DECEMBER . . . 1962

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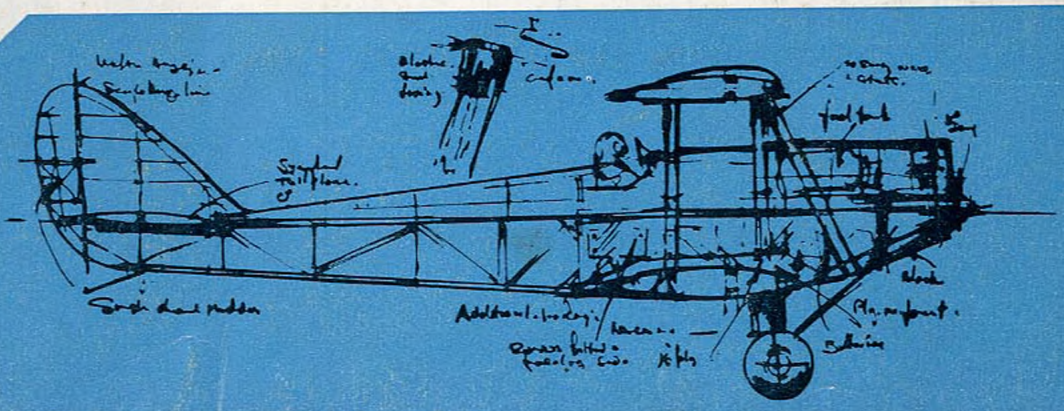

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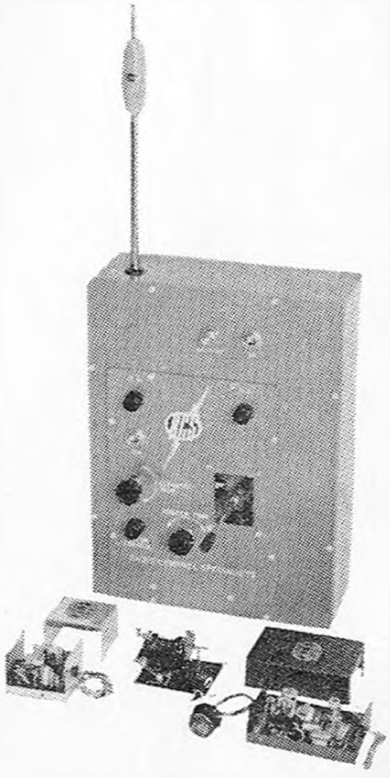

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# RADIO CONTROL MODELS & ELECTRONICS

DECEMBER 1962

VOLUME 3 NUMBER 12

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( Monday to Friday )


## NEXT MONTH . . .

**Highlights of the issue include . . .**

SIMPLE ALL TRANSISTOR TRANSMITTER
R/C SCALE
PRINTED CIRCUIT CONSTRUCTION
LATEST EQUIPMENT ON TEST
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**Plus the usual favourites**

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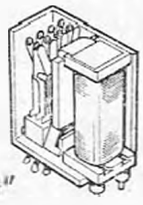

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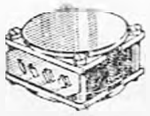

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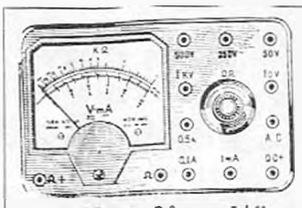

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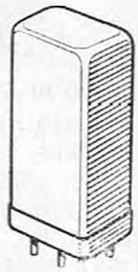

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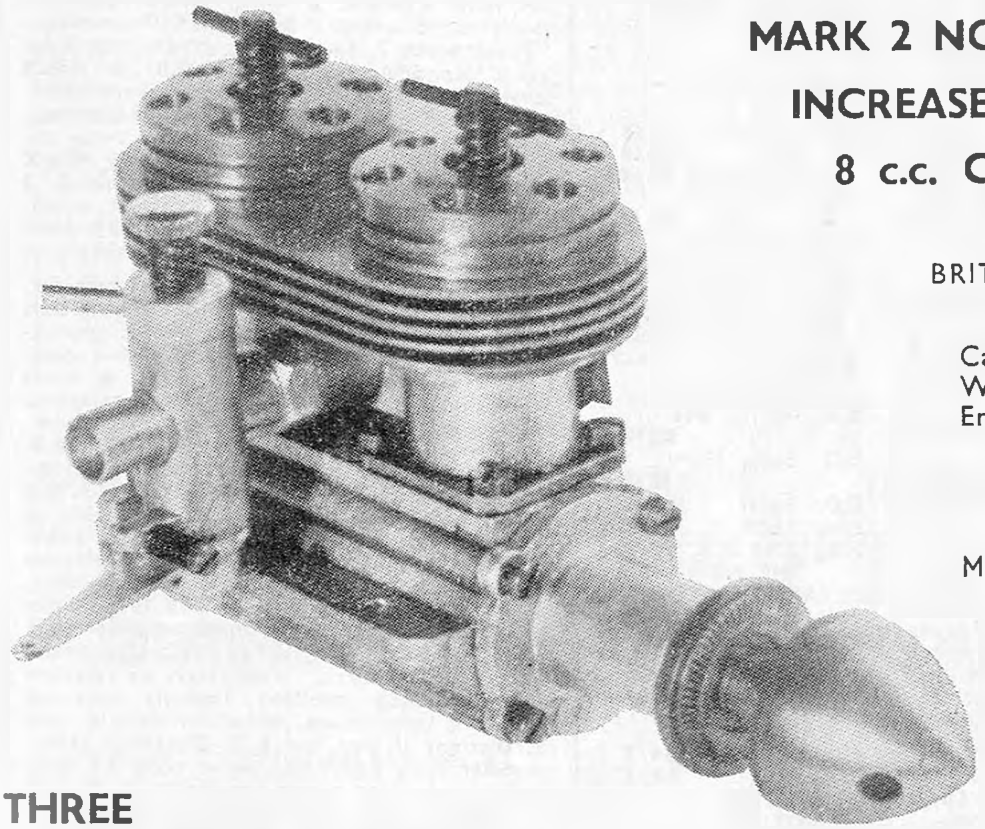

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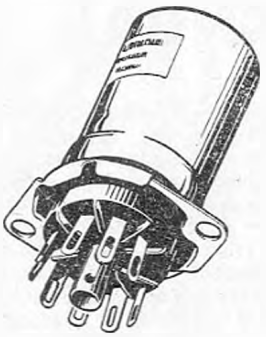

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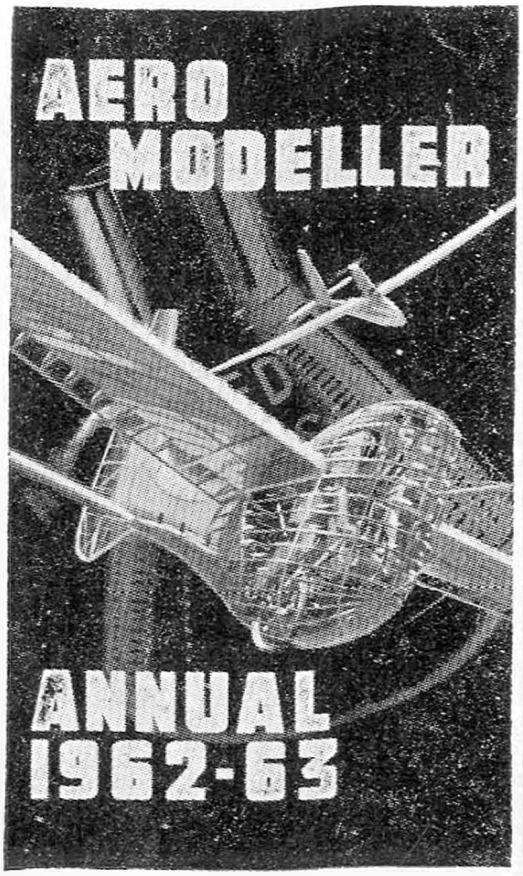


IN ONE YEARLY VOLUME is gathered the cream of the world's model plans, plus articles on subjects of special interest in the current year, plus a selection of practical and theoretical information that will help aeromodellers of all degrees of skill. The cover painting depicts man-powered "Puffin" against a starry sky with American space capsule "Friendship VII" in orbit. Articles include Man-powered Flight; a 3-volt sub miniature Transistor Receiver by Dave McQue; Franz Czerny on Jedelsky's "Standard" models; Schneider Trophy in Minature; Water-powered Free Flight; Lightweight Rubber Models by Peter Gasson; Anti-warp Structures; Control Surface Design for R/C; Fact & Fallacy of Design Theory; Scale Prototypes for R/C; Glide Trim; Power Prop Selection; Multi is the Real Answer. Also included: Engine Analyses of the year, International and British Contest results, and a host of fully dimensioned model plans.

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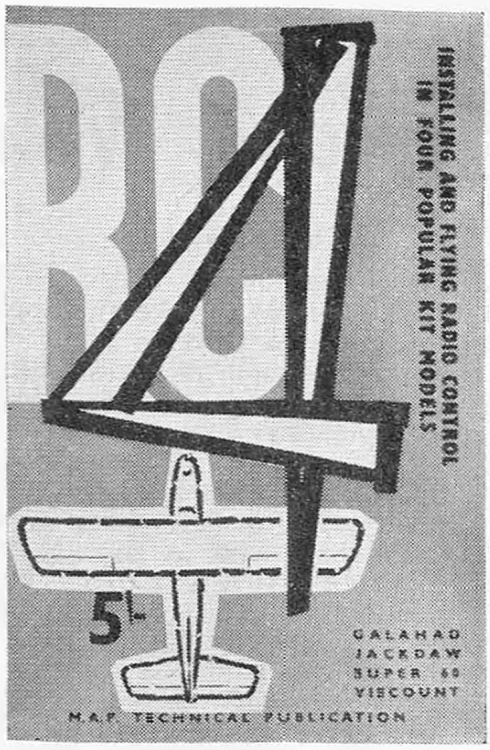
# R/C BIG 4




RADIO CONTROL BIG FOUR is a new departure in model technical journalism that will fill a real need amongst newcomers to r/c flying. It caters for the man who has just bought, or is thinking of buying his first r/c kit in which to install and fly his first equipment. We approached the manufacturers and designers of the four British kits now on the market and invited them to tell us all about them. The result is a book which amplifies the building instructions supplied with the kits, tells why the designers did what they did, how they installed their equipment, how they flew the models, and snags they met and overcame, tips on better building—in fact it is nearly as good as having these expert designers and flyers standing with you as you progress. The kits covered are MERCURY GALAHAD; FROG JACKDAW; KEILCRAFT SUPER SIXTY; VERON VISCOUNT.

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# Here, There & Everywhere

### Merry Christmas

Or should we wish you a happy (R)Xmas! We make no apologies for this piece of corn, in fact it introduces our new simple relayless multi receiver.

You may be wondering what Christmas greetings are doing by arriving in your favourite magazine on November 6th. Well, this is after all the December issue and press dates being several jumps ahead may tend to give the impression that contest results, etc., are several months late when one picks up the odd back issue. This brings us to our next item . . .

### "We've Got It" or "You've Had It"

Do you have a full stock of each year's copies of *R.C.M. & E.*? Occasionally we find it necessary to refer readers with queries back to some of our earlier issues. We are, of course, anxious to avoid this procedure when publishing articles, and feel that a little gen repeated is better than a sometimes fruitless search through earlier and perhaps incomplete volumes. In case you have a particular need to make good any deficiencies in your existing stock of *R.C.M. & E.'s*, we publish below a list of the available back issues, which may be obtained from our editorial offices—price 2/4d. each which includes postage (in U.K.).

### Available Back Issues

June, August and September, 1960 (Volume 1).

January, February, *March, April, May, *June, July, August, October, November, December, 1961 (Volume 2)

February, March April, May, June, July, August, October, November, December, 1962 (Volume 3).

*Stocks are low on these issues so hurry!

### On the Cover

*Now a new approach to "Rudder Only" in the shape of "Six Gun", John Dumble's National's winner, featured in our centre pages and available in the A.P.S. range.*

### Light Entertainment

P. L. Heaven of Bristol sent us a description of a display operated in Lewis's store which was devised by the R.E.M.E. and was christened "Telstar". This was in fact a modulated light link between a tape recorder and a loud-speaker. We understand that quite a good quality reception was to be heard, music being played on the tape recorder, amplified and fed to a number of Pea bulbs whose modulated light was reflected from a mirror on to a light sensitive transistor. The signal was then amplified and fed to the speaker. A simple little experiment itself, but serving to show that there are other linkages, if short, besides radio systems.

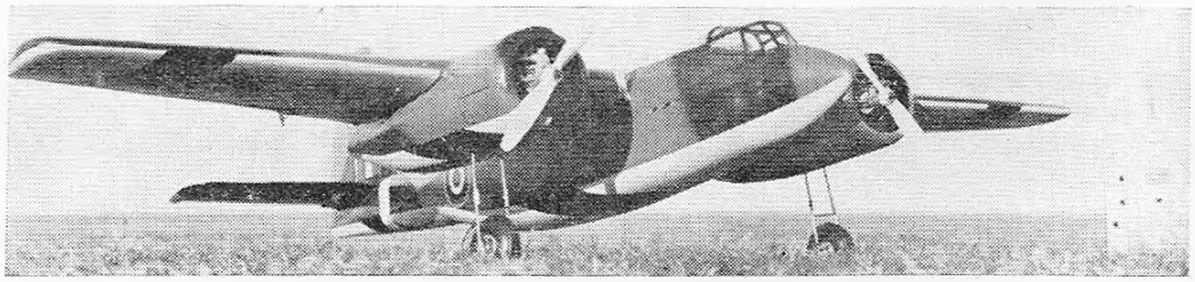
### First British R/C Scale Twin

Our picture shows David Walker's "first". A 1/9th scale Miles monitor (approximately 72 in. span and 10½ lb.). Two Merco 35's with 10 x 6's take the model around at a realistic flying speed.

We witnessed the successful test flights at Southern Multi Flyers' field. A most impressive sight. It flies on one motor, too, thanks to skilful test piloting by Harry Brooks. Read next month's *R.C.M. & E.* for a flight commentary and some vital information on twins and scale models generally.

### Demonstrations Galore

At the invitation of Squadron Leader Corser, we paid a visit to the R.A.F. Gaydon "At Home" where we were entertained by a very fine full-size and model air display. The reliability of the



Superhet radio equipment and the proficiency of the radio pilots enabled the models to mix freely with some of the full-sized aircraft in the show. From where we stood it appeared as though a "Chipmunk" and a model were actually stunting together.

The models flew from a dispersal area behind the crowd so as to allow free passage of the full-sized aircraft on the main runway. We understand that at R.A.F. Benson a similar display was given, using a common take off area. Now it is one thing for a mechanic belonging to a full-sized kite to hop smartly out of the way of a model, but it is a good deal harder for a bod who has just executed a nice take off by his model to jump equally smartly out of the way of a large jet bomber. It seems now-a-days that the only limiting factor to our hobby is the human element!

**Harassed Helmsmen**

The amount of boat gen has, over the past months, become extremely sparse. We, not the least, are anxious to see more boat material in our pages. After all, suitable waters are more easy to find than flying fields, and even though the number of controls are fewer and installations tend to be of a simpler nature than those in aircraft, they are no less interesting. We would welcome some unusual and informative write-ups *by* boat people *for* boat people. How about it skippers? (we pay too!)

**Suitability Symbols**

In order to save some of the explanatory preambles in the headings of our articles, we have adopted the simple expedient of prefixing and terminating articles which may be applied to boats, aircraft or cars by an anchor, airscrew and wheel symbol respectively. This we hope gives immediate indication of the suitability of the equipment described therein for a particular branch of the hobby. We hope that this arrangement will enable the reader to turn speedily to the article on the subject nearest to his heart.

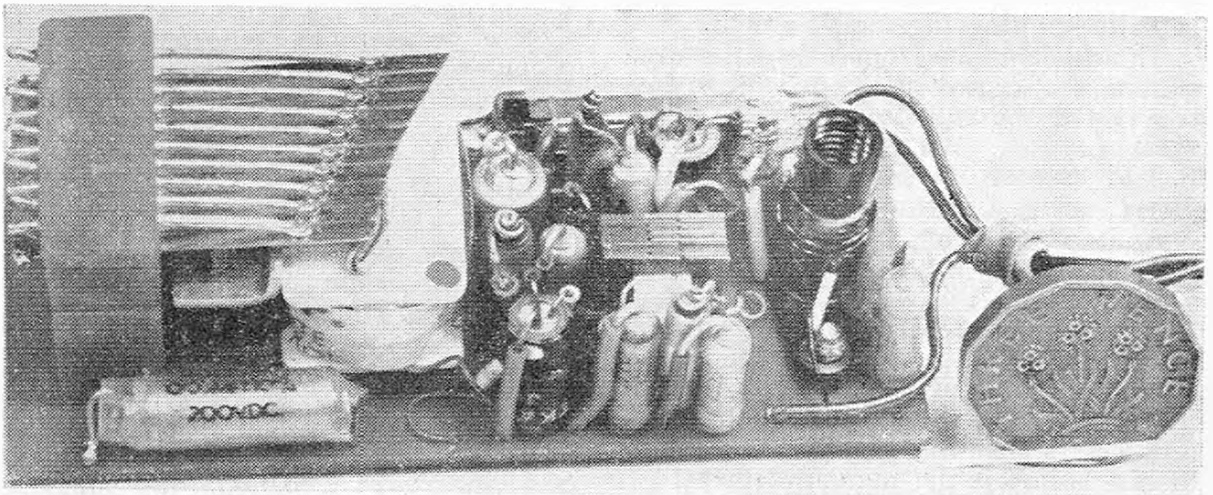
**This could be you — or could it ?**

*In most R/C clubs up and down the country, there are individuals few in number, who are most knowledgeable on radio and electronics and who, unselfishly give their precious time to development, correction, and improvement of fellow members' radio gear, etc. May I hand out a bouquet to one such person. I refer to John Masefield of the Wulfruna Club Comparatively shy by nature, John is the person responsible for ironing out the gremlins which the Wolverhampton chaps encounter, all of his spare time in club activities, is given over to helping the other chap, so much so, that he has never had time to enjoy controlling a boat of his own, or making one for that matter. The Wulfruna Super-het is one of his developments, and first class it is too, reliable in operation, and ultra sensitive. It is a credit to his ingenuity and patience. As Midland technician and rep. for the E.M.I. group, he travels anywhere in the course of a day, rectifying anything from an electronic organ, to a computor, and one would think that by the end of the day, he would have had enough, but not a bit of it, invariably, after tea, he gets out his test gear, and nips off to help someone else less knowledgeable, so let us not forget the Johnny Masefields of our hobby, not for them the glory of prizes, they are content, in their own way, to know they have helped, but let us give credit where it is due, and those who are interested or fortunate enough to win contests, etc., with home made equipment, part of which has been developed by some other club member, don't forget the chap who made it possible, and without whose friendship we would be much the poorer.*

R. P. MEREDITH,

*Birmingham Group, R.C.M.S.*

# The Multi-Gem



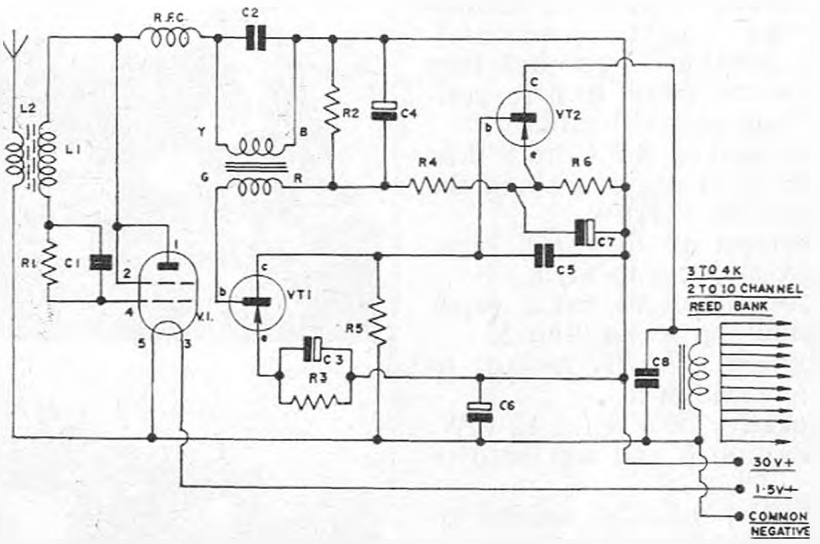
## AT LAST . . . G. HATTEMORE HAS PROVIDED US WITH A REALLY SIMPLE HOME BUILT REED RECEIVER FOR USE IN AIRCRAFT OR BOATS

UNTIL now there has been a sad lack of "Do-it-yourself" relayless 2-10 channel Rx's., reliable, simple to build and relatively cheap. Having looked around a little the writer was unable to find this ideal combination just waiting to be built, so the idea of breaking into the "Multi" business was temporarily shelved. However, in the August and September issues of the *R.C.M. & E.* there appeared an interesting article called the "Orbit Story"—the necessary information to produce an Rx. (and to be fairly certain that it would operate satisfactorily) became available. The Rx. about to be described is based on this circuitry. No claim is made for originality. The circuit is a fairly conventional super-regen with transformer coupled two transistor AF stages. Whilst the Rx. is primarily intended for relayless servos it can, of course, be easily modified to operate relays in the conventional way.

**Compact Construction**

To keep the overall size as small as reasonably possible it was decided to mount most of the components vertically. This necessitated the use of a printed circuit board type construction. The required board was designed by the writer and manufactured for him by the O.B.M. Co., who incidentally, are able to supply the necessary parts to make this Rx, with such things as a ready wound coil and R.F.C. at a very reasonable price. They also recommend this Rx. for use with the "Eight Channel Hand Held Tx." and the "Duo Ten Tx." designed by G. C. Chapman, parts supplied by them. All tests were made with these Tx.'s.

The design of the printed circuit board was such that either of two types of reed bank could be used, these being the E.D. Octave or the R.E.P. ten channel. Both work very well on this Rx. and, no doubt, many other types of reed bank would, when suitably attached, operate satisfactorily. On the printed circuit board directly beneath the reed bank there are 11 tags. These are to permit the wires from the reed contacts to be fixed to the board and then further wires from the board to the various servo plugs. This method of connection avoids throwing loads, applied through the wiring, on to the reed bank. The transformer can be mounted with its laminations protruding through the printed circuit board to produce a more rigid fixing without untidy straps, otherwise a liberal application of Araldite should be used. It also takes up less space in the horizontal plane and thus allows a more compact arrangement of components. Due to the close




**COIL WINDING DETAILS**

**L1—28 Turns of 38 s.w.g. enamel wire.**
**L2—2 turns of 26 s.w.g. cotton cov. wire.**
**RFC—36 turns of 38 s.w.g. enamel wire on stripped T.V.1 choke (1 amp.).**

**VALVE, TRANSISTOR AND TRANSFORMER DETAILS**

**Valve—XFY.34.**
**T1 and T2—OC84, OC72, or XC 161.**
**Transformer—Ardente 10:1 (D 129).**

proximity of the components it is suggested that the wires from resistors and capacitors should be sleeved. The transistor wires should be sleeved and doubled back down the sides of the transistor; this allows a heat shunt to be used fairly easily.

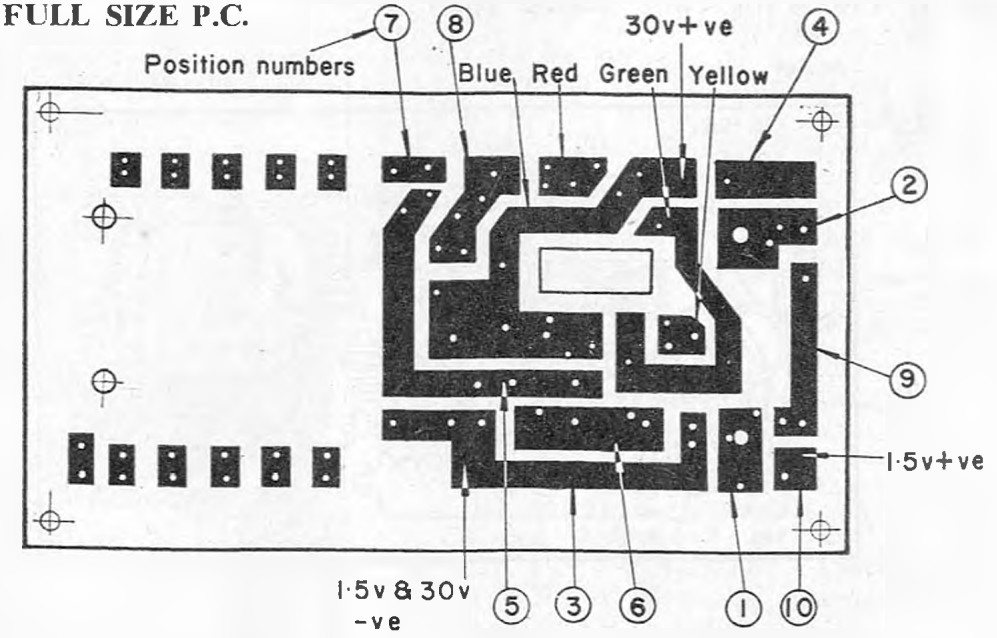
**Method of Assembly**

Apply two small dabs of "Araldite" or similar to one end of the transformer lamination and press it into or on to the p.c. board so that it projects from the plain side of the board.

(1) Coil the four wires from the transformer (Blue, Yellow, Green and Red) and solder them to their appropriate positions on the p.c. board. These are noted on the layout drawing as Blue, Yellow, Green and Red, together with positions 1 to 10.

(3) Fix coil L1 in position with 8 B.A. screws and nuts and solder ends of

**FULL SIZE P.C.**



coil and ends of link turns in the following manner. TOP coil to position 1. BOTTOM coil to position 2. TOP link turn to position 3. BOTTOM link turn to position 4. Solder nuts to p.c. board.

(4) Solder one end of R.F.C. to 8 B.A. coil securing screw at position 1 and the other end to position YELLOW.

(5) Solder bottom of .01 m.f.d. capacitor to YELLOW and top to BLUE.

(6) Solder bottom of .01 m.f.d. capacitor to BLUE and top to position 5.

(7) Solder bottom of 2.7K resistor to BLUE and top to position 6.

(8) Solder negative of 6 m.f.d. 12 V.W. capacitor to position 6 and top positive to BLUE.

(9) Solder bottom of 82K resistor to position 5 and top to position 3.

(10) Solder positive ve bottom of 8 m.f.d. 30V.W. capacitor to BLUE and top negative to position 8.

(11) Solder positive ve bottom of 6 m.f.d. 12 V.W. capacitor to BLUE and top negative to position 38.

(12) Solder bottom of 2.7K resistor to BLUE and top to position 8.

(13) Solder bottom of 12K resistor to position 8 and top to position RED.

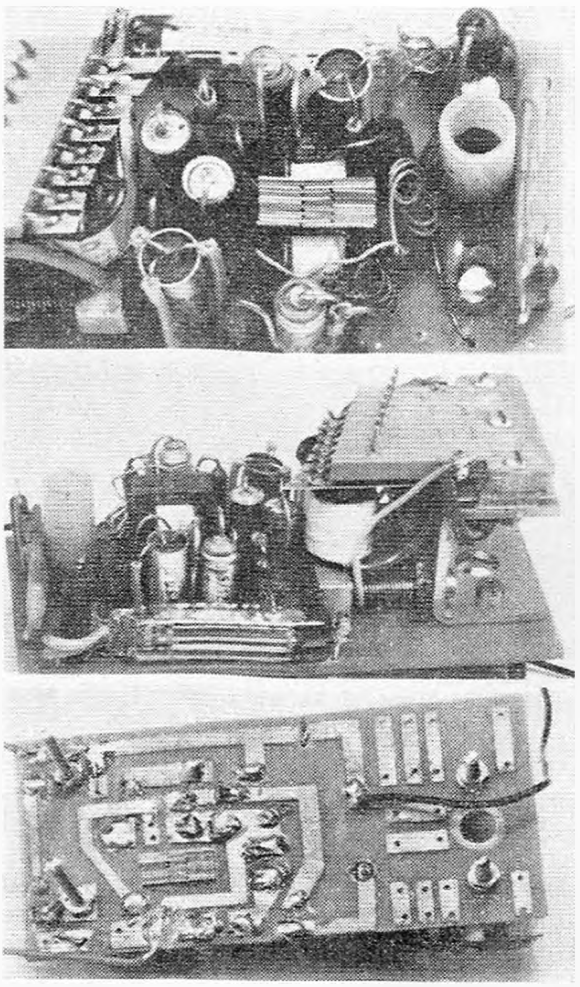
(14) Solder positive ve of 8 m.f.d. 30 V.W. capacitor to RED and top to BLUE.

(15) Solder bottom of 3.9K resistor to BLUE and top to RED.

(16) Solder 45 pf capacitor horizontally between position 2 and position 9.

(17) Solder bottom of 2 meg resistor to position 2 and top to position 9.

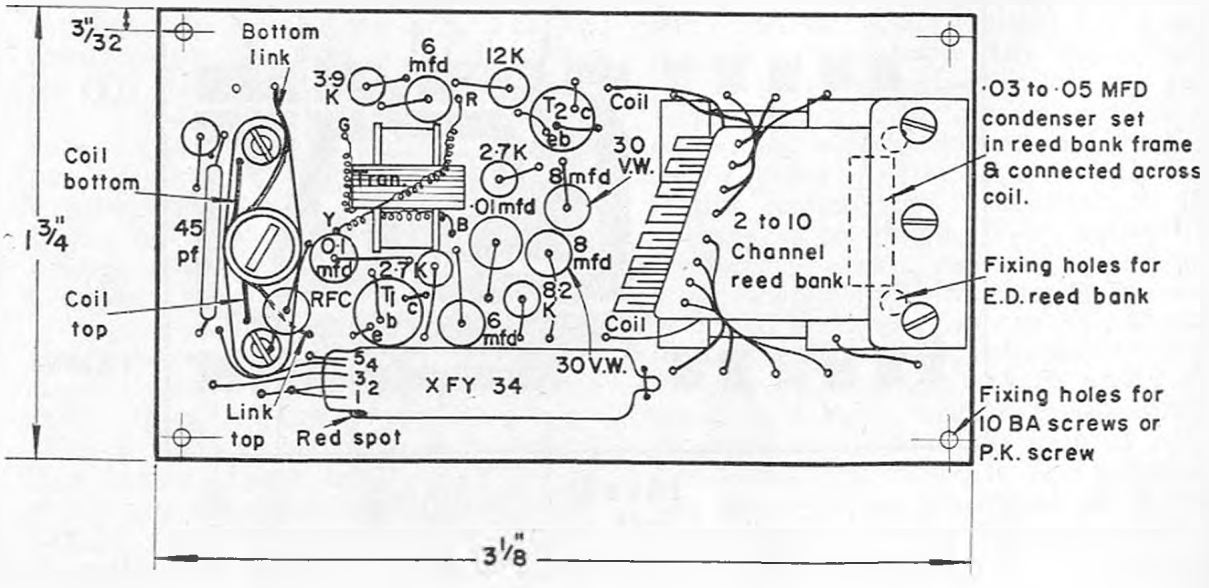
(18) *Transistor VT*1: Solder connections as follows. BASE (centre wire) to GREEN. COLLECTOR (wire nearest spot)

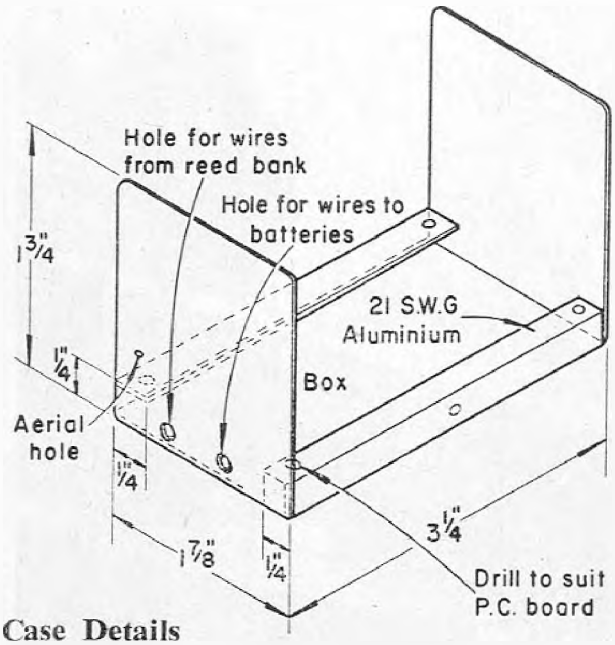


**Top, close-up of the Rx. part shows comfortable spacing and inverted transistors. Other two views emphasise the simplicity.**

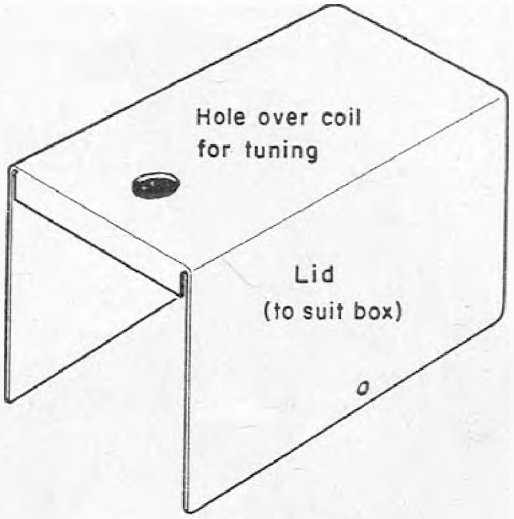
## PLACEMENT DIAGRAM

*Hold page up to the light to register with Lands.*






**Case Details**

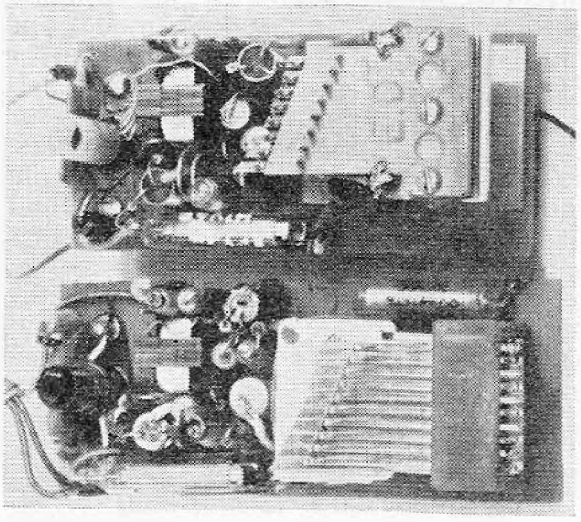



to position 5. EMITTER (remaining wire) to position 6.

(19) *Transistor VT2*: BASE (centre wire) to position 5. COLLECTOR (wire nearest spot) to position 7. EMITTER (remaining wire) to position 8.

(20) Valve XFY 34: The valve has a red spot on one side, near its wires. Counting from this side the wires numbered are 1 to 5. Sleeve all wires—solder wires 1 and 2 to position 1, wire 3 to position 10, wire 4 to position 9 and wire 5 to position 3. Secure valve tip by small piece of 26 s.w.g. wire (or similar) threaded through p.c. board and twisted (twist carefully, or buy a new valve!).

**Snap! Upper Rx. built by Geoff Chapman (also on opposite page). Lower Rx. by the author. E.D. and R.E.P. reed banks used respectively.**



(21) AERIAL: Solder 36 in. of plastic covered flexible wire to position 4.

(22) Solder length of blue plastic covered wire to position 10 for 1.5v. + ve, a length of red plastic covered wire to BLUE position for 30v. + ve and a length of blackplastic covered wire to position 3 for common − ve.

(25) An .03 m.f.d. to .05 m.f.d. should be set into the body of the reed bank and connected to position 3 and position 7 together with the wires from the reed bank coil The value of the condenser used is dependent on the type of reed bank used.

**List of Components**

¼ in. Coil Former "Aladdin"—1
XFY 34 Valve—1
10:1 Ardente (D129) Transformer—1
OC 84, OC 72 or XC 161—2 (similar)
1 AMP TV1 Choke rewound 10 μh—1
3K to 4K 2 to 10 Channel Reed Bank—1
38 s.w.g. enamelled wire—2 yards
26 s.w.g. cotton covered wire (or enamel wire plastic sleeved)—1 yard
2 meg Resistor—1
3.9K Resistor—1
2.7K Resistor—2
82K Resistor—1
12K Resistor—1
45 pf Capacitor—1
.01 m.f.d. Capacitor—1
.03 to .05 m.f.d. Capacitor (depending on reed bank)—1
6 m.f.d. 12VW Electrolitic Capacitor—2
8 m.f.d. 30VW Electrolitic Capacitor—2
Printed Circuit Board to suit—1

(*Continued on page* 606)

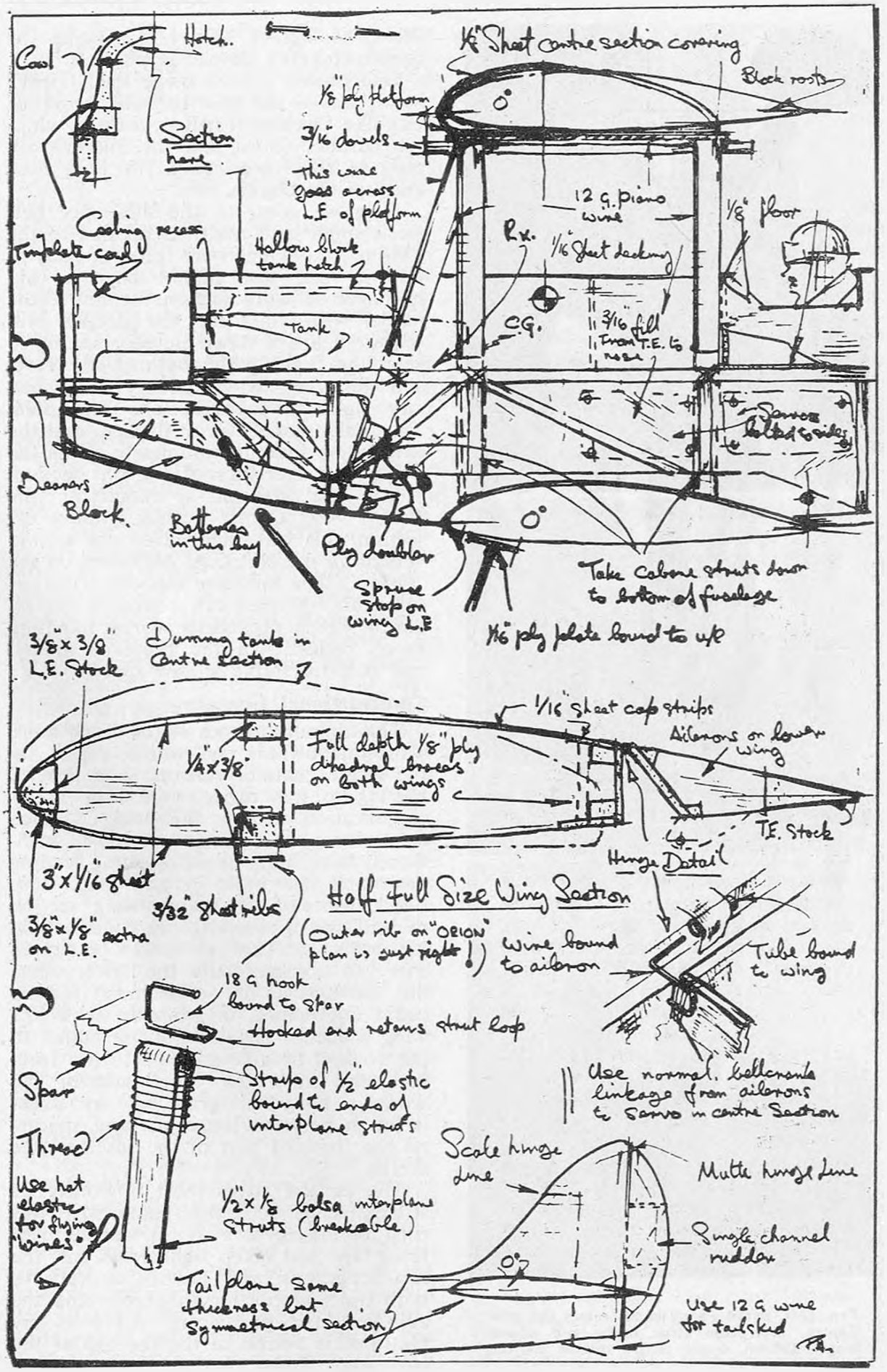

# Jack's Gipsy

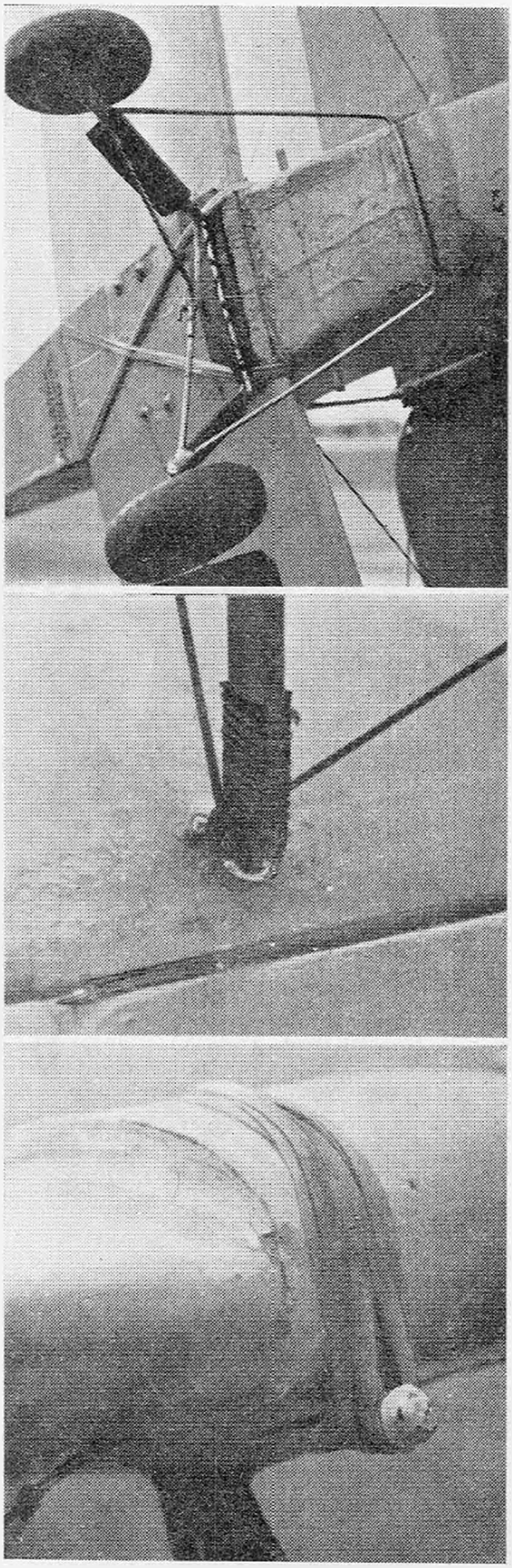
## COMPILED FROM NOTES SUPPLIED BY JACK MORTON AND OUR SKETCH DETAILS

*Jack Morton's version of our A.P.S. "Gipsy Moth" needs no introduction. The original plan, designed by Sid. Allen is of course for single channel equipment and a maximum of 5 c.c. power. Many modellers, fascinated by the performance of Jack's now famous model, have attempted to fit multi control into models built from the single channel plan. This is a procedure which is definitely not to be recommended; the designer did not intend the model to carry either the extra weight or to execute the manoeuvres which the modern multi equipment facilitates. Jack has answered a number of enquiries from would be "Moth" builders and given them the information which we now present in the form of a sketch page, together with a few tips on trimming which could be applied to other scale models. Now over to Jack . . .*

I HAVE always been a scale modeller at heart, with a particular interest in Biplanes, even in the days of free-flight and control line I had a soft spot for this type of model. Now, with the great advancement of radio control equipment, it is possible to do what I consider the ultimate in our hobby: scale multi. It is not just a case of taking a free flight or single channel model and installing multi gear. In my opinion before building a multi scale model one must decide first whether it is to be for flying or just for a show piece, and I think it is much nicer to see them fly, executing realistic manoeuvres, so a line must be drawn where scale *interferes* with the flying ability and performance. The amount of detail that can be modelled is almost never-ending, indeed it could become such an elaborate affair that one is afraid to fly it. Don't forget, the life of a multi channel model built for aerobatics can be very

**Heading : Jack starts up assisted by Roy Norris at the Sutton Coldfield Rally.**


Cowl
Hatch.
Section here.
1/8" Sheet centre section covering
Block roots
1/8" ply platform
3/16 dowels
this runs across L.E of platform
12 g. piano wire
1/8" floor
Cooling recess
Tinplate cowl
Hollow block tank hatch
Rx.
1/16" Sheet decking
Tank
C.G.
3/16" fill from T.E. to rear
Servos bolted to side
Dessars Block.
Batteries in this bay
Ply doubler
Spruce stop on wing L.E
Take Cabane struts down to bottom of fuselage
1/16" ply plate bound to u/c
3/8"x 3/8" L.E. Stock
Dumming tanks in Centre Section
1/16" Sheet cap strips
Ailerons on lower wing
1/4"x 3/8"
Full depth 1/8" ply dihedral braces on both wings
T.E. Stock
Hinge Detail
3"x 1/16" sheet
3/32" sheet ribs
3/8"x 1/8" extra on L.E.
Half Full Size Wing Section
(Outer rib on "ORION" plan is just right!)
Wire bound to aileron
Tube bound to wing
18 g hook bound to spar
Hooked and retains strut loop
Spar
Strips of 1/2" elastic bound to ends of interplane struts
Use normal Bellcrank linkage from ailerons to servo in centre Section
Thread
Use hot elastic for flying wires.
1/2"x 1/8 balsa interplane struts (breakable)
Scale hinge line
Matte hinge line
Single channel rudder
Tailplane same thickness but Symmetrical section
Use 12 g wire for tailskid



Top, U/C detail (wing bands retain the gear. Centre, interplane strut fixing and aileron hinge. Bottom, upper centre section showing dowel.

short, as well I know! So make the construction as simple as possible.

One reason for choosing the "Gipsy" Moth was to be able to build a simple box-like fuselage, furthermore the wings are parallel chord and the ailerons are only in the lower wing. A long nose and upright engine.

Now we come to the difference between single and multi as applied to the "Moth", the wings were followed only in outline, one just cannot have a thin uncambered wing section for multi, the model will climb far too steeply, will require a lot of down-elevator keying to keep the flight path anything like level and the wings will probably fold when any tight manoeuvres are attempted. The multi model has to fly fast, and the extra wing loading completely spoils the flying characteristics of the old section.

My first attempt at modifying the "Moth" was to use a thin symmetrical section, this was changed on the second version to the N.A.C.A. 2415 used on the "Orion". The tailplane was also changed to a thin symmetrical section, a combination which proved its worth: handling much better than the previous model, and is more stable at low speeds.

**Constructional Changes**

The airframe comes in for much more punishment than one would expect on the single channel version, so a general beefing-up was carried out. The major modification is on the wings, which apart from the sections previously mentioned have hefty spars, sheeting leading edge and are built in one piece with block roots in the upper-wing section and all tips of similar block construction. Naturally, the fuselage has to be carved away to accommodate the lower wing, but this acts as an access hatch for the radio equipment, in common with low wing models. A false floor is added to the cockpit to give stiffness to the fuselage and keep the "goo" out of the works. Diagonal grain $\frac{3}{16}$ in. sheet is let in between longerons and spacers on the forward part of the fuselage, see sketch.

The cabane struts must obviously be strengthened: 10 gauge piano wire was used bound to $\frac{1}{8}$ x $\frac{5}{16}$ in. spruce with linen tape and taken right down past the top longerons and bound securely to both top and bottom longerons and the adjacent fuselage spacers. An $\frac{1}{8}$ in. ply platform is bound to the the top of the strut and carries two $\frac{3}{16}$ in. dowels on

its undersurface, these are in one piece from L.E. to T.E. and serve as attachment points for the wing retaining bands. The elastic fixings for the interplane struts accommodate changes of incidence. The struts are only there for show and are simply strips of balsa so that they break before they punch holes in the wing.

The undercarriage is basically the same as the original, but is simply bound to a piece of plywood at the rear location point, this ply plate is not fixed, but merely rests against a strip of hardwood glued to the leading edge of the lower wing. The whole unit is held on by rubber bands and knocks off cleanly in a heavy landing.

**Flight Trim**

First, the motor; use the biggest engine you can get your hands on—I have seen more prangs due to underpower than over. The amount of down and side thrust depend on the engine you finally use and its prop. The Enya 60 in my model has a 12 in. x 6 in. nylon prop and 5 degrees side and 8 degrees downthrust when needed. Do not under any circumstances try to test glide the model. After checking the controls let it bore down the runway under full power. Remember that the incidences are all zero, so it should stay on the deck; cut the motor and try again adding incidence very slowly (about $\frac{1}{16}$th at a time) to the leading edge of the top wing. It may be necessary to repeat this procedure several times until the model finally unsticks. From my experience I do not advise altering the bottom wing incidence. It is not necessary to change the tailplane incidence, the whole rear unit is securely fixed at zero incidence. After flying the model around, noting the usual adjustments that may be necessary for correcting rudder, elevator or aileron neutrals, throttle back and trim for a fast steep glide to insure that one does not get a stall on landing.

**Aerobatics**

This is where the big motor comes into its own; models do not have much chance of following the flight pattern of their full size counterparts to the letter when executing some manoeuvres. Inertia, Reynolds number and all the complicated aerodynamics seem to spoil its chances, unless one has enough power up front to pull it through most of the S.M.A.E. schedule manoeuvres.

Now a word about the manoeuvres which scale models generally are made to perform. This is really bound up with the pointing which the scale competition rules (and judges) appear to standardise. As I see it, the big difficulty in judging scale competitions' manoeuvres is the limitation of the full-sized aircraft. For example, a loop to a full size "Moth" has a diving approach, is a nice big round loop, throttling back at the top and recovering to level flight, somewhat lower than the entry point. This manoeuvre looks (and sounds) really scale. If consecutive superimposed loops are called for, the competitor is restricted in a choice of scale subjects to one of the comparatively few full size aircraft that will do an S.M.A.E. stunt schedule.

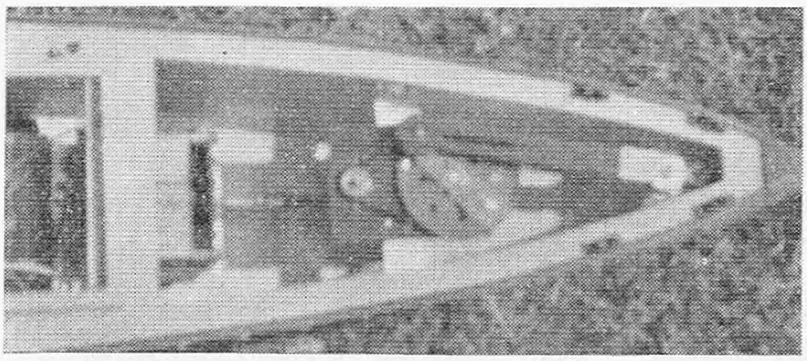
*We are always open to suggestions from readers for fresh scale subjects. Main points to bear in mind are*: (1) *Upright or sidewinder motor.* (2) *Fairly simple construction.* (3) *Ability of components to knock off.* (4) *Change of airfoil sections without too obvious a deviation from scale.* (5) *Reasonable long nose moment.* (6) *Capable of structural reinforcement.* (7) *Comparative lack of vulnerable detail.*

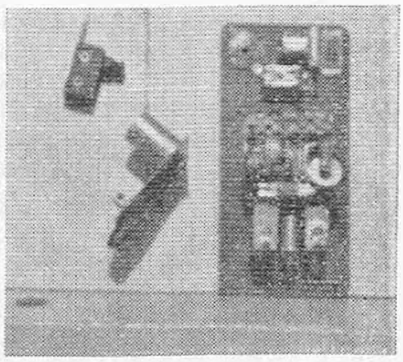
*Let us drop a few suggestions after a perfunctory glance at the A.P.S. plans range; there are only seven of the models which, if enlarged, could accommodate most of the points mentioned.*

*Missile Thrush F.S.P.* 304
*Avro* 504*k F.S.P.* 343
*Avro Avian F.S.P.* 468
*R.E.8 F.S.P.* 418
*Westand Widgeon F.S.R.* 211
*Luton Minor F.S.R.* 534
*Druine Turbulant F.S.P.* 613.

*The above models would, of course, all have to be enlarged and completely redesigned structurally but have the advantage of reasonably low fuselage cross sectional area.*

*We are investigating these and other models, and will be publishing some "pros and cons" in the February,* 1963, *issue.*





# Extra Controls from S/C

## AN INTERESTING APPLICATION OF SINGLE CHANNEL RADIO IN H.M.S. "WOLVERTOWN" — BY D. G. FARRON

THE following circuit appeared in the January, 1960, *Model Maker* and as it then proved extremely reliable I have decided to use it again this season in my model of H.M.S. "Wolvertown". The circuit is ideal for the newcomer to Radio Control who wishes to move on from the rudder only control, it is easy to follow and the unit can be built for as little as £4.

The circuit is ideal in that it provides for either proportional rudder or left, right and centre rudder, if an escapement is used.

Fig. 1 shows the main circuit which has been modified to provide a horn when the boat is going astern and a searchlight which flashes on and off each time a signal is transmitted.

The Motor Reverse relay is wired for use with the Taycol Supermarine, and may require modification if a different type of motor is used. The contacts on the "Reverse Relay" and "Motor Stop relay" should be capable of handling current in excess of that taken by the motor.

It will be seen from the picture of the selector unit that the slave relay and Delay Relay, are sealed types which have a resistance of 180 ohms. However, any S.P.C.O. relay can be used (a resistance above 500 ohms or below 180 ohms is not recommended) but if the resistance is not 180 ohms the value of the capacitor across the delay relay will have to be altered, e.g., 400 ohms relay - 300 u.f. capacitor.

The four-way selector may be purchased from almost any Government Surplus shop for about 10/6d. The Coil is centre tapped—one half being 15 ohms, the other 6 ohms. The coil may be rewound for 12 volt operation, or the 6 ohm winding can be utilised. The interrupter contacts on the selector are not used as the voltage is applied directly across the winding. As the selector is operated on a pulse of approximately half a second the fact that the 6 ohms winding will draw 2 amps of current is immaterial.

All relays are shown in their rest position, i.e., receiver and 12 volt supply switched off. If a current drop receiver is used the connections will go to contacts numbered 1 and 2 on the receiver relay.

A push button micro switch is used to key the transmitter, and the rudder is operated by pulses of up to approximately one second in duration. Pulses exceeding one second operate the Selector in sequence as follows: Long pulse "Motor Stop" –Long pulse "Motor Reverse" –Long pulse "Motor Stop" –Long pulse "Motor Forward".

**Heading pictures show Meccano pulley in a simple home built steering servo and linkage to the tiller. Picture on the right shows the selector unit and relays with Tx. and microswitch (left).**

The operation of the circuit is as follows: With receiver and 12 volt supply switched on. the delay relay is energised through contacts 2 and 3 on the slave relay, and the delay relay contacts 1 and 2 make. When a short pulse is transmitted the slave relay contacts 1 and 2 make and current is supplied to the rudder motor via contacts 1 and 2 on the delay relay. Although the current to the delay relay is broken it remains energised due to the 600 u.f. capacitor across it. When a pulse of approximately two seconds is transmitted. contacts 1 and 2 on the slave relay again make, but after approximately one second the delay relay drops out and its contacts 2 and 3 make, thereby supplying current to the selector. At the same time the current to the rudder motor is broken.

The "Spark Suppression" components were found to be necessary only as indicated on the circuit diagram.

The Rudder Unit shown is made up from a 24 volt Government Surplus motor which can be purchased for about 10/6d. and Meccano parts numbered 19B. 24, 18A and 35. The gearing ratio is 4-1 and is provided by pulleys. The 33 ohms resistor shown on the circuit,

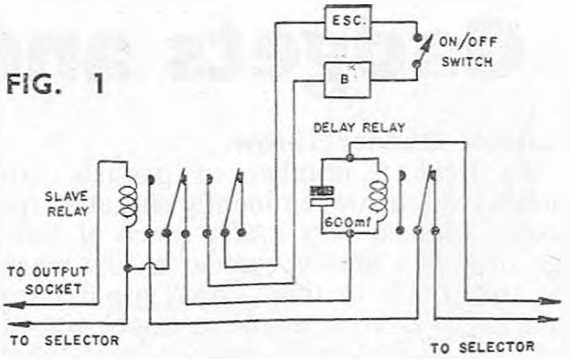



FIG. 1

reduces the speed of the rudder motor described to prevent the rudder from moving too fast. The resistor may not be necessary if a different rudder motor is used.

In my boat I use two 6 volt 9 amp/hour accumulators connected in series and these provide adequate current to operate the boat for about 20 minutes.

*We are always interested in new application of R/C for boats . . . Don't hide it under your hatch, send it in!*

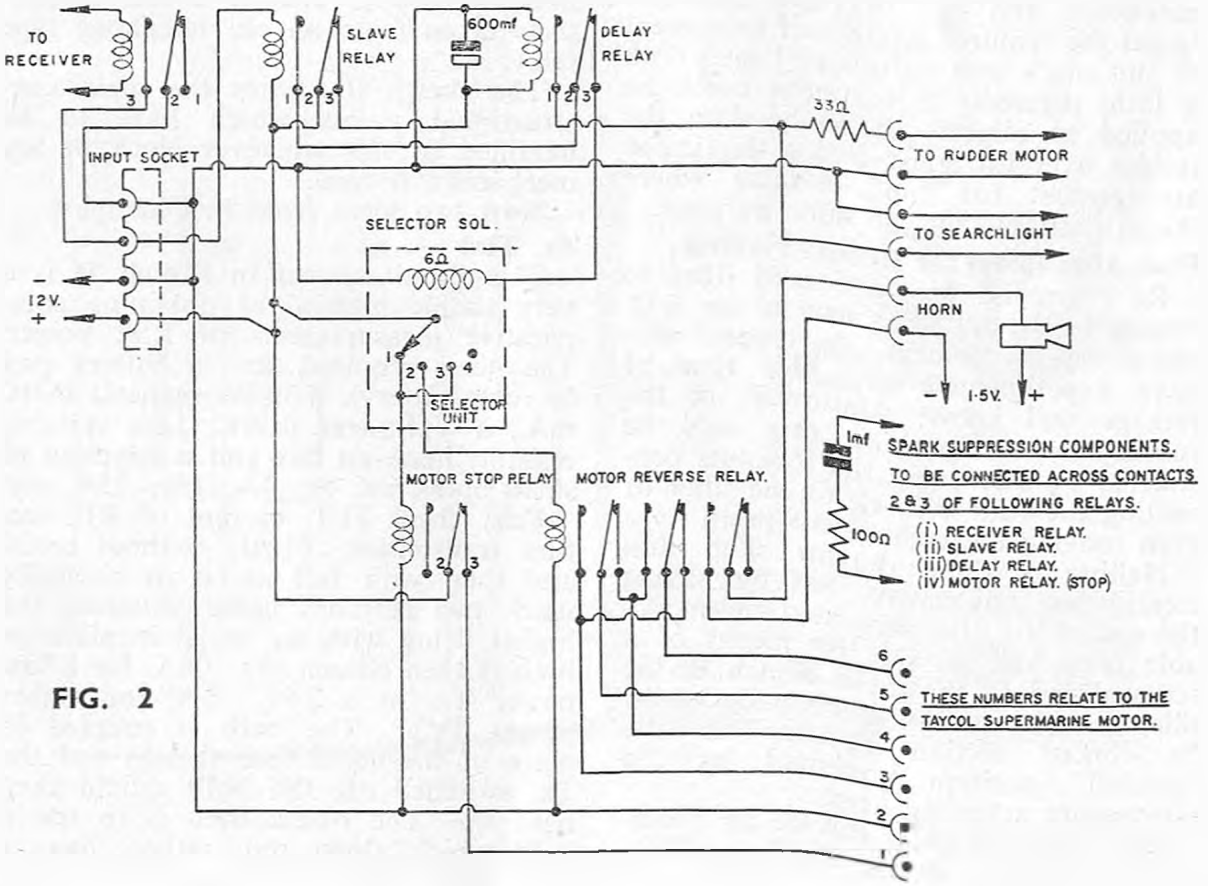



FIG. 2

# Gadgets and Gimmickry

**Variable Rudder Throw**

We have a number of gadgets this month which are eminently suitable for boats. First, a very crafty piece of linkage to give a greater rudder throw when the throttle is in the "slow" speed position. G. Everest made a mock-up of the linkage for us to try out; this takes the form of a Stephenson's link motion, and is arranged so that at "slow" speed the throttle servo swings a rudder push-rod towards the pivot end of a slotted tiller.

Now, before you, and probably ourselves become any more confused, take a look as Sketch **A**, which shows the linkage in the "slow" position. The linkage is also shown in the "fast" position diagrammatically. The construction demands very little ingenuity, Paxolin or Tufnol links and bellcrank can be easily made and it should be remembered that increasing the throw of the bellcrank operated by the throttle servo increases the rate of change between "fast" and "slow".

It would be a good idea to make a little experimental linkage with pieces of cardboard and pins or paper fasteners to get the required amount of movement to suit one's own particular boat. With a little ingenuity this system could be applied to aircraft to really slam the rudder over for spins, and a duplicated arrangement for "up" elevator where this is desirable for the same purpose.

**Fine Adjustment for Rudder Neutral**

R. Townsend uses a forked tiller to engage in the actuating arm of his E.D. clockwork escapement. As readers who have experimented with this type of linkage will know; adjustment of the rudder neutral position can only be effected by slackening the locknuts connecting the rudder stock to the tiller or even moving the escapement itself.

Neither of these systems offer sufficiently fine adjustment, but by having the end of the tiller separated and moveable from side to side by means of a screwed rod as shown in Sketch **B**. the tiller may be turned fractionally whilst its forked section remains in the "neutral" position governed by the escapement actuating arm.

The adjusting screw can be an ordinary bolt, if taps are not readily avalible, then providing the fork part is made from brass or heavy gauge tinplate, a suitable nut can be sweated to one of its lugs.

**"Clockwork" Radio**

S. Murgatroyd sent us a strange parcel which whilst being opened, gave off suspicious whirring sounds and nearly prompted us to drop it into the nearest bucket of water. Further investigation revealed a neat little balsa box containing a converted alarm clock modified to pulse a transmitter at a very low rate. Permitting a "lone hand" to carry out a range check, whilst the transmitter is pulsed by the gimmick shown in Sketch **C**. Very little modification is necessary to the clock; simply remove the balance wheel and pallette (that's the little fork shaped gubbins). Carefully solder four tiny shim brass or tinplate vanes on to the pallette wheel, this is the last gear in the train and will now act as an air brake. This will give four or five minutes run from one winding of the clock. Now turn to the gears which normally drive the hands; either the minute hand shaft or one of the gears driving the hour hand from this shaft, may be used to operate a pair of contacts taken from an old telephone type relay.

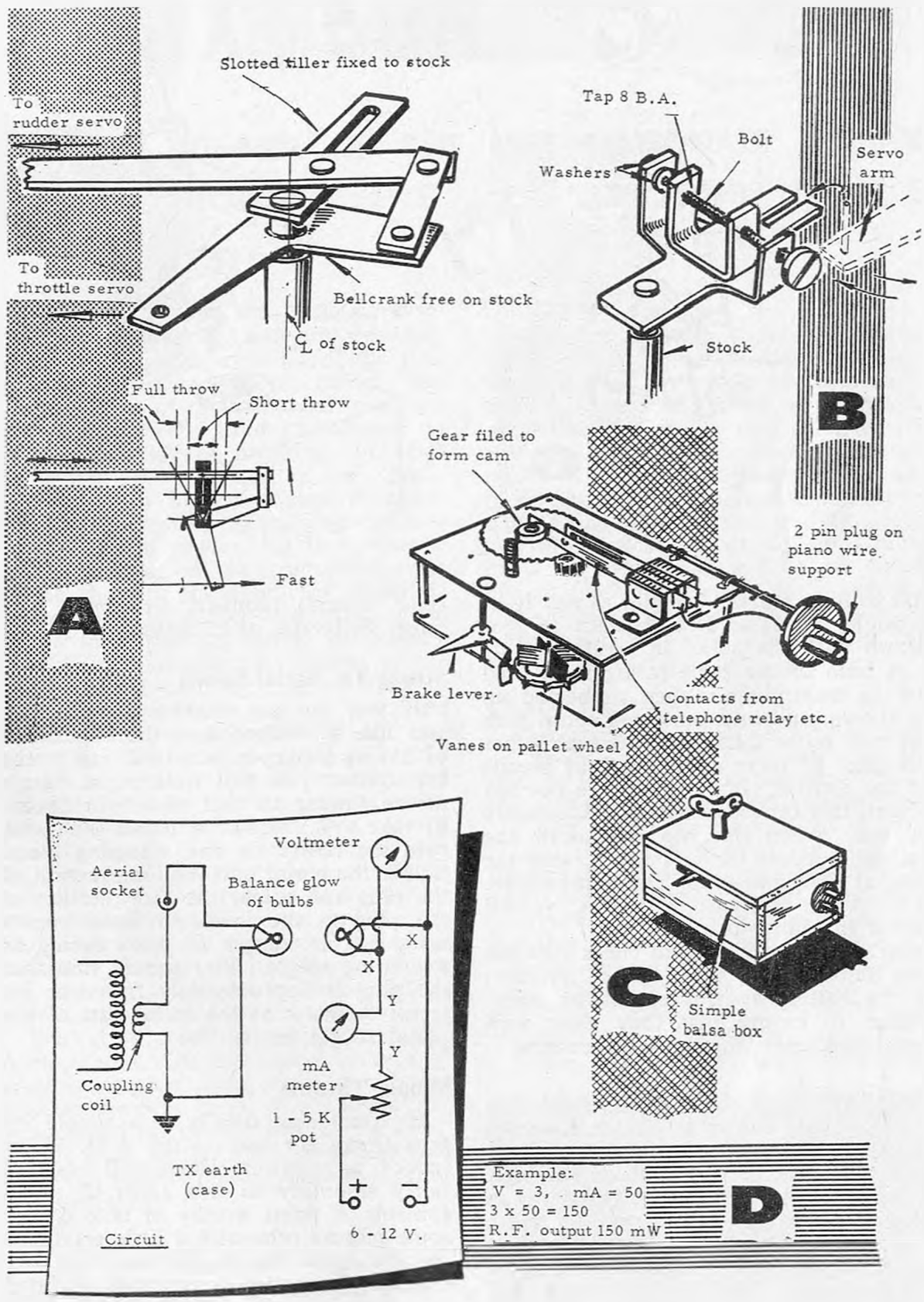
The sketch illustrates the main constructional points which have to be modified to suit whatever clock or toy mechanism is used.

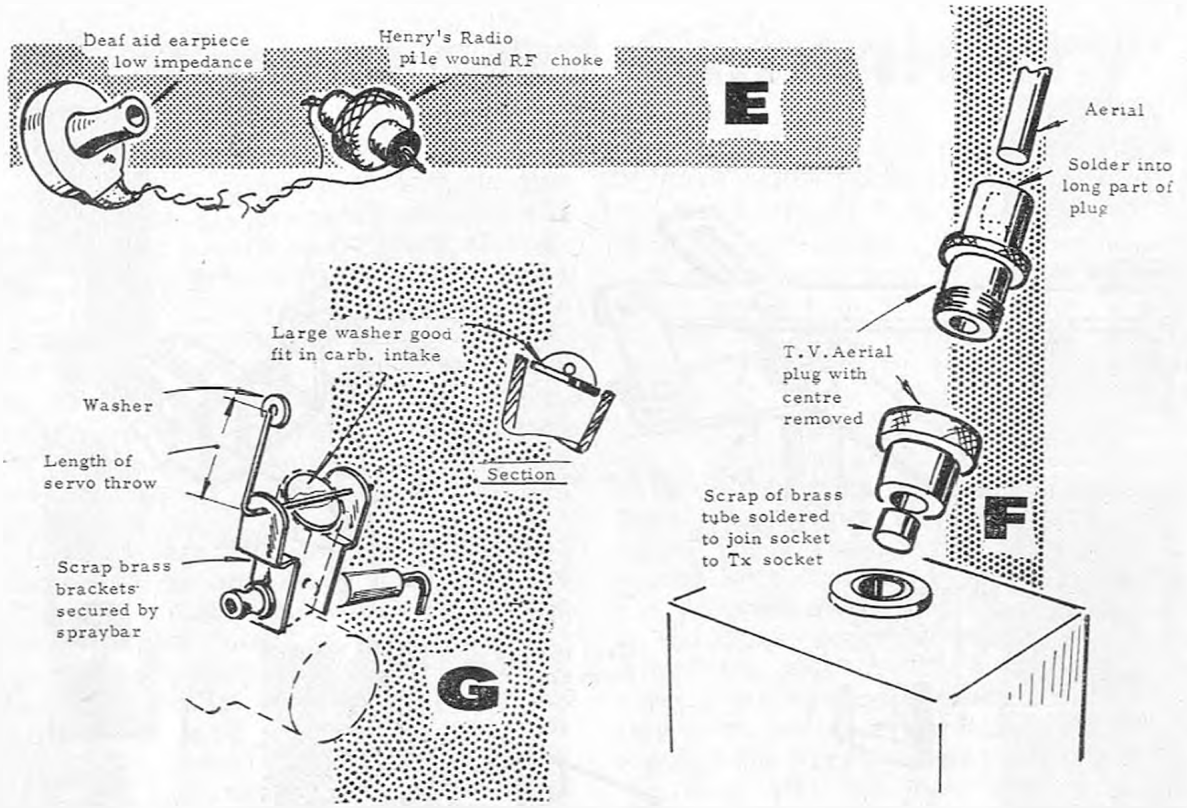
Now two ideas from P. Champion . . .

**Tx. Test**

The circuit shown in Sketch **D** is a very simple method of obtaining comparative measurements of R.F. power. The items required are: a battery (say 6v. dry battery), a milliampmeter 0-100 mA., a Voltmeter 0-10v., 1-5k variable resistor, hook-up flex and a selection of small bulbs, i.e., 6v. .4A., 15v. .25A., etc.

First check H.T. current of RF. section transmitter. Firstly without aerial and then with full aerial as normally used—two readings being obtained, the higher being with the aerial in place. A bulb is then chosen (6v. .04A. for a low power Tx. or a 2.5v. .25A. for higher power Tx.). The bulb is coupled in place of the aerial (see sketch) and the Tx. switched on, the bulb should then light up. The object then is to use a bulb which glows red, rather than at


Slotted tiller fixed to stock
To rudder servo
To throttle servo
Bellcrank free on stock
℄ of stock
Full throw
Short throw
Fast
A
Tap 8 B.A.
Bolt
Washers
Servo arm
Stock
B
Gear filed to form cam
2 pin plug on piano wire support
Brake lever
Contacts from telephone relay etc.
Vanes on pallet wheel
C
Simple balsa box
Voltmeter
Aerial socket
Balance glow of bulbs
X
X
Y
Y
mA meter
Coupling coil
1 - 5 K pot
TX earth (case)
6 - 12 V.
Circuit
Example:
V = 3, mA = 50
3 x 50 = 150
R.F. output 150 mW
D




full brilliance and to obtain as nearly as possible the same H.T. current as that drawn with the aerial in position.

A bulb of the same rating as is used on the transmitter is then connected up as shown, and in a darkened room with the two bulbs fairly near to each other the glow of them is balanced by means of the resistor. If the bulbs are not too bright, this can be done quite accurately by eye. When this has been done the voltage between X-X is taken, and the mA. at Y-Y measured. The approximate R.F. power is then: V x mA. = RF power in millivolts.

NOTE: It is advisable to check that the two bulbs are the same, and to try them in the battery resistor circuit, or transmitter, to ensure that they glow with equal brightness for the same current.

### Rx. Check

The gadget shown in Sketch **E** serves to check reed receiver operation without removing case, or from outside fuselage. It will pick up the tone or regeneration hiss of a reed receiver up to 3 in. from an entirely aluminium boxed receiver quite clearly. P. Chapmann's version employed the use of a Henry's RF choke, an alternative would be a small piece of ferrite approximately 1 x ¼ in. dia. wound (multi layer) of 36 s.w.g. (pile wound), connect the leads and either Sellotape or encapsulate.

### Strong Tx. Aerial Socket

If you are an antenna waving type and like P. Wilson had the experience of having a plug-in aerial fall out of the transmitter, you will welcome a simple device similar to that shown in Sketch **F**; take a T.V. co-axial aerial plug, discard the centre tin and clamping piece. Solder the aerial into the long section of the plug and solder the short section of the plug to the insulated aerial socket using a ¼ in. length of brass tubing as a jointing spigot. You should find that the plug is approximately the same internal diameter as the metal part of the aerial socket in the Tx.

### Simple Throttle

H. Skeet sent details of a simple intake choke for use on the A.M. 25 or indeed any motor which will respond fairly smoothly to this form of speed control. A point worthy of note is that some motors otherwise a little erratic at the low speed end of the range are considerably improved if a silencer is fitted in addition to the intake throttle. This in quite a number of places obviates the

(*Continued on page* 600)

# "SIX GUN"

THE MODEL ON THE COVER

## WINNER OF THE 1962 NATIONALS RIPMAX TROPHY EVENT - - By JOHN DUMBLE

"SIX GUN" is the result of development, through several models, aimed at fuller exploitation of the possibilities of the rudder-only model. The logical choice of multi-channel operation enabled a powerful rudder to be used on earlier models for stunting, but left something to be desired in the "precision" portion of the contest schedule. In this model, four channels operate two servos on the rudder, via two separate lever switches on the transmitter, one giving the full movement of about 25 degrees to the rudder, the other a reduced movement of about 10 degrees. Whilst mechanically the system is the same as that used by "multi" fliers to obtain elevator trim control, the extra servo is, however, self-centring. In practice "Six Gun" can be banked into a turn, left to fly itself round, and straightened up when required. Corrections to alter the rate of turn, or the model's heading in straight flight, can be given smoothly and unobtrusively, as the rate of rudder movement as well as the amount applied is reduced by the servo linkage. If a number of holes are drilled in the bar linking the two servos, the rate of "precision" to "stunt" movement can be varied experimentally.

With two channels giving trimmable control, and with the added bonuses of easy starting and adequate power under all conditions in mind, the "Merco 35" was chosen for power. One of the latest "19's", such as the Veco or O.S., could also be used without serious loss of performance.

**Interior shot of the fuselage shows the "trim bar" type linkage to the rudder. The throttle servo is fixed to the side and drives via a rocker arm.**

### Equipment

With the "Sextone" relay receiver three Servomites and all batteries weighing 16 oz., all up weight of the original was 3 lb. 10 oz., giving a reasonable wing loading for the size of model of around 17 oz./sq. ft. Structurally, the model is simple and strong, both surfaces having the full-depth main spar and D-box leading and trailing edges, featured on Chris Olsen's latest Uproar plan. As they are as stiff before covering as most models are after covering and doping, there is little hope for the warp gremlins, and nylon covering can be used with confidence.

### Construction

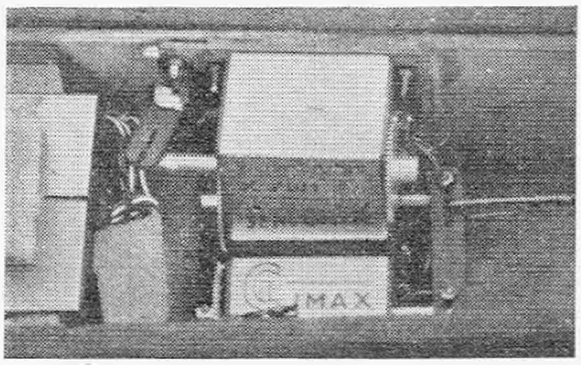
The experienced builder should have no trouble. Assembly sequence for the wing is given below as a guide.

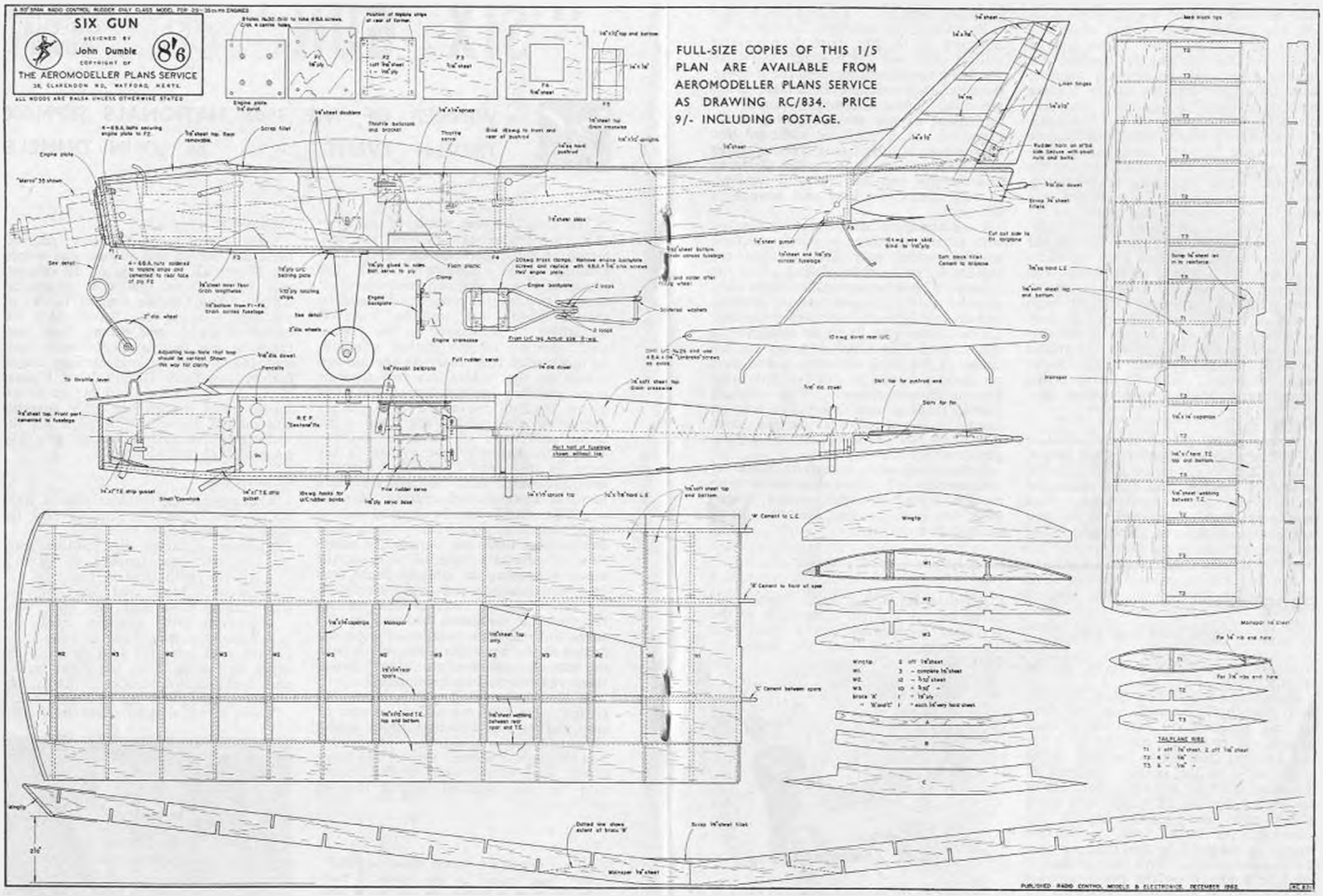
Pin down: Trailing edge bottom; Bottom rear spar (packed up $\frac{1}{16}$ in.); All ribs with slots in top.

Cement on: Main spar; Rest of ribs; Trailing edge and rear spar webs between ribs; Trailing edge top; Rear spar top; Leading edge.

Now rock over the spar to build the other half wing, then pin down centre and build centre section. Finally, add all sheet (using P.V.A.) and tips, etc.

There is no need to resort to the use




SIX GUN
DESIGNED BY
John Dumble
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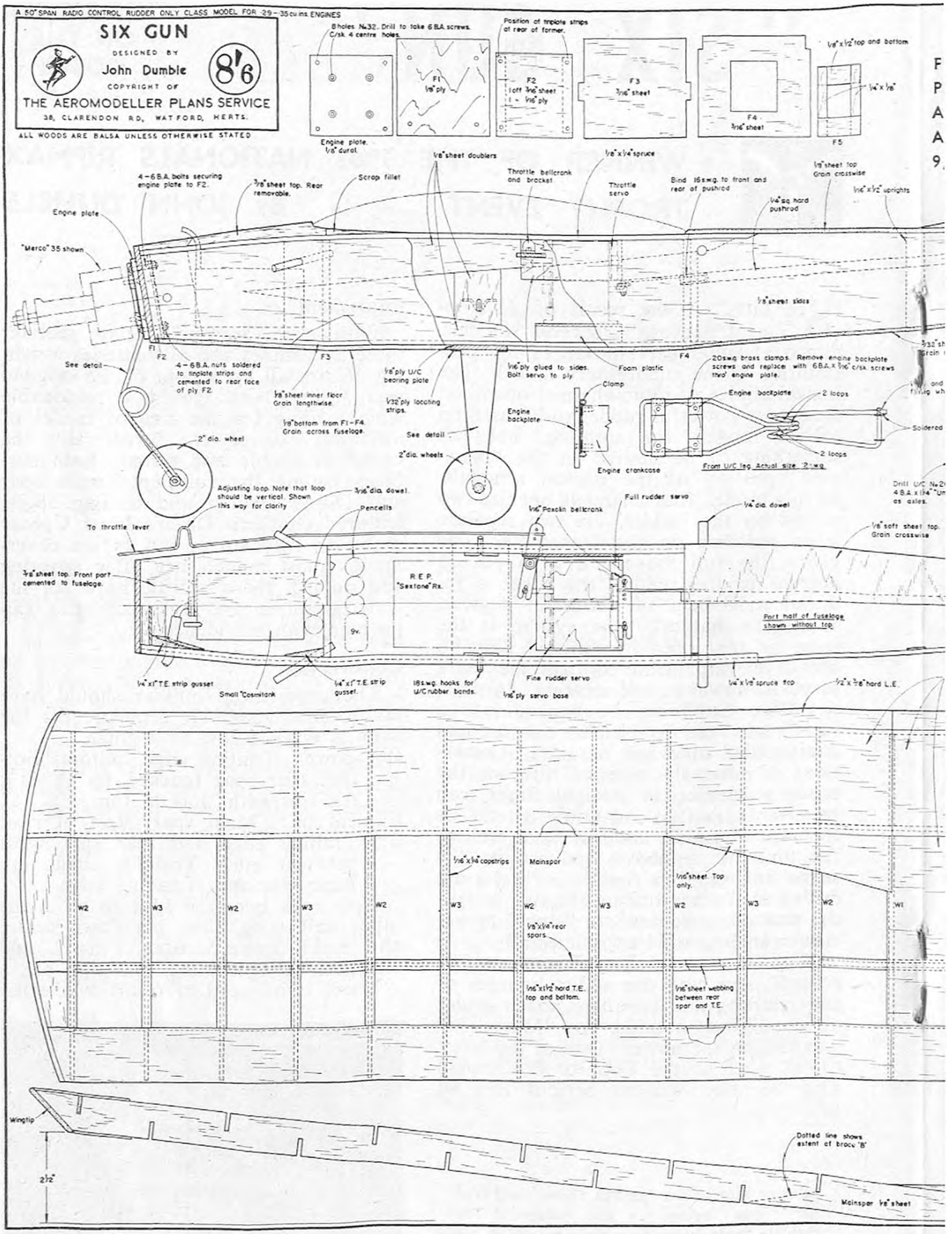
A 50" SPAN RADIO CONTROL RUDDER ONLY CLASS MODEL FOR .29 – 35 cu ins ENGINES
SIX GUN
DESIGNED BY
John Dumble
8'6
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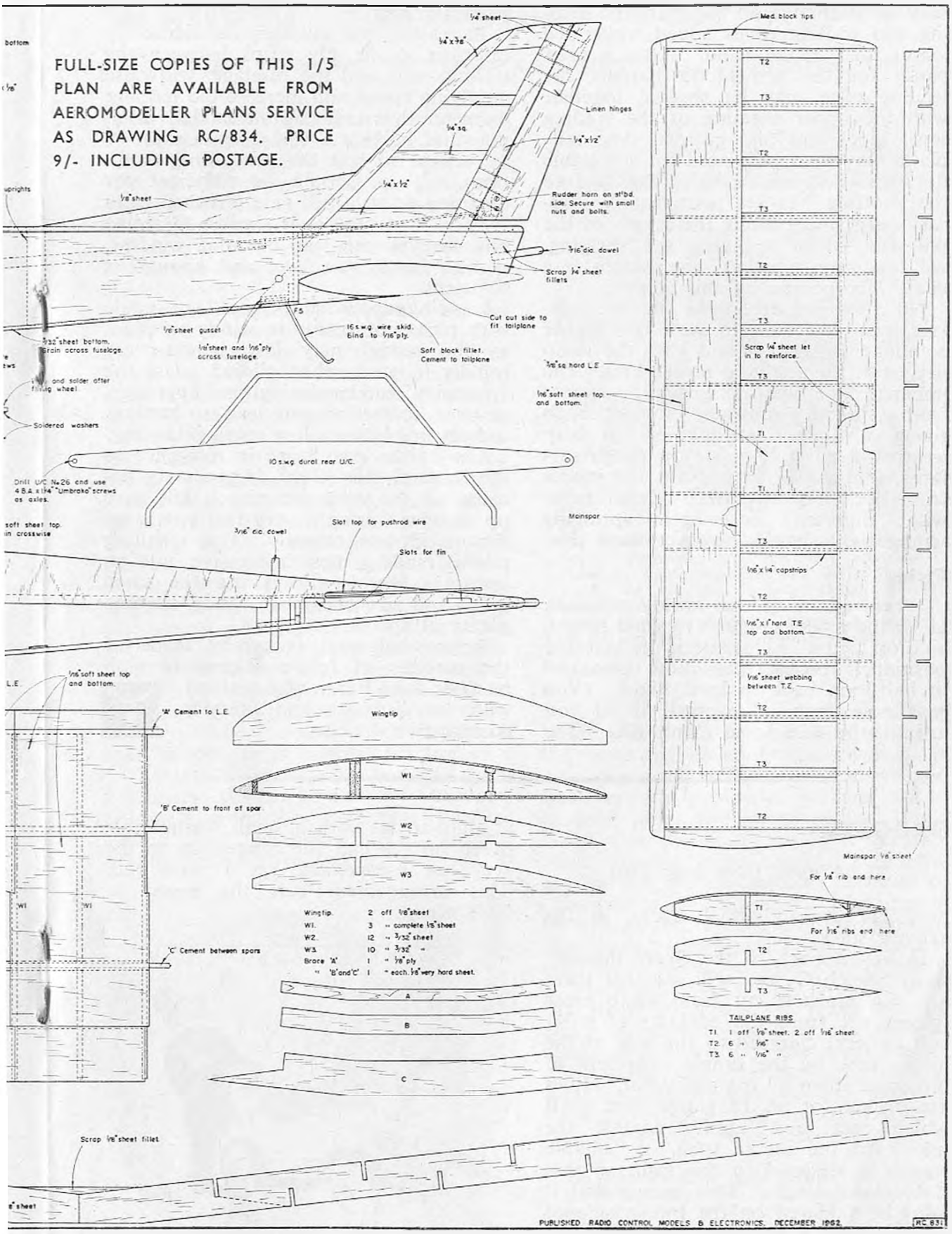
38, CLARENDON RD., WATFORD, HERTS.
ALL WOODS ARE BALSA UNLESS OTHERWISE STATED
8 holes No.32. Drill to take 6 B.A. screws. C/sk. 4 centre holes.
Position of triplate strips at rear of former.
F1 1/8" ply
F2 1 off 3/16" sheet 1 – 1/16" ply
F3 3/16" sheet
F4 3/16" sheet
F5
1/8" x 1/2" top and bottom
1/4" x 1/8"
Engine plate. 1/8" dural.
1/8" sheet doublers
1/8" x 1/4" spruce
Throttle bellcrank and bracket
Throttle servo
Bind 16 s.w.g. to front and rear of pushrod
1/4" sq. hard pushrod
1/8" sheet top Grain crosswise
1/16" x 1/2" uprights
4 – 6 B.A. bolts securing engine plate to F2.
3/8" sheet top. Rear removable.
Scrap fillet
Engine plate
"Merco" 35 shown
1/8" sheet sides
F1
F2
F3
F4
See detail
4 – 6 B.A. nuts soldered to tinplate strips and cemented to rear face of ply F2.
1/8" sheet inner floor Grain lengthwise.
1/8" bottom from F1 – F4. Grain across fuselage.
1/8" ply U/C bearing plate
1/32" ply locating strips.
See detail
2" dia. wheel
2" dia. wheels
1/16" ply glued to sides. Bolt servo to ply.
Foam plastic
Clamp
Engine backplate
Engine crankcase
20 s.w.g. brass clamps. Remove engine backplate screws and replace with 6 B.A. x 7/16" c/sk. screws thro' engine plate.
Engine backplate
2 loops
2 loops
Soldered
Front U/C leg. Actual size. 2 s.w.g.
Adjusting loop. Note that loop should be vertical. Shown this way for clarity
3/16" dia. dowel.
Pencells
To throttle lever
1/16" Paxolin bellcrank
Full rudder servo
1/4" dia. dowel
1/8" soft sheet top. Grain crosswise
3/8" sheet top. Front part cemented to fuselage.
R E P "Sextone" Rx.
9v.
Port half of fuselage shown without top
1/4" x 1" T.E. strip gusset
Small "Cosmitank"
1/4" x 1" T.E. strip gusset.
18 s.w.g. hooks for U/C rubber bands.
Fine rudder servo
1/16" ply servo base
1/4" x 1/8" spruce top
1/2" x 3/8" hard L.E.
1/16" x 1/4" capstrips
Mainspar
1/16" sheet. Top only.
W1
W2
W3
1/8" x 1/4" rear spars
1/16" x 1/2" hard T.E. top and bottom.
1/16" sheet webbing between rear spar and T.E.
Wingtip
2 1/2"
Dotted line shows extent of brace 'B'
Mainspar 1/8" sheet


FULL-SIZE COPIES OF THIS 1/5 PLAN ARE AVAILABLE FROM AEROMODELLER PLANS SERVICE AS DRAWING RC/834. PRICE 9/- INCLUDING POSTAGE.
1/4" sheet
1/4"x3/8"
Linen hinges
1/4" sq.
1/4"x1/2"
1/4"x1/2"
1/8" sheet
Rudder horn on st'bd. side. Secure with small nuts and bolts.
3/16" dia. dowel
Scrap 1/4" sheet fillets
F5
Cut out side to fit tailplane
1/8" sheet gusset
16 s.w.g. wire skid. Bind to 1/16" ply.
3/32" sheet bottom. Grain across fuselage.
1/8" sheet and 1/16" ply across fuselage.
Soft block fillet. Cement to tailplane
Soldered washers
10 s.w.g. dural rear U/C.
Drill U/C No.26 and use 4 B.A. x 1/4" "Umbrako" screws as axles.
3/16" dia. dowel
Slot top for pushrod wire
Slots for fin
1/16" soft sheet top and bottom.
'A' Cement to L.E.
'B' Cement to front of spar
'C' Cement between spars
W1
W1
Wingtip
W1
W2
W3
Wingtip 2 off 1/8" sheet
W1. 3 " complete 1/8" sheet
W2. 12 " 3/32" sheet
W3. 10 " 3/32" "
Brace 'A' 1 " 1/8" ply
" 'B' and 'C' 1 " each. 1/8" very hard sheet.
A
B
C
Scrap 1/8" sheet fillet
Med. block tips
T2
T3
T2
T3
T2
T3
T2
T3
Scrap 1/4" sheet let in to reinforce.
T3
1/16" soft sheet top and bottom.
T1
T1
Mainspar
T3
1/16" x 1/4" capstrips
T2
1/16" x 1/4" hard T.E. top and bottom.
T3
1/16" sheet webbing between T.E.
T2
T3
T2
Mainspar 1/8" sheet
For 1/8" rib end here
T1
For 1/16" ribs end here
T2
T3
TAILPLANE RIBS
T1. 1 off 1/8" sheet. 2 off 1/16" sheet
T2. 6 " 1/16" "
T3. 6 " 1/16" "
PUBLISHED RADIO CONTROL MODELS & ELECTRONICS. DECEMBER 1962.
RC 831

of the building board for the construction of the tailplane, in fact, the ribs may be assembled on the spar, and leading and trailing edges added whilst the job is held in the hand. After a brief pause for the cement to harden, the leading edge may be sheeted together with the upper sheeting of the trailing edge, block tips and gussets. The tailplane may then be placed on a suitable flat surface to check for warps before the sheeting has set permanently. Occasional sighting along the length of the tailplane whilst applying the sheeting, will indicate whether any warps are being incorporated at this stage.

No apologies are made for the fuselage, which serves to hold the other components together and keep the radio dry, with no aesthetic pretensions. The undercarriage was designed to operate from smooth runways and, though giving a long fast take-off in any weather, tends to bounce on rough surfaces and may even prevent the model from becoming airborne. Experiments with different nosewheel springing arrangement should, however, cure this.

**Flying**

When trimming for windy weather, allow the model to climb to good height, hold on "stunt" rudder until the inverted position is reached, then allow the model to half-loop back to level flight. (You have now done a "reversal" or, if you are in the U.S.A., a "Split-S".) The diameter of the half loop is an indication of the model's stuntability in that particular trim.

Increasing the tailplane incidence by inserting $\frac{1}{32}$ in. ply strips between the trailing edge and the fuselage, will raise the flying speed, and increase the looping diameter, thus reducing the model's stunt potential, so that a compromise must be arrived at to suit the prevailing conditions. $\frac{1}{16}$ in. should be sufficient for anything up to a full gale. Proceed carefully as this process is similar to seeing how far you can lean out of a window, i.e., to far is too late, and enough is sufficient.

Landing approaches should be made with plenty of power in windy weather, as the model may lose height very rapidly in gusts when gliding. Use the "precision" rudder during final approach, as over correction can lead to stalling and an involuntary low scoring landing.

Use of the past tense in reference to the original "Six Gun" is necessary because all the wing retaining bands gave up at once during a very fast pass over Epsom Downs recently. The resulting missile made a most impressive hole on impact. Moral—always use the same make and size of rubber bands, keeping plenty of spares.

Acknowledgment is hereby made of the services of fellow Richmond club member John Perry, who assisted with detail design and literally constructive criticism.

## GADGETS

(*Continued from page* 596)

need for an additional choke in the exhaust stack.

However, back to the Skeet throttle; study Sketch **G**, you will see that there are two brackets cut from scrap brass (pieces cut from the contacts of a $4\frac{1}{2}$ volt battery) clamped to the side of the intake tube by the simple expedient of threading them on the spray bar. Holes are drilled for an 18 gauge wire shaft which must rest tightly against the mouth of the intake tube. A suitable washer is soldered to this shaft so that it blocks the tube. This means that it must be soldered on the intake side of the wire and is just inside the mouth of the tube. The end of the wire is bent at right-angles with a small washer soldered on the end for connection to the servo or escapement via a push rod. This arrangement cuts the speed to 2,000 r.p.m.


*Just wait till he sees what's in the driver's seat!*

# Grundig Variophon - Variton

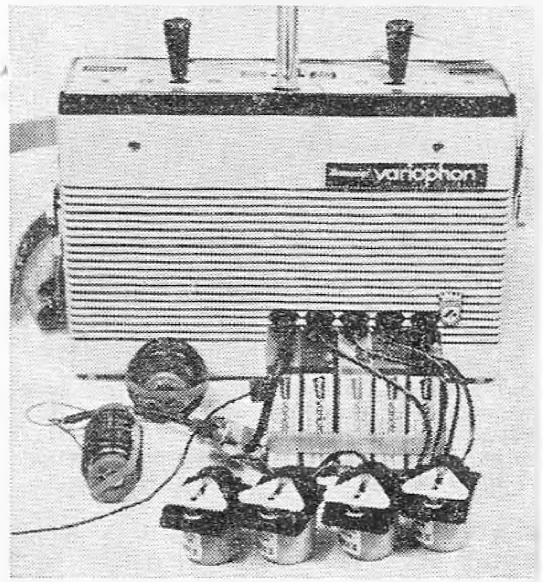
## J. H. BRUNT REVIEWS THE NEW 8-CHANNEL ALL TRANSISTOR OUTFIT

THE gear represents a serious attempt to produce a multi channel outfit which has eye-appeal and is practically "clot-proof". Apart from the electronic advantages of a tuned filter circuit and an all transistorised design, the economical Tx.'s power consumption makes it a welcome sight on the shelves of British model shops.

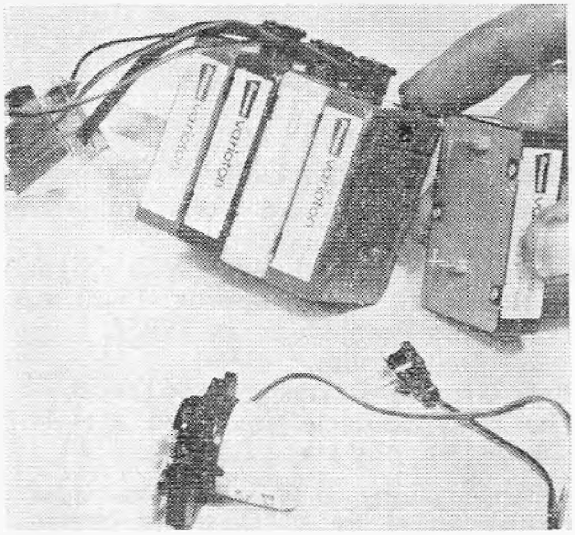
From the modeller's point of view the outfit has a number of advantages; not the least being the fact that it requires no tuning. The unit construction of the receiver and filter units gives flexibility and the relay output enables a wide variety of servos to be used. For certain applications the ready made wiring harness considerably simplifies installation and obviates all soldering. The instruction leaflet, which is printed in English. shows installations using the Duomatic, Bellamatic II and the Unimatic servos all of which are available fitted with a standard sub-miniature plug for direct connection into the filter units. We should add that the gear operates most other servos including Duramites, but of course, a separate harness has to be wired up to accommodate the latter and any other servos which require a split battery, as is normal practice.

The unit submitted for test had four Bellamatic II's added for test purposes, although with this particular harness system *and Bellamatics* the electric braking effect provided by the simple battery circuit produced a condition which was not a fair example of either the servo or the equipment's worth. It does cause the Bellamatic servos to run back extremely slowly, perhaps not a harmful point with some of the slower boats, but definitely too slow for aircraft. On the other hand, this braking is ideal for the de-clutching facilities of "Duomatics". F. Rising and other *clutch* or trim servos. It should be stressed that this single battery part of the harness is only there for those who wish to use it as an additional facility. We feel sure that many modellers will make separate servo harnesses to suit their own requirements and wire up in the usual way.

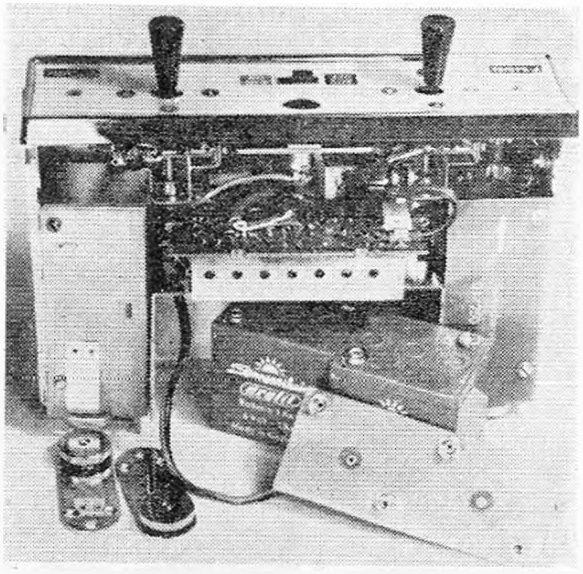
Handling the transmitter produced quite a different sensation to that experienced when using the now almost standard box of tricks. The twin control




**The complete outfit shown in this case with four Bellamatic II's for test purposes. Normally three Bellamatic II's and a Motormatic for throttle control. Other servos simply plug in to the filter units and can be wired to a separate split battery. Advantage of this system is its extreme flexibility, lack of soldering and ability to add channels two at a time, up to a total of eight.**



**The separate filter units showing the interconnecting pins and locating grooves, to prevent damage to the latter. The units may be plugged into the receiver in any order, and two four channel receiver outfits may be used with one eight channel transmitter.**



**One panel of the case removed to show how the additional tone generator unit slips into place. The battery connections are mounted on an insulated panel for fool-proof insertion of the accumulators.**

sticks would probably demand a certain amount of unlearning of existing techniques if one had flown multi on other transmitters for some time. We did not fly with the example submitted; only basing this observation on theory. However, the switches are extremely light in action and provide instant make and break, four beautifully constructed microswitches at the base of each control stick and a light centring spring are responsible for this sensitivity.

## MANUFACTURER'S DATA

**Technical Data 4/8 Channel Transmitter Grundig Variophon.**

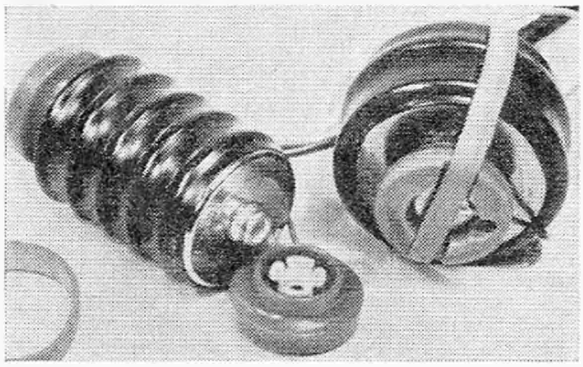
German Post Office, Licence No. F-540/62.

Frequency: 27.12 Mc/s.

Modulation: *Group* 1—Channel 1, 800 cps.; 2, 1110 cps.; 3, 1700 cps.; 4, 2350 cps.

*Group* 2—Channel 5, 3000 cps.; 6, 3670 cps.; 7, 4300 cps.; 8, 4300 cps.

R.F. Power Output: Approx. 220 milliwatts.



Temperature Range: Between −10° C. and + 55° C.

Current Consumption: Approx. 75 mA. with simultaneous working.

Working Voltage: 12 volts (10 volts minimum).

Current Supply: 2x DEAC 5/500 DKZ, 6 volt at 0.5 A.Hr.
or
2x DRYFIT 3 Ax 2D, 6 volt at 1.0 A.Hr.

*Transistors Employed*

| 4 Channel Transmitter | Additional Modulator |
|---|---|
| 2x AF107 | 2x OC75 |
| 1x AF115 | 2x OC71 |
| 2x OC75 | 1x OC74 |
| 2x OC71 | |
| 2x OC74 | |

Aerial: 8 section Telescopic 125 cm. long (approx. 50 in.).

Transmitter Case: Plastic, Polystrol, colour, white and grey.

Dimensions of Case: 200 x 145 x 55 mm.

Weight of Tx.: Approx. 1.25 K.g. (2.74 lb.) without batteries.

Battery Life: With DEAC accumulators, approx. 7 hours duration; with DRYFIT accumulators approx. 15 hours duration.

**Technical Data for the 2-8 channel Receiver Assembly**
**Grundig Varioton**

German Post Office Licence No. F-541/62.

Basic Rx. section (H.F. Stage).

Frequency: 27.12 Mc/s.

Sensitivity: Approx. 6 micro-volts.

Temperature Range: −10° C. to + 55° C.

Operating Voltage: 6 volts (minimum 5.5v.).

Current Consumption: Approx. 7-10 mA.

Transistors Employed: 2x AF115, 2x OC71, 1x 2SB56, Diodes 2x OA91.

Aerial Length: Approx. 800 mm. (31½ in.)

Dimensions: 54 x 38 x 15 mm. (2⅛ x 1½ x ⅝ in.)

Weight: Approx. 29 gram (1 oz.).

**Two Channel Filter Units**

Working Voltage: 6 volts (minimum 5.5v.).

Current Consumption: (With Signal) (No signal) 1 mA. approx. 15-20 mA.

Transittors Employed: 2x 2SB56, 2x 1N60 Diodes.

Two Grundig Relays, No. 9622-650.

The relay contacts are rated at: 4v./1.5A. 30 volts MAX., 1.5 MAX.

**Similar polarity end caps provide quick attachment of the DEACs to the harness.**

Contact Pressure: 10 gram (approx. 1/3 oz.).
Dimensions: 54 x 38 x 15 mm. ($2\frac{1}{2}$ x $1\frac{1}{2}$ x $\frac{5}{8}$ in.)
Weight: Approx. 39 gram (1.375 x 4 = $5\frac{1}{2}$ oz.)

| Order No. | Unit | Channel | Case Colour | Frequency |
|---|---|---|---|---|
| 3728 | Receiver | — | Red | 12.12 Mc/s. |
| 3729 | Tone filter unit | 1 & 2 | Green | 800 & 1110 cps. |
| 3730 | ,, | 3 & 4 | Yellow | 1700 & 2350 cps. |
| 3731 | ,, | 5 & 6 | Blue | 3000 & 3670 cps. |
| 3732 | ,, | 7 & 8 | Grey | 4300 & 5700 cps. |

Two planes or boats with four channels each may be controlled at the same time, using one transmitter for eight channels as follows:

Model 1 is fitted with a receiver using YELLOW and GREEN filter units, and can be controlled by the RIGHT hand control knob of the transmitter.
Model 2 is fitted with a receiver using BLUE and GREY filter units, and can be controlled by the LEFT hand knob of the transmitter.

Two separate transmitters *should not be used*, as the HF circuits are tuned to the same frequency 27.12 Mc/s. and will therefore interfere with each other.

Page 11 of the instruction manual shows three hook-ups for four channel working, these are provided with English wording to facilitate easy assembly.

## TRANSMITTER

## TEST REPORT

The complete equipment received for test was as follows.

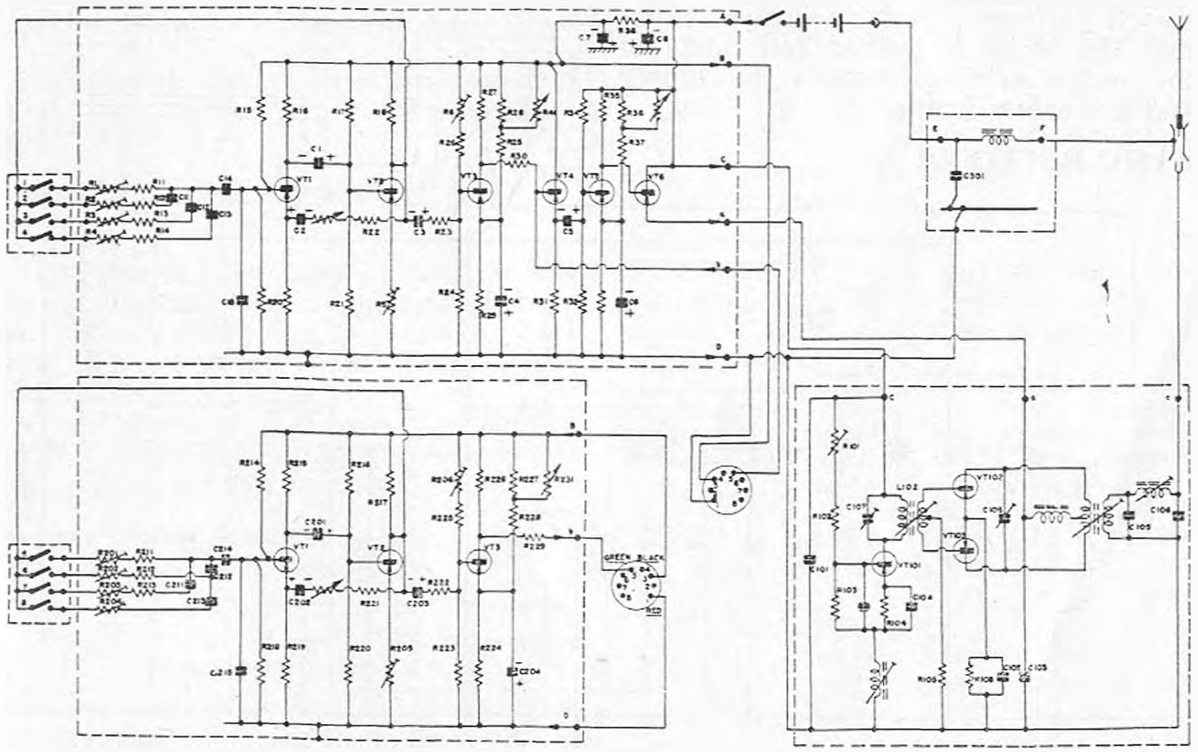
**Receiver.** Consisting of: Basic Receiver Unit, line up as follows: AF115 R.F.; AF115 Super-regen Dct.; OA91 Stabilising Diode; 2 x OC71, OA 91 and 2SB56 A.F. Amplifier and 4 (four) two channel tone filter units, each channel using 2SB56, 1N60. tone filter and Grundig relay No. 9622-650. With connecting lead via slide switch to batteries, the aerial is also wired on to the same socket.

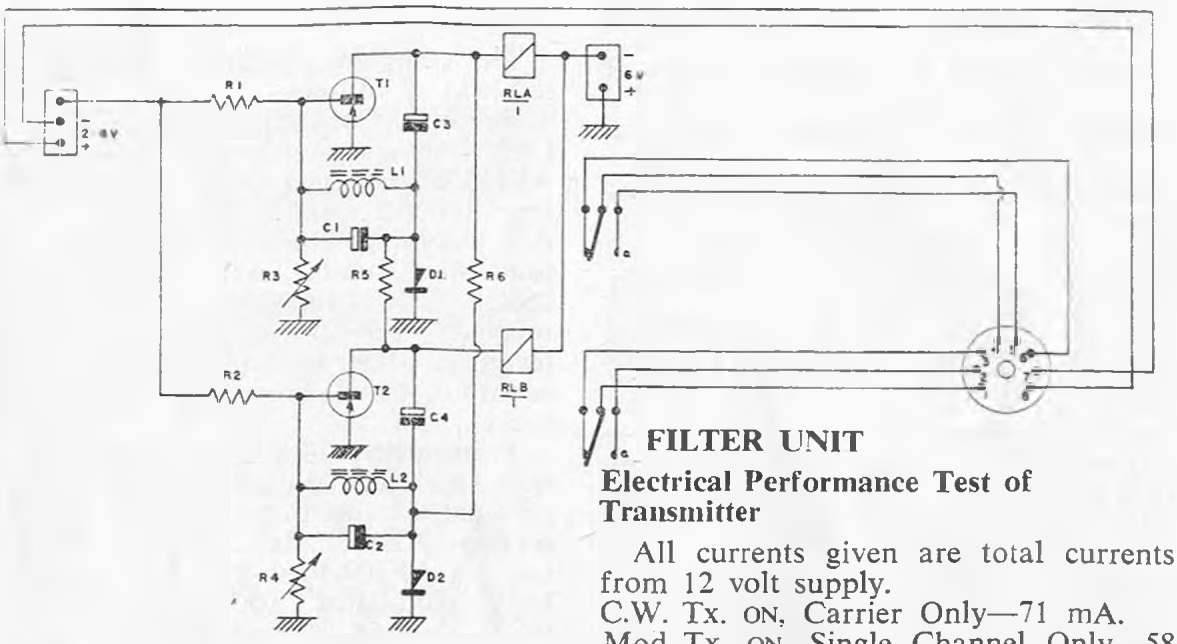
**Transmitter.** This was already fitted with four channel extension unit, making an eight channel transmitter, line up, RF section—AF115 Xtal controlled Oscillator, 2 x AF107 Push-Pull R.F. amplifier, basic modulator (four channels) 3 x OC75, 2 x OC71, and OC74, extension modulator unit (four channels) 2 x OC75 and OC71. Aerial 50 in. long, 8 section telescopic.

**Batteries.** DEAC's for receiver and servos, 5/150 DK and 2/500 DKZ Tx. supply 2 x Dryfit 3A x 2D, Accumulators.

**Servos.** 4 (four) Bellamatic II, 2 channel control servos. Self-neutralising. Fitted with leads and plugs to fit tone filters units.

**Receiver and Filter Units.** No details can be given here as the units were sealed. The units are metal cased and must be very compactly constructed considering the circuitry.






**Preliminary Electrical Check.** Connecting up the equipment is a simple operation, fitting of batteries is a straightforward job.

**Comments.** Here a snag was met with the modulation on the transmitter, at first the battery was suspected (this is always the best policy), but the carrier was quite strong. The fault was then found to be the plug connecting the extension modulation unit. This plug had been disturbed and was not making a good contact, rendering all channels of the tone inoperative. On pressing the plug home all channels functioned perfectly. NOTE: Always ensure that the aerial is pushed full home in the socket as this connects the supply and is a safety feature.

## FILTER UNIT

### Electrical Performance Test of Transmitter

All currents given are total currents from 12 volt supply.

C.W. Tx. ON, Carrier Only—71 mA.

Mod Tx. ON, Single Channel Only—58 mA. on each channel.

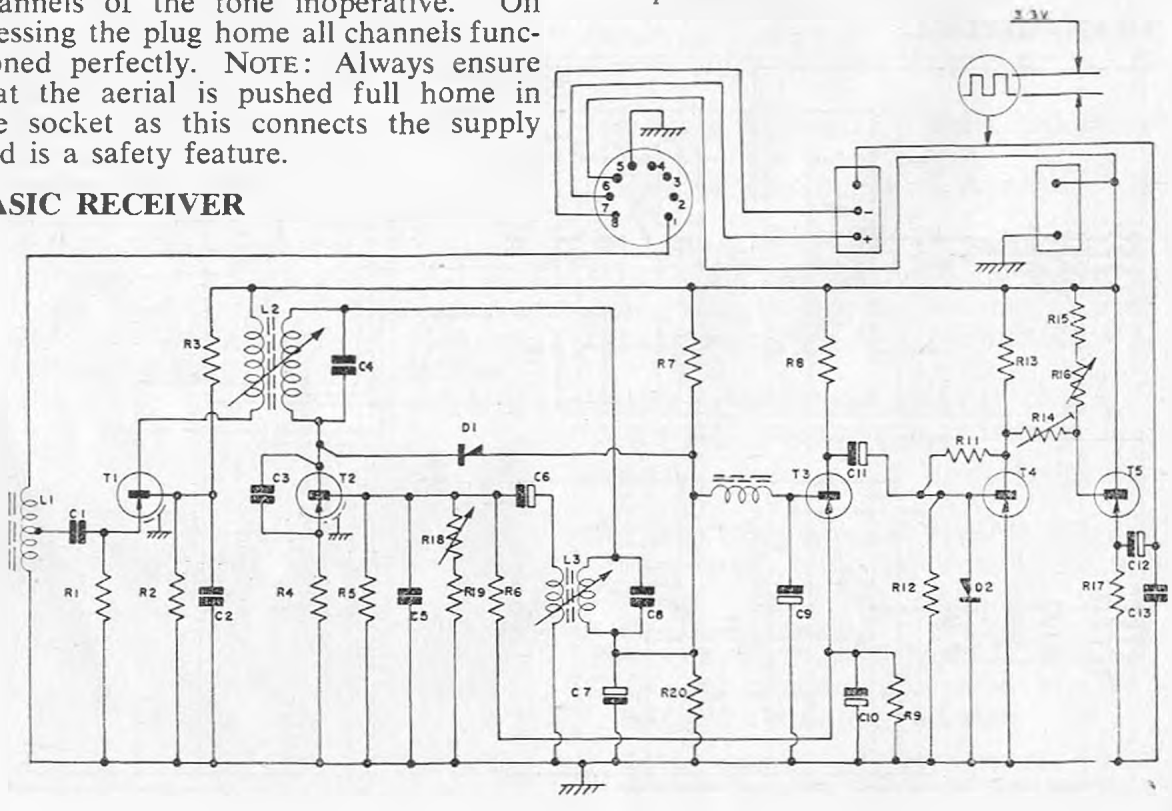
Mod Tx. ON, Simultaneous (2 channels) —64 mA. any 2 channels of 8.

NOTE: All currents are 2-4 mA. higher when transmitter is operated with aerial closed down.* Transmitter will only operate with aerial plugged in and pushed fully home in its socket.

R.F. Output: (This figure is only accurate to ± 10 per cent) 200 mW. (makers quote 220 mW.).

**Manufacturers do not recommend operation with aerial closed.*

## BASIC RECEIVER



Field Strength is very high for the power output indicating that the aerial on this transmitter is indeed tuned for maximum efficiency.

Modulation: There appears to be less modulation on simultaneous than on single channel. Further with tone modulation applied the *field strength falls** (see note indicating "downward" modulation).

*NOTE: With the field strength meter set to read full scale (100) on carrier only, when modulation is applied the reading falls to 80 on single tone and 70 on simultaneous (2 tones).

Tone Stability: Very good indeed. In fact even after a night in the refrigerator (suitably protected in a polythene bag to stop condensation) the Tx. operated all channels on the receiver the following morning.

Reduced Voltage Operation: The transmitter will still operate with the supply volts down to 10.5 volts. There was no noticeable change in the frequency of the tones. With the supply volts reduced to 9 volts the transmitter no longer functioned.

NOTE: At this point the accumulators would badly need a recharge in any case.

Very well built and neatly constructed. The controls are easy to operate. The only thing that could be improved is the clips securing the accumulator cover plate on the underside of the transmitter. These are a trifle flimsy bearing in mind the acc's are quite weighty and a jolt could cause quite a pressure on the clips.

**Comments.** Apart from the retaining clips the transmitter is very soundly built.

### Elctrical Performance Test of Receiver

For this test the relay output contacts were connected to a circuit using indicator lamps rather than the servo's. This was done to give an easy visual indication.

Total Receiver Currents (transmitter placed 10-12 feet from receiver aerial plugged in, but not extended).

Supply Volts—6 volts.
Basic Receiver Unit only

NO SIG. 7.75 mA.
CARRIER ONLY 7.5 mA.
TONE ON ANY CHANNEL 7.5 mA.

Basic receiver Unit plus any single filter unit plugged in to the Basic Rx. unit.

NO SIG. 9.25 mA.
TONE ON ANY ONE OF THE TWO CHANNELS OF UNIT PLUGGED IN 23 mA. min., 29 mA. max. This applies to any unit of the four.

Standing Currents with No sig.
TWO UNITS PLUGGED IN 10 mA.
THREE ,, ,, ,, 11 mA.
FOUR ,, ,, ,, 12 mA.

With all units plugged in and operating simultaneous.
ANY TWO TONE COMBINATION FROM EIGHT
48 mA. min. 54 mA. max.

There was no change in the supply voltage level during these tests. The order in which the plugged units are arranged makes no difference. Voltage output taken at A.F. output terminal of basic receiver unit. Measured from + terminal of supply line to A.F. output terminal. using an A.C. meter 3 volt range (3v. F.S.D) 1000 ohms per volt
Receiver off NO READING
Receiver on 1.6 volts.
This is noise due to super-regen hiss.
Receiver on; Transmitter Carrier on 0.25 volts*
Transmitter modulated single tone 1.6-2 volts depending on channel selected.
Transmitter modulated simultaneous two tones 1.25-1.5 volts depending on channels selected.
*Reduction of noise depends on carrier level.

**Reduced Voltage operation of Receiver**
—at 5 volts no apparent change.
—at 4.5 volts receiver ceases to work.

### Sensitivity

Better than 5$\mu$ volts (maker's figure approx. 6$\mu$ v.). For this test modulation of SIG. GEN was 75 per cent, checked on all A.F. channels 1-8.

### A.F. Filter Bandwidths

For the following test the SIG. GEN was modulated to 80 per cent using an external A.F. oscillator covering the range 600-6000 c.p.s.

| CHANNEL FREQUENCY Makers Figures | Low cps. | Mid. cps. | High cps. | Band-width cycles |
|---|---|---|---|---|
| 1 | 825 | 750 | 830 | 925 | 175 |
| 2 | 1110 | 1050 | 1150 | 1250 | 200 |
| 3 | 1700 | 1550 | 1700 | 1850 | 300 |
| 4 | 2325 | 2150 | 2350 | 2550 | 400 |
| 5 | 3000 | 2750 | 2975 | 3200 | 450 |
| 6 | 3670 | 3400 | 3675 | 3950 | 550 |
| 7 | 4300 | 4100 | 4350 | 4600 | 500 |
| 8 | 5700 | 5450 | 5700 | 5950 | 500 |

With modulation reduced to 50 per cent no effect was noticed on the level at which relays operated. With over-modulation no interaction between channels was noticed.

**Susceptibility of Receiver to Interference**

The receiver is in no way prone to impulse interference, this is very good considering the high sensitivity! The following notes were compiled when it was noticed that the monitor receiver (also a transistor super-regen) caused interference to the Varioton receiver. NOTE: Another super-regen receiver operating close to the Varioton receiver can cause sporadic and random selection of channels when the Variophon transmitter is on carrier only. This could cause trouble when carrying out a ground check close to another aircraft or boat, the receiver of which has been left in an active condition. Particularly with persons moving close to the transmitter aerial. Channels most likely to be affected are 7 and 8, 5 and 6 slightly less, 3 and 4 even less, 1 and 2 are almost free of the effect. This appears to be due to the transmitter signal and signals radiated by the offending receiver beating together and producing random tones which are picked up by this very sensitive receiver. Remedy: Carry out ground checks well clear of other models, and with minimum of helpers.

**Range Test of Tx. and Rx.**

This is well in excess of 1,000 yards ground to ground as would be expected from the test figures obtained. Model will be out of sight before control is lost.

**Comments.** The plug and socket and interconnection system is very good. Virtually foolproof. We would have liked the aerial to be separate from the supply lead, but in this case interference doesn't seem to be a problem.

*The importer wishes to point out that he has tried a 6v. battery, fitted a 7Ω resistor across each motor and now has sufficiently fast centring.*

## MULTI-GEM

(*Continued from page* 587)

**Checking**

The completed receiver should then be checked through against the "Method of Assembly" and the layout drawing before applying any power. All the flux should be cleaned from the coppered side of the p.c. board and a check made to ensure that no part of the printed circuit has been shorted out by solder.

Connect the 1.5v. battery first and ensure that the filament in the valve is lighting up. If it is not—check the assembly again! Connect the 30v. battery and a faint sound should be heard from the reed bank. Switch on the carrier wave of Tx. and tune the Rx. coil slug until the reed bank becomes quiet. Key a tone on the Tx. and this should vibrate a reed. The Tx. must be tuned into the Rx. There is no built in tuning on the Rx. other than the coil slug and there should not be any need to vary the components. The sets so far produced by the writer and his friends have all worked immediately without fuss or fiddling.

**Availability of Components**

**M.G. 1.** Pack contains:
- Grey Hammertone aluminium case ready drilled.
- P.C. board, ready drilled.
- Ready wound tuning coil (U/K band).
- 10uh choke.
- 10: 1 transformer.
- Nuts and screws.

**M.G. 2.** Pack contains:
- Valve and pair of selected transistors.

**M.G. 3.** Pack contains:
- All resistors and capacitors.
- Reed bank (optional extra).

The O.B.M. Co., 4 Lowden Road, Southall, will be pleased to supply the above packs which together are sufficient to make a complete 'Multigem' Rx. — see their advertisement, page 622.

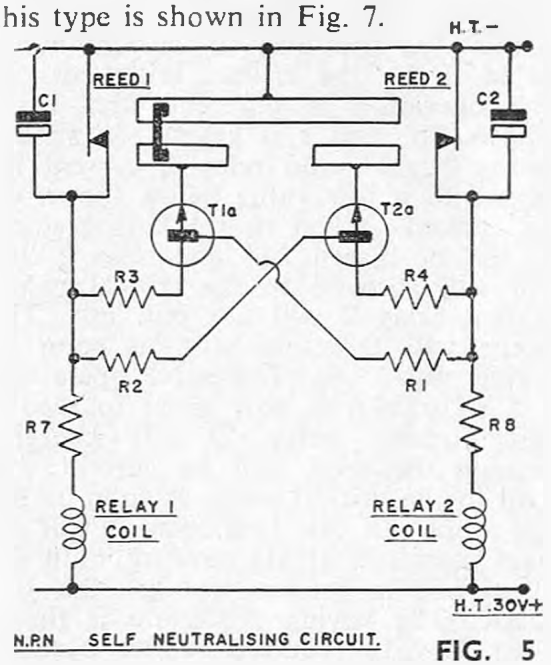
# Single Battery Servos

## PART TWO

By DAVID CONNOLLY

THE first part of this article dealt with the advantages of using a single battery supply instead of a centre-tapped one, and gave details of wiring for the 3-channel rudder system.

The principle of neutralising via the relay coils rather than the relay contacts can also be applied to self-neutralising servos. In this case logic elements such as transistors must be included in the circuit, but nevertheless the circuitry is not complicated and can be placed inside the servo. The prototype servo used the circuit of Fig. 5, and was used with an E.D. 4-channel receiver. It can be seen that this circuit uses NPN transistors (type 2N35) which are difficult to obtain, being American made. However, the receiver can be modified so that PNP transistors can be used, and the 'Mark II' used GET 104 PNP transistors. The circuit for this case is shown in Fig. 6. The 'Mark III' servo was used with an R.E.P. Quadratone all transistor receiver, using 9 volt supply, as opposed to 30 volts on the other types with the valve/transistor receiver. This version used GEC S1 transistors. The circuit for this type is shown in Fig. 7.




N.P.N SELF NEUTRALISING CIRCUIT. FIG. 5

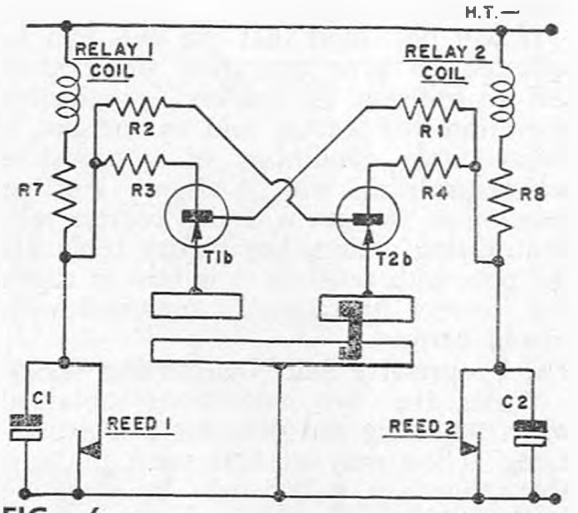



FIG. 6 P.N.P. SELF NEUTRALISING CIRCUIT.

### Circuit Description

The circuit operation for all three circuits is identical. In each case, the servo motor is wired to the relay contacts as in Fig. 8, using a single battery supply. The principle of operation is as follows: Relay 1 can be energised either by reed 1, or by transistor T1 in parallel with the reed. The transistor can only operate the relay provided two conditions are fulfilled:

(a) The shorting wiper is to the left of centre.

(b) The transistor is biased 'on'.

Condition (a) is fulfilled when the rudder is 'left', and condition (b) is fulfilled when relay 2 is not energised. Under these conditions, relay 1 will energise, giving 'right' rudder, and the rudder will move towards centre. When centre is reached, condition (a) is no longer fulfilled, relay 1 drops out, and the rudder stops at centre. This is the self-neutralising action, and will work from either 'left' or 'right' since the circuit is symmetrical. Turns are applied in the normal way, via the reeds. If reed 1 is operated, relay 1 energises. This cuts off T2, and the shorting wiper moves right. As soon as the tone stops, T2 will turn on, energising relay 2 and centralising the rudder.

The values of resistors R1 and R2 depend on the receiver voltage, the type of relay used, and the gain of the transistors. Although these values can be calculated, the easiest method is to put pots in the circuit, adjust for correct operation, and measure the pot resistance. A resistor of the same value can then be wired in permanently. For 30 volt receivers, use a 1 Meg pot. for 9

volt receiver 100 K.

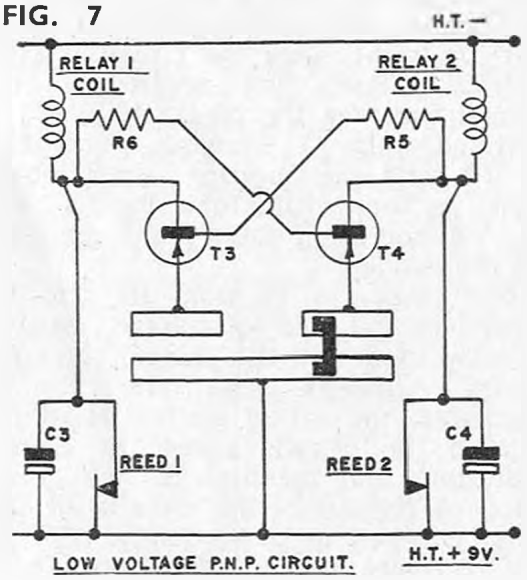
It will be found that the pots can be adjusted to give operation other than self-neutralising. At one end, progressive operation will occur, and as the pot is rotated two conditions of 'progressive self-neutralising' will be found. Further rotation of the pot will give correct self-neutralising action, but before replacing the pots with resistors it is best to check that correct operation is obtained with an old battery.

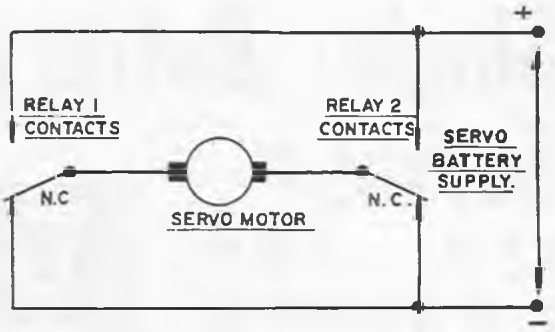
**The Progressive Self-Neutralising Servo**

While the two conditions obtained when adjusting the pots for self-neutralising action may at first seem undesirable, they are well worth investigating further. The explanation of this unusual action is to be found in the toggle action which occurs in relays. For example, a relay may pull in at 3 mA., but will not drop out until the current has dropped to 2 mA. Therefore, if the current is increased from zero to 2.5 mA., the relay will not pull in. However, if the current is reduced from 4 mA. (relay pulled in) to 2.5 mA., the relay will remain 'in'. The state of the relay with 2.5 mA. flowing through it will therefore depend on the current flowing previously, and it is this factor which gives 'progressive self-neutralising' action in the servo. Referring to the circuit of Fig. 6, the operation is as follows.

If reed 1 is keyed, the rudder moves "right" (as before), and T2 will be biased 'off', but in this case the 'bias off' condition is such that the critical current flows through relay 2. (This current was 2.5 mA. in the example above, but will be about 7 mA. for a low voltage relay). When keying stops, the self-neutralising

FIG. 7




SERVO MOTOR SWITCHING CIRCUIT. (MECHANICAL LIMITS)

FIG. 8

action will occur, since T2 will turn full on and energise relay 2. But if reed 1 is keyed before the rudder has centralised, T2 will return to the bias off condition when the critical current is again flowing. This time, however, the current has reduced from the full on current to the critical current, and relay 2 will not drop out. Since relay 1 is being energised through reed 1, both relays are operated, and the motor will stop. (This can be seen from Fig. 8). The keying procedure is therefore: key to the required rudder position, then give a quick blip 'off—key', and hold the key on. The rudder will then stop in the required position until the key is released, when self-neutralising occurs. Any rudder position can be held at will (progressive action) and self neutralisation is also available, hence the title 'progressive self-neutralisation'. Remember, this is available from only two channels.

A second type of P.S.N. action can also occur with the circuit. Whereas in previous action, the 'bias off' current was adjusted to give the critical current, in this type the 'bias on' current is adjusted to be the critical relay current. The operation is different, and is as follows. If reed 1 is keyed, the rudder moves "right", and relay 2 current increases to a low value below the drop-out current. When reed 1 keying stops, T2 will be biased 'on', and relay 2 current will increase to the critical value, so that relay 2 will not pull in. The motor will therefore stop as soon as keying stops, i.e., progressive operation. If a short blip is now given to reed 2 (left rudder) relay 2 will energise through the reed, and its current will drop to the critical value as soon as the blip stops. In this case relay 2 will remain energised, giving centring, until the T2 circuit is broken through the p.c. board. The keying procedure is therefore: Key to required rudder position

and release. For centring, blip opposite rudder.

This second variant is more economical on relay current, but the keying process is a little less obvious. Since the circuit is basically the same for all types of servo action, a servo can be built to include pots for R1 and R2, and by adjusting these the servo can be made progressive, progressive self-neutralising, or self-neutralising at will. Clearly, the adjustment for P.S.N. action is fairly critical, and to increase the difference between the pull-in and drop-out current of a relay the back contact of the relay can be bent away from the armature a little if the adjustment proves too critical.

### Circuit Variants

The three circuits shown all operate in the same way, but depend on the type of receiver to be used. Fig. 5 is for use with valve/transistor receivers such as the E.D. Black Arrow or the earlier R.E.P. type, using 30v. H.T. It will be found that the reed comb in these receivers is connected to the negative H.T. line, in which case NPN transistors must be used. These transistors must have a collector/emitter voltage rating of at least 25v., so that the OC 139 is unsuitable. The 2N35 was used in the prototype.

The polarity of the reeds and relay coils in these receivers can be changed without affecting performance, and if this is done PNP transistors can be used as in Fig. 6. The receiver modification involves connecting the reed comb to H.T. positive, and reversing all the electrolytic capacitors across the reeds. The common end of the relay coils should now be taken to H.T. negative. Some makes of receiver may have the reed comb connected to H.T. positive, in which case PNP transistors can be used without this modification. The transistors can be any PNP type with a voltage rating better than 25v.

All transistor receivers such as the R.E.P. Quadratone use 9v. H.T. and in this case the circuit in Fig. 7 is suitable. The R.E.P. receivers have the reed comb connected to positive H.T. so PNP transistors can be used. GEC S1 types were used in the prototype, but any which will take 15 mA. and 6v. will do.

Resistors R3 and R4 in the 30v. circuits are included to reduce battery drain, but are not used in the low voltage circuit.

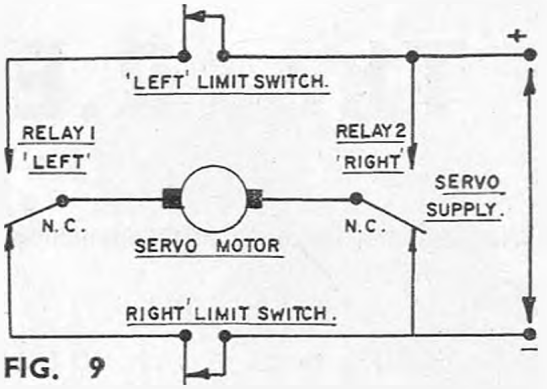



FIG. 9

CIRCUIT FOR ELECTRICAL LIMIT SWITCHES

### Component List

| | |
|---|---|
| R1, R2 | 1 Meg Pots, replace by correct value resistor (see text). |
| R3 | 1.8K. |
| R4 | 1.8K. |
| R5, R6 | 100K Lin Pots, replace by correct value resistor. |
| R7, R8, C1-4 | These components are already in the receiver. |
| T1a, T2a | 2N35 |
| T1b, T2b | GET 104, OC72, etc. |
| T3, T4 | S1, GET 104, OC72, etc. |

Although mechanical limit switches (i.e., overrun on screwed rod) have been used in the prototype servos, electrical limit switches can be used. The switches should be wired into the servo motor circuit, as in Fig. 9.

As can be seen from the circuit diagrams, two extra wires must be connected to the receiver. These go to the junction of the reed contact and the relay coil on each of the relays used for the servo. These connections will not affect the operation of the receiver when used with conventional servos, nor will the polarity change of the reeds and relays, if this is necessary.

### Summary

The single battery servo has several advantages over its tapped battery counterpart. Although some modification to the receiver is necessary for single battery working, this will not affect receiver operation when used with other servos. Single battery working also allows the use of progressive self-neutralising servos which cannot be done with the tapped battery type. Receiver modification is not complicated. If two pots are built into the servo, the servo can be adjusted very easily for any type of operation. Constructional details of single battery servos developed for boat use will appear in Part III.

# The R.E.P. Story

## PART - - - 2

After R.E.P.'s range of multi 10 channel equipment became available, George felt that the beginner had been neglected. Being a modeller himself, in touch with modellers (beginners and experts) he found the majority of beginners have difficulty in connecting escapements, especially when a mixture of different makes of equipment are used, with leads of different colours to be connected. He felt there would be a good market for a single block unit. The Reptone was an experiment on which a lot of money was spent, but it has repayed itself. Originally the Reptone was intended for boats only, unfortunately it has been used in aircraft in spite of its weight and bulk. It is one complete receiver, battery box, motorised actuator, direct coupling to the rudder of any boat without any soldering or knowledge required to operate.

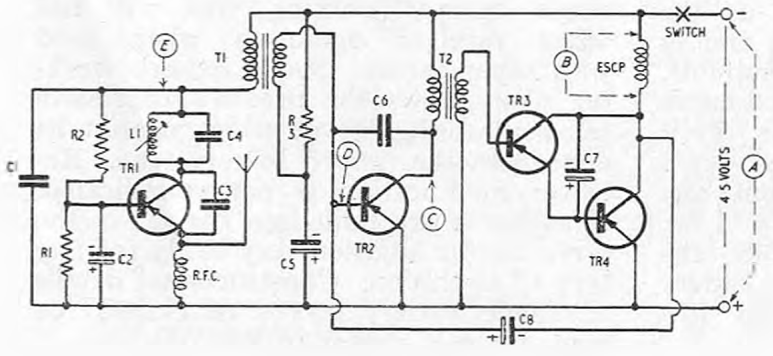
A year later the Mini Reptone followed for the aircraft people using the same principle. Both have been very successful, and have probably brought in far more people to radio control than would have applied with the standard equipment in which one has to solder connections and fit plugs and sockets. The basic idea has been fulfilled, because it has been found via contacts of customers that the beginners who started off with the Reptones and Mini Reptones have, a year or 18 months later, progressed to the more complicated multi equipment. Obviously these two have opened up a new field and have brought in far more interest to radio control as such.

The Octone and now, of course, the Dekatone are simultaneous transmitters giving the means of controlling "two handed", for the first time with British equipment.

From the application aspect, George has been a very keen modeller and in the early days won quite a few contests. In the last couple of years, however, he has dropped out, for two reasons. One being that the amount of work on hand takes up a large amount of his time, and the second reason, which is quite genuine, is that it is felt the manufacturer of equipment has too many advantages compared with the amateur, and he feels it would be unfair for him to compete with them continuously, in fact, he adds that they are probably far better than him at controlling models these days.

The staff of R.E.P. have grown with the firm, quite a few have been with the firm for some time besides John Dumble, Jerry Fyford and Pete Dodd have been with the firm for the past three years, and those who work there seem to like to stay. Most of the employees are modellers who take an interest in the work.

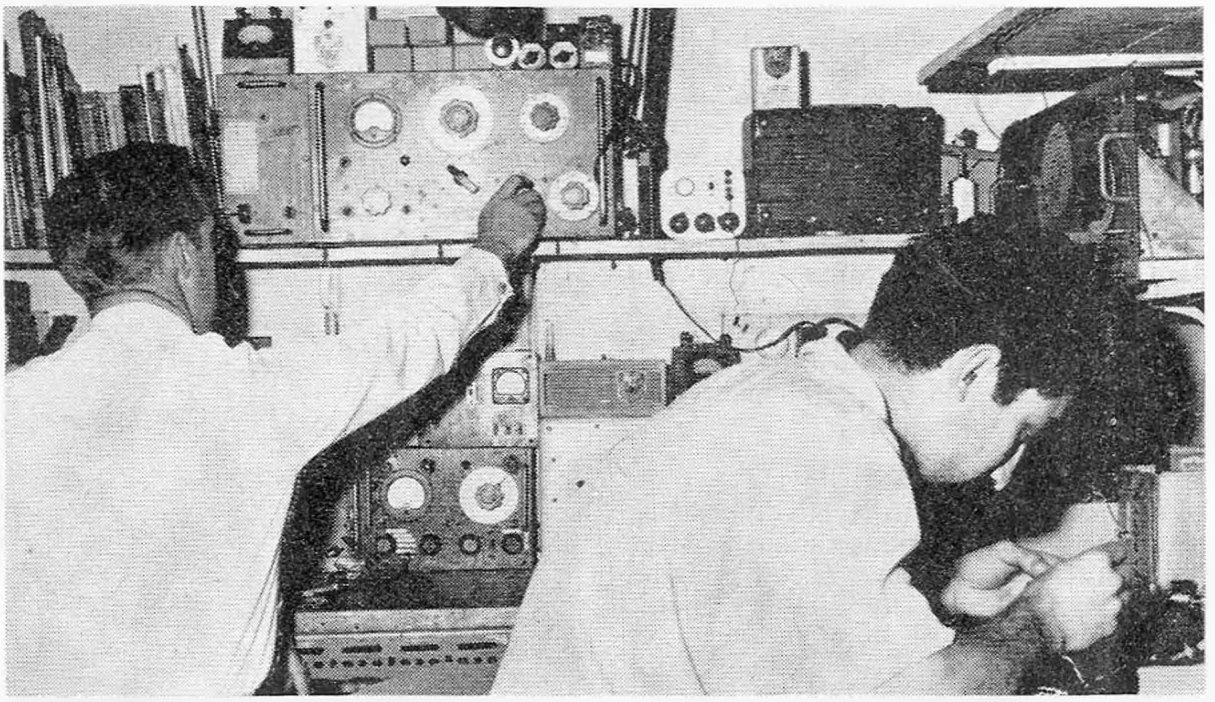
### MINI REPTONE RECEIVER




### COMPONENTS

| | |
|---|---|
| C1—30pf. | R3—22k. |
| C2—1mf. | TR1—SB 305. |
| C3—22pf. | TR2—OC44. |
| C4—47pf. | TR3—OC44. |
| C5—1mf. | TR4—V15/20P |
| C6—.003mf. | T1—D,1005 Ardente. |
| C7—50mf. | T2—D,1005 Ardente. |
| C8—.5mf. | L1—7½ turn coil. |
| R1—10k. | RFC—approx. 70-100 microheneries. |
| R2—33k. | |

NOTE.—A diode and resistor are connected across the escapement coil to act as a suppressor.



Now in 1962. it is found that the premises are too small to produce enough to satisfy not only the home needs but the overseas markets which are rapidly expanding. In France where it is very difficult to sell any radio control. R.E.P. find one of their best overseas buyers. On the production side. service and clerical side the present staff is 15, which for a firm which started five years ago with two is quite an achievement. George does feel that this has been due to the type of equipment produced and to the fact that R.E.P. has anticipated the demands of the modellers. They have always been open to suggestions and advice from modellers for one tends to be biased by the beauty of one's own baby and it takes outsiders to point out the flaws.

### Plugging R/C

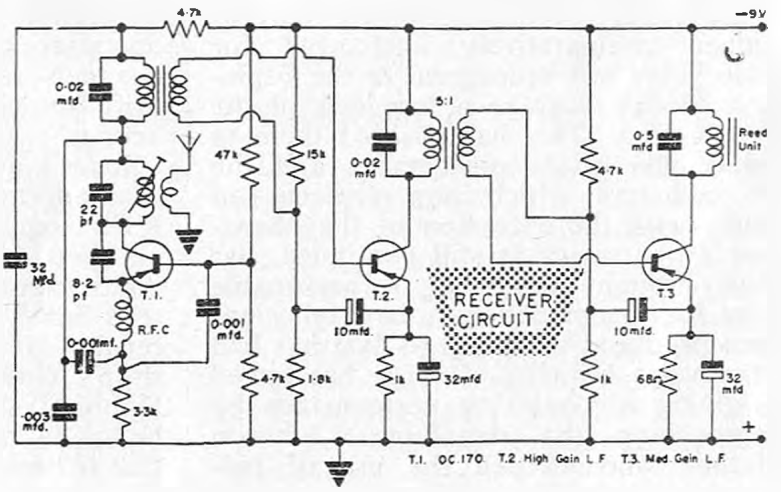
R.E.P. has made four T.V. broadcasts up to date, one of them being a complete half hour programme devoted to radio control alone. On this programme such modellers as Chris Olsen. Stewart Uwins and Paul Rogers took part. The other programmes have been connected with a semi scientific programme. usually compiled by Authur Garret who is a well known scientific broadcaster. his interest in radio control has been immense.

### Future Policy

A superhet receiver will be in production very shortly and quite a few have

John Dumble (left) checks some equipment whilst Peter Dodd investigates a repair job. There is certainly no lack of test gear !

## 2-10 CHANNEL TRANSISTOR Rx.



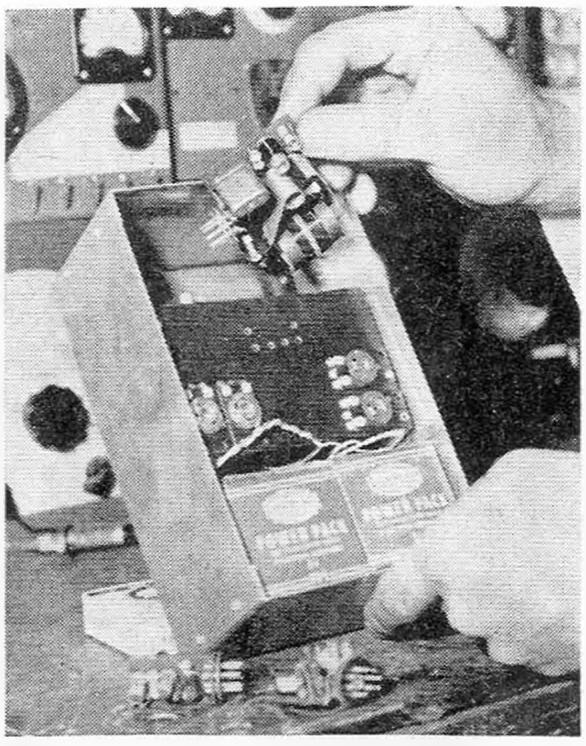
been made up and distributed amongst special modellers in order to get their criticisms and tests, which up to date have been good; in fact, some of the boat competitions have been recently won with R.E.P. Superhets. It is hoped by design or construction to put them out at a reasonable price to enable modellers to fly several models simultaneously in a club for example and eliminate interference from most other transmitters. George believes this to be a thing of the future—within the next few years the majority of modellers will change over to Superhets.

**Power Packs**

As accessories two types of power packs have been produced; one for the transmitter which from a 6 volt accumulator supplies all the battery needs eliminating the cost of replacement of dry batteries. With a usual small portable 6 volt accumulator the average time on these is four hours before recharge. The receiver power converter runs off the actuator batteries consuming only a fraction of the current of the actuators used and supply the power needs for the receiver. However, the need for the receiver power pack has been reduced in view of the fact that at the beginning of this year all of the multi channel receivers were changed to fully transistorised circuits which run off a low voltage anyway. One of the greatest advantages is in the reduction of weight because the H.T. and L.T. batteries of the previous multi sets can weigh up to 4 or 5 ounces, in this particular case the converter weighs an ounce. Five ounces can make all the difference between a model flying well or not.

**Separate Components**

The R.E.P. reed unit which had remained comparatively unchanged for three years was redesigned at the beginning of this year to a moulded plastic construction. This has enabled them to reduce the price considerably and the 10 reed unit which now replaces all others with the exception of the Miniature Three which is still continued, has been brought down to a reasonable price for the modeller. A new relay has been produced which up to date has had no adverse criticism, George has aimed at giving non sticking performance by approaching the metallugist Johnson Mathee who advised the use of palladium silver for the contacts. The size has been brought right down and he has used the best points of one of the best known American relays in size and construction (he is not adverse to using other people's good points).



**The latest spot of development; an all transistor Tx. for multi with plug in modulator and R.F. sections.**

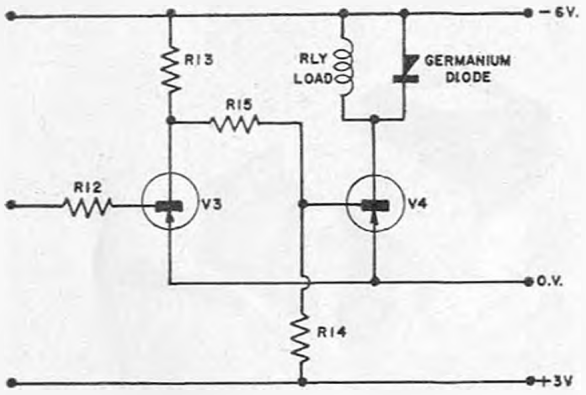
**Research**

A visit to the Sheen Lane establishment, reveals the checking, testing and research department presided over by Peter Dodd. Here, the new ideas are created and we had the pleasure of watching some very fine electronic gimmickry in operation. An all transistor transmitter obtaining simultaneous operation by high speed mixing of the channels alternately was seen and its drift free characteristics observed on the 'scope.

Indeed a comprehensive array of test gear adorned the workbenches. All the R.E.P. equipment is checked and finally matched here, although naturally the multi transmitters are set up to suit the reed banks at the main factory. All the repairs are carried out, and the workshop's close proximity to the "Cosmic Hobbies" shop enables a quick check to be made on any "pranged" equipment that is brought in for service.

# Modification to the 'Independent Pulser'

A NUMBER of queries have been received regarding the "Independent Pulser" published in November, 1961, issue of *R.C.M. & E.* The circuit values as published were incorrect and this revised circuit of the last two stages should be of interest to those readers who have been unable to make the pulser work.



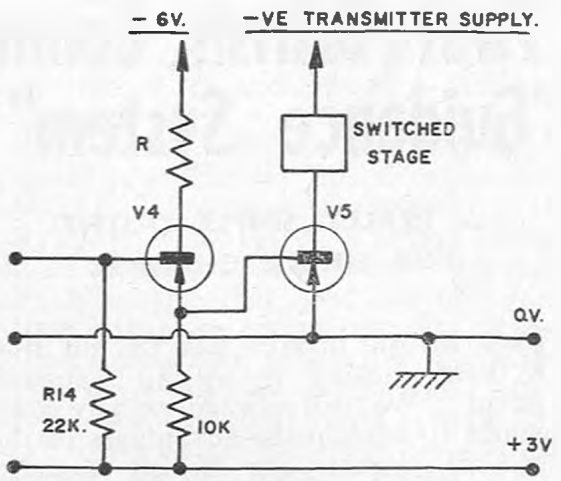

**Values : R12 : 18K R14 : 22K**
**R13 : 10K R15 : 4.7K**

**Switching stages of Independent Pulser**

The arrangement shown above should deliver up to 10 mA. from V4 collector if V4 has a moderate a'(35-65), corresponding to transistors such as GET 103, 104, 106, 111, 114, 535, 536, 871, 881, 891, 892 and OC71, 72, 76, 77, etc. If a high a'(80-200) switching type such as: GET 102, 113, 872, 875, 882, 885, 888, 890, 892 is used, currents between 10 and 40 mA. will be available. In all cases reduction of R13 to 4,700 ohms will increase the current available by 50 per cent.

The minimum usable load resistance is fixed by the above considerations. If the load resistance is made two to three times greater than the minimum, a satisfactory safety factor results.

| *R13* | *Transistor a'* | *Min. load res.* |
|---|---|---|
| 10 kilohms | moderate | 600 ohms |
| 4,700 ohms | moderate | 400 ohms |
| 10 kilohms | high | 300 ohms |
| 4,700 ohms | high | 200 ohms |




**Values : R14 : 22K**
**R★ : 470Ω**
**R16 : 10K**

The resistors R15 and R16 are included to ensure adequate temperature stability for V4, which under extreme conditions would otherwise be subject to thermal runaway. These resistors cause some loss however.

Now that high power R.F. transistors are on the market, many people are very interested in electronically keyed transmitters. If a suitable NPN transistor cannot be obtained, V4 can be supplemented with a further transistor with suitable power and current ratings:—

In a typical circuit with a 250 mA. current requirement from V5, V4 is a GET 872, R is 470 ohms and V5 is a GET 116. Maximum voltage that V5 will safely switch is 30v. in this case. Power is 7 watts max. which is more than sufficient for most R/C purposes.

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**ERRATUM Tuning Fork Tones**

**November issue Part 2**

On page 551 in the second column after "Araldited", the following was omitted: " . . . into the alloy housings which have a hole about 0.02 mm. larger than the outside diameter of the magnet. The tuning forks and coils are mounted on the glass fibre base plate, which also has the solder tags for the electronics. Each tuning fork oscillator is mounted on its own base plate and these are Araldited . . ."

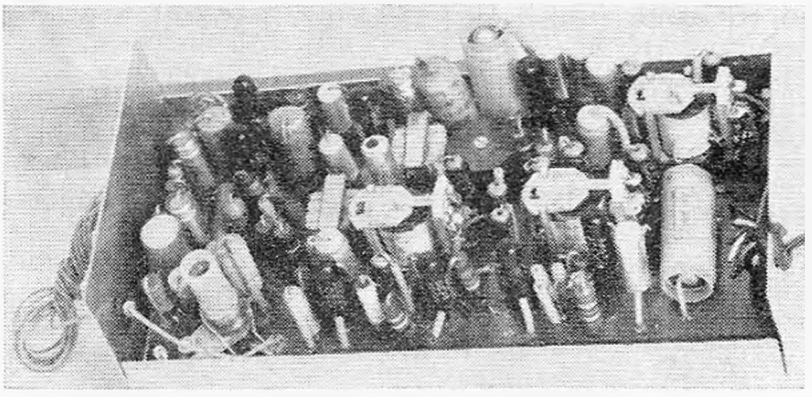
# First British Commercial All Transistor "Guidance System"

## A REALLY SIMPLE OUTFIT FOR SINGLE CHANNEL


THE British market has up till now been lacking in an all transistor system. We will not go to any great lengths to explain the advantages of this type of system; the British modeller should now be well acquainted with all its good points.

R.C.S. (Radio Control Specialists) already well known for their pulse proportional outfit (first on the British market *complete* set of pulse gear) have scored another "first" with a really compact well balanced all transistorised single channel tone transmitter and a sub-miniature all transistorised super-regen receiver giving a relayless output for use with escapements. The receiver operates from 4.5 volts supplied by pen cells which. of course, also operate the escapement. The complete outfit comes with a battery box and wiring harness which whilst giving an extra set of connectors for a motor control escapement is intended for connection to either a simple 2P 2N escapement provided or with the option of using a compound escapement and transferring the first escapement to function as throttle control. The equipment, whilst intended for aircraft including ¼A (.020) sizes, should also work effectively in model boats although we have yet to see whether sequential motorised escapement may be used without interference. The receiver is not affected by close proximity to electric motors when wired separately as would be the case with a boat driving motor. The transmitter will operate on only 9 volts, gives quite adequate range on 12 volts provided by two PP1's but extra range can be obtained with 18 volts. The Tx. will operate perfectly safely on this higher voltage and the slightly smaller and lower capacity PP's will, of course, still fit the case.

As with the other R.C.S. equipment the workmanship is excellent and the novel two piece, slide fitting plastic case to the receiver and the hammertone steel Tx. case with its complete absence of screws and other extraneous fitting devices make a most attractive combination for the beginner or single channel expert.



**Heading : Transistor Tx. and Rx., the latter slid partly out of its neat plastic box. Left : All in one Dual Proportional All Transistor Rx. and De-Coding unit. Facing page (left) : The new mark/space pulsed Tx. and new R.C.S pulsed Rx. and servo. (Right): The F.S.M. Monitor and transistor test unit.**

Now a brief technical description.

**Rx.**

4 transistor tone 27 Mc/s. super-regen.
Weight: 1½ oz.
Size: 1¾ x 1¼ x 1 in.
Batteries 4.5v. (3 pencells). Battery box provided.
Current: 5-10 mA. idle.
350 mA. on signal with typical escapement.
Tone from: 400-2.000 cps.

**Tx.**

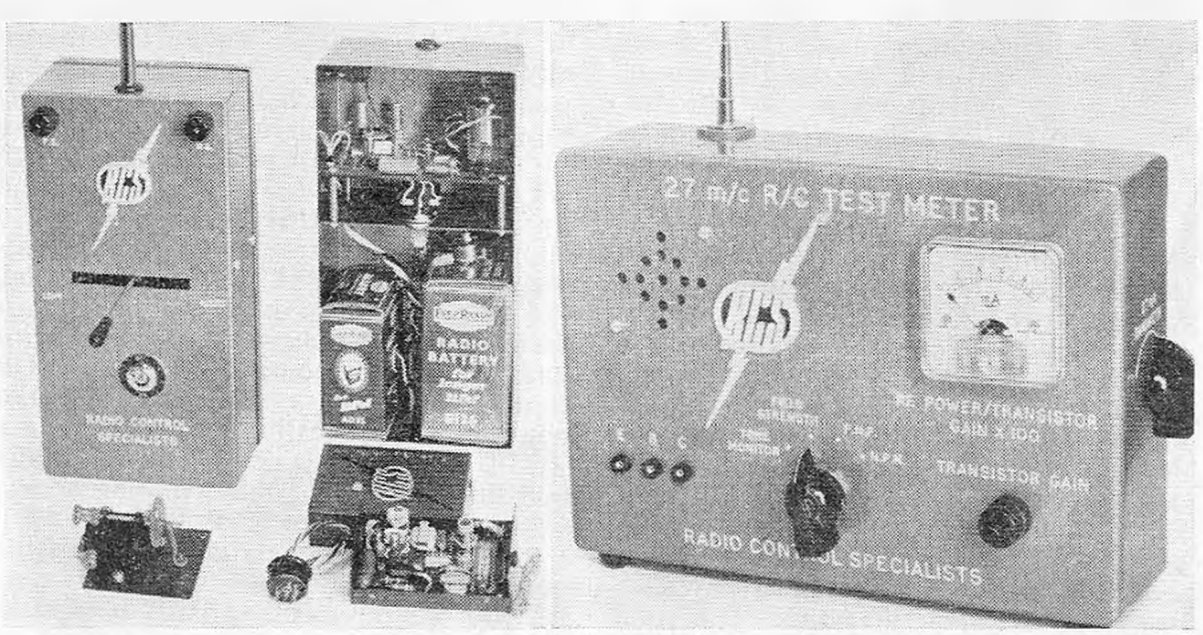
5 transistor Xtal controlled. 27 Mc/s.
Modulation: 100 per cent, square wave.
Radiated Output: 350 mW. (12v. input).
Weight: 2¼ lb. including batteries.
Size: 5½ x 3½ x 2½ in.
Batteries: 1 PP3 9v., or 2 PP6 (12v.), or 2 PP 18v.
Controls: On-Off switch. Tone Key.
Aerial: Tuned centre loaded telescopic (removable).
Complete outfit (Tx., Rx.. Battery box. harness, and 2P2N escapement is available. *See advertisement inside front cover.*

R.C.S. have produced a number of extremely multi purpose test meters which may be used as a field strength meter. monitor and transistor tester for both PNP and NPN transistors. A neat telescopic aerial folds completely down inside and a multi switch may be positioned to operate whichever facility is required. A small loud speaker gives a clear indication of the tones and field strength may be measured as R.F. power. The same unit measures NPN and PNP transistor gain and leakage on a miniature panel mounting 0-1 milliameter. The circuit is tunable throughout the 27 Mc/s. bandwidth so some indication of the accuracy of a Tx. may be gauged.

The latest additions to the pulse systems produced by this firm are the new R.C.S. receiver designed by P. Lovegrove which gives a relay output for Galloping Ghost or similar systems. We understand that an "add on" rate discriminator and pulse omission detector is produced for gallop free operation of the elevators, and if additional gearing is used—ailerons. This system has been flying successfully for some time with and without coupled rudder.

For the simpler rudder only enthusiast (ideal for boats too) the latest version of their pulsed transmitter offers variable mark/space with full and no signal buttons and with this latest version a geared potentiometer driven from the control stick. The centring spring has been omitted as this was found to be better for "Flight neutral" and a wider range of M/S pulsing is now available (80:20). The dual proportional system is available to special order, the same facility is offered for purchasers of their recently introduced "All In One" dual-proportional-plus-throttle receiver giving three simultaneous relay outputs from the mark/space (rudder and/or ailerons). rate (elevator), and tone change (throttle).

We are looking forward to flying some around for ourselves this year so that we may produce a modellers report and will then set Mr. Brunt loose on it for the technical comments.



# Commercial Developments

By TONY DOWDESWELL

## CONSUMER STAFF MEMBER SAMPLES NEW PRODUCTS AT HOME & ABROAD

NEWS for single channel fans, comes from **G. Franklin Radio Control Models** of Leicester, who will be offering the **J-Que** all transistor receiver published in the 1962-63 Aeromodeller Annual—now on sale. The set is unboxed and has a baseboard size of just $2\frac{1}{16}$ in. x 1 in. The circuit employs five transistors for reliable operation, driving the escapement direct, but not using a common battery supply for receiver and actuator. Two sets of cells are used, two slim pen cells (U16) for the receiver and the other set for the actuator. The beauty here is that actuator power can be either two or three cells (3v. or 4.5v.), which means the receiver is not limited to those more sensitive 3 volt working escapements. Obviously, with two sets of batteries, this will not permit installation in the very smallest of .010 cu. in. powered models, but for .020 powered models down to 30 in. span, this receiver will certainly be a practical proposition. Ready-built and tested (no kits will be available) it costs £7.5.0d. and most encouraging of all, it's British!

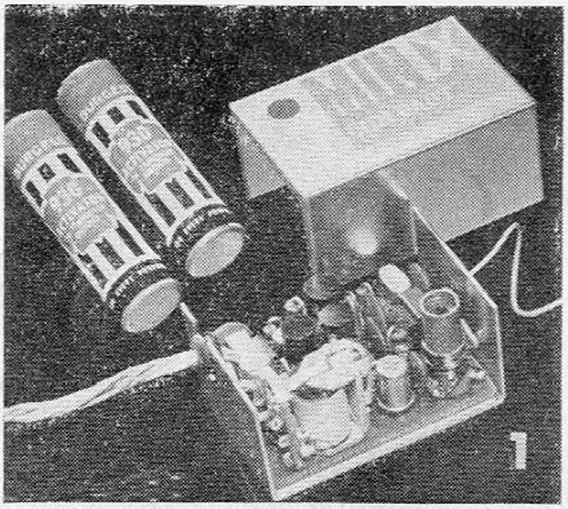
A prototype for a matching all transistor transmitter is at the moment being tested, but details and price of this are as yet not available.

The Franklin brothers are best known for their hub brakes (quite the best we have ever seen) and steerable nosegear, a new version of which is just announced. This, like the earlier version is a floor mounted unit of which the circular mounting plate/bearing forms the basis. The steering head which pivots in the mounting plate has a brass bearing and also forms the mounting block for the two independent coil sprung piano wire undercarriage legs which are retained in the block by grub screws. Each leg has a brass axle bearing which is supplied loose so that the legs may be cut down if necessary and then soldered in position. The crosspiece actuating horn, keys into the top of steering head, retained with a brass bolt and washer, each end of the horn having a brass bushed take off point. The total weight of the unit, $2\frac{1}{2}$ oz., is nothing to a multi channel model and the quality of workmanship is well up to the high standard of previous Franklin introductions. Priced at 37/6d.

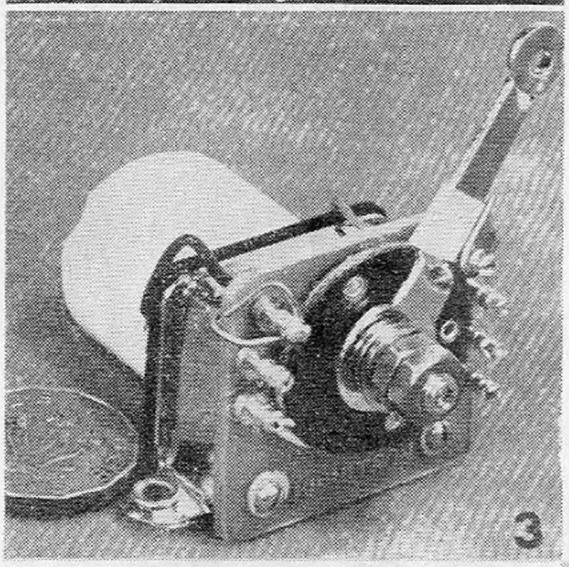
The tendency in the development of radio control equipment seems to be a concentration on equipment to suit the aircraft side of the hobby. This is perhaps understandable in view of the fact that specifications and tolerances are much tighter than is the case with model boats. For instance, aircraft fans tend to demand minimum weight equipment working on the smallest batteries in order to reduce pay-load for better performance. This has resulted in a preoccupation with aircraft equipment among manufacturers, perhaps on the assumption that what works in a model aircraft, will work equally well in a boat.

The new **Minnitron Servo** manufactured by Minnitron Ltd., The Premier, Minnis Road, Birchington, Kent, designed by a leading boat enthusiast is therefore of particular interest. Minnitron, weighing $2\frac{3}{4}$ oz., is intended either for multi channel or pulse proportional control, and is similar in operation to the Taplin Universal Actuator, no longer in production. The motor uses an Ever Ready T.G.18 case but internally is quite different, and is bolted to a gear box which forms the two mounting lugs. An etched circuit, gold plated (to prevent corrosion) wiper board with wiring tags is bolted to the other end and the geared drive shaft mounts a slipping clutch wiper plate and actuating arm. When the servo is activated, the actuating arm drives to one of its extremities, whereupon the clutch slips and the motor continues to run. On termination of signal the servo neutralises electrically. The servo has a $\frac{3}{32}$ in. play about neutral intentionally and linear throw of the actuating arm is $\frac{13}{16}$ in. either side of neutral. Price 49/-.

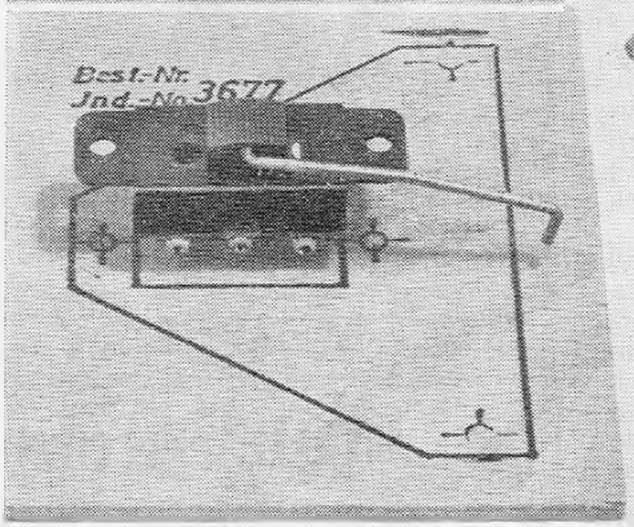
Looking for a single channel superhet receiver? The **MIN-X Superhet** may fill your requirement. This is housed in

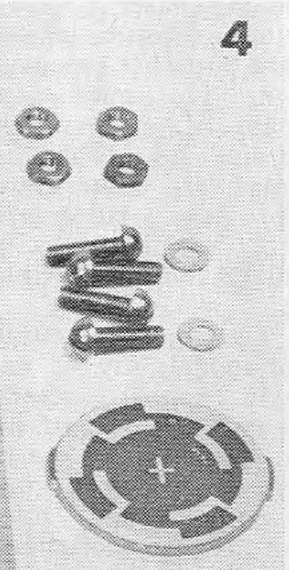


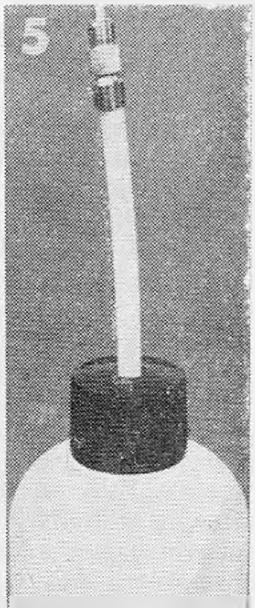


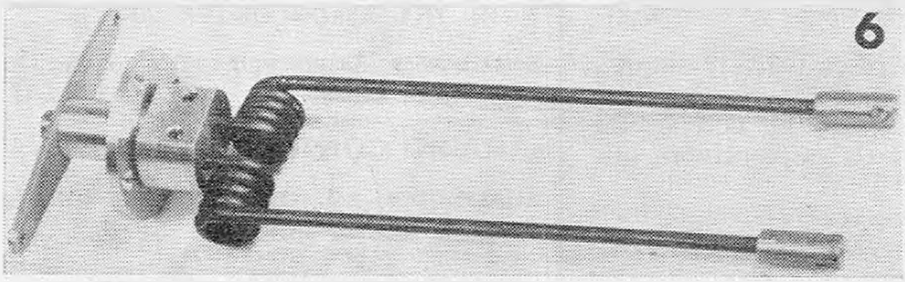



1. The new Min-X Compact receiver.
2. Min-X Superhet single channel receiver.
3. New Minnitron servo is small.
4. Graupner Unimatic Extension kit parts, including 4 position wiper disc. Ply triangle must be cut out, bolted to the Unimatic servo and switch fitted.
5. Valvespout fuel bottle from H.J.N.
6. New Franklin nosegear is a beautiful job.




a strong metal case with the usual MIN-X gold anodised finish and measures $2\frac{1}{2}$ x $2\frac{3}{8}$ x $1\frac{1}{16}$ in. Being an all transistor set, it works off 6.25 volts (DEACs) or 6 volt power supply. Idle current is 8-10 mA. and signal-on current 50 mA. Operating and maintainance instructions provided with the receiver, underline several interesting points. Spark suppression of the escapement coil (if escapement is used with this Rx.) is a first essential to prevent relay contact burning, and for this a 47 ohm $\frac{1}{2}$ watt resistor is used. If a motorised servo is switched by the Jaico relay, motor noise must be suppressed by a 0.05 mfd. capacitor placed across the brushes.

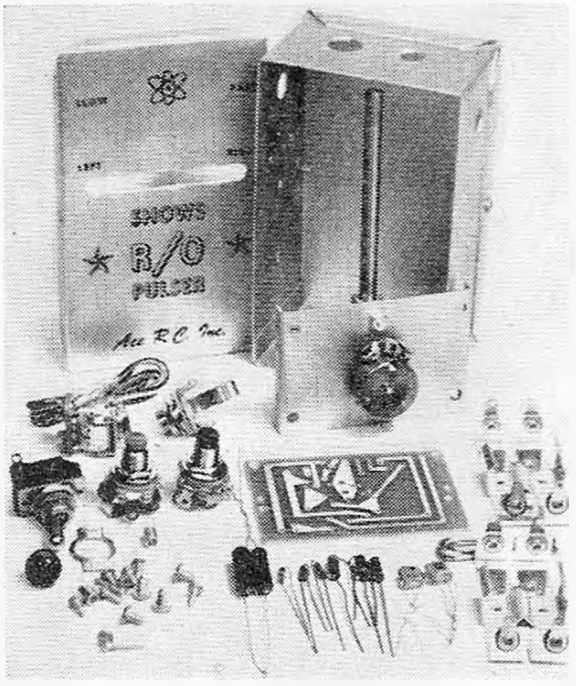
Tuning a superhet receiver to a transmitter is no easy job, and the manufacturers stress that insertion of a matching crystal is not necessarily the answer. They therefore urge that no tuning adjustments are made by the purchaser unless he has some knowledge of the workings of a superhet receiver and has access to an oscilloscope. In most cases we feel that prospective purchasers will not be in such a happy position. Therefore if the receiver is not purchased together with a matching transmitter on one of the five spot frequencies, it will be necessary for the purchaser to forward his existing suitable transmitter to the supplier so that the superhet receiver can be aligned to it. This may also necessitate a change of transmitter crystal. Such a service Ed. Johnson, who supplies the receiver, assures us he is willing to provide. However, remember, not all transmitters will be suitable, so consult Ed. before placing an order.

Weighing $4\frac{1}{2}$ oz., this superhet would require a fairly large model; say 48 in. minimum span. Single channel aircraft fans have as yet shown little interest in the superhet receiver, but for boat work where a little extra weight does not matter, the MIN-X Superhet may find an enthusiastic reception by modellers whose water sees a great deal of activity and where the 27 Mc/s. waveband is heavily used.

£24.0.0d. is a high price for any single channel receiver, but it is worthwhile to note that this set may be converted up to 12 channels by the replacement of the relay with a reed bank.

The **MIN-X Compact** all transistor relay receiver, first reviewed in our July, 1961, edition, has now been completely revised to be smaller in overall size at $1\frac{7}{8}$ x $1\frac{1}{4}$ x $\frac{7}{8}$ in. and lighter at $1\frac{3}{4}$ oz. which makes it the smallest relay receiver at present available. It works off 3 volts (2 pen cells), draws 4-6 mA. when idling, and 28-30 mA. current on receipt of a signal. The Compact now has a low resistance Deans relay. Price, again from Ed. Johnson, is £12.0.0d. Incidentally, MIN-X radio control equipment can now be obtained through model shops.

A visit to Henry J. Nicholls' shop revealed the **Valvespout** squeeze bottle. This 6 oz. bottle is moulded in yellow polythene. It has a turned metal bung in the neck through which passes a polythene feed tube, the external end, capped with a turned brass twist-valve, which



prevents fuel flow when the bottle is not in use. This handy item costs 3/9d.

Now how's your pulse rate? Roland Scott sent us the **Shows Rudder Only Pulser** ; this is supplied in kit form and contains all the components and hardware necessary for the construction of a simple multi vibrator. Two transistors, five resistors. a couple of capacitors and a diode are soon soldered into the printed circuit board providing the mark space output via a relay. Control is. of course. via a simple potentiometer direct coupled to the control stick which is a very nicely made item. Conveniently placed "full" and "no" signal control buttons. a pulser "on-off" switch and jack socket. all fit comfortably into the anodised aluminium case. Pen cells supply the pulser power and are carried in ready-made battery clips. £8.5.0d.

At the same time we received the **Shows P.O.D.** (pulse omission detector) also from R.S. An elaborate instruction leaflet gives ample indication of its application. although we would hesitate to recommend it to the absolute beginner on account of what we anticipate to be a slight difficulty in matching to suit particular receivers and pulse rate range. The actual circuit of P.O.D. is a simple one transistor plus transformer circuit employing the diode pump arrangement which feeds the output relay. Some measure of adjustment is provided by a subminiature pot and the whole box of tricks is assembled on a simple printed circuit board. Price £6.

New from Ripmax, the **Graupner Unimatic Extension Kit,** an extra accessory for electric R/C boats to provide ahead-stop-astern sequence motor control. A ply plate mounts the D.P.C.O. slide switch bolts on to the servo. Drive yoke and switch are connected by push-rod. either as a second servo on single channel via "quick blip". or using one channel of a system. Price 7-.

To end this round up we move over to the 'hot tip' department ! From information received there seems every likelihood that Tom Brett's *Apogee* multichannel low winger that won the fly off at the World R/C Championships back in August, will be kitted under the *Debolt* label.

**Opposite top left: Shows Rudder Only Pulser with "full" and "no" signal buttons (motor) has many quality components.**

STATEMENT REQUIRED BY THE ACT OF AUGUST 24th, 1912, AS AMENDED BY THE ACTS OF MARCH 3rd. 1933, AND JULY 2nd. 1946. AND JUNE 11th. 1960 (74 Stat. 298). SHOWING THE OWNERSHIP, MANAGEMENT. AND CIRCULATION OF RADIO CONTROL MODELS, published monthly at New York, N.Y., for October 1st. 1962.

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K. M. EVANS. Secretary; for and on behalf of Model Aeronautical Press Ltd.

Sworn to and subscribed before me this 8th day of October. 1962.

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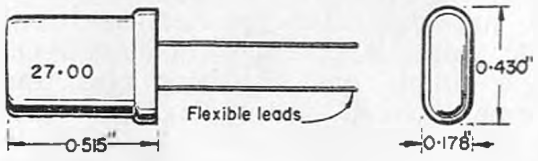


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|---|---|---|---|
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