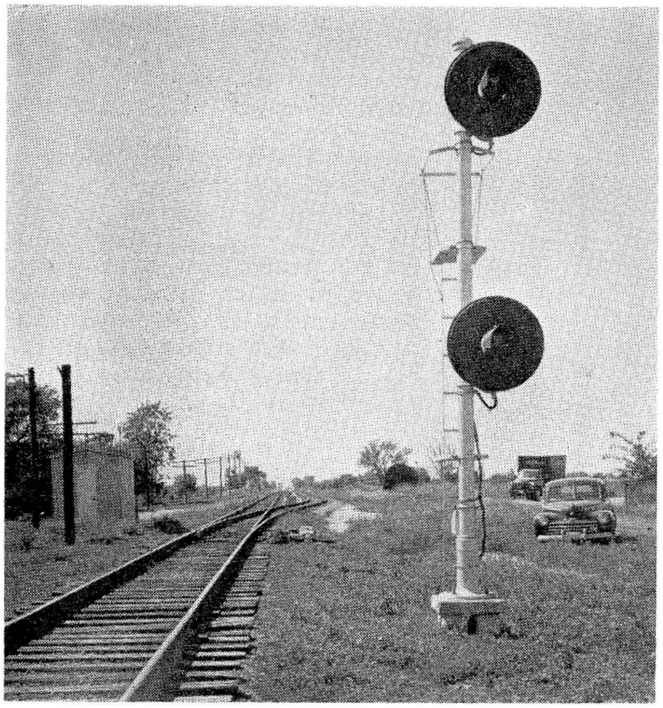
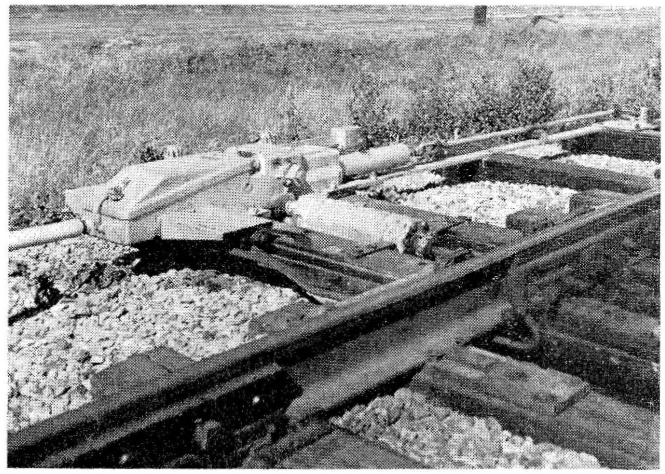


Power switch at one end of siding and . . .



Spring switch at the other end

Railway Signaling and Communications

# Burlington Has Modified CTC

## for Medium Traffic Single-Track

**Power switch at one end of each siding, and spring switch at the other end, is main feature of practice that cuts total cost to fit requirement for operation of 8 to 10 trains daily on "hot-shot" route**

*Editor's Note: A renewed interest in modified forms of centralized traffic control, for use on light-traffic lines, has recently been aroused by advertisements by manufacturers, and by the Panel Discussion at the September annual meeting of the Signal Section, AAR. This article concerning the Burlington's modified CTC is, therefore, timely, as is also the Seaboard article in the October 22 issue of Railway Age and the November issue of Railway Signaling & Communications. Also, reference should be made to diagrams and explanation of Modified CTC on page 764 of the 8th edition of Railway Track & Structures Cyclopedia and to an article concerning modified CTC on the Canadian National in the April 1953 issue of RS&C.*

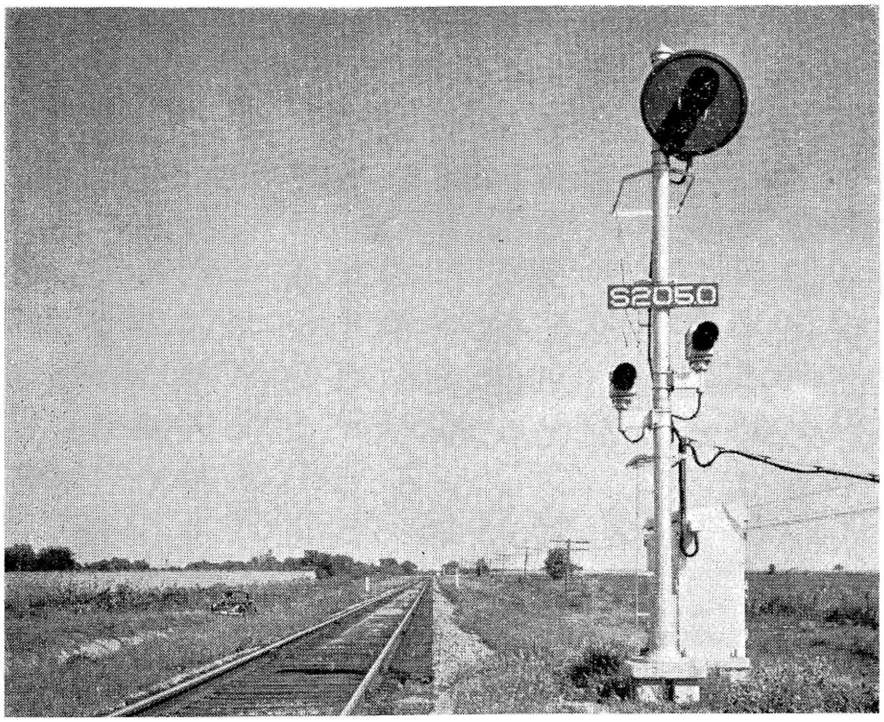
A MODIFIED ARRANGEMENT of centralized traffic control, designed to reduce first costs in proportion to requirements of comparatively light traffic, has been developed and installed extensively on the Burlington, the most recent project being on 69 miles of single track between the west end of Bushnell, Ill. and Carthage Junction which is near Quincy, Ill.

Previously no signaling was in service on 44 miles of this section of single track, the siding switches being hand-thrown, and train movements were authorized by timetable and train orders. Some form of track-circuit-controlled signaling was desired.

Experience on the Burlington showed that conventional automatic block gives protection, but necessitates the continued use of timetable and train orders to authorize train movements. On the other hand, this road has proved that the practice of authorizing train movements by signal indication, in centralized traffic control territories, is a means of saving train time, increasing track capacity and improving safety. Thus for the Bushnell-Carthage Jct. territory, the objective was to adopt a form of centralized traffic control that was modified according to the requirements of medium to light volume of traffic, and by this modification to reduce the equipment required, so that the cost would be not much more than for complete system of conventional automatic block, thereby being within the expenditure authorized for signaling in this territory. As applying to similar circumstances on other extended sections of single track, the Burlington, several years ago, had arrived at these same conclusions, and in 1950 had developed the modified CTC as above discussed, a major project on 240 miles between Ravenna, Neb. and Alliance, having been completed in 1951.

### What is the Modification?

As compared with conventional CTC, including a power switch and three signals at each end of every siding, the modified system as installed on the Burlington, has a power switch at only one end of each siding; a spring switch being used at the other end. The layout at the power switch includes the usual arrangement of three controlled signals. At the spring switch end, there is a leave-siding signal and a special take-siding aspect on an intermediate signal. One advantage of this modified arrangement is that all the controls for an entire siding can be handled by one field




**Special aspect directs train to enter siding at hand-throw switch**

coding station. Such an installation reduces the cost, at sidings, about 35 per cent, compared with a power switch and complete signaling at both ends, as installed on territories with heavier traffic elsewhere on the Burlington.

## An Aspect that Obviates a Signal

As a general rule, trains are directed by the dispatcher to enter a siding at the power switch end, and to depart at the spring switch end. However, signaling is arranged to enter at the spring switch end if the dispatcher decides that train time can be saved. Thus this result is accomplished in the Burlington system by adding an aspect to an existing signal.

Referring to the typical track and signal plan in Fig. 1, when the dispatcher decides that an eastbound train is to be directed to enter the spring switch end of the siding at station A, he sends out a control code that causes eastbound signal S-196.2 to display an aspect of "red over two lunar lights." The lunar lights are 3 ft. apart, at an angle of 45 deg. Also, the next signal in approach, S-202.8 displays the approach aspect, yellow. These aspects direct an eastbound train to pass signal S-196.2, and stop just short of the switch at the west end of siding A. Then a member of the crew reverses the switch by means of the hand-throw stand so that the train can enter the siding; returning the switch to normal at completion of the movement. Insofar as opposing train movements are concerned, the overall siding-to-siding block is from one power switch to the next as for example the 10 miles from signal 104L at siding A to signal 100R at siding B. Intermediate signals permit trains of the same direction to follow in the same siding-to-siding block.

Referring to Fig. 1, signal S-196.2 was located far enough west to make the block between this signal and eastward signal is 2 miles, which is equal to train stopping distance plus a safe margin at this location.

Representatives of the operating, engineering and signal departments cooperated in determining the end of each siding at which the power switch was to be installed, to fit in with train operations and grades. In general the decision was on the basis that loaded trains in the direction of preponderance of traffic are to hold the main, and lose very little time in making meets. Other factors being equal, the power switch is at the east end of one siding, and at the west end of the next one. The siding turnouts are No. 15 with 30 ft. points, good for speeds up to 30 mph.

## What is Medium Traffic?

With reference to single track lines, the Burlington applies the terms "light-traffic" "medium traffic" or "heavy traffic" on the basis of several factors: (1) average number of train movements; (2) train interference, based on number of meets and passes in territory being studied; and (3) tightness of schedules as part of overall run between major cities.

The daily traffic at the Bushnell-Carthage Jct. territory includes three passenger trains each way, three through freights southward and two northward, with a local freight northward daily except Sunday. About 45 extra freight trains are operated each month. Thus an average of about 13 trains are operated daily.

This 69 miles between Bushnell and Carthage Junction is a portion of a 466-mile route of the Burlington between Chicago and Kansas City. Fast passenger trains make this run in 8 hours, including nine scheduled stops. Scheduled freights make this run in about 12 hours. These are hot schedules, and are maintained on an on-time basis to meet competition. The two fast overnight passenger trains, as well as two manifest freights, all regularly meet in the 69 miles between Bushnell and Carthage Junction.

As explained by the dispatcher, the CTC has proved to be the means of saving train time in numerous instances. For example, the meet between the two opposing

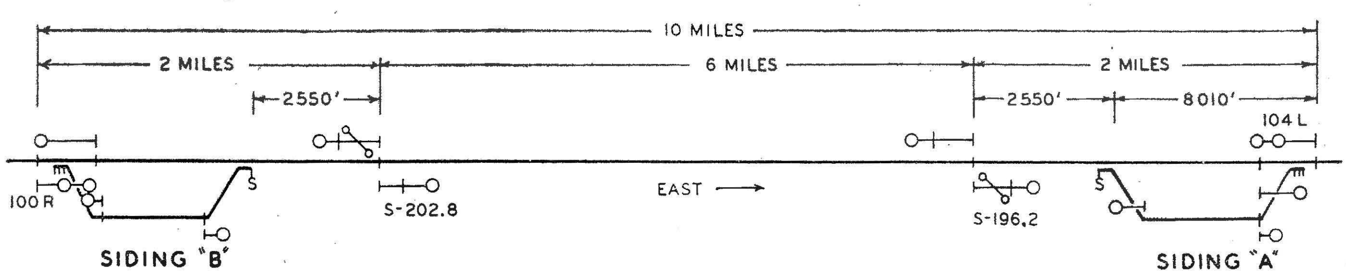



**Fig. 1—Typical layout of modified centralized traffic control as applied on the Burlington**

day passenger trains has been advanced about 35 miles, which saves about 30 min. for one of these trains. The eastward manifest freight No. 70 was previously held at West Quincy for a meet with westbound passenger train No. 35. Now, with the CTC, the regular practice is to advance No. 70 up the hill 6 miles to the siding at Ewbanks, to meet the No. 35; which saves at least 25 minutes for the No. 70 most every day. As stated by the dispatcher, he uses the CTC effectively to get the local freight train over the territory much faster than previously. This is important when making connections with through trains at Galesburgh.

### Several Sidings Discontinued

Prior to the installation of the CTC the sidings at Macomb, Colchester, Augusta, Camp Point and Ewbanks were lengthened to 140-car capacity, and at Golden to 130 cars. These five sidings were equipped for CTC. Three other sidings ranging from 48 to 55 car capacity, and 14 other shorter sidings range from 17 to 28 car capacity, were left with hand-throw stands. The CTC control machine is in the dispatcher's office at Galesburgh.

### Locks on Hand-Throw Switches

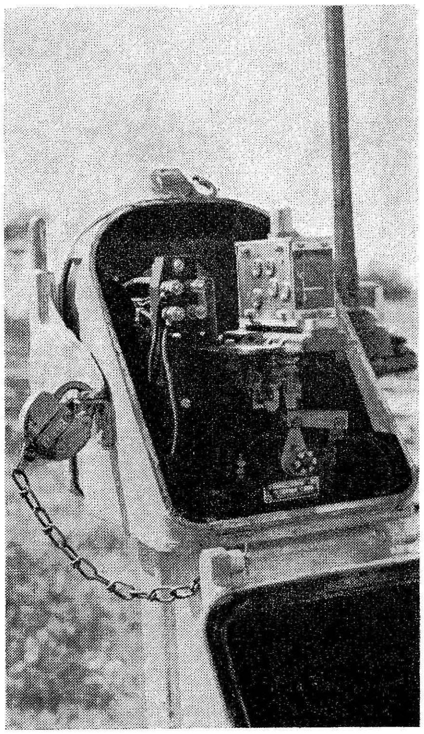
As part of the CTC project between the south end of Bushnell and Carthage Jct. locks were installed on main track hand-throw switches. Electric locks of the automatic unlock type in combination with track circuits, were installed at the 13 switches which are used most frequently by the local freight crew, and mechanical type locks were installed at the remaining 26 switches which are used less frequently.

Each mechanical type lock is controlled locally by a mechanical time release. When the conductor of a train crew has permission from the dispatcher to use such a switch, he unlocks the padlock and opens the front door of the lock. This action shunts the track, thus causing the signals in each direction to display the red aspect. Then he moves the lever to the preliminary position (about 7 deg.). This starts the mechanical timing device, set at a predetermined time. After the time has expired, the mechanical device lifts a toggle, thereby effecting mechanical release, as is indicated by display of "Unlock" to a member of the crew. Then he can complete the operation of the crank which pulls the plunger out of the lock rod. Later, when he restores the plunger to its normal position, he also thereby rewinds the mechanical-type time release device.

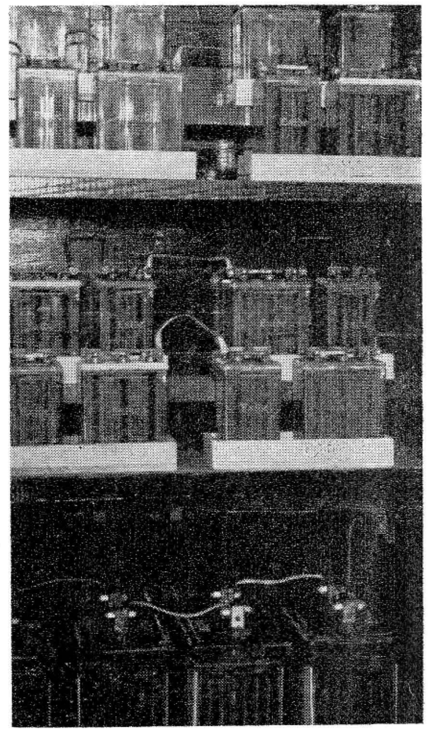
Single Track Modified CTC on Burlington Lines

| | Year Installed | Miles | Number of Trains Pass. | Frt. |
|---|---|---|---|---|
| Alliance, Neb. to Ravenna | 1951 | 240.4 | 4 | 5 |
| Esteiline, Tex. to Wichita Falls | 1955 | 125.9 | 4 | 8 |
| Bushnell, Ill. to Carthage Jct. | 1955 | 69 | 6 | 7 |
| Mark, Mo. to Macon | under construction | 64.8 | 6 | 9 |

On other parts of the railroad where heavier traffic is operated, the Burlington has conventional CTC with power switches at both ends of sidings on a total of 1,019.4 miles.



Mechanical type switch lock



Storage batteries at control office

### Switch Layouts Well Built

New switch layouts with No. 15 frogs were installed at the ends of CTC controlled sidings. For the power operated switch, Racor adjustable rail braces and three Racor vertical-pin type rods were installed. For the spring switch, Racor adjustable braces and five Racor vertical pin type rods were installed, a GRS roller bearing was installed in each spring switch.

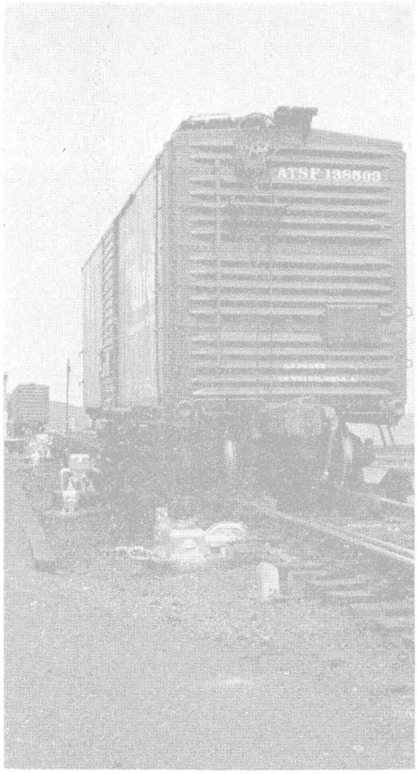
The switch points are 30 ft. long, and in order to insure that the entire length moves over properly, an auxiliary throwing device, made of pipes and cranks, extends from the switch machine to a second operating rod 15 ft. 6 in. from the point. A special switch circuit controller checks the operation of the middle section of the points.

At each of the spring switch layouts, a new GRS Type A switch stand was installed, which, in effect, is a manually-operated switch and lock movement including an automatic mechanical facing-point lock with a release for trailing moves from the siding. A Pettibone-Mulliken oil buffer spring mechanism is connected in the switch operating rod.

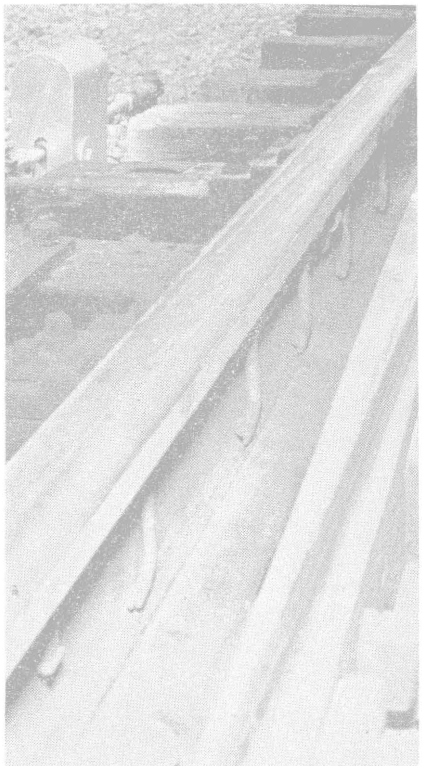
### Power Supply

On this territory a.c. power at 220 volts is distributed from various locations on a pair of No. 6 copper wires. Low-voltage transformers feed through rectifiers to charge storage batteries which are the lead type, some made by Exide and the remainder by Gould. At

(*Continued on page* 21)



Four retarders handle 15 class tracks



Snow blower control valve and nozzles

tions of these signals are repeated on the retarder operator's control machine panel. The hump radio net includes the yardmaster, hump conductor and the three hump engines.

### Detector Checks for Broken Wheels

Two "Wheel Checkers," one for each rail, are located at the crest of the hump to detect broken wheels. When one of the "fingers" of the detector fails to be depressed properly, because of a break in the tread or flange of a wheel, the detector actuates an alarm system whereby a bell rings in the yardmaster's office and a red warning detector lamp is lighted on his communications' console. The retarder operator also has a detector warning lamp on his control machine. Identification of the car having the broken wheel is fairly easy because the pin puller uncouples the cuts just before they pass over the wheel checkers. Upon hearing the detectors' warning bell the yardmaster looks up to see the car or cut leaving the detector, and then calls the car inspector foreman to tell him the car numbers and classification track so that he can inspect them.

A one-rail retarder is in approach to the beam scale so that single cars can be properly slowed so as to pass over the scale at 2 mph. Normally this scale is open, being manually controlled by the retarder operator for weigh cars.

The classification track switches are the electro-pneumatic type which go over in 0.6 sec. Considerable snow falls in this yard, it being in a river valley. To keep switches free of drifting and falling snow, Racor snow blowers have been installed on all classification track switches. These blowers use compressed air at 90 psi which is blown out of nozzles mounted on the gauge side of the stock rail along its web. The snow blowers are controlled by a toggle lever on the retarder control machine panel, but for periodic checking of their operation, a test panel and controls are in the retarder and automatic switching control relay housing. Here the maintainer can turn on each blower individually and receive an indication that it is operating properly.

The automatic switching equipment, retarders, classification track switches, as well as relays and other signaling equipment and controls were furnished by the Union Switch & Signal division of Westinghouse Air Brake Co. The engineering, planning and installation of the signaling facilities at Stevens yard was undertaken by C&O signal department employees under the jurisdiction of T. L. Carlson, superintendent of signals.

## Burlington Has Modified CTC

(*Continued from page* 17)

each power switch there is a set of 12 cells of 80-a.h. battery, and at each intermediate signal there is a set of 5 cells of 60-a.h. battery. At the control office the code line is fed by a set of 35 cells of 8-a.h. battery. Two sets of 12 cells each of 280-a.h. battery feed the local circuits at the office.

### Concrete Houses at Field Stations

At each field station, such as at the end of a power siding, there is a 6 ft. by 9 ft., or 8 ft. by 10 ft.—depending upon the requirements—Massey concrete house for relays, code equipment and batteries. These houses were wired complete with relays in place, in the signal shop at Aurora, Ill. The relays were strapped down during shipment. Sheet-metal cases, also wired in the shop, are used at intermediate locations.

The wire for the battery circuit to switch machines is No. 6 ordinarily, but if the run is more than 500 ft., No. 4 wire is used. The cables from a house to a switch machine ordinarily include an eight-conductor No. 12; and one two-conductor No. 6. From a house to a two-arm signal, the cables include one two-conductor No. 8 for lamp circuits; one six-conductor No. 12; and one four-conductor No. 12. The track connections are single-conductor No. 8.

### Trencher "Digs In" Buried Cable

On this project a large percentage of the trenches for buried cable were dug with a Barber-Greene self-propelled power trenching machine. At locations where it was necessary to cross tracks, a power boring machine was used to drill a 4-in. hole through the dirt fill under tracks and then the cable was pulled through. This avoided unnecessary disturbance of ballast. Where the ground was not firm enough for boring, a pusher was used to push pipe through fills.

This CTC was planned and installed by railroad forces under the direction of A. L. Essman, chief signal engineer, Chicago. The major items of signal equipment were furnished by the General Railway Signal Company.