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A Whole Railroad of C. T. C.

The Nickel Plate is well along on a program of train operation by signal indication on all single-track through routes, Buffalo to Chicago and St. Lou's



Reprinted from
RAILWAY AGE
April 23, 1949

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Main track station-leaving signal and leave-siding signal are on one bracket mast

The New York, Chicago & St. Louis is now far advanced on an extensive program of installing centralized traffic control on all single-track sections on its through routes. Seven sections of C.T.C., totaling 281 mi., are now in service. As each was completed, a decided improvement was noted in operations. Train movements are now authorized by signal indication instead of train orders, thus saving time by making closer meets. Also, power switch machines, longer turnouts and special signal aspects are aids in reducing time previously lost in entering and leaving the sidings.

Westward from Buffalo, N. Y., through Cleveland, Ohio to Arcadia, 285 mi., the Nickel Plate has four sections of single track, totaling 106 mi., which were equipped with centralized traffic control prior to 1948. Westward from Arcadia it has two principal lines, including both single and double track, one leading to Chicago, 237 mi., and the other to St. Louis, 434 mi. The Chicago line has been protected by automatic signals for many years. The single-track sections on this line are Arcadia to New Haven, Ind., 78.8 mi., on which the C.T.C. construction is nearing completion; and Hadley, Ind. to Van Loon, 120.4 mi., on which, for 33.5 mi.—Hadley to Claypool, Ind.—C.T.C. is now in service.

On the 434 mi. between Arcadia and East St. Louis, where no automatic block was previously in service, the 188 mi. from Arcadia to Frankfort, Ind., are being equipped with centralized traffic control. On the first

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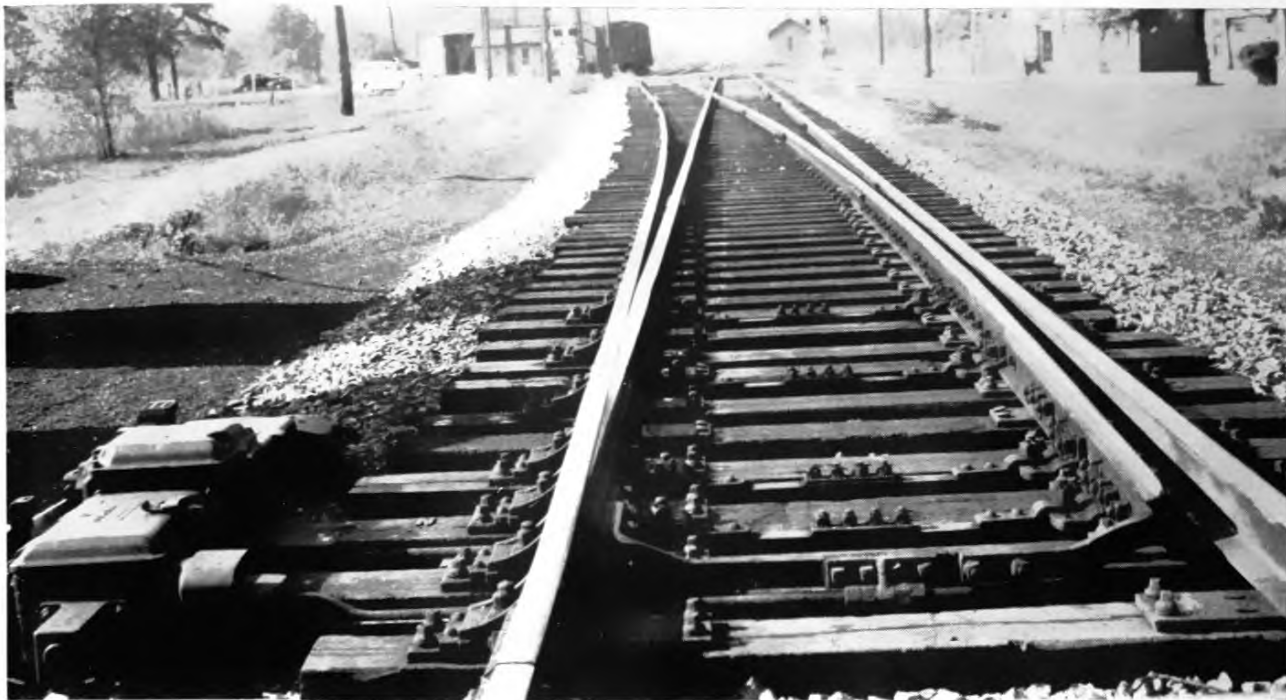
section, 63 mi., between Arcadia and St. Marys, Ohio, C.T.C. has been completed, and on the remainder, 60.8 mi. between Frankfort and Muncie, and the 64.1 mi. between St. Marys and Muncie, C.T.C. is authorized and will be completed during 1949. The completion of this project will provide operation by C.T.C. or double track westward from Buffalo to Claypool and Frankfort. The installation of some form of signaling westward from Frankfort to St. Louis, 248 mi., is being studied.

The C.T.C. control machines in the territory west of Bellevue, Ohio, are in the respective division dispatcher's offices. One machine, in the office of the dispatcher for the Fort Wayne division, at Fort Wayne, controls the Arcadia-to-New Haven section. A second machine, in the office of the dispatcher of the Chicago division, also at Fort Wayne, controls the Hadley-Claypool section, and is designed to control as far west as Van Loon, a total of 120 mi. The machine at Lima, Ohio, which controls the 63 mi. of C.T.C. now in service between Arcadia and St. Marys, is designed to control a total of 188 mi. between Arcadia and Frankfort.

Low Grades and Easy Curves

Generally speaking, the grades are light on the Nickel Plate lines west of Arcadia. Especially between Arcadia and Fort Wayne, and between Arcadia and Lima, the country is prairie, with only slight rolling grades, and comparatively light curvature. From Arcadia to M.P. 361, a few miles east of Fort Wayne, there are 75 mi. of tangent track, except for curves of 4 min. or less. Likewise, on the St. Louis route, the line is tangent from M.P. 58 at Findley to M.P. 86 at Lima, except for a 15-min. curve at M. P. 74. With such relatively light grades and curvature, trains handle heavy tonnage at good speeds.

In addition to operating two passenger trains each way daily on its lines from Arcadia to Chicago and to St. Louis, the Nickel Plate has six scheduled through freight trains each way, with extra sections as required. For example, on the line between Lima and Frankfort, the normal daily traffic includes four passenger trains and from 12 to 18 freight trains, totaling 16 to 22 trains daily. Approximately the same number of



Power switch machines and new No. 18 turnouts facilitate movements entering and leaving sidings

trains are operated daily between Arcadia and Chicago.

Previously, when train movements were authorized by timetable and train orders, the freight trains lost much time waiting on sidings for meets. Also, time was lost when trains reduced speed and stopped to permit trainmen to operate the hand-throw switches. Now, with centralized traffic control, train movements are authorized by signal indication, and the signals, as well as the power switches, are controlled by the dispatchers. The indication lamps on the track diagram of his control machine inform the dispatcher as to the progress being made by each train, and he can control the signals and switches to direct trains to make meets on very close time.

Fewer Sidings

The Nickel Plate's experience with earlier installations showed clearly that traffic can be handled efficiently by C.T.C. with fewer sidings than are required under operation by train order and timetable. Whereas 36 sidings had previously been used between Arcadia and Frankfort, the new project included power switches and C.T.C. controlled signals at only 23 of these sidings. In general, these sidings are about 6 to 9 mi. apart. At 13 other locations, the existing sidings either were removed or left in place with the hand-throw switch stands in service for use as house tracks or switching spurs to serve local industries. In general, the sidings to be power equipped as part of the C.T.C. were lengthened to a minimum of 7,500 ft. where physical conditions permitted.

The signals now in service in these C.T.C.-controlled territories provide a complete range of aspects to direct trains to utilize the track facilities most effectively. With certain exceptions the turnouts at the ends of

double track, and at the ends of the sidings used by through trains, are No. 18, with 30-ft. points, which are suitable for diverging train movements at medium speed. Furthermore, the sidings have been brought up to a standard of construction and maintenance to permit trains to operate on them at medium speed. Track circuits on these sidings are used to control the aspects of signals to direct trains to enter them, and the same circuits control appropriate track-occupancy lamps on the C.T.C. control machines. Each station-entering signal has the equivalent of three operative "arms." The top one is a standard three-unit head. The second is a single-lamp unit that is normally dark, but which can be lighted yellow. The third "arm" is a two-unit head, which displays either red or yellow.

If a siding is unoccupied, when the entering switch is reversed and the station-entering signal cleared for an approaching train to enter, the aspect is red-over-yellow-over-red—Medium-Approach, Standard Code Rule 286. In this instance, the approach signal displays the yellow-over-green, Approach-Medium aspect, Rule 282. Thus the engineman of an approaching train has information which permits him to bring his train up to and through the No. 18 turnout at the speed for which the turnout is designed, rather than entering at restricted speed, prepared to stop short of trains or obstruction.

The sidings are longer than the average length of freight trains, so that trains can be brought to a stop from medium speed before reaching the leaving ends. Thus, the No. 18 turnouts, together with the signaling arrangement, save considerable time for trains when entering sidings.

If a second train in the same direction is to enter an occupied siding, the aspect is red-over-red-over-yellow. Restricting, Rule 290. No signal can be displayed for a train to enter a siding if a train of an opposing di-

rection is already occupying it, or if a signal for an opposing movement is displayed. If such a move must be made in an emergency, special instructions are required.

Since trains operate on sidings and pull out of sidings at medium speeds, it is important that the leave-siding signals display aspects which can be seen plainly by enginemen at a considerable distance in all kinds of weather. In winter, snow frequently obstructs dwarf signals. The Nickel Plate, therefore, has adopted high signals rather than dwarfs for leave-siding signals, and these high signals display aspects helpful in expediting trains. In each instance, the leave-siding signal is on a bracket mast with the main-track station leaving signal. For example, as shown in one of the illustrations, the mast is to the right of the siding so that the main-track signal is on the left and the leave-siding signal is at the right. The leave-siding signal has the equivalent of three "arms," the top one and the bottom one being represented by red marker units. The middle "arm" is a two-lamp head which is normally dark, but which can display either green or yellow. The Medium-Clear aspect, Rule 283, red-over-green-over-red, indicates Proceed — medium speed within interlocking limits. It is displayed when the signal is lever-controlled and two or more automatic blocks ahead are unoccupied, permitting a train to be accelerated to maximum authorized speed as soon as it has cleared the turnout.

The Medium-Approach aspect, Rule 286, red-over-yellow-over-red, indicates Proceed at medium speed prepared to stop at next signal. This aspect is displayed when the signal is lever-controlled with the first automatic block unoccupied, but with the second block occupied by a train of the same direction.

The Restricting aspect, Rule 290, red in the top arm, yellow in the bottom arm, indicates proceed at restricted speed prepared to stop short of train or obstruction.

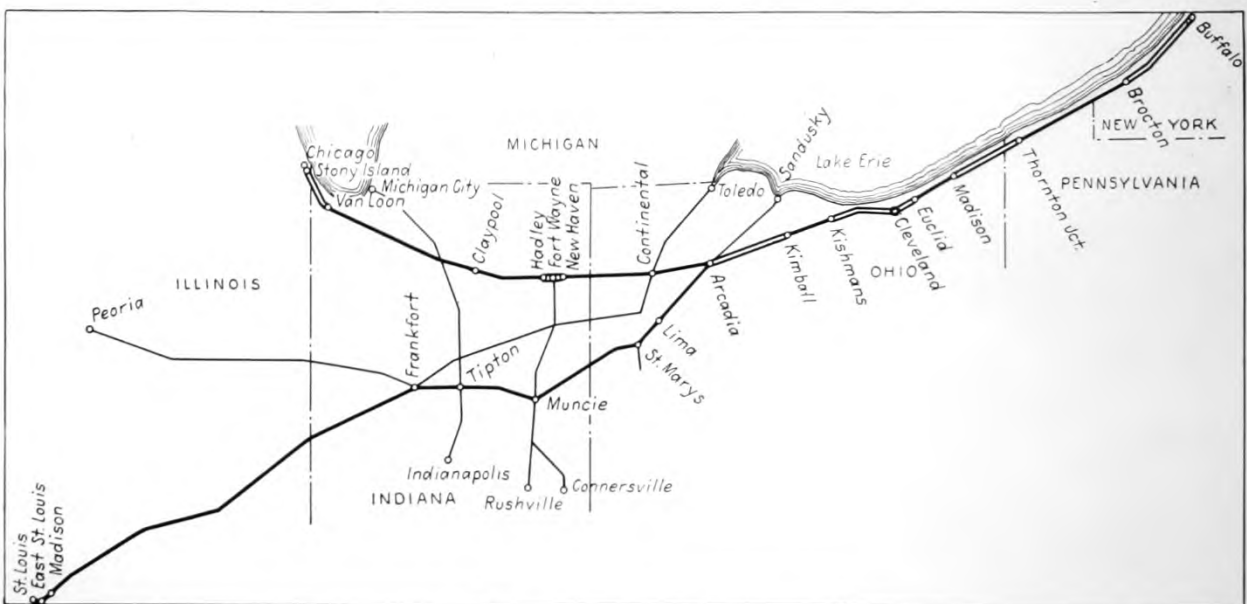
This aspect is displayed when a leave-siding signal is lever-controlled and the automatic block ahead is occupied by a train of the same direction. This aspect is used only at points where it is desired to allow a train, which is waiting on a siding for a train of the same direction to pass, to get under way while the leading train is receding in the first automatic block. This facilitates local switching or station work.

Flashing-Red Aspect

In the yard areas through Lima, there are numerous switching moves which require the switch engines to make movements on the main track. When a road train is to be moved through the yard territory, standard code aspects are displayed on the various home signals for the desired train movements. For such movements the tracks must be clear of trains and the switches properly lined. At other times the dispatcher in charge of the C.T.C. control machine can display "Flashing Red" or "Switching" aspect on certain home signals to permit engines to make the necessary movements past these signals to shift cars, or to change engines and cabooses on standing road trains which are serviced at the terminal. Road trains are not authorized to accept this aspect either to enter or depart from the yard territory.

To clear the main track through the yard for a road train movement, the "Switching" aspects are changed to Red-Stop; a siren is sounded, notifying all yard movements to clear the main track and yard leads; and, after a time delay, if main tracks have been cleared and switches positioned, the proper aspects for road train movements can be displayed. In this way through train movements are protected and yard movers are not delayed unnecessarily.

This centralized traffic control project was constructed under the direction of S. C. Raber, signal engineer.



The Nickel Plate has long stretches of main-line single track (heavy lines on the map)