To Be Answered in a Subsequent Issue

(1) *Do you consider it advisable to provide track circuit control for automatic highway crossing signals on passing tracks which are used considerably by trains operating at fairly high speeds? How are the circuits arranged?*

(2) *What is the best method of preventing frost trouble on contacts and commutators of signal mechanisms and circuit controllers?*

(3) *When using power drilling machines for bonding, how many machines and men can be profitably used in one crew?*

(4) *What effect does density of freight traffic, as measured by the number of trains per day, have upon the "dead" time of train operation? "Dead" time is the time consumed by delays. What ratio does such delay time bear to total time over a district?*

Are Automatic Signals on Sidings Justified?

"Where passing tracks are lengthened to say 8,000 ft. to facilitate non-stop meets on centralized control installations, is it advisable to provide automatic signal protection on the passing track, and if not, what rule is used to cover the operation?"

Believes There Are Two Answers to This Problem Depending on Train Speeds Through the Siding

By B. J. Schwendt

Assistant Signal Engineer, New York Central, Cleveland, Ohio

If speed through the siding is to be kept down to approximately 10 m.p.h., such as is the common rule on most roads where No. 10 turnouts or crossovers are used to enter a siding, in my opinion no signaling is necessary unless special conditions exist, as the method of operation can be covered by standard Code Rule No. 105 (new Code, January, 1928) which reads as follows:

"Rule No. 105—Trains using a siding must proceed, expecting to find it occupied. Sidings of an arranged direction must not be used in a reverse direction unless authorized by the .... or in emergency under flag protection."

Under signal dispatching, such as we are using, it is so arranged that both entering signals cannot be cleared at once. This will prevent two trains from entering the opposite ends of the same siding through error on the part of the dispatcher, which might result in their getting together. This same arrangement of signals takes care of the requirement in the second part of Rule 105 about established directions, as under signal dispatching any siding may be used in either direction under signal protection; therefore the second part of the rule would not be needed.

In special cases such as above mentioned it may be necessary to signal the siding. The following case is a sample in which signaling in one direction would be desirable: A siding is approximately two miles long, but the north end of it for approximately a mile is crossed by a number of city streets. Trains of 100 cars are operated requiring only one-half of this siding to get into clear. If such a train should enter from the south and proceed to the north end, the usual delay of a random meet with an opposing train might be such that the train would have to wait five minutes or so for the opposing train to pass. Under such circumstances it would be necessary for the train in the siding either to back up to the entering end to clear the street crossings or cut them; in either case the delay would be considerable. The use of a northward signal midway of this siding to announce when conditions are right for the train to move on to the north end and pass on out would probably justify its expense many times over. There may be many other conditions requiring such treatment where long sidings are involved.

If high-speed turnouts suitable for train speeds of approximately 30 m.p.h are used and the siding is also suitable for similar train speeds, it is in my opinion necessary to track circuit the siding and provide an intermediate speed entering signal to correspond with the speed allowed (30 m.p.h.) In our practice this would call into use the middle arm on a three-arm signal or the middle unit on a three-unit, color-light signal. Should a second train follow the first into the siding, the lower or calling-on arm or unit would be used. In this case, as above described, the opposing entering signals are again arranged to provide the necessary opposing protection so that two trains cannot enter, going in opposite directions simultaneously.

If a second train is to follow the first into this siding sufficiently often to warrant it, then it might be desirable to add an intermediate automatic signal on the siding as such a signal might save a little time to the train as compared with entering at low speed on the calling-on arm signal. As soon as the first train would clear the intermediate signal on the siding (should one be provided) the intermediate speed signal would again be available for the second train; however, in the absence of the intermediate signal on the siding, the second train would necessarily be obliged to enter on the calling-on arm; i.e., entering an occupied block. On account of the 30-mile speeds involved it would be much better and more economical in my opinion to track circuit the siding than it would be to depend on a rule such as in the first case mentioned.

In connection with the entire subject of lengthening sidings, as suggested in the problem, a recent study of the relation of siding lengths to time saving that will justify these siding lengths, indicates that on an average there is nothing to be gained by lengthening sidings except in special cases where the number of meets are sufficient to warrant it. The reason is that the value of train time saved in so doing will not pay the additional carrying expense of the sidings lengthened. This study was based on conditions where about 30 trains per day were being operated, about one-half freight trains and one-half passenger trains, resulting in an average of three or four meets per siding per day. This same study, however, showed that it is of advantage and can be justified economically if 30-mile instead of 10-mile turnouts on sidings are used.

Recommends Track Circuit Protection on Long Sidings Where No. 16 or No. 20 Turnouts Are Used

By Burt T. Anderson

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It would appear necessary and advisable in either case to cover the operation by a rule. The old A. R. A. Code Rule 105 reads as follows: "Trains using a siding must proceed expecting to find it occupied by other trains. Sidings of an assigned direction must not be used in a reverse direction unless authorized by the .... or in an emergency under flag protection."

Under a centralized control installation, if it is desired to speed up train movements into and through the passing siding, the use of automatic signal protection on the passing track will prove to be of operating advantage. Train movements into a passing siding are governed by a restricting signal (new A. R. A. Code Rule 290) indicating "proceed prepared to stop short of train, obstruction, or anything that may require the speed of a train to be reduced." Naturally such a train movement, being made over a short turnout, No. 10 or No. 12, onto a passing siding unprotected with track circuits where a switch may be disarranged, a car fouling the siding, or the siding blocked, will be at a low enough speed to permit a stop within the range of vision. If the same train movement is made over a No. 16 or No. 20 turnout, governed by a signal indicating "proceed at not exceeding medium speed" (new A. R. A. Code Rule 283) onto a passing siding protected by track circuits, the train will clear the main line in a much shorter time, thus expediting the movement. In this last case, Rule 105 must necessarily be revised to agree with the improved signal indications and other requirements as may be met on each particular railroad.

The question, noted above, may lead some men to conclude that it is desirable under centralized control to extend passing sidings to about 8,000 ft. in length, whereas the majority of such installations have been made to *existing track facilities* or have included only minor track changes. A system of remote control or centralized control added to an existing track layout will result in expediting train operation at a minimum signal expenditure and show a high return upon the investment. The ideal arrangement, from a dispatching standpoint, would be one in which all turnouts could be run at medium speed and the passing track signaled for train operation in either direction by signal indication and of such a length as to permit of all non-stop meets. As the cost of extending the passing track and providing higher speed turnouts is several times the cost of the signaling, it would require special operating conditions to warrant such a track and signal facility.

It seems that the best plan would be to require that each application of centralized control be studied in order to meet the operating requirements in that particular case. The economic benefits derived from such a signal installation will make it possible to apply the yearly saving to the cost of additional track and signal facilities, such as may be justified by the new operating and traffic conditions.

Pere Marquette Runs Passenger Trains Through Sidings at 30 M.P.H.

By G. W. Trout

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If the automatic block indication is not carried through the siding, it is necessary for trains to enter the siding on a low-speed route signal, not exceeding 10 m.p.h. under our rules. The turnouts in our centralized control territory are No. 15 and the sidings are laid with 90-lb. rail and are well ballasted. We are, therefore, able to enter and go through these sidings at 25 or 30 m.p.h. with safety, when a block indication is given that the siding is clear.

Further, we find it is desirable in a great many cases to run our passenger trains through the siding rather than to put tonnage freight trains through the siding. This would not be a good practice if the siding were not protected by automatic block signals.

Depends Upon Density and Character of Traffic

By W. M. Post

Assistant Chief Signal Engineer, Pennsylvania, Philadelphia, Pa.

If the passing track is of such length that it is desired to operate trains at a speed exceeding "restricted speed," the track should be designated as a main track, so as to be safeguarded by train rules and block signals. The question of the degree of signal protection would depend upon the density and character of traffic. In my opinion, if passing tracks are not surrounded by all the safeguards required for main tracks, they should be regarded as sidings and trains permitted to proceed at restricted speed only. Definition of restricted speed in the new standard code is, "Proceed prepared to stop short of train, obstruction or anything that may require the speed of a train to be reduced."

More Comments on Interlocking Relays

"Is it better to use a stick relay circuit or an interlocking relay for the control of highway crossing signals? What are the advantages and disadvantages of each method?"

When Used As a Single-Purpose Relay It Is Satisfactory

By I. S. Jones

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IN looking over the What's the Answer? section of the January issue of *Railway Signaling*, I do not find that some of the things coming under our observation of interlocking relays have been covered. Our experience with interlocking relays for crossing protection is that they are satisfactory if properly cared for when overhauled, carefully inspected while in service, and if used to control the highway crossing apparatus only. By this I mean that no control wires for automatic signals or other apparatus should be broken through contacts of an interlocking relay. The risk of front contacts fused by lightning from the line, holding one relay up and putting the crossing protection out of operation, is one objection, and the possibility of front contacts not opening when the armature is in the hook, and thereby making the automatic signals ineffective for one of more track circuits, is another.

Where crossing protection is in automatic territory we control the interlocking relays and the signal control circuits through neutral track relays, and for that, interlocking relays are satisfactory when properly maintained and used as a single-purpose relay only.

Aluminum Cable for Signaling Power Lines

"What are the advantages and disadvantages of a stranded aluminum cable (with steel wire core) for signaling transmission lines up to 4,400 volts?"

Greater Resistance to Corrosion and Reduced Weight Are Cited as Advantages

By T. H. Dickson

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A STRANDED aluminum cable with steel core has many advantages over a copper cable, or solid copper, and it has few disadvantages. Among the advantages may be mentioned the fact that the weight will be only about one-half the weight of copper of equal conductivity. Where the line is not run parallel with a highway and the line material has all to be handled by rail, mainly by track motor cars, this saving in weight is an important point. It also places a smaller load on the poles, thus insuring a longer life of line, with less possibility of interruptions. The area is slightly greater, thus increasing the wind and sleet load somewhat, but not enough, in most cases, to balance the dead load difference.

Another important point is that aluminum is not affected by sulphur and its various compounds; while copper is subject to corrosion and, as the coal used in most locomotives furnishes surphurous acid, and other sulphur compounds, this is an important point in a line paralleling a steam railway. If the line is ever scrapped, it will be found that the aluminum has a higher salvage value than copper.

The main objection is that this type of cable cannot be soldered with the same ease as copper, but with the efficient mechanical connectors of various types which are available, including sleeves and clamp types of connectors, it is not at all difficult to make connections that are good mechanically and electrically. If they are properly installed at first, they are as good a connection years afterwards as they are when installed, and they do not have the disadvantage of corroding. A soldered joint may corrode.

Care must be taken to see that tie wires used on insulators are also of aluminum, as any other tie wire will be harder and will cut the cable. On long spans, it is also good practice to give the wire a serving of aluminum wire or ribbon to avoid wear at the point of support, this serving being applied for several inches on each side of the point of support.

Portable Test Set

"What special arrangement of meters and resistance units have you found most convenient for testing relays in the field?"

A Volt-ammeter with Variable Resistances and Knife Switch Are the Essential Requirements

By C. W. Hummell

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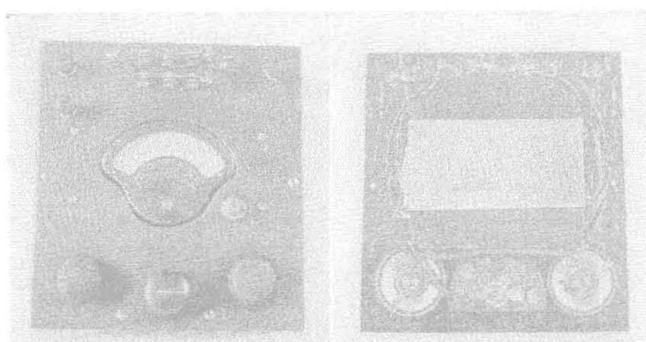
THE portable test set shown in the illustration is for the purpose of measuring relay current, track circuit consumption, for signal operating tests and also for measuring the drop-away and pick-up of relays. The essential unit is a Weston Model-280 volt-ammeter with voltage scales 0 to 1.5, 15 and 150 volts. There is also a current scale from 0 to 0.15, 1.5 and 15 amp. The remainder of the equipment comprises a double-pole, double-throw knife-switch, two variable rheostats of the radio type, and



Front and rear view of portable test set for checking signal and track circuits

a six-point multi-tap dial switch. It will be noted that the volt-ammeter has been mounted at the rear of the Bakelite panel, an opening being sawed in this panel to permit the scale to be read easily.

Reference to the scheme of connections shows that the test set can be connected to use 20-ohm and 200-