Single Track with C.T.C. Replaces Double Track on Milwaukee

Because of changes in traffic, use of modern locomotives, and increased capacity due to modern signaling, trains are being handled efficiently on one main track, thus saving $1,500,000 in relaying rail on one track rather than two

New signal track with road bed of previous second track at right

ON 67 miles of road between Green Island, Ia., and Marion, the Milwaukee Road has changed from double-track, equipped with automatic block, to single-track equipped with centralized traffic control. This is a portion of the Milwaukee's route from Chicago west to Omaha, Neb. and Sioux City, Ia. Forty years ago, when the second track was added in this territory, a large number of trains were operated, many of which were short freight trains handling live stock. In recent years, the traffic has changed, the railroads have lost the farm to market live stock traffic and present day traffic can be moved in longer trains at greater time spacing, all of which is adapted to the use of modern high-powered locomotives operating at faster speeds. Thus the number of trains was reduced.

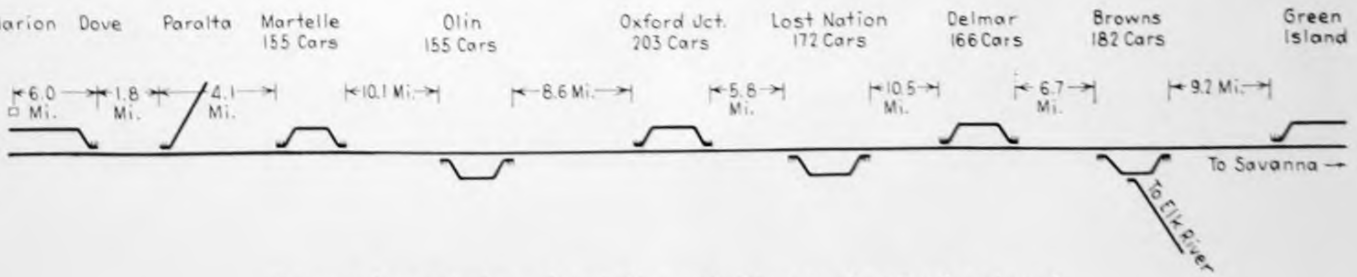
12 to 14 Trains

The Mid-West Hiawatha, high-speed streamlined Diesel day-time passenger train is operated each direction daily, and one night passenger train is operated each way Three time freights are scheduled each way, and a local freight is operated eastward one day and westward the next, excluding Sunday. Including extra trains, a total of 12 to 14 trains operate over the entire territory daily. In addition, trains to and from the Calmar line use the main line between Marion and Paralta.

Rail Due For Renewal

Based on experience on sections of single-track equipped with C.T.C. on other parts of the Milwaukee, the management and operating officers were confident that the present-day traffic on the Green Island—Marion section could be operated efficiently on one main track. The occasion to take action in 1950 was that the rail on both main tracks in most of this territory was due for renewal. The renewal of rail on one track instead of both, on 62 miles, and the installation of C.T.C. saved $1,500,000.

A section of the double track was left in service from Green Island west for one mile, and from Marion east for 6 miles to a new end of double track at Dove. Between Dove and Green Island, six passing sidings were established by using sections of the previous second main track, connected to the new single track main by new No. 11 turnouts with 22-ft. points. These sidings are long, ranging from 155-car to 182-car capacity, and are located at Browns, Delmar, Lost Nation, Oxford Junction, Olin and Martelle. Most of these sidings are through small towns, with industry spurs and

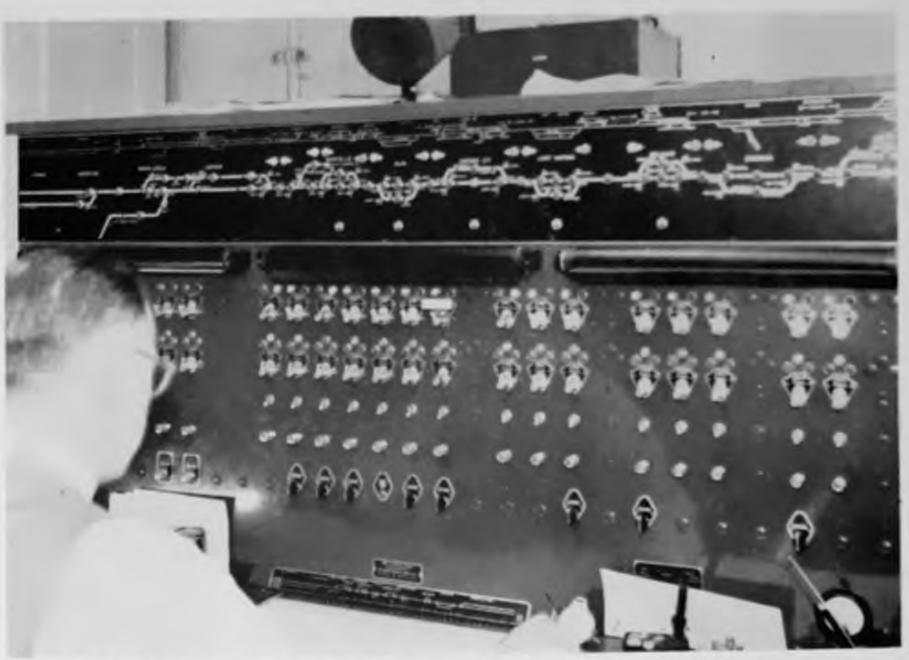


Layout of new single track main line and sidings on the 67 miles of road

Reprinted from April, 1951 issue of Railway Signaling and Communications.

#133

house tracks connected by hand-throw switches to the sidings. This arrangement has the advantage of removing these hand-throw switches from the main track, and a further aid is that the local freight trains can get off the main track onto such a siding and do switching, without interference with through trains on the main track. A possible disadvantage of locating the sidings in towns, was that a train waiting on a siding would block street crossings. Experience has shown, however, that under normal operation, with C.T.C., trains are not held on sidings, except perhaps for a very few minutes. The sidings are much longer than train lengths, and in many instances, the train using the siding does not stop when making a meet.



The control machine for the 67 miles is in the dispatcher's office

At Paralta, a mechanical interlocking was in service at a junction of the main line with a secondary line extending north to Calmar, Ia. As part of the improvements, this interlocking was eliminated, and a section of the old second main was used to move the junction westward 1,432 ft. to a new junction switch which is operated by a new electric switch machine, and this machine, as well as signals at this junction, are part of the new C.T.C. system.

At Delmar, there was previously an automatic interlocking to protect a crossing of a single-track secondary line with the double-track main line. Track changes were made to eliminate this crossing and the interlocking, when changing the main line from double to single track. At Browns, there was formerly a main track switch from the main line to an old line via Elk River. In the new arrangement, this switch is connected to the siding.

Power Switches

These track layouts as revised include power-operated switches at the ends of double track at Dove and Green Island, at the junction at Paralta, and at the two ends of six sidings. These switches and signals at these locations are controlled from the C.T.C. machine in the dispatcher's office. The system includes signals for train operation by signal indication, not only on the single-track between Green Island and Dove, but also for train operation in both directions on both tracks on the 5 miles between Dove and Marion yard.

Single-direction automatic block

New junction layout

Layout at end of siding

The power switch layouts are well equipped with insulated gage plates, rial braces and swivel pin type of switch rods

signaling including upper-quadrant semaphores was previously in service on the double-track main-line. This signaling included conventional d.c. track circuits and line-wire control circuits. When making the recent improvements, all this old signaling was replaced. The new signals are the searchlight type, and the track circuits are the coded type.

When using the C.T.C. control to clear a signal for a station-to-station train movement, a preliminary operation in the field is to cause the track circuits to feed from one siding to the next, in the direction opposite to the train movement. Thus all local signal controls are accomplished by track circuits without line wire circuits. After a train departs, the track circuits are normally energized by steady energy.

The intermediate signals are arranged as double locations, and are spaced approximately 2.5 to 3 mi. apart depending on the overall distance between sidings. The signals including those at the sidings and intermediates are controlled to display three aspects, and controls are arranged for following train movements in a station-to-station block, the same as in conventional a.p.b. signaling.

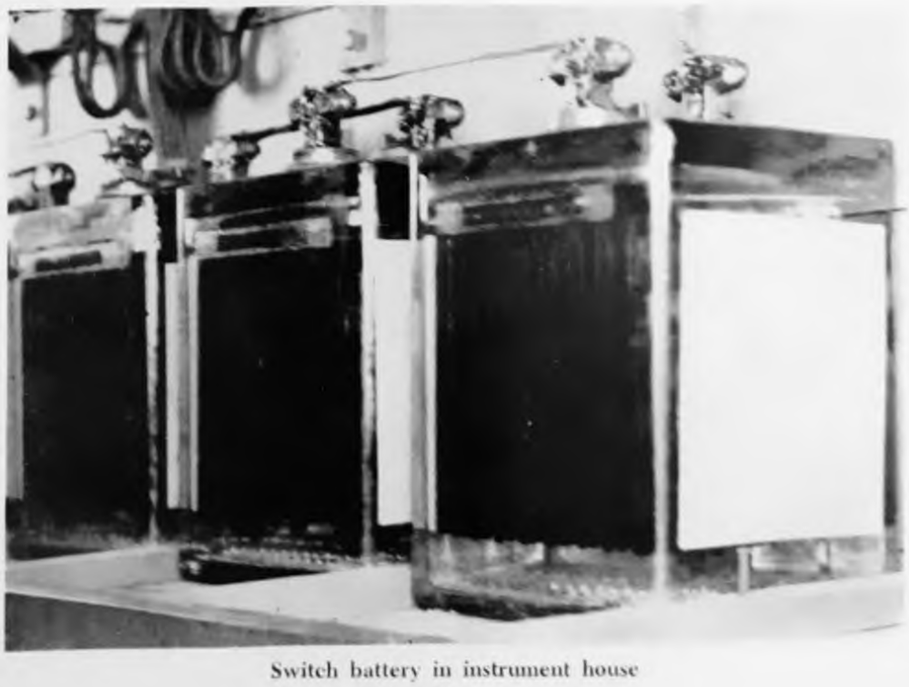
Between Green Island, Iowa, and Browns, where the line parallels a heavily wooded bluff along the Maquoketa River, two No. 10 Copperweld weatherproof wires are used for the C.T.C. code line, and from Browns to Marion this circuit is on two No. 9 bare copper wires, previously used as a telephone circuit. Local signal line control circuits, within passing siding limits, are on No. 10 Copperweld wire, weatherproof. The 220-volt a.c. power distribution circuit is on No. 10 weatherproof copper wire.

Power Supply

At each power switch location a set of 13 cells of 160-a.h. Exide storage battery feeds the switch motor. Eight of these cells are used also to feed the line code equipments. Each coded track circuit is fed by one cell of Edison 80-a.h. storage battery. The switch-detector track circuits use conventional d.c. relays normally energized, and each such circuit is fed by two cells of 1,000-a.h. Edison primary battery. The track circuits are bonded with Cadweld bonds which were installed on all the new rail as it was laid.

The switch layouts at ends of sidings are No. 11 turnouts with 22-ft. points. Each of these switches has four Type M Ramapo vertical-pin tie rods and a Type U U.S.&S. Co. front rod. Each switch has four 1-in. by 10-in. insulated gage plates which are on ties No. 1 and No. 2 to 4 inclusive. Racor Security type adjustable rail braces are used on these ties. In previous practice, the tie plates on two ties were long enough to extend to and be bolted to the lugs on the switch machine. A new practice to save metal is to make the plates all the same length, and, on two ties, to connect the ends of the plates to the machine with lengths of ¾-in. by 3-in. iron bar. In addition to saving metal, this practice has the advantage of making it easier to replace a switch machine.

The buried cable from an instrument house to a switch machine includes five No. 9 and seven No. 14 wires. The connections to the rail are single-conductor No. 9. The wiring inside the houses is No. 14 flexible. The insulated wire and cable on this project was made by the Kerite Company. The wiring connections in the houses and cases were made with Aircraft-Marine solderless connectors. This installation of C.T.C. was planned and constructed by signal forces of the railroad under the direction of L. B. Porter, superintendent telegraph and signals, the major items of equipment being furnished by the Union Switch & Signal Company.



Switch battery in instrument house