

Three Steps in the Signal Transformation Recently Effected on the C. B. & Q., the Center Illustration Showing the Completed Job

Color-Light Signal and A. C. Floating Change-Over on the Burlington

Primary Batteries and Lower Quadrant Double Arm Semaphore Signals Removed Between Chicago and Aurora

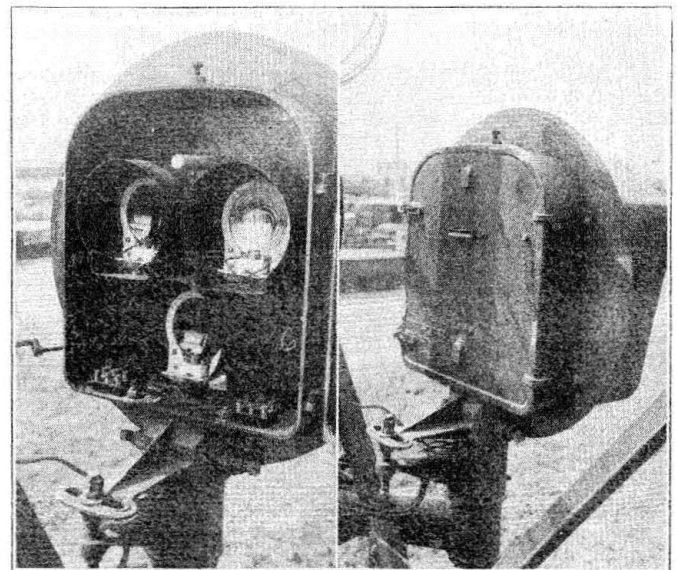
ON the 36.6 miles of three-track main line between Chicago and Aurora, the Chicago, Burlington & Quincy has recently completed a change in signaling facilities that involved the replacement of 368 Hall Style-K, 60-deg. lower-quadrant double-arm semaphore signals with triangular type color-light signals, and of primary batteries with an a. c. floating system. The semaphore signals had been in service since 1914. This project was actually carried out in two stages, the first including the replacement of oil lamps and primary batteries with the combination of electric lamps and an a. c. floating system and the second, the removal of the Hall Style-K, lower quadrant signals and the installation of color-light signals. The first stage of the work was started in 1923 and completed the following year, while the second stage was started about the middle of 1925 and is now practically finished.

Changes in Battery Power Supply

Formerly five cells of 500-a. h. primary battery connected in multiple were used on each track circuit, of which there were, on the average, three between bridge locations. After the installation of the a. c. floating system the number of track circuits was reduced to an average of two per signal and one cell of 120-a. m. lead battery was used per track circuit. For operating and line circuits, four sets of 500-a. h. primary batteries with 16 cells per set, were formerly used at each bridge. These were replaced with five cells of 120-a. h. lead storage battery at each bridge location. Both Exide and Prest-O-Lite storage batteries were installed on this job. About 25 primary battery wells were released for service elsewhere on the railroad.

On this 36.6-mile section of line, on which the a. c. floating system is used, power is furnished to the railroad at 17 different points along the right-of-way.

In many cases there is an individual connection to the power company's system at each bridge location which is possible, largely because of the presence of a rather extensive distribution system in this suburban area. As a matter of fact, the only transmission



Left—Rear View of G.R.S. Triangular Light Signal
Right—Same Signal with Cover Closed

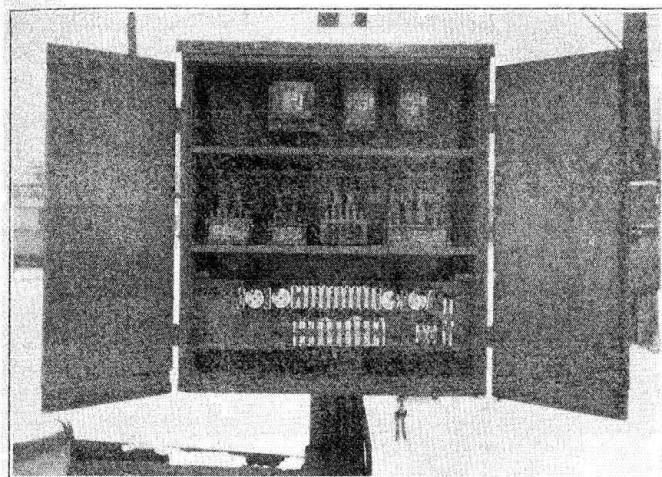
line that it was found advisable to build is the 220-volt, 17-mile line between Downers Grove, Ill., and Aurora. Power is supplied to this line at 5 different points and to avoid a serious power failure on any section, or a line failure that might tie up a substantial part of the line, the line has been adequately sectionalized by the installation of pole type disconnect

switches. The line wire is No. 9 hard drawn copper with triple braid weather-proof covering.

Most of the rectifiers are of the mechanical type, as manufactured by the Leich Electric Company. There are, however, a number of Balkite electrolytic rectifiers installed, the cells being in the battery wells with the storage batteries, while the transformers, as shown in one of the accompanying illustrations, are mounted in the relay cases.

Rising Maintenance Costs Forced Removal of Old Semaphore Signals

Separate home and distant signals mounted on a common mast were in service prior to the change-over according to Burlington established practice. A study of the division's maintenance costs disclosed a



Relay Box Housing a Mechanical Rectifier and Transformers for Electrolytic Type

gradually rising tendency with respect to the old semaphore installation, due largely to its obsolescence, necessitating relatively high prices for renewal parts. This led to the decision to replace the semaphore with a more modern type of signal.

Before the semaphores were taken out of service, triangular type color-light signals equipped with 8 3/8-in. standard doublet lenses were installed in their permanent locations on the present signal bridges and wired up complete. They were in each instance mounted on short lengths of 5-in. scrap superheater flues suitably fastened to the bridges by means of special clamp design castings. These cast fittings were all made in the Burlington's shop and foundry. The General Railway Signal Company furnished 164 of the triangular color-light units and the Chicago Railway Signal Supply Company furnished the remaining 20 units. Most of the latter are installed on the 6-mile section at the extreme east end of the territory. All color-light units are equipped with double filament 10-volt, 18-watt lamps.

Signals Are Approach Lighted When Operating From Storage Batteries

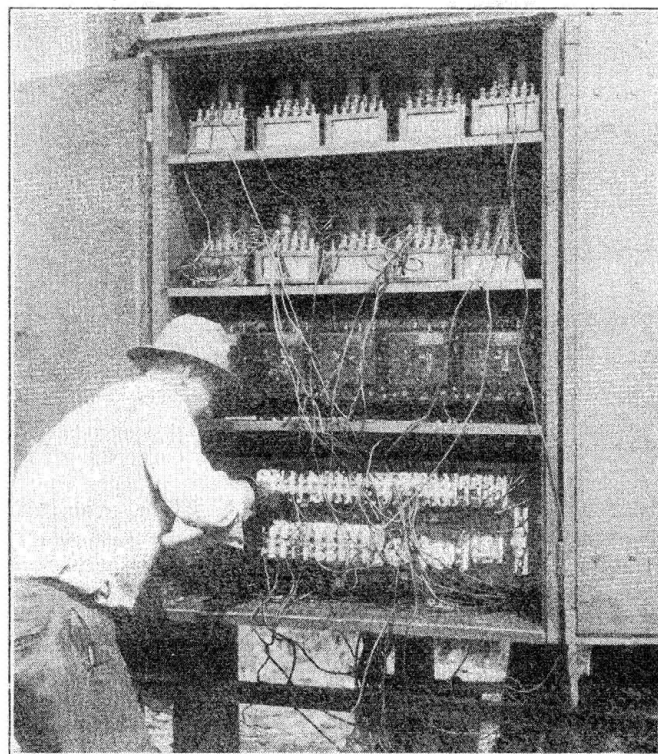
As it was desired that the color-light signals be continuously lighted from alternating current but approach lighted from storage batteries in the event of a power failure, it was necessary to install power-off relays and approach lighting relays. The latter, however, were installed only for the two outside tracks, the approach lighting for the middle track being arranged through the line relays. Type DNL relays of the Union Switch & Signal Company connected in

series with the track circuits were installed to provide for the approach lighting feature on the two outside tracks.

At the same time that the color-light signals were installed, the signaling scheme for the middle track, which was signaled for both directions, was changed from the overlap system to the A. P. B. system. The positive blocks in each case extend between the cross-over interlockings located in this territory. What little circuit rearrangement was needed to carry out this change, consisted principally of the introduction of two or more "stick" relays per block. No change in line wire controls was necessary.

Old Semaphores Overhauled and Installed on Lighter Traffic Territory

As stated previously the lower quadrant semaphore signals were kept in service until the color light signals were ready for operation. Conservative estimates indicated that the remaining useful life of these signals, had they been retained in service on this heavy traffic territory, would not have been more than five years, but it was recognized that these same signals were



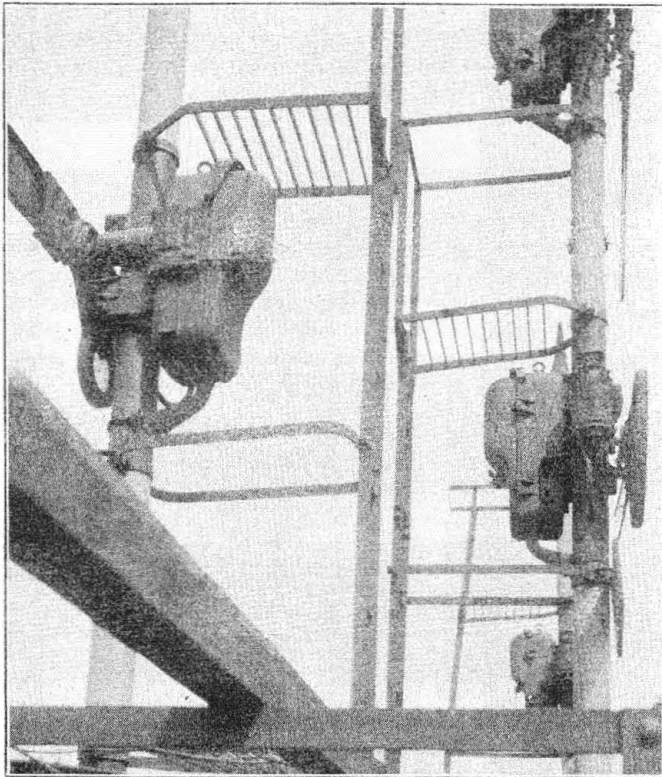
A Construction View of One of the Relay and Rectifier Housings

capable of another 20 years' service if installed on some lighter traffic section of the railroad. However, before the old mechanisms were shipped out to the Ottumwa division for service after removal from this territory they were thoroughly overhauled and inspected at the Aurora signal shop. Many of them are now in service as 19-ft. ground signals, being considerably shorter than the regulation type of 26-ft. ground mast signal.

The energy consumption of these old mechanisms, was lower than the present power requirements of the light signal installation. In fact, the energy costs of the present installation over that of the previous semaphores and storage batteries amounts to about \$400 a year.

The actual work of "cutting over" involved merely the transfer of relay wires at the relay cases, as all

the rest of the work had been done previously. Bulletins were issued by the operating department on the day a particular stretch of color-light signals went in service, instructing trainmen on the new indications. The semaphore arms were removed immediately after the cut-over was made, but the signal mechanisms and masts were not removed until a material train was



Type of Lower Quadrant Signal Mechanisms Removed

in the vicinity. The illustrations reproduced at the head of this article portray the several stages in the color-light signal change-over. A signal inspector went over each section of the road as it was placed in service to check up on the details of the field work.

The first section to be cut over extended from Canal street to Kedzie avenue, 5 miles, the second from Kedzie avenue to La Vergne, 4 miles, the third from La Vergne to Congress Park, 5 miles, the fourth from Congress Park to Hinsdale, 3.6 miles, the fifth from Hinsdale to Downers Grove, 4 miles, the sixth from Downers Grove to Naperville, 4 miles, the seventh from Naperville to Eola, 5 miles, and last, Eola to Aurora, 5 miles.

No changes in the maintenance organization have been made since the light signals were installed, as the present territories are considered long enough to tax the ability of the average maintainer on account of the large amount of highway crossing signals and gates in this section.

Representative Newton of Minnesota has introduced a bill in the House of Representatives to amend section 26 of the interstate commerce act, which authorized the Interstate Commerce Commission to require automatic train control installations, by adding language making it the duty of every carrier to which a train control order has been directed "to furnish all reasonable facilities to the engineers or other employees of the commission for inspection, at any stage, of installations of the safety devices provided for by that section, and for that purpose to furnish such employees, when properly identified, with transportation upon the locomotives or freight trains of the carriers." * *

Bureau of Signals Comments on D. & H. Installation

THE Interstate Commerce Commission has made public a letter addressed by E. H. DeGroot, Jr., director of the Bureau of Signals and Train Control Devices, to J. T. Lorce, vice-president of the Delaware & Hudson, regarding the preliminary inspection of the installation of the intermittent inductive type of auto-manual train stop device of the General Railway Signal Company on the 20.1 mile single track section between Plattsburg and Rouses Point, N. Y. As a result of this inspection, the following criticisms and comments are offered:

1. The track inductor as located and fastened makes displacement or removal unlikely, and it is therefore, believed that the employment of detectors is not required on this installation.

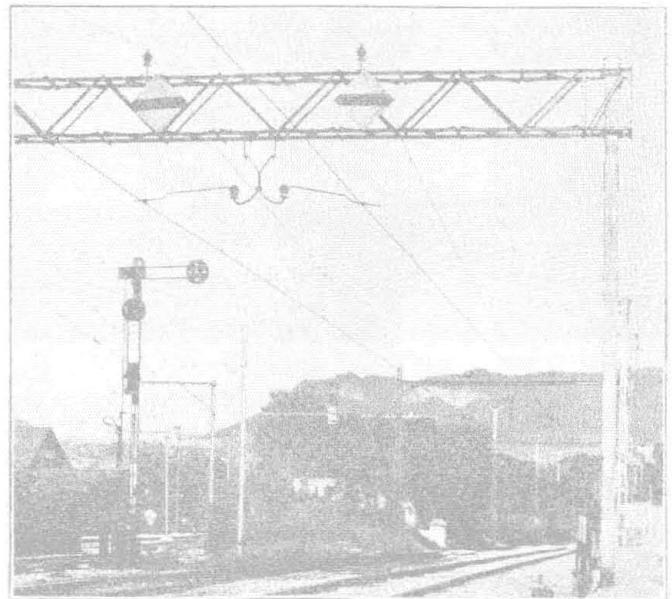
2. The closing of the inductor winding results in a clear operation of the device; hence a cross in the wires leading to this winding would result in a false clear condition of the inductor. It is therefore vital that the installation and maintenance of the track inductor circuit shall be such as to protect the integrity of this circuit.

3. Since certain crosses in the locomotive circuits could result in false clear operations, it is obvious that the integrity of these circuits must be protected.

4. During the inspection it was noticed that the conduit piping at the rear of the tender near the equipment box was installed in such manner that the conduit and fittings would be submerged should water accumulate there. Your representatives state orally that this has been corrected.

5. It was observed during the inspection that engineers forestalled when passing outbound over test inductors, but had no test for an automatic brake application. As will be appreciated, the latter is the more important test and you may desire to consider having this test made.

"The object of this and other preliminary inspections is that of constructive criticism; the pointing out of such matters as may be helpful to the carrier in checking an installation against the specifications and requirements of the commission's order and comments concerning such other related points as our necessarily brief inspection may develop. The foregoing criticism and comments are offered accordingly. They are not intended, nor are they to be taken either as condemnation or approval of this or any other device in connection with which they may be offered."



Semaphore and Catenary Signals in Switzerland