

tower to change the direction of traffic on any or all of the tracks between Grove St. and Bergen.

The track relays and track battery feed at each point are interchanged when the lever controlling the direction of traffic is reversed. By doing this, the polarized system may be used without any line wires for controlling the distant signals. The lever for the change in the direction of traffic cannot be thrown if there is a train between the outbound signals at Grove St. and the inbound signals at Bergen. This not only prevents the reversal of traffic while a train is using a track, but also prevents the possibility (which would otherwise be present) of throwing signals to danger in face of traffic.

The advantage of the control used for the block signals is apparent, as it allows the maximum number of train movements in the direction of traffic established, it being possible to have a train in each of the five blocks on any of the four tracks between the interlockings when the traffic is set up for running between Grove St. and Bergen, and a train in each of the four blocks when the traffic is set up for running between Bergen and Grove St., while in previous installations of this nature it has been customary to make one block of the system when reversed traffic was established.

It is the practice, with the system above described, to use the three southerly tracks for inbound traffic during the rush hours in the morning when a great many trains are entering the station and few, if any, are leaving; while, in the evening, the three northerly tracks are used for trains in the opposite direction.

Between Grove St. and Bergen Interlockings, aerial cable is used which is suspended from a stranded messenger wire, the messenger being clamped to iron pipe poles about 12 ft. high and set in concrete foundations. Where it is necessary to carry this cable through the short tunnels and street bridges, which are all of concrete, lead-covered cable has been installed in clay ducts provided for that purpose and connected to the aerial cables in terminal boxes at each end of each duct.

This entire installation was carried out by the Union Switch & Signal Co. under the direction and supervision of W. H. Willis, signal engineer of the Erie.

### AN INTERESTING CASE OF TROUBLE

BY S. L. B.

While maintaining a certain district some time ago a case of trouble showed up which by voltmeter test proved to be a short in a track section. In making tests at a switch located in the circuit I discovered that on stepping upon the back switch rod, the needle of the voltmeter responded with a jump, so I took the insulated rod apart, thinking, of course, that the trouble was there. I could not find anything wrong with the insulation of the rod, however, but to my surprise the circuit was clear while this rod was out of the track. I then thought it must certainly be in the other rod, so I put the back rod in place again and took out the front rod. My experience with this rod was the same as that with the other.

My next move was to pry the switch point away from the stock rail, and this caused a deflection of the voltmeter needle also. Next I discovered that by disconnecting the switch-box rod the trouble was cleared. Upon further investigation I found that the short-circuit was through the switch box and connecting rod as follows: A large nail had been driven, by construction men, through the trunking covering the track wires leading to the switch box, cutting the insulation of the wire leading from the far rail and making contact with it. The end of the nail was up against one of the lag screws which secured the switch box to the head block, and the short-circuit was established. The current passed through the far rail, through the wire to the nail, thence through the nail to the lag screw, and to the switch box and switch-box rod to the near rail.

### SIGNALING PRACTICE ON STEAM RAILWAYS\*

BY L. R. CLAUSEN.†

Probably every man who is interested in railway signaling has, at some time, realized the comparative scarcity of recorded information relative to "Signal Practice," or the use of signals as related to the operation of trains. Much of a technical character relating to the construction and mechanical or electrical operation of signaling devices has been published by the Railway Signal Association, the railway periodicals and the signal manufacturers, but very little of the why and wherefore of the use of signals.

In 1895 the Railway Signal Association was founded, as The Railway Signal Club, by six signal engineers in Chicago for the study of railway signaling problems, and in 1899, the American Railway Engineering and Maintenance of Way Association was established for similar study of all problems of railway maintenance. The Railway Signal Association, as a body, and the signal committee of the latter association devoted the first two years of their existence to the details of construction and maintenance. During this period, a feeling was gradually developing among signal engineers, and others interested, that something should be done in the way of investigating and adopting fundamental principles involved in signal practice. Considerable variation existed in the practices of the different railways, each being largely determined by the opinion of the individual signal engineer. With very few exceptions, the engineers were not sufficiently well informed to have confidence in their opinion and many changes in methods occurred. The free exchange of ideas at the meetings of the two associations referred to, had the effect of creating new doubts and changes. The need of some fundamental principles or standards was fully recognized and a search was started in the year 1905.

About the same time it became evident that there might be conflict in the work of the Maintenance of Way Association Committee No. 10 and that of the Railway Signal Association. To guard against this unfortunate possibility, the executive committee of the Signal Association, through the president, appointed a standing committee on signal practice, composed of all members of that association who were also members of the Maintenance of Way Committee No. 10. This had the effect of making the membership of both committees nearly identical and paved the way for the harmonious action desired.

#### EARLY PRACTICE.

Very soon after the establishment of regular traffic on American roads, the need for some kind of fixed signal for the control of trains became apparent. This brought into use various forms of targets or signs. Some of these were used in connection with breaks or obstructions in main track, such as switches, railroad crossings, junctions, drawbridges, etc. Others were used for stopping trains at stations for various reasons, such as the delivery of train orders or spacing trains under a block system. The indications of these signals or targets (that is to say their meaning to the engine and trainmen), first used were danger or stop,—caution,—and safety or clear. The corresponding lights used at night were red, green and white. In later years the indications have been changed to stop, caution and proceed. The conception of these indications as used was as follows:

STOP—As mandatory.

CAUTION—You may proceed unless otherwise restricted, but always with caution.

PROCEED—You need not stop, or you may proceed unless otherwise restricted.

The semaphore, on account of its distinctive appearance, was early adopted for use at stations. This is true of points where interlockings were not in use, as well as where interlockings were in use.

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