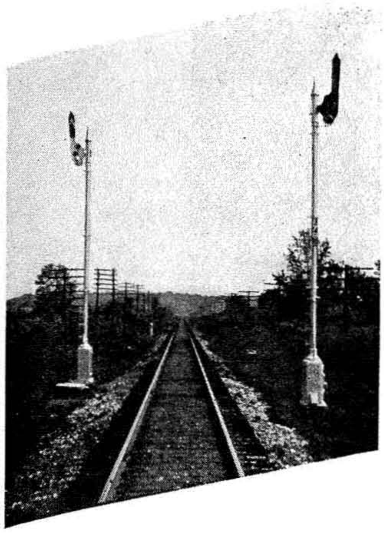
Electric Lighting of Semaphores



Substantial economies and improved signal indications result from substitution of electric lamps for oil lamps on the Louisville & Nashville

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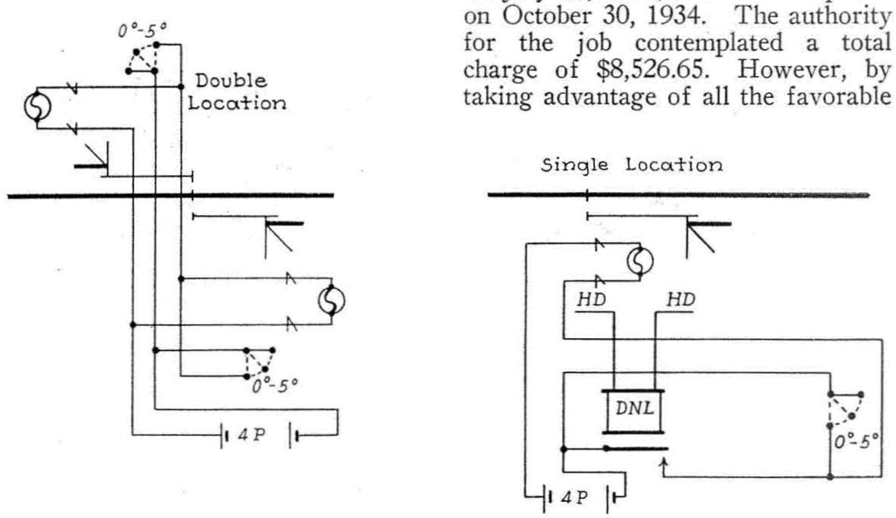
IN APRIL, 1934, authority was given to substitute electric lamps for oil lamps and retire the markers on the semaphore signals on the single-track line of the Louisville & Nashville between Henderson, Ky., and Amqui, Tenn., 136 miles. The signals had been in service for 15 years, and the oil lamps required considerable attention. With the extended maintenance territories, it was difficult for the maintainers to attend the oil lamps and give proper attention to other equipment under their charge.

A survey showed that Union Switch & Signal Company Style-D electric lamps, formerly used for marker lamps, could be released from signals on other portions of the road. Primary battery jars and covers could be released from another portion of the line, where the lighting of signals had recently been changed from primary battery to train control power. At most all of the signals, battery housing and signal circuit controllers were in place, and spare conductors in parkway cables were available at many locations. The result was that the money actually spent for the job was confined to the purchase of wire and cable, conduit and fittings, battery elements, lamp bulbs and miscellaneous materials.

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. Four cells of 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. The lamp bulbs are rated at 3½ volts, 120 milliamperes, so it is important that proper focus and alinement be provided.

The lamp cases were sent to the shop, where the sockets were reset and soldered in place. The lamps were painted both outside and inside with aluminum paint, and clear cover glass was substituted for the lunar white glass which had been in use.



Typical circuits for approach lighting control

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.

For single locations, DNL relays were installed in series with the H.D. 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 reversal of polarity.

No extra help was authorized for the work, and as no extra force was available, the regular maintainers made the installation. Work started on July 15, 1934, and was completed on October 30, 1934. The authority for the job contemplated a total charge of $8,526.65. However, by taking advantage of all the favorable factors, the total charge was only $6,412.84, and the actual out-of-pocket was $3,182.91, all of which was for new materials.

Savings and Benefits

On the basis of time spent previously by the maintainers in attending the oil lamps and the cost of supplies and equipment, including motor cars, it is estimated that it cost $1.24 per month per lamp to maintain the oil lamps. Taking the same factors into consideration, it is estimated that it costs but $0.19 per

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month per lamp to maintain the electric lamps. Up to June 30, 1936, only 24 of the 139 sets of lighting battery had been renewed. These were in yards where there is considerable switching. After the date mentioned, 115 sets remained to be renewed. From an inspection of the batteries and a review of operating conditions, it appears that the average life of the lighting batteries will be approximately four years for one lamp, or two years for two lamps.

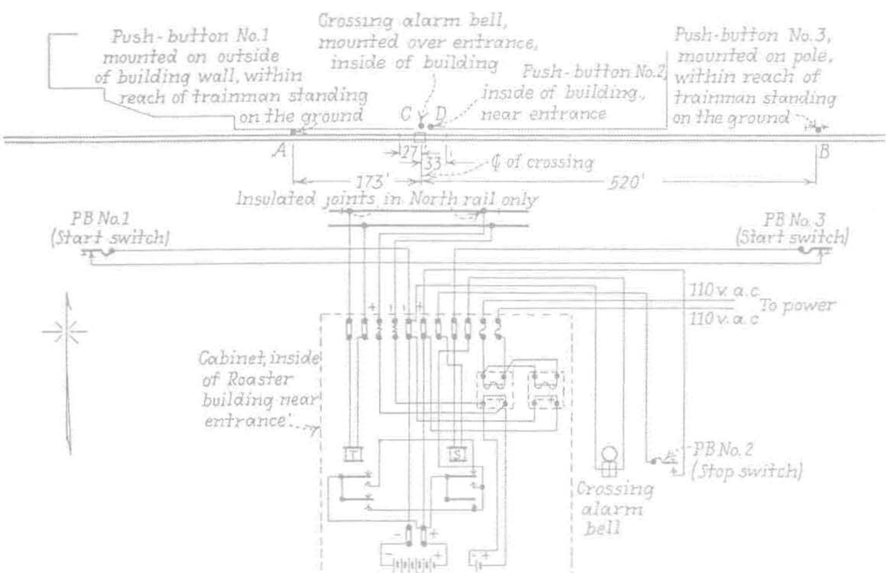
No payroll saving has been shown, but the change has removed "lamp day" from the maintainers' calendars, and allows almost one-fifth more time for the maintenance of other equipment. The signal indications are much improved because the lights not only show up well at night, but can readily be seen by enginemen on cloudy days.

Crossing Protection For a Building Entrance

RECENTLY, the Great Northern encountered a rather unique problem in crossing protection, at Great Falls, Mont. Here the railroad serves the Anaconda Copper Mining Company's smelting plant, and the house track serving the "Zinc Roaster" building runs directly along and close to one side of this building, which is about 820 ft. long. Near the middle of this side of the building is a driveway entrance to the building, and there is considerable vehicular traffic, as well as pedestrian traffic, through this building entrance-way. Freight cars are moved over the crossing six or seven times a day.

Particularly because of the danger to trucks leaving the building when a car is being spotted at or moved past the building entrance, it was desired to provide some form of crossing protection. Straight automatic control, obviously, was impossible. Finally, a scheme of combined manual and automatic control was devised, and this method has been found to provide the desired protection at very low cost.

Several years ago the Anaconda Company installed, at the crossing, a manually-controlled crossing-alarm-bell of the type used at railway-highway grade crossings. Under this system, which was superseded by the present installation, the bell was controlled by two single-throw switches, one at each approach to the crossing. When a switching move was to be made to or over the crossing, a trainman would close one of these single-throw switches, and the bell would ring until the switch was later opened by a trainman.



Automatic stopping and manual starting characterize the operation of the crossing-alarm-bell at this grade intersection of an industry track with a driveway entrance to a building

Often, the train crew would forget, or find it inconvenient, to restore the control switch to its normal position when the train left the crossing, and the result was that the bell would commonly ring for long periods of time when there was no occasion for such a warning indication. Naturally, therefore, the bell failed to command proper respect. The Anaconda Company asked the Great Northern to design a control system that would operate satisfactorily, and the railroad's signal department responded with the system described below.

Mounted over the entrance and inside the building is the crossing-alarm-bell referred to above. Three push-buttons and a 60-ft. track-circuit provide the desired manual-automatic control. Push-buttons No. 1, at *A,* and No. 3, at *B,* are used for starting the bell. Push-button No. 1 is mounted on the outside of the building wall, within reach of a trainman standing on the ground. Push-button No. 3 is mounted on a pole, and, like No. 1, is within reach of a trainman standing on the ground. Grade conditions were responsible for the location of these push-buttons at different distances from the crossing, No. 1 being 173 ft. and No. 3 being 520 ft. from the crossing.

Consider a switch engine approaching the crossing from the west. A trainman presses push-button No. 1 momentarily. The bell then starts ringing and the locomotive can proceed. When push-button No. 1 was pressed, the control relay, *S,* dropped, and the crossing-alarm-bell circuit was closed through a back contact of *S,* as shown in the sketch.

When the locomotive reaches *C,* the short track-circuit over the crossing is shunted, and track-relay *T* drops, closing the pick-up circuit of relay *S* and causing relay *S* to be restored to its original, normal position. However, the bell continues to ring, its circuit now being closed through a back contact of relay *T.* The bell continues to ring until the locomotive has moved off the track circuit; the bell then automatically stops ringing.

Push-button No. 2 is provided for the purpose of stopping the bell from ringing when a train fails to proceed to the crossing track-circuit after a starting push-button has been operated. Push-button No. 2 is located inside of the building, close to the entrance, where any employee or other authorized person can reach it when he realizes that the bell is ringing without proper cause. As the sketch shows, this push-button is in multiple with a back contact on relay *T,* and accomplishes, manually, exactly the same purpose that the track circuit usually accomplishes automatically.

Only two insulated joints are used, the south rail not being insulated. Storage batteries, on a-c. floating charge, are used throughout. Relays, and batteries are housed in a wooden cabinet inside of the building.