Railway Signaling

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Protecting Main Line Switches

ALMOST all ordinary switch stands include provision for locking by placing the handle in a notch in which it is held by the padlock. However, the absence of suitable means for the ready adjustment of the normally closed point and the tendency to introduce lost motion and spring in the connections, in many cases, permits the movement of the handle to be completed when the switch point is blocked open far enough to cause derailments.

One of the principal advantages of automatic block signaling is the protection of main line switches, which is accomplished by connecting a switch circuit controller to the normally closed switch point so that if for any reason the point is loose or blocked away from the stock rail more than ¼ in. the signal protecting this layout will indicate danger. Such a switch controller, and the signals in connection therewith, provide protection by indicating the position of the switch up to the time the train passes the signal. From that time, the switch stand and connections are depended upon to hold the switch in position during the passing of the train.

Additional protection is afforded by an interlocked switch, in which the switch is actually locked in each position by a facing point lock or a switch and lock movement before the circuits can be completed to cause the signal which protects the layout, to assume the clear position.

In many reports of the earlier interim inspections of train control installations, as well as in later final inspection reports, the Interstate Commerce Commission has suggested to different roads that the type of fouling protection employed at sidings and crossovers be given consideration with the possibility of increasing protection. For a crossover this suggestion refers to an arrangement of shunt foulings that will permit the signals to clear, when both switches are closed, if a car or an engine is standing on the crossover, fouling both mains. Some roads eliminate such a possibility by installing a special arrangement of insulated joints and shunt-fouling circuits. Others install a separate track circuit and a few roads provide a locking arrangement that insures that both switches must be open or closed when the locking member is thrown. The Norfolk & Western; the Cincinnati, New Orleans & Texas Pacific; and the Pennsylvania are among the roads providing such protection. In fact, the Pennsylvania has not only equipped the crossovers but also the main line turnout switches with hand-operated switch and lock movements on the five divisions recently equipped with automatic train stop. On the West Shore line of the New York Central, recently equipped with automatic block signals, the crossovers are provided with lever stands that operate bolt locks for both switches; on the facing-point switches a single-lever stand is arranged to operate the pipe-connected derail on the turnout and to bolt-lock the switch. For a number of years the Erie has been using a facing-point lock on all main-line switches in automatic territory on heavy traffic lines.

In consideration of the fact that some roads are installing locking arrangements on main-line switches, general consideration of the problem of better protection for switches would seem to be in order. The first question is to determine whether the standard switch stands in use are designed and maintained to afford the best protection possible. If those responsible consider additional protection over and above the switch stand and switch circuit controller necessary, some type of locking arrangement is the next logical step. Authorities differ as to whether such additional equipment is necessary or justified; nevertheless the subject is bound to come up and in order to be prepared to discuss the subject a study of both sides of the question should be made.

Why Not Use the Term "Automatic Interlocking"?

ON the floor of the recent convention of the Signal Section, A. R. A., a lively discussion developed on the question whether the term "automatic interlocking" should be applied to an installation now designated in the proceedings of the Signal Section as "automatic signal protection for railroad grade crossings."

One speaker contended that such an installation complied with the definition of an "interlocking," in that the movement of the functions "must follow each other in a predetermined order." The signal engineer of a large road put it this way, "A proper term to describe such an arrangement is 'Automatic Signals for the Protection of Railroad Grade Crossings'; however, the laws of several states require interlockings at railroad grade crossings if trains are to be allowed to pass without stopping. Therefore it is necessary in such states, that the installation be called an 'interlocking' for the purpose of securing approval of the railroad commission."

It is necessary also in referring to such an installation in the railroad time tables, to describe the layout as an interlocking, in order to use the name approved by the state commission and that which the railroad is permitted to use to enable trains to proceed over the crossing without stopping. It seems desirable, therefore, to refer to such protection as "automatic interlocking" although, properly speaking, the arrangement is practically that of an automatic signal installed for the protection of movements over a railroad grade crossing.

The practical use to which the protection will be put will have to be considered in determining the title as well as the strictly technical terms which may be more properly applicable. Many outlying crossings have not been interlocked because the expense of a complete interlocking, with towermen on service 24 hours, has not been justified. At many such points the so-called automatic interlocking is adaptable and will permit the elimination of train stops to such an extent that a decided saving can be made. In view of the substantial economies that may be effected it would seem that the Signal Section should reconsider the nomenclature applied to such layouts and apply the term "automatic interlocking," thereby removing an obstacle that is in many cases at present hindering the railways from securing approval for such installations.

Unit Basis for Maintenance of Signal Equipment

DIVIDING up an installation of signals into maintainers' territories of equal mileage does not necessarily give each man the same amount of work. In recognition of this fact several roads assign definite unit values for the maintenance of each signal, switch box, track circuit, and other functions of signal and interlocking equipment, in an effort to secure uniform results. This system of units is, however, only a start, for consideration must also be given to many other local factors in order to reach a fair average. Curves, grades, tunnels and heavy winds affect the time required to get over the road. Winter weather may be especially severe on one section, thus limiting the actual field maintenance work to 9 or 10 months, while on other parts of the road, the winters may be comparatively "open." Such conditions can be compensated for by varying the number of total units to be assigned to territories on different divisions or districts. On the Northern Pacific a committee of signal supervisors not only worked out a system of units but also agreed on the number of units to be assigned to each maintainer's territory on each division. This system of equating the amount of work has been followed for several years to the satisfaction of all concerned. On many other roads the introduction of a unit basis for maintenance will be the means of eliminating controversies and uneven division of work, which may be the cause of some of the signal failures at present.

How Long Is a Track Circuit

TRACK circuits are all of the same width but they vary in length according to local conditions and the maximum length for standard practical operation varies from 2,500 ft. to 10,000 ft. on different roads. The successful operation of track circuits depends on the bonding, ballast, drainage, amount of salt brine drippings, and the climate.

After years of experience, the majority of roads have decided that long track circuits are not practicable because of frequent failures in wet weather. Some roads fix 3,500 ft. as a maximum, others even less. As explained in an article elsewhere in this issue the New York Central recently completed an extensive signal installation on the West Shore line, in which the blocks are about a mile long and each block is divided into two center-fed track circuits with storage battery using a relay on each end of each track circuit so that each track circuit feed is about 1,200 ft. to 1,500 ft.

On the Erie the automatic signals are about a mile apart and the three indications are secured by polarized track relays fed the length of the block by primary battery. The New York, New Haven & Hartford has an installation of automatics with the signals about a mile apart in which polarized track relays are fed the length of the block from storage batteries. The Southern has for years successfully operated two-mile polarized a-c. track circuits for the control of automatic signals. On the recently completed signal and train stop installations on the Pennsylvania, three-position a-c. track relays, fed the length of the blocks in most cases, are used to secure the three indications of the signals, the blocks being about 1.5 miles long.

Center-fed track circuits with short length feeds, such as are used on the West Shore, afford economical and reliable operation under all weather conditions without constant attention or adjustment, the effect of foreign current is to a great extent eliminated, and broken rail protection is increased. In contrast the polarized track circuit, extending the length of the block, eliminates line control circuits with attendant first cost, maintenance and a certain number of failures due to line breaks, lightning, etc. With the rapidly increasing mileage of stone ballast, heavier rail, better bonding and good drainage, it may be practicable to use longer track circuits successfully on new installations or to eliminate cut-sections of signaling in service. However, reliability of operation of signaling is becoming more important every day, so that such a change in standards should be preceded by a study of local conditions in each case.

Letters to the Editor

Non-Interlocked Interlocking Machines

To the Editor:

With the machines of but a few years ago, before lever locks, route locking, detector locking, "SS" circuits, "KR" circuits (or what have you?) were in common use, mechanical locking between levers was quite essential. With any of the modern mechanical or electro-mechanical plants it would be possible to remove all of the mechanical locking between levers and it would still be impossible to set up a route incorrectly and get the signal for it. Mechanical locking is only preliminary and it is expensive. If we are electrically-locking our machines it would appear that a part, of not all, of the mechanical locking is superfluous.

The writer has installed and has had in service for some time an S. & F. machine handling switches and derails and table lever controllers handling the signals. No mechanical locking is used between the mechanical and table levers and no mechanical locking between table levers. The machine is as nearly foolproof as any completely mechanically-locked machine.

There seems to be no good reason why electrical locking cannot be entirely substituted for mechanical locking in many instances, thereby reducing costs and saving tower space. Why not?

Signal Engineer.