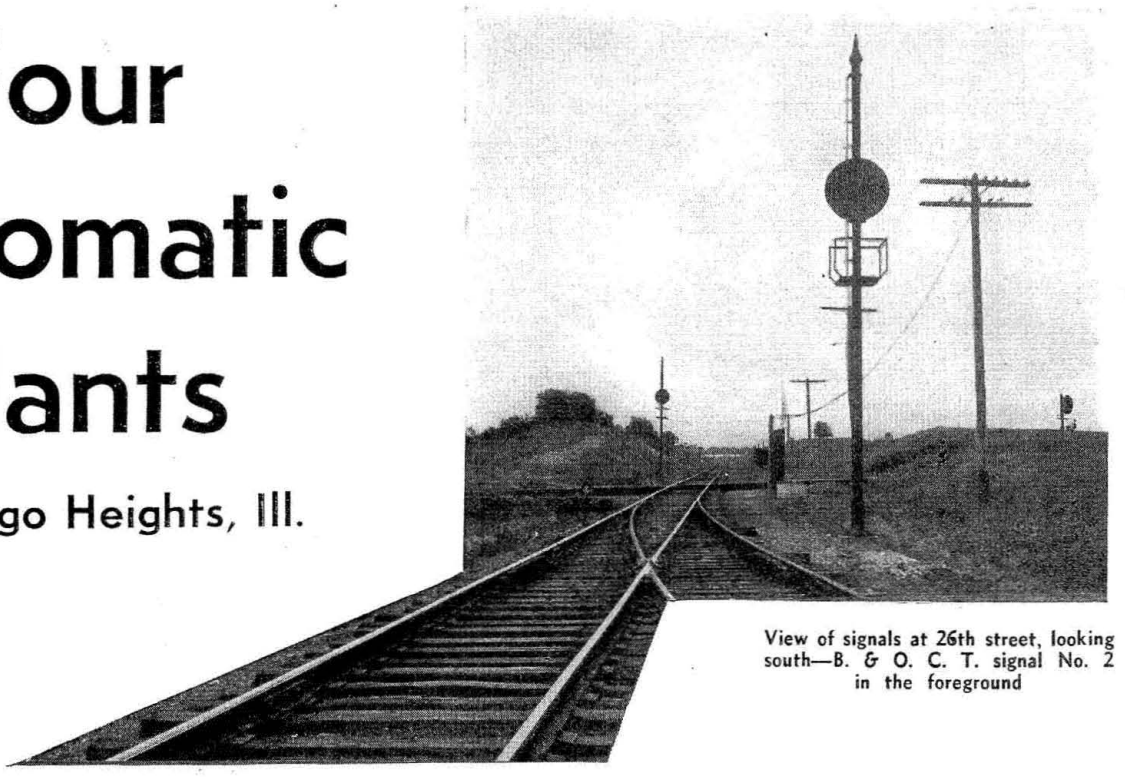
B. & O. C. T. Stops Theft of Coal with

Four Automatic Plants

at Chicago Heights, Ill.



View of signals at 26th street, looking south—B. & O. C. T. signal No. 2 in the foreground

Resulting annual saving, together with reduction of losses due to train stops, will pay for interlockings in less than two years

FOUR automatic interlocking plants of an extremely simplified type, completed in January 1932 by the Baltimore & Ohio Chicago Terminal Railroad on a freight line in Chicago Heights, Ill., have most effectively achieved their twofold purpose. One of the objectives was to eliminate the cost of stopping all trains at each of four railroad grade crossings. The other objective was to stop the wholesale stealing of coal from the many trains which were required to stop at these crossings. Formerly, the only crossing protection was that provided by "Stop" boards and red lights.

Coal Thieves

The line in question is a freight connection between the B. & O. C. T. and the Chicago, Milwaukee, St. Paul & Pacific's line extending from Chicago Heights to the coal fields near Terre Haute, Ind. In normal times the Milwaukee operates about five coal trains each 24 hours over this line through Chicago Heights, as well as a few merchandise freight trains. The B. & O. C. T. uses this line only for switching service.

For years a very costly and annoying condition existed at Chicago Heights. Coal was stolen in enormous quantities from the stopped and slow-moving trains. As many as 200 thieves would board the trains, in daylight as well as at night, and throw off as much as 50 tons of coal while the crossing stops were being made. It was necessary to send armed police through Chicago Heights with each shipment, but even this policy did not effectively solve the problem. A logical remedy was to install an automatic interlocking at each of the crossings, in order to permit the trains to run through without stopping. As stated in the opening paragraph, this has been done, and the results have been eminently satisfactory. It is still necessary to send an armed policeman through Chicago Heights with certain shipments of coal, but the theft of this commodity has been almost entirely eliminated. Added to the saving thus effected is the appreciable but not so tangible saving resulting to the railroad from the elimination of thousands of train-stops annually, and the benefits derived by the municipality from the reduction of highway congestion at the street crossings in this territory, since trains now clear these street crossings in much less time than was formerly required.

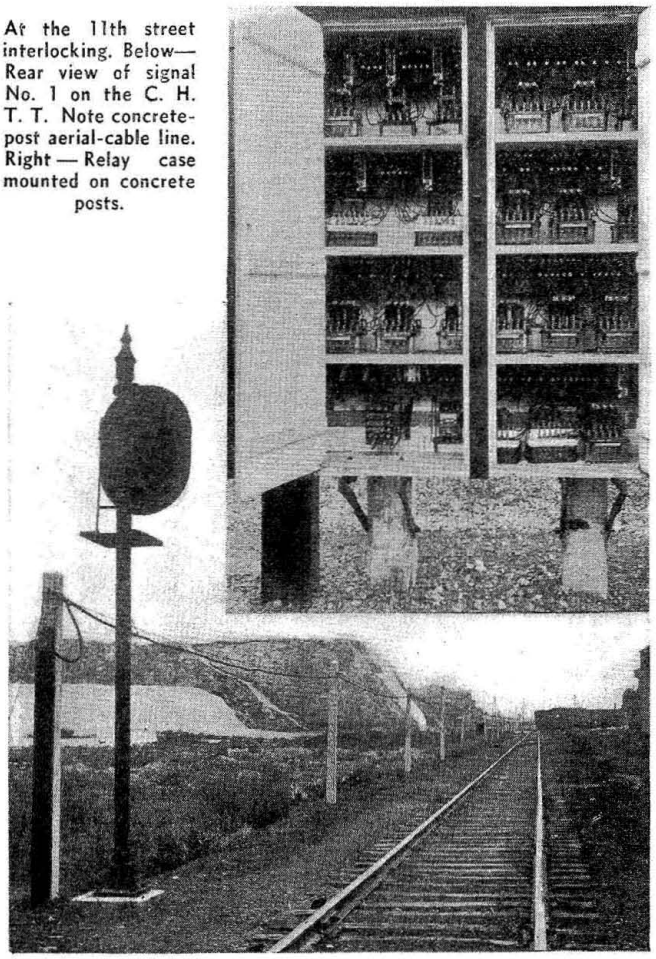
Location and General Features

The automatic plants are located at 26th, 22nd, 17th and 11th streets, all of them being within a distance of

two miles. In each case the B. & O. C. T. crosses the Chicago Heights Terminal Transfer Railroad, now part of the Chicago & Eastern Illinois. The plant at 26th street is a crossing of two single tracks, slightly complicated by the presence of two side-track switches. At 22nd street the track layout is somewhat more complicated, consisting, in effect, of the double-track B. & O. C. T. line crossed by a crossover extending between two lines of the C. H. T. T. which are parallel to and on either side of the B. & O. C. T., as shown in the track-and-signal diagram. The plant at 17th street is essentially a single-track crossing, with side-track switches, and with a secondary track extending over the crossing, train movements on the latter being protected by a mechanical gate arrangement. The 11th Street plant is a simple single-track crossing without any complications whatever.

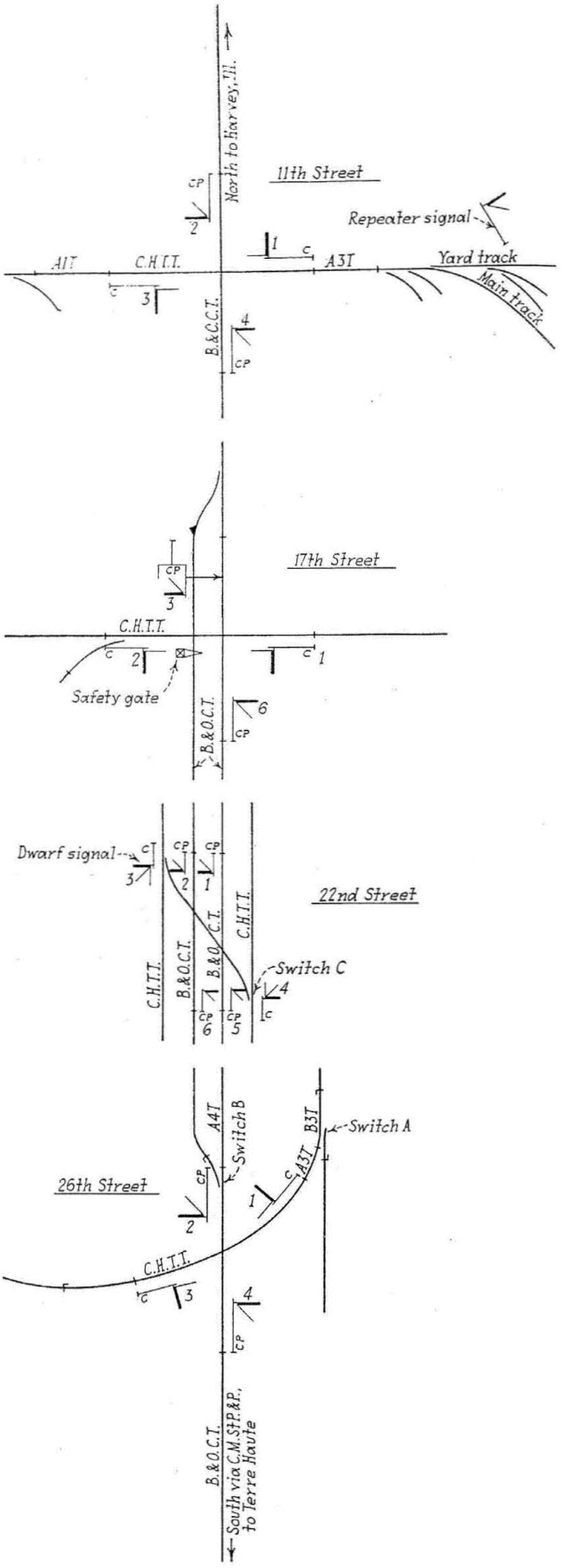
Important Characteristics

At each crossing the signals are located within 100 ft. of the intersecting tracks. Approach or distant signals are not used, partly because train movements through this territory are restricted by time-card order to 15 m.p.h. The approach track circuits on the B. & O. C. T.



At the 11th street interlocking. Below—Rear view of signal No. 1 on the C. H. T. T. Note concrete-post aerial-cable line. Right — Relay case mounted on concrete posts.

are approximately 2,000 ft. long; on the C. H. T. T. they vary from approximately 250 to 350 ft. in length. Color-position-light signals are used on the B. & O. C. T. and color-light signals on the C. H. T. T. Most of the signals are of the two-position type and, with the exception of the four dwarf signals on the B. & O. C. T. at 22nd street, all the signals are of the high type. Time releases are the media for emergency operation of the plant by trainmen. Where conditions permitted, the signals are approach-lighted. The signals on the C. H. T. T.



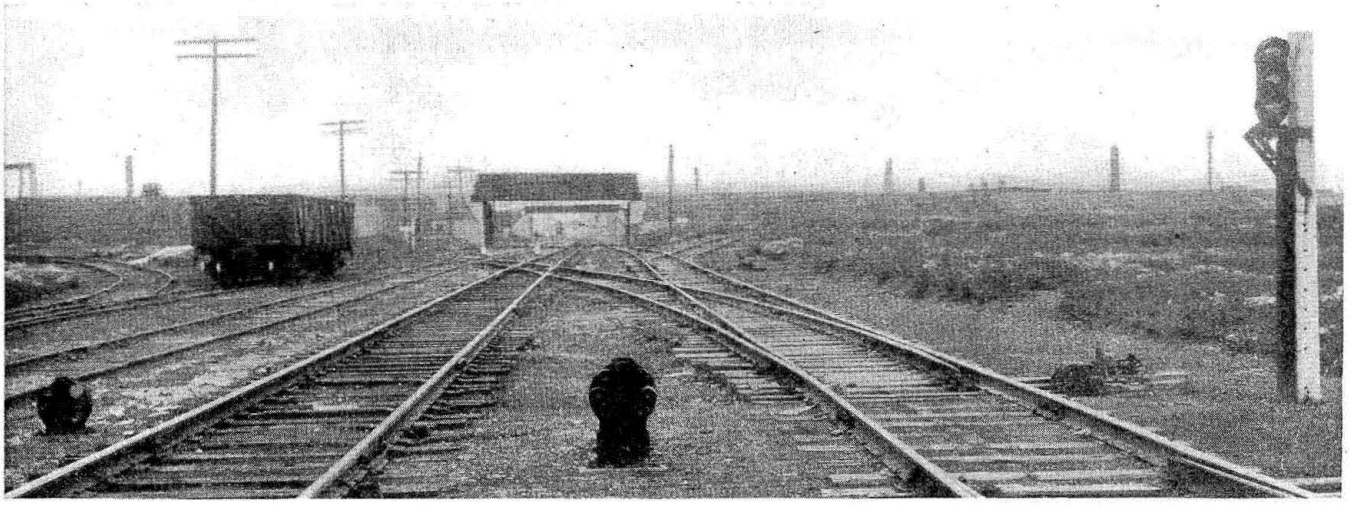
The problem presented by the presence of local complications was successfully solved

at 11th street and at 17th street, because of the short length of the track circuits, are continuously lighted, normally displaying the Stop indication.

Local Complications

The presence of passing tracks and industry spurs and the number of switching movements in this territory introduced a few circuit complications, some of which are of interest. At 26th street, approach track-circuit *B3T-A3T* is selected through the switch circuit controller in such a manner that when switch *A* is reversed, to permit switching movements not involving the crossing, signal *1* will not clear even when approach circuit *B3T* is occupied. Fig. 1 shows how this is accomplished. Switch *B*, in the southward B. & O. C. T. approach circuit at this plant, is wired so that a repeater of approach track-circuit *44T* will be de-energized when the switch is reversed, thus permitting signal *2* to be cleared for a southward movement out of the side track.

In effect, the 22nd Street plant is a double-track line crossed by a single track. Signal *4* at this plant is normally green, to permit switching movements not involving the crossing. When switch *C* is reversed, the approach relay for the crossing is de-energized, and, if conditions are proper, signal *4* changes to yellow, the indication for a movement over the B. & O. C. T. tracks. Signal *3* is similarly controlled.



View of plant at 22nd street, looking north—Signals (left to right) No. 6, 5 and 4 in foreground—Signal No. 4 is in effect a dwarf signal, but was raised to improve its visibility

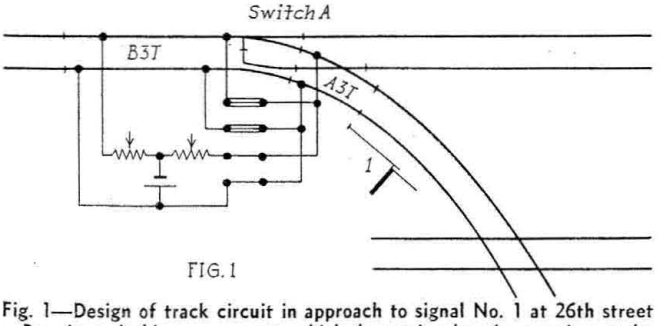


FIG. 1

Fig. 1—Design of track circuit in approach to signal No. 1 at 26th street—Permits switching movements which do not involve the crossing, to be made without tying up the plant

Manual Control of Home and Repeater Signals

At 11th street the westward approach on the C. H. T. T. curves sharply, as shown in the track-and-signal plan, making it necessary to provide the auxiliary repeater signal shown, in order to convey the indication of home signal *1* to an engineman who is approaching but unable to see this home signal at the crossing. The location of this repeater signal is unique, in that it is separated by two yard tracks from the track on which it governs train movements. It is a one-color (green) signal and is normally dark, the indication corresponding with the Stop indication of home signal *1*. In a control box at this repeater signal are two push-button switches for the use of the trainmen. One of these switches is for clearing the home signal (and thus simultaneously clearing the repeater signal), and the other is for releasing the route in the event that the contemplated movement over the crossing is not made. At the east end of approach circuit *A3T* and at the west end of *A1T*, in this same plant, a push-button switch, mounted in a wooden case, is provided for the purpose of enabling trainmen to leave cars standing on the approach circuits without tying up the plant.

Concrete Pole Line

Concrete cable posts (illustrated) carry the wires which are used for the repeater signal and special control circuits described in the preceding paragraph. These posts were made at the Baltimore & Ohio Railroad Company's signal reclamation shop at Zanesville, Ohio. Hazard aerial cable carries the control and repeater signal circuits on the westward approach, while only two open line wires are required for the control circuits on the eastward approach.

In order to minimize malicious tampering with certain signals, ladders were not installed. However, at 17th street a portable ladder is stored for the use of the maintainer, although he rarely finds it necessary to use the ladder, as he is able to climb the comparatively short masts without difficulty.

A-C. Floating System

With the exception of a few track-battery locations where a-c. power is not readily available, and where Waterbury 500-a.h. primary batteries are used, the a-c. floating system of power supply is used throughout, the 110-volt a-c. power being purchased at two points and transmitted over two No. 6 open line wires to the various

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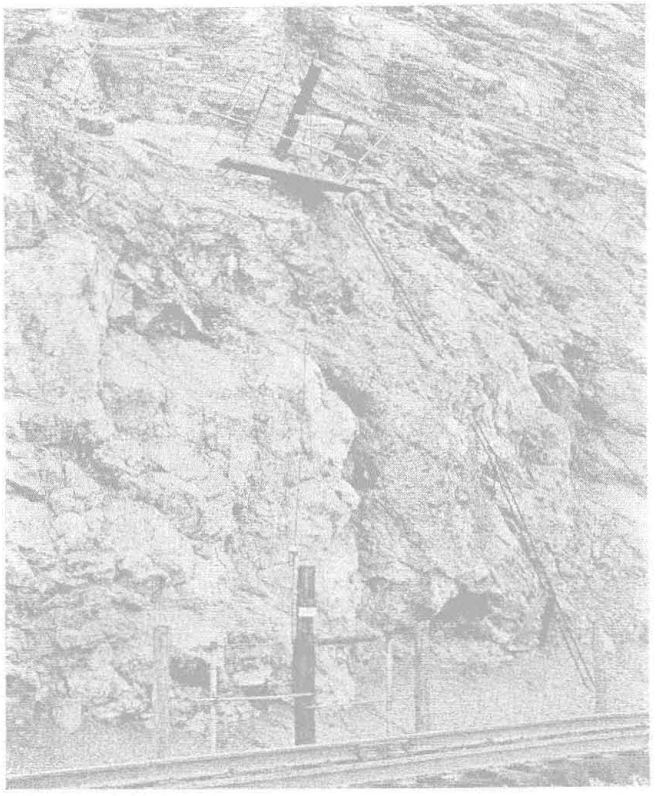
All circuit controller stations above the track level are reached, where necessary, by either wooden stairs or steel ladders, anchored to the face of the cut or bluff, and each station is provided with a working platform, suitably guarded by pipe railing, to insure the safety of the men charged with the examination and resetting of the controller.



Two circuit controller stations, one in a fence at the track level and the other, reached by a steel ladder, in a fence about half-way up the cut slope

Air drills, supplied with air from portable compressors at the track level, were used to drill for the shooting necessary in preparing the post holes and the holes for anchoring the platforms at the controller stations. The use of scaffolding or life lines was also necessary at many points in actually setting up the fences. This work was done largely by the bridge maintenance forces of the road because of their familiarity with rock excavation and the methods which had to be employed at many points. All electrical wiring and signal work, on the other hand, was done by the signal department forces. In spite of the difficulties encountered in the fence construction, the average cost of the fences, including all wiring and signal connections, has been only about $1 a lineal foot.

Inspection of Fences

Inspection of the fences and their operating mechanisms is largely in the hands of the signal department, while any sizable repairs to the fences themselves are made by the forces which constructed them. Signal maintainers, passing over their territories on motor cars, can observe the condition of the fences without difficulty. If any of the control mechanisms have been operated, the cause of the operation is removed, if possible, and the circuit controller contacts are restored to their normal positions. If the aid of the section forces is required in any of this work, these forces are called upon.

If a train is stopped through the operation of any of the fence installations, it proceeds under caution until it is beyond the restrictive territory of the signal. The engineman reports the stop indication to the nearest towerman or despatcher, who immediately notifies the signal maintainer.

All of the fence installations on the Norfolk & Western were designed and installed under the general direction of W. P. Wiltsee, chief engineer, with all signal matters in direct charge of D. W. Richards, signal engineer.

Four Automatic Plants on B. & O. C. T.

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plants. Exide Type-EMGO-7 storage cells are used on the a-c. floating track circuits, with Balkite Type C-1 rectifiers. Six Exide Type-EMGO-5 cells are used in each operating battery, charged by a Balkite Type C-1 Form-B rectifier.

Ten-volt 18-watt precision-base lamps are used in the color-light signals on the C. H. T. T. The color-position-light signal lamps on the B. & O. C. T. are rated at 13½ volts, 17 watts. All lamps are renewed after an estimated service life of 1,000 hrs.

Construction Details

The names of several manufacturers appear in the list of materials. Of the bootleg outlets several were made by the Railroad Accessories Corporation, a seven-strand track-connector being used. General Railway Signal Company and Railway Supply Company relays are used. The wooden relay cases are mounted on concrete poles of the type described in connection with the concrete cable-post lines. The switch boxes were manufactured by the General Railway Signal Company. All of the signals were supplied by the Union Switch & Signal Company. Single-end insulation is standard in B. & O. C. T. rail joints; double-end insulation is used on the C. H. T. T.

Designed under the direction of G. H. Dryden, signal engineer of the Baltimore & Ohio, and installed under the supervision of C. O. Seifert, signal supervisor of the B. & O. C. T., the four plants were erected at a cost of approximately $21,000, which was borne entirely by the C. M. St. P. & P. All four plants are maintained by and at the expense of the B. & O. C. T. Maintenance costs are low, as it was not necessary to increase the force as a result of this installation.

Signal cabin and floodlighted tracks on the New Zealand Railways