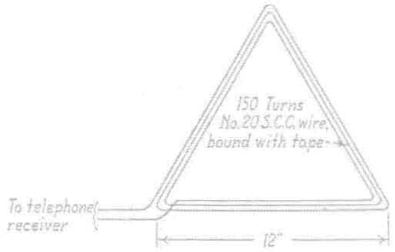
Insulated joints should be inspected for bad end posts and fibers. The joint should be clear of ballast or other materials. There should be nothing except the fibers between the plates and the rail. On lead rails and other curved rails, chips sometimes reach from the ball of the rail to the plates, and short circuit the joint; these chips should be removed.

All causes of trouble can be grouped under three heads: Leaks, resistance and interference. Leaks include anything that diverts the current from its intended path. Resistance includes anything from a poor contact to a broken wire or rail. Interference is that condition which exists when adjoining circuits leak through defective insulated joints.

To determine if the trouble is caused by a leak or by resistance, if primary battery is the source of power, the best way is to connect an ammeter in series with the battery and closely observe the reading. An abnormally high reading indicates a leak or short, while a low reading indicates that the trouble is due to resistance in the circuit. The best way I know of to locate shunts or shorts, is to use a suitable interrupter and a good exploring coil. A very suitable interrupter for this kind of work was described on page 430 of the December issue of *Railway Signaling*.

The extent to which a telephone receiver, used with an exploring coil, will respond to an interrupted current of given value flowing in a conductor, will depend on the proximity of the coil to the conductor it is desired to trace. A sensitive exploring coil must have a form that permits the largest possible number of lines of force to reach the coil in such a way that they will not nullify each other's effect.

In a small coil, only part of the coil is effective, because the lines of force that cut the upper part of the coil induce therein a current that opposes that induced in the lower part. After experimenting with coils of different forms, I have found that a triangle is the most efficient shape for a given length of wire. I have made a coil of 150 turns of No. 20 single cotton-covered wire



Sketch showing construction of an exploring coil used for "shooting" track-circuit defects

in the form of a triangle, one foot on each side, and it is so sensitive that, when used with an ordinary telephone receiver, it will pick up an interrupted current of 0.5 amp. when the coil is held more than one foot away from the conductor carrying the current. Perhaps the easiest way to make the coil is to draw a triangle on the work bench, drive a nail at each of the angles, and wind the wire around these nails, bringing the two ends out at the same corner. The coil may then be fastened with tape at a number of points, the nails pulled out, and the entire coil taped over.

A good way to locate defective bonding is to connect the meter as before and watch the reading closely as a train passes over the circuit. The reading should increase very gradually as the train progresses from the relay end to the battery end of the circuit, and should decrease just as gradually with a reverse movement. Any sudden variation in the reading will indicate a defective joint. By noting the position of the train at that instant, one can get an idea of where the defective joint is.

Another method is to watch the reading as a helper walks over the circuit and taps each joint with a hammer. A variation in the reading when a joint is being tapped indicates defective bonding.

A test for interference can be made by disconnecting the source of power and noting if a reading can still be obtained on the track. If so, the battery can be reconnected and adjoining circuits disconnected to see if this will make a difference in the reading obtained. If the reading on the track is not altered when adjoining circuits are disconnected, the interference can be assumed to be foreign current.

Take-Siding Signals

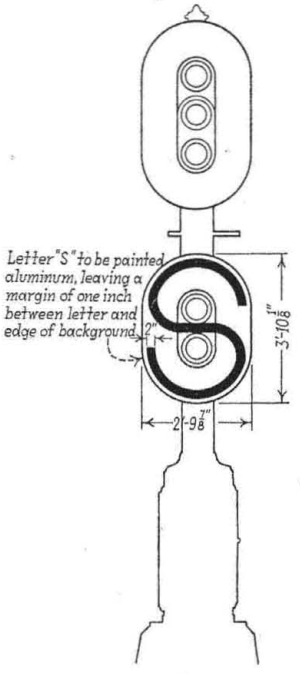
"Under what circumstances are you using 'take-siding' signals? What are the operating benefits? What type of signal and control is used?"

Used in Remote-Control Installations

By F. H. Bagley
Signal Engineer, Seaboard Air Line, Norfolk, Va.

We are using "take-siding" signals only in connection with remote-control switches in automatic signal territory. The illustration shows the design of such a signal. This is the entering signal at head blocks, the top unit being for giving the indication for the main-track movement, and the bottom unit being the "take-siding" indication.

The letter S on the "take-siding" unit is painted aluminum color



In our remote control switch installations, the switch only is controlled by the operator, and the signal indications are selected through the switch. We have made a number of these installations during the past two years, controlling both ends of the passing sidings in this manner, and we find them of great benefit in train operation, frequently allowing non-stop meets to be made.