I am aware of the several arguments in favor of the call-on signal as a medium of keeping traffic moving through the plant in case of a track relay being down, and also for switching movements, with the customary safeguards afforded by the operating rules, but my opinion is that an interlocking plant can be maintained so that the possibility of the track circuit or any other apparatus failing to function is very remote.

In regard to switching movements, I believe that most of them can be made with the regular signal. However, when this signal is in the vicinity of a large terminal where either the head or rear ends of trains are switched, the switching can be taken care of more safely by the use of a push-button in the tower; this push-button is used jointly with the signal lever, and, when operated, causes the regular signal to display the yellow aspect only. In using the push-button and lever jointly to obtain this switching move with the regular signal, positive instructions should be issued to the effect that it is to be used only for switching moves to place cars or engines upon the train being switched and in no case to be used for any through moves.

All through moves are to be made upon the standard indication of the interlocking route signal. The responsibility for the use of the push button jointly with the signal lever rests with the towerman, who is not permitted to use the push button to permit a train to pass a signal in case of a failure of any of the apparatus through which the signal is controlled. The joint use of the push-button and lever in reality cuts out the track circuit where the train stands while it is being switched.

I do use, in automatic signal territory, a signal called a call-on signal but which is used for an entirely different purpose than the one referred to in the question. The call-on signal thus used is located at the distant end of a passing track, and the aspect of this signal is dark when the signal is not in use and yellow when conveying information to a train. It is controlled by the operator at the station and is selected through all of the track sections between the operator and the signal location. It is used only to advance a train to the operator and gives no block rights or other authority. When the indication of this signal is yellow a train may proceed under rule to the station for further orders, but the signal does not give the train any rights, and it is necessary for the train to go farther than the station to receive orders from the operator at that point. This signal is never used in connection with interlocking plants.

As I do not use a call-on signal at interlocking plants, I am unable to answer the question, "What features can be incorporated to insure that a call-on signal will clear for only a specified route?," other than to suggest making it a 100 per cent route signal, in which case it ceases to be a call-on signal. However, if used as a call-on signal, the circuit should be the stick type so that it will have to be cleared for each move, and the control should be cut through as many functions ahead of the signal as possible.

Complications Would Arise

By C. J. Kelloway

Superintendent of Signals, Atlantic Coast Line, Wilmington, N. C.

The primary object of the "call-on" signal is to eliminate hand signaling and its indication to "proceed at slow speed prepared to stop" should be rigidly observed. Occasional "efficiency checking" will soon determine whether its indication is being violated.

Undesirable complications would be introduced by endeavoring to change the operation of the "call-on" signal and I doubt whether the final result would warrant the additional expenditure, for it would still be necessary to give the signal practically as at present.

W. H. Elliott, signal engineer, New York Central, suggests that mechanical locking be used to compel a call-on signal to clear for only a specified route. Mr. Elliott's opinion is that call-on signals should be used when movements are to be made at restricted speed, the latter being defined as "a speed not exceeding that which will enable a train to stop short of a train ahead, obstruction, or switch not properly lined, and to look out for a broken rail."

Centralized vs. Remote Control

"What is the proper definition of centralized traffic control as distinguished from remote control?"

As the Operating Department Sees It

By H. B. Reynolds

Assistant Trainmaster and Division Operator, Pennsylvania, Fort Wayne, Ind.

The editorial comment under "A definition for centralized traffic control," in the June issue of *Railway Signaling,* expresses practical and sensible views on this subject.

In naming and defining the "hot potato," I would suggest the definition given in the following paragraph. This definition in no way conflicts with interlocking rules. It paves the way to directing and governing movements between holding points, by means of fixed signals whose indications supersede time-table superiority and take the place of train orders. This new member of the block system family must be provided with requisites, a set of operating rules, and a place beside its brothers—"manual," "controlled manual" and "automatic" signal systems.

Centralized traffic control block system: A series of consecutive blocks governed by block signals controlled by continuous track circuits, electrically operated by control machine in central station, the signals arranged to restrict movements opposing that for which their indications establish the current of traffic."

Operating Expense Factor in Definition of C. T. C.

By F. B. Wiegand

Signal Engineer, New York Central, Cleveland, Ohio

Centralized traffic control is what might be termed "amplified remote control." Signal apparatus remotely controlled is ordinarily a unit layout whereas centralized traffic control is comprised of several of these units spaced as traffic conditions warrant to keep trains moving with minimum delay. I believe that the following definitions are proper:

Centralized traffic control—A series of remotely controlled interlocked switches and/or signal layouts operated from a central location, designed for the purpose of increasing freight train speed, gross tons per freight train, gross ton miles per freight train hour, and saving of time per freight train mile.

Remote control — Interlocked switch and/or signal layout operated from a station at some distant location, designed for the purpose of facilitating train movements.

C. T. C. Multiplicity of Remote Control Points

By A. G. Moore
Advertising Manager, General Railway Signal Company, Rochester, N. Y.

Centralized traffic control is a system of train operation by signal indication controlled from a central location.

Remote control is a method of controlling a location, usually consisting of a switch or switches with signals governing over it or them, from a distant point.

Remote control differs from centralized traffic control in that trains are not directed by signal indication over any extended territory. Centralized traffic control can be considered as a multiplicity of "remote controls" with the controls originating at a common point.

Track-Circuit Operation

"What can be done to improve track-circuit operation in tunnels and snow-sheds where the ballast conditions are very unsatisfactory? How should a gauntlet track be track-circuited under such conditions?"

Depends Upon Particular Conditions Encountered

By C. A. Taylor
Superintendent Telegraph and Signals, Chesapeake & Ohio, Richmond, Va.

The question of improving track-circuit operation through tunnels, especially in territories where heavy freight trains are operated, is, according to my experience, one that requires considerable study and experimenting to determine the type of installation that will give the best results.

In our longer tunnels we have experimented with various types of bonding, but we have found that ordinary No. 8 bond wires, placed outside of the angle bars where they can readily be inspected, give as good or better service than any other type of bonding, at a minimum cost.

The worst ballast conditions we have are usually found in our longer tunnels because of the ballast always being wet and because of the accumulation of cinders on the ties and around the base of rails, causing very low ballast resistance.

For some time it has been our practice to install two iron bond wires outside of the angle bars for each joint, when the rail is installed. In some of our longer tunnels where gaseous conditions are rather severe, we have found it desirable to apply two additional iron wires to each joint after the rail has been in service for one year, and according to our experience a bonding arrangement of this kind will last the life of the rail.

At locations where fans are used, very little trouble is experienced with track circuits, due to the fact that the gases are blown out of the tunnel and most of the cinders and other small particles of dirt are collected between the rails at the end of the tunnel, and by having the track at this point cleaned periodically, the track circuits can be kept in very good condition.

I am of the opinion that where a gauntlet track is installed through a tunnel of any length, two independent track circuits should be provided, one for each track, and the rails should be kept far enough apart to provide at least two or three inches clearance between the tie plates under the adjacent rails.

Low Resistance Bonding Essential

By W. E. Shepherd
Signal Supervisor, Great Northern, Whitefish, Mont.

Track-circuit operation in tunnels and snow sheds, where ballast conditions are bad and where there is considerable moisture, requires special consideration and a little more than ordinary care. There is danger of rust on rails causing high-resistance shunting when the track is occupied. Consequently great care should be observed to keep the current through the relay just above the pick-up value, and possibly a little under the working current value. Also, the drop-away current should be about 50 per cent of the pick-up current. Only relays that are in the best of condition should be used on tunnel track sections. The ballast conditions should be made as good as possible. If possible, crushed rock should be used and the ballast should be kept away from the rails. Drainage should be provided.

The bonding should be of very low resistance. Either welded bonds, copper-strand bonds with 7 No. 12 B & S wires, or four No. 8 B & S solid copper bonds, should be used. Copper weld bonds, also, should be satisfactory.

Primary battery, with five or more cells in multiple, probably provides the best source of power, as the low voltage is desirable on account of current leaking through the ballast. With five or more cells in multiple, the voltage will be fairly constant. The resistance used between the battery and the rails should be as high as possible, and should not be less than 0.3 ohm.

Track conditions in tunnels are fairly constant and circuits can be adjusted closely. This makes it desirable to arrange the track sections so that they are entirely either inside or outside of the tunnel. Adjacent rails should be of opposite polarity at relay locations.

If the track is gauntleted, separate track circuits should be used, insulated from each other, with the relays at the ends farthest from each other. The adjacent rails should have opposite polarities.

Transformers in Parallel

"What precautions must be observed in operating transformers in parallel?"

Three Conditions

By George O. Huginbach
Engineering Department, General Railway Signal Company, Rochester, N. Y.

The proper conditions for paralleling transformers are as follows: (a) The ratio of primary to secondary voltage should be the same for all transformers in the bank, and terminals of similar polarity only should be connected together. Otherwise, large local currents will flow whether or not the transformers are connected to a load, and the load will be poorly distributed among the transformers. (b) The percentage of impedance should be approximately the same for all the transformers. Otherwise, the transformers with the lower impedance will be compelled to carry more than their share of the load. (c) The ratio of the resistance to