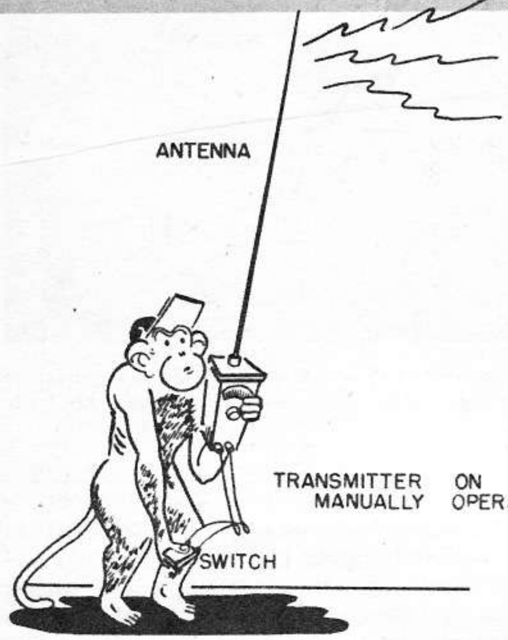
Basics of Radio



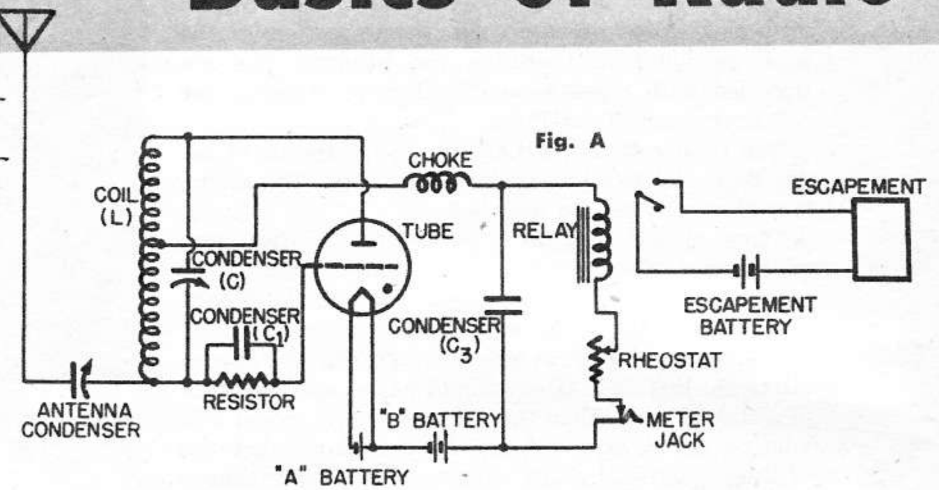


Fig. A

■ The average radio equipment used to guide model planes is not complex, even though it may appear so to the model builder with no electrical or radio experience.

We take the basic schematic (Fig. A) and break it into smaller segments and show how each contributes to the overall operation of the radio equipment.

Inductance (L) and capacitance (C) must be tuned to frequency being used (Fig. B) . . . certain combinations of L and C will work at 27 megacycles and a different set of combinations will work at 50 megacycles. The antenna condenser controls the amount of signal that is fed into the receiver from the antenna. This is made adjustable to take care of such factors as variations in tube characteristics. R and C_1 combine to control tube action. They cause the tube to go in and out of oscillation at a frequency considerably lower than radio frequency being used, to produce what is known as super-regeneration.

Diagrammatic operation (Fig. H) of the vacuum tube . . . when the signal is off, the grid allows electrons to pass; electron flow goes from the filament through the control grid to the plate. However, when signal is on, the electron flow is stopped by the grid. The battery acts as a pump for the flow.

The tube (Fig. K) acts as a control valve for the relay . . . with no signal from the transmitter, the tube passes a high current and causes the relay to operate. When the signal is applied, the current through the tube drops to a low value and the relay releases. The dot on the tube schematic indicates that the tube has traces of special gas in its bulb.

The condenser acts to provide a path of low opposition to radio frequencies, while the choke provides high opposition to these frequencies (Fig. F) . . . the combination of the choke's strong opposition, and the condenser's shunt or diverting path, keeps the radio frequencies out of the relay circuit where they are objectionable.

Providing a variable resistance to control current flow through the vacuum tube and relay is the purpose of the rheostat (Fig. G) . . . the higher the resistance, the lower the

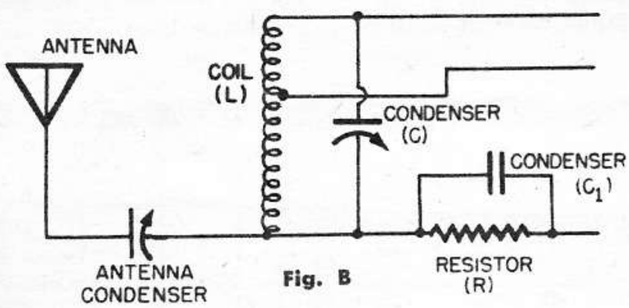


Fig. B

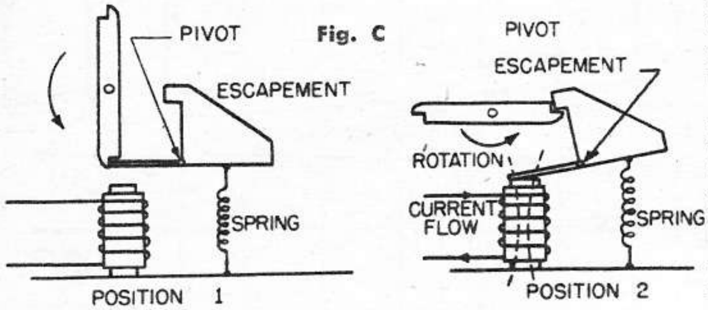


Fig. C

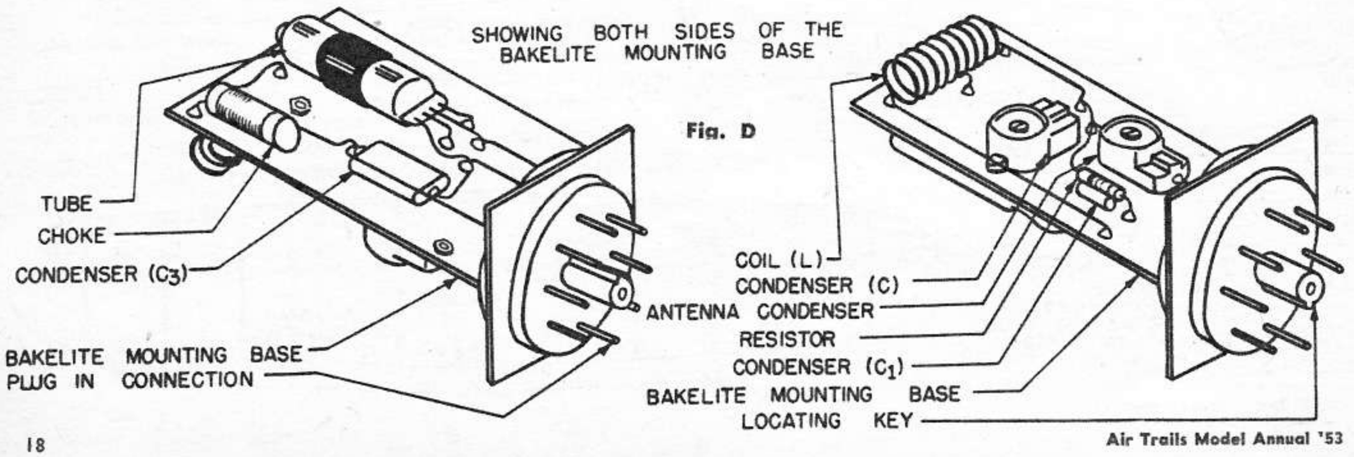


Fig. D

Control

This gives you a good idea of how the model receiver works

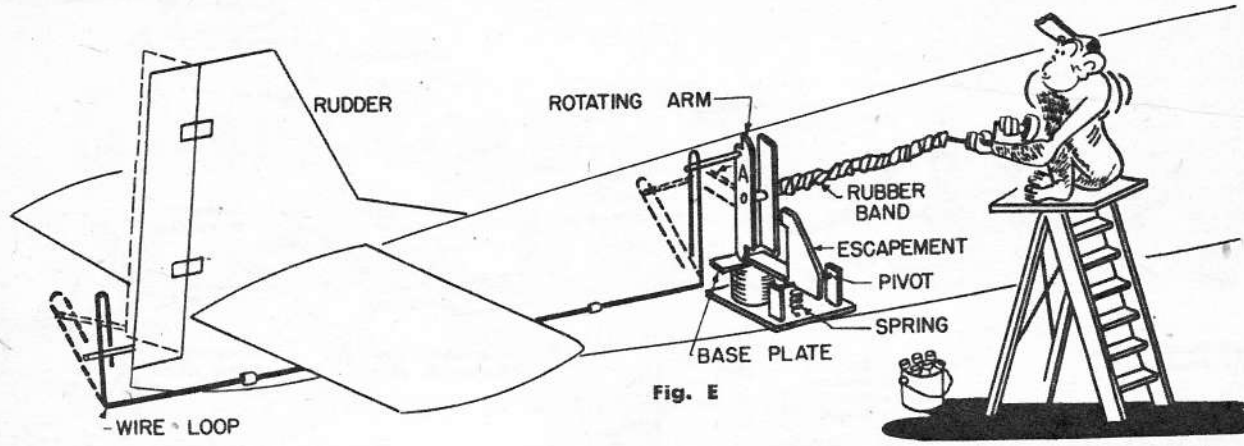


Fig. E

current. It is necessary to have this variable to take care of such factors as aging of the tube and batteries and type of relay used. The meter jack is used in the testing and adjusting of radio equipment. A meter placed in the circuit at this point will measure the DC current through the tube and relay circuit.

A relay (Fig. J) is used to enable a small change in current through the tube to control a larger flow of current through the escapement. Mechanical operation of relay: when a current flow is set up in the coil, the magnetic field pulls the pivoted bar downward and electrical contact is made between the bar and the upper contact. On receipt of signal, the current flow decreases and the spring pulls the bar to establish connection between the bar and the lower contact. The dotted lines indicate a magnetic field is set up when current flows.

The purpose of the escapement (Fig. C) is to move the control surfaces, thereby guiding the plane in flight. The actual mechanical power to move the control surface is furnished by a wound-up rubber band. The escapement merely controls the application of power to the control surfaces at the will of the operator. The escapement is basically a heavy duty relay. The current flow through the escapement is much higher than that of a relay and therefore the escapement can do more mechanical work. The simplest escapement is (illustrated) the two-arm, self neutralizing type. In the absence of a signal from the controlling transmitter the control surface is neutralized. Mechanical operation of escapement: on current flow, magnetic field pulls down arm, which releases catch point and allows plate to catch it in position 2 and hold it there as long as the current flows. When the signal is no longer received, the magnetic field ceases and the spring releases the bar, which returns to neutral position (1). Thus the rudder must go through a sequence of movements rather than offer a selection due to the fact that movement of the rotating arm is only in one direction.

Mechanical application of escapement to move control surface (Fig. E) ... when the signal is applied, the rotating arm A moves bar into position shown by dotted lines, which moves the wire loop and rudder to the left. When the signal is not applied, arm A returns to neutral. As the signal is again applied, the wire-loop, and rudder will move to the right, establishing the sequence of operations. Rubber band must be wound beforehand to provide mechanical power to turn escapement.

Component layout (Fig. D) shows both sides of the bakelite mounting base. The components of the basic schematic circuit may be laid out on a mounting base in many different positions. One such "plug-in" mounting is illustrated.

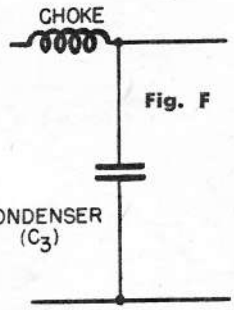


Fig. F

Fig. G

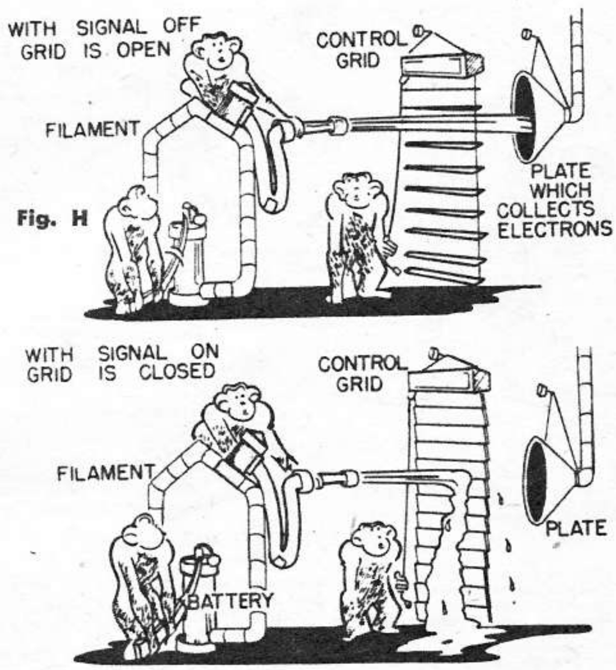
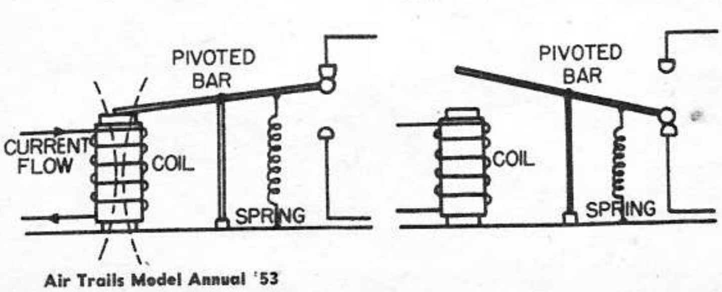


Fig. H

Fig. J



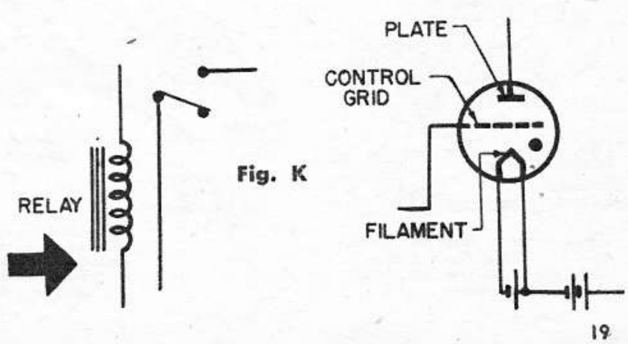


Fig. K