design, a corresponding advancement is made in the art of signaling. An attest of this statement is readily supported by noting the changes in modern interlocking and signaling practices since the improved modern relays have been available.

Many noteworthy improvements have been made in the construction of relays. The materials in the old relays were made in the forms and shapes desired with no thought of preparing them to secure the best results. In modern relays all material is carefully treated. The treatment of the iron has greatly improved the magnetic qualities so that residual magnetism does not build up with the age of the relay and, as a consequence, the operating characteristics, such as the pick-up and drop-away, remain more nearly constant.

The treatment of materials used in the contact assembly has greatly improved the contact performance, and the design is now such that there is better compression of back contacts and greater slide or wiping action in front contacts. A new relay can remain in service at least twice as long as an older type, without being shopped.

Modern relays are moisture and dust proof and also more compactly assembled. When any changes are made in existing installations more relays can be placed in the old housing. The terminal post arrangement has been improved so that all posts are in front. They can, therefore, be readily inspected and circuits more readily traced through the relay.

In substituting a modern relay for one of the older type, the resistance of the coils of line relays can be about twice that of the older relay. When a change is made in track relays the pick-up and working characteristics of the modern relay are so near the same values that the current consumption can be greatly reduced. The savings which can be made are fully explained in the June, 1935, issue.

Finally, modern relays give long service at much lower consumption of energy. They are more dependable, efficient and economical and have more sensitivity to train shunts.

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Facing-Point Locks on Switches

"On main-line high-speed automatic block-signal and train-control territories, is it necessary to install a mechanical facing-point lock separate from the switch stand on facing-point switches?"

Added Protection Desirable

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

The question assumes, I take it, that a facing-point lock is necessary on facing switches in main-line high-speed automatic block-signal and train-control territory. I believe this protection is very desirable, if not absolutely necessary, whether in or out of train-control territory.

In my opinion there should be a lock rod in addition to the operating rod so that the switch will be secured to the switch stand by two connections when set for the main track. It is not necessary, nor do I think desirable, to have a separate lever for operation of the facing-point lock. It is better done by a switch-throwing and locking mechanism.

I quote the specification for use of locking switch stands in effect on the Pennsylvania:

USE OF HAND-OPERATED MECHANISMS

1202. Locking switch-stands shall be used:
(a) With circuit controller
(1) In automatic block and controlled manual-block territory.
(2) In manual-block territory, at switches protected by distant switch signals (track circuit or line controlled) or distant switch indicators.
(b) Without circuit controllers:
In manual block territory only where local conditions warrant mechanical switch locking, and when approved by the general manager.

1203. Switch-stands, without the locking feature, shall be used for operating all switches except where the locking switch-stand is required or warranted, as outlined in paragraph 1202.

Especially Valuable at Grade Crossings

R. D. Moore
Signal Engineer, Southern Pacific
San Francisco, Cal.

On the Southern Pacific we have been somewhat concerned about switches located in close proximity with highway crossings, owing to the possibility of a train striking an automobile and the automobile in turn striking the switch stand and opening the points. To provide some measure of protection against this hazard, we have, in a number of cases, equipped such switches with a switch-point lock.

As there are possibilities of very serious derailments occurring under the circumstances cited above, I believe that these locks are well worth installing, particularly on switches located close to road crossings. Grade crossing accidents are numerous, and one can readily visualize what might happen if an automobile were thrown against a switch stand.

Plating and Bracing Important

P. M. Gault
Signal Engineer, Missouri Pacific
St. Louis, Mo.

In my opinion the addition of a facing-point lock to a hand-throw switch does not result in enough increased protection to warrant the additional expense. In our automatic-signal territory we endeavor to keep our switch circuit controllers adjusted so that, with the switch point open ¼ in. and with the stock rail against the braces, the governing signal will be in the stop position. In order to maintain an adjustment of this kind, it is essential that gage plates, gage rods and braces all be tight and free from lost motion.

In my opinion any money which is available for the improvement of switches should be spent along the lines of additional plating and bracing, and not for facing-point locks or other "gadgets" which may be of doubtful value, when it comes to the question of making the track 100 per cent safe for high-speed trains.

Not Economically Justifiable

W. J. Eck
Assistant to Vice-President, Southern
Washington, D.C.

The installation of facing-point locks would not be economically justified when we consider the very few accidents which have occurred in the past at facing-point switches, resulting from the lack of a lock, as compared with the total number of trains operated over such switches daily.

Throw Rod Should Be One Piece

F. B. Wiegand
Signal Engineer, New York Central
Cleveland, Ohio

I assume from the conditions outlined in the question that the separate lock is intended to insure that the switch points are in the proper position. On this basis my experience

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indicates that there is no necessity for the application of a mechanical facing-point lock separate from the switch stand on facing point switches in automatic block-signal and train-control territory. However, it is essential that the throw rod be forged from one piece of metal, i.e., the rod should be one continuous piece without a weld.

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Inspecting Switch Circuit Controllers

"On main-line automatic-block signal territory, how frequently should switch circuit controllers, connections, and the circuits affected, be tested and inspected?"

Monthly Report Made

E. G. Wesson
Assistant Signal Engineer, C.B. & Q.

On the Burlington, switch boxes are inspected thoroughly and all necessary adjustments made during the last week of each month. At the end of the month a report is rendered to the effect that "all switch boxes have been inspected and adjustments are correct." The fact that "all fouling sections have been tested and are o.k." is reported at the same time.

Maintenance men make inspections of operating rods, fittings, etc., each time they are around a switch between these detail monthly inspection periods.

Inspect Every 30 Days

P. A. Starck
Assistant Signal Supervisor, C. & N.W.
Sioux City, Iowa

Assuming that the track in the immediate vicinity of a switch is reasonably well maintained, it is my opinion that a switch circuit controller in automatic signal territory should be inspected and readjusted, if necessary, at least once every 30 days. Of course, proper track maintenance includes consideration of alinement, surfacing, gage, rail creepage, condition of switch points, braces and plates, etc.

The performance of switch circuit controllers and circuits in continuous train-control territory, where the circuits are so installed that the opening of a contact will remove train-control energy from the track section in which the switch is located, clearly demonstrates that not infrequently switch points will open under a train sufficiently to cause a circuit interruption. However, when carrying no load, the points seem to be in proper and safe condition. Unquestionably, such opening, if occurring during a facing-point movement, might result in serious consequences.

The same condition with respect to opening under passing trains will exist in non-train-control territory, but it may not so readily be brought to light by reason of the difference in the functioning of the circuits. An inspection at least once each 30 days is necessary in order that such improper condition of switches or switch circuit controllers might be discovered and proper corrective measures initiated.

For other answers to this question see page 442 of the August issue.

How to Avoid Switch Troubles

Carl T. Smith
Assistant Signal Supervisor, B. & M.,
Concord, N. H.

The best way to avoid troubles resulting from switch circuit controllers being out of adjustment is to make weekly inspections of all switches. The inspection should include operation of the switch several times so as to detect lost motion in the fittings, examination of the electrical connections, and the maintenance of a 3/16-in. switch-point adjustment of the contacts. At every inspection the fouling circuit at the siding should be tested by shunting at the clearance point. A voltmeter connected across the main track should be used to determine the effectiveness of the shunt. Rails in reasonably good condition, having good bracing and heel blocks at switches, are necessary if signal failures are to be prevented.

Section men should not be allowed to do any track work at main line switches without first notifying the signal maintainer of what is to be done. Such work as raising track, installing new heel blocks, ties or switch connections that may change the gage of the points and track, alining and respiking switches, changing insulation such as that of joints, gage rods or head rods, should not be done except in the presence of the signal maintainer, who can make proper adjustments after the work is completed. The section men are the signal maintainer's best friends, and close co-operation between the track and signal forces goes far in the elimination of hazardous conditions and train delays.

Of course, the traffic density to a great extent determines the frequency of switch box and fouling inspection. However, accidents have happened in light-traffic territories, as a result of improper or too infrequent inspection of track and signal apparatus.

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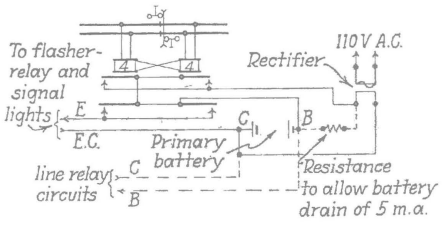
Circuit for Flashing Light Signals

"What circuit arrangement can be devised for use at flashing-light crossing-signal installations so that, without the use of a power-off relay, the standby primary battery and rectifier are both on a normally-open circuit?"

Output Circuits Normally Open

J. Birchall
Signal Inspector, Pere Marquette
Detroit, Mich.

The accompanying sketch illustrates a simplified circuit arrangement for a flashing-light signal using primary battery for standby power. The rectifier is adjusted to the operated load, the output circuit being run through two pairs of back contacts in the interlocking relay in a parallel-



Details of crossing-signal circuit—Dotted lines show optional variation

series arrangement. The primary battery is connected between the two pairs of relay contacts making the rectifier and the battery operate in parallel, only while the signal is in operation, both being normally on open circuit.

The dotted lines refer to a second-

Note: For another answer on this subject see page 380 of the July issue.

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