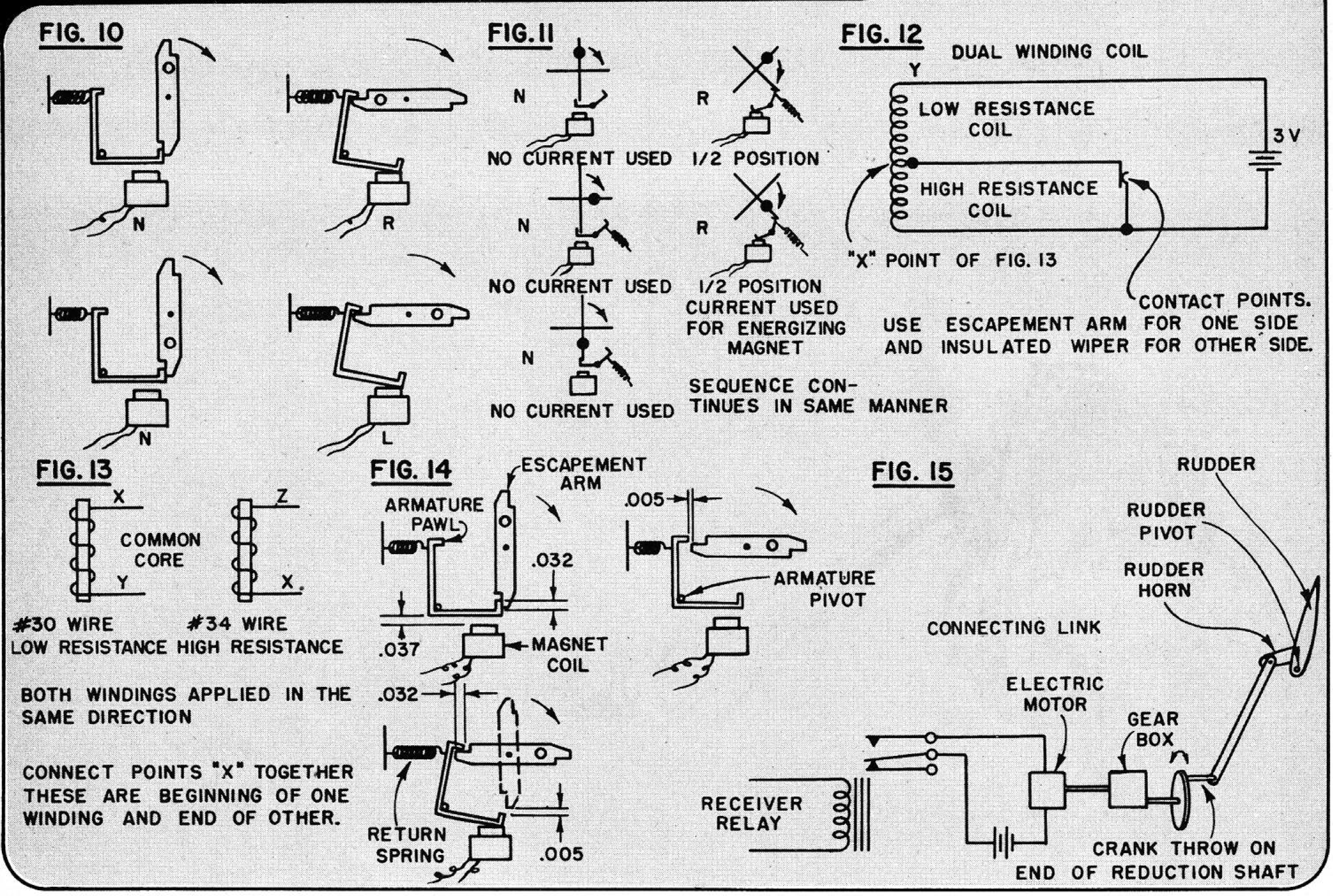
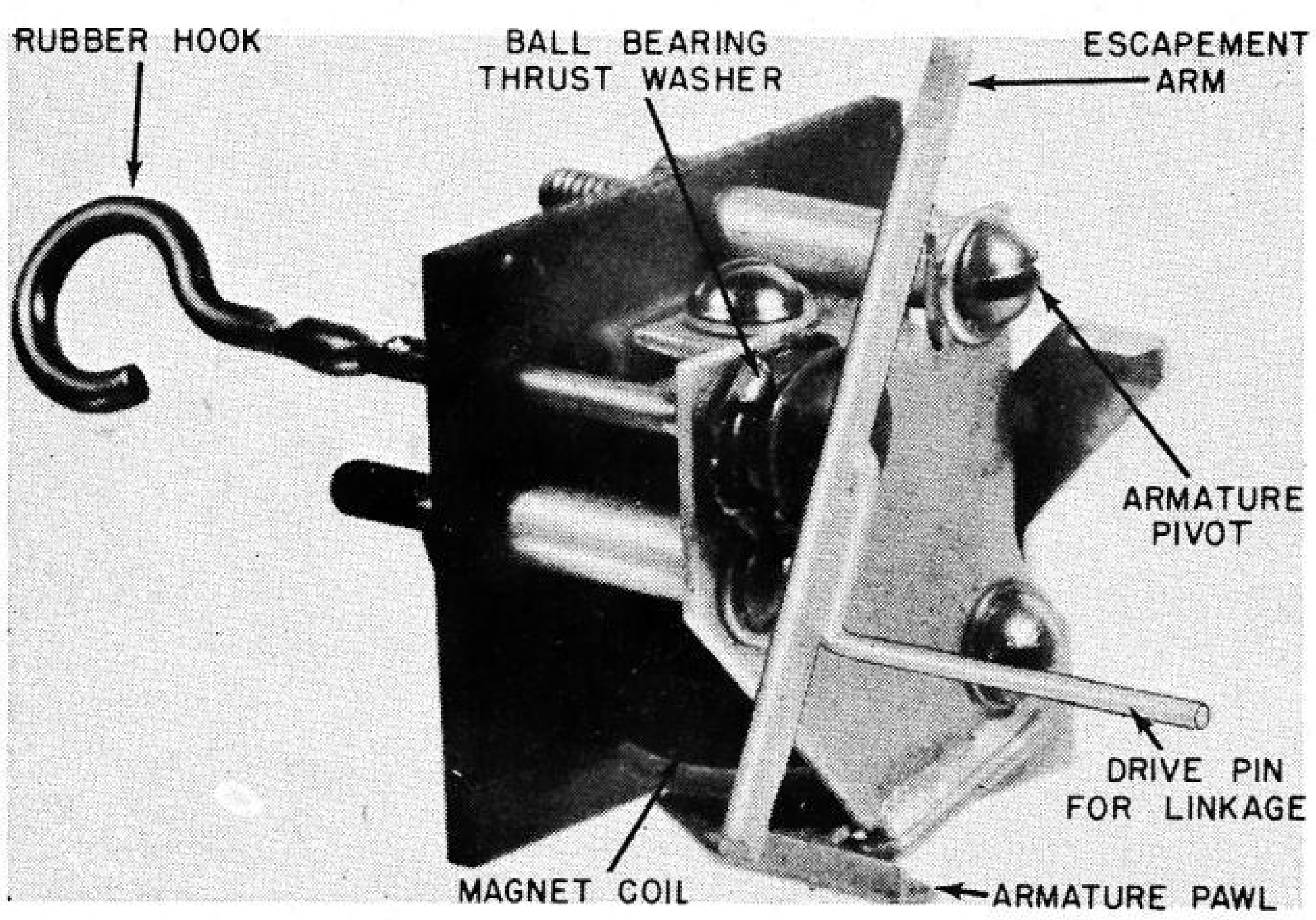
ACTUATORS





Escapement parts. This a Bonner manufactured for Vernon C. MacNabb.

ACTUATORS

More crack-ups have been caused by faulty escapements and/or their adjustments than from radio failures. The escapement must be understood, and cared for diligently.

An actuator is any electric-mechanical device for moving the various controls, such as rudder, elevator, engine speed, bomb dropping, etc. At the present time, over 90 per cent of the fliers use an escapement actuator. The basic type is shown in Figure 10. The main features of an escapement are the light weight and the use of a rubber band to supply the mechanical power and motion. As can be seen in Figure 10, the main object is that a sequence must be maintained in order to operate the escapement. That is, a pattern must be followed from neutral to left to neutral to right to neutral to left etc. However, this action takes place rapidly enough that its motion is not noted on the average flying model. One must remember the sequence however. Another objection is that on the self-neutralizing type, current is consumed as long as any position except neutral is used. On the four position (Good Brothers, Beacon type in Figure 11) no current is used other than that used to pulse from neutral to left or right and back to neutral. Half positions on this type require current to hold in the half position. The current drain on the Beacon escapement is approximately 300 mils when used with a three volt supply. The average self-neutralizing escapement, when used with three volts, draws from 600 to 1000 mils, and is typical of the single coil construction.

One of the newer developments in the escapement field is the current saver device, first placed on a model escapement by E. D. of England. The feature of this type escapement is that even though one ampere may be used to trip the armature pawl, only 90 milliamperes will hold it in place. The one ampere surge is only for a fraction of a second and then the drain is reduced. The author has used penlight cells for about three months of flying with an escapement like this and entirely reliable operation has been had at all times. (Continued on page 43)

R. C. Actuators

(*Continued from page 26*)

The circuit of a current saving escapement is shown in Figure 12. This can be adapted to any escapement on the market or to any one the modeler may prefer to build. If space permits on a homemade unit, two coils may be used. Otherwise, the single coil must be wound with No. 30 and No. 34 wire simultaneously and connected in series so that the flux lines are additive and not bucking each other. Figure 13 illustrates this and should be followed when designing dual winding single coils. With reference to Figure 12, the points are situated so that they are closed when the escapement is at neutral, thus shorting out the high resistance winding. When current is supplied to the low resistance winding and the armature picks up, this point moves and allows the high resistance to be put in series with the low resistance, thus decreasing the current consumed.

The proper operation of an escapement depends on the adjustment. Figure 14 shows the approximate clearances for proper operation. The spring tension on the armature pawl will vary with various types of escapements but should be tightened only to the point where the magnet coil will attract the armature reliably and with a snappy action. A piece of cellophane should be placed between the armature and the tip of the magnet coil. If these two surfaces are allowed to come in direct flat contact with one another, any residual magnetism induced in the two pieces may seal them together strongly enough to make it difficult for the return spring to pull back the armature.

Common causes of escapement skipping are as follows: (1) Sloppiness in the escapement arm shaft and the armature pawl pivot shaft; (2) Incorrect clearance at the latching points; (3) Incorrect angles on the ends of the escapement arm and on the stops of the armature pawl; (4) Rubber band wound too tightly, or too heavy rubber used; (5) Indirect causes from poor connections or bad relay contacts, or chattering relay contacts.

Three to four and a half volts should be used on the magnet coil and a single loop of 1/8″ rubber 14″ long, wound to a full row of knots should be sufficient for normal use.

Some builders may have a preference for placing the escapement either in the tail or in the cabin. The author prefers placing it in the cabin because of the shorter electrical connections involved and ease of adjustment, if needed. Balancing the model may also be made easier. Due to the relatively low resistance of the coils, a resistance of only one ohm in the connecting wires may lower the effectiveness of the magnet by 20 per cent.

One of the most unique actuators on the market is the Rudevator, capable of giving rudder, elevator and engine control; it operates on three to four and half volts.

Another type of actuator, the model development of which was pioneered by George Trammel, is the magnetic servo type. Plans for building various designs of this type have been presented in the June 1947 issue of M.A.N. The principle of this actuator, basically, is that for a given flux density as determined by the amount of voltage applied, a given movement is obtained. This lends itself to a proportional or modulated control which is what experienced radio control builders should strive for.

This method eliminates the sequencing that is necessary with an escapement, and allows the control to be positioned at any spot between neutral and full left or right.

John Worth of Hampton, Virginia, has developed several proportional type controls using both electric motors and a pulsed magnetic armature. Mr. Worth's designs lend themselves very well to a small Class B model or even to a Class A ship. One of the earliest applications of the electric motor system was used by Chester Lanzo in winning the Nationals back in the middle thirties in the radio control event, and is shown in Figure 15. Upon receipt of a signal, the electric motor was energized and remained running as long as the signal was held, driving the rudder continuously from left to right, etc. Since the plane was slow-flying, the key was depressed until the rudder turned it to the necessary direction, then released.

The End