ber of turns and the larger volume of copper in the coils, and also due to the higher efficiency of the magnetic structure, the time required for these relays to release by train shunt action is somewhat longer than was true with the earlier relays, and therefore there is probably more need at the present time for taking special action to insure quicker releasing of such relays on short track circuits.

In order that these conditions can be appreciated, reference should be made to the table below, giving the actual release time in seconds due to train shunt action for a DN-11 4-ohm 4-point relay meeting A.A.R. Specification 105-37. The notes in connection with this table explain clearly the typical track circuit used for arriving at these comparative figures. This table shows data for 100-ft. track circuits, as well as 5,000-ft. track circuits, and illustrates the trend due to increased train shunt resistance, changes in length of track circuit, and changes in ballast conditions.

If the standard DN-11 relay used in this illustration is made quick-acting by the use of copper shims under the backstrap, the shunting time will be reduced approximately 50 per cent. If the track relay is a 2-point relay, such as our standard DN-22, the releasing time will be reduced 70 per cent, and if special means are used, such as operating the coils in multiple and with additional resistance between the rails and the relay, the time can be reduced to approximately one-sixth of the time taken for the standard DN-11 relay.

Testing Automatic Signal Controls

"What is the proper procedure for testing automatic block signal controls at a hand operated switch including a switch circuit controller connected to track shunt circuits and line break circuits?"

Preliminary Inspection Important

J. H. Craig
Atchison, Kansas

The switch should first be inspected for loose or broken bolts and misplaced cotter pins. The switch rods and lugs should be inspected for defects and they must be properly secured to the switch points. The proper distance must be maintained between the switch point and stock rail at all times. The switch should be tested for proper tension upon the switch point and ease of operation. A check should be made to be sure the switch rods do not drag on ties or plates, or rub against the rail.

After the switch is in good order and proper adjustment the switch circuit controller should be tested and inspected. The switch circuit controller should be securely fastened to one of the head blocks. The operating rod should be in proper alignment and properly connected to the switch point and to the circuit controller. When any lost motion is found it must be taken up immediately. Electrical connections inside the switch circuit controller must be tight. The bearings should be well oiled and free from dust and dirt. The finger contacts should be in proper alignment, and should be kept clean. The contact surfaces should be clean and bright to insure proper contact.

A test of the automatic block signal controls can now be made. The work thus far is all preliminary, but highly important because one unit not functioning properly will give false results in testing the automatic block signal controls.

In the case of shunt circuits, when a ¼-in. gage is placed between the switch point and the stock rail, the switch circuit controller should shunt the track, stop the flow of battery to the relay and cause the track relay to be down. When the track relay is down the automatic signal control is open and the signal control relay will be down because its coils are de-energized. A voltage test with a voltmeter should be made across the terminals of the track relay to determine if the relay is properly shunted by the switch circuit controller. A voltmeter is connected across the terminals of the signal control relay to determine if any voltage is present. If there is any reading on the voltmeter the source of the battery should be determined immediately, and the situation promptly corrected.

In the case of line break circuits, when a ¼-in. gage is placed between the switch point and the stock rail the switch repeat should be down to open the automatic block signal control circuits. The signal control relay will be down because its coils will be de-energized. A voltage test should be made across the coils of the switch repeat relay to be sure the switch circuit controller is operating properly. The switch repeat relay should be completely de-energized. The voltmeter should then be connected to the terminals of the signal control relay to determine if any battery is present. If any battery is present immediate action should be taken to locate the trouble, and to promptly correct it.

Testing the automatic block signal controls proper does not require much time or work. All the preliminary tests as listed should be made because the proper functioning of the automatic block signal controls depends upon the proper operation of track relays.

The track relay is affected by the switch circuit controller, and the position of the switch circuit controller is determined by the switch.

Track Circuit Connection in Electrified Territory

"On electrical propulsion territory what is the advantage and disadvantage of attaching the track circuit connection directly to the rail as compared with attaching it to the lug in the impedance bond?"

Added Protection with Lug Connections

C. Ross Davis
Department of Public Works,
San Francisco, Cal.

On our San Francisco-Oakland Bay Bridge Railway, except in a few locations where no impedance bond is available, all our track connections are made to lugs in the impedance bonds.

The insulated joints are installed exactly opposite. For the track circuit leads we use a heavily protected (trenchlay type) No. 6, 2-conductor cable, with the protection removed and the two conductors separated only inside the bond housing. Each connection to the rail consists of two 350,000 c.m. copper conductors (flexible bond stranding) soldered into a bond lug, and welded to the rail about four inches apart.

Advantages of our practice are the good mechanical protection obtained