contacts through cams on the shaft. The energy is supplied by a coil which is alternately energized and de-energized by supply force to an armature attached to the wheel. One transmitter has contact capacity to handle ground detector circuits for two separate sets of batteries provided the batteries do not have tapped connections.

Proximity Detector System

THE "proximity detector system" recently developed by the Union Switch & Signal Company, Swissvale, Pa., is designed to meet the need for train-detecting apparatus which does not require electrical contact between the wheels of the train and the track rails. The apparatus is designed to meet safety circuit requirements. It is especially adaptable for detecting the presence of cars on railroad grade crossings or at other locations where the installation of short detector track circuits is difficult or impracticable.

The proximity detector is said to operate on a modified a.c. Wheatstone bridge principle. Train detecting means consist of a loop which is laid parallel to the rails and is connected to form one arm of the bridge circuit. The general scheme of the circuit is illustrated in Fig. 1, with the bridge circuit represented by points 1, 2, 3 and 4. High frequency a.c. generated by an oscillator is impressed at points 2 and 4. An amplifier, connected at points 1 and 3, in conjunction with a code following type relay CD, is used to detect and indicate an unbalance of the bridge circuit. With the track section unoccupied,

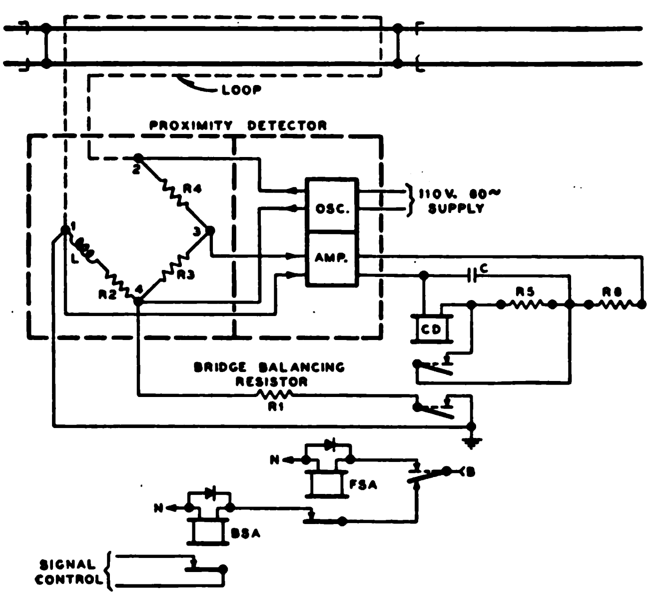
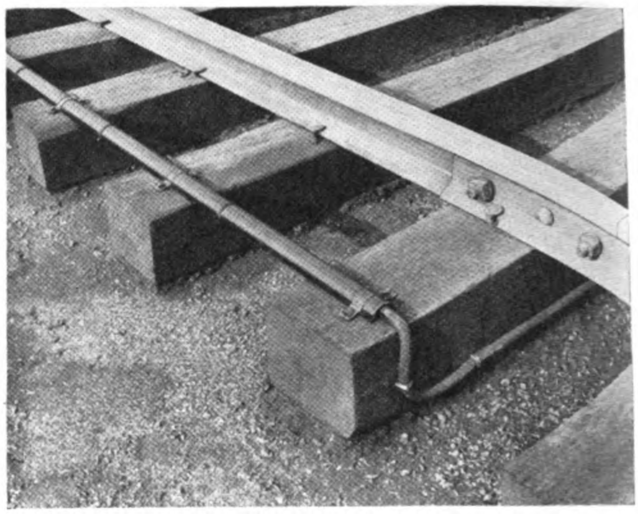


Fig. 1—General scheme of proximity detector system circuit

any small normal amount of unbalance is insufficient for detection and will not cause the CD relay to pick up. However, the presence of a car in the track section changes the magnetic field produced by the a.c. in the loop. The resulting change in the inductance of the loop circuit

Further information on these new developments may be had by writing to the manufacturers. In doing so, please mention *Railway Signaling.*



Method of installing proximity detector system loop

produces sufficient unbalance of the bridge circuit to energize the CD relay through amplification of the voltage existing at points 1 and 3, due to the unbalanced condition.

In order to meet safety circuit requirements, the "proximity detector" circuits are arranged to produce an automatic coding action which causes the system to operate on the closed circuit principle. Any apparatus or circuit failure will result in a cessation of the code, causing the same indication as produced by a train occupying the track section. Bridge arm 1-4 is arranged with bridge-balancing resistor R1 in series with a front contact of relay CD. The bridge circuit is balanced only when relay CD has its front contact closed. When relay CD is de-energized, resistor R1 is disconnected from bridge arm 1-4 so that the bridge circuit is unbalanced intentionally, causing relay CD to become energized. When relay CD picks up, the bridge circuit is again balanced and relay CD is again de-energized to unbalance the bridge circuit and cause the operating cycle to repeat, provided there is no train in the track circuit. With a train in the track circuit, of course, additional unbalance would be produced, causing steady energization of relay CD. Thus, when the system is functioning normally, relay CD is constantly opening and closing its contacts to check the functioning of the bridge circuit. The coding action thus produced maintains both decoding relays FSA and BSA normally energized in the conventional manner. Any cessation of the code, due to a train in the track section or an equipment failure will de-energize relay FSA—likewise its front contact repeater relay BSA and thus open the signal control circuits.

The time-delay circuit consisting of capacitor C and resistor R5, according to the manufacturer, is provided to assure that relay CD will operate at approximately 180 code speed with full operation to both positions and with "on" and "off" periods approximately equal. With resistor R5 in series with the coils of relay CD, this relay cannot pick up until capacitor C is charged to a higher voltage than the pick-up value of the relay. When relay CD does pick up, a front contact shunts resistor R5 and the full voltage across capacitor C is applied directly to the relay coils to obtain additional release time.

As shown in Fig. 1, a low impedance shunt is connected across the rails at each end of the loop to confine the circulating current induced in the rails to a short length of track, and also to cause it to remain substantially constant regardless of natural variations in the ballast leakage. This is said to insure against undesirable unbalancing of the bridge circuit which otherwise might result, because of inherent transformer action between the rails and the loop, with fluctuations in the rail current caused by ballast conditions producing corresponding fluctuations in the loop current.

The low impedance bond connections, as shown in Fig. 1, are used at locations such as railroad grade crossings, where the proximity detector circuit is not located within

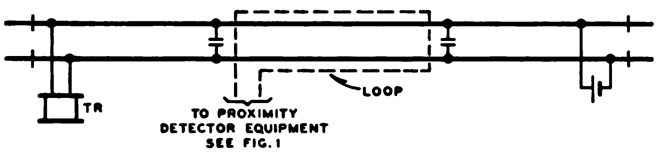
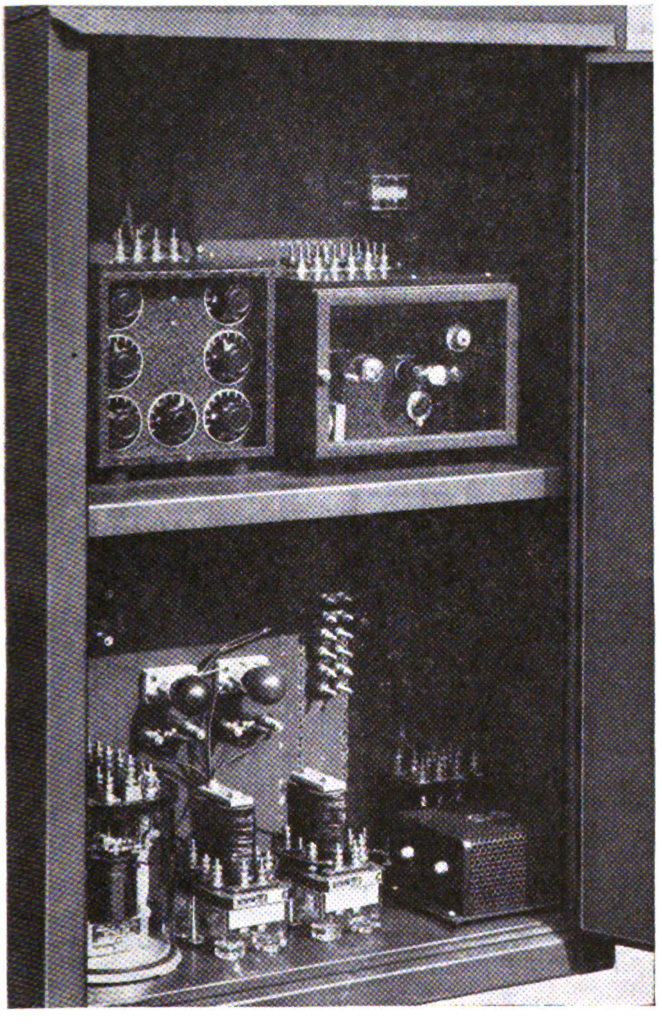


Fig. 2—Circuit where proximity detector is within limits of conventional track circuit

a conventional track circuit. In an application where the "proximity detector" is located within the limits of a conventional track circuit, capacitors having a low impedance to the high frequency a.c. are used to shunt the rails, as shown in Fig. 2.

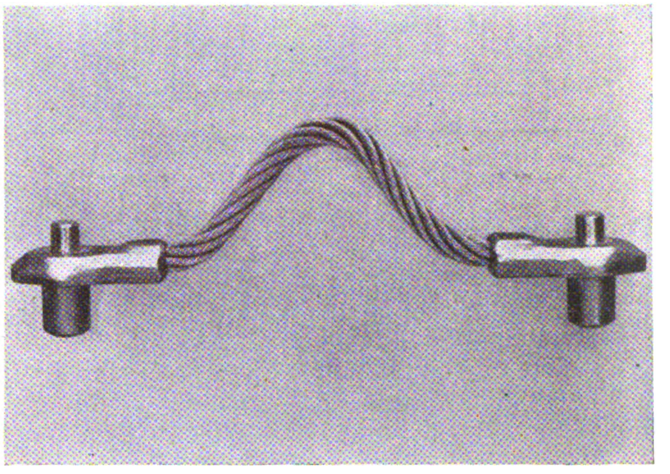
Oscillator and amplifier units employed in the proximity detector system are vacuum tube devices designed to function at a particular frequency, usually 50 k.c. The oscillator unit is designed with highly stable characteristics to prevent appreciable variation of the generated frequency from the specified value. The amplifier unit is designed to be selectively responsive only to the frequency generated by the oscillator, thus preventing energization of the detector (CD) relay by stray currents. The oscillator and amplifier units are designed to operate on 110 volts, 60-cycles. Power consumption with the bridge circuit energized is approximately 40 watts, which is low enough to permit operation from a regular tuned alternator in case of power outage.



Proximity detector apparatus inside instrument case

Flat Top Bond

THE American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio, has recently developed a new type of rail-head bond, known as the flat top bond. Until



The new flat top type rail-head bond

this development, bonding by means of the rail head has suffered from one serious drawback, according to the manufacturer, because bonds were vulnerable to mechanical damage from dragging equipment. This vulnerability was due to two reasons: (1) The physical dimensions were such that the distance from the rail to the top of the terminal was approximately ½ in., thus presenting a good sized target, and (2) The mass of the terminal was concentrated in the head of the terminal. This meant that when a blow was struck at the head of the terminal, the inertia of the head caused the point of maximum stress to be transferred to the weaker portion of the stud, and a shear failure occurred at the hole.

With the new design of the flat top bond the large mass is said to be taken away from the terminal head. This means that the terminal will hug the rail and seldom be struck. If it is struck, there is small likelihood it will be knocked off, since the head, now being weaker than the stud, will crumple. The force of the blow will not be transferred to the stud, but will cause distortion of the terminal head.

Magnetic-Stick Relays

POLARITY-RESPONSIVE relays with the magnetic-stick feature have been announced by the General Railway Signal Company, Rochester 2, N. Y. These relays are made plug-in, quick-detachable, and referred to as Type B relays; they are also available with A.A.R. binding posts, in the line commonly known as the Type K. In both types of relays, the magnetic structure is equipped with an alnico permanent magnet. Current of one polarity through the relay windings causes the armature to pick up. Current of opposite polarity causes the armature to