and burned at 5.0 volts. Whereas, for continuously lighted signals, the operative signal unit would be burned at 7.5 volts; but, when transferred to the marker, it would be burned at 5.0 volts. Where, with the single-filament lamp, it is not possible to maintain proper voltage regulation, the reserve lamp may prove the most economical, as all that is then required is to allow the normal bright filament or reserve lamp to burn out. With the lamp showing dim enginemen will report it and renewal will be made in a short time.

We use signal-filament 8-volt 18-watt lamps in color-light signals and maintain the voltage regulation. For electrically lighted semaphore signals, we use the cut-in relay and reserve lamps.

Emergency Yellow Unit

J. A. Johnson
Signal Engineer, Missouri-Kansas-Texas, Denison, Tex.

We burn our lamps slightly under the rated voltage. On our color-light signals we apply an emergency yellow-light unit, which is located slightly below the regular unit. An ANL-2 relay is in series with the feed circuit for the green unit and the regular yellow unit. If a green, or Proceed, indication is to be displayed and the light bulb has burned out, the ANL-2 relay switches the current on to the emergency yellow unit, displaying an emergency caution indication to approaching trains. If the yellow or caution indication is to be displayed and the lamp filament is burned out, the ANL-2 relay will switch on the emergency unit displaying an emergency caution indication for approaching trains. The rules require that trains receiving an emergency yellow indication report same at the first open office, so that the dispatcher will be in a position to notify the signal maintainer. We do not make a practice of calling the maintainers out after their regular assigned hours for replacing burned-out lamps, except when the lamp in the red unit is burned out. The maintainers are merely notified, so that they will be in a position to make lamp replacements promptly during their regular assigned hours.

Since we adopted this emergency unit we have not followed the practice of keeping a record of each lamp, as was formerly done in order to change the lamps at the end of their rated service life. In checking over the lamp renewals for the last two and a half years on 18 of our signals, we find that the life of the lamps will average 7,000 hours or better.

The use of the emergency yellow unit saves the expense of calling maintainers to make lamp replacements, eliminates stopping of trains, and gives us considerably more than the rated service life of our lamps.

One-Hour Burning Test at Rated Voltage

C. A. Taylor
Superintendent of Telegraph and Signals, Chesapeake & Ohio, Richmond, Va.

The present standard lamp for use in light signals on the Chesapeake & Ohio is a rebased lamp with a PS-16 clear bulb, a medium bayonet base, and two filaments. The lamps are purchased without collars and are rebased at a central shop before being distributed to the signal maintenance forces. In order to prevent failures during the early part of the lamp service life and to take care of the normal sagging of the filament the lamps are given a rigid inspection at the shop and a one-hour burning test at rated voltage before being rebased. The period of one hour for burning test was established after several years of experience, using longer burning periods, ranging up to 48 hours. The one-hour period has proved entirely adequate.

Standard instructions covering requirements for recording the life of lamps, and for inspecting, testing and renewing the lamps, are furnished to all signal maintenance forces. The strict observance of these instructions has resulted in uniformity of practice and satisfactory performance. These instructions embody the following features:

1. Lamps are burned at approximately 90 per cent of their rated voltage.
2. They are renewed on a regular schedule which permits total period in service equivalent to a maximum of 3,000 burning hours. The supervisor of signals furnishes each maintainer with a renewal schedule showing the actual number of days the lamp is to remain in service on each light unit.
3. Light-signal inspections are conducted at least weekly and oftener under certain local conditions.
4. To detect burnouts of either filament, a burning test is conducted weekly, using 2 volts (for a 10-volt lamp). By observation of the dull red glow, the maintainer can definitely determine the continuity of both filaments.
5. Lamps are immediately renewed when one filament fails.
6. Voltage tests at the lamp are conducted semi-annually to insure lamp voltages within minimum and maximum requirements. These include tests of the d-c. stand-by, as well as of the normal a-c. power source.

A complete service record of all lamps is maintained by each maintainer on a special form prepared for that purpose. Burned-out and defective lamps are accumulated for observation and study and each one failing in service is checked against the service record. No auxiliary devices, such as reserve lamps, are being used.

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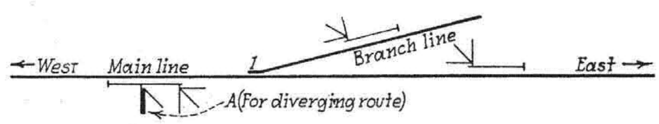
Automatic Operation

"It is desired to install automatic interlocking at the junction of two single-track lines (illustrated). Can switch 1 and signal A be controlled automatically for an



eastward train movement from the main line to the branch line? Would it be feasible to install a preliminary track circuit and time-element device so arranged that the route lined up would depend upon the speed at which the approaching train passes over this preliminary track circuit?"

Part-Automatic Control

P. G. Seaholm
Office Engineer, Great Northern, St. Paul, Minn.

To operate switch *1* and signal *A* automatically for movements from the main line to the branch line, by means of a short preliminary track circuit and time-element device, would, in my opinion, not prove satisfactory. Although such an arrangement could be worked out, it would be difficult to regulate the speed of all trains to such an extent that both main-line and branch-line movements would not be delayed.

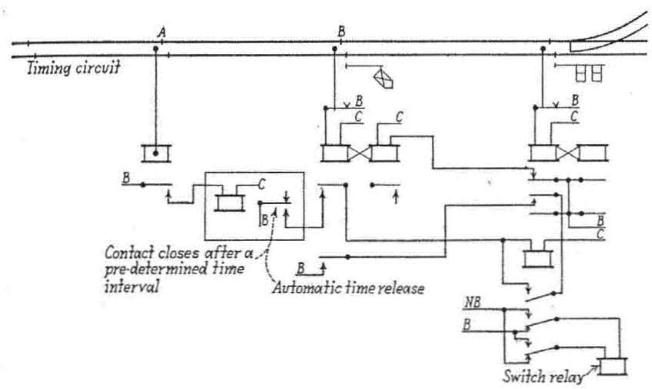
More dependable operation would be obtained by using manual control for movements from the main line to the branch line, and automatic control for all other movements. The manual control could be placed in the hands of the operators at the nearest open telegraph office, or, if all branch-line trains came to a stop at some nearby point before approaching the junction switch, a push-button could be located at such a point, where a member of the crew of branch-line trains could operate it to line up the switch for a branch-line movement. By the use of a time relay to prevent an instantaneous change of routes, and by using a dual-control switch machine, such a plant would give safe and dependable service.

A Proposed Scheme

P. P. Ash

Chief Signal Draftsman, Louisville & Nashville, Louisville, Ky.

It is possible to throw the branch-line switch by means of a timing device whose operation depends upon the speed of the train. In the scheme I have in mind a slow train would cause the switch to be thrown, while a fast train would not affect the position of the switch. The



Speed-control circuit for the operation of the junction switch. Slow trains throw the switch at A

timing control should be located far enough from the switch so that the switch will be thrown in ample time before the train is on the approach-locking circuit. Once the train has entered the approach-locking circuit, the switch can not be moved, because the detector locking will then prevent it from so doing. The switch-operating circuit will, of course, be held open also while the train is on the track circuit between the home signals. The sketch shows a speed-control circuit which may be incorporated in the design of such an installation.

Suggests Use of Push-Button

W. M. Whitehurst

Circuit Draftsman, Central of Georgia, Savannah, Ga.

The use of a time-element device for clearing any route automatically, would no doubt prove to be a disappointment. Those who are familiar with signal systems and their application to train operation, realize the necessity of anticipating every possible kind of train movement. If a time-element device were used to line up the diverging route, occasions would certainly arise when the diverging route would be lined when not desired. This condition would not occur many times before the operating officers would object to the project.

Several installations on the Central of Georgia, covering similar problems (converting to "automatic" control, installations which were formerly controlled by interlocked desk circuit controllers), are operating successfully, utilizing a push-button, operated by a member of the train crew, for lining up diverging routes. This is probably the simplest and surest way of complete control in such instances.

In designing circuits for such an installation, it is necessary to prevent the clearing of the diverging route by a following train when the train ahead is in a position to accept the "high-arm" route. This condition indicates the desirability of having an indication, for use of the diverging-route crews, that a train is, or is not, in a postion to accept a Proceed indication from the "high-arm" signal. Some stopping point not too far distant could be utilized in giving the necessary information and control to the crews, who expect to use the diverging route.

Plan Is Feasible but Has Objectionable Features

A. R. Whitehorn

Commercial Engineer, General Railway Signal Company, Rochester, N. Y.

It is entirely feasible to install a time-element device so that trains moving only at certain (presumably low) speeds will automatically reverse the switch and in turn clear the lower signal. This would be the simplest and possibly the most economical arrangement, but it has the objection that an eastbound train, using the main line, might unexpectedly pass over these definitely established points at low speed and reverse the switch. This would necessitate a stop at the switch to restore it to its normal position by hand, thus causing delay. To avoid this necessitates a deliberate action on the part of the engineman, which adds to equipment and first cost. Therefore, it becomes a question of how much additional expenditure can be justified to overcome this objection.

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Dwarf Signal Locking

"Should some form of locking, i.e., approach, time or stick locking, be applied to levers controlling dwarf signals in regular power interlocking plants?"

Should be Ineffective if Signal Has Not Been Cleared

C. F. Stoltz

Signal Engineer, Big Four, Cincinnati, Ohio

The purpose of an interlocking plant is to permit convenient and expeditious operation of track and signal functions. However it may be accomplished, interlocking must preclude the possibility of any of these functions being operated inadvertently or otherwise, so as to jeopardize traffic. The early interlocking plants made provision against the inadvertent movement of these functions, with the exception of the one covered by this question. There was no means of preventing a leverman from restoring a signal to display the Stop indication and then immediately changing the route over which the signal had invited a train to proceed. Such protection is quite as desirable and necessary as that otherwise provided and the absence of such locking has resulted in some of the most disastrous accidents.

This locking can be accomplished by a mechanical time lock on the signal lever, or by approach, time, or stick locking, the time interval of which is obtained through