

## RAILWAY SIGNALING.\*

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Railway signaling naturally divides itself into three general heads. Namely, "Interlocking, Block Signals, and Miscellaneous Signals."

The primary reason for the use of signals on a railway is to convey information to the engine driver as to what action he is to take, and when to act. The difference between driving a locomotive and driving a horse and carriage is a question of momentum. In the case of the locomotive, a weight of several hundred, or thousand tons is moving at high velocity, in the case of the carriage, a weight of a few hundred pounds is moving at low velocity, the control of the one is only approximate except through the lapse of a considerable interval of time, while the other is practically under instant control. Signaling has developed two types of signals, which are known as, a Home Signal, and a Distant Signal. A home signal is a signal located along side of the track marking a definite point beyond which, the engine driver must not proceed, unless the signal indicates that he can do so. As noted above, it is physically impossible to stop a train moving at any considerable speed instantly, therefore if the train is to be stopped before it passes the home signal, some preliminary information must be conveyed to the driver, as to what indication will be presented to him by the home signal. The means employed is the distant signal, which is set in advance of the home, a distance depending on the braking distance of the highest speed trains, and is simply a repeater of the home. When the driver finds a distant signal indicating that the home signal is at the stop position, he can apply brakes and bring his train to a stop before he reaches the home signal. If the distant signal is indicating clear the home signal must also be indicating clear.

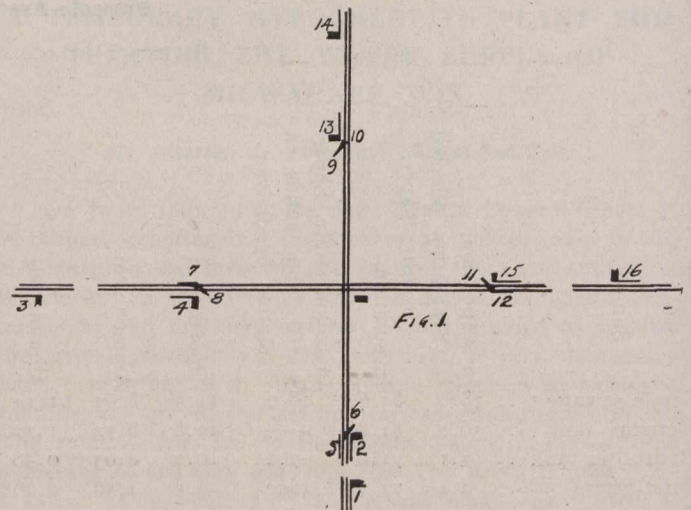
In modern signaling the semaphore has come into general favor, as giving the best results with unfavorable weather conditions, and changing back grounds.

The indications are given by the arm of the semaphore. The stop indication by the arm in the horizontal position, and the proceed indication by the arm inclined. Until recently the distant signal arm was distinguished from the home by having a V shaped notch cut out of the end. The indications of the distant signal were the same as the home, that is, the horizontal position of the distant arm indicated caution (that the home signal arm was at stop), the inclined position of the distant arm indicated that the home signal arm indicated clear. There is a confusion here quite apparent, as with the home arm horizontal, an indication is given that the engineer must not proceed beyond the signal whereas the horizontal position of the distant blade indicated caution, "proceed but be prepared to stop at the home signal," and the only distinguishing mark for the distant arm is the V shaped notch, which is not distinguishable at any distance nor in all weathers, consequently there is serious objections to this horizontal indication having two possible meanings. The latest practice is to have each arm capable of giving three unmistakable indications, i.e., horizontal meaning stop, inclined at an angle of 45° caution, and vertical, meaning proceed, this is more consistent, and it is impossible to mistake the indication.

The fundamental principle underlying the construction of signals, is that a failure in any part should cause the arm

of the semaphore to assume the horizontal position, indicating stop. The common practice in America has been to give the indication by moving the arm from the horizontal to an inclined position below the point of support, this necessitates the use of a heavy counterweight to bring the arm back to the horizontal should any part of the signal break, naturally the accumulation of ice and snow on the arm itself would tend to offset this counterweight, and there are cases on record where such accumulation has been sufficient to hold the signal clear, when it should have returned to the horizontal. The German practice has always been to move the arm above the point of support, thus doing away with the heavy counterweight, and with this still further advantage, that any accumulation of snow or ice on the blade tends to bring it back to the horizontal. This practice has found favor among the American Signal Engineers, and also is being used on the Western Lines of the C.P.R. and C.N.R. This is unquestionably a move in the right direction and has everything to commend it.

While the day indications of a signal are given by position, the night indications are given by colors. Red has always been used to indicate the stop position, but for the other indications practice has differed on different roads. The different colors are obtained by means of shutters of



colored glass, which are moved in front of an oil lamp attached to the signal mast, these colored glasses are fastened into the same casting to which the arm giving the day indications is attached, each indication of the arm has then a corresponding color indication. It is essential if the principle of signal construction above referred to, is to be carried out, that the day indications and the night indications should be given by the same mechanism, that is, it should not be possible to give an indication for proceed with the arm, without at the same time and by the same means, giving this proceed indication with the proper color. There are a good many signals in use in Canada to-day which do not conform to this requirement. The night indication in these, is given by rotating the lamp on its vertical axis, while by means of a pinion gear the arm is made to move, it is under these circumstances easy to conceive of a condition where the night indication would be one thing and the day indication the opposite. This becomes particularly dangerous when we realize that at night, when the engineer gets close up to the signal, the head light of his engine would illuminate the arm, and there are very few engineers who finding the arm indicating clear, would not accept this as sufficient authority to proceed, even though the light on the signal as he approached showed red.

\*Read before the Central Railway and Engineering Club of Canada, at Toronto, Ont.