charging rate. Also we have found that with the ordinary circuit arrangement the signal maintainer sets his charging rate too high, not knowing the number of train movements or how long a train may stand on the track circuit. By using a fixed resistance with an automatic cut-out feature all of this difficulty is eliminated. The rectifier is adjusted for (1) the normal output, which must be sufficient to maintain the battery in a charged condition, and is also adjusted for (2) the maximum load which the storage battery is required to handle.

Figure 2 shows a similar circuit scheme for a color-light automatic signal which is approach-lighted. This uses a Balkite rectifier also and operates in the same manner as in Fig. 1. As before the normal charging rate is obtained with the fixed resistance in circuit through a front contact of the approach track relay, but when the track relay is de-energized the load charging current is obtained through the back contact. If the approach track relay is not located at the signal as in this case, the charging wire could be carried through the front and back contact of an approach-lighting relay. Also this circuit can be used with a multi-tap transformer instead of fixed resistance and will give the same satisfactory results.

It has been our experience that this scheme keeps storage batteries charged to capacity all the time. By burning the signal lamps directly from the battery, a uniform voltage is maintained at all times, thus eliminating all light failures due to excess lamp voltage.

This circuit arrangement has been designed by the writer and patents have been applied for in the United States.

Toronto, Ont. H. L. BLACK,
Superintendent of Signals, Canadian National, Central Region.

Reliability of A-C. Power Supply Is Determining Factor

IT is recognized that alternating current is cheaper to use than rectified current. With the present day power networks extending over the country failures are relatively few. Those that may occur can be provided for by having both a normal and reserve supply of alternating current fed from opposite ends of the signal power line. This practice is almost universally followed in a-c. train control installations. It seems strange that it should be considered necessary to use storage batteries for a reserve power supply where a railroad is in the vicinity of large industrial plants which are served by a reliable power supply. It is also significant that these large power using industries do not have any floating battery system to fall back on.

A railroad signal power line, of course, is strung out over considerable territory, which makes its problem a little different than that of the industrial power user. If wind or sleet, however, destroys part of the signal control line there will be, of necessity, restrictions on speed regardless of any floating battery system. Where a reliable source of power is not available, it is necessary to use a power-off relay. In all other locations where the power supply is assured, I believe that a normal and reserve source fed from the opposite ends of a power line with automatic control is the most ideal arrangement.

The power-off relay can be dispensed with where a storage battery reserve is provided by increasing the output of the rectifier to take care of the steady current load as well as the charging requirements of the battery. It is also possible to increase the size of the storage battery if it is desired to eliminate the power-off relay.

Chicago, Ill. C. F. LOWER,
Signal Draftsman, Chicago & Northwestern.

Does Not Recommend Use of Power-Off Relays—Longer Lamp Life Obtained from Approach Lighting Scheme

IT has been my experience that better service is obtained from color-light signals without the use of power-off relays. Of course if the method of operation is to light the signals directly with alternating current but at the same time to use storage batteries trickle-charged as a reserve then a power-off relay is a necessity. However, a more constant voltage and consequently a longer life may be obtained from the lamps in the color-light signal by operating them on the approach lighting plan from the storage battery and using the alternating current merely to charge the storage battery through the rectifier.

At special points on our installation we use the power-off relay to cut the storage battery from its rectifier onto a trickle charging set of primary battery when the a-c. power is off. This gives a reliable source of power and is very well adapted to points where an unreliable alternating current source of power is available.

St. Paul, Minn. C. A. DUNHAM,
Superintendent of Signals, Great Northern.

Control of Stop Indication in Approach-Lighted Territory

"Should the stop indication of approach-lighted color-light automatic signals be displayed as long as the block is occupied?"

Believed Desirable Because It Affords an Opportunity to Track, Station and Yard Forces to Observe Signal Performance While Trains Are in the Block

IN my opinion it is very desirable to provide a red or stop indication in approach-lighted color-light automatic signal territory when the block is occupied, irrespective of another train in the approach section. Primarily, this control arrangement gives the track, station and yard forces an opportunity to observe the performance of the signal while trains are in the block. If circumstances permit, however, the signal should be illuminated constantly on all indications. On our recent signal installation the signals, when operating from the storage battery reserve, are approach-lighted and the stop indication is prolonged as long as the block is occupied regardless of a following train in the approach section.

Denver, Colo. B. W. MOLIS,
Signal Engineer, Denver & Rio Grande Western.

Sees No Advantage in Prolonging Stop Indication

IN the approach lighting of double track signals it is our practice to provide approach lighting in its strictest sense. We do not believe that additional safety results from the practice of prolonging the stop indication until the train clears the block, except, of course, when other trains are following. In lighting signals on single track it is our practice to light from block to block or from passing track to

passing track in absolute permissive block territory. It is not known whether this practice increases the safety of operation so far as trains are concerned but it does to a certain extent increase safety insofar as motor cars are involved. Motor car operators can thus determine whether any of the single track is occupied by a train and furthermore whether the train ahead is traveling in the same or opposite direction. That is, a motor car operator encountering a caution signal after a green signal, or a red signal after a caution signal, knows that he is approaching a train moving in the same direction. On the other hand, if the head block signal is displaying a "stop" indication the chances are likely that a train is approaching in the reverse direction in which case all opposing signals are red.

Louisville, Ky. W. H. STILWELL,
Acting Signal Engineer, Louisville & Nashville.

Can See No Additional Safety If Stop Indication Is Prolonged—Might Be Cheaper to Light Signals Continuously

I AM unable to see any additional safety resulting from showing a red light as long as a train is in the block on an installation of this kind, as long as there is no train approaching. It would be the same as putting out a flagman to flag a train that had stopped even though it was known positively that there was no other train on the road. The name "approach-lighting" indicates that the light will be shown only when a train is approaching.

Of course, there would be no harm in displaying a light continuously in these signals if the current for these lights is so small that it would not pay to put in "approach-lighting." It would be cheaper, on account of less apparatus, to leave the light burn continuously, but then it would not be approach-lighting.

St. Paul, Minn. C. A. CHRISTOFFERSON,
Signal Engineer, Northern Pacific.

Other Comments

SINCE the "stop" indication of a color-light automatic signal is of no use unless a train is approaching the signal, it would seem uneconomical to provide the circuit arrangement for displaying a "stop" indication at all times while the block is occupied, in the opinion of T. S. Stevens, signal engineer system, of the Atchison, Topeka & Santa Fe. Similarly, C. H. Tillett, signal engineer, of the Canadian National, Central Region, believes that nothing is gained by displaying a "stop" indication as long as the block is occupied. His opinion is expressed as follows, "This gets back to the old argument that if there were no ears to hear there would be no sound. Consequently, if there is no train approaching and thus no one to see the signal, why light it?"

Sees No Advantage in Prolonged Stop Indication

I CAN see no particular advantage in controlling signals in such a manner as to maintain a red stop indication as long as the block is occupied. On our lines, the approach lighting scheme is used on several thousand miles of automatic signals, both of the semaphore and color-light type, and the light is extinguished as soon as the train enters the block.

No real advantage would accrue from displaying the red light while the train was passing through the occupied block. Our experience indicates that lighting of the signal on approach only fills every possible operating requirement.

Omaha, Nebr. A. H. MCKEEN,
System Signal Engineer, Union Pacific.

Checking Up on Signal Observance

"Do operating rules on your road require signal supervisors or maintainers to report any irregular observance of signals by enginemen which may be noted?"

Signal Supervisors and Signal Maintainers Are Required to Report Irregular Observance of Signals on the A. C. L.

ON the Atlantic Coast Line it is our practice to conduct periodical surprise tests, a record of which is made on our Form 4009, as shown herewith, for the purpose of determining the observance of signals by trainmen. These tests are carried out jointly by the supervisor of signals and the trainmaster. This procedure is in accordance with our instructions which require that signal supervisors or signal maintainers report all instances of irregular signal observance which may come to their attention. This form (No. 4009) is filled out in triplicate, the original being sent to the superintendent.

It will be noted that the train number, engine number and whether or not the train stopped at a "stop" signal, is recorded on this form. In the event that the train passes a "stop" signal, the information is noted, giving the number of the signal which was not observed and the speed at which the train passed the "stop" signal.

Wilmington, N. C. C. J. KELLOWAY,
Superintendent of Signal, Atlantic Coast Line.

Atlantic Coast Line Railroad Company

.....192....

Surprise Tests of Automatic Signals between..... and.....

Signals No.....and.....were set at stop at.....M.,..... Day and Date .....and again set at Normal at.....M.,..... Day and Date

Tests by:.....

Train No.	Engine No.	Stopped at Signal No.	Passed Signal No.	At miles per hour	Time A. M.	Time P. M.	Remarks

A. C. L. Form 4009 for reporting periodical surprise tests of signal observance