

SOME SUGGESTIONS AS TO THE SELECTION OR DEVELOPMENT OF A BASIS FOR A CORRECT SYSTEM OF RAILWAY SIGNALING.

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man. The word "Aspect," as used in this discussion, refers to the picture that the signal presents to the engineman.)

Such preliminary study has been made by most Signal Engineers, and that result is that forty or more indications have been found desirable by some. A brief trial in providing this number of indications, or even half the number with aspects, from the customary semaphore (or its practical modifications) will, the writer believes, convince anyone that without some system, nothing but a conglomeration of aspects, wholly impractical, can result.

This brings us to the selection of some kind of a basis in working out a system of proper indications for a practical signaling system. It is obvious that a number of different schemes can be used for subdividing and building up a list of requisite indications. For example:

- (1) Signals may be classed as those relating to tracks, and those relating to trains; or
- (2) Those restricting rights and those conveying information.

Many opinions can be advanced, and many have been advanced, on this question. The writer's personal opinion, however, from what study he has given the subject, is that the only proper basis for a signal system is the control of the physical movement of the train.

If this latter basis is used in selecting indications, except as explained below, but three indications are necessary.

Generally speaking, and except as explained below, but three actions can be taken to fully control the physical movement of a train in motion:

- (1) It can be stopped.
- (2) It can be allowed to proceed.
- (3) Its speed can be restricted for a greater or less distance.

From this it follows that but three signal indications are necessary:

- (1) Stop.
- (2) Proceed.
- (3) Reduce Speed.

Some roads may require, for convenient operation, two reduce-speed indications. If so, a fourth indication would be required. Again, no reference has been made to diverting trains to other tracks, which, however, can safely be done on the reduce-speed indication. Some roads may require separate indications for this purpose, but they are not absolutely necessary and, therefore, a part of the signal system just outlined, which is complete without them. The basis above referred to, the writer believes to be the only correct one, as it strikes at the very result we are trying to accomplish, namely, the control of the physical movement of the train.

The system outlined is complete and sufficient for any railroad, provided, however, that there is no overlapping of signal functions or indications, and each signal reads to the

next. Experience has shown us that it is practically impossible at the present time to so signal a railroad that each signal will always read to the next. For example, we have non-block interlocking stations in the middle of manual block sections, and many other conditions of overlapping indications we can all think of with a few moments' study. It is manifestly then a question of providing for Overlapping Indications. Overlapping indications constitute the obstacle to the success of the simple signal system outlined above.

The overlapping indications met with in practice to-day, and which probably will be met with for years to come, make it necessary for us to make further distinctions in signal aspects, and therefore further indications. Right here is where extreme caution is required in further enlarging the signal system. The question is, "What further distinctions shall be made, and what further signal indications shall be used to provide against overlapping indications?" It is the writer's personal opinion that whatever distinctions are made they should be so made as not to interfere with the basis of the system referred to above. Here again we are confronted with the fact that if a different indication, or set of indications, is used for each particular purpose for which railway signals are used, entirely too many indications will be the result. A broader and more general classification should be made, something that will result in fewer indications. It should be remembered that the chances of an engineer making a mistake in interpreting signal aspects increase rapidly with the increased number of aspects, and possibly vary directly as the square of the number of aspects.

It is obvious that there are many ways of making distinctions in signal indications or aspects, and the question may be summed up as follows: Shall we make each signal for a special purpose distinct by special indication and aspect, and thereby have no overlapping indications, but a large number of indications, or shall we make a broader classification with a considerably smaller number of indications (and therefore aspects) and avoid overlapping indications, by combining the functions of the signals themselves? The writer believes that the latter is the proper course, in view of the excessive number of indications and aspects resulting from the former course. Assuming that the latter course is the proper one, the question is, "What broad classification shall we use?" A study of the conditions and the available number of safe aspects leads to the belief that the distinctions should be made according to the methods of operation of the signals themselves in ordinary road operation as follows:

Class 1. Signals operated by attendants.

Class 2. Signals operated automatically.

Class 3. Signals located to show conditions of track or to mark physical characteristics of the road, such as switchstands, stop signs, etc.

The writer advocates the broad basis described above, for the reason that no other classification or methods of distinctions which have come to his notice seem to be proper, and certainly our experience with them to date has shown that it is impossible for signal engineers to agree on the necessary or requisite indications under any of the classifications that have been suggested to date. The writer also advocates this classification for the reason that it seems to aim at the proper result, which is, the control of the physical movement of the train.