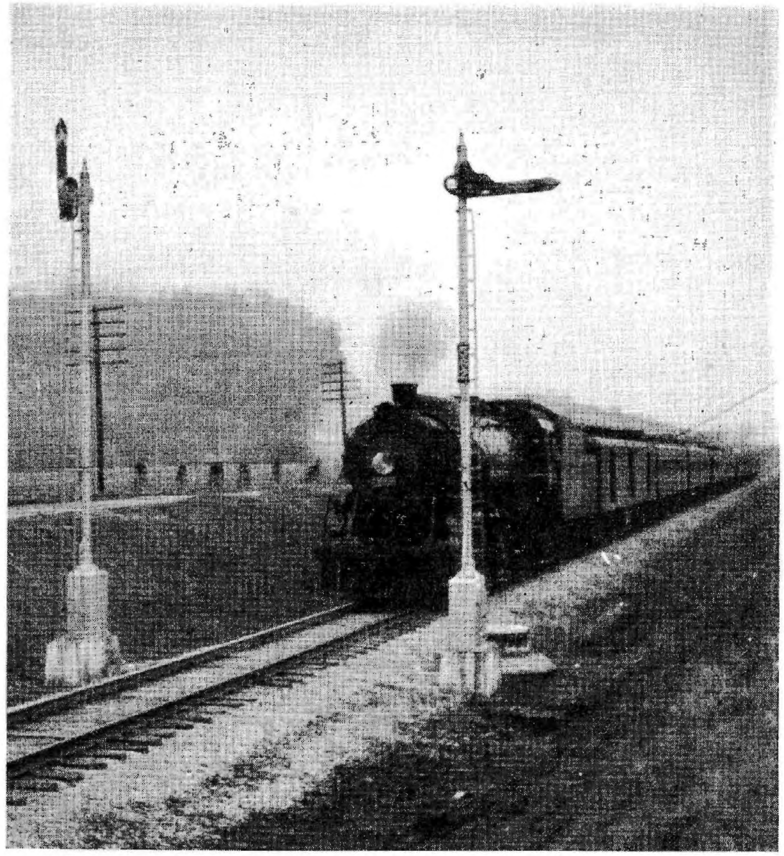
Changeover on 136 miles, using primary battery, shows annual saving of $3,031 on investment of $6,142; aspects are improved and maintainers have time for other work

By W. H. Stilwell
Signal Engineer,
Louisville & Nashville



Typical location equipped with electric semaphore lamps

Electric Lights for Semaphores

In 1934, the Louisville & Nashville substituted electric lamps for oil lamps on semaphore signals on 136 miles of single-track, A.P.B. automatic signaling on a subdivision between Henderson, Ky., and Amqui, Tenn. The low-voltage electric lamps are fed from sets of four cells of primary battery. Quite recently the last of the original battery elements were renewed, and, therefore, data from carefully kept records is now available to show the economies effected by the electric lamps as compared with the oil lamps previously used.

Prior to 1934, the signals had been in service 15 years, and the oil lamps, taken care of by the signal maintainers, required considerable attention and time; furthermore, in view of the increased train speeds, the oil lamps did not give satisfactory night aspects.

On account of the discontinuance of marker lamps on signals over the system at about the same time, a sufficient number of Style-D, Union Switch & Signal Company lamp cases, formerly used as markers on another division, were available. These lamp cases were sent through the shop, where they were cleaned and painted inside and outside with aluminum paint. The lunar white glass, formerly used, was replaced with a clear cover glass. The lamp bulbs to be used were rated at 3.5 volts, 120 m.a., so that it was important that the proper focus and alinement be provided. Therefore, the lamp sockets were reset for the exact focal position and, as all lamps were of the precision type, the adjustments were sealed with solder.

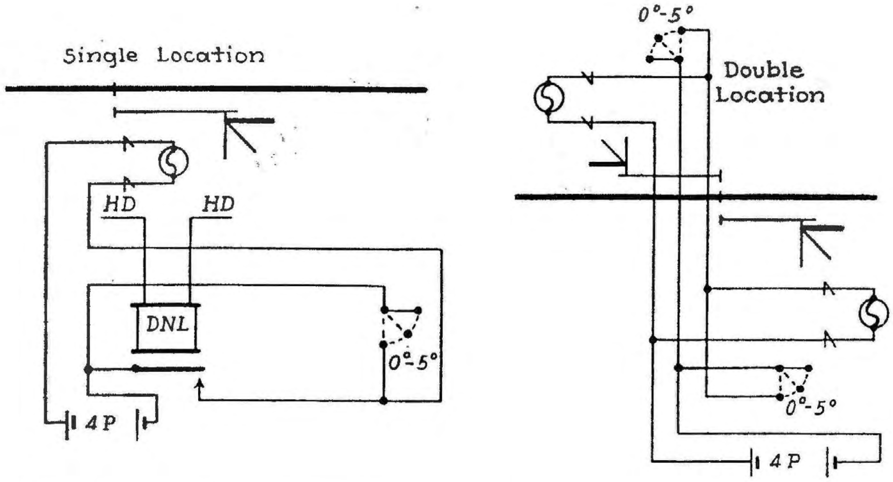
Primary battery jars and covers were released from another division where an a-c. power line had been installed as part of a train control installation. At most of the signal locations on the territory, battery housings and circuit controllers on the signals were in place, and at some locations spare conductors in parkway cables were available. The result was that the money actually spent was confined to the purchase of wire and cable, conduit and fittings, battery elements, lamp bulbs, and miscellaneous materials.

Approach Control Used

The signal mechanisms are of the base of mast type; therefore, it was necessary to carry the wires up the poles in conduit. New ½-in. galvanized conduit was used and G.V. pipe caps served as outlets. Connections to the cases were made by the use of ½-in. to 1½-in. reducer bushings. Rubber-covered copper wire, No. 14, was used for light wires from the cases to the lamps. From the cases to the battery wells, No. 14 copper wires in parkway cables were used, and the case wiring was of No. 16 P.F.S. with "Bee" wire eyes.

As the signals were controlled by the A.P.B. system, the new lamp control circuits were arranged for block-to-block lighting, as indicated by the diagrams. This modification of approach lighting is used generally on the Louisville & Nashville. For single locations, DNL relays were installed in series with the HD relay ahead, to secure the approach indication. Polarized line circuits were in use; therefore, the DNL relay was installed between the battery and the pole changer to avoid release of the relay with each reversal of polarity.

Four cells of Edison 500-a.h. primary battery in series were installed at each location. At a single signal location, a battery is used to light a single lamp, but at a double location one battery lights two lamps. A total of 139 sets of batteries were installed to feed 237 signal lamps on the 136 miles of territory.



Typical approach control circuits for controlling the electric semaphore lamps

Results After Five Years

In order to determine the actual cost of signal lighting, a careful record was kept of all labor and material used in renewing batteries and replacing lamps, and motor car mileage was recorded, as shown in the accompanying table. The 139 sets of original battery, of four cells each, provided energy for lamp operation for 204,510 lamp days, or 6,817 lamp months, before being renewed. Where four lamps were fed from one battery set, and much switching took place, the minimum battery life was 179 days. Where only one lamp was lighted from a battery set, and the train speeds were high, the maximum battery life was 1,579 days. In studying the table, the reader should understand that the calculations are confined to the periods of the life of the original battery at each individual signal location. On this basis the total cost of $1,187.04 is divided by 6,817, the number of months of semaphore lamp service rendered, which gives $0.174 as the cost of signal lamp service for each 30-day month. In comparison, on the same basis as above, the cost for maintaining and operating the oil semaphore lamps was $1.24 per month.

On a yearly basis, the 237 electric semaphore lamps each save $1.066 per month, totaling $3,031.68 annually. The total cost of the changeover was $6,412.84. Originally it was estimated that the cost of the maintenance and operation of the electric lamps would average $0.19 per signal per month, whereas the actual cost, as explained previously, is $0.174. Thus the annual charge is less than originally anticipated, which is probably due to the fact that, in this type of service, the batteries render considerably more than their rated ampere-hour capacity.

No payroll reductions were made on account of the changeover from oil to electric lamps, but the installation has allowed the maintainers more time for other signal maintenance work. The electric lamps give a much stronger light than the oil lamps did, and can be seen more readily by enginemen at night, and, furthermore, the electric lamps show up on cloudy days. These advantages are important in consideration of the increased train speeds of recent years.

Cost of Electric Lighting of Semaphore Lamps

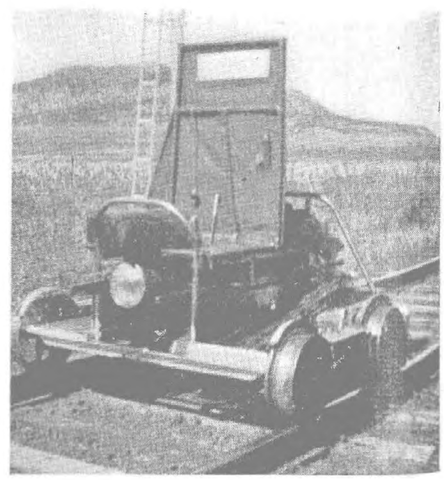
556 primary battery renewals at $1.15	$ 639.40
503 electric lamp bulbs at $0.42	211.26
1,807 miles motor car operation at $0.02	36.14
139 hours maintainer labor at $0.85	118.15
139 hours helper labor at $0.59	82.01
69½ hours maintainer travel time at $0.85	59.07
69½ hours helper travel time at $0.59	41.01
Total	$1,187.04

Motor Car Windshield

R. B. Workman
Colorado & Southern,
Trinidad, Colo.

The January issue of *Railway Signaling* contained a description of a motor car windshield designed by R. E. Moore, of the C. C. C. & St. L. The following describes a popular type windshield used on the Colorado & Southern. It is made up by using ½-in. and ¼-in. single-strength iron pipe, welded at all connections and covered with canvas which is painted green to eliminate sun glare. The windshield has a shatterproof glass window, a wing extension to protect the legs and feet of the operator, and a pocket, sewn and riveted in place, for carrying a volt-ammeter, screw drivers, shunt files, and a complete layout of flagging equipment. The windshield is made up in a V shape to reduce wind resistance. The cross bar serves as an arm rest which in turn reduces back fatigue. The windshield is fastened to the seat deck the correct distance forward from the car operator, he being the judge of this distance; this method of fastening the windshield does not interfere with removal of the seat deck to repair or clean the engine.

The skeleton framework reduces the weight to a minimum, which, for



Windshield applied to motor car

the one shown in the accompanying illustration, is 11 lb.

It is my opinion that every motor car should be equipped with a windshield 12 months of the year, for not only does it protect you in winter from snow and cold but in the summer it is helpful as protection from rain and insects. Many more defects of roadway apparatus will be discovered by operators of motor cars protected with a windshield than with those not protected.