flows first through one half of the winding and then through the other half in the opposite direction. A sixty cycle alternating voltage - approximately a square wave - is induced in the transformer secondary and applied to the grid of the first amplifier tube, V1.

The magnitude of the induced secondary voltage is proportional to the magnitude of the d-c input signal. Its phase depends upon the direction of the d-c input signal; that is, the direction of unbalance in the external input circuit. If the polarity of this input signal is reversed, then the transformer primary current flows in the opposite direction during each half cycle, thereby reversing the instantaneous polarity of the secondary voltage (i.e., shifting its phase by 180 degrees).

Low thermal techniques are used in the design of the entire input circuit. The filter, converter, and input transformer are mounted on an insulated sub-chassis which is at guard potential. The sub-chassis to main chassis resistance is higher than 10,000 megohms, a two microfarad capacitor having high insulation to d-c providing an a-c bypass to the main chassis. The transformer coils are of "humbucking" construction so that external magnetic fields are cancelled out. These coils are enclosed with mumetal shells for magnetic shielding, while the outer case of the transformer provides electrostatic shielding. The heaters in the first two stages of amplification are operated on direct current.

6. GUARDING

The entire input circuit is guarded to provide freedom from adverse effects of leakage current paths between any portion of this circuit and the chassis. All guarded circuits are shown shaded in Fig. 3.

When the detector is connected to a potentiometer, it is likely that a potential difference will exist between one of the detector input terminals and the potentiometer case or ground. If leakage paths are permitted to exist between the opposite detector terminal and ground, this potential will pass these leakage currents directly through the detector, as illustrated in Fig. 4A. A false zero would result from the zero offset produced. The guard system in this detector, in conjunction with that used in the potentiometer, in effect, eliminates the cause of these leakage paths. It surrounds the entire detector input circuit with a surface of guard potential, the potential of the potentiometer side of the detector, as shown schematically in Fig. 4A.

When connected to a Wheatstone Bridge, one side of the detector is usually tied to the unknown resistor, the other side of which is normally grounded or close to ground. If this is true, leakage current from this high side of the detector could flow to ground by virtue of the emf between this point and ground, as illustrated in Fig. 4B. This leakage path, if permitted to exist, could introduce measuring errors by shunting the unknown resistance.

Note that Fig. 4A and 4B are representative circuits that do not necessarily apply to a specific installation. Specific instructions for connecting the 9834 to an L&N bridge or potentiometer will be found in the direction book for the bridge or potentiometer.

The guard system in this detector, in conjunction with that used in the bridge, surrounds this critical side of