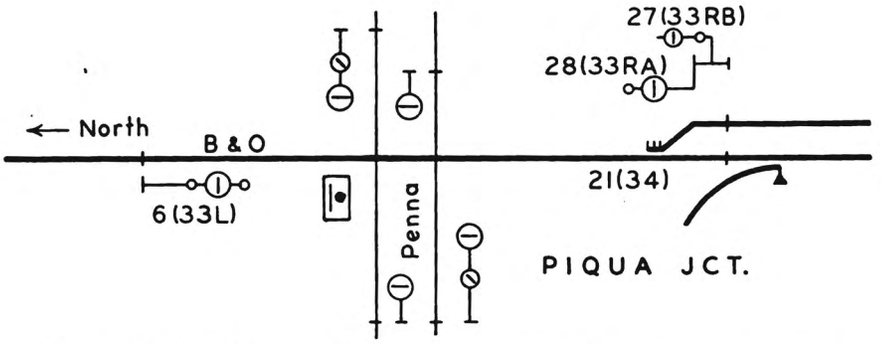
Local control in conjunction with dispatcher control is required to move trains over two railroad crossings, Troy (NYC), and Piqua Junction (PRR). At Wapakoneta (NYC),



Switch 2 and signals 3R, LA, LB, LC are controlled locally at Needmore yard

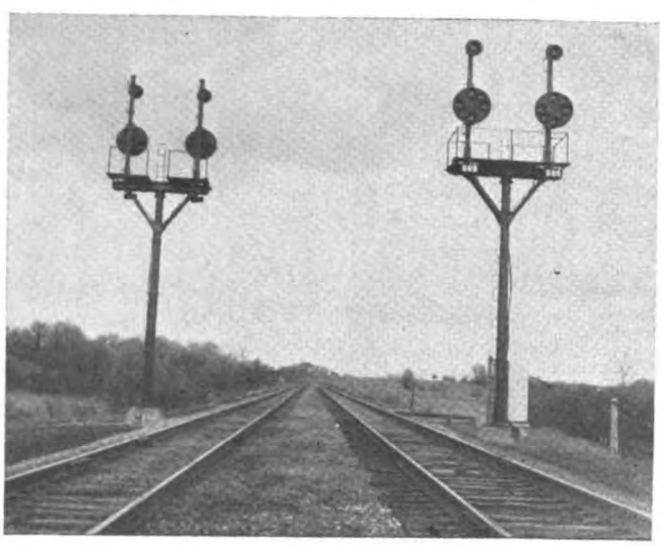
the dispatcher has complete control of the crossing. Approach indication lamps are on the track model diagram to indicate the approach of a NYC train. Either the B&O or NYC home signals at the crossing can be cleared by the dispatcher at Dayton.

Cooperation between the dispatcher and the interlocking operator (or leverman) is required to permit a B&O train to move over the crossing, either Troy or Piqua Jct. For example, at Piqua Jct. when the dispatcher desires to clear signal 33L to allow a southbound train to proceed over the Pennsylvania crossing, he moves signal lever 33 to the left and presses the code starting button. A green lamp in the barrel of the signal lever is lighted indicating that the code has been sent and an indication received. The code action lights a lamp in an arrow on the track model board of the tower at Piqua Jct. If there are no conflicting signals cleared on the PRR, the operator lines the route as requested by the indication light, and clears the southbound B&O signal. The clearing of the signal puts out the green light in the barrel of the signal lever at Dayton and lights the green lamp



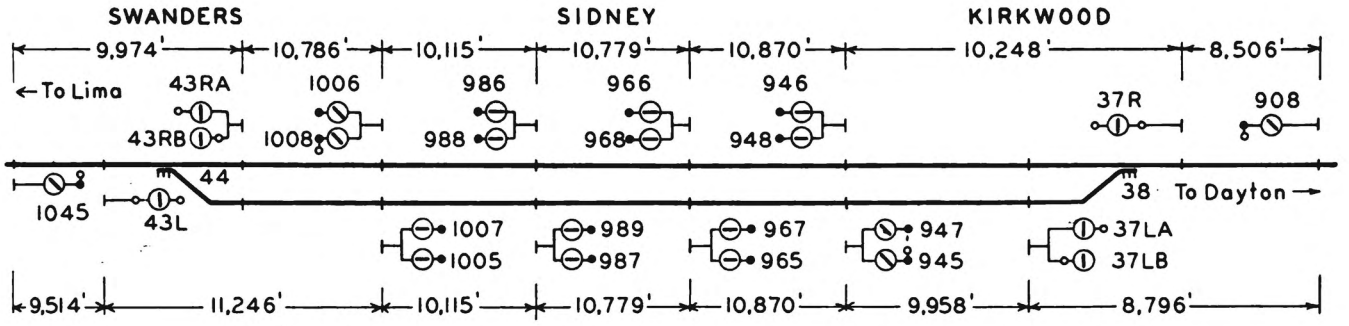
Piqua Jct. interlocking is controlled locally as well as by CTC for B&O moves

Seven Sidings Removed



Signaling both tracks for either direction running on 10 mi. of double track enabled removal of center siding at Sidney

Seven sidings were taken out of service as passing tracks in conjunction with the CTC project. Four of these were removed completely; one each at Tipp City, Troy, Sidney and Anna. Three sidings were shortened and left storage tracks, being equipped with hand-throw switch machines, electric locks and derails; Kirkwood, Swanders and Anna. One siding at North Dayton, at north end of Needmore Yard was extended, as was a siding at Troy; a total 4,112 ft. of track being added in these extensions. A total of 29,267 ft. of track was removed on this project. By signaling the 10 mi. of double track between Swanders and Kirkwood for either direction running on both tracks, the B&O was able to remove five passing tracks; two at Anna and one each at Swanders, Sidney and Kirkwood. The ten remaining sidings were equipped with power switch machines. At Vandalia and Piqua Jct. the double crossovers at the center of the passing tracks were also equipped with power switch machines. The sidings at Vandalia hold 172 and 196 cars, and at Piqua Jct. 145 and 142 cars, respectively. Other sidings and their capacities are: Tipp City, 124 cars; Troy, 148 cars; Botkins, 95 cars; Wapakoneta, 172 cars; and the Cridersville lap, 87 and 96 cars respectively. Thus the dispatcher has 10 sidings and 10 mi. of double track in which to pass trains.



Signaling for reverse moves on double track enabled removal of five passing tracks

in the south arrow located above the signal lever. Thus the signals governing over the crossing can be cleared only by cooperative action between the dispatcher and the operator.

Color-Position-Light Signals

At Kirkwood and Swanders, No. 20 turnouts are used at the ends of double track with the tracks arranged so that the northbound or No. 2 track uses the straight route at these two points. For this reason all passenger trains, when possible, and many freights are routed over the northbound route thus saving the time required to slow to the timetable speed of 30 m.p.h. when entering or leaving the No. 1 track.

The signals at these two locations are of the CPL high-type, with the station-entering signal on a straight mast, and the station-leaving signals on a double-masted bracket post. When a switch is lined for the diverging route, the station-entering signal displays the Medium-Approach aspect (two yellow lights inclined 45 deg. to the right with a white marker below the main light unit), or the Medium-Clear aspect (two green lights in a vertical row with a white marker under the main light unit), depending upon the occupancy of the block ahead. The distant signal displays the Approach-Medium aspect, two green lights in a vertical row with a white marker light above and to the left of the main light unit. When the switch is lined normal, the station-entering signals at the ends of double track will display the high-speed aspects.

At the power controlled switches at passing tracks station-entering CPL signals are mounted on straight masts. Station-leaving signals are mounted on straight masts where the main track is to the right, or on bracket posts where the main track is to the left of the passing track. This arrangement removes the necessity of swinging the passing track on wide track centers around the main-track station-leaving signal. CPL dwarf signals are used for station-leaving signals thus providing true block indication for all moves from the passing sidings. Straight time locking is used on all controlled signals, based on AAR specifications.

When a train is to leave a siding over a No. 16 turnout, the engineer may get one of three aspects depending on block conditions as follows: Stop and Proceed, Medium-Approach, or Medium-Clear. The two latter indications allow a maximum speed of 30 m.p.h. until the rear of the train has cleared the switch. On turnouts shorter than No. 16, the absence of the bottom marker gives the Slow-Approach or Slow-Clear indication limiting the speed over the turnout to slow speed or 15 m.p.h. The signaling is arranged and the aspects are such that an engineman can bring his train up to and through a turnout at the prescribed speed, thus eliminating delays in getting trains in and out of the ends of double track and passing track as well.

On the single track portions between passing tracks, all intermediate CPL signals are mounted on 28-ft. masts at twin locations. The intermediate signals on the double track portion between Swanders and

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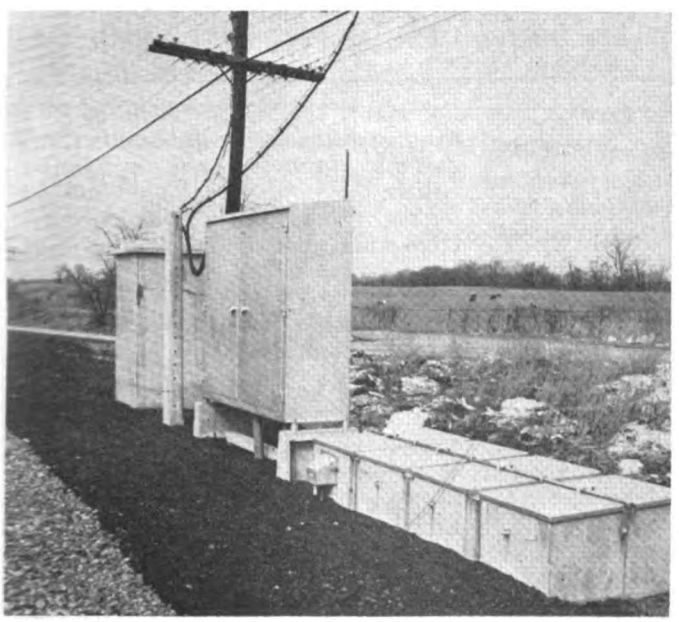
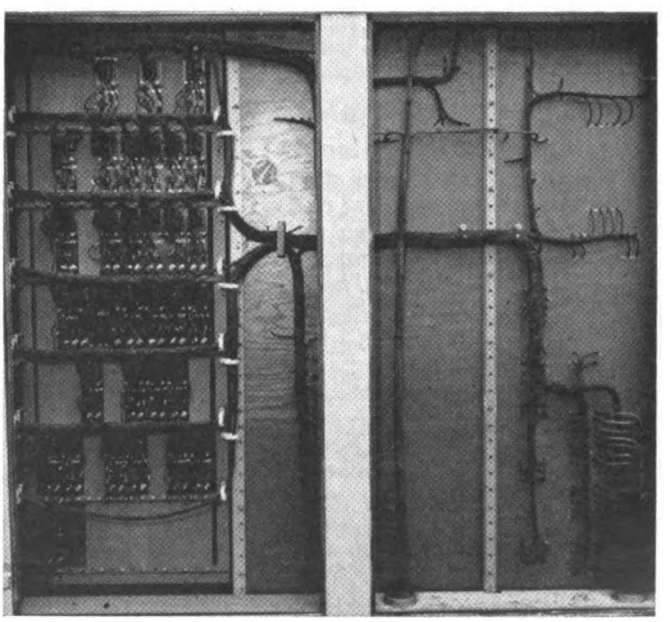
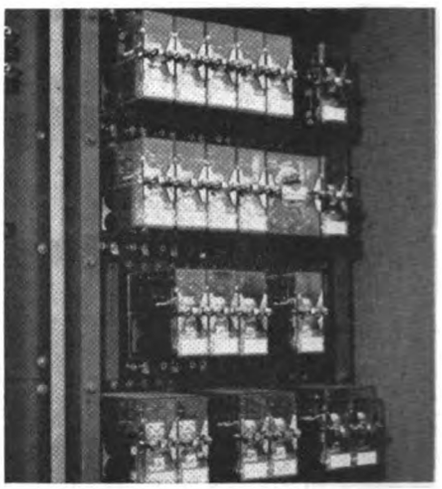


Relay case and battery boxes at the end of a siding



Rear view of relay case where plug-in relays are used

New hand-throw switch machines and electric locks installed at spur tracks



Plug-in relays used at ends of sidings

B&O CTC

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Kirkwood are mounted on double-masted bracket posts, also at twin locations. The main track signals are approach lighted. The dwarf signals are continuously lighted, except when the power is off; then they are lighted only when they display an aspect other than Stop. All bracket masts and straight masts supporting high signals are grounded for lightning protection. A No. 6 copper wire is welded to the pole (base of bracket mast) and to a ⅝-in. sectional Copperweld ground rod 8 ft. long.

Operation of Switches

The power switch machines are model 5D with dual control, operating on 24 volts d.c. As part of this project, all main-track hand-throw switches to spur tracks previously in service were replaced with model 9 hand-operated switch machines equipped with a model 10 electric lock. Derails have separate hand-throw stands equipped with model 10 electric locks, and model 6 switch circuit controllers. Approach locking is used to release the electric locks on hand-throw switches and derails. A releasing track section is also used to obtain an unlock if a train or engine pulls up on this section.

Track Circuits and Power

Conventional d.c. track circuits are in service, using two-ohm track relays, fed by one cell of 120-a.h. Exide DME-13 lead storage battery. At each bungalow, 12 cells of Exide DME-9A storage battery supply power for the switch machines. Control circuits are fed by 6 cells of 120-a.h. Gould battery. Commercial power at 110 volts a.c. is purchased at several towns, and feeds both ways from these locations on No. 4 wire. A split battery, providing 12 or 24 volts d.c., is at the freighthouse at Dayton, location of the control machine. Operating battery for the machine is 12 cells of Exide DME-13. The code line is supplied by 40 cells of Exide 8-a.h. battery.

The field coding station equipment at power switch locations is installed in welded steel housings, which also contain type B relays, batteries, charging equipment and maintainer's telephone. This telephone, an Automatic Electric monophone, is connected to the dispatcher's line. At intermediate locations, type K relays were installed in steel relay cases. All intermediate signals were respaced for increased braking distance. Relay case foundations were furnished by the Permacrete Products Corp. Concrete cable posts, battery boxes and signal mast foundations for the bungalows and bracket masts were poured in place.

The code line is No. 8 Copperweld, 40-per cent conductivity. For B relay wiring, 26-strand flexible wire was used, and 19-strand flex wire for K relays, using Raco B-wire eyelets. Wiring to switch machines is 12-conductor underground cable (3 No. 9 and 9 No. 14). Track wires terminating in Raco bootlegs at the rails are No. 9 or No. 6 depending on lead distance. Low-voltage lighting lines use No. 9 wire. Underground cable is bronze-tape armoured. All wire and cable was furnished by the Kerite Company.

Signal Construction

The construction work was handled by a construction supervisor, assistant construction supervisor, a signal storekeeper and six gangs, each consisting of a foreman and 12 men. Because half of the men were new to signal work, a signal training program was conducted concurrently with the construction work, consisting of classes held one night each week.

Construction headquarters were set up at Sidney, Ohio, 34 mi. north of Needmore Yard, near the center of the project. A prefabricated steel building was erected for a material storehouse, where cases were wired and switch gauge plates were mounted on ties.

Each construction gang had a two-ton truck equipped with a hand-operated winch for handling heavy material. Aerial cable was spun in the field, using spinners manufactured by the General Machine Products Co., Philadelphia, Pa. An International Harvester H-tractor equipped with an Auburn trencher was used for trenching. The use of the power trencher more than offset the cost of the machine on this job alone. Ingersoll-Rand air tools were used for digging under the track for track connections. A rubber-tired tractor pulled an air compressor along the right-of-way supplying air for a jack hammer that was used to break out old foundations. This in itself allowed the regular signal forces to do the final cleaning up and removal of old foundations, instead of employing a separate gang for this work.

This centralized traffic control project was planned and constructed by signal forces of the Baltimore and Ohio, under the jurisdiction of the late A. S. Hunt, chief engineer, communications and signals, and under the direction of the late W. W. Welsh, signal engineer. The major items of signaling equipment were furnished by the General Railway Signal Company.