

The Delaware, Lackawanna & Western's

Approach-Lighting System

for Semaphore Signals

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IN September, 1928, the Delaware, Lackawanna & Western installed automatic electric approach lighting to replace oil lamps on the semaphore signals on its Ithaca branch, between Owego, N.Y., and Ithaca, a territory of 34.3 miles of single track. The average number of trains per day have varied from 6 to 10, with occasional Cornell University specials in addition. Upper-quadrant motor-type signals have been in use on this line for 18 years. All of the signals are the single-arm type except two with double arms, making a total of 75 lamps. When electric lighting was installed, all the oil lamps were replaced by 3.5-volt, 0.3-amp. electric lamps, each operated from a separate set of four Edison 500-a.h. primary cells connected in series. All lamp renewals, however, have been made with 120 m.a. bulbs as they have been found adequate for this service.

Approach-Control Circuits

Approach circuits for operating the lamps range from one-half to two miles in length. If the track relay is located at the signal, its back contact is used to close the lamp circuit, when the track circuit extends a sufficient distance in advance of the signal for proper sighting. In some cases, use is made of the line relay in the control circuit for the signal governing in the opposite direction. Where no line relays are available at the signal location, DNL relays are used in series with the signal control circuits.

Of the 75 sets of primary cells installed in 1928, 22 sets still have their original elements, and up to January, 1936, had shown no indication of approaching exhaustion, so that they will very likely have operated for 8 years before renewals are necessary. The other sets of cells were renewed as follows: One each in 1930, and 1931, 4 in 1932, 3 in 1933, 33 in 1934,



and 11 in 1935. The two sets renewed in 1930 and 1931 were already partially exhausted when placed in this service, as they had been used in another circuit prior to the installation of approach lighting. The 7 sets renewed in 1932 and 1933 are located at stations where excessive discharge, due to trains standing in the circuits, cause them to exhaust sooner than cells at other locations.

Life of Battery

The average life of cells renewed to date is about 5.5 years, and even though this average is lower than the life expected from renewals, their operating cost was considerably less than \$1 per year per lamp. This cost is based on renewals at slightly more than \$1 each net, allowing salvage credit for exhausted elements. On this same basis, the annual cost of operation with the other 22 cells which are in their eighth year without renewal, will be about 50 cents. As the average cost for operating oil lamps varies from \$6 to \$12 a year per lamp, it is evident that a considerable saving has been effected with approach lighting. Electric lamps also provide better light, are much more uniform with

respect to brilliancy in spread, as well as being generally much more reliable.

The primary cells used for lighting are housed in the same concrete wells with the cells used for motor and line circuits. As all cells give an indication of approaching exhaustion, an occasional visual inspection of the indicator panels has been the only battery maintenance required since the installation was made, aside from the time required to replace exhausted elements.

Results Satisfactory

No failures of lamps, chargeable to the power supply, have occurred in more than six years. In fact, the only failures which have occurred with electric lighting were due to "burn-outs" before the initial adjustments of the system had been completed, following the installation.

This branch line provides an excellent field for demonstrating the merits of approach lighting under severe service conditions, as it is situated in the Finger Lake district of New York state which is noted for its severe winters and for its high winds during the summer months. During the winter it is particularly difficult to operate motor cars on account of deep snow, sleet storms and heavily frosted rails, and it was frequently necessary to send out two men instead of one as usual to cover the daily assignment of oil lamps. These adverse conditions not only caused oil-lamp failures but also made it difficult to refill the oil founts without moisture getting in, and interfered with proper cleaning, adjusting and lighting of the lamp wicks. For the sake of economy, as well as to save time under these conditions, the lampman had to shift lamps resulting in inaccurate alinement.

Generally, the replacement of oil lighting with electric lamps operated from primary batteries on this branch has materially improved service and effected a saving in operating expense. An indirect benefit is the information regarding approaching trains, given to users of track cars, by the approach-lighting feature.