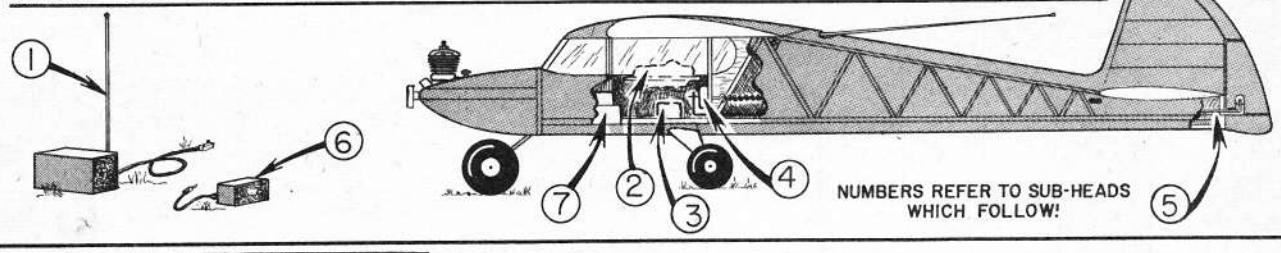
FM DATA SHEETS

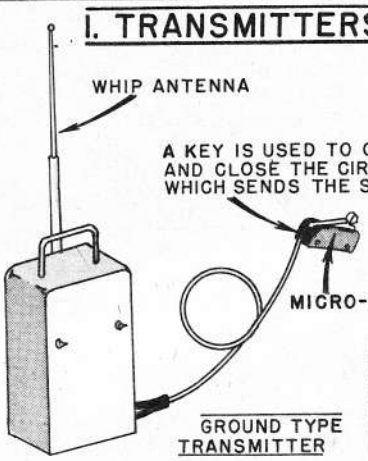
No. 11 — SINGLE-CHANNEL R/C EQUIPMENT

WHAT YOU NEED FOR CONTROLLING MODEL PLANES BY RADIO:



NUMBERS REFER TO SUB-HEADS WHICH FOLLOW!

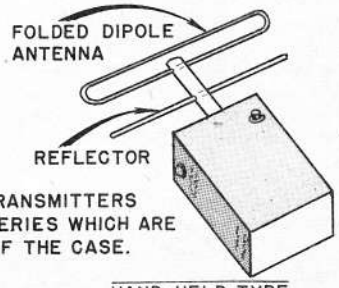
1. TRANSMITTERS:



GROUND TYPE TRANSMITTER

THESE COME IN SEVERAL TYPES, FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. UNLESS YOU HAVE A "HAM" LICENSE, YOU ARE RESTRICTED TO THE OPERATION OF RADIO CONTROL EQUIPMENT ON THE 465MC AND 27 1/4MC BANDS.

465MC AND 27-1/4MC STATION LICENSES MUST BE OBTAINED FROM YOUR LOCAL F.C.C FIELD OFFICE--NO TESTS REQUIRED.



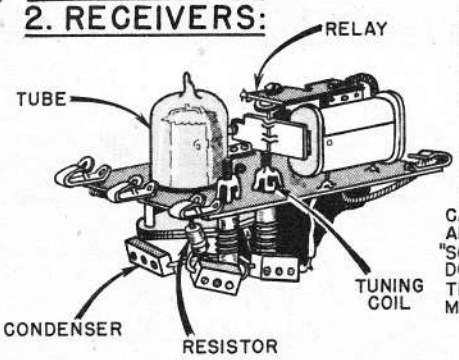
THE HAND-HELD TRANSMITTERS OPERATE ON BATTERIES WHICH ARE MOUNTED INSIDE OF THE CASE.

HAND-HELD TYPE TRANSMITTER

GROUND TYPE TRANSMITTERS ARE MORE VERSATILE SINCE VIBRATOR POWER SUPPLIES, WHICH HOOK UP TO AUTO BATTERIES, CAN BE USED. THIS ELIMINATES CHANGING BATTERIES. POWER UNITS OF THIS TYPE ARE "HOME BUILT". BATTERIES ARE USED IN COMMERCIAL UNITS.

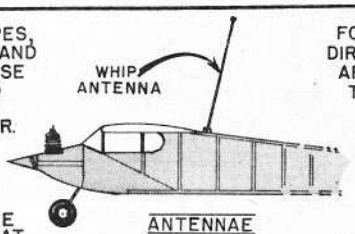
IF BATTERIES OR TUBES MUST BE REPLACED, USE EQUIPMENT WHICH IS IDENTICAL TO THAT USED, OR RECOMMENDED, BY THE MANUFACTURER OR DESIGNER.

2. RECEIVERS:



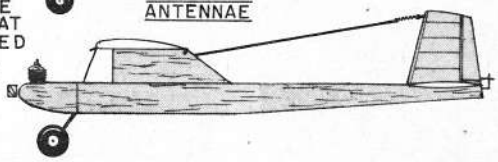
THESE COME IN SEVERAL TYPES, FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. USE A RECEIVER THAT IS DESIGNED FOR OPERATION ON THE SAME CHANNEL AS THE TRANSMITTER.

THE BASIC TYPES ARE THE "HARD TUBE" AND "SOFT TUBE" RECEIVERS. VACUUM TUBES ARE CALLED "HARD" WHILE THOSE THAT ARE FILLED WITH GAS ARE CALLED "SOFT". BOTH TYPES WORK WELL. DO NOT USE TUBES OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER OR DESIGNER!



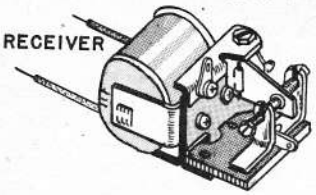
FOLLOW THE DIRECTIONS WHICH ARE SUPPLIED WITH THE EQUIPMENT AS THE ANTENNA LENGTH AND TYPE CAN BE VERY CRITICAL!

ANTENNAE



3. RELAYS:

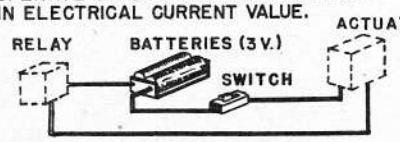
THESE COME IN SEVERAL TYPES AND ARE USUALLY PURCHASED AS SEPARATE UNITS. SOME RECEIVERS HAVE THEM BUILT IN.



WHEN BUYING A RELAY CHOOSE ONE WITH A RESISTANCE VALUE OF ABOUT 8000 OHMS.

THEY ARE ELECTRO-MAGNETIC SWITCHES.

RELAYS ARE USED TO CONTROL THE ACTUATOR CIRCUIT. THEY OPERATE ON THE RECEIVER'S CHANGE IN ELECTRICAL CURRENT VALUE.



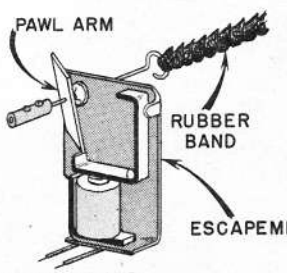
THIS IS A SCHEMATIC SHOWING THE "RELAY TO ACTUATOR" CIRCUIT. SOME UNITS NEED UP TO 6 V. SO CHECK THE SPECIFICATIONS.

THE RELAY CONTACTS CAN BE ADJUSTED TO PROVIDE OPTIMUM OPERATION WITH ANY RECEIVER.

4. ACTUATORS:

THESE COME IN SEVERAL TYPES AND AT A WIDE RANGE IN PRICE. THOUGH THE SIMPLE ESCAPEMENT IS MOST COMMON, THERE ARE MANY OTHERS IN USE. SOME OF THESE ARE:

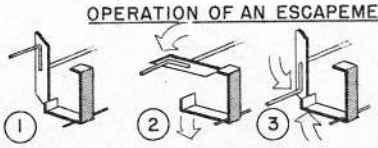
(A) COMPOUND ESCAPEMENTS
(B) PULSE MOTORS
(C) SERVO MOTORS
(D) SOLENOIDS



TO RELAY AND BATTERY CIRCUIT

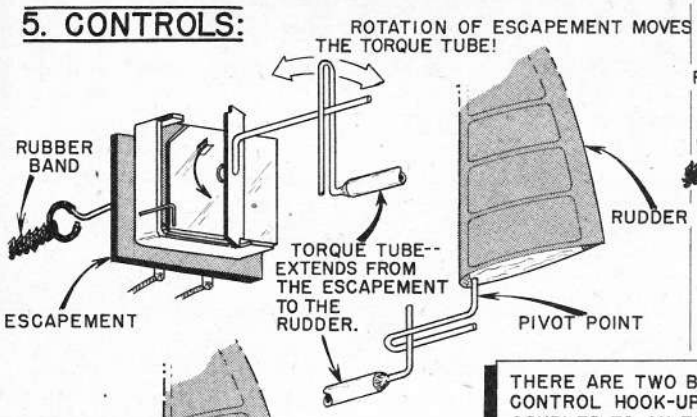
ESCAPEMENTS MOVE THE CONTROLS WITH POWER DERIVED FROM A WOUND RUBBER BAND OR SPRING.

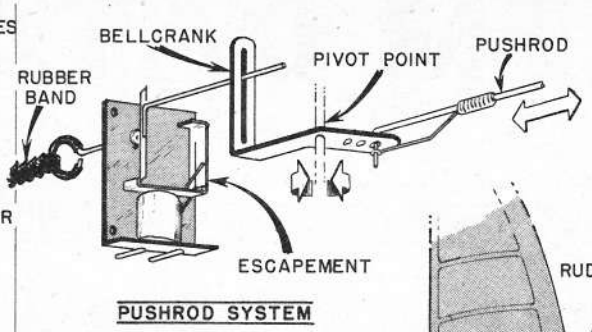
OPERATION OF AN ESCAPEMENT



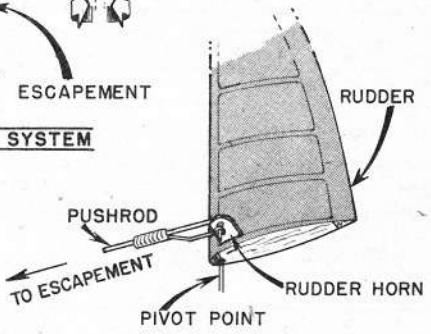
1. NO SIGNAL
2. SIGNAL ON--ARMATURE PULLS TOWARD COIL AND ALLOWS PAWL ARM TO MOVE 90°.
3. NO SIGNAL--TURNS 90°.

5. CONTROLS:





PUSHROD SYSTEM



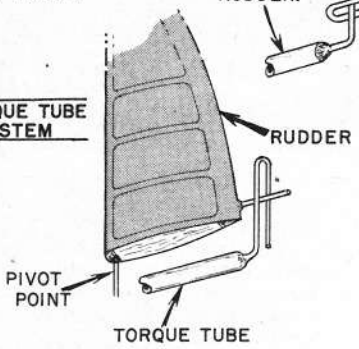
AS THE ESCAPEMENT ARM ROTATES IT TURNS THE BELLCRANK ON THE PIVOT POINT. THIS MOVES THE PUSHROD WHICH IS CONNECTED TO THE RUDDER HORN.

THERE ARE TWO BASIC TYPES OF CONTROL HOOK-UPS WHICH CAN BE COUPLED TO AN ESCAPEMENT:

(A) TORQUE TUBE
(B) PUSHROD

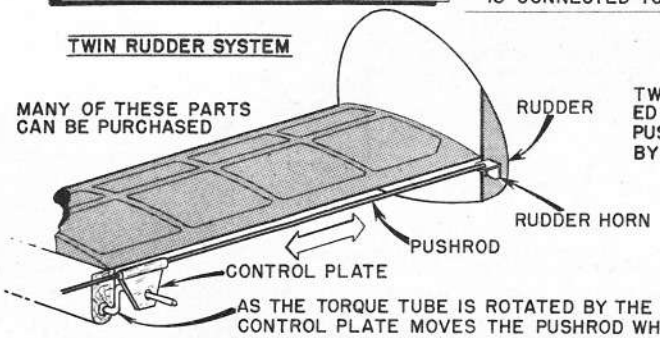
THE DRAWINGS SHOW EXAMPLES OF HOW THESE CAN BE APPLIED TO A RUDDER--THERE ARE MANY PRACTICAL VARIATIONS AND APPLICATIONS TO OTHER CONTROLS.

TORQUE TUBE SYSTEM



THE MOVEMENT OF THE TORQUE TUBE FROM RIGHT TO LEFT IS APPLIED TO THE CONTROL SURFACE BY ONE OF THE CONTROL LINKAGES SHOWN ABOVE.

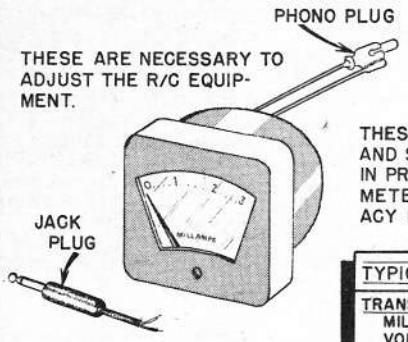
TWIN RUDDER SYSTEM



TWIN RUDDERS ARE LINKED TOGETHER BY A SINGLE PUSHROD WHICH IS MOVED BY A TORQUE TUBE.

AS THE TORQUE TUBE IS ROTATED BY THE ESCAPEMENT, THE CONTROL PLATE MOVES THE PUSHROD WHICH IS CONNECTED TO A RUDDER HORN ON EACH OF THE RUDDERS.

6. METERS:



THESE ARE NECESSARY TO ADJUST THE R/C EQUIPMENT.

THESE COME IN VARIOUS TYPES AND SIZES AND AT A WIDE RANGE IN PRICE. THE HIGHER PRICED METERS OFFER GREATER ACCURACY BUT ARE NOT A NECESSITY.

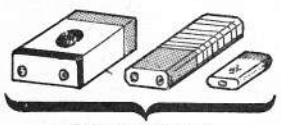
TYPICAL METER VALUES:	
TRANSMITTER	
MILLAMPS	0-50
VOLTS	0-6, 0-150
RECEIVER	
MILLAMPS	0-3
VOLTS	0-6, 0-100

ALL OF THE METERS LISTED ARE DIRECT CURRENT (D.C.).

THE METERS SHOULD HAVE PLUGS ATTACHED TO THEM SO THAT THEY MAY BE READILY INSERTED INTO, OR REMOVED FROM, THE CIRCUITS WHICH MUST BE CHECKED. FOLLOW THE MANUFACTURER'S OPERATING INSTRUCTIONS AT ALL TIMES!

7. BATTERY EQUIPMENT:

THESE COME IN VARIOUS TYPES AND SIZES. IT IS NECESSARY TO CHOOSE THE TYPE WHICH IS BEST SUITED TO THE SIZE OF YOUR MODEL.



"B" BATTERIES

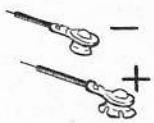
"A" BATTERIES

TRANSMITTER:	
N60, 490, VS090	90.0v
K-45, XX45, 467	67.5v
RECEIVER:	
VS016, 477, 457	67.5v
Z30, 455, 738	45.0v

TRANSMITTER:	
720, 2FBP, VS005	1.5v
736, F3, VS067	4.5v
RECEIVER:	
915, Z, VS034	1.5v
7, 935, VS033	1.5v

HEARING AID BATTERIES:	
504E, 411E, U10E	15.0v
505E, 412E, U15E	22.5v
506E, 430E, U20E	30.0v

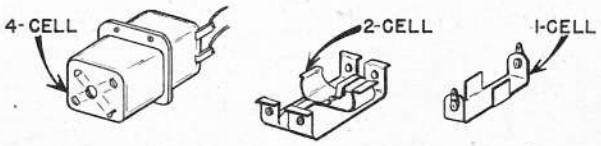
THESE ARE RECOMMENDED FOR USE WITH 1/2A R/C MODELS.



SNAP-ON BATTERY CONNECTORS

PLUG-IN BATTERY CONNECTOR

THESE CHARTS LIST CODE NUMBERS OF BATTERIES THAT ARE COMMONLY USED WITH R/C EQUIPMENT.



BATTERY BOXES ARE A CONVENIENT WAY TO MOUNT SMALL BATTERIES INTO A MODEL. THESE ARE AVAILABLE IN VARIOUS TYPES AND SIZES.

ACCESSORIES:

SCREWDRIVERS ARE VERY POOR TOOLS FOR TUNING RADIO EQUIPMENT AS THE METAL IN THEM DISTURBS THE CIRCUIT.

PLASTIC TUNING WANDS, SUCH AS TV REPAIRMEN USE, CAN BE OBTAINED AT ALL RADIO SUPPLY HOUSES. WHEN YOU TUNE YOUR EQUIPMENT DO NOT HOLD ON TO ANY PART OF IT AS THIS WILL ALSO DISTURB THE CIRCUIT. DOUBLE CHECK BY STANDING AWAY AND TESTING.

WHEN INSTALLING THE R/C EQUIPMENT IN YOUR MODEL YOU WILL NEED SMALL ACCESSORIES SUCH AS:

HOOK-UP WIRE
NUTS AND BOLTS
PLUG SOCKETS

HERE SOME OF THE OTHERS WHICH YOU WILL NEED.

KEEP A FEW SLIDE SWITCHES ON HAND. RECEIVERS USUALLY REQUIRE THE DOUBLE POLE—SINGLE THROW (DPST) TYPE. A SINGLE POLE—SINGLE THROW (SPST) TYPE IS USED IN OTHER PARTS OF MODEL; SUCH AS THE ACTUATOR CIRCUIT.