chines manufactured by the signal companies have point detectors built into the machine and, therefore, separate point detectors are not required.

Reasons for Using

W. M. Post
Assistant Chief Signal Engineer, Pennsylvania, Philadelphia, Pa.

It has been the practice on the Pennsylvania for several years to use point detectors for new work and renewals on all power switch machines whether located at outlying points or in an interlocking. We also use point detectors on new work and renewals on the switch and lock movement types of hand-operated switch throwing mechanism, such as the T-10 or Bethlehem Steel Company's devices. These point detectors are used so that in case a switch is run through, of if dragging parts of trains force the switch point open, the signals protecting the switch will display their most restrictive indications.

On All Outlying Switches

J. P. Muller
Engineer of Signals & Telegraph, Boston & Maine, Boston, Mass.

With regard to the question regarding the use of point detectors on electric switch machines, it is our standard practice to use point detectors on all outlying switches.

Replacement and Life of Lamps

"What is your practice in replacing lamps in color-light automatic signals? Do you transfer the lamps from one unit to the next and if so, how long a period is allowed in each aspect? How long an average life do you get from the lamps?"

Removed When First Filament Fails

E. Winans
Signal Engineer, Atchison, Topeka & Santa Fe, Los Angeles, Cal.

All color-light signals on the Santa Fe Coast Lines are normally lighted on a-c. All of the later installations have battery stand-by. While burning on a-c., they are constant burning. It is possible to secure correct operating voltage for the lamps by means of transformer adjustment without the use of resistance units, with the results that there is little voltage increase on the second filament when the first filament fails.

At one time it was the practice to shift lamps from one unit to another at four-month intervals which resulted in one year's service per lamp. Of this year, the lamp bulb burned for approximately four months, and it was noted that the majority of burnouts were in the newly-installed bulbs. If they lived through their initiation period, they usually lasted a full year.

Four years ago we adopted a double-filament bulb for Style L signals, and eliminated the secondary lamps. We were already using double-filament bulbs in the Style R and searchlight signals. At that time we abandoned the practice of shifting bulbs from unit to unit. Bulbs are left in service until the glass darkens or until the first filament fails. Dark signals are quite few, and, under the practice of replacing bulbs only when the first filament fails, are no more frequent than when we were replacing bulbs at stated intervals.

Practically all failures of the first filament are detected before the second filament fails. Of the few lamp failures we have, practically all occur in the green units. It is impossible to give figures as to average life of bulbs. The average over-all life of the few that totally failed in the green units in the last four years has been 5,653 hr. Almost all the bulbs that were in the red and yellow units four years ago are still there. Of course, they have burned only a small percentage of the time.

Emergency Yellow Unit Used

J. A. Johnson
Superintendent Telegraph & Signals, Missouri-Kansas-Texas, Denison, Tex.

We do not transfer the lamps from one unit to the next but each of our color-light signals is equipped with an emergency yellow light unit, which is located below the regular unit. An ANL-2 relay is in series with the current that lights up the green unit and the yellow unit, and the circuit is so arranged that if either of these two units is burned out, the current is transferred to the emergency yellow unit, which gives the approaching train a caution indication.

The new lamps are put into the emergency unit first and they are allowed to remain until there is a burn out, then this lamp is stepped up to the red unit, from there to the yellow unit, and finally to the green unit. We let all of our lamp bulbs stay in the signals until they burn out.

From the check that we have so far made, about 10 per cent of our lamp filaments are burned out by static lightning before they reach the green unit. An actual record kept of the lamps in a number of our signals, shows that a new lamp serves an average of 3,453 hr. in the emergency unit, 4,215 hr. in the red unit, and 8,507 hr. in the yellow unit and 3,670 hr. in the green unit. This refers to 8-volt, 10-watt lamps burned at about 7.5 volts, burning continuously when they are transferred to the green unit.

We believe that we make a saving in the consumption of lamps, and we also find that the use of the emergency yellow unit results in a saving of train delays and of expense in calling out maintainers.

Normal Lighting Involved

F. H. Bagley
Superintendent Telegraph & Signals, Seaboard Air Line, Norfolk, Va.

The practice of replacing lamps in color-light signals on the Seaboard Air Line is as follows:

(a) Lamps must be renewed and changed in color-light signals every 230 days. At signals that are normally green, a new lamp will be placed in the green unit, the lamp from the green unit will be placed in the yellow unit, the lamp from the yellow unit will be placed in the red unit, the lamp from the red unit will be placed in the marker lamp or scrapped.

(b) At signals that are normally red, a new lamp will be placed in the red unit every 230 days, the lamp from the red unit will be placed in the green unit, the lamp from the green unit will be placed in the yellow unit, and the lamp from the yellow unit will be scrapped.

(c) At two unit signals, signals that are normally red a new lamp will be placed in the red unit every 230 days, the lamp taken from the red unit will be placed in the yellow unit, and the lamp from the yellow unit will be scrapped or used in marker lamps.

(d) At two-unit signals, signals that are normally yellow, a new lamp

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will be placed in the yellow unit every 230 days, the lamp taken from the yellow unit will be placed in the red unit, and the lamp removed from the red unit will be placed in the marker lamp.

Discoloration of Glass

C. H. Tillett

Signal Engineer, Canadian National, Toronto, Ont.

Practically all of our automatic signals are of the multiple-light type, equipped with a relay that cuts in the yellow indication in case the lamp of the green unit is burned out. The lamps of the red indication are connected to the circuits in the normal manner.

An examination of the bulbs, when they receive their weekly cleaning, will reveal a discoloration on the glass, thus permitting the lamp to be changed long enough before the actual burn-out takes place. Occasionally a lamp will fail shortly after it has been put to use but these are rare occurrences; however, when it does happen no advance warning is given. Our lamps in the green indication average about two years; the ones in the red about four years, and we have rarely to change the yellow.

We attribute the long life we get out of our lamps to the fact that they are approach lighted, and are lighted directly off of the storage battery instead of the alternating current supply with power-off relays. This latter method of lighting was discarded early in our experience because of the loss of lamps caused by bad voltage regulation of the power supply.

Discontinued Transference of Lamps

L. S. Werthmuller

Assistant Engineer, Missouri Pacific, St. Louis, Mo.

It formerly was the practice on the Missouri Pacific to transfer the lamps from the green to the yellow and from the yellow to the red unit, and for a time we felt that this was giving us very good results. We determined, however, that we probably were damaging the filament more in transferring than if we had permitted the lamp to run its life in the unit in which it was originally installed. On a large percentage of our signal mileage we use the double-filament bulb and by inspection of the lamps, we are able to detect approximately 75 per cent of the lamps with one filament burnt out before we have failure of other filament. On the single-filament lamps, the signalmen are able to avoid a large percentage of failures by inspecting the filament while burning for weak points which are shown by increased illumination at the weak point in the filament or by discoloration when the lamp is not illumined. As we have but an average of five train delays per year due to burnt-out lamps in our 2,000 miles of automatic signals, I believe our present system is very satisfactory.

Left in Service for a Fixed Period

W. N. Hartman

Assistant Signal Engineer, Chesapeake & Ohio, Richmond, Va.

Several years of experience with various types of lamps in color-light automatic signals finally led to the adoption, in 1936, of differential filament lamps. These lamps after being installed in the signals are not transferred from one unit to the other but are left in service in the unit, in which originally installed, for a fixed period of time as follows: 300 days in normally burning (green) lamp units and two years in yellow and red lamp units, the burning time of which is dependent on volume and speed of traffic. These fixed periods of time for retaining the lamps in service in the various units are, for the present, arbitrary but were tentatively adopted as the result of extensive tests which indicated an expectancy of 6,000 or more hours burning life without failure of either the primary or secondary filament, when burned at a maximum of 90 per cent of their rated voltage.

It is not possible to state, at this time, how long an average life may be expected from lamps of this kind, as this will depend on the percentage of lamps requiring renewal prior to the end of the fixed life period due to burned out filaments and other defects. The arbitrary fixed life period may be lengthened or shortened, depending on future performance records.

Track Shunting Problems

"Where a certain few track circuits at interlockings are causing trouble due to failure to hold a shunt, on account of infrequent use by trains, what practical remedy can be applied?"

Trouble Due to Film

A. R. Whitehorn

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

It is evident that the problem we are confronted with in holding a shunt is due to a film or corrosion on the track circuits or rails due to infrequent use by trains. If the equipment using this track circuit is of a sufficient weight, the problem is to be sure that the relay shunts when the train enters the section and it has been found in the past year or two that the most logical assurance of a shunt when film or corrosion is present on the rails is to increase the potentials which will break this film down and, consequently, be assured of the shunt.

We have found that this increased voltage with increased resistance inserted in the relay end of the track circuit has been a decided improvement in shunting, but there is a certain amount of sacrifice of broken rail protection by having this voltage increased. Some attempts have been made to reduce the sacrifice of broken rail protection to the minimum by having a fluctuating potential. The high or peak voltages provide good shunting and the mean voltage, or rather the average voltage, determines the amount of sacrifice on broken rail protection.

The development of the so-called primary secondary track circuit arrangement was brought about in an attempt to overcome momentary loss of shunt but, of course, can have incorporated in it the same features of an increased voltage and in this way it will do double duty by assuring, first, good shunting and second, the overcoming of a possibility for momentary loss of shunt. It is self-evident that the more light-weight equipment and so-called streamlined trains that are used, the possibility for momentary loss of shunt becomes greater.

The use of the primary secondary relay combination using an increased resistance in the relay leads to the

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