delay to traffic. It would appear, therefore, that the safest arrangement would be to provide adequate telephone communication with the tower or some form of indication to be operated from a push button by trainmen after their train has been brought to a standstill behind the signal.

Experience shows that the possibility of enginemen over-running signals at terminals is much greater than at isolated plants and it would appear that in order to prevent accidents it is very important to give the matter of enginemen over-running signals consideration, for the reason that even though the signal apparatus might have functioned correctly, an accident might occur. Therefore, in order to prevent this possibility, consideration should be given to what would be the result if an engineman overlooked a stop signal while releasing of the detector locking is carried out.

Elimination of Lock Rods

"In your opinion is it practicable or advisable to use no lock rods on power-operated switches in terminals where low train speeds prevail?"

Necessity for Lock Rods Has Disappeared Because with Heavier Rail, Rolling of the Switch Point Is Not Likely to Occur

By C. D. CRONK

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IN reviewing the signaling to be decided upon for the new Cleveland Union Terminal, the matter of the elimination of the lock rod was discussed and it was decided that a study should be made of switch mechanisms, which brought out that switch mechanisms, meeting the requirements of A. R. A. Sig. Sec. Spec. No. 10,120, "Universal Electric Motor Switch Operating and Locking Mechanism" as developed by the General Railway Signal Company and the Union Switch & Signal Company, do not require the use of the lock rod for holding the switch points in position. The Model-5 and 5A switch machines of the General Railway Signal Company, provide in the slide bar mechanism for the operation of the pole changer, and lock rod locking if used, a dog which blocks in position, the cam which operates the throw bar of the switch, likewise the Style-M switch machine manufactured by the Union Switch & Signal Company provides in the gear train, when the switch machine has completed its stroke either in normal or reverse position, that the gears which directly operate the throw bar are thrown off center, which in effect provides a means of maintaining the position of the switch machine when external force is applied to the points. Therefore, the necessity for lock rods disappears, for the reason that with the larger rail, the rolling of the switch point is less liable to occur. Also when front rods with a cross section of 1 in. x 2½ in. of a design as shown on A. R. A. Signal Section Plan 1534 is used with any size rail. Therefore, the analysis of the above determines that with the use of SS control, which when operated through the medium of a switch machine which requires that the switch be in proper position corresponding to that of the lever and locked in that position through the agency of the locking of the throw rod, signals governing movements over such switches cannot be cleared unless the agencies of the SS control have been completed.

A further study of the signaling to be decided upon, determined that indication parts could be eliminated and in this connection there are a number of reasons why indication parts are not required. Basicly and foremost we do not hesitate to apply electric interlocking principals to a mechanical interlocking machine. This was first inaugurated by the introduction of the power operated home and distant signal. It is true at the outset, we provided electric locks as indication locks, however, that was before the extensive use of route and detector locking. With the advent of route and detector locking and approach locking, it very soon became apparent that the electric locks used as an indication lock on the lever controlling a power operated signal, performed no function except to retain and not permit the release of mechanical locking until the signal controlled by such lever had assumed its most restrictive indication, however, it was apparent that this function could readily be transferred to the electric lock on the facing point lock lever, and with a considerable saving of expense in connection with electric locks which were used only for the purpose of checking the position of the power-operated signal.

Therefore, in analyzing the necessities for indication locking, it became apparent that with the proper design of control circuit for the home and dwarf signal it was unnecessary to maintain a switch lever in its indicating position until such indication had been received as in the analysis of this, the only functon that the indication lock or indication magnet performed was or is to derange the mechanical locking between levers to such an extent as to make it impossible to reverse a signal lever controlling a series of such routes until indication has been received. Therefore, with this as a basis it was decided that indication parts were unnecessary in so far as the performance of the plant was concerned, provided all of the electrical features which are now embodied in the present control of indication parts were maintained so that with the completion of the stroke of the switch machine, the same medium which now energizes the indication parts of the power interlocking machines now on the market, are maintained, and the control for signals governing movements over such routes is provided for by the electrical device that formerly released the mechanical locking in connection with the indication magnet.

Briefly, we have retained all of the electrical characteristics in connection with indication circuits, and have eliminated all of the mechanical characteristics now present in machines of each signal company manufacture, and have reduced the interlocking machine to one of primary mechanical function, that is, a means of controlling switches and signals by levers provided with mechanical locking to require the predetermined sequence of operation without the undesirable features which have ever manifested themselves in connection with all indication parts as originally designed.

In connection with the above features we are providing an electric lock on each switch lever so controlled that with the signal lever reversed and the signal clear or the track circuit occupied, the electric lock is de-energized.

In the study of the signaling for the Cleveland Union Terminal, it was decided that an additional indication should be provided. This we called the "fourth indication" which provides a red over a

yellow light for all dwarf signals. We are modifying the standard code to the extent that red over yellow indicates: "Proceed at slow speed prepare to stop, track occupied." The fourth indication will be very helpful in switching movements to give the engineman advance information as to whether or not the route which he was to take, perhaps beyond the point of vision, is clear. The other indications making up the fourth indication are as follows: Yellow: Proceed at slow speed prepare to stop, track unoccupied." Green: "Proceed, track unoccupied, next signal clear."

Aluminum Cable for Signal Power Lines

"What are the advantages and disadvantages of a stranded aluminum cable (with steel wire core) for signaling transmission lines up to 4,400 volts?"

Greater Cross-Sectional Area Required May Lead to Sleet Trouble

By C. H. TILLETT
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I HAVE never considered the use of aluminum cable for this purpose, although I can see that it would be a satisfactory article, if anyone desired to use it, and market conditions were such that aluminum was cheaper than copper at the time it was desired to use it. I believe this was the case at one time, but as I have not done any high-voltage transmission work for some time, I am not sure that it is the case just now.

Personally, I prefer copper to aluminum because the same conductivity can be secured with less cross section to collect sleet, and as telegraph poles are ordinarily spaced, sufficient mechanical strength can be secured with copper alloy wire to cover our small conductivity requirements.

Storage Batteries Applied to Interlocker in 1891

"When were storage batteries first applied for the operation of track circuits and of interlocking facilities?"

Storage Cells Were First Applied to Operation of Electrically-Actuated Switch Valves to Replace Gravity Batteries*

IT was in 1891 that the first electro-pneumatic interlocking that employed electrically-actuated switch valves was installed by the Union Switch & Signal Company at the Jersey City terminal of the Pennsylvania. Previously, hydrostatic pressure served this purpose in this system. The use of electrically actuated switch valves introduced a great number of electro-magnets not previously used. The operation of these switch valves and of signal valves, lever locks, relays, etc., involved a materially greater normal current flow from the batteries serving the interlocking than formerly and 250 cells of gravity batteries failed to meet the needs of this particular plant. During the installation of the plant these facts became conspicuous and a departure from the practice of employing gravity batteries became necessary.

W. H. Higgins, who was assisting the Union Company in the installation of the plants, suggested the use of storage batteries. Previously he had assisted the Pullman Company in some experiments with storage cells in car lighting service. Mr. Higgins secured a half dozen old chloride accumulators from the Waldo avenue shop of the Pullman Company and set them up in the tower. He then wound coils of No. 9 iron telegraph wire on broomsticks and stretching these between improvised cross-arms on a nearby pole, he charged the batteries from the 110-volt, d-c. generator by which the station was lighted. All the troubles experienced with the gravity cells disappeared the instant the six storage cells supplanted the 250 gravity cells, and this meant much to the development of the electro-pneumatic system.

This incident constitutes, as far as is known, the first application of storage cells for interlocking and block signal work in America. A few months later Mr. Higgins carried 12 No. 14 wires from 12 resistance coils in the tower to the 12 track circuits and removed the 24 cells of gravity batteries. This was evidently the first time storage batteries were applied to track circuits, and it is especially notable because the 12-volt battery was used for all 12 track sections and the same battery was used for supplying the interlocking machine.

* Information in this article taken from *Railway Signal Engineer*, February, 1919, page 69. W. H. Higgins, was signal engineer of the Central Railroad of New Jersey, at the time of his death in January, 1919.

Small Soldering Pot

By D. W. Ketchum

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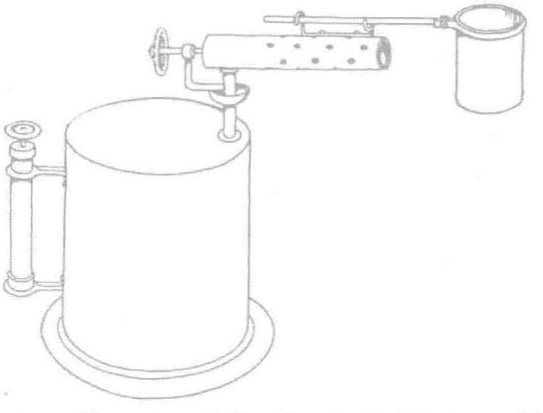
IT is handy to have a small solder pot available when renewing the eyelets on jumper wires used for battery and relay connections. These eyelets frequently become mashed or broken after continued transferring of jumper wires. New eyelets can be installed quickly if a small solder pot is used. I made such a solder pot from an empty can that had been used for what is known as "canned heat," because this particular type of can has a seamless bottom which I rounded out so that the solder would flow easily. A strap iron clamp was made to fit around the top of the can, fastening it securely to the can with a small bolt as shown in the illustration. Then to facilitate heating the solder in this



Miniature solder pot and handle attached to top of blow torch

can, the handle was shaped to fit the top of the blow torch in such a way that the bottom of the solder pot would be directly in the flame of the blow torch. Owing to the small size of the pot, the solder can be melted quickly. In fact, care should be used not to overheat the solder. A one-quarter turn of the handle is advisable, because this will make the handle lay flat on top of the torch.