Editorial COMMENT

Single-Track Signaling

THE editorial on page 612 of the November, 1939, issue of *Railway Signaling* discussed some of the newer problems concerning single-track automatic block signaling which have arisen on account of increased train stopping distances and some of the new Interstate Commerce Commission regulations. The following comments represent "unfinished business" on the same subject, with an attempt to offer possible practicable solutions for the problems involved.

Problems Involved

A good argument might be prepared to prove that the entire proposition represents "much ado about nothing," with the contention that few, if any, collisions have ever occurred under the circumstances under discussion, and that, therefore, signaling, as now located and controlled, is free from logical criticism. On the other hand, certain roads, when making studies of train stopping distances and signal locations as well as the problem of insuring an Approach aspect in approach to each signal displaying a Stop or Stop-and-Proceed aspect, have encountered several problems. In order to insure a minimum train-stopping distance in approach to a signal indicating "stop," plans are under way on one road to set two and in some cases three or four signals to display the Approach aspect. Where distances between passing track layouts are comparatively short, the "second" train in a meet may be required, according to rule, to run at medium speed for an entire station-to-station distance or at least for several miles, thus needlessly extending the train delays. In one instance, five scheduled meets are made daily at a passing track included in such a proposed arrangement.

The use of the Approach aspect on two or more successive signals is inconsistent with the principles of signaling, and has two disadvantages. First, if the enginemen observe the speed requirements, trains are delayed unnecessarily; and second, if the enginemen "get wise" to the operation at some locations, they may come to disregard the speed restrictions, and some time may be "caught short" with only one "yellow" when they figured on a second one. Granting that the use of overlaps and successive Approach aspects seems to be a necessary evil under some circumstances, the problems involved must be solved, and the practices eliminated eventually.

On single track, with train-stopping distances ranging from 5,000 to 8,000 ft., consideration of spacing staggers one train-stopping distance, to say nothing about two such lengths, and the attempt at the same time to provide uniform time-distance blocking for following trains leads to the conclusion that no logical solution is available without adopting additional aspects or some new arrangement of controls. In the Signal Dictionary, published in 1911, explanations were given of absolute permissive single-track signaling systems in which opposing station-leaving, head-block signals normally display the Stop aspect, and, as a train approaches a signal, it clears under approach control and at the same time holds the opposing signal at Stop. An advantage of such an arrangement is the impossibility of two opposing trains accepting Proceed aspects simultaneously at opposing station-leaving, head-block signals. Having eliminated this possibility, no consideration need be given to the stagger of intermediate signals and they can be located on the time-distance basis, to afford most efficient operation of following trains, as well as on the basis of at least train-stopping distance between signals.

Use Part of the Old Idea

A disadvantage of the schemes shown in the 1911 dictionary, however, was the necessity for approach clearing control sections which, for the most part, were track circuits on the main track within the limits opposite the clearance points on the sidings. Such clearing sections would not be long enough for train speeds of today. To use one or more blocks in approach to a passing track as approach clearing sections for station-leaving signals would set the opposing station signal at Stop too soon, and thus hold an opposing train at the next town.

Out of the schemes mentioned above, however, we might at this date revive the practice of "normal danger" aspects for the head-block, station-leaving signals, and take from more modern practice the idea of manual remote control of these signals, with the two-fold advantage of being able to direct train movements by signal indication without train orders, and to eliminate the problems concerning staggering and improper spacing of intermediate signals.

A contention might be advanced that all or nothing of C.T.C. can be used, because if train movements are to be directed by manually-controlled signals, signals must be included to direct trains to enter and leave sidings as well as to enter and leave station layouts on the main track; furthermore, indications as to the locations of trains must be provided on the control panel. Granting that this contention is well taken with reference to any territory where complete C.T.C. is justified, it is still well to keep in mind that the purpose of this discussion is to evolve a solution for the problems now being en-

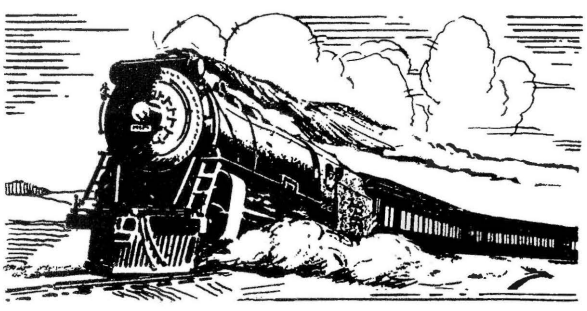
countered on the vast majority of single-track signaling now in service where some practical means, more economical than complete C.T.C., is being sought.

An important problem in devising a more simple and less expensive system of centralized traffic control is to reduce to a minimum the number of controls for signals, and for power switches, if used, as well as the number of indications on the control machine to report conditions in the field. Some ideas tending toward simplification may be taken from past practice as well as from some of the recent projects of a somewhat different character. In an earlier type of one-wire-and-common centralized traffic control scheme, one polar relay controlled each power switch, and the position of the switch, together with a check of the track on which and the direction which a train approached determined which of the four signals was to clear. Furthermore, an indication of a switch operation and an OS report also came in the same wire. A second idea with reference to consolidation of controls may be taken from an article elsewhere in this issue describing an installation on the New York Ontario & Western, in which two power switch machines, at opposite ends of a section of single track, and the two opposing signals for governing train movements over the single track, are all controlled by one lever. Another idea, which eliminates switch control, and the possibility of eliminating station-entering signals as such, offers possibility of controlling opposing station-leaving, head-block signals with one lever, is explained in an article elsewhere in this issue relating to "running" sidings on the Missouri Pacific.

One idea, gained from a study of these articles which may be of benefit in simplification, is to include in one lever control the control of station-leaving, head-block signals and perhaps the switches, for the two ends of sidings which lead to the intervening section of single track, rather than basing the control on a switch and the four signals surrounding the switch. This idea is adaptable primarily to making train meets, and further study may be required to apply simplifications to provide for passes also.

Fewer and Better Passing Tracks

The expenditure required for installation of any C.T.C. or modified C.T.C. depends largely on the number of passing tracks involved. In general, it may well be said that, on the majority of single-track lines, too many short passing tracks are now in service, whereas half as many passing tracks, lengthened to twice maximum train length, would efficiently serve the needs of the longer and faster trains of today. The proof of this contention can be forecast accurately by redispatching the present and anticipated traffic on time-distance charts. For example, on one recently completed C.T.C. project, two passing tracks were eliminated in a 25-mile territory. Important for consideration is the practice of using No. 20 frogs with equilateral turnouts, as now in service at one point on the Chesapeake & Ohio, and on the Wabash, which can be used either at the ends of double track or at the ends of running sidings to permit diverging train movements at speeds up to 70 m.p.h., thus reducing delays.



Combine and Simplify Indications

Aside from the controls of signals and switches, the number of indications on the control machine is an important factor in determining the amount of control apparatus and line circuits. Granting that indications of all conditions in the field, as to switch position, signal aspects, and track occupancy, are desirable, where economically justified, nevertheless, for the proposed scheme of modified C.T.C. for station-leaving, head-block signals only, it would seem that a trial might be made of a project including indications repeating only the indications of station-leaving signals and OS reports.

By thus reducing, to a minimum, the controls and indications, it may be practicable, by the use of direct-wire or simplified code control schemes, to evolve a system of combined automatic and manual control which can be justified on vast mileages of existing and proposed single-track as well as double-track signaling. As a means of reducing expenses, the C.T.C. line control circuits can be superimposed on existing telephone train dispatching line circuits without interfering with telephone conversation.

Thus in conclusion it may well be said that many tricks of the trade, both old and new, can still be utilized to evolve a system for signaling which will not only eliminate the troubles being encountered but also produce a system to permit more efficient train operation. This can and should be done.

Running Passing Track on M.P.

(Continued from page 84)

display the green aspect. The south-bound freight on track No. 1 may proceed when the yellow aspect of signal No. 7L is displayed.

The new searchlight type color-light signals are the General Railway Signal Company's Type SA equipped for operation on 4 volts direct current. The signal lamps are rated at 4 volts and have single filament rated at 3 watts. The signal lamps are lighted by approach control circuits.

The signal operating coils and lamps for the three signals at each end of the siding layout are fed from a set of 3 cells of Edison storage battery of the portable type. These batteries are replaced at regular intervals by similar batteries which are charged by a rectifier in the maintainer's tool house. The control circuits are fed by a set of 12 cells of Edison 500-a.h primary battery, and three cells of the same type of primary battery in multiple are used to feed each track circuit.

The installations were planned and installed by signal department forces of the Missouri Pacific, the major items of signaling equipment being furnished by the General Railway Signal Company.