Train Order Signals

Unless an Approach aspect is provided in conjunction with a train-order signal when displaying an aspect indicating that orders are to be delivered to an approaching train, one or both of two situations that are detrimental to efficient train operation result, i.e., either the trains over-run the offices, or else they lose too much time because the enginemen reduce speed when approaching the offices in order that they may see the aspects of the train-order signals in time to stop their trains. Of course, it is not necessary to stop a train to pick up a Form 19 order, but a Form 31 order, which requires a stop, may be issued at any time at any office.

In automatic block signal territory no accident will result if a train over-runs a train-order signal, providing the train is being operated in accordance with the aspects of the automatic block signals. Consideration of improvements in train-order signals, particularly with reference to approach signal aspects, does not, therefore, involve safety, and the matter is one for decision on the part of the railroads to be based solely on its merits as a means of reducing train delays.

A Study of Delays Involved

On the majority of the roads, especially in automatic block signal territory, the train-order signals normally display the clear aspect, and are placed at the Stop aspect only when orders are to be delivered to an approaching train. Even with this practice, a freight train over-ran a station almost a mile recently, although the engineman saw the train-order signal and applied the brakes when approaching the station. In this instance a serious delay was incurred before the orders could be picked up and the train again started on its way.

Perhaps the delays to trains occasioned by reducing speed when approaching train-order offices and also while again accelerating to maximum permissible speed, are not recognized or are accepted as inevitable. By a study of data and curves showing the time and distances involved when braking and accelerating a train, the time lost, as compared with running through at normal speed, can be determined. Assume, for example, that under certain conditions of curvature or weather conditions, the speed of a ten-car passenger train of standard equipment must be reduced from 90 m.p.h. to about 50 m.p.h., in order that the engineman may see a train-order signal within braking distance. Approximately 9 sec. is lost by the time the speed is reduced to 50 m.p.h., without allowing for sighting time, mental reactions, or operation of the brake handle. The rate of acceleration to normal speed depends on the rating of the locomotive, grade, curves, etc. An engineman who can “kick off” the brakes at 50 m.p.h. and accelerate a ten-car passenger train to 90 m.p.h. within a distance of five miles is doing very well, but even in doing this he loses about 55 sec. Thus a total of approximately 64 sec. is lost. The time loss for heavy freight trains, operated at comparatively high speeds, is much greater because longer braking distances and accelerating times are involved. Accurate data can best be obtained by making a series of test runs in which no speed reductions are made when approaching train-order offices.

Definite proof of what these delays may amount to was brought out in a study of a new centralized traffic control installation which had eliminated the train-order signals. Here, passenger trains which operated through the territory without taking siding increased their average over-all speed from 49 to 54 m.p.h. The reason is that, under train-order operation, enginemen usually reduce train speed approaching some of the block offices in order to observe the train-order signals while approaching within braking distance, while under C.T.C. operation no such reductions in speed are necessary.

Some roads have spent hundreds of thousands of dollars for major line changes to effect a few minutes saving for each train, and roads with 20 to 30 trains daily have made and are now making curve revisions which cost $10,000 or more for each minute saved for each train. The most practical means of clipping 10 to 15 minutes off a schedule is, of course, to eliminate those factors which necessitate reductions from maximum permissible train speeds. For this reason, the possibility of saving train time by improved train-order signaling cannot be dismissed without at least giving the matter serious consideration from all angles.

Is the Train-Order Signal Essential?

An idea might be advanced that all train-order signals might possibly be eliminated. Train-order signals or their equivalent, however, are essential on all territories where train movements are authorized by time-table and train orders, and this situation exists except where train movements are authorized by signal indication without
train orders, such as on territories where controlled manual block or centralized traffic control is in service.

At first consideration, it might seem possible to eliminate train-order signals at some outlying stations, especially where orders are issued infrequently. The answer from operating officers, however, is that although the train-order signals at such offices may be used but rarely, nevertheless they are needed badly under certain circumstances, and, therefore, few if any can be eliminated. Although certain offices are closed during some tricks each day or full 24 hours on Sundays, and the employees time-table gives information to that effect, nevertheless such office may be placed in service in an emergency; therefore, enginemen must at all times observe the aspects displayed by all train-order signals.

Combine Them With Other Signals

Providing that a study on a given division indicates that the train delays caused by the circumstances outlined above are appreciable, the next problem is to determine a policy concerning train-order signals and Approach aspects for such signals, as well as to decide whether such signals are to be a part of or separate and distinct from existing automatic block or interlocking signals.

In the vast majority of instances, semaphores are used for train-order signals, and the two arms, one for each direction, are both mounted on one mast, which, except in rare instances, is located at the office building rather than being associated with or at the right of the track governed. Thus with reference not only to the purpose, but also the location, as well as the type of signal and operating arrangement in many instances, the train-order signal is foreign to either automatic signaling or interlocking. In other words, the train-order signal is a hang-over from practices that prevailed prior to the installation of automatic block signaling. In the early days, interlockings were, likewise, a thing unto themselves. When automatic block signaling was developed, however, the track circuits were extended through the interlockings, and the home signals as well as the approach signals are arranged to operate semi-automatically under track circuit control as automatic block signals. The next problem, therefore, is to determine whether this essential nuisance, the train-order signal, can be brought into the automatic block-interlocking family. The problem is, of course, not new, and several roads have developed and installed arrangements which partially or totally solve the problem. The review of some of these systems should be of interest at this time when the train-order signal problem is becoming acute on account of the necessity for making every possible saving in train time.

Viewing the problem from the standpoint that the most important factor is to provide an Approach aspect, some roads have installed circuit controllers and have so connected control circuits that if the train-order signal is displaying a Stop aspect, the automatic block signal in approach will display the Approach aspect. Although this practice has been in effect for many years on several railroads with satisfactory results, signal engineers of other roads argue that if an engineman obeyed an Approach aspect displayed on an automatic signal and then picked up a train order at an office, he might assume that he had fulfilled all of the requirements of the indication of the Approach aspect, and then would accelerate his train, without considering the fact that the automatic signal, or perhaps an interlocking home signal, which he is to arrive at next, may be indicating stop.

A Consolidated Signal

In consideration of the contention last mentioned, one practice is to eliminate the separate train-order signal used exclusively for that purpose, and to install two combined automatic block-train order signals, one for each direction located within a hundred feet on the departure side of the station. At all times when no train orders are on hand to be delivered to an approaching train, the operator leaves the switches on his desk in the normal position, thus completing the circuit for the manual control feature of these signals. If orders are on hand, he throws the switch corresponding with the signal for the given direction of the approaching train and thereby opens the control circuit for the signal, thus causing the signal to display its most restrictive aspect and the next automatic signal in approach to display the Approach aspect. At all times the regular automatic block signal controls by track circuits are in effect. Thus in all respects this combination of train order-automatic block signal is equivalent to the use of interlocking signals also as automatic block signals, as previously explained.

The combined train order-automatic block signal should, of course, be an absolute signal, Rule 292, and should be so designated by the usual arrangements; in addition it might be well to adopt a practice followed in some instances of mounting on the mast a sign reading “Train Order Signal.” Introduction of signals capable of displaying the Stop aspect, Rule 292, into a system in which the remaining signals display the Stop-and-Proceed aspect, Rule 291, calls for the provision of telephones at offices which may be closed part time, so that, when a train is stopped by an absolute stop signal on account of a signaling failure, a member of the train crew can communicate with the dispatcher.

An Entirely Separate System

In order to obviate this ever-present absolute signal situation and also to provide a system of train-order signals, not only at the offices but also the Approach aspects, which are separate and distinct from the automatic block system, the Michigan Central has developed and extensively installed a unique arrangement. Here, each train-order signal at an office, as well as the approach train-order signal, consists of an extra searchlight-type signal unit mounted on the mast of regular automatic signals, brackets being used to set the center of the special unit 2 ft. 9 in. to the right of the mast. In order to inform an engineman whether he is to slow down to pick up a Form 19 order or to stop to pick up a Form 31 order, a different arrangement of aspects is provided not only on the train-order signal at the office but also on the approach train-order signal. This system was explained in detail in an article on page 158 of Railway Signaling for May, 1931.

The combined train order-automatic block signal previously described, and the Michigan Central system both necessitate that signals should be located near and preferably a bit “beyond” the office. When planning new installations on multiple-track lines, such an arrangement
might readily be provided; and at this
time when many roads are rescaling
signals to provide adequate train-
stopping distances, the proper ar-
rangements might be accomplished
without much additional expense. On
single track, with the usual locations
of signals at the passing track
switches, and with the office located
within the limits of the passing track,
additional train order-automatic sig-
als would, obviously, be undesirable,
and the use of the station-leaving sig-
als for the combined purpose would
depend on the distances involved and
the frequency with which train orders
are issued at the office being con-
sidered.

At Interlocking Plants

For use at interlocking stations
which also are train-order offices, va-
rious arrangements of combined train
order-interlocking signals have been
developed. Some roads provide, on
the home signal mast, an extra lamp
unit which is normally extinguished.
When orders are to be delivered, the
speed of an approaching train is re-
duced in accordance with an Approach
aspect on the signal in approach. An
aspect including a yellow light in the
regular home interlocking signal
“arm” and a yellow light in the extra
unit indicates that a route is complete
for the train to proceed as far as the
office to pick up orders. To make the
aspect significant, some roads flash the
lamp in the extra unit. Also, some
roads use red instead of yellow in this
extra lamp unit. One idea, which per-
haps has not yet been attempted,
would be to provide no extra unit but
to flash the lamp in the regular inter-
locking signal unit when orders are to
be picked up. Another arrangement is
to utilize the interlocking signals, in-
cluding the approach and the home
signal, to bring a train to a stop, and
then, by means of a flag or an illum-
inated sign in the window of the
tower, authorize the train, when the
home signal is cleared, to proceed as
far as the office to pick up orders. In
some instances, the stop at the home
signal can be eliminated by using the
Slow-Clear aspect, Rule 287. In addi-
tion to these several methods, the
Michigan Central system of separate
train-order signals is applicable for
use at interlockings.

Graphite Lubricant
for Signaling

The Acheson Colloids Corporation,
Port Huron, Mich., has developed
lubricants which are claimed to be
especially adaptable for use in the
railway signaling field, to lubricate
padlocks, and for use on contacts in
interlocking machines, circuit control-
ers, etc.

The graphite used in these lubri-
cants is originally produced in electric
furnaces, and then colloidalized by the
Acheson process so that the vast ma-
jority of the particles of graphite have
a dimension of less than one micron,
and, therefore, are many thousands of
times finer than ordinary powdered or
flaked graphite. This extreme subdivi-
sion permits the graphite particles,
practically speaking, to impregnate the
pores of the metal, thus forming a
more tenacious bond which resists re-
moval to a much greater degree. This
extreme subdivision permits the graphite particles,
practically speaking, to impregnate the
pores of the metal, thus forming a
more tenacious bond which resists re-
moval to a much greater degree. This
coating of graphite serves as a solid
lubricant to minimize wear between
metal surfaces. The long life of the
lubricating surface is an important
factor in reducing the attention re-
quired for cleaning and lubricating the
apparatus.

In order that the colloidal graphite
may be applied in liquid form, thereby
forming a uniformly thin coating, a
vehicle of carbon tetrachloride is
mixed with the graphite to form a
liquid which can be applied with an oil
can. After application, the carbon
tetrachloride, having served its pur-
pose as a vehicle, evaporates, leaving
no residue to which dust might cling.

The manufacturer claims that the
coiloidal graphite as applied to con-
tacts in electrical equipment forms a
lubricating surface of extremely low
electrical resistance, such that this fac-
tor need be given no consideration.
The lubricant is, therefore, recom-
ended by the manufacturer for use
on contacts in various types of circuit
controllers in the signaling field such
as controllers on interlocking
machines, in switch circuit controllers,
power switch machines, etc.

In addition, the lubricant is used in
padlocks, especially for those used out
of doors where they are subjected to
weather conditions, such as those locks
on instrument cases, signals, switch
machines, circuit controllers, junction
boxes, etc. The construction of a pad-
lock necessitates that the lubricant
must be thin enough and must possess
certain characteristics of surface ten-
sion and adhesion to penetrate to the
inaccessible portions of the lock and
leave a lubricating coating on these
parts. The lubricant should not be
subject to gumming, and high tempera-
atures during summer weather should
not cause it to creep out of the lock.
The manufacturers claim that collo-
dal graphite in a vehicle of carbon
tetrachloride possesses the necessary
penetrating characteristics and that it
will not gum or creep out during sum-
ner temperatures. Thus by the use of
a lubricant that gets to all the con-
tacting surfaces within a padlock, and
stays there for an extended period, the
life of the lock is materially increased.
Furthermore, the presence of the
lubricant minimizes the condensation
of moisture on these surfaces in a
lock; thus the tendency for locks to
freeze during low temperatures is
obviated.

Micrometer Drill
Grinder

The Atlas Press Company, Kalama-
zo, Mich., has developed and placed
on the market a micrometer drill
grinding device, known as the W-30,
which can be attached to power bench
and floor grinders made by this com-
pany or to most types of grinders
made by other manufacturers. One
reason for developing this device as an
attachment, rather than a complete
machine, was to make it practicable
from an economical standpoint to pro-
vide equipment for accurate drill
grinding in numerous small shops and
in crews on the railroads, especially
for gangs which are applying rail
bonds for track circuits. With the