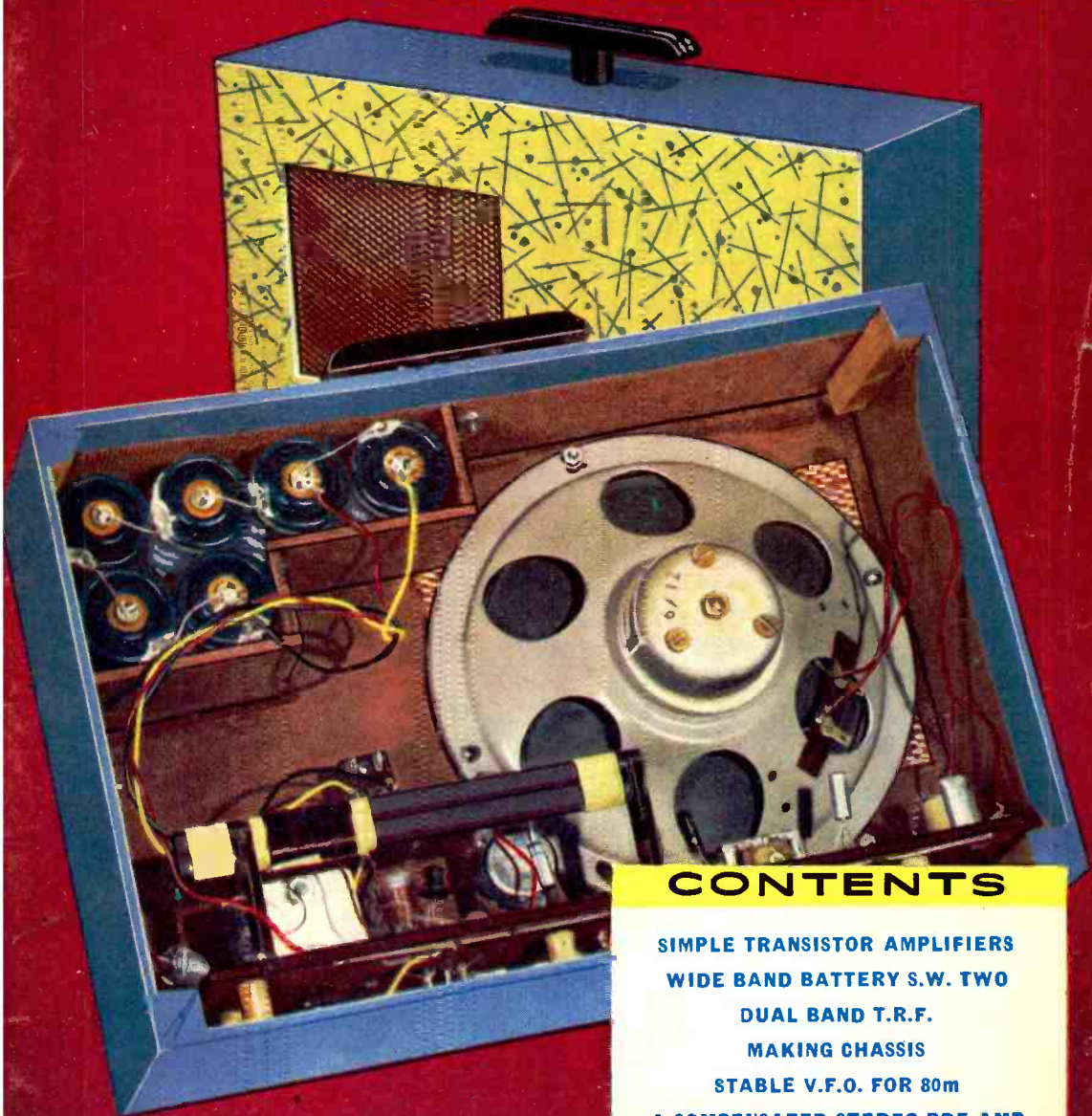


A FOUR TRANSISTOR T.R.F.

# PRACTICAL 1/6 WIRELESS

JUNE  
1960



## CONTENTS

SIMPLE TRANSISTOR AMPLIFIERS  
WIDE BAND BATTERY S.W. TWO  
DUAL BAND T.R.F.  
MAKING CHASSIS  
STABLE V.F.O. FOR 80m  
A COMPENSATED STEREO PRE-AMP  
ETC. ETC. ETC.



**RADIO & TV TABLES**

**"NEWSTEAD"** (as illustrated). This contemporary "Slimline" TV Table is finished in highly polished walnut veneer. Measures 19" x 13" x 20" high.

Price £3. 7. 6 (inc. P.T.)

**"CHATSWORTH."** Finished in highly polished walnut veneer. Measures 19" x 14" x 21" high.

Price £4. 0. 0 (inc. P.T.)

**"WELBECK"** (as illustrated) measures 20" x 20" x 20" and is fitted with self-adjusting gliders.

Price £3. 15. 0 (inc. P.T.)

**"SHERWOOD"** will accommodate the largest television receivers; measures 23" high x 25" wide x 22" deep.

Price £5. 5. 0 (inc. P.T.)

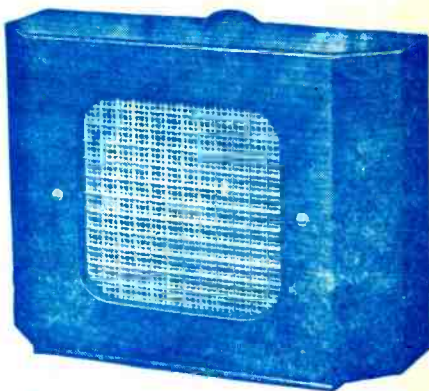
**"SENIOR,"** of ample dimensions (18" x 24" x 25" high).

Price £4. 18. 9 (inc. P.T.)

All are supplied packed flat ready for instant assembly and with the exception of the Welbeck and the Chatsworth have easy running 2" castors.



*The symbol  
of extra  
High Quality*



*Stentorian*  
EXTENSION SPEAKERS

These well designed speakers demonstrate the traditional Whiteley quality at really competitive prices. This range of extension speakers has finger-tip volume control, is superbly finished in polished walnut veneer and provides excellent reproduction.

**WHITELEY ELECTRICAL RADIO CO. LTD.  
MANSFIELD . NOTTS**

**WITH THE  
EXCLUSIVE  
FINGER-TIP  
VOLUME  
CONTROLS**

- 'BUDE' 60/-
- 'BEDFORD' 72/-
- 'BRISTOL' 86/6

Prices include P.T.

**ERSIN MULTICORE SOLDERS**

*for a first class joint every time*

Ersin Multicore contains 5 cores of extra-active, non-corrosive Ersin Flux. Prevents oxidation and cleans surface oxides.

**SIZE 1 CARTON**

5/-

**HANDYMAN'S  
CARTON**

Suitable for 200 average joints.

6d.

**HOME CONSTRUCTORS  
2/6 PACK**

In addition to the well-known Home Constructors Pack (containing 19ft. of 18 s.w.g.

60/40 alloys) a similar pack is now available containing 40ft. of 22 s.w.g. 60/40 alloy especially suitable for printed circuits.



Wherever precision soldering is essential, manufacturers, engineers and handymen rely on MULTICORE. There's a MULTICORE SOLDER just made for the job you have in hand. Here are some of them.

**SAVBIT TYPE 1 ALLOY**

A specially formulated alloy to reduce the wear of soldering iron bits. Contains 5 cores of non-corrosive Ersin Flux and is ideal for all soldering purposes.

**SIZE 1 CARTON 5/-**

Available in three specifications.



**BIB WIRE STRIPPER  
AND CUTTER**

Strips insulation without nicking wire, cuts wire cleanly, splits extruding flex. **3/6 each**



**MULTICORE SOLDERS LTD.,**

MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS. (BOXMOOR 3656)



**Solve  
that  
Circuit  
trouble!**

**PIFCO**  
*Radiometer*

Not only circuit tests but everything electrical can be tested with this handy compact meter. Tests H.T. & L.T., Valves, components, electrical appliances and car lighting systems, etc. May be used on A.C. & D.C. mains.

See the Radiometer at your dealer or write for illustrated leaflet to:—

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All Valves Brand New  
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Grid of vacuum tube part numbers and prices, including categories like METAL RECTIFIERS, CATHODE RAY TUBES, and various valve types such as 6X4, 6BE6, and 6BM8.

TERMS OF BUSINESS C.W.O. or C.O.D.  
2/9 PACKING CHARGE ON ALL C.O.D.  
ORDERS. POSTAGE 3d. PER VALVE.

OBSOLETE VALVES A SPECIALITY.  
QUOTATIONS GIVEN ON ANY TYPE  
NOT LISTED.

## R.S.C. HI-FI TAPE RECORDER KIT

**REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN HALF AN HOUR**

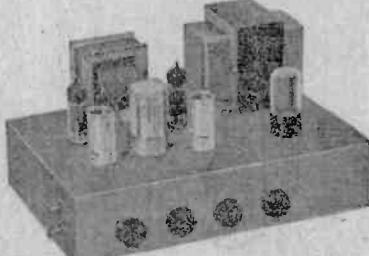
The Recorder incorporates the Latest Collaro Tape Transcriber. The Linear LT45 High Quality Tape Amplifier listed £12.10. High Flux 2 M. Speaker listed 30/- empty Tape Spool, a Real of Best Quality Tape listed 2/6, and a Handsome Portable carrying Cabinet finished in Two-tone covering, size 18 x 13 x 9in. high. listed £4.10.0. and circuit. Total cost if

purchased individually approximately £40. Performance equal to units in the £80-£80 class. Send **25/2** GNS. H.P. TERMS. Deposit 5/9. Carr. 1/7. Price if settled in 3 mths.

**TELEVISION RECTIFIERS.** 250 v. 200mA, small size, Only 6/9 ea. **RE-ENTRANT SPEAKERS.** Tannoy. 8 watt. 7.5 ohms. Only 19/6 each. Or 35/- per pair.

## HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

**PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES**



Two input sockets with associated controls allow mixing of "mike" and gram, as in A10. High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, 6Y3. High Quality sectionally wound output transformer specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. **INDIVIDUAL CONTROLS FOR BASS AND TREBLE "LIFT" and "CUT"** Frequency response: 1.3 D.B. 30-30,000 c/c.s. Six negative feedback loops. Hum level 60 D.B. down. ONLY 23 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs. **FOR STANDARD or LONG PLAYING RECORDS.** **FOR MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS, etc.** **OUTPUT SOCKET** with plug provides 300 v. 30 mA, and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12.9x7in. For A.C. mains 200-250 v. 60 c/c.s. Output for 3 and 15 ohms speakers. Kit is complete to last unit. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/- (Or factory bulk 45/- extra).

If required louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS, DEPOSIT 18/9, and 12 monthly payments of 18/9.** Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.

**EX. GOVT. MAINS TRANSFORMERS**  
 Primaries 200-250 v. 50 c.p.s. A.C.  
 250 v. 60 m.a. 6.3 v. 2 a. .... 10/11  
 270-0-275 v. 100 m.a. 6.3 v. 7 a. 5 v. 3 a. 21/9  
 300-0-300 v. 60 m.a. 6.3 v. 2 a. .... 11/9  
 300-0-300 v. 100 m.a. 6.3 v. 2 a. 5 v. 2 a. 18/9  
 350-0-350 v. 160 m.a. 6.3 v. 5 a. 5 v. 3 a. 27/9

**2 VOLT ACCUMULATORS**  
 Varleys small size 4 x 3 1/2 x 1 1/2 in., 2 v. 14 A.H., brand new, 6/9.

**SELENIUM RECTIFIERS**

F. W. BRIDGE	H.T. Types H.W.
6/12 v. 1 a. .... 3/11	150 v. 40 m.a. .... 3/9
6/12 v. 2 a. .... 6/11	250 v. 50 m.a. .... 3/11
6/12 v. 3 a. .... 9/9	250 v. 60 m.a. .... 4/11
6/12 v. 4 a. .... 12/3	250 v. 80 m.a. .... 5/11
6/12 v. 6 a. .... 15/3	250 v. 250 m.a. 12/9
6/12 v. 10 a. .... 25/9	<b>CONTACT COOLED</b>
6/12 v. 15 a. .... 35/9	250 v. 20 m.a. H.W.
24 v. 2 v. 2 a. .... 14/9	6/11, 250 v. 75 m.a.
	F.W. (Bridge) 8/11.

## HI-FI 10 WATT AMPLIFIERS

Slightly store soiled but guaranteed unused and in perfect order. Fitted Mullard valves. Dual inputs for "mike" and gram. etc. Bass and Treble Controls. High sensitivity and quality. For 200-250 v. A.C. Carriage 7/6. **£5-19-9**

## R.S.C. BATTERY CHARGING EQUIPMENT

**ASSEMBLED CHARGERS**

6 v. 1 amp. ....	19/9
6 v. or 12 v. 1 amp. ....	28/9
6 v. 2 amps. ....	28/9
6 v. or 12 v. 2 amps. ....	38/9
6 v. or 12 v. 3 amps. with ammeter. ....	59/9

Always ready for use. With mains and output leads. Carr. 3/6.



**Assembled 6 v. or 12 v. 4 amps.**  
 Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finish. Fused **69/9** and ready for use with Carr. 5/- mains and output leads. Terms: Deposit 13/3 and 5 monthly payments 13/3.

**ASSEMBLED CHARGER**  
 6 v. or 12 v. 2 amps.  
 Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case finished attractive blue hammer finish. Ready for use with mains and output leads. Double Fused Only **49/9** Carr. 3/9.

**Guaranteed 12 months BATTERY CHARGER KITS**  
 Consisting of Mains Transformer, F.W. Bridge, Metal case, Fuse-holders, Grommets, panels and circuit. Carr. 8/6 extra.

6 v. or 12 v. 1 amp. ....	24/9
As above, with Ammeter. ....	32/9
6 v. 2 amps. ....	25/9
6 v. or 12 v. 2 amps. ....	31/6
6 v. or 12 v. 2 amps. inclusive of Ammeter. ....	42/9
6 v. or 12 v. 4 amps. ....	53/9
6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector. ....	59/9

**CHARGE AMMETERS**  
 0-1.5 a., 0-3 a., 0-4 a., 0-7 a., 0-25 a., 0-60 a. 8/9.

## R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

**Interwound and Impregnated. Primaries 200-250-250 v. 50 c/s. Screened. TOP SHROUDED DROP THROUGH**  
 250-0-250 v. 70 m.a. 6.3 v. 2 a. 5 v. 2 a. 17/9  
 350-0-350 v. 80 m.a. 6.3 v. 2 a. 5 v. 2 a. 18/9  
 350-0-350 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 25/9  
 300-0-300 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 25/9  
 350-0-350 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 25/9  
 350-0-350 v. 100 m.a. 6.3 v. 4 a. 4 a. C.T. 25/9  
 6-4.5 v. 3 a. .... 25/9  
 350-0-350 v. 150 m.a. 6.3 v. 4 a. 5 v. 3 a. .... 29/9

**FILAMENT TRANSFORMERS**  
 All with 200-250 v. 50 c/s. primaries 6.3 v. 1.5 a. 5/9; 6.3 v. 2 a. 7/6; 0-4-8.3 v. 2 a. 7/9; 12 v. 1 a. 7/11; 6.3 v. 3 a. 9/11; 6.3 v. 6 a. 17/6.

**OUTPUT TRANSFORMERS**  
 Midget Battery Pentode 6E1 for 3S4, etc. .... 3/9  
 Small Pentode 5000 0 to 30 .. 3/9  
 Small Pentode 7,8,000 to 30 .. 5/9  
 Standard Pentode 5,000 0 to 30 .. 5/6  
 Standard Pentode, 7,8,000 0 to 30 .. 5/6  
 10,000 0 to 30 .. 5/6  
 Push-Pull 10-12 watts 6V8 to 30 or 150 .. 18/9  
 Push-Pull 10-12 watts to match 6V8 to 3-5-8 or 15D .. 19/9  
 Push-Pull EL84 to 3 or 150 .. 19/9  
 Push-Pull 15-18 watts, 6L6, KT66 .. 22/9  
 Push-Pull for Mullard 50 Ultra Linear .. 29/9  
 Push-Pull 20 watts, sectionally wound 6L6, KT66, etc. to 3 to 150 .. 47/9

**ELIMINATOR TRANSFORMERS**  
 Primaries 200-250 v. 50 c/s.  
 120 v. 40 mA, 5-0-5 v. 1 a. .... 15/9  
 90 v. 15 mA, 4-0-4 v. 500 mA. .... 8/9

**SMOOTHING CHOKES**  
 150 mA, 7-10 H250 ohms .. 11/9  
 100 mA, 10 H 200 ohms .. 5/9  
 80 mA, 10 H 350 ohms .. 5/9  
 60 mA, 10 H 400 ohms .. 4/11

**CHARGER TRANSFORMERS**  
 All with 200-250-250 v. 50 c/s Primaries:  
 0-9-15 v. 1 a. 12/9; 0-9-15 v. 3 a. 16/9;  
 0-9-15 v. 5 a. 19/6; 0-9-15 v. 6 a. 23/9.

**AUTO TRANSFORMERS, 60 watt**  
 0-110/115-220/250 v. 8/11 each.

**FULLY SHROUDED UPRIGHT**  
 250-0-250 v. 60 m.a. 6.3 v. 2 a. 5 v. 2 a. .... 17/9  
 Midget type 21-3-3in. .... 17/9  
 250-0-250 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 25/9  
 300-0-300 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 26/1  
 350-0-350 v. 100 m.a. 6.3 v. 4 a. 5 v. 3 a. 26/9  
 300-0-300 v. 130 m.a. 6.3 v. 4 a. 6.3 v. 1 a. for Mullard 510 Amplifier .... 35/9  
 350-0-350 v. 150 m.a. 6.3 v. 4 a. 6 v. 3 a. 35/9  
 425-0-425 v. 200 m.a. 6.3 v. 4 a. C.T. 6.3 v. 4 a. C.T. 5 v. 3 a. Suitable Williamson Amplifier, etc. .... 49/9

**D.C. SUPPLY KIT.** 12 v. 1 a. consisting of a partially drilled metal case, mains trans. F.W. Bridge Rectifier, 2 fuseholders and fuses, Change Direction switch, variable Speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains, etc. Limited number available at 33/9.

## R.S.C. A12 STEREPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and point-to-point wiring diagrams supplied. Only good quality Carr. and pkg. 5/- components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

**STEREO EQUIPMENT OFFER.**  
Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acos T10 Stereo head with diamond stylus suitable most pick-ups. **£6-19-6** Carr. 7/6

**PICK-UP ARMS** complete with Hi-Fi turnover crystal head. Acos GP54. Limited number brand new. Perfect, at approx. half price. Only 29/11.

**ACOS CRYSTAL MICROPHONES.** Mic40 rand or desk Listed 45/-. Only 27/9. 39-1 Stick types. List price 5 gns. Brand new. 39/6.

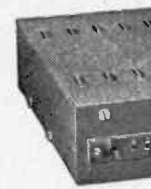
## R.S.C. 30 WATT ULTRA LINEAR HIGH FIDELITY AMPLIFIER A10

A highly sensitive Push-Pull high output unit with self-contained Pre-amp, Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response -3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF86, EC33, 6X7, 607, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built with 12 months' guarantee, for £13.19.6. TERMS: DEPOSIT 24/9 and 12 monthly payments of 24/9.

**FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.**

## R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 x 2 1/2 in. Approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 v. and 90 v. This includes latest low consumption types.



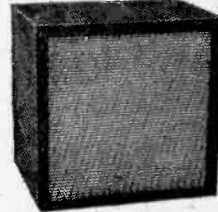
Complete kit with diagrams, 39/9, or ready to use. 46/9.

**R.S.C. 1-4 WATT AT HIGH-GAIN AMPLIFIER**  
For 200/250 v. 50 c/s. Mains input. Appearance and Specification, with exception of output wattage as A. amplifier. Complete Kit with diagrams. £3.15.0. Carr. 3/6.

**R.S.C. BRADFORD, MANCHESTER and LEEDS**  
(Leeds) Ltd.

## 4 Gns.

## 12in. 10 WATT HIGH QUALITY LOUD-SPEAKER



**POISHED WALNUT FINISHED CABINET**

Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only 44.19.6 Carr. 5/- Terms: Deposit 12/-

and 9 monthly payments of 11/12. **12 in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS.** Size 18 x 18 x 8in. Finish as above. Terms: Deposit 13/10 and 12 monthly payments of 13/10. Only 27.19.6. Carr. 8/6.

**LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER.** Suitable for use with any record playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 7-5-3/4in. high. Guaranteed for 12 months. Only 25/19/6. Send S.A.E. for illustrated leaflet. Terms: Deposit 22/6 and 5 monthly payments of 22/6.

## R.S.C. 45 WATT AS HIGH-GAIN AMPLIFIER



A highly sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 db. down. 15 db. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 A. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched wiring diagrams and instructions. Exceptional value at only 24/15/0, or assembled ready for use 25/- extra, plus 3/6 carr.; or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

## R.S.C. PORTABLE GUITAR AMPLIFIERS

**Junior 5 watts High Quality output.** Separate Bass and Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v. Twin inputs. High Flux 8in. Loudspeaker 'built-in'. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carry-in handle. H.P. Terms. Deposit £1 and 9 monthly payments of £1. **£8-19-6** Carr. 7/6

**Senior 10 watts High Fidelity output.** Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12in. for Bass notes and a 7 x 4 in. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit 26/9 and 12 monthly payments of 26/9. **15 gns.** Both models for 200-250 v. Carr. 10/- A.C. mains.

## SPECIAL TRANSISTOR OFFER.

TS1 Brimar. Brand new. Perfect. 3 for 10/9

Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120v. 90 v. and 90 v., 40 mA. and 2 v. 0.4 A. to 1 amp. Fully smoothed. Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s.

**SUITABLE FOR ALL BATTERY RECEIVERS** normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions. 49/9, or ready for use, 59/6.

**EX-GOVT. CASES.** Size 14-10-8 1/2 in. high. Well ventilated, black crackle finished, undrilled cover. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE. OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9. Plus 2/6 postage.

TERMS: C.W. or C.O.D. No. C.O.D. under £1. Post 1/9 extra under 22; 2/9 extra under 65. Open 9 to 8. Wed. and Sat. Trade supplied. S.A.E. with all enquiries. Mail Orders to 29-31 Moorfield Rd, Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, 2, and 8-10 Brown St. (Market St.), Manchester 2, or 56 Morley Street, (next to Majestic Ballroom) Bradford.

**PLESSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER** (12,000 lines) with built-in tweeter (completely separate elliptical speaker with choke condensers, etc.) providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rates 10 watts. Price only 25/17/6.

**HI-FI CRYSTAL PICK-UP HEADS.** (Turnover type with sapphire stylus). HGP59. Standard replacement for Garrard and B.S.R. B.S.R. Ful-ii, Garrard GC2. 19/9.

**POWER PACK KIT.** Output 250 v. 50 mA. fully smoothed and 6.3 v. 1.5 A. Consisting of Mains Transformer, Selenium Rectifier, Smoothing Choke, Double Electrolytic Capacitor, Chassis 6in. x 3 1/2 in. and Circuit. Only 19/9.

**P.M. SPEAKERS.** 2-3 ohm, 2 1/2 in. Perdio 21/9. 5in., 17/9. 6in. 16/9. 8in., 19/9. 8 x 6 in. 25/9. 10in. 26/9. 10 x 6in. 29/9. 12in. 29/11. 10in. W.B. Stereorian 3 or 15 ohms type HF1012 10 watts. Hi-fidelity type. Recommended for use with our A8 Amplifier. 24.10.9. 12in. Plessey 3 ohms 10 watts (12,000 lines), 59/6.

**TWEETERS.** Plessey 3n 19/9, 15n 25/9.

**GL3A MINIATURE 2-3 WATT GRAM AMPLIFIER.** For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Over-all size 1 1/2 in. x 2 1/2 in. x 2 1/2 in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 59/6.

**SUPERHET FEEDER UNIT.** Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). Delayed A.V.C. employed. The W.Ch. Sw. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. on 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts 59/- with illustration. 2/6. Total building cost 24/15/-. For descriptive leaflet send S.A.E.

**COLLARO CONQUEST 4-SPEED AUTO-CHANGER** with high fidelity Studio Pick-up. Latest model. Brand new. Cartoned. For 200-250 v. 50 c.p.s. A.C. mains. Our price 27.19.6. Carr. 5/6.



## COMPLETE V.H.F./A.M. RADIO FOR £12.12.0

Brand new set, in superb walnut cabinet (size 19 x 8½ x 14 in. high). Covering 80-100 Mc/s. 16-49 M., 200-500 M. and 1, 200-2,000 M. Mains trans. 200-250 v. with 3 tapings. Ferrite rod aerial for A.N. Controls: volume on/off tone, tuning, w/change, Gram, and ext. speaker position provided. Fully guaranteed. Post and packing 5/- extra.



The famous Cossor

### TRANSISTOR BATTERY PLAYER (Kit)

We can now supply the following parts to build this unit:

- 1) Player Case.
- 2) Garrard Motor (BA.1).
- 3) Amplifier (4 Transistor).
- 4) Speaker.
- 5) Knob, Plugs, etc.

**COMPLETE**  
**£5.9.6**

p. & p. 5/-

## OUR LATEST OFFER: THE FAMOUS COSSOR

(Traveller's Friend) TRANSISTORISED  
**POCKET RECEIVER**  
IN LEATHERETTE CASE

This set can be built for **£7.19.6**. Size 6 x 3¼ x 1½ in.

Weight 17 ozs. This set covers medium waveband 190/500 metres intermediate frequency. 470 kc/s using 4 transistors (Ediswan) and 2 diodes on a printed circuit board, plus a 2½" moving coil speaker. Instruction book with point to point wiring diagram, 2/6 each. Batteries, PP4 (Ever Ready) 2/- each. P. & P. 2/-.

**ALL PARTS CAN BE SOLD SEPARATELY**



Garrard BA.1 Battery Player **COMPLETE** £3.9.6 p. & p. 4/6.

### 17" TUBE BARGAIN

by well-known manufacturer

Type CME/1702 90° (seconds) with line EHT Transformer. Scanning Coil, and Frame Output Transformer.

**COMPLETE**  
**£6.19.6**

p. & p. 10/-

## CHANGERS

COLLARO CONQUEST	£7.19.6
B.S.R. UA8 .. .. .	£6.19.6
GARRARD RC.120 .. .	£9. 7.6
GARRARD RC.121 .. .	£10.19.6
	p. & p. 3/6.



### TRANSCRIPTION TURNTABLE

Collaro 4-speed type 4T200/PX with studio transcription pick-up.

**£16.19.6**

### COSSOR BAND 3 CONVERTOR KIT TYPE ZB2

For television receiver model 927 and others, most channels, complete

**39/6** p. & p. 2/6

### RECTIFIERS

<b>Westinghouse</b>	<b>Sentercel</b>	
14A86 .. .. .	RM1 .. .. .	5/9
14A97 .. .. .	RM2 .. .. .	7/6
14A100 .. .. .	RM3 .. .. .	9/-
	RM4 .. .. .	17/-
<b>Contact Cooled</b>	RM5 .. .. .	22/-
14RA1282 .. .. .		
14RA1283 .. .. .		

### CARTRIDGES

Collaro Studio O ..	18/-	Collaro Studio P ..	18/-
		B.S.R. .. .. .	18/-

### VOLUME CONTROLS

Less switch type, long spindle, all values .. .. . 2/10 each  
Double-pole type, long spindle, all values .. .. . 4/6 each

### MAINS TRANSFORMERS

M.T.1 250/250 80 mA.	19/6
M.T.2 350/350 80 mA.	19/6
M.T.3 0/30 volts tapped,	19/6
M.T.4 150 watt Auto Transformer,	19/6
M.T.5. Battery Charger	
4 amp.,	19/6
M.T.5a Battery Charger	
1½ amp.,	16/6

### STANDARD ELECTROLYTICS

8 µF x 450 volt ..	1/8
8 x 8 x 450 volt ..	2/4
16 mf. x 450 volt ..	2/3
16 x 16 x 450 volt ..	3/6
32 µF x 450 volt ..	3/6
32 x 32 x 450 volt ..	5/6

### SPEAKERS

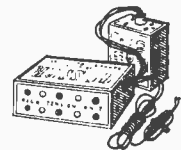
3½" Speaker ..	17/6
5" .. .. .	15/-
6½" .. .. .	16/6
8" .. .. .	17/6
6" x 4" .. .. .	15/-
8" x 5" .. .. .	19/6
10" x 6" .. .. .	25/-
12" .. .. .	32/6

### TRANSISTORS

PMP Junction Type Audio, Yellow/Green Spot. price 5/-  
R.F. Transistor, Yellow/Red Spot, price 8/6  
Crystal Diodes GEX00, price 1/- each! 9/- per dozen.

### 8 VALVE 5 WAVE Am/Fm. Chassis by Famous Manufacturer

Covering long, medium, 2 short and VHF/FM bands. Pick-up and extension speaker sockets, dial fly-wheel tuning power pack and amplifier on separate chassis. For 200/250 v., A.C./D.C. mains. Special price **£17.19.6** p. & p. 5/-.



### TAPE DECKS

- 1) B.S.R. Monardeck s.s. £9.19.6
  - 2) Collaro Studio push/b. controls, 3 motors, 3 speeds. £15.15.0
- p. & p. 5/-.

### MICROPHONES

Acos Crystal Stick mike, type MIC39/1. Complete with cable 39/6  
Type 40 Mike, hand or table mike, 25/6. P. & p. 2/-.

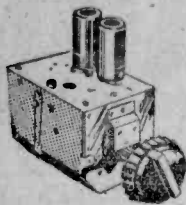
Convert your Battery Set to Mains with a **COSSOR BATTERY ELIMINATOR** MU2. For operation on 200/250 v. 50 c/s A.C. mains. Output: L.T., 1.5 v. 125 mA; H.T., 90 v. 10 mA.

**OUR PRICE 37/6** p. & p. 2/6

## WIRECOMP ELECTRONICS

378 HARROW ROAD, LONDON, W.9. TEL.: CUNNINGHAM 9530  
Hours of business: 9 a.m. to 6 p.m. Open all day Saturday. Opposite Paddington General Hospital. Buses 18B & 36 pass the door

**12-CHANNEL TURRET TUNER**



Ideal for converting an old or building into new T.V. These are brand new stock, not surplus, supplied complete with valves and coils for local Band I and Band III stations.

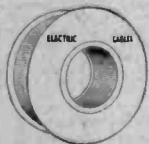
**Model 1.** I.F. Output 2938 Mc/s series heaters (parallel heaters, 5/- extra).  
**Model 2.** I.F. Output 16/19 Mc/s parallel heaters (series heaters 5/- extra). With instructions and circuit diagram, 79/6. Knobs 3/6 extra postage and insurance 2/6.

**Chassis Assembly**



Superhet Chassis, 3-waveband, coloured scale, scale pan, etc. Scale size 14 1/2 in. x 3 1/2 in. Chassis size 15 in. x 15 in. x 2 in. Price 9/6, plus 1/6 post.

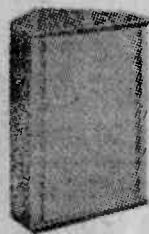
**Versatile Wire**



Single-strand 18-gauge with P.V.C. covering which makes it rustproof. Extra strong, will stand tremendous strain. Ideal for gardening, clothes lines, indoor aerials, etc.

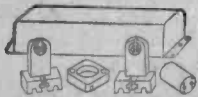
etc. Also being steel alloy and having a resistance of approximately 1 ohm per yard this can be used for electrical work, soil heating, wrapping round water pipes, etc. New on drum containing 3,000ft. Price 8/6, plus 3/6 carr.

**Cabinet for Hi-Fi Speaker System**

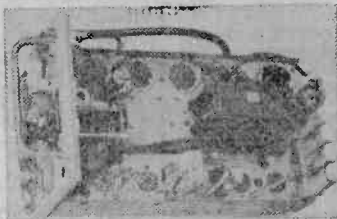


Acoustically designed bass reflex cabinet made by W.B. "STERN-TORIAN." Price £9/9 or 20/- deposit and 19 weekly payments of 10/-. Choice of several others available. Call or write for list. Add 5/- carr.

**Fluorescent Light Bargain**



Kit of Parts comprising: choke, two lamp holders, starter holder and starter, 40 watt, 18/6; 80 watt, 23/6. Plus 2/- post and insurance.



**Klystron Receiver**

Partly stripped but containing valuable Klystron with tuning mechanism and a host of spares including condensers (paper and mica), transformers, relay bobbins, pot. meters, resistors, delay line coils, coil formers, knobs, pye sockets, trimmers, valve holders, a very useful chassis and case size approx. 15 x 9 x 7 1/2 in. and hundreds of other useful sundries. Price only 19/6 plus 7/6 carriage and packing.



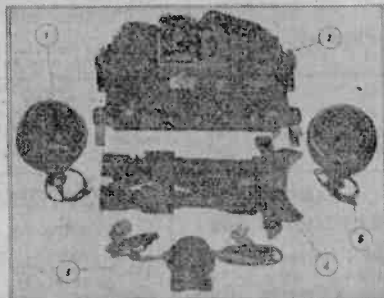
**Welding Transformer**

Output 2/3 volts by high and low switch. Continuous rating 250 amps. Intermittent for spot welding exceeds 2,000 amps. Unused, slightly soiled, but perfect working order. £3.10.0 plus 3/6 carriage.



**Breakdown Unit**

Receiver Type 3085. Over 30 lbs. of useful spares including metal rectifiers, transformers, pot. meters, switches, valve holders, resistors, coils, coil formers, knobs, pye plugs, sockets, slow-motion drives, trimmers, etc. etc. Must have cost £100 each. Slightly soiled but most parts usable. 15/- plus 10/- carriage.



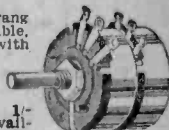
**TABBY EQUIPMENT COMPLETE**

Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, powerpack for 8 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—£8.19.6 or 10/- deposit and 15 fortnightly payments of 10/-.

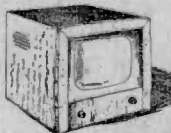
**FOR ADDRESSES SEE OPPOSITE PAGE**

**Morganite Potentiometers**

Single and 2-gang types available, standard size with good length spindle, all new and boxed. Single types, 1/- each, values available: 5K, 10K, 25K, 50K, 100K, 250K. 1 meg. 2 meg. Gang type 3/- each—values available: 5K+5K, 10K+100K., 1 meg.+1 meg., 2 meg.+2 meg.



**Now reduced to 19/6**



14in. T.V. cabinet of the latest styling—beautifully veneered and polished—limited quantity. sale price 19/6 each. Carriage and packing 3/6 extra. Masks 10/- extra.

**Thermostats**

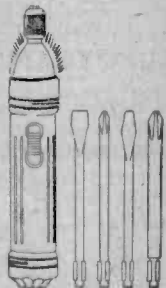


Useful for the control of appliances such as convectors, gluepots, vulcanisers, hot plates, etc. Adjustable to operate over temperature range 50-550 deg. F. fitted with heavy silver contacts, 8/6. Other types: 11 amp., 3/6; 5 amp., 9/6; 2 amp. QMB, 5/6; 15 amp. QMB, 15/- amp. enclosed wall mounting type, 29/6.

**Transistor Snip**

Equivalent of red spot—suitable all if circuits—tested before despatch. 4/6 each.

**For Your Service Department**



An invaluable tool for working inside a dark cabinet or cupboard. This is a screwdriver with torch and has four interchangeable bits, two for the ordinary slotted screws and two for Phillips heads. The torch section operates from 1 1/2 v. batteries in the handle and will save its cost in frayed tempers alone. Why not treat yourself to one of these now? Only 10/6, plus 1/6 post and packing.



**1960 ALL Mains Amplifier**



Undoubtedly finest value obtainable in amplifiers—powerful three valve circuit ideal for dances, parties, etc. Complete with valves, mains, transformers, volume and tone controls, but less chassis, speaker and cabinet. Price only 29/6, plus 2/6 post and ins. Data free with parts or available separately 1/6.

**Band III Converters**



Suitable Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF80 valves, coils, fine tuner, contrast control, condensers and resistors. (Metal case available as an extra.) Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately 1/6.

Please send two more kits, the one you sent last week is performing magnificently. We receive this sort of letter every day of the week, so if you have hesitated because you thought our kits too cheap you need hesitate no longer. Luminous switch, double pole designed for electric blankets, neon indicators glow when appliance is switched on. 10/-.

**Cabinet Snip**



This fine cabinet as illustrated but less control knobs is available this month at a special snip price of 12/6, plus 3/6 post and insurance. Size is 13 1/2 x 9 x 4in. and it is nicely covered in two tone I.C.I. fabric.

**Glass Panels**

Size 10 1/2 x 9 1/2—parcel of five panels.

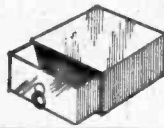
**7/6**

Plus 3/6 carr.



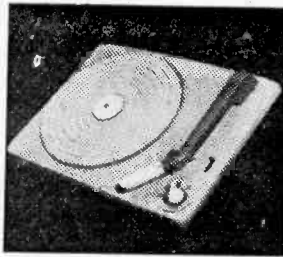
**Component Storage Drawers**

Stout board construction these drawers are ideal for small parts. Supplied complete with simple erection instructions—1/6 each or 12 drawers each 6 x 2 1/2 x 6 1/2in., 13/6, post 2/-.



**Philips AG2009 Transcription Unit**

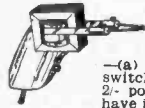
Philips AG2009 Record Player, a modestly priced 4-speed unit with many outstanding features, is ideal for the enthusiast who is assembling his own equipment or modernising an older installation. The pick-up arm is wired for stereo and the Philips stereo head is available as an optional extra.



Eddy Current Brake gives +2% fine adjustment on all four speeds. Continuously variable pick-up playing weight (2-12 gms.). Supplied with Philips Hi-Fi crystal head, type AG3019 for microgroove and 78 r.p.m. Frequency response 30-15,000 c/s. Pick-up lifting and lowering device. Individually balanced heavy turntable. Muting switch fitted.

Can be used with any amplifier or radio set. Complete with monaural pick-up, £10.10.0, or £1 deposit and 21 fortnightly payments of 10/-. Available also with stereo head, diamond or sapphire stylus. Prices on request.

**Making a Solder Gun**



A 7-second solder gun of the type costing 23/4 was described in "Practical Mechanics". Only two essential parts are required —(a) the transformer and (b) the push switch. These we can supply at 11/6, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

**The Taylor Meter Model 127A**

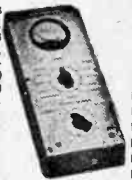


A pocket size meter but with a big scale and a sensitivity of 20,000 Ohms per volt D.C., therefore an ideal unit for television servicing — robustly made and complete with leads and prods—20 ranges as follows: D.C. current 50 micro-amps, to 1 Amp. D.C. voltage—0-1,000 volt in seven ranges (25 KV, with external probe, optional extra). Volts A.C.—0-2,500 in six ranges. Ohms—0-20 Ohm in three ranges (self-controlled).

Self-contained 3 1/2in. movement. Price £10 or 10/- deposit and 21 fortnightly payments of 10/-. Non-callers add 5/- carriage and insurance.

**A.C./D.C. Multimeter Kit**

Ranges: D.C. volts 0-5, 0-50, 0-100, 0-500 0-1,000. A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 D.C. milliamps 0-5, 0-100 0-500. Ohms 0-50,000 with internal batteries. 0-500,000 with external batteries. Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions price 19/6, plus 2/6 post and insurance.

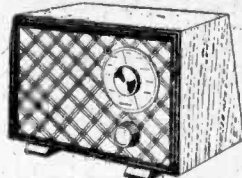


**Crystal Mike by Acos**



Model 39/1, this is ideal for tape or general amplifiers, complete with screened lead 39/6, plus 1/- post.

**New Improved Circuit for the 1960 Skysearcher**



This is a three valve receiver kit using modern circuitry. Ideal as a second set for the bedroom, workshop, etc. All parts including mains transformer, valves, resistors, coils, etc., but not cabinet, chassis or speaker, 29/6, plus post and ins. 3/6. Data free with parts or available separately 1/6.

**Service Data**

100 service sheets, covering British receivers which have been sold in big quantities and which every service engineer is ultimately bound to meet. The following makers are included: Aerodyne, Alba, Bush, Cosor, Ekco, Ever-Ready, Ferguson, Ferranti, G.E.C., H.M.V., Kolster Brandes, Lissen, McMichael, Marconi, Mullard, Murphy, Philco, Philips, Eya, Ultra. Undoubtedly a mine of information invaluable to all who earn their living from radio servicing. Price £1 for the complete folder.

**Hi-Fi Snip Infinite Wall Baffle**



Nicely veneered and polished. Corner fitting (attaches to picture rail). Takes up no floor space. Gives really fantastic results with only low-priced 8 in. speaker fit using for tweeter. Only 45/- each, carriage and insurance 3/6.

**ELECTRONIC PRECISION EQUIPMENT LTD.**

66 GROVE ROAD, EASTBOURNE, SUSSEX

This is the correct address for post orders and for prompt attention please mark your envelope Dept. 7, also enough for postage.

Electronics (M.P.) Ltd., 520 High Street North, Manor Park, E.12  
Phone: Hford 1011  
Half day Thursday

Electronics (Ruislip) Ltd., 42-46 Windmill Hill, Ruislip, Mddx.  
Phone: RUISLIP 5780  
Half day Wednesday

Electronics (Crowdon) Ltd., 266 London Road, Crowdon.  
Phone: CRO 6558  
Half day Wednesday

Electronics (Finsbury Park) Ltd., 29 Stroud Green Rd., Finsbury Park, N.4.  
Phone: ARChway 1049  
Half day Thursday

# EASY AS A.B.C. TO BUILD

The new, exciting De Luxe "Gold Star" Pocket Radio in beautiful moulded plastic case— This model is a highly sensitive, self-contained set covering all medium waves. Uses modern miniature "button-base" valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans—the case is supplied ready drilled! Size of radio only 4 1/4 in. x 2 1/4 in. x 4 1/4 in. —and batteries fit inside. We can supply all parts including case, detachable aerial, instruction book, wire, screws, etc. for only 37/6, plus 2/6 Post and Packing (C.O.D.)

### 37/6



2/- extra. (Parts sold separately, priced parts list 1/6.)



### 29/6

Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1 1/4 in. x 1 in. x 1 1/4 in. —"feather-weight"—yet gives clear, crisp, personal-phone reception over all medium waves. Tiny battery inside lasts months—costs 6d. No snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only 29/6 (add 2/6 Post. etc.). C.O.D. 2/- extra. (All parts sold separately, priced parts list 1/6.) Send Now!

Can Be Built for 47/6. Build this exceptionally sensitive high efficiency personal phone radio. Uses unique assembly system and can be built by anyone without any radio knowledge whatever in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6 1/4 in. x 5 in. x 3 in. Covers all medium and long waves. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holiday, etc. BUILD THE "SKY-ROMA" NOW! Total building cost—everything down to the last nut and bolt. 47/6 (Postage, etc., 2/-)—with full set of clear, easy-to-follow plans. (Parts sold separately. Priced parts list and plans 1/6.) C.O.D. 2/- extra.



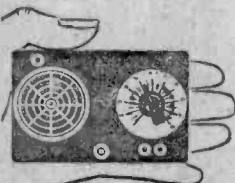
### 47/6



## THE SENSATIONAL POCKET RADIO!

### 29/6

The sensational "Silvertone" model A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" building cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4 1/4 in. x 2 1/4 in. x 4 1/4 in.—a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, screws, wire, etc. for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/6.)



### THIS TRANSISTOR SET Can Be Built For Only 29/6.

### 29/6

The "Sky-Scout" Pocket two-stage transistor set, size only 1 in. x 3 1/4 in. x 4 1/4 in. Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- Post and Packing, INCLUDING CASE, TRANSISTOR, STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS, nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list and plans 1/6. VERY SIMPLE TO BUILD.



## MATCHBOX SIZE RADIO!

This amazing "Tiny-Tim" model—no larger than a match box—costs nothing to run—ever! No batteries! No Valves! No complete electricity! Will never run down or burn out. Uses the latest TRANSISTOR TYPE GERMANIUM DIODE, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can build it within an hour using our step-by-step instruction book, etc. for only 17/6, plus 2/- Post and Packing (C.O.D. 2/- extra). (Parts sold separately, priced parts list 1/6.)

### 17/6

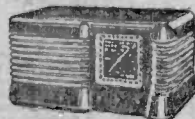


### Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step! Remarkably sensitive—covers all medium waves, inc. Luxembourg, Home, Light. Size only 2 1/4 in. x 3 1/4 in. x 5 1/4 in.—Not a Toy! But a Real Personal-phone, Valve Radio with Detachable Aerial IDEAL FOR BEDROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc. for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately, priced parts list 1/6.) Send Today! Money refunded if parts returned intact within 7 days.

### 39/6

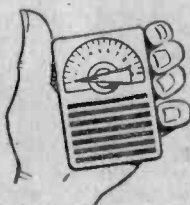
Choice of beautiful walnut veneered cabinet or ivory bakelite. This is the

### 107/6



lowest possible price consistent with high quality. No radio knowledge whatever needed

can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard coil-base valves. (Low running costs—approximately 18 watts.) Size 12 in. x 6 in x 5 in. Build this long-range powerful midget NOW. TOTAL BUILDING COST INCLUDING PLANS, ETC., 107/6. (Post and Packing 3/6.) Parts sold separately. Priced parts list and plans 1/6. C.O.D. 2/- extra.



### 45/-

**TWO-TRANSISTOR POCKET SET.** Can Be Built for 45/-. BUILD THE "SKY-ROMA" NOW! TWO TRANSISTOR RADIO which gives a superb performance and is highly sensitive. Weight under 7 ozs.—yet it is a THREE-STAGE receiver covering all medium waves, working entirely off a "penlight" battery. Every part tested before despatch! SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS. Total building cost including case, transistors, etc.—everything down to the last nut and bolt—ONLY 45/- with plans. Postage, etc. 2/- (C.O.D. 2/- extra.) (Parts sold separately. Priced parts list and plans 1/6.) RUSH YOUR ORDER TODAY!

## CONCORD ELECTRONICS

210, Church Road, Hove, Sussex

Dept. PW19

Orders receive prompt attention. Cheques accepted. Cash on delivery 2/- extra. Please print name and address in block letters. Suppliers to Schools, Universities, Government and Research Establishments. Complete range of components and valves stocked. Regret no C.O.D. abroad. DEMONSTRATIONS DAILY AT WORKS.

**LOOK—ONLY £6-17-6!**



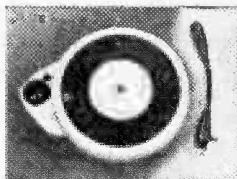
**BRAND NEW—NOT SURPLUS!** In maker's sealed cartons. Latest UAS "Monarch" 4-speed record-player complete with High-fidelity "turnover" head. Type HGP 37—1 Capacity of 10 Records, plays 12in., 10in. and 7in. intermixed in any order, 78, 45, 33 $\frac{1}{3}$  and 16 r.p.m. For A.C. mains 100 to 250 volts. Exclusive "magdisk" selector gives quickest and quietest change over. With full instructions and fixing plans. Limited quantity at £6.17.6 plus 4/6 Post, Packing, etc. **WHY PAY MORE?**

**LIMITED QUANTITY "CABY" TESTMETERS!** Never before such amazing value! A high grade universal testmeter. Large scale (3 $\frac{1}{2}$ in.), highly sensitive movement (500 Micro Amps) Measures A.C. Volts, D.C. Volts, D.C. Current, Ohms, Decibels. Inductance and Capacitance Ranges: D.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v., A.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v., D.C. Current—0-500 Micro-Amps, 25 Milliamps, 250 Milliamps. Resistance—0-10 K ohms and 1 Megohm. Decibels—-20 dB. to -42 dB. and -20 dB. to -30 dB. Capacitance—100 pfd. to 0.8 mfd. Inductance—10 to 1,000 Henries (also with external D.C. voltage will measure to 100,000,000 ohms!). A beautiful, strongly-made instrument. Brand New, not a kit, at only 97/6, incl. test prods, instruction book and internal batteries (replacements cost only 6d. ea.). Plus 2/6 P. & P. (C.O.D. 2/- extra.)

**LOOK AT THESE "CONCORD" BARGAINS**

**Build this MAINS "FRYING PAN" RADIO for only 67/6!**

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141K, 2201A, C14FM, CRM141, CRM142, CRM143, MW36-24, MW36-44	£3-5	£5-5	
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AMAZINGLY POPULAR-IDEAL SECOND SETS

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Latest B.M.R. TUO Turntable, together with lightweight Starulax dial sapphire crystal turnover pick-up head. **£3/10/-** Carr. Truly amazing value at 3/.

**1 WATT TRANSISTOR**  
Output Stage. Manufacturers' matched pair GEL15 Transistors with push-pull input and output Transformers and Amplifier circuit.

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Min. 8 - 3in. 11/- 10in. 13/-  
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25 FT. P.V.C. insul., excellent (15 coils, diff. colours, 4/6)

B.S.R. MONARDECK TAPE DECKS 49 10 0  
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**12in. TV'S** 5 channel table models including speaker, line transformer cabinet. Top make requiring only valves and tube to complete, your choice if available (carr. 4/-). (Or £3 per dozen, carr. free.) **15/-**

**14in. TV'S** 5 channel as above **35/-** (carr. 4/-)  
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Assortment of miniature silver mica and ceramic condensers, 0.1-1000 P.P. Dist. value over 25/-

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EMI 4-speed Stereo ... 18 10 0  
GARRARD 4-speed 48P ... 17 7 6  
GARRARD 4-speed TA MK11 ... 28 10 0  
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**VALVES SOILED, GUARANTEED 3 MTHS.**

**EY51, PL81 AMAZING 5/-**  
**TAPE RECORDERS** (Carr. Free)

**LATEST ALBA.** Using the B.S.R. Monardeck 3 1/2 I.P. tapes 5 1/2 in. spools, and is absolutely complete in attractive carrying case. 28 kas. ELPICO tape recorder, similar to above. 26 kas. FIDELITY Super tape recorder. 29 kas.

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**FREE TRANSIT INSURANCE.** All valves are new or of fully guaranteed ex-manufacturer or ex-equipment origin. Satisfaction or Money Back Guarantee on goods if returned unused within 14 days.

024	5/8 6AT6	7-8 6AQT	6/8 6X5GT	6/8 12X7GT	5/8 50A5	9/9 6DF3	9/9 6DC91	5/9 6E11	4/9 6H78	18/- 6H160A4	4/9 6UH81	8/8	
1A0T	5/8 6AU8	7/9 6K7	9/9 7A7	10/6 12K8GT	11/6 80D04T	18/- 6F10	4/- 6EX32	6/9 6M34	8/8 6H08	18/- 741	7/8 6UCL82	11/3	
1A7GT	11/9 6B7	9/6 6K7G	2/5 7B5	12/6 12Q7GT	5/8 50L6GT	9/9 6F99	7/9 6KX33	7/- 6M80	9/3 6N52	10/6 6H120C	12/6 6UCL83	13/6	
1D0T	9/9 6B8G	3/8 6K7GT	5/- 7B6	9/6 12M7GT	6/- 53K11	10/6 6H63	6/9 6KX74	8/9 6M81	9/3 6P41	4/8 114	8/4 6UFL1	8/8	
1G5	9/8 6B8B	6/- 6K8B	5/8 7B7	7/3 12M7	5/8 54K10	8/9 6H76	5/8 6KX80	8/9 6M84	9/9 6P6	2/3 118	8/6 6UF42	8/8	
1H5	9/9 6B8C	3/8 6K8C	11/3 7C3	7/9 12M7	5/8 51SPT	11/- 6H77	7/9 6KX80	9/9 6M85	10/6 6PAC90	10/6 6UFL2	8/6 6UFL3	9/4	
1H6GT	9/9 6H09G	12/6 6K25	7/6 7C6	7/9 6E22N7GT	8/6 7C7	8/- 6K32	11/9 6KX129	9/9 6N51	16/- 6PC94	7/6 7U24	16/- 6U95	9/6	
114	3/8 6B8H	6/- 6L1	12/6 7E7	9/6 12X4	9/6 7T7	8/9 6K91	8/- 6KX81	9/9 6N51	6/9 6C85	9/3 6U25	12/6 6UFL6	14/6	
115	3/8 6H1J6	8/- 6L5	9/6 7K7	7/6 148T	14/8 9T8	7/6 6K92	8/6 6C135	7/6 6M148	8/9 6PC88	13/9 6U26	11/4 6UFL9	7/3	
1LNS	4/8 6B7R	9/9 6L6G	8/9 7K7	8/- 149Q3	7/9 9T8	6/8 6K96	7/9 6KX142	8/9 6Y99	8/4 6PC89	13/9 6U31	7/3 6UFL1	7/8	
1N0T	9/9 6B7W	7/9 6L7	9/- 7K1	10/6 19B46G	18/- 858	9/6 6L33	8/6 6KX163	8/6 6C190	8/6 6C190	8/6 6C190	12/- 6UFL4	12/6	
1R4	8/- 6B7W	6/8 6L7G	7/8 787	9/8 20D1	9/6 90A9	4/6 6L33	9/9 6C180	7/6 6L40	6/9 6CF82	7/6 6U35	8/9 6UFL4	6/6	
1R4	8/8 6B7W	5/8 6L18	9/- 7V7	7/6 20E2	9/6 117Z7	10/6 6L33	9/9 6KX182	10/- 6L41	7/6 6C192	8/6 6U37	26/6 6UFL4	7/9	
1R5	5/8 6C3	8/6 6L19	12/6 7Y4	7/- 29L1	13/6 186HT	16/- 6L91	8/9 6C183	14/6 6L90	6/3 6C193	11/6 6U43	8/9 6UFL9	6/6	
1T4	4/3 80C4	9/6 6L19	8/8 7Y4	7/8 30Y1	11/3 725A	29/6 6L92	8/6 6E122	12/- 6L91	7/- 6P154	8/9 6U50	6/4 6UFL6	12/6	
2D21	4/8 6C08	4/8 6L19	7/6 8Z3	9/6 12M7	6/8 80T4	7/6 6L93	6/9 6E134	3/8 6L91	7/- 6P155	4/8 6U52	5/4 6UFL7	8/8	
3A4	5/8 6C09	9/6 6L20	8/6 10C1	11/- 20P4	17/- 80T5	6/9 6L96	7/6 6E139	4/8 6C238	8/9 6P155	7/6 6U53	5/6 6UFL8	10/6	
3Q4	7/6 6D0HG	18/6 667	8/6 10A2	13/6 20P5	18/- 8008	18/- 6A59	10/6 6D140	13/6 6C238	12/6 6P156	8/9 6U54	5/6 6UFL9	11/6	
3Q5GT	8/9 6C16	9/6 6L1	14/- 10C14	9/6 25A0	8/6 955	3/9 6A0B0	7/6 6F141	8/8 6C237	10/6 6L93	8/9 6U101	14/6 6UFL1	11/6	
3R4	6/- 6D1	9/6 6E25	9/- 10P1	9/6 25A0	8/6 955	2/9 6A0C1	9/9 6E142	7/6 6A0C2	9/6 6L94	11/- 6U55	9/6 6UFL4	6/6	
3V4	7/- 6D2	9/9 6E28	12/6 10P9	10/3 33L6GT	8/- 8050	5/8 6A0F2	8/6 6E143	8/6 6E144	11/4 6D1D9	8/6 6L95	14/6 6UFL2	15/- 6U55	9/9
5840	9/6 6D3	12/6 80Q7G	6/9 10L14	8/- 26V5G	9/6 97E3	10/- 6B34	10/- 6E145	11/4 6E146	8/6 6L96	9/9 6U101	14/- 6UFL3	10/6	
5840	5/- 6D4	4/9 80Q7G	9/3 10L13	8/3 25Z4G	7/6 90M1	10/- 6E34	7/- 2/6 6L95	7/6 6L96	7/6 6L97	7/6 6U101	14/- 6UFL3	10/6	
5V40	9/6 6E1	5/8 6E17G	7/6 10L11D	8/9 25Z5	8/- 9003	4/- 6E31	8/9 6E14	3/8 6E147	8/9 6L97	7/6 6U101	14/- 6UFL3	10/6	
6V40	6/- 6E6G	8/6 6E6A7	5/9 10L13	9/6 25Z4	8/- 9004	5/9 6E33	9/4 6E149	8/9 6E148	8/9 6L98	7/6 6U101	14/- 6UFL3	10/6	
6X3GT	8/6 6E6M	7/- 6E67	4/9 10P14	9/6 27E8	18/- 4Z31	9/6 6E35	5/- 6E145	7/6 6E149	8/9 6L99	8/9 6U101	14/- 6UFL3	10/6	
6Z40	8/6 6E12	3/6 6E67	4/9 10P15	8/- 280C1	7/6 838	8/6 6E36	8/6 6E149	8/6 6E149	10/3 6T44	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6Z40T	11/4 6E13	6/9 6E67	5/- 12A5	5/3 30P5	7/6 865	4/6 6E37	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A7	10/- 6E14	9/6 6E67	5/9 12A7H	6/8 40D1L	9/6 6C133	21/- 6E38	8/6 6E149	8/6 6E149	3/8 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E15	8/6 6E17GT	6/- 12A8	9/6 10L1	7/9 6C133	7/6 8E39	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8GT	13/6 6E16	9/6 6E17GT	4/9 12A8	7/9 90P4	12/6 6C133	18/- 6E121	14/- 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8H	8/6 6E17	8/6 12A7	5/- 12A7	8/- 6C31	9/6 80P12	8/- 6C31	9/6 6E149	21/- 6E38	7/9 6T01	14/- 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E18	8/6 12A7	6/8 12A7	7/9 10D3	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E19	8/6 6E17GT	6/- 12A8	9/6 10L1	7/9 6C133	7/6 8E39	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	9/6 6E20	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8G	6/9 6E23	6/9 12A7	5/- 12A7	5/9 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	10/6
6A8T	4/3 6E24	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E25	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8G	6/9 6E26	6/9 6E17G	4/9 12A8	5/9 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	8/- 6C31	9/6 80P12	10/6
6A8T	4/3 6E27	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E28	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E29	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E30	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E31	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E32	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E33	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E34	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E35	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E36	2/9 6E17G	4/9 12A8	8/- 33L6GT	9/- 6E152	8/6 6E31	4/6 6E149	8/6 6E149	8/6 6E149	8/6 6E149	8/6 6U101	14/- 6UFL3	10/6
6A8T	4/3 6E37	8/6 12A7	5/- 12A7	6/8 10P16	7/9 10D3	1/8 6E32	3/8 6E32	4/6 6T01	4/6 6T01	8/9 6E149	8/9 6U101	14/- 6UFL3	10/6
6A8G	9/6 6E38	2/9 6E17G	4/9 12A8	8/- 33L6GT	9								

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## YOU CAN BUILD A COMPLETE TAPE RECORDER

**A SELECTION OF HIGH FIDELITY PORTABLE TAPE PREAMPLIFIERS**

Adds "Hi-Fi" TAPE RECORDING TO YOUR EXISTING AUDIO INSTALLATION

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Dep. £3.8.0 and 12 of £1.4.11.

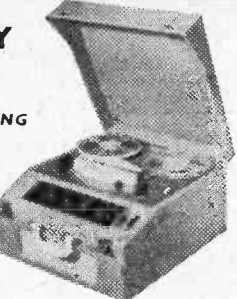
ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT FOR £11.15.0 and £14.10.0, respectively. WHEN ORDERING PLEASE STATE MAKE OF TAPE DECK TO BE USED. We present this "Hi-Fi" Preamplifier strictly to Mullard's specification incorporating ONLY NEW HIGH-GRADE COMPONENTS and the SPECIFIED NEW MULLARD VALVES. It comprises a COMPLETELY SELF-CONTAINED UNIT, neatly finished in Hammered Gold with a very attractively engraved PERSPEX FRONT PANEL.

### FOR PERMANENT HIGH FIDELITY INSTALLATIONS WE ALSO OFFER (excluding case)

- (a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PREAMPLIFIER and Power Unit Assembled and Tested. **£32.10.0**
- (b) As above but TYPE "C" PREAMPLIFIER supplied as complete KIT OF PARTS H.P. Deposit £8.10.0 and 12 months £2.7.8. **£29.0.0**
- (c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PREAMPLIFIER & Power Unit assembled, tested. **£35.0.0**
- (d) As (c) but Type "C" as COMPLETE KIT OF PARTS H.P. Deposit £7.11.4 and 12 months £2.11.4. **£32.0.0**
- (e) The TRUVOX Mk. VI DECK and the assembled Type "C" Preamplifier and Power Unit. H.P. Deposit £8.0.0, and 12 months £2.18.3. **£40.0.0**
- (f) As above but Type "C" as complete KIT OF PARTS H.P. Deposit £8.0.0, and 12 months £2.18.3. **£36.10.0**
- (g) The BRENNELL Mk. V DECK and the assembled Type "C" PREAMPLIFIER and POWER UNIT H.P. Deposit £9.4.0. and 12 months £3.7.6. **£46.0.0**
- (h) As (g) but Type "C" as complete KIT OF PARTS H.P. Deposit £9.4.0. and 12 months £3.7.6. **£43.0.0**
- (i) The WEARITE 4A DECK with TYPE "C" assembled and tested. H.P. Deposit £11.4.0. and 12 months £4.2.1. **£56.0.0**

(Carriage and Insurance on above quotes 10/- extra.) PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE

**STERN RADIO LTD.**  
109 & 115 FLEET ST LONDON, E.C.4  
Telephone: FLEET STREET 5812/3/4



for **£36.0.0**

- H.P. TERMS Deposit £7.4.0. 12 months £2.12.10.  
**FOR THIS WE SUPPLY:**
- ★ COMPLETE KIT OF PARTS TO BUILD THE HF/TR3 TAPE AMPLIFIER.
  - ★ THE NEW COLLARO "STUDIO" TAPE DECK.
  - ★ PORTABLE CARRYING CASE (as illustrated).
  - ★ ROLA/CELESTION 10in. x 6in. P.M. LOUDSPEAKER.
  - ★ ACOS CRYSTAL MICROPHONE, 1,200ft. SPOOL E.M.I. TAPE.

For those who prefer another type of TAPE DECK we will supply precisely as above—but IN PLACE of the COLLARO "STUDIO" DECK—WE INCLUDE: "TRANSCRIPTOR" **£39.15.0**

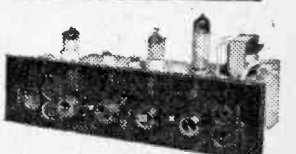
- (a) The Mk. IV COLLARO TAPE DECK H.P. Deposit £8.0.0 and 12 months £2.19.2. (£1 extra to wire up the Transcriptor Switch Banks.) **£45.0.0**
  - (b) The New TRUVOX Mk. VI DECK H.P. Deposit £9.0.0 and 12 months £3.6.0. (Carriage and Insurance on all above is 12/8 extra.) **£45.0.0**
- For Constructors with their own Cabinet WE OFFER**
- (a) COMPLETE KIT to build the HF/TR3 Amplifier, together with the COLLARO "STUDIO" DECK. **£28.0.0**
  - (b) As above but with HF/TR3 supplied ASSEMBLED AND TESTED H.P. Deposit £6.6.0 and 12 months £2.8.2. **£31.10.0**
  - (c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK. (£1 extra if we are required to wire up Deck Switch Banks.) **£30.15.0**
  - (d) As above but HF/TR3 supplied ASSEMBLED AND TESTED H.P. Deposit £7.0.0 and 12 months £2.10.5. **£34.10.0**
  - (e) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK. **£36.0.0**
  - (f) As above but HF/TR3 supplied ASSEMBLED AND TESTED H.P. Deposit £7.18.0 and 12 months £2.17.11. **£39.10.0**
  - (g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENNELL Mk. V TAPE DECK. **£41.10.0**
  - (h) As above but HF/TR3 supplied ASSEMBLED AND TESTED H.P. Deposit £9.0.0 and 12 months £3.6.0. **£45.0.0**

Carriage and Insurance on each above is 10/- extra. Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA/CELESTION 10 x 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1,200ft. SPOOL E.M.I. TAPE—ALL FOR £8.0.0. Carriage and Insurance 5/- extra.

**WE HAVE THE NEW 2 SPEED TWIN TRACK TRUVOX Mk VI TAPE DECK IN STOCK £26.5.0**  
DEPOSIT: £5.5.0 and 12 MONTHS £1.18.6.

### THE MODEL HF/TR3 TAPE AMPLIFIER

**INCORPORATING 3-SPEED TREBLE EQUALISATION** by means of the latest FERROXCUBE POT CORE INDUCTOR. **PRICE FOR COMPLETE KIT OF PARTS £12.15.0**  
**PRICE FULLY ASSEMBLED & TESTED £16.10.0**



**HIRE PURCHASE.** Deposit £3.6.6 and 12 monthly payments of £1.4.2. A very high-quality Amplifier based on the very successful TYPE "A" design completed in the MULLARD LABORATORIES. ONLY NEW HIGH-GRADE COMPONENTS are incorporated including MULLARD VALVES and a GILSON OUTPUT TRANSFORMER—other features are—Magic Eye Recording hand indicator—Effective Tone Control—Monitoring and Extension Speaker Sockets—has own Power Supply and can be used as independent Amplifier for direct reproduction of Gram Records or from Radio Tuner. Overall size 11 x 6 x 6in. Can be supplied for use with Truvox—Collaro—Lane—Brennell or Motok Decks. Please specify which. Send S.A.E. for leaflet or 2/6 for complete Assembly Manual.

# STERN'S MULLARD DESIGNS

Designed by MULLARD—presented by STERN'S strictly to specification

## COMPLETE KIT OF PARTS—

### MULLARD "5-10" MAIN AMPLIFIER

For use with the MULLARD 2-stage pre-amplifier with which an undistorted power output of up to 10 watts is obtained. We supply SPECIFIED COMPONENTS AND NEW MULLARD VALVES, including PARMKO MAINS TRANSFORMER and choice of the latest Ultra-Linear PARMKO or the PARTRIDGE Output Transformer. PRICE COMPLETE KIT (PARMEKO Output Trans.) **£10.00**

Alternatively we supply ASSEMBLED AND TESTED **£11.10.0**

ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, £1.6.0 EXTRA



## MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE COMPLETE KIT OF PARTS ASSEMBLED AND TESTED **£8.0.0**

Supplied strictly to MULLARD'S SPECIFICATION and incorporating:

- Equalisation for the latest R.I.A.A. characteristics.
- Input for Crystal Pick-ups, and variable reluctance magnetic types.
- Input (a) Direct from High Imp. Tape Head. (b) From a Tape Amplifier or Pre-amplifier.
- Sensitive Microphone Channel. • Wide range BASS and TREBLE Controls



## COMPLETE MULLARD "5-10"

The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Only Specified Components and new MULLARD VALVES are supplied including PARMKO MAINS TRANSFORMERS and choice of the latest PARMKO or PARTRIDGE Ultra-Linear Output Transformers.

PRICE COMPLETE KIT OF PARTS OR ASSEMBLED AND TESTED **£13.10.0**

HIRE PURCHASE (Assembled Amp. only). DEPOSIT £2.14.0. 12 months at 19/10.



ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. £1.6.0 extra.

## COMPLETE MULLARD "3-3"

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT. COMPLETE KIT **£7.10.0** OR ASSEMBLED AND TESTED **£8.19.6** (plus 6/6 coverage and insurance) H.P. Terms: Deposit £2.0.0 and 8 months at £1.0.0. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMKO OUTPUT TRANSFORMER.



## STEREO "3-3" MAIN AMPLIFIER

Comprises two "3-3" MULLARD MAIN AMPLIFIERS on one chassis and is designed to operate with our DUAL CHANNEL PRE-AMPLIFIER for both STEREOPHONIC or MONAURAL operation. Its output power is 6 watts (3 watts per channel).

PRICE: COMPLETE KIT **£10.0.0**

Alternatively ASSEMBLED AND TESTED **£11.15.0**

H.P. Terms: Deposit £2.7.0 and 12 months at 17/4.



## SPECIAL PRICE REDUCTIONS

(c) The KIT OF PARTS to build both the "5-10" Main Amplifier and the 2-valve PRE-AMP CON: **£15.15.0**

(d) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. £9.16.0 and 12 months of £1.7.8 **£18.18.0**

(e) The KIT OF PARTS to build the DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CON: **£21.10.0**

(f) The DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED **£25.0.0** H.P. Terms: Deposit £5 and 12 months of £1.16.8.

(g) The KIT OF PARTS to build one "5-10" MAIN CHANNEL PRE-AMP CONTROL UNIT **£21.10.0**

(h) ONE "5-10" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER both ASSEMBLED and TESTED **£25.0.0**

H.P. Terms: Deposit £5, 12 months of £1.16.8.

(i) KIT OF PARTS to build Two "5-10" MAIN AMPLIFIERS (incorporating Parmeko Output Transformers) and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT **£31.0.0**

(j) TWO "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0** H.P. Terms: Deposit £7.4.0, 12 months £2.1.0.

Carriage and Insurance 7/8 extra. Prices quoted are subject to £1.6.0 extra for Partridge Transformer.

## STEREO DUAL CHANNEL PRE-AMPLIFIER

This model incorporates two Mullard 2-valve Pre-Amplifiers combined into a Single Unit enabling it to be used for both STEREOPHONIC or MONAURAL operation. It is designed primarily to operate with our range of MULLARD MAIN AMPLIFIERS but will also operate equally well with any make of Amplifiers requiring an input of 250 mvolts. COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0** Operates equally well for MONAURAL only operation with one "5-10" Main Amplifier to which the second Main Amplifier can at anytime be added, thus very easily providing for both STEREO or MONAURAL reproduction. THE ASSEMBLY MANUAL is available for 3/-



## COMPLETE STEREO AMPLIFIER

A thoroughly recommended Mullard design that very effectively meets the many requests for a low-priced but good quality DUAL CHANNEL STEREOPHONIC AMPLIFIER. Output power is 4 watts from STEREO or MONAURAL gram inputs. **£8.10.0** PRICE: COMPLETE KIT OF PARTS **£10.10.0** ALTERNATIVELY ASSEMBLED AND TESTED



## RADIOGRAM CHASSIS!

### and V.H.F. RADIO TUNING UNITS

WE HAVE THE COMPLETE RANGE OF ARMSTRONG and DULCI high quality replacement Chassis in STOCK. Descriptive leaflets are available—enclose S.A.E.

Please enclose S.A.E. for DESCRIPTIVE LEAFLETS COMPLETE ASSEMBLY MANUALS are available at 1/6 each.

## !! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET

B.S.R. MONARCH UA8 4-speed mixer Autochanger with Crystal Pick-up. **£6.19.6**

The NEW COLLARO MODEL RP594 4-speed Single Record Player. Studio Cartridge. **£9.18.9**

The COLLARO "CONQUEST" 4-speed Autochanger Studio Pick-up. **£7.10.0**

The COLLARO 4-speed Single Record Player. Studio Pick-up. **£6.9.6**

THE NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER. **£8.7.6**

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records. **£10.10.0**

GARRARD MODEL TA.Mk.II 4-Speed Player fitted high output Crystal Pick-up. **£8.10.0**

GARRARD MODEL R210. Autochanger 4-Speeds. High output, Crystal Pick-up. **£10.0.0**

Carriage and Insurance on each above, 5/- extra.



# STERN RADIO LTD.



# Stern's "fidelity" TAPE RECORDERS

**BEFORE YOU BUY  
—YOU SHOULD  
HEAR THESE**

**RECORDERS. THEY ARE COMPARABLE  
TO THE MUCH HIGHER-PRICED MODELS**

There are no better value for money Tape Recorders on the market—if you can't call and hear them, send S.A.E. for fully descriptive leaflets.

**MODEL CR3/S** Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-Speed Deck H.P. Terms: Deposit £8.4.0 and 12 months of £3.0.2 **£41.0.0**

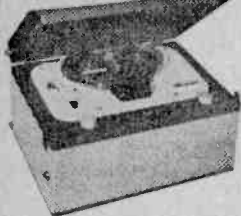
**MODEL CR3/T** Incorporates the very popular 3-Speed COLLARO Mk. IV "TRASCRIPTOR" Deck which has both upper and lower tape tracks **£49.10.0** H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.

**MODEL TR3/Mk. VI.** Incorporates the New TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck **£49.10.0** H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.

All prices quoted provide for the COMPLETE RECORDER including CRYSTAL MICROPHONE and 1,200 ft. Spool of Tape.

Each Model incorporates the highly successful HF/TR3 Amplifier (described opposite) thus ensuring truly "Hi-Fi" record and playback facilities.

Model HF/G2R



## and NOW WE INTRODUCE

### ① MODEL HF/G2P TAPE PREAMPLIFIER

The Ideal "Link" to add High Quality Tape Recording facilities to existing Audio Installations and the

### ② MODEL HF/G2A TAPE AMPLIFIER

Designed to our usual High Technical Standard. Being based on the very successful Mullard Tape Design. They incorporate MULLARD VALVES and only HIGH GRADE COMPONENTS

AS A RESULT WE PRESENT ...  
**TWO UNITS METICULOUSLY  
MATCHED TO CORRECTLY  
OPERATE**

### THE NEW GARRARD "MAGAZINE" TAPE DECK

Both Units form an entirely new "Easy to handle" presentation, each is completely self contained with Power Supply (Loudspeaker Amplifier HF/G2A only), and all INPUT and OUTPUT sockets incorporated on the chassis, which itself is constructed to allow for direct attachment to the tape deck. Thus the tape deck with the Amplifier (or Preamplifier fixed to it) form ONE COMPLETELY SELF-CONTAINED WORKING UNIT which requires only screwing into a Cabinet and Connecting to the Mains supply. As is usual with GARRARD products this Tape Deck is a Precision Engineered Unit of Excellent Quality operating two tracks at 3 1/2 in./sec. speed. It is the "Easiest to Handle" Tape Deck, having only two controls and incorporates the new instantaneous Tape Loading Magazine which makes tape loading as simple as putting on a Record.

**OVERALL PERFORMANCE IS REALLY EXCELLENT**

### A SPECIAL CASH ONLY OFFER !!

The very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER.

ALL for ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS. The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Resine. WE ALSO SUPPLY SEPARATELY—

(a) The 2-stage (plus £4.2.6

Rectifier) AMPLIFIER

(c) 6" P.M. SPEAKER 18/9

(b) The PORTABLE CARRYING CASE

£3.17.6 Carriage and Insurance 4/- extra.



### STERN'S MK. II "fidelity" F.M. TUNING UNIT

PRICE **£14.5.0** (Plus 5/- Carr. and Ins.)

HIRE PURCHASE: Deposit £2.17.0 and 12 Monthly Payments of £1.0.11

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps at 6.3 volts and 25 ma. at 250 volts.

**HOME CONSTRUCTORS ! YOU CAN BUILD THIS TUNING UNIT FOR ONLY £10.10.0 (Plus 5/- Carr. & Ins.)** Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6.



**109 & 115 FLEET ST., LONDON, E.C.4**  
Telephone: FLEET STREET 5812/3/4

PLEASE ENCLOSE S.A.E. WITH ALL ENQUIRIES.



WE OFFER AS FOLLOWS:

- (a) Model HF/G2R Portable TAPE RECORDER, includes spool of L.P. Tape and Crystal Microp. **£33.0.0** H.P. Terms: Deposit £5.12.0, 12 monthly payments £2.8.5
- (b) Model HF/G2A-D, comp. AMPLIFIER and TAPE DECK. Inc. spool of L.P. Tape and L/S. **£27.10.0** H.P. Terms: Deposit £5.10.0, 12 monthly payments £2.0.4
- (c) ASSEMBLED AND TESTED AMPLIFIER Model HF/G2A..... **£15.0.0** H.P. Terms: Deposit £3.0.0, 12 monthly payments £1.2.0
- (d) Model HF/G2P PORTABLE PREAMPLIFIER. Complete in Portable Case (like HF/G2R) **£30.0.0** H.P. Terms: Deposit £6.0.0, 12 monthly payments £2.4.0
- (e) Model HF/G2P-D, comp. PREAMPLIFIER and TAPE DECK. Includes spool of L.P. Tape. **£26.0.0** H.P. Terms: Deposit £5.4.0, 12 monthly payments £1.18.2
- (f) ASSEMBLED AND TESTED PREAMPLIFIER Model HF/G2P..... **£14.0.0** H.P. Terms: Deposit £2.16.0, 12 monthly payments £1.0.6

### THE "ADD-A-DECK" incorporating the NEW B.S.R. Carriage and Insurance, 10/-

Deposit **£3.12.0** **£17.17.0.**  
12 mths. £1.6.2

Designed to operate through the Pick-up Sockets of the standard RADIO RECEIVER through which first-class results are obtained. It consists of a Twin Track Tape Deck, incorporating matched Preamplifier, and operates at 3 1/2 in./sec. speed.



Supplied fully tested and completely assembled on an attractive wood plinth, and only requires connections to the mains supply and the Pick-up Sockets, for which purposes "floating" leads are incorporated.

### "Hi-Fi" LOUDSPEAKERS

WE HAVE IN STOCK A COMPLETE RANGE BY GOODMANS—WHARFEDALE—W.B.

Illustrated and Priced Leaflets on request.

### HOME CONSTRUCTOR

A RANGE OF "EASY TO ASSEMBLE" PREFABRICATED CABINETS. Designed by the W.B. "STENTORIAN" COMPANY for "Hi-Fi" Loudspeaker systems or to accommodate high-quality equipment. The acoustically designed Bass Reflex Cabinets containing the very successful "Stentorian" Speakers give really first-class reproduction and are well recommended. Models are also available to accommodate high-quality Amplifiers, Preamplifiers, Tuning Units, Record Players, etc. All models are very easily assembled, in fact, only a screwdriver is required. Fully illustrated leaflets are available, including specifications of the STENTORIAN LOUDSPEAKERS.

# Let I.C.S. train YOU!



**COURSES ON:—**

- **RADIO and TELEVISION**
  - **SERVICING ELECTRONICS**
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**C. & G. Radio Amateurs' Exam.**  
(Amateurs' Transmitting Licence)

**British Institution of Radio Engrs., etc.**

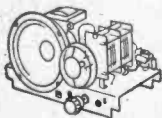
Whether you plan to have your own business, to become an electronics engineer or to take up a career in industry, an I.C.S. Course will help you to succeed. You learn at home in your own time, under expert tuition. Moderate fees include all books.

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### Practical Radio Course

● A basic course in radio, electronic and electrical theory backed by thorough practical training. You build a 4-valve T.R.F. and a 5-valve superhet radio receiver, signal generator and multi-tester.

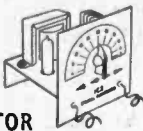
● Other Learn-as-you-Build radio courses are available



**5-VALVE SUPERHET RECEIVER**



**MULTI-TESTER**  
(Sensitivity 1,000 ohms per volt)



**RF/AF SIGNAL GENERATOR**

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for FREE book on careers in Radio, etc., and full details of I.C.S. Courses.

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(Dept. 171J), Intertext House, Parkgate Road, London, S.W.11.

Please send book on \_\_\_\_\_

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(Block Letters please)

Address \_\_\_\_\_

Occupation \_\_\_\_\_ 6-60

## INTERNATIONAL CORRESPONDENCE SCHOOLS

**SOUTHERN RADIO'S WIRELESS BARGAINS**

ATTACHMENTS for "18" Transreceivers. ALL BRAND NEW. HEADPHONES, 15/6; HAND MICROPHONE, 12/6; AERIALS, 5/-; SET OF 6 VALVES, 30/-.

CONDENSERS. 100 Assorted. Mica Tubular, etc. NEW, 15/-.

CONTACTOR TIME SWITCHES. 2 impulses per sec. in case 11/6

REMOTE CONTACTOR. For use with above. 7/6

LUBBRA HOLE CUTTERS. Adjustable 1/2" to 3 1/4". For Metal, Plastic, etc. 7/-

MAGNETS. Strong Bar Type. 2" x 1/2". 1/6 each.

MORSE TAPPERS. Midget Type. 2/9. Standard, 3/6. Heavy Type on Base, 5/6. ALL BRAND NEW.

PACKARD-BELL AMPLIFIERS. Complete BRAND NEW with Valves, Relay, etc., etc., 17/6 each.

QUARTZ CRYSTALS. Types F.T.241 and F.T.243, 2-pin, 1/2 Spacing. Frequencies between 5.675 Kc/s. and 8,650 Kc/s. (F.T.243) 20 Mc/s. and 38.8 Mc/s. (F.T.241), 54th Harmonic, 4/- each. ALL BRAND NEW. TWELVE ASSORTED CRYSTALS, 45/-.

Holders for both types, 1/- each. Customers ordering 12 crystals can be supplied with lists of frequencies available for their choice.

QUARTZ CRYSTAL CASES (F.T.241/243) 10/6 per dozen.

RECORDING BLANKS. New "Emidisc", ready for use. 13", 6/- each. Or 15 complete in metal case 4/4.

RESISTANCES, 100 Assorted useful values. New wire end, 12/6.

SPECIAL OFFER. 12 ASSORTED METERS. Slightly damaged. Mainly broken cases (perfect movements). Including 3 Brand New Aircraft Instruments. 12 for 45/-.

STAR IDENTIFIERS. Type 1 A-N Covers both Hemispheres, 5/6.

TI154 TRANSMITTERS. Complete, NEW condition. In Transit £25.00 case

TRANSPARENT MAP CASES. Plastic. 14" x 10 1/2". Ideal for Maps, Display, etc. 5/6

TRANSRECEIVERS. Type "38" complete with 5 valves, etc. New condition. untested by us, but serviceable, no guarantee, 22/6 each.

ATTACHMENTS for Type "38" Transreceivers. ALL BRAND NEW. PHONES, 15/6; THROAT MICROPHONES, 4/6; JUNCTION BOXES, 2/6; AERIALS, No. 1, 2/6; No. 2, 5/-; WEBBING, 4/-; HAYERSACKS, 5/-; VALVES, A.R.P.12, 4/6; A.T.P.4, 3/6. Set of FIVE VALVES, 19/- the set.

POST OR CARRIAGE EXTRA. FULL LIST OF RADIO BOOKS, ETC., 3d.

**SOUTHERN RADIO SUPPLY LTD.**  
11 LITTLE NEWPORT ST., LONDON W.C.2. GER. 6653

## REPANCO TWINETTE

A NEW REMARKABLE TWO TRANSISTOR PORTABLE RADIO FOR THE HOME CONSTRUCTOR

- ★ LOUDSPEAKER, 7 x 4 in. ELLIPTICAL
- ★ TWIN FERRITE SLAB AERIALS
- ★ LONG AND MEDIUM WAVES
- ★ PROVISION FOR EXTERNAL AERIAL
- ★ SIZE 7 x 5 x 3 in.
- ★ LOW BATTERY CONSUMPTION

Send now for Easy Wiring Plans and Component Price List, 1/6 (post free).

## OTHER REPANCO EASY-TO-BUILD RECEIVERS

	Envelope
The R.E.P. One-valve Radio	9d.
The Hiwayman. A 4-valve Portable Radio	1/6
F.M. Tuner Unit. 5 Valves plus Tuning Indicator	1/6
Three Dee. 3-transistor Radio	9d.
Mini-3, Mk. II, 3-transistor Pocket Radio	1/3
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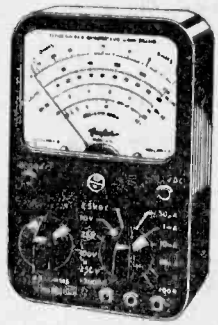
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D.C. current 50µA to 1 amp.  
D.C. volts 0.3 v. — 1,000 v. (25 k v by probe).  
A.C. volts 1 0 v. — 1,000 v.  
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**P. C. RADIO LTD.**  
**170 GOLDHAWK RD., W.12**  
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Transformers. Relay supply. Primary 230 v. Sec. 0.27-28.31 v. at 0.5 amps. 15/-.

P. & P. 5/-.  
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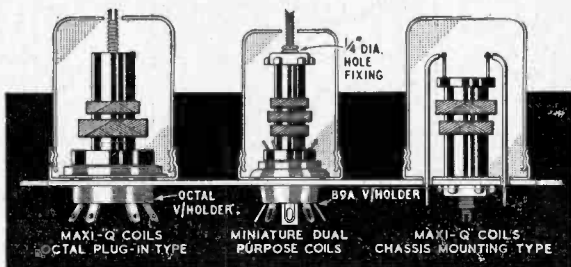
Avominors. Leather case. With leads, fully tested and guaranteed. With batteries. 2,000 volt, D.C. £2.19.6. P. & P. 2/6.

Output Transformer in screening can giving 9 different ratios 10 : 1 up to 120 : 1 for battery receivers or any high resistance pentodes used as output valves, 6/6. P. & P. 1/6.

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Coverage from 3.8 to 2,000 metres in 7 ranges—  
Each coil is packed in an aluminium container  
which may be used as a screening can for the  
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BLUE Signal Grid Coil with Aerial Coupling  
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interval coupling winding—GREEN Grid Coil  
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Superhet Oscillator for I.F. of 465 Kc/s—WHITE  
Superhet Oscillator for 1.6 Mc/s. Prices range  
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150-400 Kc/s; (2) 530-1600 Kc/s; (3) 1.5-4 Mc/s;  
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GENERAL CATALOGUE covering full range of components send 1/4d. in stamps or P.O. PLEASE SEND S.A.E. WITH ALL ENQUIRIES.



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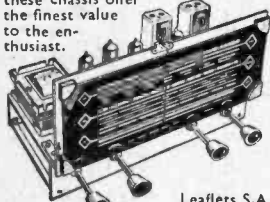
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Single valves, post 6d.

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TERMS: Remit with Order or C.O.D.

Built to the highest specifications,  
these chassis offer  
the finest value  
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### ALL BRITISH RADIOGRAM CHASSIS. 3 WAVEBANDS 5 MULLARD VALVES

ECH81, EF89, EBC81, EL84, EZ80  
Brand new and guar. A.C. 200/250 v.  
Short - Medium - Long - Gram. P.U.  
High Q dust core coils. Latest  
circuit technique. AVC and neg.  
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13 1/2 x 6 x 7in. high. Aligned and  
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Matched Speakers, 5in., 6 1/2in., 8in., 17/6 ea. 10in., 25/-.



The Briffman Successor

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BRAND NEW  
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OUR PRICE

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MODEL UA8

### GARRARD 4-SPEED HIGH FIDELITY UNITS

Autochanger 121 Mk.II 10 gns.  
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Price inc. plug-in, normal  
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BRAND NEW		VALVES		ALL GUARANTEED		FAMOUS MAKE PLASTIC RECORDING TAPE							
OZ4	6/-	6BA6	7/6	6SJ7M	6/6	EL41	9/-	PCL82	11/6	Long Play 7in. reel, 1,700ft.	35/-		
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ISS	7/-	6CA	5/-	6UG	7/6	DL96	8/6	EM81	9/6	PY81	9/6	5in. reel, 850ft.	21/-
IT4	6/-	6D6	6/-	6V6G	7/6	EAB-C80	8/6	EY51	9/6	PY82	7/6	3in. reel, 225ft.	7/6
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3Q5	9/-	6G6	5/6	12AT7	8/-	EBC41	8/6	EZ40	7/6	QP25	7/6	5in. reel, 600ft.	15/-
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6AG5	5/-	6K7M	7/6	35Z4	7/6	EF41	9/6	MU14	9/-	VP23	6/6		
6AL5	5/6	6K8G	7/6	807	5/6	EF80	7/6	P61	3/6	U76	6/6		
6AM6	5/-	6N7M	6/6	954	1/6	EF91	5/-	PCC84	9/6	VR105/30	9/-		
6AT6	7/6	6Q7G	7/6	956	2/6	EF92	5/-	PCF80	9/6				
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12in. Stalwart, 15W ... .. 90/-  
12in. Foam Suspension ... .. 120/-

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**TERMS — NO DEPOSIT — INTEREST FREE — 20 or 36 WEEKS TO PAY**

**B.S.R. MONARCH U.A.8  
4-SPEED AUTO CHANGER**

**£6.19.6**

or terms

Incorporating auto and manual control complete with turnover crystal P.U. and Sapphire stylus. A.C. Post and Ins. 5/6 or initial payment 8/11 plus Post and Ins. and 19 weekly payments of 6/11.

T.U.9 B.S.R. 4-speed single Player  
Collaro Conquest 4-speed Autochanger  
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Post and Packing on each of above

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5/6



**DE-LUXE TAPE RECORDER  
CABINET**

**ONLY 29/9**



Beautifully made Tape Recording Cabinet. Size 13 x 10½ x 7 ins. Covered in two tone rexine Cloth. Stylish design. Carrying handle and detachable lid with lock and key. Easily adapted to Record Player Cabinet. Exceptional value at this very low price. Post and Packing 4/6.

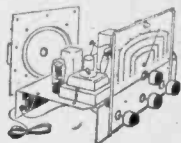
**TV CHASSIS FOR SPARES  
ALL THIS FOR ONLY**

**9/6**

56 Resistances including 7 variable controls. 54 condensers, including electrolytics. Coils. 7 I.F. and R.F. transformers. 13 valve holders. (8-B8A, 2-B7G and 3 octal) 4 transformers Mains-Output-Line-Frame. Chokes 250 mA. Metal Rectifiers—300 volts at 250 mA. Fuse panel, scanning coils, focus magnets. Plugs, sockets, switch, chassis screws, tag strips, etc. I.F. strip can be separated. Power pack can be used without dismantling. These chassis have been used, but were working when stored. Six page circuit and instructions showing positions of each component. Carriage 7/6.

**SUPER CHASSIS 3/11 Per Week**

On the initial payment of 5/1, plus carriage of 5/6, this chassis will be despatched. Balance at 3/11 for 19 weeks. 5-valve superhet chassis including 8in. P.M. speaker and valves. Four control knobs (tone, volume, tuning, W/change switch). Four wavebands with position for gram. p.u. and extension speaker. A.C. Ins. and Carr. 5/6.



Cash Price 79/6

**EXTENSION SPEAKERS**

**19/9**

In polished oak cabinet of attractive design. Complete, fitted with 8in. P.M. speaker of highest quality, switch and flex. Ready for immediate use. Ideal for bedrooms, kitchens, workshops, etc. Insurance and Carriage 3/9.



**HOME RADIO A.C. OR UNIVERSAL**

**79/6**

A.C. or Universal mains 5-valve octal superhet. 3 w/band receiver can be adapted to gram p.u. In attractive polished cabinet. Dimensions 9½ x 18½ x 11½ ins. Insurance and Carriage 4/6. Terms available.



**SEND FOR A FREE CATALOGUE**

Giving Full Details of Terms and Goods



**£2**

allowed on old tube

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**REPLACEMENT RE-BUILT  
TV TUBES**

Or yours for initial payment of 8/6 (plus Carr. and Ins.) and 19 weekly payments of 8/6. 12 months full guarantee. All sizes. Completely rebuilt gun assembly, new cathode, heaters, etc., giving the high standard required for long picture life, quality and value. Carr. and Ins. 15/6.

**EXPRESS DESPATCH SERVICE.** Please phone to confirm tube in stock. Send Telegraph Money Order, tube despatched Passenger Train same day. This service only available with remittance by Telegraph Money Order and Cash Sales—not terms.

**MODERN 17" TV CHASSIS  
COMPLETE AND WORKING  
ONLY 19 Gns.**

A chassis including 17in. tube, permanent magnet speaker, 13-channel Turret Tuner (any two selected channels fitted). Other channels supplied on request at 7/6 each. 13 valves. Chassis and valves guaranteed for three months. Tube 12 months' full guarantee. A.C. only. Ready and working to fit into your own cabinet. Carr. and Ins. 25/- As above with 14in. tube, complete and working, 12 gns.



**STEREO RECORD  
PLAYER CABINET**  
with extension speaker cabinet

at the  
amazing  
offer of

**99/6**

Portable 1960 show model in two tone colours. Extension speaker cabinet secured in lid. Size 18 x 14 x 8½ ins. high. This stereophonic player complete, retails at 35 gns., in the shops today. Ins. and Carr. (with order) 5/6, or initial payment plus Ins. and Carr. of 6/1 and 19 weekly payments of 4/11.



**RECORD PLAYER  
CABINET R.P.8**

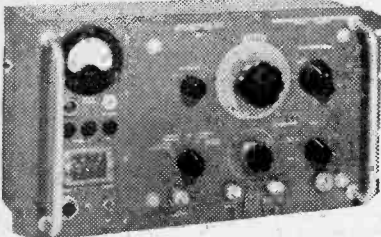
**79/9 or 5/4**

Initial  
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Balance at 3/11 a week for 19 weeks. This contemporary cabinet in two-tone grey rexine is ideal for the modern home. Added attraction is the cream plastic speaker fret. Press button lid; lock. Fittings for screw-in legs. Internal measurements 14½ x 18 x 18½in. deep. Takes a Garrard 121 Mk. 2 or B.S.R. U.A.12: 9½ x 4½ elliptical speaker, 19/6; our Mk. 2 control portable amplifier at 79/6. Carr. and Ins., 5/6.

**INSULATING TAPE 1/6** Finest quality. Large roll in sealed metal container (75 ft. x ¼in. wide). Post on 1 tin 9d. Post on 6 tins 2/-.

**DUKE & CO. MANOR PARK, E.12**  
Tel. ILF 6001/3

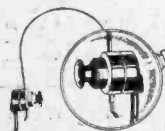


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Manufactured to laboratory standard. Covering the complete frequency range of 8.9-300 Mc/s. in 6 bands. Complete with internal 110-250 v. A.C. Power Pack. Incorporates 110  $\mu$ V R.F. meter with variable carrier control. Five position switched attenuator giving 1  $\mu$ V to 10 MV and 10 db to 20 db. Variable Multiplier 1 to 10 and calibrated 0-20 db. Outputs: C.W., square wave and sine wave. Provisions for external sine wave or pulse. Complete with 7 valves and calibration charts. Here is your opportunity to own a Laboratory Signal Generator, covering the widest frequency range ever offered at a fraction of the original cost. We anticipate an overwhelming demand therefore send your order now to avoid disappointment.



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using soft rubber miniature ear moulds for maximum music and voice reproduction of the finest quality. Supplied free is a small transformer unit with cord and plug which steps impedance up to 4,000  $\Omega$ . ONLY 15/- P. & P. 2/6.

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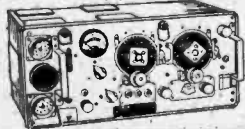
**POCKET RADIO.** The new exciting De Luxe "Gold Star" in beautiful moulded plastic case—a highly sensitive, self-contained set covering all medium waves. Uses modern miniature valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans. Size only 4 1/2 in. x 2 1/2 in. x 1 1/2 in. Batteries fit inside. Only 37/6. P. & P. 2/6.

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Special Offer—Order Now! Limited number only.



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A self-contained Trans/Receiver for Telephone and C.W. Range approx. 10 miles. Freq. 6-8 Mc/s. (50-30.3 metres). Valve line-up: 3 ARP-12, 2 AR-9, 1 ATP4. Complete with aerial. H.T. and L.T. meter and all accessories. Weight 20 lbs. Size 8 x 10 x 17 in. ONLY 80/- Carr. 10/-.

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**Our Price 70/-**

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A must for every Constructor and "Ham", consists of moving coil, padded head phones and microphone.

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As described in "Practical Wireless," March page 961, April page 1027 and May. This most famous Army Trans/Receiver covers 2-8 Mc/s. (150-37 metres) in two bands and 230-240 Mc/s. V.H.F. Has an Intercom. amplifier. Designed for 12 and 24 volt operation. Uses a 6-valve superhet receiver. I.F. being 465 kc/s. and a 6-valve transmitter designed for voice and C.W. operation. Incorporates test and tuning meter for voltages, aerial loading and current tests. Panel Controls: Frequency tuning, P.A. tuning, Gain control, M.C.W., C.W. R.T. switch, Heterodyne, nesting, off-on, Quench, aerial—A.V.C.—L.T.—H.T.—Drive tests. Supplied complete with 15 valves and instruction book.

SET ONLY **65/-**

Carr. 10/-

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FULLY ILLUS. CATALOGUE 1/3 Post Free.

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We are proud to offer these Brand New British Army Portable Transmitter Receivers. The improved model MKII (not to be confused with earlier models) is sold exclusively by us!

**NEW IMPROVED MODEL!**



The Radiophones are simple and a delight to operate as all controls are mounted on the front panel of the Set and clearly marked. The fine tuning dial is fully calibrated and complete with locking position. Change over from send to receive is performed by a flick switch.

The MKII Radiophones are designed for reliable voice intercommunication operating up to 10 miles depending upon obstructions and elevation. The combined Transmitter Receiver covers the whole frequency range between 7.4-9 Mc/s. and is fully tunable on both Transmitter and Receiver. The Receiver is an extremely efficient superhet featuring ultra high amplification, automatic volume control, highly sensitive output, and noise clipping. On test this Receiver astounded us, for on a short aerial we heard 65 Short Wave Stations, One as far away as Russia.

The Transmitter is automatically tuned to the Receiver hence eliminating unnecessary controls, and affording speed and simplicity of operation. Incorporates full side tone facilities. The master oscillator is an electron coupled oscillator and can be regarded as a form of Hartley. Includes R.F. power amplifier, audio modulator, automatic P.A. Tuning. The Transmitter range, unlike the receiver, is largely dependent on prevailing obstructions and elevation but these can be compensated for by the addition of extra aerial length.

The Model MKII operates from standard dry batteries 3v. L.T. and 120v. H.T. Consumption: L.T. receive 23 amps. L.T. send 45 amps. H.T. receive 9 Ma. H.T. send 14 Ma. average battery life 30-35 operating hours. The Radiophones incorporate 5 valves: R.F. Amplifier, I.F. Amplifier, Second Detector, Output, and Power Amplifier.

All sets are supplied complete with all accessories comprising of dynamic sound powered headphones, electro magnetic supersensitive microphone, 4 ft. aerial, Junction box, battery connection details and full circuit diagram.

PRICE ONLY **60/-** PER SET  
P. & P. 4/-

OR TWO SETS FOR **£6** POST FREE

BATTERIES 20/- PER SET

DE LUXE 12ft. WHIP AERIAL 12/6 P. & P. 2/6



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Our inclusive price for all components, cabinet and battery, complete in every detail:

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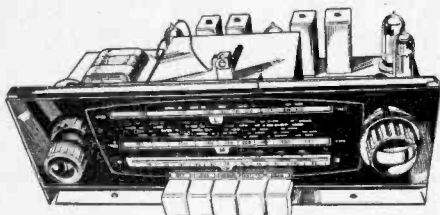
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## BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £13.68. (P. & P.) 10/-



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Tapped input 220-225 v. and 226-250 v. A.C. ONLY.

Chassis size 15 x 6 1/2 x 5 1/2 in. high. New manufacture.

Dial 1 1/2 x 4 in. in gold and black.

Pick-up. Extension Speaker. Ae., E., and Dipole sockets. Five "piano" push buttons. OFF L.W., M.W., F.M. and Gram. Aligned and tested. With all valves and O.F. Transformer. Tone Control Fitted.

Covers 1,000-1,900 M.; 300-500-M.; 88-98 Mc/s.

Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85.

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10 x 6 in. ELLIPTICAL SPEAKER, 20/-, to purchasers of this chassis.

**TERMS:**—(Chassis) £4.16.8 down + 10/- carr. and 6 Monthly Payments of 30/- or with Cabinet and Speaker £5.6.2 down and 7 Monthly Payments of 32/-.



### COMPLETE RADIO FOR ONLY £10.10.0. carr. pd.

Size 19 x 13 x 7 1/2 in. or Chassis and dial for £8 (carr. paid). Chassis Size 15 x 6 1/2 x 5 1/2 in.; 1,000-2,000 M.; 200-550 and 16-54 M. Mains (200-250 v. A.C.) and O.P. Trans. (3 ohm); Gram., Aer., E. Ext. L.S. Sockets; New Mullard Valves ECH42, EF41, EBC41, EL41, EZ40 and Magic Eye EM61. Dial 1 1/2 x 3 in. Fully aligned. Fantastic value for money.

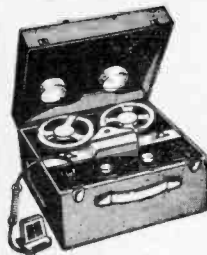
6 1/2 in. or 6 x 4 in. speaker fitted to cabinet. New Manufacture.

**BATTERY ELIMINATOR.** Converts your Battery Set to Mains. For 4 Low Consumption Valves (98 range), 90 v. 15 ma. and 1.4 v. 125 ma., 42/6 (2/6 post). 200-250 v. A.C. Size 5 1/2 x 3 1/2 x 2 in. Also for 250 ma. 1.4 v. and 90 v. 15 ma. at same price. Specify which, or give Valve line-up.

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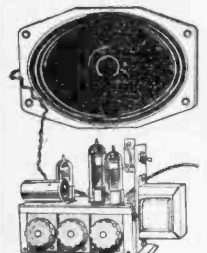
50 SILVERED MICA AND CERAMIC CONDENSERS. 10/- 50 RESISTORS. 5/- ALL DIFFERENT VALUES.

21 TUBULAR CONDENSERS (7 values 0.001 to 0.1 mf), 4/6.



### COMPLETE TAPE RECORDER FOR ONLY £19.19.0.

B.S.R. deck. Two-tone leatherette case, Acos crystal mike. 850ft. tape, extra spool. On/Off Tone and Vol. 7 x 4 in. Speaker. 1 1/2 hrs. playing time. Single speed 3 1/2 in./sec., fast forward and reverse, mike and radio inputs, ext. speaker socket; cannot be accidentally erased. 13 1/2 x 12 x 8 in. Weight 20 lbs. 12 months guarantee. Carr. 7/6 extra. Terms: £8 down and 6 monthly payments of 50/-.



### 3-VALVE AMPLIFIER (INC. RECT.).

Capable of giving 6 watts. Mains and output transformers. Valves ECC81, EL84 and Rect. 3 Controls, volume, bass and treble. On/Off switch. Fully guaranteed. Chassis size 6 1/2 x 3 x 2 1/2 in. 6 1/2 in. round or 7 x 4 in. elliptical speaker, state which. Not suitable for microphone input.

67/- (3/- p. & p.).



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On Fabric-covered Baffle 12 1/2 x 5 in. Mains and Output Transformers. Metal Rectifier. ECL82 Valve. Tone and Volume Controls. On/Off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. Useful for Stereo

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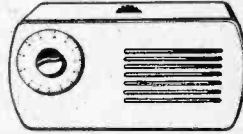
Valves DK96, DF96, DAF96, DL96. Requires Ever Ready battery B103 or battery elim. for converting to mains operation—see adjacent item. Two Short Wavebands 2.5 to 7 Mc/s and 6.5 to 17 Mc/s. Cabinet. 12 x 7 1/2 x 6 in. ONLY £4.10.0 (2/6 p. & p.). (MW and SW £4.15.0 plus 2/6 p. & p.) In kit form with instructions and fully wired coil pack. Two Short Wavebands £4. One MW and SW £4.5.0. Plus 2/6 p. & p. Separate items supplied. Send for List.



**TAKE A CHANCE.** We have surplus to present manufacturing requirements tens of thousands of resistors, silvered mica, tubulars, volume controls, electrolytics, valve holders, etc. **SEND US 20/-** for a bargain parcel of new goods. Our good name is your guarantee. Money back if not satisfied. State preference of types of goods.

### SIX TRANSISTOR SUPERJET KIT £8.19.6

Med. and L.W.; Printed Circuit; Instruction Book. Internal aerial. All items supplied separately. Write for price list. Battery, 9 v., PP4, 2/6.



### ALL ITEMS GUARANTEED 12 MONTHS—B.V.A. VALVES 3 MONTHS.

Send 6d. (stamps will do) for our illustrated catalogue of the above items and others. All New Goods. Delivered by return. Terms:—One-third down and balance plus 7/8 in four equal monthly payments. Postage with down payment (C.O.D. 2/- extra.)

SEE SPECIAL TERMS FOR A.M./F.M. CHASSIS AND TAPE RECORDER. Posted Orders to Camberley Please.

See additional advertisement on page 152

## GLADSTONE RADIO—58A HIGH STREET, CAMBERLEY, SURREY. Te. 22791

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# Practical Wireless

VOL. No. XXXVI, 640, JUNE 1969

Editorial and Advertisement  
Offices:

## PRACTICAL WIRELESS

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## Stereo—Rise and Fall?

ALTHOUGH the idea of stereo effects in sound reproduction has been known almost as long as the equivalent effects in sight-stereoscopy—it was only with the introduction of stereophonic, two-channel, gramophone records that the experimental facts became common knowledge to radio enthusiasts. Although doubts were expressed at its inception, stereophonic sound has proved that it will retain a steady, if not increasing, popularity. However, it is certainly true, to judge from our talks with dealers and enthusiasts and from our correspondence, that stereo does not yet enjoy the popularity or reputation which first greeted its appearance. Stereo seems to be thought of at present as a rich man's amusement, too expensive for the ordinary enthusiast. Whilst this is by no means altogether true, it may be said that the conversion of existing equipment from mono to stereo may involve the purchase of considerable extra equipment. It may also prove difficult to obtain the necessary units to form the needed second amplifying chain and, of course, the present pick-up head will have to be replaced with a stereo type—chosen from a very large and somewhat confusing range. Another loudspeaker unit will be needed too and, if the existing cabinet is an elaborate affair, the cost of duplication would not be negligible. Stereo also has a reputation of being very critical so far as the position of the listener relative to the loudspeaker is concerned. Whilst this reputation is not altogether deserved, it is certainly true that best results are obtained by listening in the theoretically correct position.

These, then, are the factors which we think account for the decline in interest in stereo and may also account for the slow progress in the development of stereophonic broadcasting. However, those hi-fi enthusiasts who can construct amplifiers should realise that in their hobby they have the means to even out the expenses incurred in conversion. Contrary to most written or spoken opinions, it is possible to obtain satisfactory results from stereo records even if the two amplifying channels are not perfectly matched. Thus, for first essays in the field of stereo, the second amplifier could quite well consist of a low output single-ended circuit which would need only a simple tone control circuit to enable the two channels to be balanced to suit the listeners' hearing and the acoustics of the room. The second loudspeaker could be a cheaper version than the one already in use. If a good cabinet is employed, the difference in the performance of the two units should not be too intrusive.

Of course, the true enthusiast will not be satisfied for long with such arrangements. However, they will prove sufficient to reduce the initial expense and enable a good stereo head to be purchased. The constructor can then improve the system by degrees and, most important, in the light of his experience; probably the final results will be better than if the amplifier chain had been duplicated at the outset.

Our next issue, dated July, will be published on June 7th.

# Round the World of Wireless

## POTENTIAL AND CURRENT NEWS

### Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of February, 1960, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

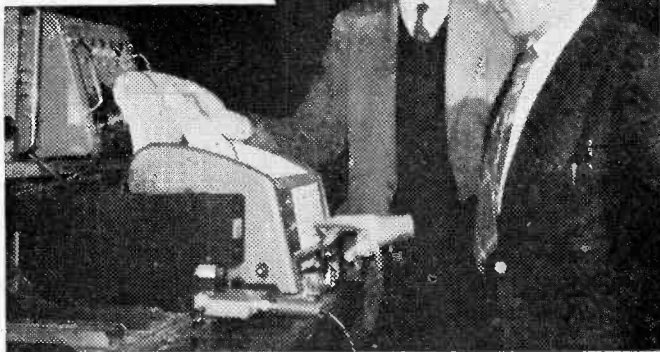
Region	Total
London Postal .. .. .	798,737
Home Counties .. .. .	755,859
Midlands .. .. .	558,614
North Eastern .. .. .	621,925
North Western .. .. .	525,595
South Western .. .. .	543,184
Wales and Border Counties .. .. .	276,734
<b>Total England and Wales</b> .. .. .	<b>3,990,748</b>
Scotland .. .. .	470,129
Northern Ireland .. .. .	137,014
<b>Grand Total</b> .. .. .	<b>4,597,891</b>

### Agreement

THE English Electric Valve Company Limited, England, and Eitel McCullough Incorporated, U.S.A., have concluded an agreement for the exchange of technical information and manufacturing know-how over a large range of klystrons, travelling wave tubes and power tubes. This agreement will enlarge the range of tubes in their respective catalogues and enable both Companies to get into production quickly on a composite range of each others products within these important fields.

### Royal Radar Establishment

THE Ministry of Aviation, acting on behalf of the Royal Radar Establishment at Malvern, has placed an order with the Marconi Company for the supply and installation of a 50kW 50cm airfield control radar Type S264, together with two moving coil display units and ancillaries. The equipment, which will be sited at the R.R.E. airfield at Pershore, Worcestershire, is scheduled to go into operation in mid-1960. Several years ago one of the earliest 50cm radars, a Type II, was installed at Defford and later transferred with the establishment to Pershore and has been in con-



A transistorised airborne teleprinter receiver (Type AD308), now in production by Marconi's, has been ordered by B.O.A.C. for its fleet of Boeing 707's. The equipment is used for receiving weather information broadcast on narrow-band frequency-shift-keyed telegraphy in the frequency range 90-150kc/s. The teleprinter receiver is here shown being tested in conjunction with a printer by two testers at the company's Basildon Works.

stant use at this important airfield ever since. Pershore airfield, which is about three miles from Bredon, is surrounded by hilly terrain, with the Malvern Hills to the west. As the south-west limits of the Birmingham Air Traffic Control Zone lie only some 15 miles away, the need for good radar surveillance of the area is self evident.

### Embakasi Landing System

THE Pye Instrument Landing System for bringing airliners safely to touchdown under all-weather conditions, has been selected by the East African Civil Aviation Authority for installation at the newly developed Nairobi airfield. The use of this airfield, with its 13,500ft runway for the new jet main route through Africa, makes precision radio guidance essential. The equipment has been found suitable for providing such vital service for this latest and most up-to-date of the world's airfields.

### Electronics Industry Council

THE formation of an Electronics Industry Council has been announced in London by the Electronic Engineering Assoc-

iation, who with the Radio and Electronic Component Manufacturers Federation and a number of other bodies had been discussing this for some time. The new Council will be concerned with electronic instruments, sound and television transmitters, radio communication equipment, radar and radio navigational aids, computers, industrial electronic control equipment and industrial television and the electronic components used therein. Its constitution will provide for the adherence of associations or federations of manufacturers concerned wholly or partly in the manufacture in the United Kingdom of electronic components, apparatus and equipment except for those used in the broadcast radio and television receiving industry and for public telephone services.

The main function will be to deal with matters of concern to the whole industry while its constituent bodies remain autonomous in their own fields of activity.

The gross output of the industry with which the Council will be concerned is valued at about £200 million annually and is growing quickly. The exports for this



section of the industry, also expanding rapidly, in 1959 were worth approximately £50 million. One of the first tasks of the Council will be to co-ordinate statistics.

#### *New Work for Liverpool Factory*

**A** LIVERPOOL factory which was to have closed is now to be kept partly open. This announcement was made recently by Associated Electrical Industries Limited. The London Electric Wire Company and Smiths, now a subsidiary of A.E.I. announced last November that their Bootle factory would have to be closed because of the rationalisation of cable manufacture within the Group. This announcement was made with much regret and since then continuous efforts have been made to find another use for the factory which is in an area where alternative employment is difficult to find. It has now been found possible to use part of the factory for the manufacture of resistance wire for the Vactite Wire Company, a subsidiary of LEWCOS. Although the number of employees working on this product will at first be small, it is likely to grow. Union leaders in the district and a number of employees have been informed of the new developments.

#### *Plessey win Radio Order*

**I**T is announced by Plessey International Limited that they have received an order from the Canadian Government for C42 VHF radio communication equipment valued at nearly \$5,000,000. It is believed to be by far the largest single order ever received from an overseas country for British VHF radio communication equipment. The equipment will be used by the Canadian Army. This announcement follows the substantial order for similar VHF equipment for the Australian Army received by Plessey from the Australian Government last year. This communication equipment is extremely robust and is the latest multi-channel VHF radio telephone system to have been successfully tried and proved under battlefield conditions. The British, New Zealand and South African Armies have already been supplied with large quantities of identical equipment which was developed by the Electronic and Equipment Group of Plessey in close co-operation

with the S.R.D.E. (Signals Research Development Establishment) of the Ministry of Aviation. The order was negotiated by The Plessey Company of Canada Limited and delivery is expected to begin shortly.

#### *Agreement*

**A**N agreement has been signed in New Delhi between the Indian Government and Marconi's for co-operation in the local manufacture under licence of equipment of Marconi design.

The agreement, which provides also for technical assistance and the supply of materials and components, will form the basis for Indian manufacture of equipment in the aeronautical radio, sound and television broadcasting, communications and radar fields.

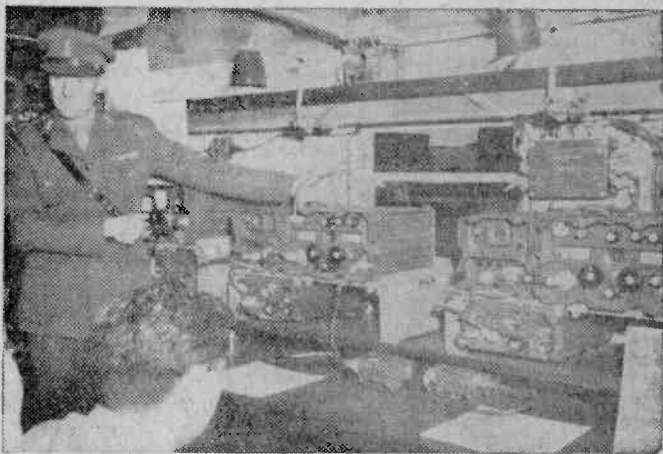
#### *Government Policy towards Electronic Equipment Firms*

**S**PEAKING at the annual luncheon of the Electronic

their activities in the equipment field.

"The Government's policy is to maintain in this country efficient capacity for the design, development and production of aeronautical equipment. It is not our intention to encourage air-frame manufacturers to undertake work formerly done by specialist equipment manufacturers. But equally it is no part of our policy to try to prevent them from widening their range of business, provided they do so at their own risk and expense. The Government have invested large sums of public money in Laboratories and other technical facilities at the works of the specialist firms. We certainly do not propose to duplicate these facilities elsewhere at public expense.

"In development and procurement, our objective will be to obtain products of the requisite quality produced efficiently at the lowest possible cost; and our con-



*The Plessey C42 equipment shown is installed in a Royal Corps of Signals demonstration vehicle. The equipment, which is the same as that going to Canada, is used to give demonstrations of VHF communication in military establishments throughout the U.K. This photograph was taken at a demonstration staged by Plessey International Limited for Commonwealth Signals officers.*

Engineering Association recently, the Minister of Aviation, Mr. Duncan Sandys, said:

"I know that some of you are worried lest the recent mergers in the aircraft industry should have unfavourable consequences for the equipment manufacturers. You may have fears that the big new groups will further extend

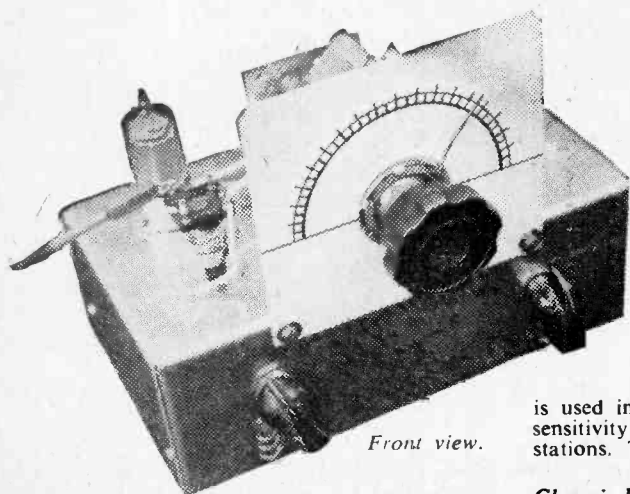
tracts will be placed with this aim in mind.

"What I have said will, I hope, reassure you that we do not intend to support unfair and un-economic competition against our established suppliers. In so far as the competition is fair and economic, I am sure you will be well able to look after yourselves."

# Dual-Band T.R.F.

A ONE VALVE PLUS CRYSTAL  
DIODE CIRCUIT FOR HIGH  
QUALITY

By R. Morgan



Front view.

The tuner gives an output of very good quality. Both medium and long waves are tuned, dual-band coils simplifying switching. A high gain pentode is used in the R.F. stage, and this gives enough sensitivity for reception of a reasonable number of stations. The complete circuit is shown in Fig. 1.

## Chassis Layout

WHEN an amplifier is fed with the signal obtained from a radio tuner this allows the equipment to be used for reception of broadcast programmes. Many amplifiers are capable of giving excellent volume, with high quality reproduction, and there are numerous musical and other programmes which are good material for listening to in this way. The tuner described here employs only one valve, so that current may be drawn from the amplifier. Current requirements are 6.3V 0.3A for the heater, and approximately 10mA at about 250V for H.T. In almost all cases this will be available from the amplifier, without any danger of overloading the power supply components.

A chassis 7in. x 4in. and 2in. deep will be convenient, with the tuning condenser placed centrally as in Fig. 2. A ball drive with a ratio of about 4:1 is fitted to the condenser. The lug on this drive must be fixed against rotation, and this is done by bolting it to a bracket secured to the chassis, as shown. The front of the drive should stand just forward of the front chassis runner, so that a pointer will clear the dial. The pointer is fixed to the part of the drive which rotates with the gang condenser spindle. If the tuner is to be placed in a cabinet with transparent scale, the dial carries no markings. If not, then it can be marked out with stations, wavelengths, or a simple 0-180deg. scale can be fitted.

If the gang condenser has trimmers, extra trimmers are not needed, but the performance will be improved if separate trimmers are fixed across each section of the coil, i.e. across the M.W. and L.W. windings. If M.W. only is used, extra trimmers are soldered to each set of fixed plates, and returned to a lead going to the chassis, as in Fig. 2. Surplus 30pF air-spaced trimmers, or mica 50pF or 60pF postage-stamp trimmers are satisfactory.

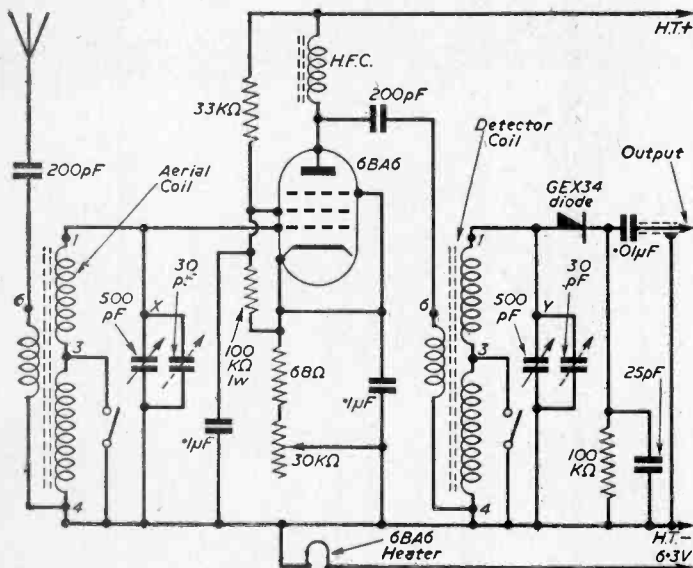


Fig. 1.—The circuit diagram.

## Assembly

The front runner is drilled for the 30k volume control and wavechange switch. The B7G valveholder will require a hole  $\frac{1}{4}$ in. in diameter.

The dual range coils are fastened by two 6B.A. bolts and should be so positioned that both ends can be reached, because separate cores are provided for M.W. and L.W. windings.

**COMPONENTS LIST**

- 6BA6 Valve.**
- B7G valveholder.**
- Crystal diode GEX34.**
- Pair of QA 11D coils (Osmor).**  
(If a dial is to be used, where possible obtain this to match coils).
- H.F. Choke (Osmor QC1).**
- 2-pole wavechange switch.**
- 25pF. two 200pF, 0.01μF and two 0.1μF condensers.**
- 2-gang 500pF tuning condenser, two trimmers.**
- 68Ω 33k and 100k ½W, and 100k 1W resistors.**
- 30k potentiometer.**
- Ball Drive.**
- Chassis size 7in. x 4in. knobs, etc.**

connection of the diode, as in Fig. 3. If the output lead to the tuner is short, it need not be screened which is an advantage, but if hum or instability arises, screening is necessary, the braiding being wired to the chassis, as shown in Fig. 3.

**Power Circuit Connections**

The chassis forms a common return for heater and H.T. circuits. In some amplifiers, the heater circuit is centre-tapped, either by an actual centre-tap on the mains transformer, or by means of two resistors. If so, the tuner chassis is used for H.T. negative return only. The two heater leads from the valveholder are then kept separate from the chassis, and taken to the amplifier heater circuit. There will then be four circuit connections: two for heater, and two for H.T.

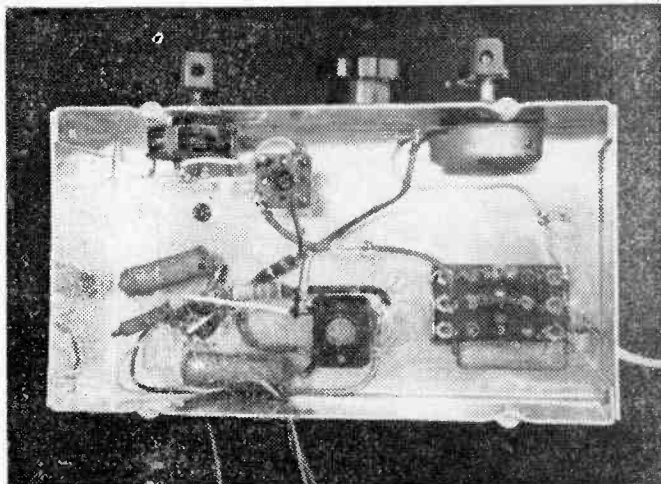
If H.T. current for the tuner cannot be drawn from a decoupled point, a resistor can be added in

**Connecting Details**

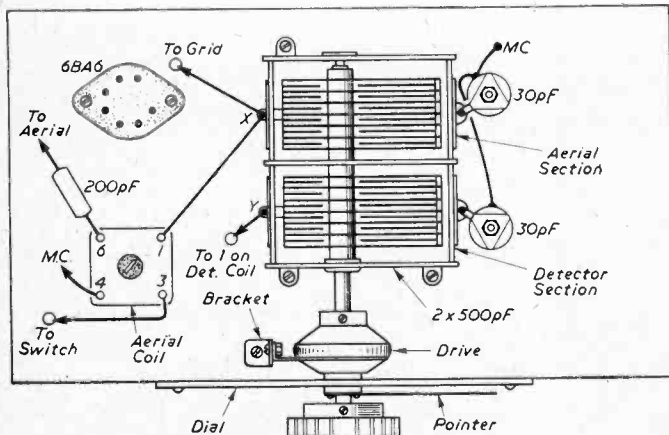
All connections are shown in Figs. 2 and 3, and only a few leads pass through the chassis. The lead "X" goes from the rear fixed plates to the valveholder, as shown, this point also being joined to (1) on the aerial coil. Lead "Y", from the front section of the gang condenser goes to (1) on the detector coil, shown in Fig. 3, the black end of the diode also being joined to this tag.

When the switch is set for medium wave reception, tags 3 on both coils are switched to chassis. A 3-point switch, or 2-pole 2-way switch is suitable; unrequired tags can be ignored. Various points marked "M.C." are soldered to tags bolted firmly to the chassis.

A small tagboard supports the 0.01μF and 25pF condensers, 100k resistor, and also takes the red



*Underchassis view.*



*Fig. 2.—Above chassis layout and wiring.*

the H.T. lead to the tuner, with a decoupling condenser from H.T. positive, at the tuner to chassis. The resistor may normally be about 5k, but can be of larger value if the amplifier has a 350V supply line about 15k then being suitable. With small or very well decoupled and smoothed amplifiers, this additional decoupling will not be required. The condenser value is unimportant, 8μF or 16μF being suitable.

The tuner is not intended for use with simple amplifiers drawing H.T. directly from the mains. It can, however, be used with these if the chassis is taken to mains neutral. Isolation from the mains is nevertheless preferable, and most amplifiers of other than very simple type will have H.T. drawn from a transformer, so that the tuner chassis will not be alive.

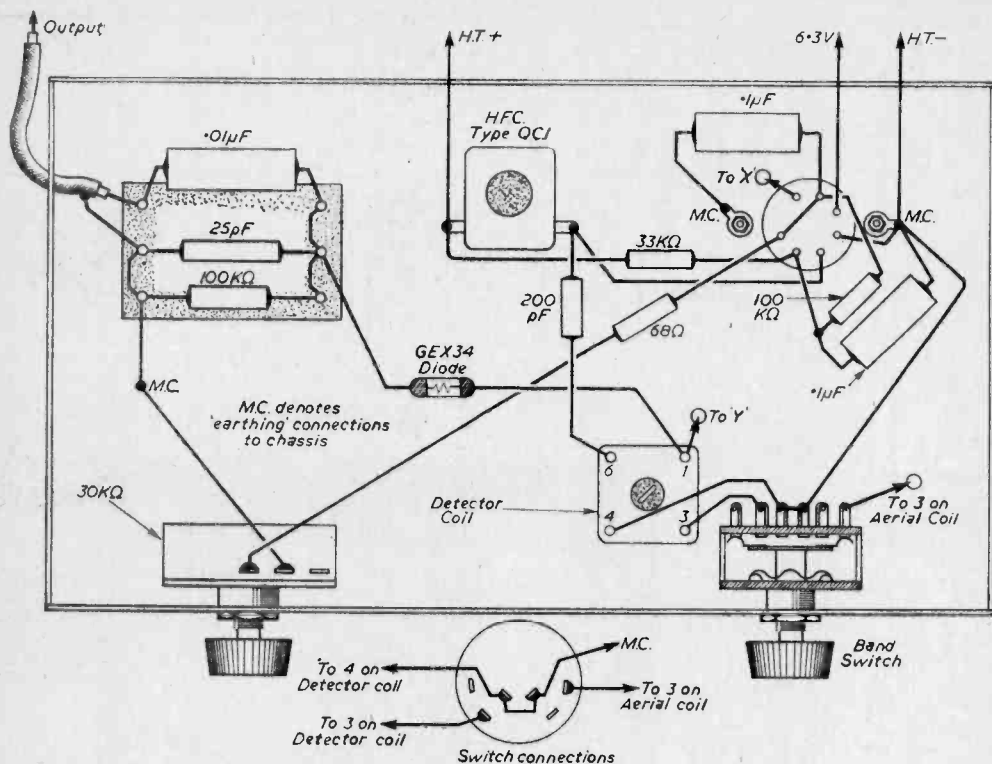


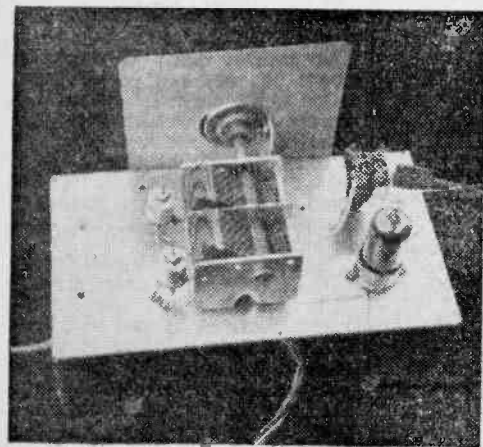
Fig. 3.—Wiring below the chassis.

**Core and Trimmer Adjustment**

With the switch set for M.W. reception, a station should be tuned in near the low wavelength end of the band (gang condenser nearly open) and the trimmers are adjusted with an insulated tool for best reception. A station is then tuned in near the high wavelength end of the band, and the coil cores at the tagged ends of the coils are adjusted

with an insulated blade, for best results. These adjustments should be repeated. Alignment will prove to be very easy with this type of circuit. The pointer positions at which stations tune in will be influenced to some extent by the settings of trimmers and cores, and sensitivity will vary accordingly, and this should be remembered if a dial marked with stations or wavelengths is fitted.

When the M.W. band has been adjusted, the L.W. cores, at the untagged ends of the coils are adjusted for best results, the trimmers being left untouched (unless separate trimmers are used for each band).



A finished tuner.

**MEDICAL ELECTRONICS CONFERENCE**

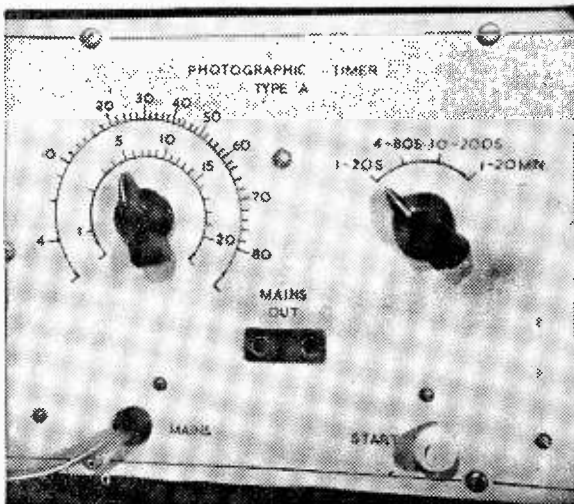
THE Third International Conference on Medical Electronics, organised by the Electronics and Communications Section of the Institution of Electrical Engineers in association with the International Federation for Medical Electronics is to be held at Olympia, London, 21st-27th July this year. A scientific exhibition will be associated with the conference.

Medical electronics applied during high speed flights—supply of oxygen, and measurement of human response under such abnormal conditions—is to be discussed, together with the use of electronics to accelerate escape in emergency. Another interesting factor to come under consideration is the possible use of electronics to counteract boredom and loneliness during the speed flight.

# Electronic Photo Timer

ACCURATE TIMING OF LONG INTERVALS

By H. D. Kitchen



The front panel of the finished timer.

THIS article describes the design and construction of an electronic interval timer specifically suited to the requirements of an amateur photographer. A timer is particularly useful for enlarging, the exposure being normally less than a minute. Many photographic processes, such as silk screen manufacture and other "Bichromate" processes require relatively long intervals, of anything up to 15 minutes. If a timer is to be useful for a wide variety of photographic work it is desirable, therefore, that the range of intervals covered should be from about one second to about 15 minutes. A timer covering such a range may also be used to time the development process, as it is now standard practice to develop on a time and temperature basis.

## Principles

Many mechanical timers indicate the termination of the required period by means of a bell or other audible alarm. This method is, however, unsatisfactory for periods of a few seconds owing to the

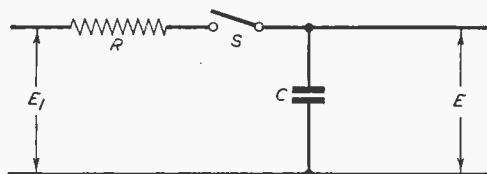


Fig. 1.—Basic R/C timing circuit.

inevitable human delay in switching off the enlarger or other apparatus when the alarm sounds. Although this error is negligible for longer periods, one often starts to do other work during a long period of timing and may be inconvenienced by being interrupted by the alarm. To avoid these difficulties it is very desirable that the timer should be capable of switching lamps off at the end of the required period. By the use of a relay this becomes a simple matter but obviously necessitates some form of electrical control.

A convenient method for determining the timing interval is to use the charging of a capacitor through a resistor. This principle is used in most electronic timers and also in the one to be described. Therefore, the theory behind the

method will be outlined first to show its limitations.

In Fig. 1 is shown a capacitor and resistor in series across a steady potential. If the voltage on the capacitor is initially zero it can be shown that the voltage on the capacitor increases, as it charges, according to the expression

$$\frac{E}{E_1} = 1 - \exp(-t/CR)$$

## Time Constant

The shape of the curve according to this expression is shown in Fig. 2 and is the well-known exponential rise. The potential on the capacitor after an interval of time equal to CR is 63 per cent of E1. This point is used to define the "time constant" of the resistance capacitance combination. We can devise a simple timer by incorporating a change-over switch and connecting the capacitor to some form of trigger which will actuate a relay when the potential of C reaches some predetermined level. A circuit of this type employing a valve as the trigger device shown in Fig. 3. The operation of this circuit is as follows:

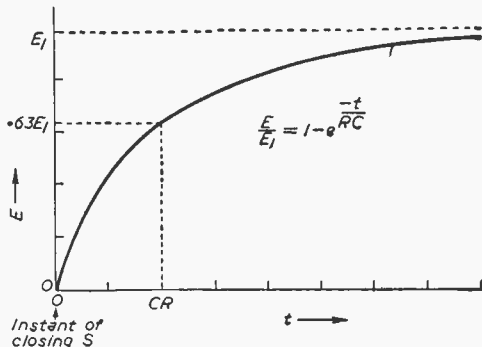


Fig. 2.—Curve showing the exponential charging of the capacitor C in Fig. 1.

Switch S is momentarily thrown into position 2, thus discharging the capacitor. As the valve cathode is held positive with respect to the grid by the "bleed" from H.T.+, the valve will now be cut off. This will de-energise the relay, the contacts of which switch on the controlled apparatus. The switch S is returned to position 1 and the timing period begins, C charging up

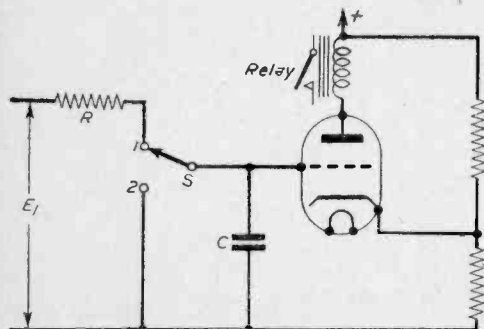
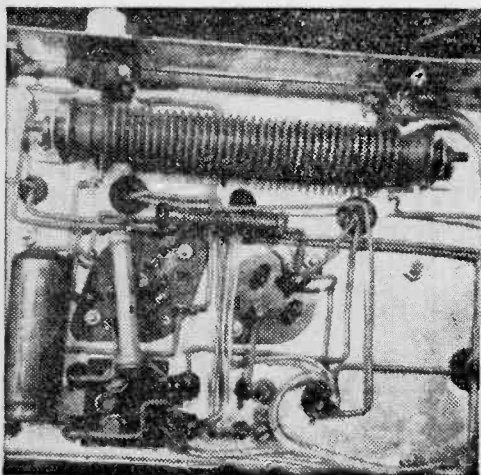


Fig. 3.—Simple interval timer using the basic circuit of Fig. 1.

through the resistor R until, at some point, the valve draws sufficient current to energise the relay and thus switch the apparatus off or on, as required. This situation will persist until the switch S is again momentarily thrown into position 2 to repeat the sequence. If we suppose that the valve draws sufficient current to actuate the relay at a grid potential of  $E_g$ , then we may show timing period on the graph of Fig. 2. This has been done and is shown in Fig. 4. Examination of this shows that we may vary the timing period in any of the three following ways:

- by varying the potential  $E_g$  at which the valve operates the relay (e.g., by variation of the cathode voltage).
- by varying the charging potential  $E_1$ .
- by varying the time constant of the capacitor resistor combination  $RC$ .



Underchassis view.

## Results

Each of these possibilities is shown in greater detail in Fig. 5. Taking first Fig. 5(a), representing case "a" above, we see that equal changes in  $E_g$  only produce equal changes in the time interval over the bottom part of the curve, where it is nearly linear. As  $E_g$  approaches  $E_1$  the time interval changes by an increasing amount for the same change in  $E_g$ . If we increase  $E_g$  above  $E_1$  the relay will never operate, as the valve cannot pass sufficient current. This effect means in practice that the variation of the time interval with  $E_g$  is non-linear, giving a very cramped scale with an abrupt cut-off as  $E_g$  approaches  $E_1$ . In the cramped region the voltage  $E_g$  will be very critical for a given time interval, as only a very small change in  $E_g$  will give rise to a large variation in the interval. Thus, although we could theoretically achieve a wide range of interval by variation of  $E_g$  alone, we are limited in practice to a maximum value of about 80 per cent of  $E_1$ , if the device is to have any degree of accuracy. When  $E_g$  is 80 per cent of  $E_1$ , the interval obtained is 1.61CR. The scale shape of the method of Fig. 5(a) is shown in Fig. 6(a) when a linear potentiometer is used.

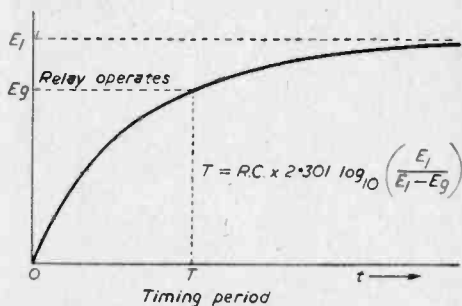


Fig. 4.—Charging curve of the timing capacitor C in Fig. 3, showing the point  $E_g$  at which the relay operates and the timing interval  $T$ .

Turning now to the second method (b) in which the charging potential  $E_1$  is varied, we find a similar situation to that just described. This is shown in Fig. 5(b), non-linearity between the time interval and the change in  $E_1$  being again apparent. There is a difference, however, between this case and that considered above, in that an increase in  $E_1$  causes a decrease in the time interval. This is because increasing  $E_1$  reduces the ratio  $E_g/E_1$  on which the time interval depends. To achieve a reasonable degree of accuracy,  $E_g$  must not exceed about 80 per cent of  $E_1$ , as before. That is,  $E_1$  must not drop below about 1.25  $E_g$ , or, expressed as a percentage, it should exceed  $E_g$  by 25 per cent. The scale shape obtained by varying  $E_1$  is shown in Fig. 6 (b), when a linear potentiometer is used.

## Varying Time Constant

The remaining method (c), variation of the time constant of the RC combination, is illustrated in Fig. 6(c). In practice variation of the time constant is obtained most conveniently by variation of R, although C could be varied with equal results, if variable capacitors of several microfarads were available. Although, therefore, impracticable when

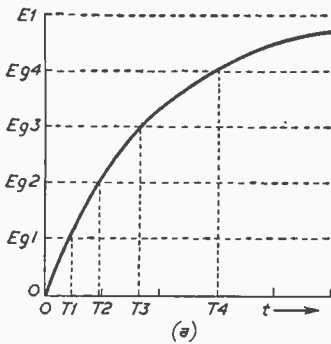


Fig. 5a.—Timing interval obtained when  $Eg$  is varied.

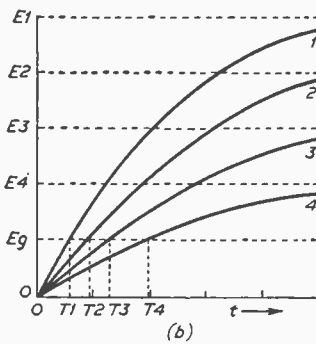


Fig. 5b.—Interval when  $E1$  is varied.

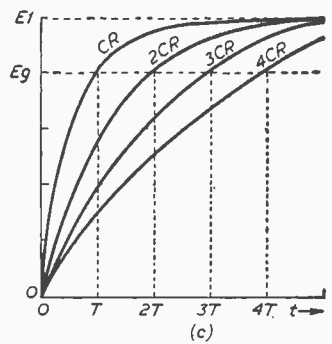
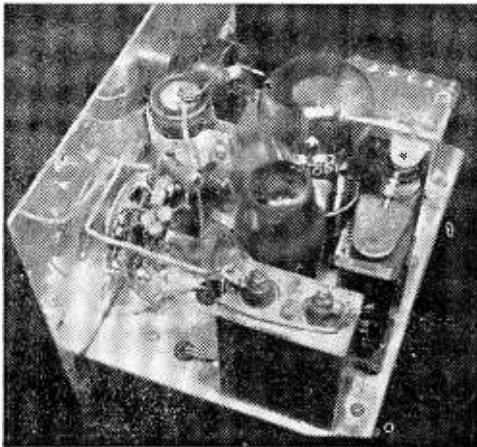


Fig. 5c.—Interval obtained when the time constant  $CR$  is varied.

continuous variation of the time interval is required, it is nevertheless possible to use variation of  $C$  if variation of the time interval in steps is permitted. The time interval is, in this case, directly proportional to the time constant of the RC combination and the resulting scale shape is

e.g.,  $100\mu F$  and  $6M$ . An electrolytic capacitor is unsuitable in conjunction with a resistor of many megohms, because of its random leakage current, and a paper type would be essential. Paper capacitors of such large capacitance are, however, very bulky and the practical limit is about  $10\mu F$ , which would necessitate a resistor of  $60M$  for the same interval. Variable resistors of such high value are not manufactured and, even if they were, setting its value to give an interval of a few seconds in a coverage of 16 minutes would not be very accurate, to say the least. To obtain a fair degree of setting accuracy over a range of from a few seconds to about a quarter of an hour, it would be necessary to switch in different values of capacitance and give considerable difficulties with providing satisfactory insulation (remember that the variable resistor would be about  $60M$ ). It is obvious from the foregoing that there are considerable practical difficulties with the single time constant type of timer depicted in Fig. 3, when a wide range of intervals is required.



Rear view.

linear when a linear potentiometer is used, as shown in Fig. 6(c). The same remarks as before apply regarding the maximum value of  $Eg/E1$  and the arbitrary limit of  $Eg$  not more than 80 per cent of  $E1$  will imply a maximum time interval of  $1.61CR$ .

Of the above three basic methods for varying the timing interval, the last has been chosen in this design because of the linear scale shape. As has been mentioned above, the precision obtained in the timing interval is dependent on the ratio of  $Eg/E1$ , a value of 0.80 being taken as the limit. Thus, if we require a maximum time interval of 16 minutes, the time constant  $CR$  must be 10 minutes. Such a long time constant demands high values of both  $R$  and  $C$ ,

These difficulties can be largely overcome by the use of two separate RC combinations, which are employed in the following manner. The first time constant,  $C1R1$ , provides a maximum period of about 30 seconds and is continuously variable, using a variable resistor of 1 or  $2M$  and an electrolytic capacitor. A second RC combination is used to obtain longer delays and the complete circuit based on these principles will be given next month.

(To be continued)

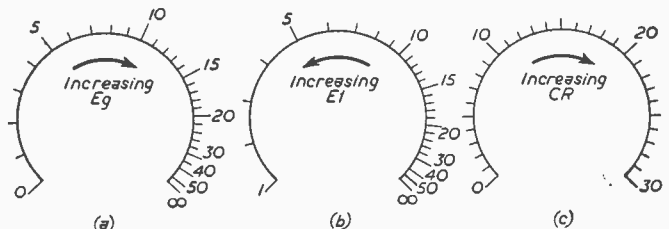
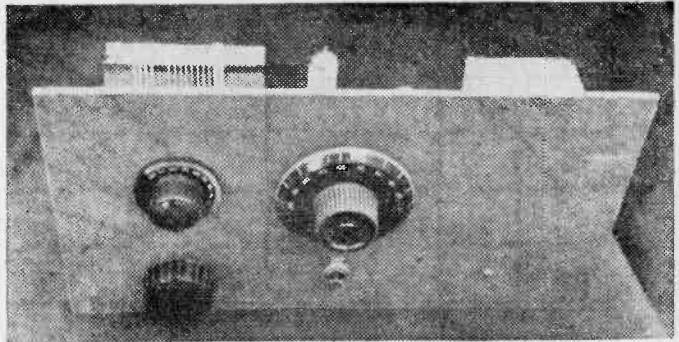


Fig. 6a.—Scale shape obtained when  $Eg$  is varied by means of a linear potentiometer. Fig. 6b.—Scale shape when  $E1$  is varied by means of a linear potentiometer. Fig. 6c.—Scale shape when  $R$  is varied with a linear potentiometer.

# Wide-band Battery S.W. Two

A COMPREHENSIVE  
CIRCUIT WITH WIDE  
COVERAGE

By J. Johnstone



The completed receiver.

THIS receiver, described here, operates from a 90V H.T. battery and 1½V L.T. supply, two valves being used in an "all-dry" circuit. Alternatives to the 1S5 and 1S4 are given in the component list and may be inserted with no changes to wiring or components. It is in order to use a 3S4 instead of the 1S4, if this should be to hand or more readily available. If so, it is necessary to join tags 1 and 7 of the valveholder, using this point as filament positive. Tag 5 is then wired to chassis, being filament negative. With this slight modification, alternatives to the 3S4, which include the CV820, DL92, N17, and 1P10, may be inserted.

The circuit is shown in Fig. 1, a home-wound coil of efficient design being arranged to cover approximately 17 to 55m., so that coil changing is not required for 19, 20, 25, 31, 40 and 49m. bands. To obtain this coverage, C1 has to be of fairly large capacity, about 300pF to 400pF being most

suitable. Standard ceramic insulation single gang condensers are satisfactory. A short-wave type condenser is also perfectly satisfactory. The receiver will work just as effectively with other valves, but if the maximum capacity is less, the higher wavelengths will not be reached. Similarly, a 500pF condenser may be used, the band specified then being covered before the condenser is fully closed.

Tuning is actually carried out with the 20pF bandspread condenser, which should be fitted with a reasonably large knob and dial. This exact capacity need not be used, but a condenser of about 15pF to 25pF is most generally convenient, giving a reasonable coverage, yet not being too critical when tuning. The bandset condenser C1 must also have a scale or dial, so that settings can be returned to when necessary.

The use of two valves in a circuit of this type gives a very quiet

background, and very remote stations may be heard with phones. Really long-distance reception is, in fact, possible.

### Coil Windings

The coil is wound on a 6-ribbed former 1½ in. across the ribs, and notched about 8 turns per inch. A plain former, 1½ in. in diameter may be used if the turns of wire are securely fixed to it. Holes are drilled to receive 6B.A. rods about 2 in. long, so that the coil can be mounted as shown in Fig. 2.

The 4½-turn aerial coupling winding can be wound first. The beginning of this winding, point 1, is anchored to the 6B.A. rod. Bare, enamelled, or cotton-covered wire of 26 to 18s.w.g. may be used, and 4½ turns are wound on. The wire is then taken down through a small hole, and along inside the former to a terminal, which is used for aerial connection. This is point (2) in the diagrams.

A space of about ¼ in. is then

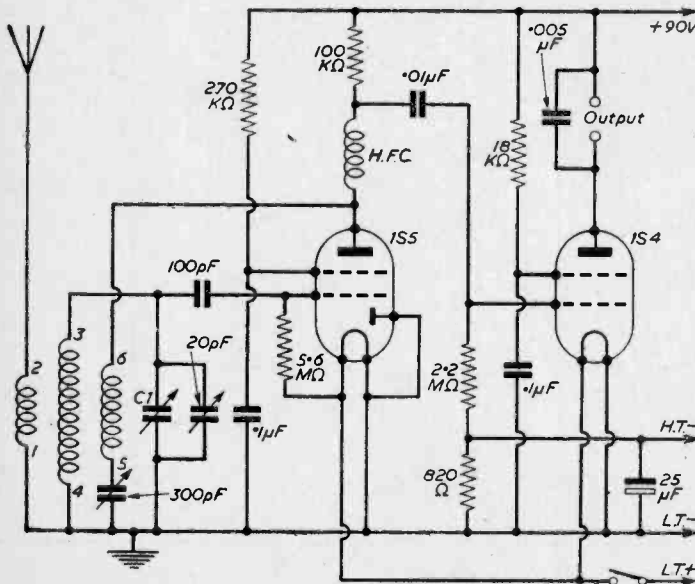


Fig. 1.—The circuit diagram.



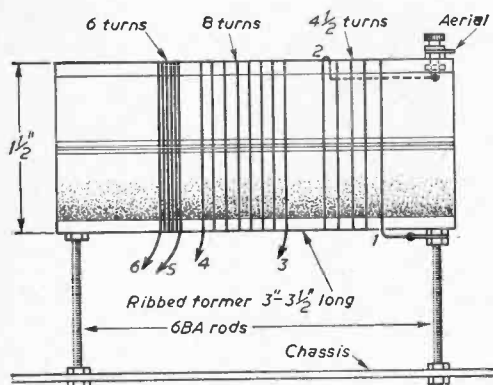


Fig. 2.—Details of the tuning coil.

left, and the 8-turn winding is put on. This can be 22 to 18s.w.g. tinned-copper or enamelled wire. Point (3) is the beginning of the winding, and goes to the fixed plates tag of C1. Point (4) is the end of the winding, and goes to the moving plates tags, and chassis. The wire ends can be anchored by passing them through small holes drilled in the former.

The reaction winding consisting of 6 turns of 26 to 22s.w.g. insulated wire, is now put on. Turns are side by side, and the coil is very near the 8-turn winding. The beginning, point (5) goes through the chassis to the fixed plates tag of the 300pF reaction condenser. The other end (6) passes to the detector anode.

**Above the Chassis**

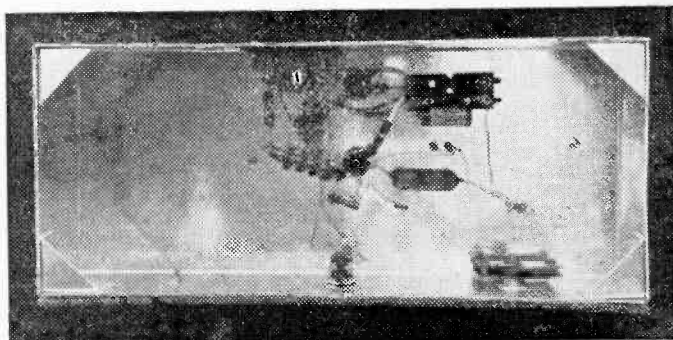
A fairly long chassis will allow the batteries to be accommodated as in Fig. 3, so that the receiver

is self-contained in this respect. Any 1 1/2V dry battery can be used for the filaments. If of the kind made for portables, take positive to the switch and negative to the chassis. Plugs to fit H.T. and L.T. batteries can be purchased from most dealers. A pair of fairly large torch battery cells, in parallel, will also do for L.T. If the card cases are removed, and a metal clip fashioned to clamp the cells to the chassis, this will provide the negative connection. The positive lead, from the switch, can then be fitted with clips, or joined to the cell caps by soldering.

**Condensers**

The two variable condensers are wired together as in Fig. 3; C1 is bolted to the chassis by means of angle brackets. If a panel-mounting condenser is fitted instead, join the moving plates tag to a tag bolted to the chassis.

Connections, and the approximate positions of parts below the chassis, are shown in Fig. 4. Leads



**Underchassis wiring.**

in the detector stage, especially to valve and coil, should be short and direct. The polarity of the 25μF condenser should be observed. Some leads pass through the chassis, as explained. Those from

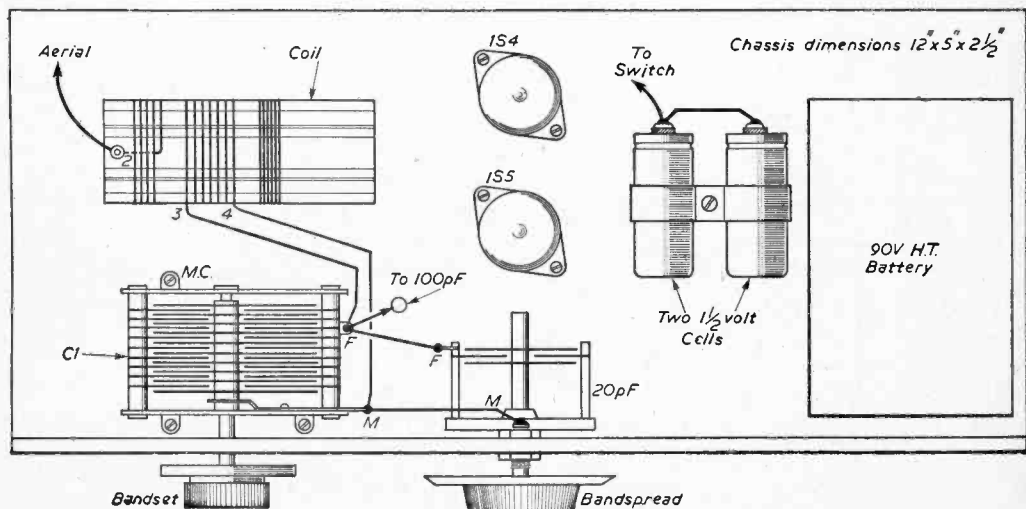


Fig. 3.—Wiring above the chassis.

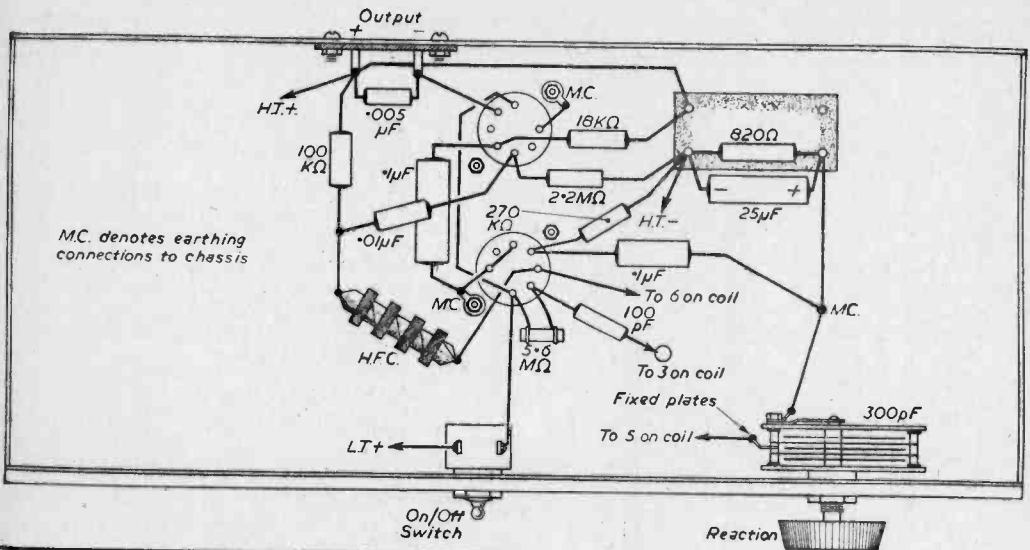


Fig. 4.—Underchassis layout and wiring.

A metal panel is helpful in removing hand capacity effects, or an insulated panel may have a thin sheet of aluminium fitted behind it for the same purpose. This is particularly helpful with short-wave type tuning condensers, but less important with a condenser with metal frame.

#### Using the Receiver

The valves are inserted in the positions shown in Fig. 3. If an earth is available, it is taken to the chassis. The aerial is connected to the terminal, shown in Fig. 3.

For a 2/3 ohm speaker, the transformer can have a ratio of about 60:1. Its primary is wired to the receiver, and the secondary to the speaker. A moderately large speaker (say 4in. to 6in.) of the kind intended for battery receivers will give best results. It should be fitted in a cabinet.

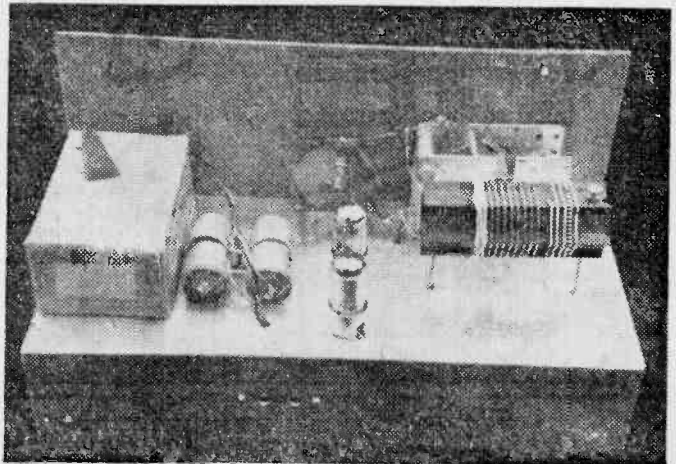
(Continued on page 154)

- Components List**
- 1S5 (or CV784, DAF91, or ZS17).
  - 1S4 (or CV783 or DL91).
  - Two B7G valveholders.
  - 300pF reaction condenser with knob.
  - 20pF or similar variable condenser with dial and knob.
  - 400pF or similar variable condenser with dial and knob.
  - Coil as described.
  - Fixed condensers: 100pF, 0.005μF, 0.01μF preferably mica, two 0.1μF 250V or similar, 25μF 25V or similar.
  - Resistors: 800Ω, 18k, 100k, 270k, 2.2M, 5.6M, all ½ or ¼W.
  - S.W. H.F. Choke.
  - On/off switch.
  - Chassis, panel, 2-way socket strip, battery plugs, etc.

the reaction winding—(5) and (6)—can most easily be the ends of the actual winding, with insulated sleeving added where the wires pass through the chassis.

The output socket strip is bolted to the back runner, and holes large enough to clear the plugs or sockets will be necessary. Battery leads are made from thin flex, and pass up through the chassis. These leads should be fitted with appropriate plugs, or otherwise identified, as the valves will be damaged if the lead from the switch is taken to the H.T. battery in error.

Unused valveholder tags must not touch other tags, leads, or the chassis because in some cases the pins support electrodes. "M.C." shows connections soldered to tags bolted to the chassis in the usual way.



Rear view of the receiver.

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S.33

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UXR-1

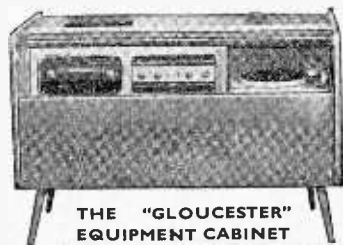
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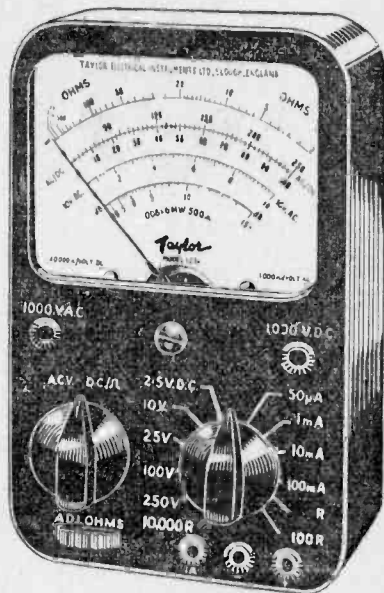
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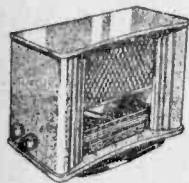
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Chassis 16 $\frac{1}{2}$  x 6 $\frac{1}{2}$  x 7in. high. Dial in red, gold and brown. 18 x 4in. 1000-2000M; 200-550M and 6-18Mc/s. 4 knobs in front. Ferrite rod aerial; Tone control; Ext. L.S.; P.U.; Ae and E sockets. Gram. mains socket 200-225 v. and 226-250 v. A.C. Valves ECH81, EBF80 ECC83, two EL84 in push-pull. GZ30 rect. Fine value for money at £7.10.0 (7/6 carr.).

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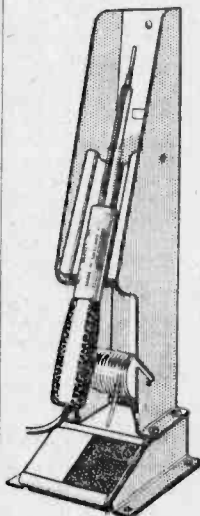
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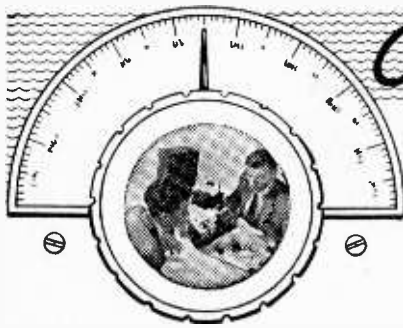
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# On Your Wavelength

BY THERMION

## Circuitry

IT is interesting to note that, of late, the popularity and use of the metal rectifier are increasing. Although these devices were very popular in the early days of radio, once reliable rectifying valves were produced, they were used in circuits only rarely. True the old metal rectifiers tended to be large and cumbersome, and their valve counterparts were much easier to accommodate, but there is now every justification for their increased use. It has always been impossible for me to understand why more amateur constructors do not make use of them, it could be that their very name conjures up visions of long, multi-finned devices reminiscent of years ago. However such types now appear only when a high current output is required; one of the best methods of effecting the cooling of an operating rectifier is the use of a flow of cool air around plates or fins. Another method of cooling is the use of a heat-sink—generally the chassis of the receiver—to which the rectifier is clamped. The heat generated is then conducted to the large surface area of the chassis which enables its dissipation to the surrounding air to proceed at a much higher rate than if the rectifier itself were air-cooled. This cooling of metal rectifiers is extremely important. Most types have an appreciable “forward” resistance and the current flowing in this resistance gives the usual  $I^2R$  losses which appear as heat. If the heat is not dissipated, then the temperature of the rectifier increases and so does the  $I^2R$  factor. The temperature will continue to rise and the rectifier may eventually burn out. If, therefore rectifiers with low forward resistance were produced, the heat generated would be less and cooling problems might be eliminated. This has proved possible now that silicon power diodes are available. These, so far as domestic circuits are concerned are little bigger than conventional germanium, signal, diodes and need no heat sink, being air-cooled. The forward resistance is extremely low; one type for TV receivers has a quoted forward voltage drop of 1.1 at a current of  $\frac{1}{2}$ A! Reverse voltage ratings are such that at the moment, it is necessary to use two diodes in series for ordinary rectifying circuits in TV receivers driven direct from the mains—the peak reverse voltages must be taken into account. The reverse resistance of these diodes is extremely high and naturally is not the same for every diode. Therefore, when two are connected in series, it is often recommended that equalising resistors be connected across each of the diodes. These may each have a value of, say, 470k. This procedure ensures that

the diodes are subjected to equal reverse voltage stresses which are well within the ratings of the devices.

It is not generally known that with most types of rectifier, it is wise to employ series limiting resistors. These ensure that, when equipment is first switched on, the momentary surge of current (which may otherwise reach a very high value) necessary to polarise the electrolytic condensers in the power pack, does not exceed the rating of the rectifier.

While most constructors will not wish to employ the latest silicon power diodes in their designs they should certainly consider the use of more conventional and well established metal rectifiers; they are not museum pieces and are often used commercially, especially where high currents at low voltages are required. The use of a metal rectifier will often save space and less heat will be generated. The heater current for the valve equivalent will also be saved.

## Simulators

THE role of electronics in evaluating the performance of complicated apparatus, etc., was brought home to me recently when I read about the use of an E.M.I. time delay unit for Italy's Harwell. Apparently, one of the biggest problems of the scientists who design and operate nuclear reactors is to ascertain how the coolant circuits of the reactor would behave under certain conditions, such as the sudden failure of the circulating pumps. This could cause serious damage to the reactor unless the control arrangements were adequately designed.

It is obviously impossible to study the potentially dangerous conditions on the reactor itself, but the design information can be obtained from a conventional analogue computer used as a simulator. The most difficult part of the problem is the electronic simulation of variable transport lags and E.M.I. Electronics Ltd. has recently supplied to the Centro di Studi Nucleari di Ispra, Milan—Italy's Harwell—a variable time delay unit which solves the problem more accurately than previously.

Data can be delayed by a continuously variable amount determined by the voltage applied to a “Delay Control” input, which accurately controls the speed of a loop of magnetic tape passing preset positioned record and replay heads. The total range of delay is 0.1 to 10 seconds in three pre-selected ranges.

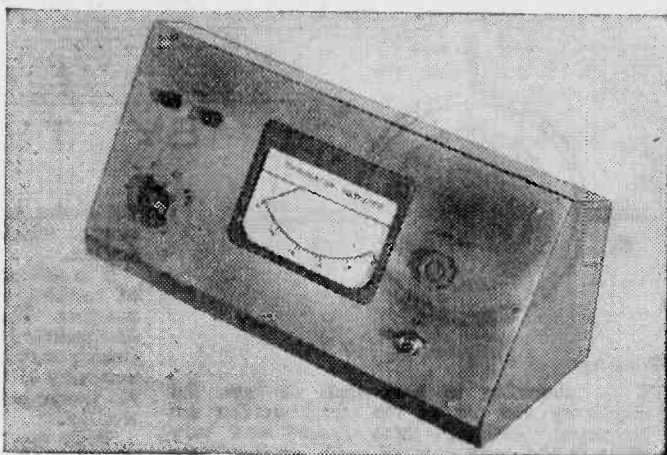
This is only one use of computers to iron out problems of design. They can be used for matters completely unconnected with electronics and they become “black boxes” which simulate accurately the characteristics of the machine, plant or system concerned. No doubt as computer design progresses, they will become more and more valuable in this field.

# Transistorised Voltmeter

HIGH INPUT IMPEDANCE  
FOR ACCURACY

(Continued from page 26 of the  
May issue)

By D. Saull



The completed voltmeter.

**T**HE method of assembly used in this voltmeter is simple, with components on one side of the hardboard sub-chassis and the inter-connecting wiring on the reverse, as in printed circuitry. Complete wiring details are given in Figs. 7 and 8 and these show clearly the mounting of the resistors in the input attenuator circuit.

### Panel and Case

The front panel is cut from a piece of hardboard, size 11in. x 5½in., with cut-outs to take the meter dial, switch, and 'set zero' control spindles. The front panel carries the on/off switch, and the input terminals, and is secured to the chassis by four lengths of 5/16in. dowel rod, screwed at either end. The dowel rods act as spacers, and their length depends upon the depth of the meter (Fig. 10).

The case is made from hardboard as shown (Fig. 11) and cemented. The front panel is screwed to the case by four ¼in. wood screws passing into strip wood blocks cemented to the inside of the case. The front panel and case is covered with a

plastic adhesive material (a piece 18in. x 27in. is ample).

The 32µF capacitor is housed between the chassis and the front panel and secured by a clip made from a 1in. strip of card bent round and cemented to the back of the front panel.

The 4½V battery is made of three U16 batteries connected in series. A strip of card is wrapped round to form a case, which is in turn cemented to the back of the chassis. The battery drain is only of the order of 1½mA and therefore the battery should seldom require replacing.

The instrument does not require any stabilising time, but may be used immediately after switching on. Likewise it should be switched off after taking the required voltage reading. Under these conditions the battery will last a very long time.

### Calibration

The meter should be calibrated on the lowest range (2.5V) from an A.C. source (e.g. a 6.3V heater winding controlled by a potentiometer across it) against an A.C. meter of known accuracy.

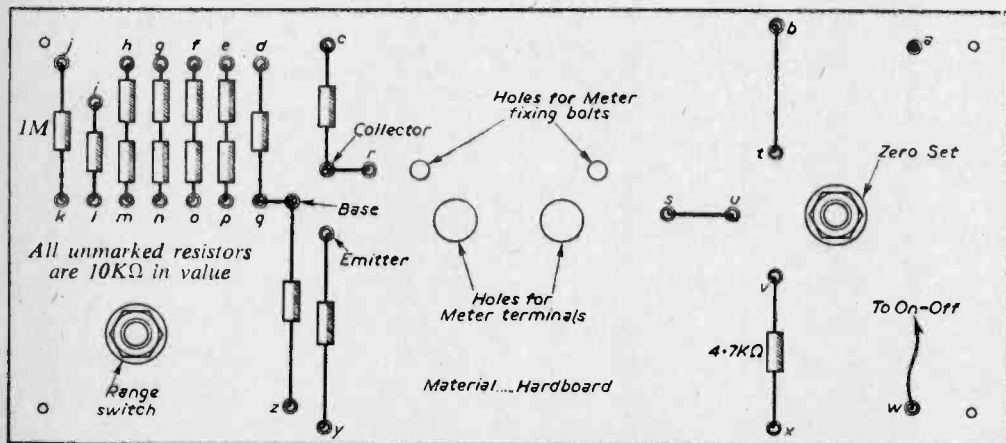


Fig. 7.—Sub-chassis wiring diagram (front side).

The positions of these screws must coincide exactly with screws marked 'B' on Front panel

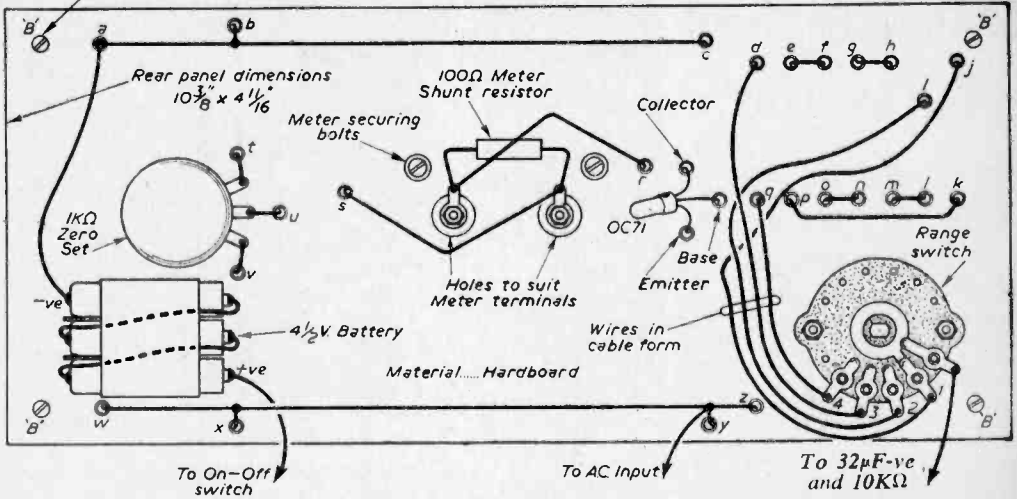
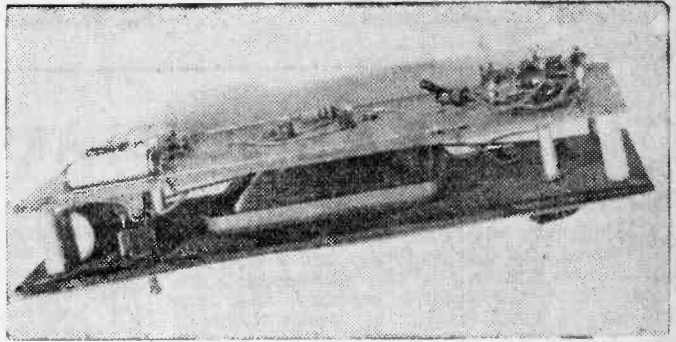


Fig. 8.—Wiring on the rear side of the sub-chassis.

Adjust the shunt resistance across the meter, decreasing its value to decrease the deflection of the meter—resistors in the 100Ω range will probably be required for a 250μA meter until half full scale deflection is obtained with 1.25V input. The characteristics of the transistor in circuit have a slight curve (Fig. 9), but if the calibration is correct at half of full scale deflection, the error will be spread over the complete length of the meter scale, and will be of a small order. An



Side view of the voltmeter.

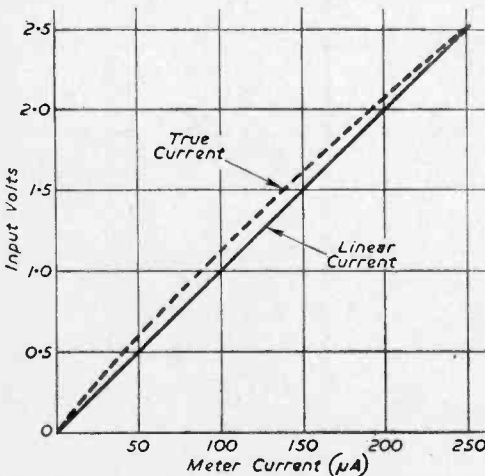


Fig. 9.—Meter characteristic curve.

accuracy of better than 5 per cent was obtained with the prototype, except over the initial few degrees of meter deflection, and this is to be expected with all but the highest grade expensive A.C. meters.

A final word of warning, current surges are harmful to transistors and therefore care should be taken to ensure that the instrument is not connected to a voltage in excess of the range to which it is set. Also, heavy inductive circuits broken

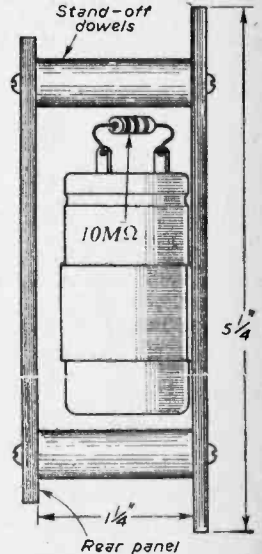


Fig. 10.—Mounting the 32μF condenser and the sub-chassis to the front panel.

with the meter in circuit could likewise cause damage to the transistor.

With the necessary care, the instrument should find many valuable uses, and is ideal for use with the Inductance Measuring Instrument described in an earlier issue of PRACTICAL WIRELESS (March issue). It may be used at frequencies of 30c/s to the cut-off frequency of the transistor (about 20kc/s for the OC71).

The circuit given is flexible, and it is left to the reader to develop it further as he pleases, their being ample space in the layout for additional components.

An A.C./D.C. range switch could be introduced, shorting out the 32 $\mu$ F capacitor for D.C. readings. In this case an additional D.C. calibration would be required, as under A.C. conditions the meter reads the average current, whereas with D.C. the meter reads the actual current.

Material  $\frac{1}{8}$ " Hardboard

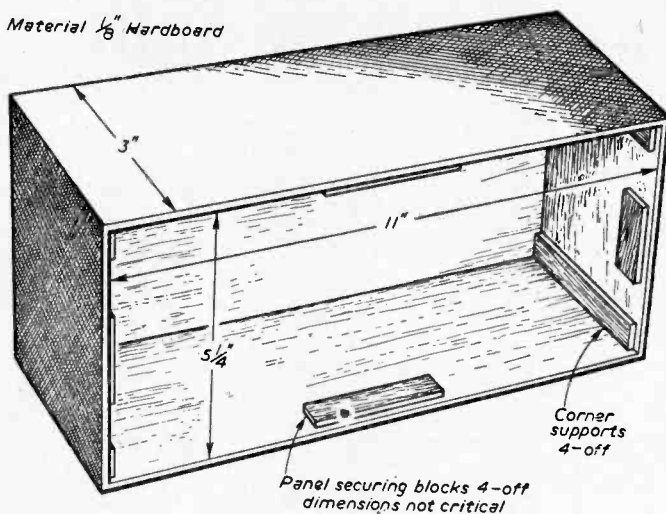


Fig. 11.—Dimensions of the case.

## R.A.E. SCHOLARSHIPS

### The Scheme

IN conformity with their policy of providing a reserve unit specifically for radio amateurs, 404 Signal Squadron (Press Communications), Army Emergency Reserve, announce that they will offer 12 R.A.E. scholarships to men wishing to become radio amateurs. The scheme is open to fit men between the ages of 18 and 40 who are prepared to enlist in the Squadron for a period of three years. When these men attend annual camp in September 1960, they will be given an intensive course in basic radio and electrical theory, plus a basic morse course. On returning home, they will continue their theory studies by means of a free correspondence course, and at the April 1961 camp specifically designed for R.A.E. candidates, plus more advanced morse training. This will allow them to sit the 1961 R.A.E. and take the G.P.O. morse test shortly afterwards. On completion of training men will be granted the trade of Wireless Operator. Men with good technical aptitude may be given further training to qualify as radio technicians.

### Pay, Allowances, Amenities

During training all volunteers are paid at Regular Army rates, plus a Bounty of either £9 or £19 depending upon re-call liability. Uniform, food, accommodation and travel are free. Typical recruit pay rates are:—

£9 Bounty. Single man, £18; married man, £24.

£19 Bounty. Single man, £28; married man, £34.

This is for a 15 day camp. The Bounty part of the payment is Tax Free.

There is a good social life at camp, plus opportunities for sport and shooting. The Squadron has an active radio club and operates GB3AWR at camp. Volunteers who make good progress will be given permission to operate a transmitter from their homes on Service frequencies before obtaining the G.P.O. licence.

### Obligations

The only peace-time training obligation is to attend one 15 day camp each year. There are no compulsory week-end or evening drills, though voluntary training nets are run. All volunteers can be called for full-time service by Royal Proclamation in a national emergency. A certain number of men volunteer for re-call without proclamation. They receive the higher rate of Annual Bounty.

### How to Apply

The number of candidates for these scholarships is likely to be high, so early application is essential. Write to:—Major J. A. Bladon, G3FUD, "Madresfield", Jack Lane, Davenham, Northwich, Cheshire.

Please give details of your age, civilian job, Service experience, radio experience, morse reading speed (if any), and whether or not you hold a driving licence. You will then be sent full details of the conditions of service and your name will go forward for a scholarship award.

Men who already hold an amateur licence or who are ex Royal Signals tradesmen will find an interesting and financially rewarding spare time occupation with the Squadron.



# An A.F. Phase-Shift Test Oscillator

by D. Noble and D. M. Pratt

**A** RELIABLE audio oscillator capable of providing a pure sinusoidal tone is an indispensable piece of equipment in the amateur workshop. Its uses are numerous, and without an audio oscillator, there are some tests which cannot



The completed oscillator.

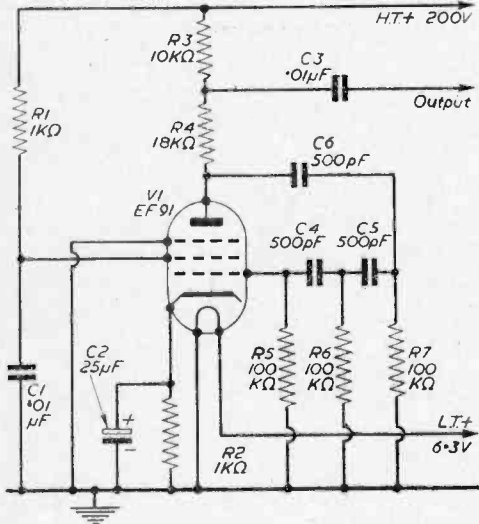


Fig. 1.—The circuit diagram.

### Construction

As can be seen from the illustrations, there are two suggested forms of construction: one of conventional design, and the other employing modern printed circuit techniques. It should be mentioned, however, that the wired version uses a valve with a B9A base, whereas the printed circuit uses a EF91 valve having a B7G base. Also, in the former case, an H.T. switch, output potentiometer and socket, and key jack are provided on the unit.

There are printed circuit kits at present available from PRACTICAL WIRELESS advertisers, and it is intended here to give full constructional details of the printed circuit oscillator so that readers unfamiliar with printed circuit techniques can try their hand at this new method of construction.

The oscillator is built on a piece of copper laminate 2in. by 3in. Having cut a piece of laminate to size, the first step of construction is to cover the copper which is required to form the

be carried out on certain types of apparatus. This oscillator can be used to check the modulation of an amateur transmitter, and to practise Morse code as well as for many applications in audio amplifier design and testing.

### The Circuit

A 'phase-shift' oscillator is employed, and this is shown in Fig. 1. The values of the capacitors C4, C5, C6 and the resistors R5, R6, R7 determine the frequency of oscillation and the values suggested in the table are calculated to give a frequency of 1000c/s.

Refinements to the circuits can include an H.T. switch, a potentiometer across the output to provide an adjustment of the output voltage, and a short-circuit type jack socket for a Morse key.

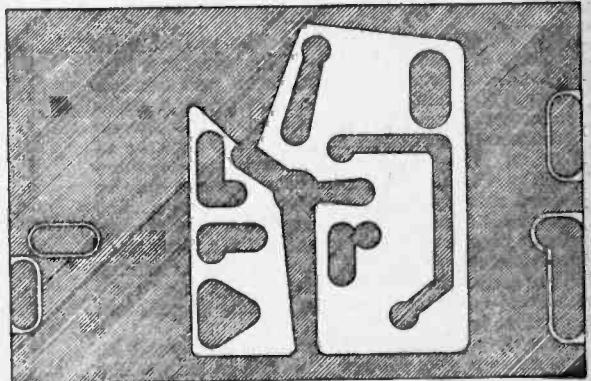


Fig. 2.—The printed wiring (full size).

'printed' wiring with acid-resistant paint. Fig. 2 shows a full scale plan of the panel after it has been painted. This is then etched in the acid, after which the paint is cleaned off with a paint thinner solution. In Fig. 3, the components are shown in position as seen from the underside of the panel, i.e., the components are actually on the reverse side of the laminate.

**Drilling**

The next step is to drill the printed panel: the valveholder pins, and the points from which external connections are to be made should be drilled with a 3/32in. drill, and the spigot of the valveholder with a 5/32in. drill. Each end of the resistor and capacitor positions are drilled with a No. 55 drill. This may be done easily by placing

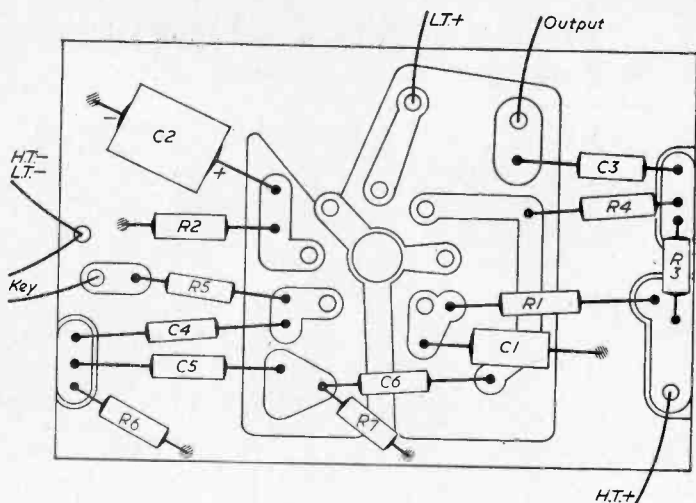


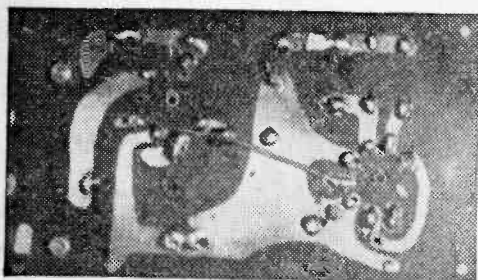
Fig. 3.—The wiring diagram.

**Components**

Before the drilling is carried out, it is recommended that the constructor obtains the components so that any slight changes in the component positions owing to differences in component sizes can be made. In the prototype the 500pF condensers were of very small size. They were about the same size as the resistors used, while the two 0.01μF condensers were a little larger. A special printed circuit B7G valve holder is required, and this may be obtained from most dealers.

It is recommended that small 3/32in. eyelets be fitted into the panel at the positions from which the external connections are to be made. These are provided to prevent the external wire leads from peeling the copper from the panel.

This oscillator unit will operate from a power-pack supplying 6.3V for the EF91 heater, and 200V H.T.



The printed wiring.

the components on the panel and marking the ends of the wires of the components with a centre punch.

**SIMPLE BATTERY CHARGER**

By S. G. Wood

THE charger here described has proved both cheap and efficient. As will be seen from Fig. 1, a metal rectifier is employed and the low voltage A.C. input required is supplied by a mains transformer. Fuses are inserted as shown to provide a measure of protection and these can each be of 3A rating. The ammeter A is a small one, reading from 0 to 4A. However, a serviceable meter may be obtained cheaply from a car dismantling yard. The resistance R is necessary to vary the rate of charge, and can be a heavy duty type with a resistance of approximately 15 to 20Ω. As the rate of charge will not exceed 2A, the entire unit may conveniently be housed within a metal box so long as sufficient ventilation is provided.

As with all battery charges, polarity must be observed, and it is always advisable to remove the "stoppers" from each cell before commencing the charge.

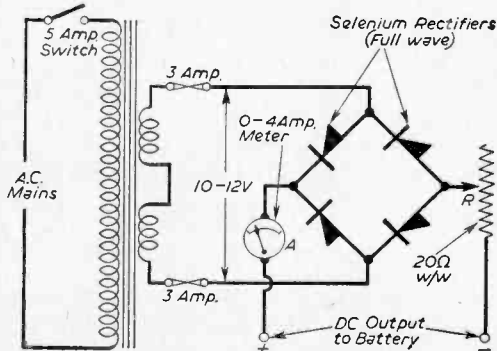
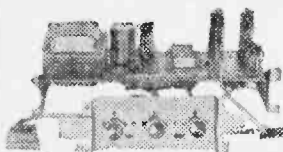


Fig. 1.—The charger circuit.

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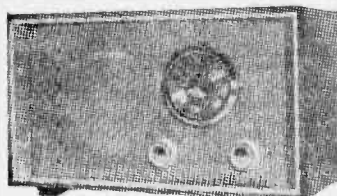


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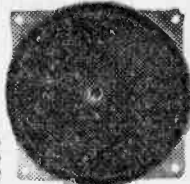


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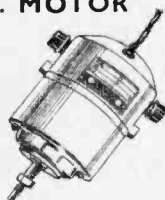
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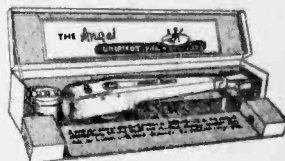
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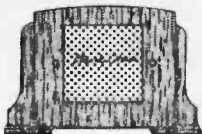
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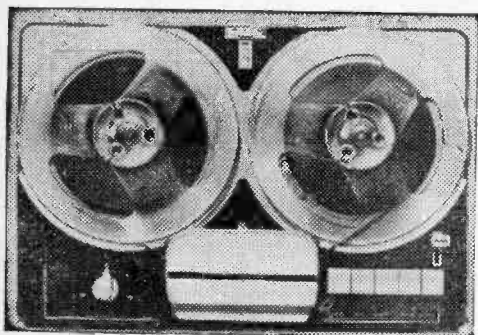
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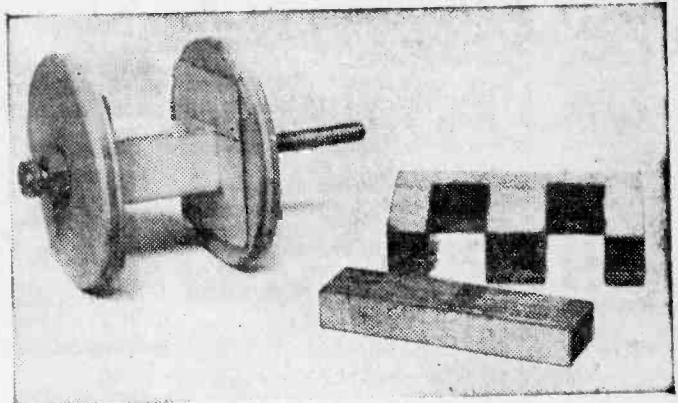
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# Interstage Transistor Transformers

PRACTICAL INFORMATION FOR HOME CONSTRUCTION

By D. Saull



Coil former and lamination stack.

WHEN considering the output stage of an amplifier the chief concern is matching the output impedance of the final stage to the speaker impedance. The former is usually hundreds of ohms, and the latter three ohms. A transformer is now almost a necessity in the circuit design. There are various methods of dispensing with an output transformer, such as using a low impedance power transistor and a high impedance speaker, but the former device draws heavy battery current, and high impedance speakers are expensive and more difficult to obtain, and so, in most cases, a matching transformer is used. The design of such a transformer for use with a Mullard OC72 output stage, working single-ended, will be considered in a future article, and a practical design given.

The earlier stages of an amplifier may be conveniently resistance-capacity coupled. However, greater gain, with perhaps subsequent omission of one or more of the stages, may be obtained if transformer interstage coupling is used. In this article the design of such transformers is considered.

An output transformer is a power transfer device; an interstage transformer is a current

transfer device. Consider an OC71 transistor (very similar to the "red spot" variety) working class A in an audio amplifier (Fig. 1). We require to transfer the current value flowing in the collector circuit of the preceding stage, to the base/emitter circuit of the following stage, and during this process achieve a current gain. This may be effected with the aid of a current step-up ratio transformer.

### Designing Interstage Transformers

A M. and E. A. No. 21 lamination in the silcor 25 grade will do well (or any lamination having a cross-sectional area of core approximately 0.2sq. in.).

The primary inductance of the winding should be of the order of 1.5-2H, which must carry a D.C. component of 1mA (the steady D.C. current of an OC71 transistor working class A).

The method of evaluating the number of turns required to obtain the necessary inductance value, and the choice of wire gauge to fill the bobbin will be given in the future article previously mentioned. This article is given for those who prefer a practical design from which to work.

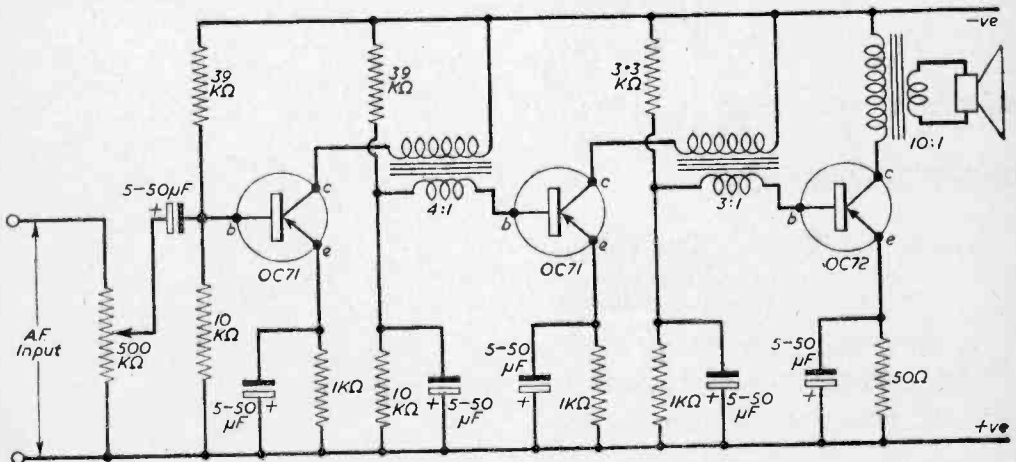


Fig. 1.—The circuit diagram of the amplifier.

In Fig. 2 is shown a pair of No. 21 laminations drawn with dimensions, and details of the bobbin construction are illustrated in Fig. 3.

The wooden winding block is made of soft wood, size  $7/16$  in. x  $7/16$  in. x 3 in., and the bobbin cut from a post-card. Adhesive is used for cementing the bobbin together, lightly smeared on the two surfaces.

The wooden winding block is cut to the exact length of the bobbin and drilled down its centre to take a 4B.A. bolt. Two end cheek supports are then cut from  $1/4$  in. plywood and drilled to take a 4B.A. bolt. The bobbin cheeks are pierced to take the lead-outs from the windings and assembled as illustrated in Fig. 3.

### Turns Ratio

A 3:1 turns ratio is required for the coupling transformer between the second OC71 and the output transistor OC72; a 4:1 turns ratio between the first and second OC71. The primaries of both transformers are identical, only the secondary turns differ.

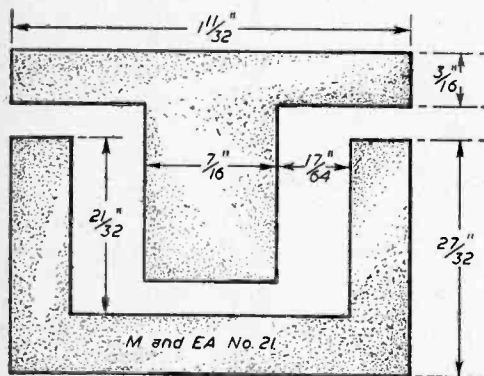


Fig. 2.—A No. 21 lamination with dimensions.

### 4:1 Ratio

Primary: 1000 turns of 36s.w.g. enamelled copper wire.

Secondary: 250 turns of 36s.w.g. enamelled copper wire.

### 3:1 Ratio

Primary: 1000 turns of 36s.w.g. enamelled copper wire.

Secondary: 333 turns of 36s.w.g. enamelled copper wire.

The bobbin may be conveniently rotated in a hand-drill, and if a black line is painted on one of the plywood cheeks, counting the number of turns on is made easier. The wire should be wound on as evenly as possible, although it does not matter if the wires cross. Care should, however, be taken not to scratch the enamel covering on the wire. If this occurs a short-circuited turn will be made and the primary inductance will fall in consequence.

Wind the primary on first (as primary and secondary wire gauges are the same). The inductance may then be checked if desired before winding on the secondary turns.

Two turns of thin paper should be wound round the first winding before commencing the second winding. When the bobbin has been wound it is laminated (interleaved) and the transformer is then ready for connecting into the circuit.

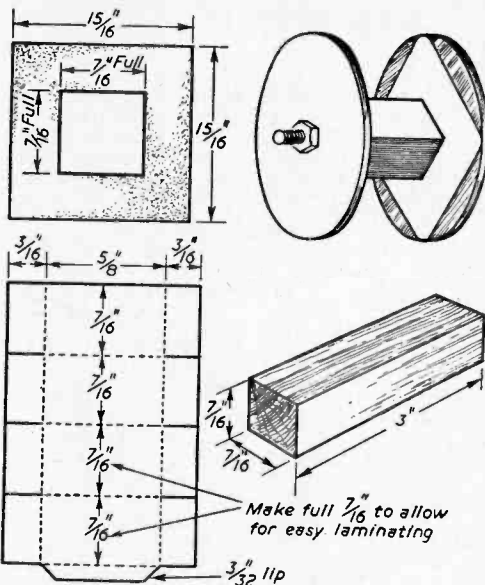


Fig. 3.—Making the coil former.

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Mr. E. M. Whitaker, B.Sc., A.M.I.E.E., has joined Associated Electrical Industries (Woolwich) Ltd., as Assistant to the Commercial Director, Mr. J. W. Ridgeway. Mr. Whitaker will be located at 155 Charing Cross Road, London W.C.2. He joined the British Thomson-Houston Co. in 1931 as a school apprentice.

Mr. Joseph Samuels, who as a member of the Board of Winston Electronics, Ltd., Shepperton, Middlesex, has been Purchasing Director for several years, has now been appointed Works Director in charge of production. Mr. Samuels, who is 49 years old, was educated at St. Mary's College and Imperial College of Science. Before joining Winston Electronics in 1954, he was for several years with Standard Telephones and Cables and later Sunvic Controls of Associated Electrical Industries, Ltd. He joined the Board of Winston Electronics in 1956.

# Making your Own Chassis

SECRETS OF THE TECHNIQUE

By V. E. Holley

CHASSIS making is an operation which constructors often avoid by purchasing the ready-made article. He who takes his hobby seriously, however, will have a continuing requirement for chassis of all shapes and sizes and will find it both economical and convenient to make

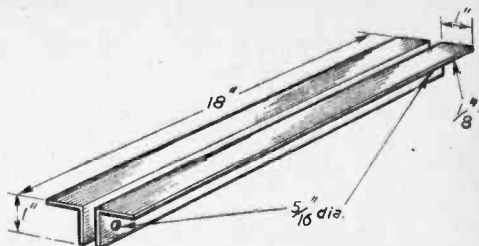


Fig. 1.—The "clamp."

where connections to the chassis must be soldered. Sheet of 20s.w.g. is suitable for light screens, small boxes and chassis up to 3in. x 3in. with no heavy components; 18s.w.g. will do for chassis up to about 10in. x 6in. with no abnormal loading, and 16s.w.g. is suitable for larger and stronger jobs.

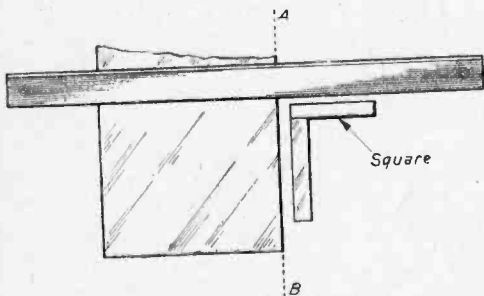


Fig. 2.—Using the clamp and square to form a straight edge at right angles to AB.

them. It is the aim of this article to show how this may be done with the minimum of tools and equipment.

### Materials

The main purpose of the chassis being to hold the components together (or to keep them apart) there is no basic reason why it should be made of any particular substance. Mild steel and aluminium sheet are commonly used, the former for cheapness, the latter because it is easy to work, has superior screening properties and is non-magnetic. Aluminium is therefore the choice for the home constructor except for certain specialised jobs

### Apparatus

It is assumed that the constructor has access to a bench having a vice firmly attached to it. Beyond this there is one inexpensive but essential piece of equipment which must be acquired and which for want of better description will hereafter be referred to as a "clamp". For this, two pieces of mild steel angle 1in. x 1/2in. and 18in. long are required and it is important that they are straight and true. Holes must be drilled at the ends and the two pieces bolted together as in Fig. 1. The holes must be accurately positioned and are best made by lining up the two pieces of angle in the vice and drilling through both in one operation. If the holes

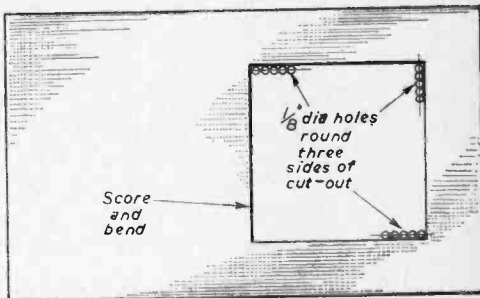


Fig. 4.—Making a rectangular cut-out.

in one piece can be threaded to receive the bolts, so much the better; otherwise nuts can be used. The bolts should not be smaller than 1/4in. and the heads should be slotted for a screwdriver.

### Cutting Sheet Metal

It is inadvisable to cut aluminium with snips or shears because these tools are liable to stretch and distort it. The following method is quick and easy and produces a straight and true edge requiring no subsequent attention. First mark out the line of cut and holding a steel rule or similar metal straight edge firmly along it, score the aluminium heavily with the point of a penknife. Go over the line several times in this way (up to 12 times for 16s.w.g.), so that the metal is appreciably weakened

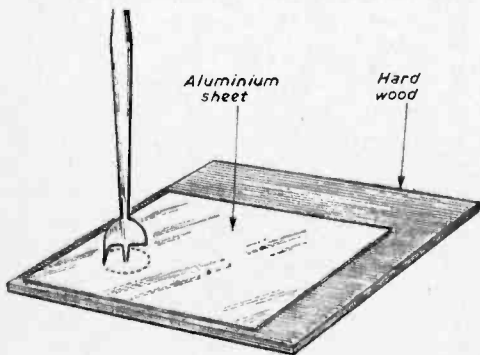


Fig. 3.—Cutting with a centre bit.

and then set it up in the right-hand end of the clamp in such a position that the score is about 1/32 in. above the surface and facing the operator. Tighten the bolts and grip the clamp in the vice close to the left-hand edge of the metal. A stout piece of board about 6 in. wide and having a reasonably true and flat surface should now be

special tools sold for the purpose, but these are expensive and there are alternatives. Twist drills, operated slowly, are satisfactory up to 1/4 in. and a hole of this size can be enlarged to 3/8 in. for a B7G socket without much difficulty by shaving the circumference with a penknife having a small narrow blade. Do not attempt to cut too deeply at each stroke.

### Circular Cut-outs

Holes of 1/4 in. diameter and above can be made with a carpenter's centre bit of appropriate size and of the type shown in Fig. 3. Place the metal on a piece of hardwood and with a twist drill make a small hole for the point of the bit to enter. Apply the bit to the metal and as soon as the outer cutter comes into contact with the surface, lubricate it with methylated spirit to ensure smooth cutting. Rotate the bit with light pressure till the outer cutter is completely through the metal. Clean up the hole with a penknife.

### Rectangular Cut-outs

Small rectangular holes are best dealt with by cutting a circular hole of appropriate diameter and then squaring it with a file. Large ones can be cut by drilling three or four 1/4 in. holes at the corners as in Fig. 4 and running them into one to form a slot into which a hacksaw blade, held in a pad handle, can be inserted to make the cut. If three sides are so cut the fourth can with advantage be dealt with by scoring and bending.

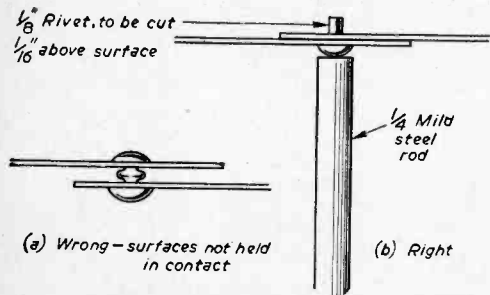


Fig. 5.—Riveting.

laid against the aluminium and the whole bent firmly and evenly away from the operator to an angle of about 45 deg. Transfer the wood to the opposite surface and bend the metal back 20 deg. or so. Repeat till the metal separates. If a large sheet has to be cut, it may not be possible to hold the clamp satisfactorily in the vice, but the difficulty can be overcome by fixing it temporarily to the edge of the bench with a couple of stout wood screws through the holes normally occupied by the bolts.

### Bending

Good sharp bends can be made by the same method, but in this case care must be taken not to score the metal too deeply or it will be unduly weakened. In making a bend, the metal should be folded over in one operation when it will be found that the bend will go to about 85 deg. If the metal is then raised in the clamp about 1/4 in., a little more pressure will take it to 90 deg.

### Shaping

To produce a straight edge on a piece of sheet put it in the clamp with the irregular edge protruding and shave off the irregularities with a file. If it is desired that the new edge shall be at right angles to an existing edge, this can be ensured by adjusting the position of the sheet with the aid of a square applied between it and the bottom edge of the clamp as shown in Fig. 2.

### Drilling

Aluminium being a soft metal, is best cut slowly by hand. A power drill tends to "walk about" in the metal and to the operator's surprise and chagrin, the hole may turn out to be in the wrong position although accurately marked beforehand. Large holes are, of course, best cut with one of the

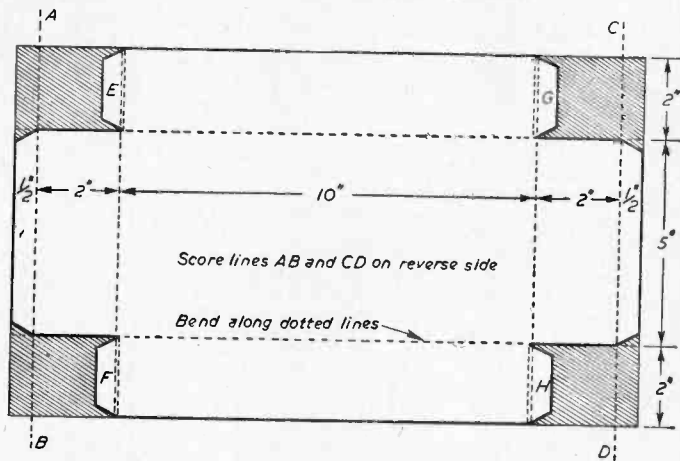


Fig. 6.—Preparing a chassis for bending.

### Riveting

Rivets are a convenient and economical means of fastening for aluminium and give a professional appearance. The aluminium round-headed type, 1/4 in. in diameter, is very suitable for general purposes and can be used for securing valve bases, small chokes and transformers, etc., as well as in the making of chassis. It is easily drilled out when required. Successful riveting requires that the rivet shall be a close fit in the hole and that it and the two surfaces to be joined shall be held in close contact during the operation. If this is not done, the rivet will bulge between the surfaces as shown



in Fig. 5 and close union will not be achieved. The head of the rivet must also be properly supported and a useful tool for this purpose can be made from a piece of  $\frac{1}{2}$ in. mild steel rod about 9in. long. Square off one end and drill it out to a concave form into which the head of the rivet will fit neatly. The rod can be held in the vice and the concave end inserted into otherwise inaccessible positions in chassis where riveting may be required. The operation is shown in Fig. 5. The tail of the rivet should be cut off about  $1/16$ in. above the top surface and then hit with a light tack hammer; fifteen or twenty light taps will produce a better result than a few heavy blows. If a flush finish is required the hole can be countersunk and the tail of the rivet tapped level with the surface.

#### Marking out

Let us now suppose that a chassis 10in. x 5in. x 2in. is required, with a  $\frac{1}{2}$ in. flange at each end for securing it to a cabinet as in Fig. 6. To allow for trimming and squaring off a piece of 18s.w.g. aluminium a little larger than 15in. x 9in. will be required. If one of the long sides is not already straight and true, it should be made so by the method already described and the chassis can then be marked out with a square and steel rule, working from this edge. Holes and cut-outs can also be marked at this stage is desired but none should be made till the chassis is complete because they will weaken the metal and may cause it to bend in the wrong place. When this has been done and the measurements checked, any surplus metal should be removed. The lines AB and CD should now be transferred to the reverse side of the sheet and scored ready for bending. The remaining bend lines should now also be scored, but note that in order that the corners of the chassis may be brought properly together, the scoring on what will be the sides must be displaced inwards by an amount exactly equal to the thickness of the metal. The shaded portions in Fig. 6 should now be cut away (a small hacksaw is a very good tool) and the metal is ready for bending.

#### Forming

Grip the metal in the clamp by each of the chassis flanges in turn and make these bends first in the manner described, using a piece of wood about 2in. wide and bending, of course, away from the scoring. The two long sides should next be bent similarly. Now remove one of the bolts from the clamp and with the aid of the vice, grip the chassis at the extreme end of the clamp by each of the four tabs E, F, G and H in turn and bend each to 90deg. To fold down the ends, cut a piece of stout plywood  $4\frac{1}{2}$ in. wide and about 9in. long and holding it firmly inside the chassis at the bend line, press the end down firmly and evenly on a piece of timber as in Fig. 7. The metal will fold to about 85deg. which will be sufficient. Set the corners true and square and secure them with bolts

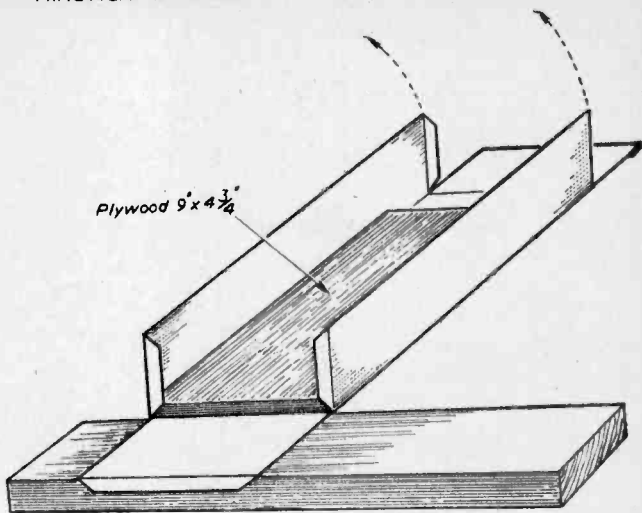


Fig. 7.—Folding the ends of a chassis.

or rivets as preferred. Holes and cut-outs for components can now be made.

#### Information Required

I wish to fit to my CR100 receiver a "magic eye." Can any reader supply data, etc., for fitting? —R. W. HOWE (162 Victoria Road, Wood Green, London, W.22).

Could any reader give me particulars of the Admiralty P104 receiver or tell me what the plug connections are? I would also be grateful for any information on Monitor Unit 56.—J. B. TAYLOR (Buxton College, Buxton, Derbyshire).

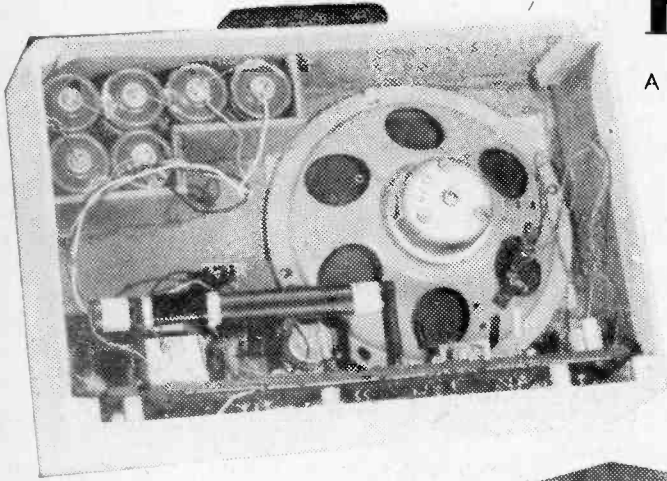
I have a V.R.L. communications type receiver purchased at least ten years ago. I have had satisfactory use from it till now. I have not been able to obtain a circuit diagram for it, and I would be grateful for any information on this receiver.—S. G. LIFTON (191 Romney Avenue, Bristol 7).

I would like information of all the R.F. units available on the surplus market, especially the 27B and 24 for conversion of R1155 to 21 and 28Mc/s.—V. E. BATCHELOR (24 Woodstock Rise, Sutton, Surrey). (Age 16 years.)

I have been a S.W.L. for four years now, and am thinking of building an amateur band receiver covering 160-10m in six switched bands, so I wonder if any reader could give me the aerial and oscillator coil winding details for these bands; also I would be interested to hear from S.W.L.s who have built their own receivers.—M. KELLETT (16 Lyons Colliery, Hetton-le-Hole, Co. Durham).

# Four Tran

A SIMPLE CIRCUIT FOR THE BEGINNER

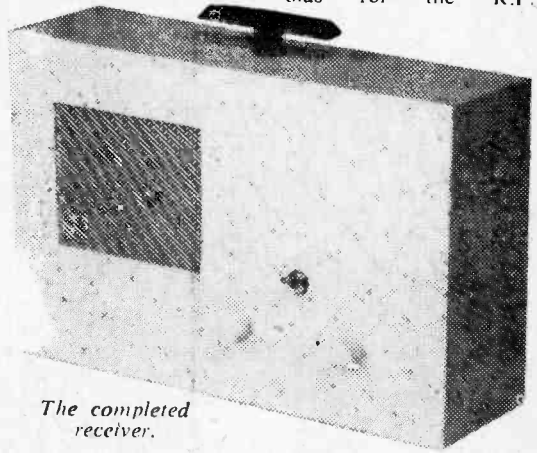


The interior of the set.

THIS receiver has been designed and presented for those who wish to construct a simple receiver, to take into the garden in the summer, or about the house, or to provide background music when reading, etc.

**Design**

Selectivity, simplicity, cheapness, and reasonable quality of sound reproduction have been the basis upon which the design was formed. The tuning coils are hand wound, and because medium wave coils are easier to wind than long wave coils, medium wave tuning only is provided in this design. The provision for long wave tuning is left to the reader if so desired; this modification would call for the addition of two long wave tuning coils and a wave-change switch, and because there is a tapping on each coil, a four pole wave-change switch would be necessary.



The completed receiver.

amplifier, and 6V negative for the collectors of the four transistors, leaving an additional 1½V for use when the battery voltage falls after usage.

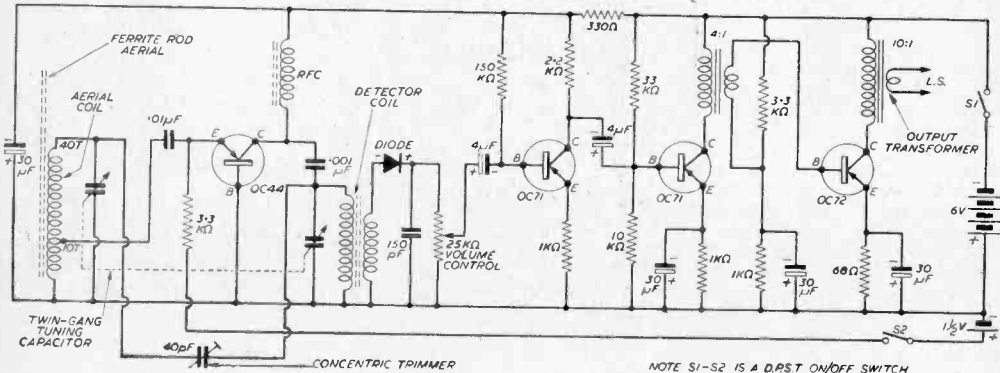


Fig 1.—The circuit diagram.

# istor T.R.F.

By D. Jacobs

### Construction

The complete circuit is shown in Fig. 1. The aerial coil is wound on two 8in. lengths of 5/16in. ferrite rod, but the length of the rods is not critical for tuning considerations. However, a large cross-sectional area of ferrite rod results in a greater

easy fixing. This tuning capacitor has two common connecting solder tags for each section situated on either side of the fixed vanes. One of these pairs is used to connect the feedback (or reaction) capacitor in circuit. The feedback (positive) capacitor used is a 40pF concentric type. Only a small degree of feedback is necessary and the degree will depend upon the signal strength of the area in which the

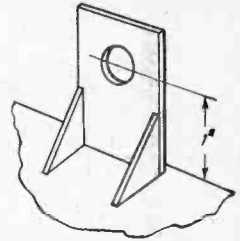


Fig. 3.—Bracket for the volume control.

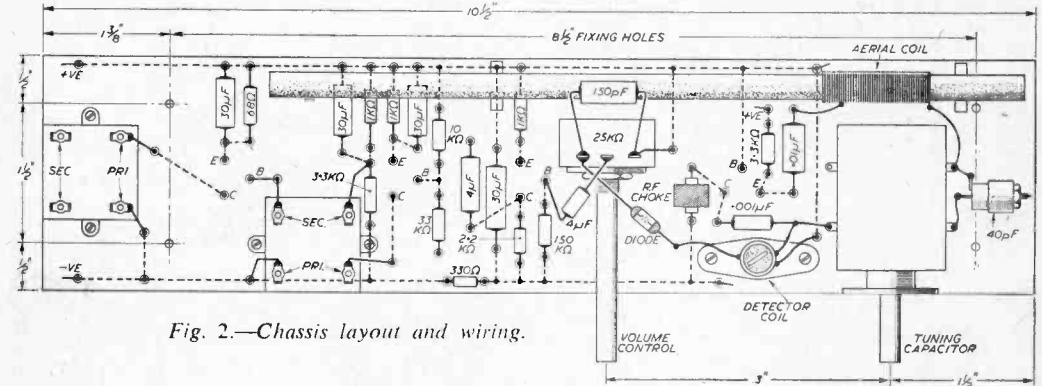
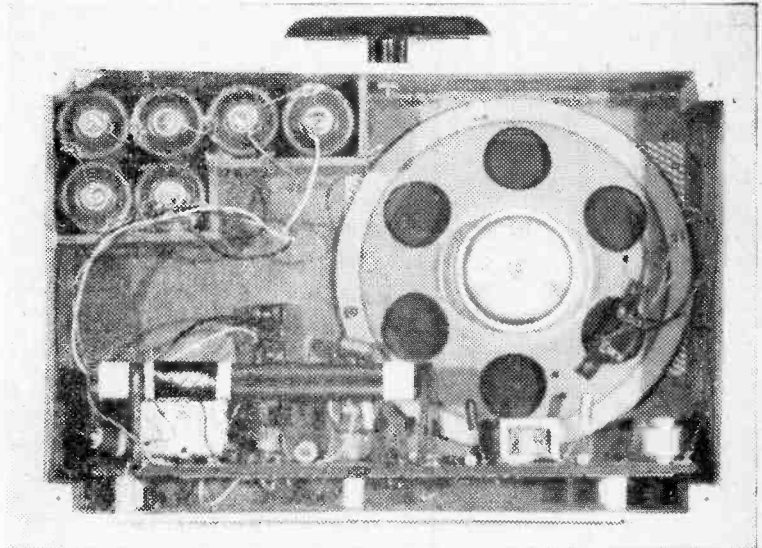


Fig. 2.—Chassis layout and wiring.

signal pick-up than a small area and, hence, two lengths are used in this design. Details of the coil are shown in Fig. 4. The ferrite rods are mounted on the chassis by means of two supports cut from hardboard (Fig. 6) and cemented in position.

The Mullard OC44 R.F. amplifier is connected on the grounded base configuration in order to present the highest input and output impedances. Matching to the input is achieved by means of a tapped coil and the 0.01μF capacitor. Current bias is supplied to the transistor by 1½V (positive) through a 3.3k resistor. The output from this transistor is taken via the 0.001μF capacitor to the R.F. transformer, the winding details of which are given in Fig. 5. A coat of varnish on the completed coil will keep the windings secure. The twin gang tuning capacitor is a miniature 365pF component with two fixing holes (tapped 4B.A.) in its base for

receiver is used. It should be set to obtain best results with no oscillation occurring at any setting of the main tuning capacitor.



Rear view of the receiver.

The secondary of the R.F. transformer is connected between the positive line and the diode detector. This is a crystal diode and the type is not critical. The volume control is of the miniature type and 25k in value. The shunt 150pF capacitor across the volume control is to bypass the R.F. component. This value is not critical and may be increased up to 1,000pF.

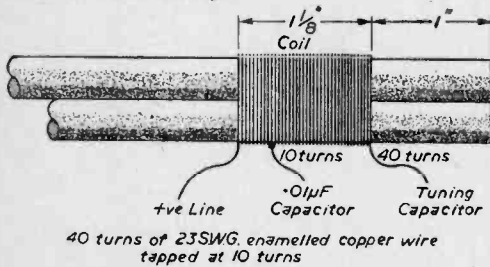


Fig. 4.—Aerial coil winding details.

**A.F. Amplifier**

The remainder is a straightforward A.F. amplifier. This section of the circuit only may be built if an A.F. amplifier is required for use with a crystal pick-up. In this case, the volume control should be of the order of 1M.

The total battery drain is about 16mA and a reasonable life should be obtained from the battery. If the reader so wishes he may use surplus type transistors but the author cannot guarantee

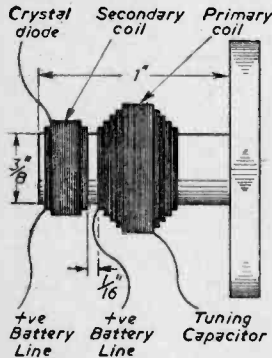


Fig. 5.—Winding the R.F. transformer.

the same low current drain. The transistors in this case would be, R.F. amplifier 'white spot'; A.F. amplifier 'red spot'; output 'green/yellow'.

**Chassis**

The chassis is made from hardboard, details of the layout being shown in Fig. 2 The chassis is attached to the base of the cabinet by means of four 3/16 in. lengths of 3/16 in. diameter dowel rod, drilled to prevent splitting the wood when screws are inserted.

The volume control is mounted in position on a bracket made from a rectangular piece of hardboard which is secured with adhesive. Small triangular pieces of hardboard may be cut and used to strengthen this bracket.

The circuit is laid out in 'printed circuit' form, components on one side of the chassis inter-wiring on the reverse side.

**Cabinet**

The cabinet is constructed from hardboard and consists of five rectangular pieces of hardboard cemented together. It is strengthened by means of small lengths of 3/4 in. by 1/2 in. stripwood cemented into the four corners on the inside to finish flush with the back of the cabinet. The back should have a number of holes drilled in it to allow a flow of air.

The battery is kept in place by means of a small compartment constructed from hardboard as shown in the illustrations.

To the inside of the back piece may be cemented a piece of sponge rubber (or plastic) to cover the batteries and keep them securely in place when the back is screwed into position.

The cabinet is of sufficient size to allow for a 6in. speaker, a larger size speaker being cheaper to purchase and giving better frequency response than a miniature type. It is covered in adhesive-backed

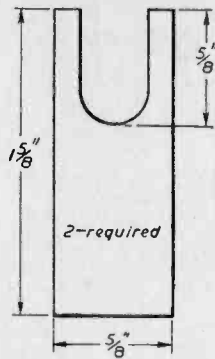


Fig. 6.—The wooden supports for the ferrite aerial.

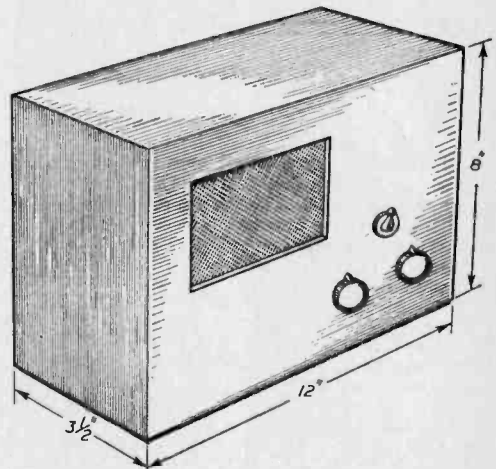


Fig. 7.—Dimensions of the case.

plastic material, using two colours, one for the front and the back, and the second for the sides, top and bottom. A plastic handle may be purchased to provide for easy carrying.

**Operation**

When completed, the battery is connected to the circuit, making certain that the polarity of the battery is correct. Incorrect polarity will result in burning out all the transistors immediately.

In use the tuning condenser is adjusted to receive a signal (note that the ferrite aerial is directional) and the dust core in the R.F. transformer adjusted, together with the feedback capacitor, to give the best results. Once these two adjustments have been carried out, the dust core and capacitor may be lightly sealed in position.

# Model Control Transmitter Circuits

BATTERY AND MAINS UNITS

By J. Gray

VERY simple circuits can be used for model control equipment operating in the 27Mc/s band, and only one or two valves will be needed, even when the model is at a considerable distance. The circuits shown here can be made up for battery or mains operation, and any power or output valves, of triode, tetrode, or pentode type, will operate satisfactorily. Smaller valves, such as A.F. triodes, may also be used if less output is required.

For battery running, a valve such as the surplus 3D6 can be operated from dry batteries, requiring 1.4V at 0.22A for the filament. Maximum anode and screen grid currents combined total 30mA, with 180V anode and 135V maximum screen grid ratings. A large output is thus obtainable, even with one valve. Other "all-dry" output valves can be used, and surplus 2V output valves such as the 220HPT and numerous similar types also function very well, but require a 2V accumulator supply. It is generally possible to use any type of valve in the circuits shown, so the choice depends on the kind of batteries or other supplies to be used, and on the output needed.

## 1-Valve Battery Transmitter

A suitable circuit which can provide control up to a few hundred yards range is shown in Fig. 1. A triode may be used instead of the tetrode shown. The H.F. choke should be a good quality short wave component, the type used in receivers being

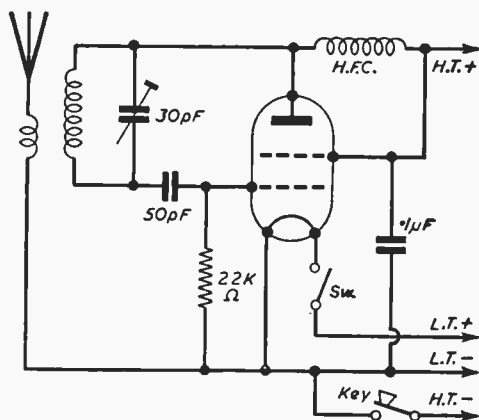


Fig. 1.—Circuit for a 1-valve transmitter.

satisfactory. The layout is not very important, provided the leads to the valve and the tuned circuit are reasonably short and direct.

The output can be modified by changing the H.T. voltage. For short range, a 90V battery will suffice. For maximum range with a particular valve, the H.T. voltage should be increased to the maximum specified for the valve type.

The tuned circuit can be made as described later, and the aerial coupled by means of a 2-turn coil. A key is included in the H.T. negative line, for control purposes. The H.T. batteries will have a long life because current is only drawn when actually keying.

## Push-Pull 2-Valve Battery Circuit

The transmitter circuit shown in Fig. 2 can provide control up to many hundreds of yards range if power pentodes and adequate H.T. are used. In general, it is unlikely that a more powerful circuit will be required, for a plane, boat, or other model. The transmitter is a push-pull version of that in Fig. 1, with each valve driving the other and it is a very powerful oscillator. Triodes may be used, with reduced output. This circuit has the additional advantage that it can at any time be used as a 1-valve transmitter simply by pulling out one of the valves. Tuning then has to be slightly re-adjusted. This reduces battery consumption when reduced range is sufficient, as when controlling a boat on a small pond.

## Mains 1-Valve Circuit

A self-contained mains circuit is shown in Fig. 3, with its own power supply. Mains running is very convenient for a model operated in the garden or house, or when testing receiving equipment indoors. Any type of valve, including pentodes or tetrodes, may be used, with mains transformer to suit. An H.T. voltage of some 250 or so will be ample. A valve rectifier can of course be used instead of the metal rectifier.

Keying is by breaking the cathode circuit. The usual value of bias resistor is included, as specified for the valve in normal A.F. or output circuits. This safeguards the valve against excess current if oscillation ceases for any reason.

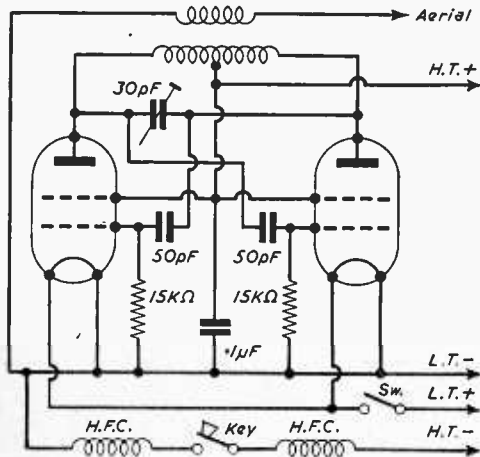


Fig. 2.—Push-pull two valve circuit.

Small triodes such as the 6C5, etc., will give adequate output for most purposes. Larger pentodes such as the 6V6 or 6L6, may be run so as to provide the maximum radiated power permitted under the terms of the model control regulations.

**Transmitter Coils**

The 27Mc/s band occupies frequencies around 11.1m, and any efficiently designed coil tunable to this band will be satisfactory. A coil with spaced turns, on a ribbed former, will give best results. With a former approximately  $\frac{1}{2}$ in. in diameter, eleven turns of 20s.w.g. or similar wire, occupying 1in. of winding space, will do. Using a 30pF airspaced trimmer, the 27Mc/s band can be found without difficulty, with a normal layout, and using the circuits in Figs. 1 and 3. For the circuit in Fig. 2, a turn or so must be removed, because of the extra stray capacity. Smooth formers, or formers of larger diameter, will be satisfactory, if the number of turns is adjusted until the transmitter operates in the 27Mc/s band, with the trimmer about one-half closed.

The circuits in Figs. 1, 2 and 3 will radiate on any frequency to which they are tuned. An aerial must not be attached until they have been set in the 27Mc/s band, and final re-adjustment of tuning should be done after adding the aerial.

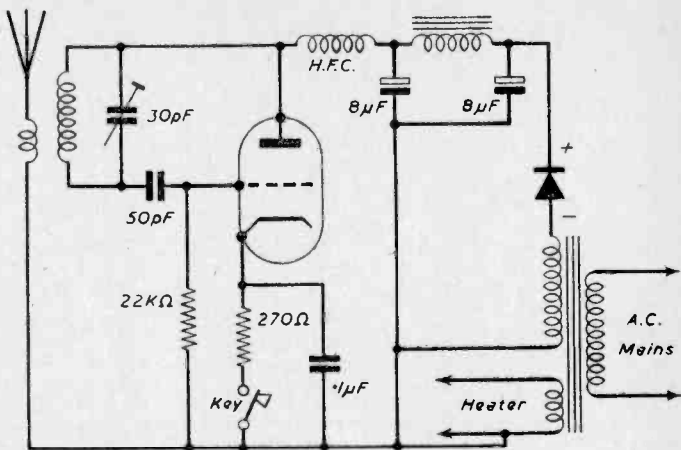


Fig. 3.—Mains 1-valve circuit with cathode keying.

the frequency meter at the correct reading, and bring it near the anode coil. The transmitter is then tuned until the bulb lights.

The meter is best kept at such a distance that the filament only just lights at the point of exact resonance. This will then give an accurate indication of frequency. It also avoids any danger of excess current "blowing" the filament, which may otherwise easily happen with mains or 2-valve battery transmitters.

A crystal diode and meter may be used instead of the bulb, as shown in Fig. 5. This gives a slightly more accurate indication than the bulb. By setting the frequency meter at some distance, the actual radiated output of the transmitter can also be compared, so that the effect of changes in aerial coupling, etc., can be seen. This type of meter must not be brought near the transmitter or coil, as described for the bulb meter, or it will be damaged. For field strength measurements up to some 20yd or so, a short aerial rod can be attached to the meter tuning

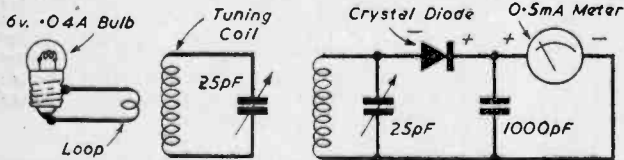


Fig. 4 (left).—A bulb meter for frequency checking.  
Fig. 5 (right).—A field strength and frequency meter.

**Frequency Checking**

With tunable transmitters of the type mentioned, a means of checking frequency must be used. A simple frequency meter can consist of a coil of the dimensions mentioned, with a 25pF or similar short wave condenser, with pointer or scale. A 2-turn loop is connected to a low consumption bulb, as shown in Fig. 4.

Construction should be rigid, and the dial or pointer knob must be securely locked. The coil turns and loop should be cemented, or held by notches in the ribs of the coil former. The bulb should not be changed after calibration, and may best be soldered in.

To calibrate the meter, a ready-made or tuned transmitter is adjusted to 27Mc/s, and the meter coil approached to the anode coil. The condenser on the meter is then rotated until the bulb lights, and the reading marked.

To tune another transmitter into the band, set

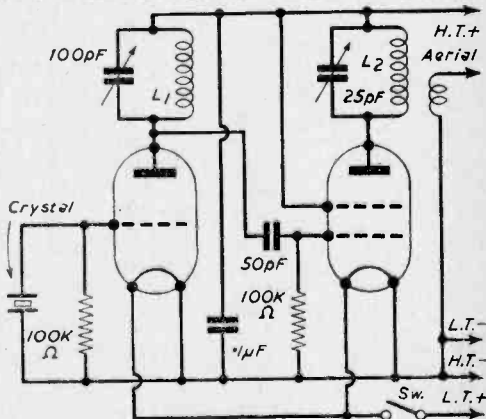


Fig. 6.—A crystal controlled battery circuit.

coil. This will make re-tuning of the meter necessary, so the rod should be removed when the instrument is used to check frequency.

### Crystal Control

When no ready tuned transmitter is available, some other means of determining frequency must be used. The simplest and most accurate method is to employ a crystal controlled circuit. This may be used as a small power transmitter by itself, or it may be employed to calibrate a frequency meter of the types described. This meter may, in turn, then be used to bring tunable transmitters like those in Figs. 1, 2 and 3 into the permitted band.

A circuit for battery operation is shown in Fig. 6, output type valves being recommended. The crystal, which determines the frequency, must be of such type that a harmonic falls within the required

L2 were tuned to 18Mc/s, or 36Mc/s, as well as 27Mc/s. These differences in frequency are, however, considerable, and cannot be reached if the coil is made as suggested, and if L2 is tuned by a small condenser such as 25pF.

If the apparatus is used as a transmitter, it is only necessary to adjust as explained. The receiver is then tuned to the transmitter signal. To calibrate a frequency meter, adjust as described, then tune the bulb or frequency meter to the crystal controlled signal. The meter is then used to set tunable transmitters on frequency.

A crystal controlled circuit for mains running is shown in Fig. 7, operation and coils being as described for the battery circuit. Cathode keying can be used, as in Fig. 3. A.F. triodes such as the 6C5 will work satisfactorily in the crystal stage. The power supply circuit in Fig. 3 may be used to provide current.

With all model control transmitters it is important to remember that radiation outside the permitted band can cause TV interference over a wide area, because harmonics may fall within the tuning range of such receivers.

### Aerials

For adjustments at short range, no aerial need be used on the transmitter. For moderate range, a short vertical rod will be sufficient. The length of this rod depends on the range required, and it can be made from two, three or four 1ft interlocking aerial rods. For maximum range, an 8ft 4in. vertical aerial rod can be used.

With the circuits shown in Figs. 1, 2, and 3, the aerial coupling loop is wound round the middle of the coil. For the circuits in Figs. 6 and 7, the loop is wound at the H.T. end of L2. The circuits in Figs. 1, 2 and 3 require re-tuning after any change is made to the aerial to ensure that the transmitter is still within the band. The crystal controlled circuits will provide a less powerful output than the tunable circuits, however.

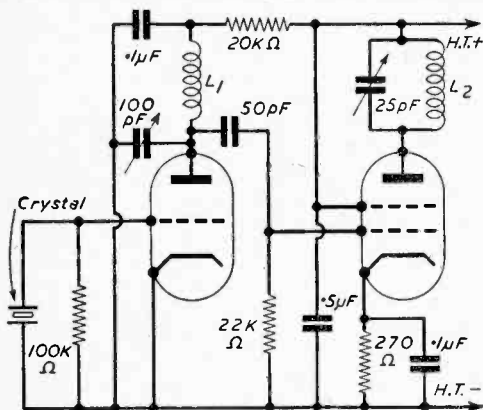


Fig. 7.—A mains crystal controlled transmitter.

band. For example, a 13.5Mc/s crystal, 9Mc/s crystal, or 6.75Mc/s crystal can be used, with a multiplication of two, three, or four times to obtain a 27Mc/s output.

Coil L1 is tuned to the crystal frequency. Using 1in. diameter formers, and 22s.w.g. wire spaced equal to the diameter of the wire between turns, 10 turns may be used for a 13.5Mc/s crystal, 17 turns for a 9Mc/s crystal, or 26 turns for a 6.75Mc/s crystal. The second valve should be removed, and a meter included in the H.T. circuit. As the 100pF condenser in parallel with L1 is adjusted, a dip in anode current will be found, showing that the crystal stage is oscillating. The best tuning point for L1 is just off resonance, where the stage starts oscillating reliably as soon as switched on. Wrong adjustment will reduce output, but not significantly change frequency, and this is, of course, the reason for using crystal control.

The second valve is then inserted, and L2, wound as described for tunable transmitters, is adjusted for best output. This can be found by bringing a bulb loop, consisting of one or two turns of wire soldered to a low consumption bulb, near the anode coil.

It is necessary to use reasonable accuracy when making the coils, because an output will be obtained on other harmonics. For example, with a 9Mc/s crystal, an output would be obtained if

## PRACTICAL TELEVISION

### CHIEF CONTENTS OF MAY ISSUE

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# Some Uses of Relays

IN CONNECTION WITH CARAVAN AND CAR RADIOS

By F. Neville Hart

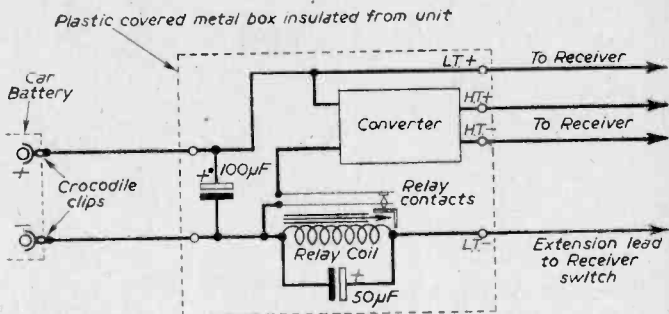


Fig. 1.—Converter unit and relay circuit.

THE writer travels about with a car and a caravan, and being a "short wave fan", has for a number of years operated a superhet. using mains valves, with the current supplied by the car battery, the H.T. coming from a vibrator unit. The latter was built into a metal box, including a high resistance relay and kept under the car bonnet. When the set in the caravan was switched on, the relay operated and brought the vibrator into circuit, to provide the H.T. current. This was done, because, if the vibrator unit were in the caravan with the radio, there was a voltage drop of about 1.5 along the 4ft or so of wire, with a consequent lack of efficiency. Often, after a night's listening, the drain on the battery was so great that on cold mornings there was insufficient "juice" to start the car.

### Remote Operation

A year ago, a battery superhet was built for the caravan, using two short wave bands, and the H.T. is supplied by a transistor converter, giving 90V at 10mA. It uses a very small current, and in no way affects starting the car, however much it is used. (Fig. 1). This too, is mounted in a metal box, with a low resistance relay, in series with the filament lead, and kept under the bonnet. The relay also serves to drop the 6V to 1.5V for the valves. When the set in the caravan is switched on, the relay operates the converter.

A 4-core wire of about 4ft is used, two wires being for the L.T., and the others for the H.T. In this case, the idea of using remote control for the converter is to prevent "pick up" of the high pitched operating frequency of the oscillating transistor, but also ensures that the latter receives the full 6V, without a voltage drop which might be caused if it were at the set end of the extension. An additional 500µF condenser was found to be needed at the receiver end across the L.T., and 100µF, across H.T. negative and earth.

A relay can be very useful if a car already has a radio fitted and one wishes to use an extension loudspeaker in the caravan, to avoid braving the elements to switch on or off (Fig. 2). A 3-core extension wire can be used, in this case, if the car loudspeaker or its transformer secondary is earthed. Otherwise, a 4-core lead is necessary. The relay can be mounted in a metal box and placed near the car battery under the bonnet. The negative terminal of the relay coil will be connected to one contact on the relay switch and also by a "flying lead" to battery negative via a crocodile clip. The positive lead from the battery will go to a switch on the extension loudspeaker in the caravan, and the return lead from the switch, to the positive side of the relay.

- T1.....Output Transformer
- F.....Flying lead with plug breaking into car LS lead
- L<sup>1</sup>, L<sup>2</sup>, L<sup>3</sup>.....Battery leads with crocodile clips from Converter unit
- C<sup>1</sup>, C<sup>2</sup>.....Relay switch contacts

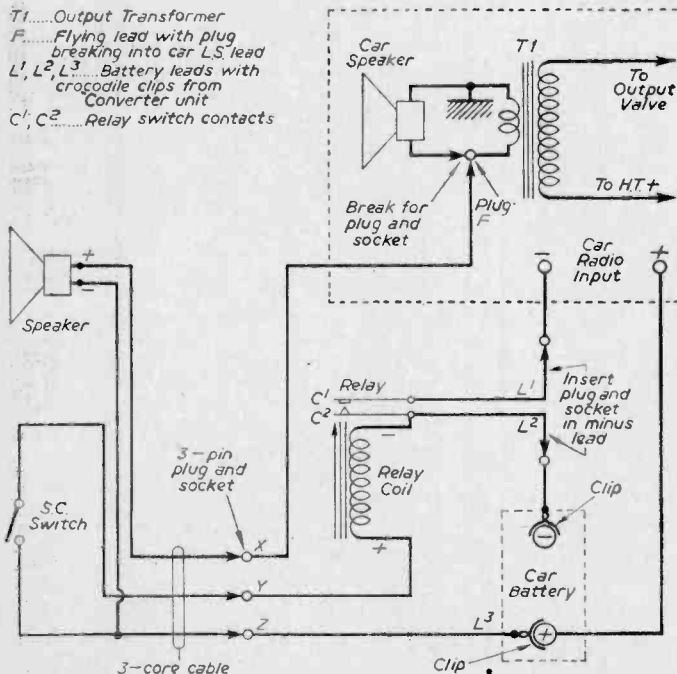


Fig. 2.—Switching the radio "on" and "off" from the caravan.

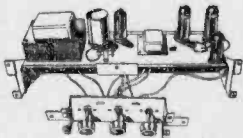




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(Page 835 February Issue.)

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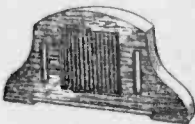
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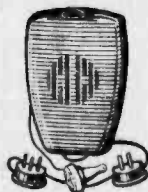
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# Simple Transistor Amplifiers

BASIC CIRCUITS FOR AMPLIFIER STAGES

By G. Green

A SMALL amplifier using up to three transistors will give quite good loudspeaker results, and can thus form the basis for an economical receiver. Amplifiers using only one or two transistors are also useful for "personal" receivers

A circuit of this kind can give quite good results, the actual increase in volume obtained depending considerably on the efficiency of the transistor. Cheap surplus transistors may be used with success, though naturally results cannot be expected to equal those obtained with a more expensive transistor.

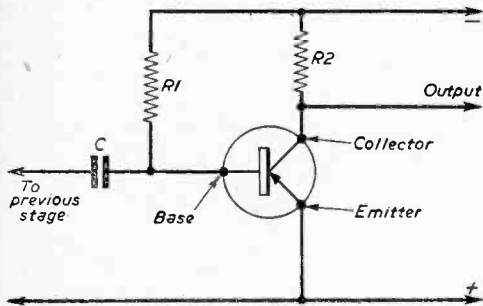


Fig. 1.—A one-transistor circuit.

intended for phones or speaker, especially as it is so easy to add an extra stage later, if needed.

A simple transistor amplifier stage is shown in Fig. 1. The value of the coupling condenser C is not critical, but should be fairly large. For coupling to a detector, 0.1  $\mu$ F to 2  $\mu$ F can be used. Between transistor stages, a rather larger capacity will improve results, and about 2  $\mu$ F to 8  $\mu$ F would be usual. A miniature low-voltage electrolytic condenser is often employed, to conserve space.

Resistor R1 produces a base voltage, and will usually be about 100k to 500k. With surplus transistors, in particular, the best value should be found by trial, because it depends on the individual transistor. The load resistor is R2—usually about 4.7k. If there is only one stage, phones may replace this resistor, being wired from collector to battery negative.

### Potential Divider

In Fig. 2 the base voltage is obtained from two resistors, and is thus less influenced by transistor current. The exact characteristics of the transistor are then less important. Values given are suitable for the TS2 type of transistor. However, surplus audio-frequency transistors can operate quite well.

If size or low cost is important, the 3.3k emitter resistor and 50  $\mu$ F condenser may be omitted, the emitter being wired as in Fig. 1. This is often done in low-cost circuits using surplus transistors.

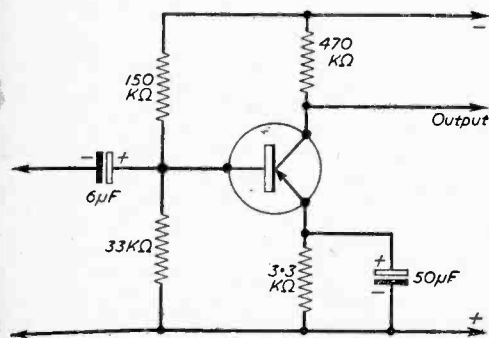


Fig. 2.—Potential divider for base supply.

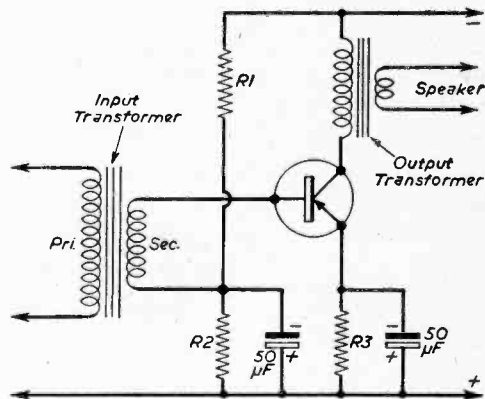


Fig. 3.—Transformer coupling.

For maximum possible amplification with any given transistor it may be necessary to modify the value of one of the base circuit resistors. However, this type of circuit will usually give good results without experiment, even with transistors of somewhat dissimilar characteristics.

A single stage of this kind may be added to a crystal set, to provide really loud headphone reception. Or it may be placed between stages in a small receiver already having one or two transistors. Where fairly high amplification is already present, less than maximum gain may be preferable from the extra stage, to avoid noise.

### Transformer Coupling

For maximum possible gain, with a limited number of transistors, or only one stage, transformer coupling may be employed in the input circuit, as shown in Fig. 3. The resistors R1 and R2 provide the base voltage, through the trans-

former secondary. Resistor R3 can be of the same value as in Fig. 2.

In small receivers, midge transistor coupling transformers will be necessary. But if size is of no importance, a larger type of transformer can be fitted. Some surplus transformers can give very good results. A step-down ratio is necessary. That is, the primary has more turns than the secondary. A suitable ratio will usually be about 3:1 to 7:1 or so. Very high impedance windings, as used for valve coupling, are not required. It is thus sometimes possible to put to good use a transformer which is not satisfactory with valves.

A transformer is also required when operating a low impedance speaker from the transistor. For a simple and economical receiver, a small transformer of fairly low ratio as used to couple a small power triode can be used. A high ratio is not required because the best impedance for the transistor is much lower than for a valve. A load of about 600 to 1,000Ω will suit many surplus and small A.F. transistors, and the transformer can thus have a ratio of about 15:1 or 20:1, for 2-3Ω speaker, or 6:1 to 8:1 for a 15Ω speaker.

With normal phones of medium impedance, no transformer is needed. But moving coil or other low impedance headsets need a transformer, for best results. For 50Ω phones, this need only have a ratio of about 4:1 or 5:1. An unnecessarily high impedance or ratio may cause mismatching worse than that experienced if the phones are used directly in the collector circuit.

### Two Transistor Amplifier

A reliable, economical receiver can be made from the circuit in Fig. 4, circuit values being for

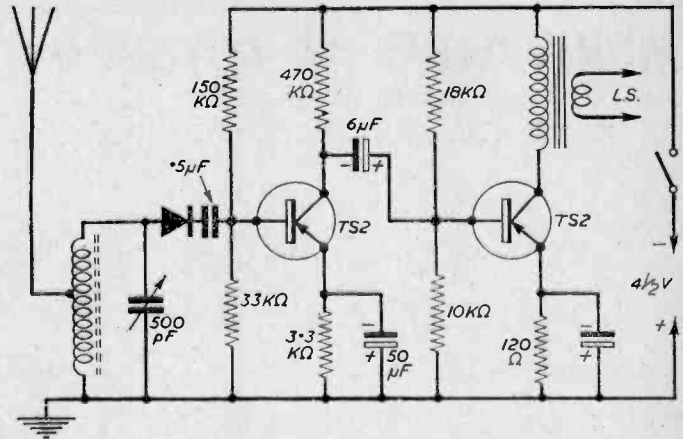


Fig. 4.—A two-stage amplifier with a detector stage.

TS2 transistors. It will be noted that values in the output stage are different from those in the first stage.

Surplus transistors can, of course, be used in such a circuit, as described. It is also quite easy to introduce a further stage, such as that in Fig. 2, between the two stages in Fig. 4. When a volume control is required, the 4.7k resistor may be replaced by a 5k potentiometer, the slider being wired to the 6μF coupling condenser.

If an outdoor or other fairly long aerial is used, aerial coupling should be reduced by moving the aerial tapping towards earth, or including a small condenser in series with the aerial lead. Tuning will otherwise be rather unselective. The circuit can, of course, be used for phone reception. If desired one stage can then be omitted. To simplify the circuit, both emitters may be returned to battery positive.

## WIDE-BAND BATTERY S.W. TWO

(Continued from page 128)

With the usual medium or high impedance phones no transformer is needed, plugs attached to the phone leads being inserted directly in the output sockets.

As the receiver is particularly suitable for beginners, a few notes on operation and short-wave reception may be helpful. Various wavebands are selected by the bandset condenser, and actual tuning is then carried out with the bandspread control knob. The full 180deg. rotation of the bandspread condenser will cover about the same band of wavelengths as 8deg. movement of the bandset condenser. (The exact relationship between the two need not be known, and depends on the capacity, shape of plates, etc.) The bandset condenser is thus advanced several degrees at a time, the bandspread control then being used to tune this section of the wavelengths covered. When the various bands have been located, the reading of the bandsetting condenser should be noted. It

is then possible to return to any band at will, and tune in stations with the bandspread condenser. Owing to the low capacity of the latter, stations will not have their readings crowded together, as is so with a large condenser fitted with a single dial.

The reaction condenser is closed sufficiently to keep the set in a sensitive condition, just below the oscillation point. This control should be manipulated as necessary, while tuning. Its influence is particularly important with weak, distant stations.

Reception on the various bands varies a great deal during the day. As a rule, it will be as well to listen on the 19 and 25m. bands in the afternoon and early evening, giving more attention to the 31 and 41m. bands later. Usually, of course, some stations will be heard on all bands at any hour, but very remote stations will only be heard when the band selected is most suitable. If a log is kept, with dial readings and times of English programmes, this will soon give a good working knowledge of S.W. reception.

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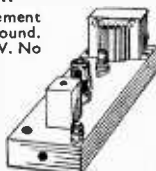


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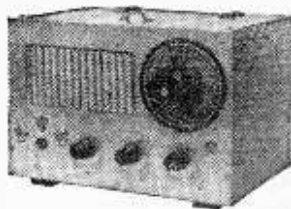


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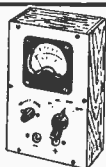
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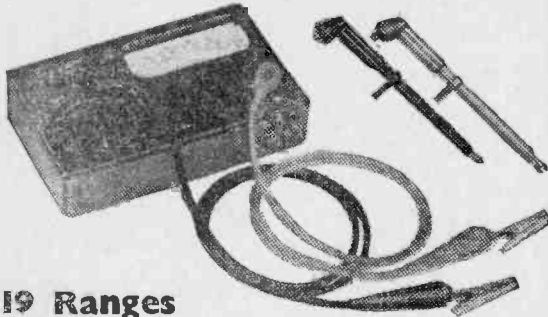
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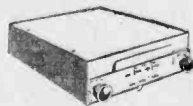
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# A STEREO PRE-AMP

A FREQUENCY  
COMPENSATED CIRCUIT

By J. S. Kendall

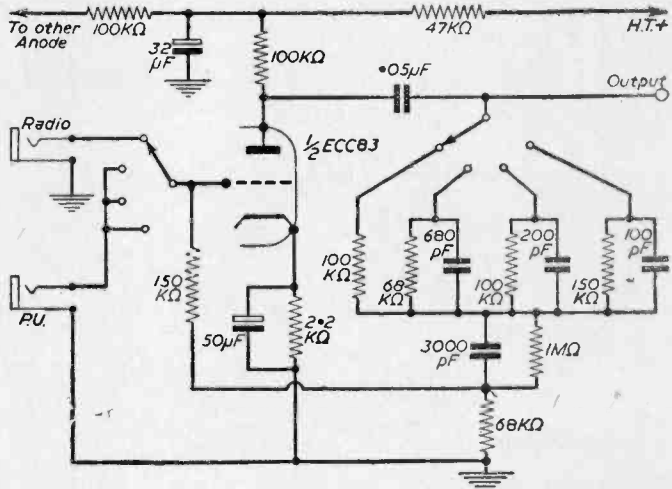


Fig. 1.—The circuit diagram (for one channel only).

ALTHOUGH most stereo amplifiers have their own balance control in the main amplifier this cannot be used to compensate for any balance in frequency response which may occur in other parts of the circuit. With a frequency

compensated pre-amplifier such as this design, particular care must be taken in the selection of the components in the frequency compensation network. The volume and tone controls are now readily available matched to a degree sufficient for

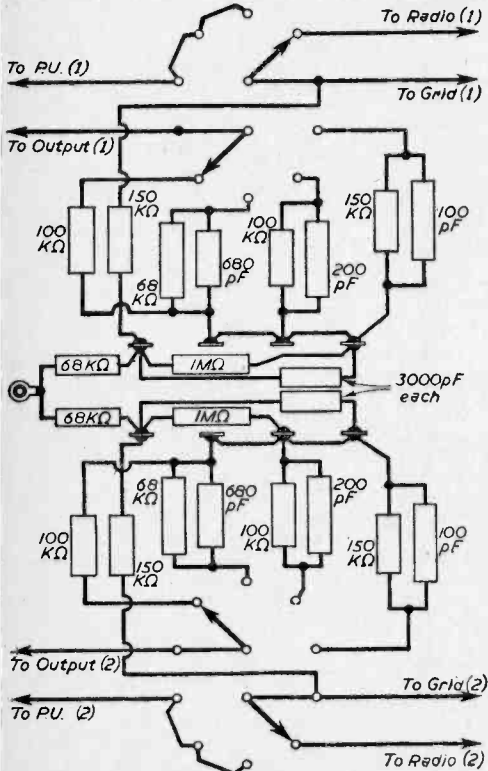


Fig. 2.—Switch wiring diagram.

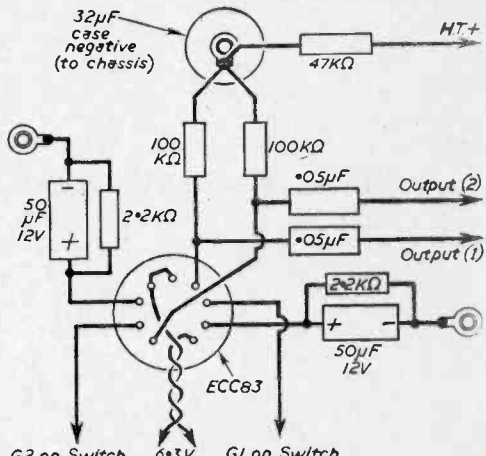


Fig. 3.—Valve base wiring.

stereo circuitry. Stray capacitance may affect the higher frequencies, but since there is heavy negative feedback at these higher frequencies in this design, layout is not over critical. The cable linking the pre-amplifier to the main amplifier can be of the "twin microphone" type which contains two individually screened conductors. Octal plugs and sockets can be used for these connections provided that a simple screen is placed at the

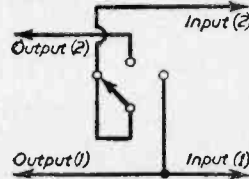


Fig. 4.—Stereo/mono switch.

socket, between the 6.3V heater circuit and the two inputs to the main amplifier.

**Value**

The valve used in the circuit is the ECC83. This has a high degree of amplification and even with heavy negative feedback there is sufficient gain in reserve for the bass compensation. The use of a dual valve also simplifies wiring.

The complete circuit diagram is given in Fig. 1. This is for one channel only, the other channel circuitry being identical. Component tolerances are not particularly critical although best results are achieved if resistors are within 5 per cent and capacitors within

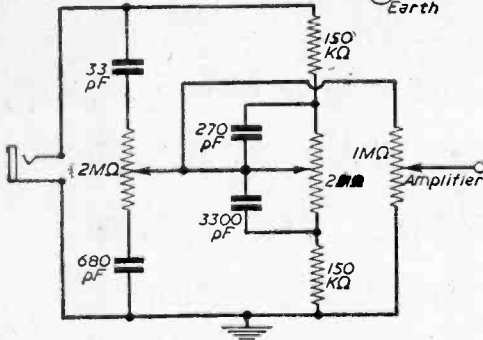


Fig. 5.—Tone and volume control circuit.

10 per cent or less. Even better results can be obtained by the use of matched pairs of components for each channel. The wiring around the valve base is shown in Fig. 3 and should be easily followed while the wiring of the components associated with the switches is given in Fig. 2. The switch should be a 4-pole 5 or 6-way type; the extra tag may be useful as an anchoring point.

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Because of their small physical size and use of drift-field construction, these transistors have small effective base width, low feedback capacitance, and a high collector-to-base breakdown voltage features which, for the first time make possible, high oscillator and amplifier performance in the FM band. In addition, the low-frequency characteristics of these transistors are carefully controlled to insure dependable performance in the standard AM broadcast band. As a result, these transistors provide the equipment designer with a transistor complement which makes

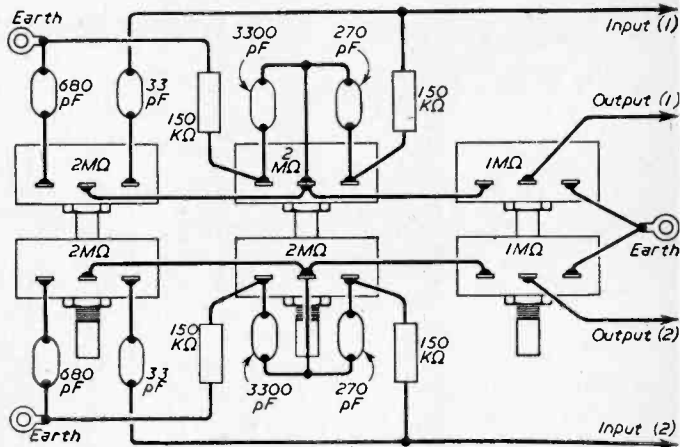


Fig. 6.—Wiring of the circuit in Fig. 5.

**Volume and Tone Controls**

Although it is common practice to incorporate volume and tone controls on the main amplifier it is possible to use the circuit illustrated in Fig. 5 between the pre-amplifier and the grid circuit of the first valve of the main amplifier. The wiring diagram for this tone and volume control circuit complete for two channels, is given in Fig. 6.

In certain circumstances when no stereo programme source is available, it may be wished to use the circuit with a mono source. A simple switching circuit is all that is needed and a suitable design is given in Fig. 4. A single-pole 3-way switch is needed.

This pre-amplifier circuit may generally be added as a front end to many main amplifiers and this extra degree of frequency compensation will be found particularly valuable for gramophone record reproduction. One switch position in the pre amplifier is suitable for radio input while the other three positions have varying characteristics and frequency responses for obtaining optimum result from both L.P. and standard recordings.

practicable quantity-produced FM and AM/FM radio receivers and tuners having high gain, high sensitivity, excellent stability, good signal-to-noise ratios, and good AVC capabilities.

For example, in a typical FM tuner operating at a frequency of 100Mc/s, the 2N1177 is capable of providing a power gain of 14dB; and the 2N1178 a conversion power gain of 17dB when followed by a 10.7Mc/s I.F. amplifier stage.

The 2N1180 in a 3-stage 10.7Mc/s I.F. amplifier circuit is capable of providing a useful power gain of 65dB with neutralization of 57dB without neutralization.

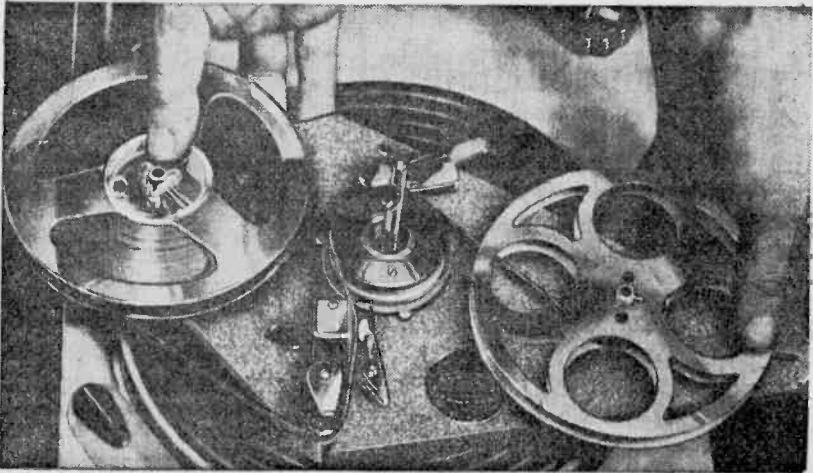
The 2N1178 when operated in local-oscillator service at a frequency above that of the incoming R.F. signal, can supply a 2N1179 R.F. mixer stage with the required oscillator-injection voltage for optimum mixing throughout the FM band.

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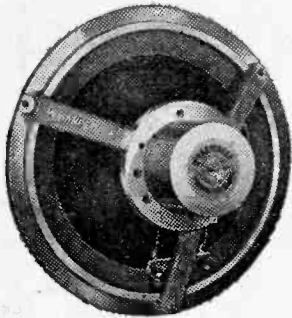
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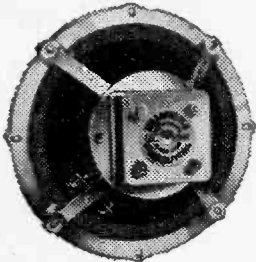
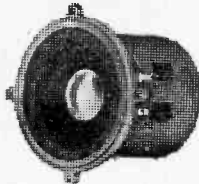
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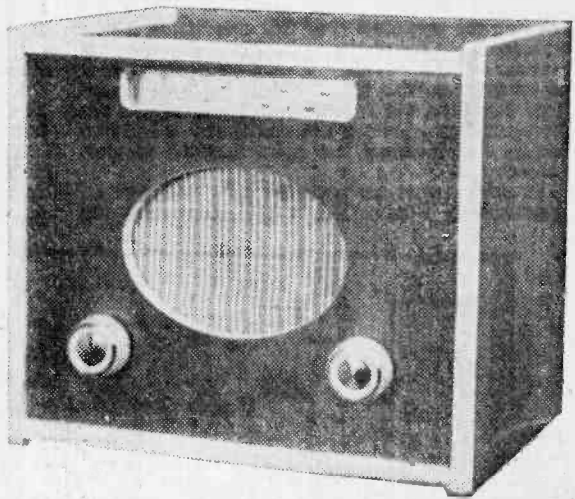
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# The Compact "4 plus 1"

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By D. H. Nash



Front view.

THE requirements considered when this receiver was designed were that the overall size should be kept to a minimum, but should not be so drastically reduced as to affect the performance adversely, or to require the use of special miniature components. Consequently, the design to be described was evolved and is fitted into a cabinet 9in. wide, 8in. high and 6½in. deep (made of ¾in. thick walnut veneered 7-ply obtained from an old TV cabinet). Tonal quality of the reproduction was found to be of a high standard from the 5in. speaker. Negative feedback is incorporated in the A.F. stages to compensate for the effects of the small cabinet. A somewhat unusual tuning drive is employed, and is the means by which the small working parts involved enable a tuning dial of useful length to be used.

### The Circuit

It will be seen from Fig. 1 that this receiver covers the medium waveband only thus saving space and simplifying construction of the frequency changer section (V1). From here the signal passes

(at 465kc/s I.F.) to the I.F. amplifier (V2); the secondary winding of the first I.F. transformer is returned to earth as no AVC bias is applied to this stage. Demodulation is performed by the signal diode of V3, the second diode providing an AVC bias voltage which is applied to V1. The A.F. output is taken from the volume control slider in the grid of V3, the output of which is R/C coupled to the output valve V4. From the secondary of the output transformer, negative feedback is applied to the cathode of V3. Space considerations resulted in the heater supplies being obtained from a small transformer. The H.T. is obtained direct from the mains. V5 being used as a half-wave rectifier by strapping the anodes.

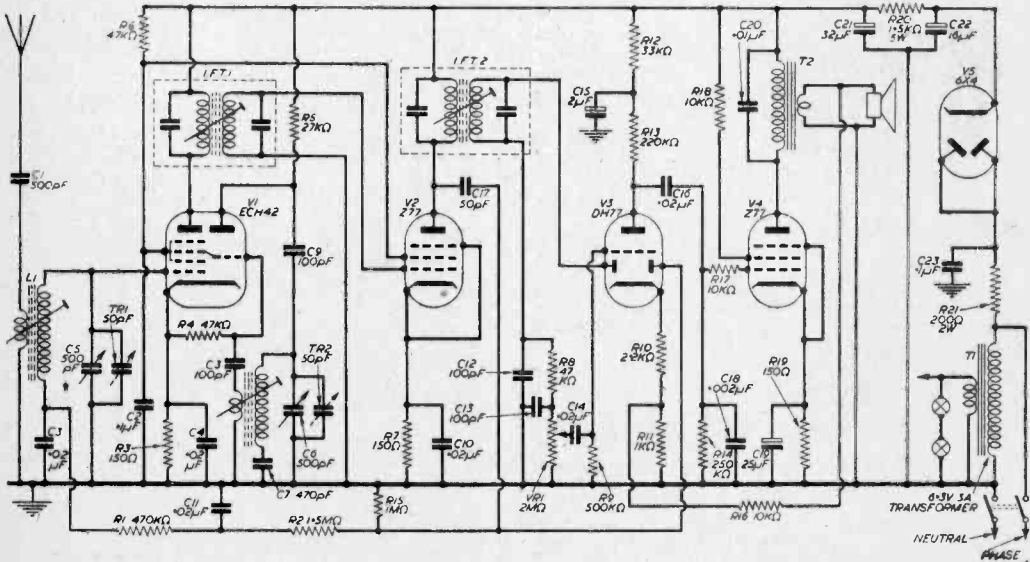


Fig. 1.—The complete circuit diagram (C1 and C23 are 750 V A.C. working).

### Construction

During the preparation of this description it was considered that the reader embarking upon the construction of this receiver should previously have had experience with less compact types of equipment; therefore, the following paragraphs and the accompanying drawings are calculated mainly to describe and illustrate the more unusual features of the design.

The components are mounted upon a chassis of approximately 6½ in. x 5 in. x 2½ in. for which the

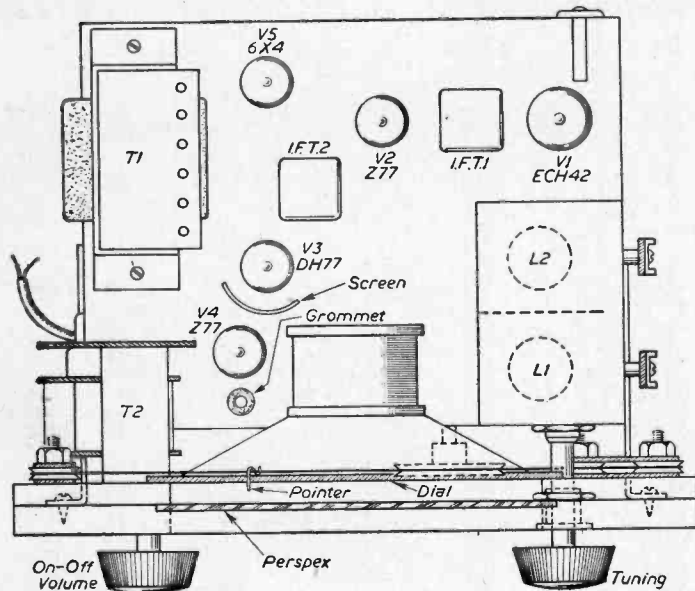


Fig. 2.—The above chassis layout.

container of a well known product was proved ideal; this is made of tinplate which facilitates the soldering of earth connections and is thin enough to make drilling, etc. easy. A 16s.w.g. reinforcing plate is fitted behind the front runner of the chassis, both this plate and the chassis being drilled to accommodate control bushes, tuning condenser fixings, etc.

It was decided to fix the front panel permanently to the chassis by means of brackets. Thus, the whole receiver, including speaker and controls, becomes one unit.

The general layout (Fig. 2) should be, in the main, adhered to as there is some risk of instability occurring if major changes are made; for the same reason care should be exercised in placing the components, especially valveholders and I.F. transformers) so that connections (particularly to valve anodes and control grids) are as short and direct as possible. The small screen between V3 and V4 should not be omitted and the condensers which are used for decoupling are best fitted with the wire end in contact with the case connected to earth. (This is usually marked with a band on the appropriate end.)

The dust-cored aerial and oscillator coils are fitted inside the simple 1½ in. high two compartment

tinplate screen as indicated in Fig. 2; this is open at the side to which the two trimmers are fixed.

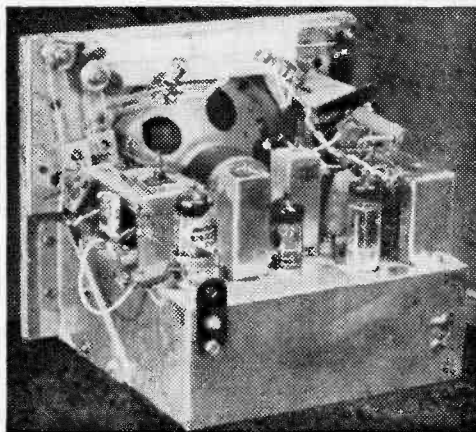
### Tuning Drive

The principle of the tuning drive is as shown in Fig. 3 where the view is from the rear of the receiver.

The most convenient size of drum it was found possible to accommodate on the tuning condenser spindle was 1½ in. in diameter and the 5/1 reduction from the ¼ in. diameter tuning control spindle (adapted from a burnt-out volume control) proved adequate for M.W. tuning. The dial pointer travel is doubled by the use of two miniature "pulley blocks"; thus the pointer travel when using the 1½ in. drum is almost 4 in. (the circumference of the drum) for the 180deg. rotation of the condenser. It follows, therefore, that the dial cut-out width in the front panel for any given drum diameter is:—(diameter of drum in inches x 3.142) ÷ ½ in.

A threaded brass bush is fitted into a suitable hole in the front panel as extra support for the tuning spindle. The approximate positions of the various pulleys, etc., are indicated in Fig. 3. The actual sizes and mounting arrangements are left to the individual constructor as use will undoubtedly be made of materials to hand. It should be remembered that sufficient clearance is required to allow the "pulley blocks" to pass each other at certain dial settings. Two approximately triangular ¼ in. thick plywood pieces will be needed at the upper corners of the panel to which they are glued and screwed. Before these are fixed in place, care-

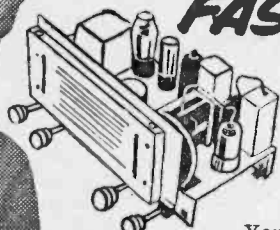
(Continued on page 165)



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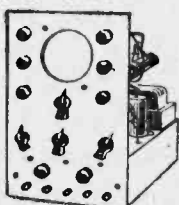
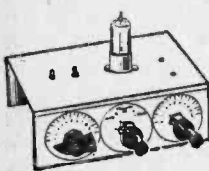
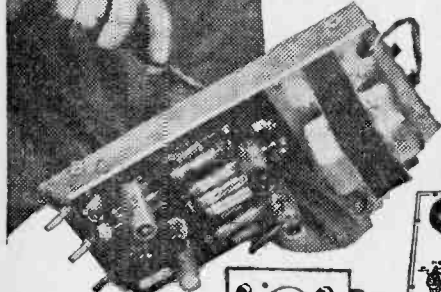
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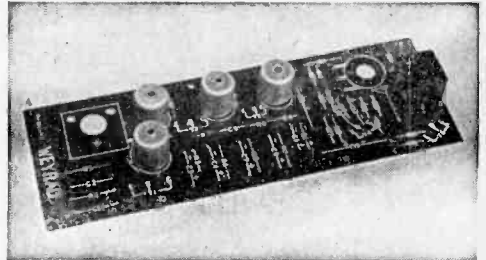
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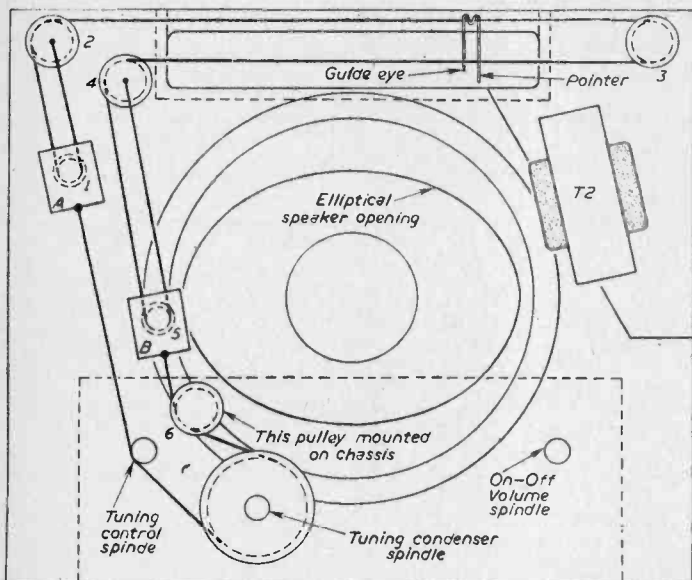


Fig. 3.—Details of the tuning drive.

ful removal of the inner layers of the panel ply for approximately  $\frac{1}{4}$  in. round the dial aperture will create a slot into which a piece of Perspex can be fitted from the top, before the receiver is slid into the cabinet. The dial itself (made of paper-backed Perspex) is held against the plywood corner pieces by small clips.

The nylon drive cord is fitted in three pieces:—

(1) Starting at the anchoring point at the centre of pulley 2, round pulleys 1, 2, 3, 4 and 5 and back to the anchoring point at the centre of pulley 4.

(2) From the condenser drum, two turns round the tuning control spindle and so to the fixing on "pulley block" A.

(3) From the other side of the condenser drum via pulley 6 to the fixing on "pulley block" B.

The wire pointer is fixed to the cord between pulleys 2 and 3, and is bent to pass over the top of the dial. The other end of this wire is formed into an eye to accommodate the cord passing between pulleys 3 and 4, so preventing twisting of the cord and keeping the pointer in line.

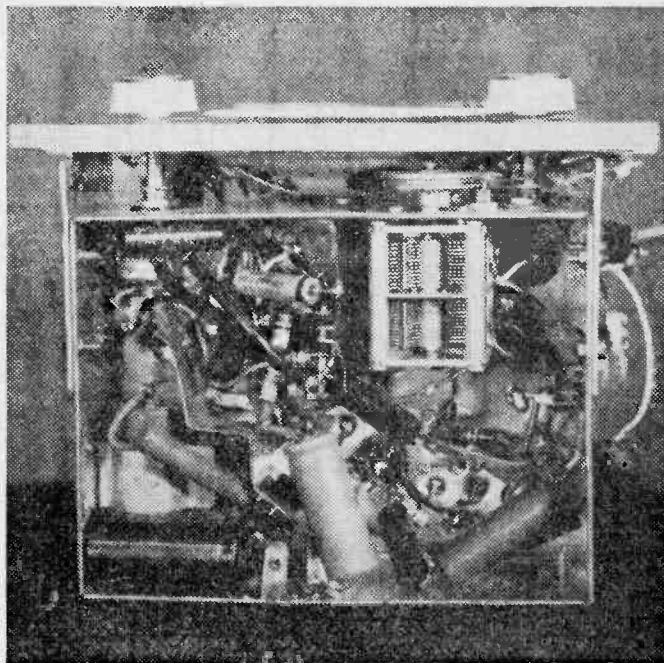
#### Alignment and Testing

If alignment is carried out with the aid of a signal generator the constructor will doubtless be familiar with the procedure involved. In the event

of this operation having to be performed without the aid of such an instrument the procedure which has recently been amply described in these pages can be followed: one end of R16 should be left disconnected, thus rendering the feedback loop ineffective, until such time as the initial tests have been carried out, and the A.F. stages are proved to be working satisfactorily. R16 can then be connected; if this results in distortion or A.F. oscillation the phasing of the feedback loop will be incorrect and the connections to either winding of the output transformer (T2) should be reversed.

#### Mains Connection

It must be pointed out, for the benefit of any constructor not familiar with the method of obtaining H.T. used that the chassis is directly connected to one side of the mains; therefore, it should be ensured that this chassis connection is neutral through a non-reversible plug, via one side of the double pole switch. *No metal part which is connected to the chassis must be left within the reach of the user.*



Underchassis view.

# A Stable V.F.O. for 80m

AN INEXPENSIVE UNIT USING SP61 VALVES

By J. Kemp

THE main purpose of this small variable frequency oscillator is to increase the usefulness and flexibility of a crystal-controlled transmitter operating in either the 3.5, 3.8 or 7.00-7.15Mc/s amateur bands. Sufficient output is available to drive a 6V6, 6L6 or 807 crystal oscillator; and the drive control may be backed off appreciably when using smaller oscillator valves. The oscillator is very stable owing to the rigid construction, and isolation from the heat producing components such as valves and resistors. The frequency change, or drift, is never greater than 150c/s, giving the percentage stability as 0.004.

### Power Supply

The power requirements are low, and could probably be met from the existing power pack. If not, the circuit of a suitable power unit will be given. The use of SP61's with their high heater current (0.6A) may be questioned, but they are cheap, well-screened and have a high slope—essential in an oscillator stage. They work much better in this application than miniature valves such as EF80's.

Another use for the unit is the reception of single sideband transmissions on any amateur band below 30Mc/s. When using external carrier injection on the incoming frequency tuning of the signal is made very much easier since the receiver has only to be set with the incoming s.s.b. inside the passband of the receiver I.F. and the V.F.O. dial moved slowly until best voice quality is obtained. The frequency stability of the receiver does not matter, and no internal B.F.O. is necessary. Amateur band CW can also be received in the same manner. If the injection signal from the V.F.O. is too strong, it may operate the A.V.C. reducing gain, but by using one or two inches of wire attached to the output socket, and by use of the "Drive" control, the correct injection of the fundamental and of harmonics up to 30Mc/s can be obtained.

### Circuit Details

The circuit (Fig. 1) consists essentially of a series tuned Colpitts, or Clapp oscillator operating on the 3.5-3.8Mc/s band this range being spread over the full 180deg of the dial. This is followed by

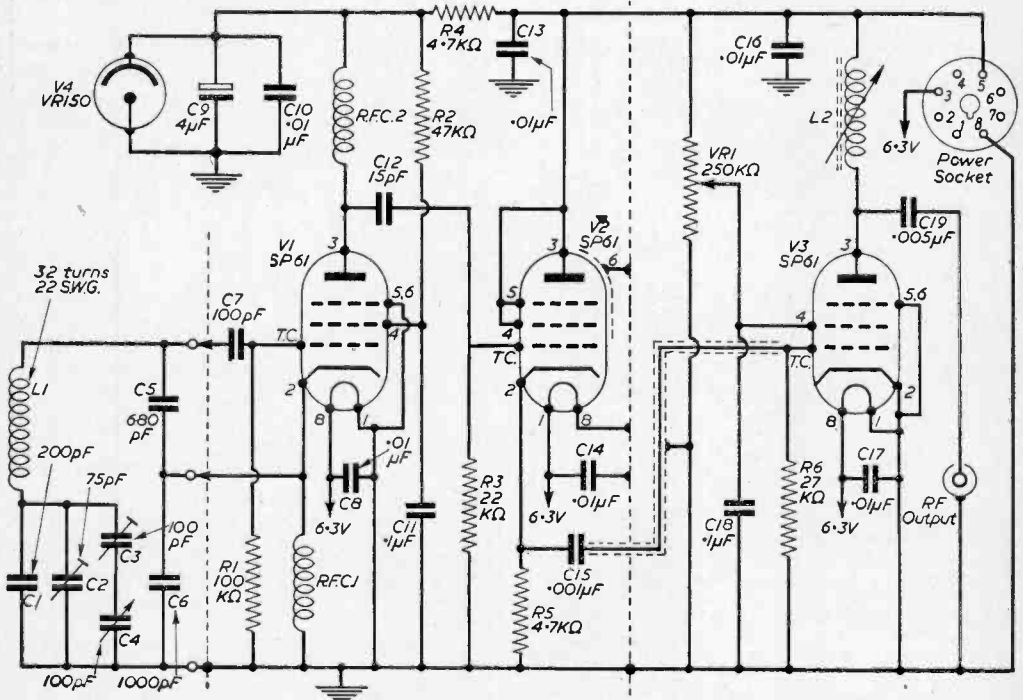


Fig. 1.—The circuit diagram of the V.F.O.



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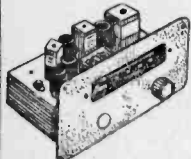
Three Jason F.M. Tuner kits with variable tuning are now available to the home constructor. Brief details are given here and our illustrated list is available free.

**MOST IMPORTANT.** We take great pains to see that every item needed is included in our kits and also that all items are entirely suitable in every way. This should be borne in mind when comparing prices.

Hire Purchase Terms are available on any kit.

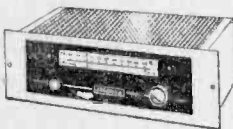
**INSTRUCTION MANUALS.** All our kits include the instruction manual, but this can be supplied separately if required. Data Publications booklet describing FMT1, 2, and 3, 2/10, post free.

### STANDARD TUNERS



**FMT1.** Supplied complete with a chassis-panel assembly fitted with a gold hammer finished panel and glass dial. Four EF81 valves are used and an external power supply is required. Complete kit **£8.19.6.** Power Pack Kit **£2.1.0.**

**FMT2.** This is a new version of the FMT1 and is supplied with a complete cabinet-chassis assembly which can be mounted in a cabinet or stood on a shelf. The circuit employs four EF80 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply **£7.17.6.** Kit with power supply **£9.16.0.**



### FRINGE TUNER

**FMT3.** This is a fringe tuner using the same cabinet assembly as the FMT2 described above. The tuner is fitted with variable AFC and uses five EF80 and one ECC81 valves. Kit less power supply **£9.19.6.** Kit with power supply **£11.13.0.**

### F.M./TV SWITCHED TUNERS

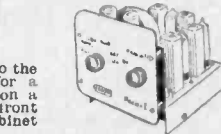
Kits for two new Jason F.M./TV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turret Tuner which gives switch positions for the three BBC Programmes as well as BBC and ITA TV Sound. A.F.C. is fitted to ensure freedom from drift.

**INSTRUCTION MANUALS.** Our kits include these without extra charge, but the manual for either tuner can be supplied separately at 3/10, post free.



**MERCURY 2.** This is similar to the TV2 but has no provision for a power supply. It is mounted on a small chassis with printed front panel and is intended for cabinet fixing. Complete Kit **£10.10.0.**

**IMPORTANT.** When ordering these kits it is essential to give the TV channels and F.M. stations required on the tuner.



**JTV2.** This tuner is complete with power supply in a cabinet which can be used either for shelf or cabinet mounting. Complete kit **£14.14.0.**

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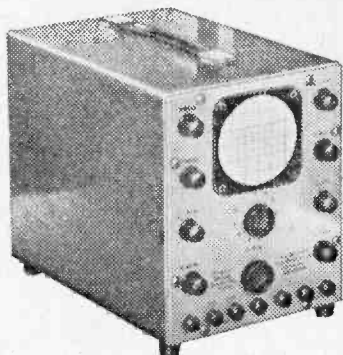
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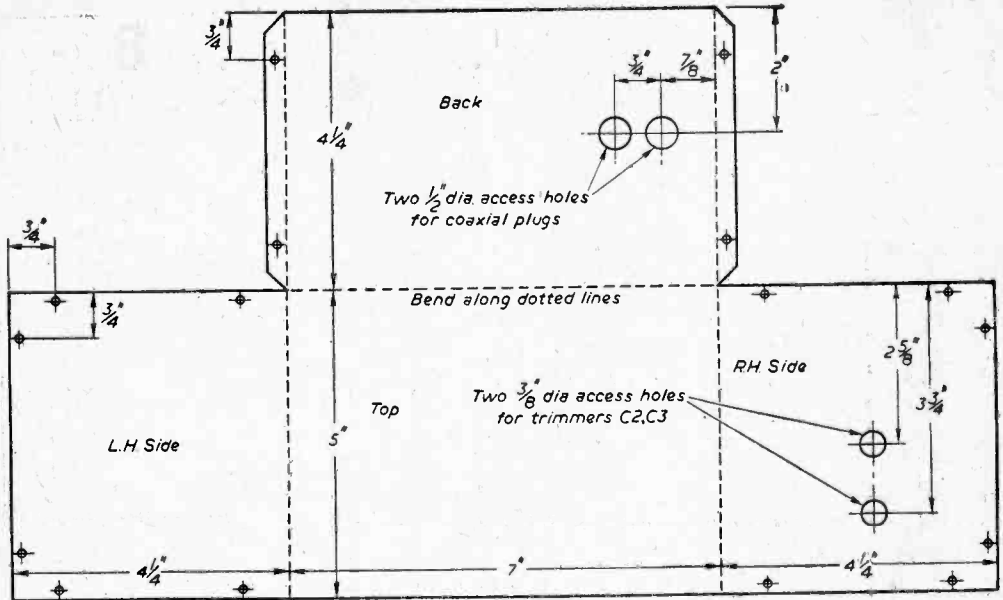


Fig. 2.—The top and back for the tuned circuit box.

an isolating cathode follower stage; followed by a tuned-anode voltage amplifier with variable screen-control.

The tuned circuit is in the upper box of the unit, being joined to the oscillator valve by two short lengths of coaxial cable. The tuning capacitor C4

(100pF) must be of a solid, well built airspaced type with ceramic insulation in order to prevent microphony as must also the 100pF airspaced trimmer in series with it and the 75pF airspaced trimmer in parallel with the combination. The coil, preferably with a ceramic former, should be mounted a

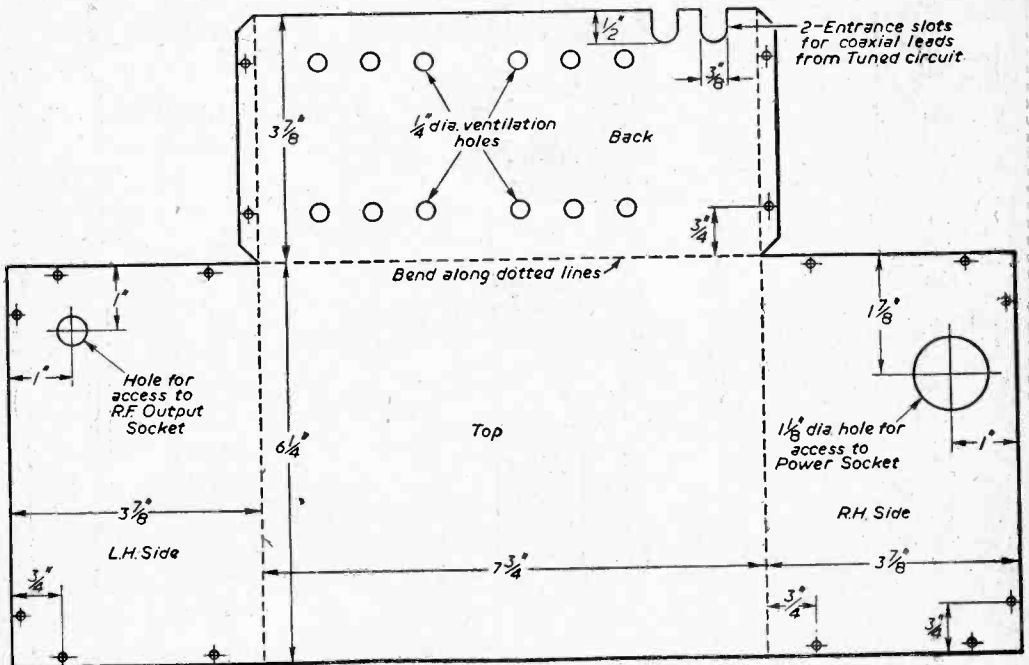


Fig. 3.—Back, top and sides of the R.F. section.

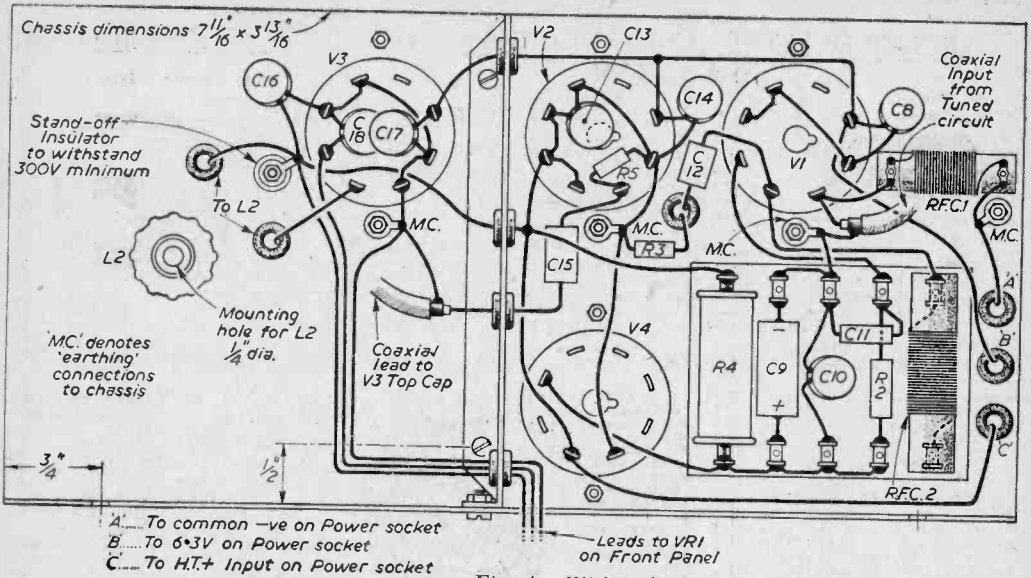


Fig. 4.—Wiring diagram of the sub-chassis.

**LIST OF MAIN COMPONENTS**

- C1—200pF mica.
- C2—75pF pre-set.
- C3—100pF pre-set.
- C4—100pF variable.
- C5—680pF silver mica.
- C6—1000pF silver mica.
- C7—100pF silver mica.
- C8—0.01μF disc ceramic.
- C9—4μF 150V electrolytic.
- C10—0.01μF disc ceramic.
- C11—0.1μF paper 250VW.
- C12—15pF silver mica.
- C13—0.0μF disc ceramic 300VW.
- C14—0.01μF disc ceramic.
- C15—0.001μF mica.
- C16—0.01μF disc ceramic 300VW.
- C17—0.01μF disc ceramic.

- C18—0.1μF paper 250VW.
- C19—0.005μF mica.
- R1—100k  $\frac{1}{2}$ W 10 per cent.
- R2—47k  $\frac{1}{2}$ W 10 per cent.
- R3—22k  $\frac{1}{2}$ W.
- R4—4.7k 5W.
- R5—4.7k 1W.
- R6—27k  $\frac{1}{2}$ W.
- VR1—250k w.w. or nearest.
- RFC1 } Surplus type  $1\frac{1}{2}$ in. long.
- RFC2 }  $\frac{1}{2}$ in. diameter close wound.
- L1—32 turns 22s.w.g. enamelled on  $\frac{3}{8}$ in. diameter former (close wound).
- L2—Denco blue range 3 chassis-mounting coil.
- V1—SP61 (VR65).
- V2—SP61 (VR65).
- V3—SP61 (VR65).
- V4—VR150, S130 or similar.

least  $\frac{1}{2}$ in. from the sides of the box, and the coaxial sockets. The fixed condensers shown should be of 2 per cent tolerance silver mica type, and all wiring done with short thick copper connecting wires used between components.

Rubber feet (grommets) should be fitted to the base to prevent vibration from reaching the tuned circuit which might cause F.M. The dials of white cardboard covered with clear varnish and marked with frequencies in ink. An epicyclic 5:1 drive is fitted to the spindle of C4 and a larger diameter knob and short pointer fitted.

(To be continued)

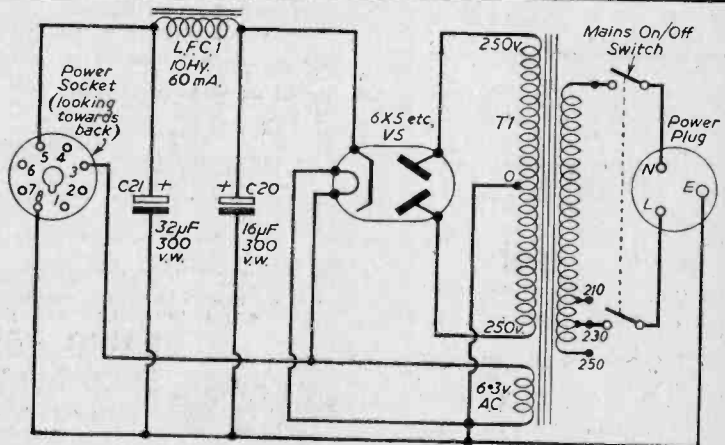


Fig. 5.—Circuit of the power unit for the V.F.O.

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THE TOURIST PORTABLE

Size only 8in. x 5½in. x 4in.

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MAINS UNIT KIT NOW Available only 45/-

4-valve, 2 waveband (Med. and L.W.) Lightweight Battery Radio. Wt. 3½ lbs., incl. B.114 Battery 8/- extra.

- Complete Receiver Component Kit ... 57/6 P. & P. 1/6
- Set 4 miniature valves (96 series) ... 35/- P. & P. 9d.
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- Cabinet, Dial & Knobs, etc. ... 22/6 P. & P. 2/-

Parts List and Instruction Booklet, 1/6. (Free with Kit.)

Latest circuitry delayed AVC & A.F. Neg. feedback. Sensitive Ferrite Rod Internal Aerial. Contemporary style 1 weight Cabinet. Operates from B114 Battery, 69 v. + 1½ v. (8/-) extra.

Terrific performance — Remarkable size — Staggering value



Complete Kit post free £6.10.0

Record Player Bargains

Latest 4-speed Models

NEW RELEASE by E.M.I.—4-speed Single Player Unit fitted with latest stereo- and monaural Xtal cartridge and dual sapphire stylus. Auto stop and start. A fidelity unit and bargain buy at only £6.19.6. Carr. and Ins. 4/6.

SINGLE PLAYERS. BSR (TU9), 90/-; COLLARO JUNIOR with latest Studio P.U. £4.10.0; GARRARD (48P), £6.17.6; GARRARD (TA Mk. II) de Luxe Model, £7.19.6. Carr. and Ins. 3/6.

AUTOCHANGERS. BSR (UA8), £6.19.6. COLLARO CONQUEST, £7.19.6; GARRARD (RC121.4D Mk. II) plug-in head, with GCS xtal. stereo adapted, 10 gns. Stereo head (G810) £2 extra.

2-VALVE 2-WATT AMPLIFIER

Twin stage ECL82 with vol. and neg. feedback-Tone controls A.C. 200/250 volt with double-wound Mains trans. Complete with knobs, etc., ready wired to fit above cabinet.

£2.17.6 P. & P. 1/-

6-in. Speaker and matching trans., 22/- P. & P. 1/6

TRANSISTOR "ONE-WATT" AMPLIFIER 6v. Battery Operated

Latest push-pull 4 transistor circuit giving full amp output into standard 3Ω speaker. Good sensitivity and improved frequency response. Neg. feedback. Var. tone and volume controls. Chassis size 6½ x 3½ x 1½in. Current consumption 10mA quiescent—200 mA at 1 watt.

2 matched G.E.C. GET15 transistors. Price 42/- per pair.

2 G.E.C. GET3 transistors. Price 21/- per pair. Driver Trans., 8/6.

O.P. Trans. (to 3Ω), 10/6.

Complete kit of parts inc. chassis, etc., less speaker, ONLY 99/6. P. & P. 2/6.

Circuit and instruction booklet 1/6 post free.

JASON FM TUNER UNITS

(87-105 Mc/s)

Designer-approved kits of parts for these quality and highly popular tuners available as follows.

STANDARD MODEL (FMT1)—as previously extensively advertised—COMPLETE KIT, 5 gns., post free. Set of 4 spec. valves, 30/-, post free.

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RESISTORS.—FULL RANGE 10 ohms—10 megohms 20% 1 w. and 1 w., 3d., 1 w., 5d., (Midget type, modern ratings), 1 w., 6d., 3 w., 6d., 10% HI-STAB, 1 w., 5d., 1 w., 7d., 5% 1 w., 9d., 1% HI-STAB, 1 w., 1/8 (10-100 ohms 2/-).

RECORD PLAYER CABINETS

Contemporary style, rexine covered cabinet in fawn and brown with cream interior. Size 18½ x 13½ x ht. 8½in., fitted with all accessories, including baffle board and anodised metal fret. Space available for all modern amplifiers and autochangers etc. Uncut record player mounting board 14 x 18in. supplied.

£3.30 Carr. and Ins. 3/6



NEW BOXED	VALVES	ALL GUARANTEED
1R5, 1T4 7/6	6DF9 9/-	EF86 13/6
185 7/6	DK96 9/-	EF91 8/6
834, 3VA 8/-	DL96 9/-	EL41 10/6
5Z4 9/6	EABC80 9/6	EL84 9/6
6K7 5/6	BCC84 10/6	EY51 10/-
6K8 8/6	ECP90 11/6	EY56 10/-
6Q7 8/6	EC42 10/6	EZ81 7/6
6V6 7/6	ECL80 10/6	MU14 9/6
DAF96 9/-	EF80 9/6	IPCC84 10/6

SPECIAL PRICE PER SET 1R5, 1T4, 185, or 384 or 3VA, 27/6. DK96, DF96, DAF96, DL96, 35/-, 6K8, 6K7 6Q7, 6V6, 5Z4 or 6X5, 35/-.

COAX 80 OHM CABLE

Stand 1in. dia. Low Loss Semi-Air Spaced Aerial. A high grade coax at Special Reduced Prices. 20 yds. 12/6, p. & p. 1/6; 60 yds., 32/6, p. & p. 3/-; 40 yds., 22/6, p. & p. 2/6; All other lengths, 8d. per yard. Coax Plugs 1/-, Sockets 1/-, Couplers 1/3, Cable End Sockets 1/6, Outlet Boxes 4/6.

Manufacturer's Surplus Bargain 7 VALVE AM/FM RADIOGRAM CHASSIS

Valve Line-up: ECC85, ECH81, EF89, EABC80, EL84, EM81, EX80.

Three Waveband and Switched Gram positions. Med. 200-500 m., Long 1,000-2,000 m., VHF/FM 88-95 Mc/s. Philp's Continental Tuning insert with permeability tuning on FM and combined AM/FM IF transformers 460 Kcs and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction of a very high standard. Chassis size 13½ x 6½in. Height 7in. Edge illuminated glass dial 11½ x 3½in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation.

Aligned and tested ready for use £13.10.0 Carr. & Ins. 5/-

Complete with 4 Knobs—walnut or ivory to choice. Three ohm P.M. speaker only required. Recommended quality speakers. 8in Goodman's special cone.....£1/6 10in. Rola (Heath Duty).....30/- Post & Pkg. 1/6. ONLY A FEW ITEMS ARE LISTED FROM OUR COMPREHENSIVE STOCK WRITE NOW FOR FULL BARGAIN LISTS. 3d.

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Phone: THO 2188. Hours 9 a.m.—6 p.m. 1 p.m. Wed. Open all day Saturday. By Thornton Heath Station.

Terms: C.W.O. or C.O.D. post and packing up to 4lb. 7d.: 1lb. 1/1: 3lb. 1/6: 5lb. 2/-: 10lb 2/9

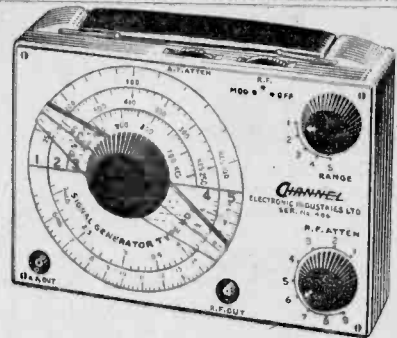
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- ★ Up to 20 Mc/s on fundamentals.
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- ★ Accuracy better than 2%.
- ★ Miniature size only 4½ in. x 3½ in.

PRICE NET **£5.15.0.** Battery 2/6 extra

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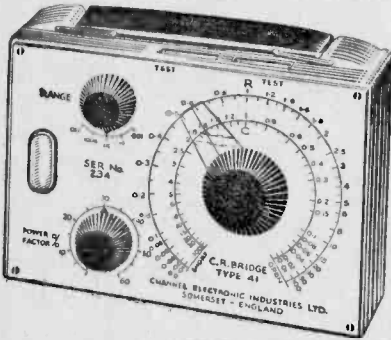


## MINIATURE TRANSISTORIZED R.C. BRIDGE TYPE 41

- ★ Capacitance 5 μF to 20 μF.
- ★ Resistance 5 Ω to 20 MΩ.
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A231	8/0	EL84	6/9	UCC85	7/-
B36	8/8	EY51	8/6	UCF80	14/-
CL33	12/6	EY85	8/-	UCH42	7/0
DAC32	9/-	EZ40	6/0	UCH81	8/-
DAF91	5/6	EZ41	7/6	UCL82	10/-
DAF96	6/11	EZ80	6/3	UCL83	12/6
DF33	9/0	FZ81	7/-	UF41	8/3
DF91	4/6	GZ32	9/-	UF42	7/-
DF96	6/11	KT83	6/6	UF89	6/6
DH77	6/6	NU14	7/-	UL41	7/6
DK32	12/-	PCC84	7/6	UL84	7/6
DK91	6/3	PCC89	11/6	UY21	11/-
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The first Transistorized Radio Tuner, specially designed for use with Tape Recorders. Converts your Recorder to a high quality Radio receiver. Direct Recording on Tape.  
5 x 3½ x 1½ in.

- ★ High sensitivity.
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- ★ Pre-setting for M.W. Programmes.
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Tested and ready for use.  
**£5.9.0. BATTERY EXTRA.**

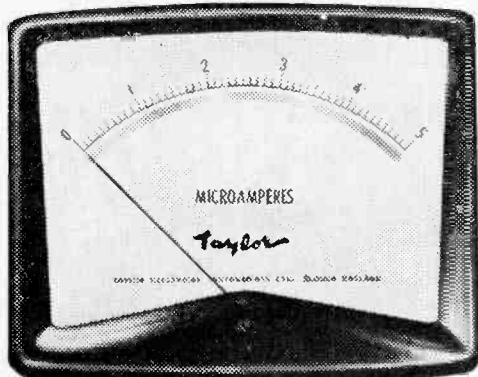
**THE TELETRON CO. LTD.,**  
112B Station Rd., London, E.4  
Phone: SIL. 0836.

# Trade News

## NEW PRODUCTS AND DEVELOPMENTS

### NEW PANEL METERS

SEVERAL new panel meters have recently been introduced by Taylor Electrical Instruments Ltd. These meters are in modern mouldings with scale lengths from 2in. to 5in. They incorporate the



One of the new Taylor panel meters.

well established centre pole movement with sensitivities from  $5\mu\text{A}$  and the cases are available in various colours to harmonise with existing equipment. A new AM/FM signal generator, Model 61a, incorporating Sweep and Crystal Calibrator is also now on the market. Further information is available from *Taylor Electrical Instruments Ltd., Montrose Avenue, Slough.*

### SHURE PRODUCTS

THE products of one of America's oldest manufacturers of audio equipment have been released for the first time in the United Kingdom. The manufacturer is Shure Brothers, Inc. and the products include pick-ups, cartridges and microphones. Their factory in Evanston, Illinois, is one of the most up to date in the country and is fully equipped for electro-acoustic research and development. Anechoic chambers and laboratory equipment have been designed by the firm's own engineering staff. Special control techniques and devices ensure the maintenance of precision quality manufacture. The model M212 studio stereo "Dyneric" integrated tone arm and cartridge (illustrated right) tracks at  $1\frac{1}{2}$ -2½ grams, reducing record wear and, the makers claim, making it impossible to scratch

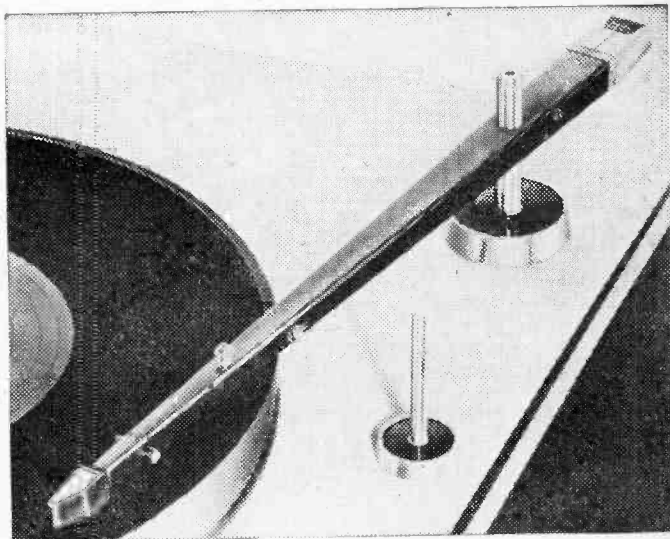
records. The cartridge is fitted with a 0.0007in. diamond stylus and is compatible for mono and stereo reproduction. The arm counterbalance floats on a damped suspension bar providing critical damping without impeding normal motion. Further details of this and other Shure products are available from the sole United Kingdom representative, J. W. Moulder, 95 Hayes Lane, Beckenham, Kent.

### AUTOMATIC RECORD PLAYER

AN automatic record player, model ST.561A has recently been placed on the market by Stella Radio and Television Ltd. Fitted with a 4-speed, push-button changer, it will also play single records automatically or manually. The pickup head has twin sapphire styli and the plastic-covered wood carrying case is finished in beige and red. The player is equipped with a stereo socket so that, with additional equipment, it can be used for playing stereophonic records. Priced at 23 guineas (tax paid), model ST.561A is made by *Stella Radio and Television Ltd., Astra House, 121-123, Shaftesbury Avenue, London, W.C.2.*

### EVENT RECORDER and HOUR METER

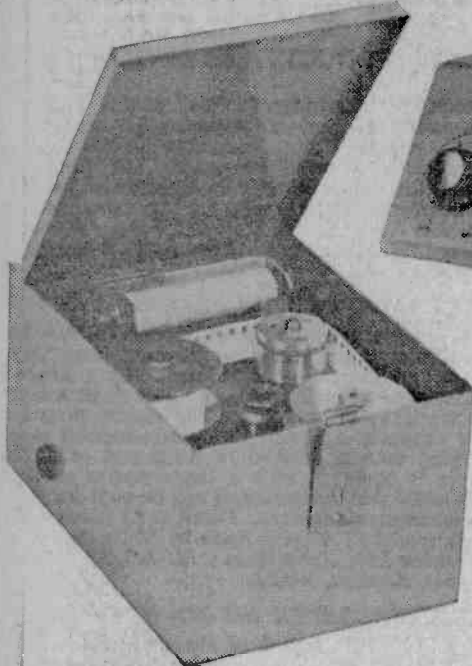
A RELIABLE record of the date and time at which electrical equipment is switched on and off, and of the period of time for which it operates, is provided by the A.E.I. Event Recorder and Hour Meter. Because its drive operates independently off any supply, the Event Recorder can be used to record the time during which a machine is shut down through mains failure. It incorporates a 15-day clockwork movement with



Shure Model M212 stereo "Dyneric" pick-up.

an accuracy of plus or minus five minutes throughout the 15-day cycle. This movement drives a

blue and dark grey hammertone. Further information and details of the price, etc., may be obtained



*The A.E.I. Event recorder.*

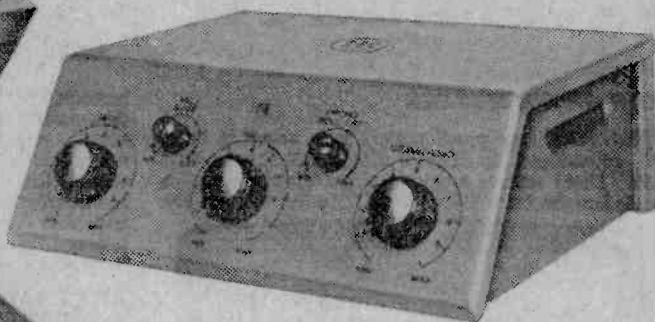
recording chart at a speed of 1 in. per hour. The recorder is available as a separate unit. Further information is available from the *Special Products Department of A.E.I. Radio and Electronic Components Division, 155 Charing Cross Road, London, W.C.2.*

#### **SERVICE OSCILLOSCOPE**

A NEW service Oscilloscope, Model OS-1, is now added to the range of Heathkits. A printed circuit board is used which provides a firm mounting for most of the components and permits a high degree of circuit stability. This is silk screen printed to show the exact location and value of each component. Features include a wide Y-amplifier frequency response, built-in voltage calibrator, timebase output socket, calibrated CRT graticule and a frequency compensated X10 attenuator input. The price is £18 19s. 6d. and the oscilloscope is available from *Daystrom Ltd., Gloucester.*

#### **TRANSISTOR AMPLIFIER**

A NEW transportable transistor amplifier, the BCS2429, has been produced by the General Electric Co. Ltd. Providing 15W of audio power, the amplifier allows up to three large projector horn loudspeakers or between ten and twenty smaller cabinet speakers to be operated at good volume with high reproduction quality. It operates from any 12-14V battery capable of supplying 2.5A (peak). The average consumption is 1A. The main frame of the amplifier consists of a lightweight webbed metal casting which forms the heat sink for the power transistors and carries the main wound components. The unit is finished in silver

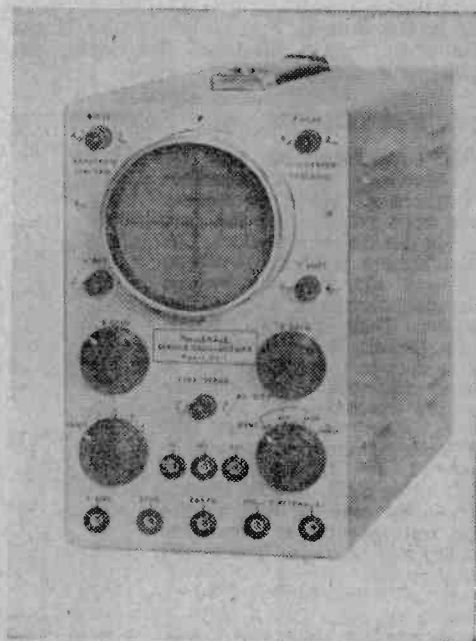


*The G.E.C. transistor amplifier.*

from the *General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.*

#### **ALLOY JUNCTION TRANSISTOR**

THE OC204 is the first large-signal device in the Mullard range of silicon alloy junction transistors. The significant features are its high peak current rating of 0.25A coupled with the high current gain of 50 at 10mA collector current and 25 at 150mA. The maximum junction temperature rating is 150degC and, like other Mullard silicon transistors, the OC204 has a metal can around the glass envelope which allows it to be clamped securely in position. It has an extremely low leakage current of 10mA at 25degC ambient temperature. Further details may be obtained from *Mullard Ltd., Mullard House, Torrington Place, London, W.C.2.*

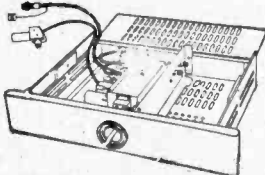


*The Heathkit oscilloscope, Model OS-1.*



### CHANNEL TUNER

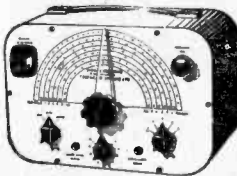
Will tune to all Band 1 and Band III stations. BRAND NEW by famous manufacturer. Complete with PCC84 and PCC70 valves (in series) I.F. 16.19 or 33.38. Also can be modified as an aerial converter (instructions supplied).



Complete with knobs.

**22/6** Plus 3/6 P. & P.  
HEATER TRANSFORMER to suit the above. 200-250 v., 6/- . Plus 1/6 P. & P.

### SIGNAL GENERATORS

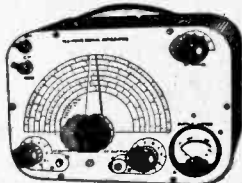


Cash £8.19.6 or 25/- deposit and 6 monthly payments of 21/6. Post and Packing 5/- extra.

Coverage 100 Kcs-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Metal case 10in. x 6in. x 5in., grey hammer finish incorporating three miniature waves and Metal Rectifier, A.C. Mains 200/250 v. Internal Modulation of 400 c.p.s. to a depth of 30%; Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Incorporating magic eye as output indicator. Accuracy plus or minus 2%

Cash £4.19.6 or 25/- deposit and 4 monthly payments of 21/6. Plus Postage and Packing 5/-.

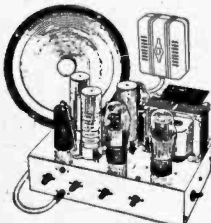
Coverage 120 Kcs-84 Mc/s Metal case 10in. x 6in. x 4in. Size of scale, 6in. x 3in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30%, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.D. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%.



### 8-WATT PUSH-PULL AMPLIFIER COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER

A.C. mains 200-250 v. Size 10in. x 8in. x 2in. Incorporating 6 valves. H.P. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feedback. Two inputs, mike and gram. and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 Kics..

± 2db; 4 db down to 20 Kics. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as £4.19.6 Plus P. & P. 7/6. Guitars, etc. Or 20/- deposit Plus P. & P. 7/6. and 4 monthly payments of 23/-.

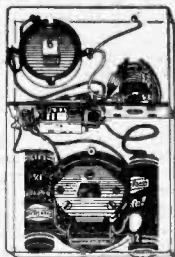


### 2-TRANSISTOR POCKET RADIO

Plus Germanium diode, fully tuneable over medium and long waves. Size 3in x 4in. x 1in. Complete set of components including case, 2 transistors and earpiece (less batteries obtainable anywhere at 10d.)

**19/6** Plus P. & P. 1/6.

Point to point wiring diagram 1/6. free with kit.



### B.S.R. MONARCH UAS WITH FUL-FI HEAD

4-speed plays 10 records 12in., 10in. or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position; colour brown. Dimensions: 12in. x 10in. Space required above baseboard 4in., below baseboard 2in. Fitted with Ful-Fi turnover crystal head.

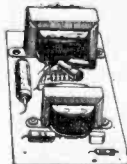
**£6.19.6** Plus 5/- Postage & Packing.

With Stereo Head, £7.19.6, plus 5/- P. & P.



### TRANSISTOR TESTER

For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case size 4in. x 3in. x 1in. Scale marked in Gain and leakage. Complete and ready for use. **19/6** Plus 2/6 P. & P



Inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the above kit. Complete kit of parts including transistors.

**19/6** Plus Post and Packing 1/6.

Point to point wiring diagram 1/6 free with kit.

### MAINS TRANSFORMERS

All with tapped primaries 200-250 volts. 0-160, 180, 200 v., 60 ma., 6.3 v. 2 amps. 10/6. 320-0-320 v. 75 ma., 6.3 v., 2.5 amp., 5 v., 2 amp. 10/6. 280-0-280 v. 80 ma. 6.3 v., 2 amp., 6.3 v., 1 amp. 10/6. 350-0-350 v. 70 mA. 8.3 v., 1 amp., 6.3 v., 2 amp. 10/6. 250-0-250 v. 70 mA. 6.3 v. 2 A. 10/6. Postage and packing on the above 3/-.

### PORTABLE AMPLIFIER

On printed circuit for A.C. Mains 200/250 v. Size 4in. x 3in. with tone and volume control. Valves: ECL82 and E280. **39/6** P. & P. 2/6.

### BUILT POWER SUPPLY UNIT

A.C. Mains 200-250 v. **21/-** Plus 3/6 P. & P.  
D.C. Output 250 v. at 75 ma.  
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# Club News

## REPORTS OF CURRENT ACTIVITIES

### ALDRESHOT AND DISTRICT AMATEUR RADIO SOCIETY

The Cannon Hotel, Victoria Road, Aldershot, Hants.  
 Hon. Sec.: A. M. Laidler, "Pondside", Sandy Lane, Churt, near Farnham, Surrey.

At the annual general meeting on March 9th it was decided that the society should have its own station operating as soon as possible and that a committee should be set up to organise an Amateur Radio Rally to be held during the summer. The age limit for junior members was lowered from 21 years of age to 18 years. Morse practice will now be held at every session and also on Tuesday nights if sufficient members were interested. The club meets every Wednesday at Gibraltar Barracks and on the second Wednesday in each month at the Cannon Hotel. A syllabus of the course for the Radio Amateurs Examination is available from the Secretary.

### AMATEUR RADIO CLUB OF NOTTINGHAM

Woodthorpe House, Mansfield Road, Nottingham.  
 Hon. Sec.: E. Weatherall, 16 Avebury Close, Clifton, Nottingham.  
 The club has two transmitters, one covering top band and the other covering 80m. to 10m. Morse classes and talks are held on Tuesdays and R.A.E. classes under the direction of G3LXL are held on Thursdays. This year the club will be entering the National Field Day Contest.

### AMATEUR RADIO MOBILE SOCIETY

Hon. Sec.: G. E. Storey, 10 Avon Road, Sunbury-on-Thames, Middlesex.

On April 10th the first ARMS Rally of the season was held and went very well. The society's net is on 28.5 M/cs every Tuesday from 9.30. Net M.C. is G3MOW who operates under G3NMS. On March 26th, thirty members of the society had a night out at the Pigalle.

### CHESTER & DISTRICT RADIO SOCIETY

Press Sec.: G. Bagley, G3JUS, Astbury Cottages, Parkgate Road, Saughall, near Chester.

On March 5th the Annual Dinner was held and about 26 people were present including XYL's and visitors. The Annual General Meeting was held on March 8th and Mr. J. Morris, G3ATZ, was re-elected as Hon. Sec. A net night is held on the first Tuesday in each month on "Top Band" at approximately 8 p.m. Meetings are held on Tuesday nights at the Y.M.C.A. St. John's House, Chester, at 8 p.m.

### CRAY VALLEY RADIO CLUB

An invitation is extended to all interested in Amateur Radio Transmission and kindred subjects. Meetings are held on the fourth Tuesday of each month at the Station Hotel, Sidcup, Kent.

### Future Events

May 24th. A Brains Trust at 8 p.m.  
 Further details from H. Miles, G2NK, 59 Amherst Drive, St. Mary Cray, Kent.

### HARLOW AND DISTRICT RADIO SOCIETY

"Black Cat", Abbess Roding, Ongar, Essex.  
 A mobile rally will be held on June 5th at the Village Hall, Magdalene Laver, near Harlow, Essex. In addition to the items of interest to the radio minded other attractions will be arranged to amuse the wives and children. Two stations will be on the air to guide visitors, G3ERN on 160 and G3JMA on 2 metres.

### RADIO SOCIETY OF GREAT BRITAIN

I.A.R.U. Region I Conference to be held in Folkestone.  
 An International Amateur Radio Union (Region I Division) Conference will be held at the Grand Hotel, Folkestone, Kent, from Monday, June 13 to Friday, June 17, 1960, with the Radio Society of Great Britain acting as Host Society.

Invitations to attend the Conference have been sent to all subscribing I.A.R.U. Member Societies in Region I and acceptances have been received from Denmark (E.D.R.), Finland (S.R.A.L.), France (R.E.F.), Germany (D.A.R.C.), Ireland (I.R.T.S.), Italy (A.R.I.), the Netherlands (V.E.R.O.N.), Norway (N.R.R.L.), Poland (P.Z.K.), Spain (U.R.E.), Sweden (S.S.A.), Switzerland (U.S.K.A.), Yugoslavia (S.R.J.). Replies are awaited from Belgium (U.B.A.) and Luxembourg (R.L.).

In addition to the delegates officially appointed by the Member Societies, Observers will be permitted to attend the Conference provided their names and addresses are submitted to the General Secretary of the R.S.G.B. at least two weeks before the opening of the Conference.

Visitors to the Conference will be accommodated at the Grand Hotel at the specially reduced inclusive charge of 50/- per day which will cover service and all meals (breakfast, lunch, afternoon tea and dinner). The hotel—situated on the famous Leas—has a commanding view of the English Channel and is one of the best appointed on the South Coast.

The Conference will be opened at 2.30 p.m. on Monday, June 13th, by the Mayor of Folkestone, after which a Plenary Meeting will be held to elect the Chairman and Secretaries of

Committees. Three main Committees will be set up, namely, Administrative and Operational, Technical, and V.H.F., plus an *ad hoc* Credentials and Finance Committee.

A tentative programme of events is set out below:  
 Sun., June 12th Delegates assemble at the Grand Hotel.  
 Mon., June 13th 9.30 a.m. Meeting of the Executive Committee.

- 2.30 p.m. Official Opening.
- 3.00 p.m. Plenary Meeting.
- 4.00 p.m. Meetings of main Committees.
- 5.00 p.m. Meeting of Credentials and Finance Committee.
- 9.00 p.m. Film Show "The Geneva Radio Conference" by Major Per-Anders Kinnman, SM5ZD (Vice Chairman, Executive Committee.)

Tues. June 14th 9.30 a.m. to 5.30 p.m. Meetings of Committees.  
 9.00 p.m. Display of Colour Transparencies by Mr. Arthur Milne, G2MI, and Dr. Arthur C. Gee, G2UK.

Wed., June 15th 9.30 a.m. to 5.30 p.m. Meetings of Committees.  
 8.00 p.m. Evening Coach Trip.

Thurs. June 16th 9.30 a.m. to 12.30 p.m. Free for shopping.  
 2.30 p.m. Visit to Canterbury and the Weald of Kent as guests of the Mayor and Corporation of Folkestone.

Fri., June 17th 9.30 a.m. to 5.30 p.m. Plenary Meetings.  
 7.30 p.m. Conference Dinner.

Sat., June 18th Delegates depart.  
 The cost of the Conference Dinner is not expected to exceed 2/- a head.

The Folkestone Corporation is to issue tri-lingual Privilege Tickets, which will enable delegates, observers, and their ladies to enjoy many local facilities free of charge.

Further details can be obtained from the General Secretary of the R.S.G.B. (Mr. John Clarricoats, o.b.e.), 28 Little Russell Street, London W.C.1.

### SLADE RADIO SOCIETY

The Church House, High Street, Erdington, Birmingham 23.  
 The club station G3JBN at the Church House is available for the use of members for constructional purposes. Thursday evenings include informal discussions, operation of the club transmitter and instructional Morse Classes.

### Future Events:

May 20th.—"A Tropical Film Show" presented by R. Heaton.  
 June 3rd.—Technical Problems in Sound and Vision.  
 June 17th.—The Collins S-Line Equipment and KWM-Mobile Equipment.

A lecture/demonstration by Mr. John Savage, Director of Engineering, Collins Radio Co. of England Ltd. Admission by ticket only, these may be obtained by personal application to the secretary. Full particulars of the society available from the Hon. Sec., Charles N. Smart, 110 Woolmore Road, Erdington, Birmingham 23.

### WORCESTER AND DISTRICT AMATEUR RADIO CLUB

Y.M.C.S. Building, Henwick Road, Worcester.  
 Hon. Sec.: R. D. Pritchard, G3HNX, 42a Avon Road, Worcester.

On February 27th an open air meeting was held for those interested in forming a club and 38 were present. A room was allocated for club use by the Y.M.C.A. and suitable gear was loaned by members. It is hoped that a complete transmitting station will be in operation shortly. The club room is open seven nights per week and plans are under way for lectures, demonstrations, morse code classes, R.A.E. coaching, a mobile rally, Field Days, exhibition and social events.

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17th Edition

By F. J. CAMM

17/6, by post 18/7

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# Letters to the Editor

*The Editor does not necessarily agree with the opinions expressed by his correspondents.*

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

## ONE VALVE CIRCUIT

**SIR,**—Since I started radio in 1913, Coherer Receiver, I have never seen published a one valve circuit in which the aerial, grid, and reaction coil work is all done on one straight coil.

Having just tried out this circuit here on the border of Kenya and Tanganyika, near Lake Victoria, I received Voice of America, Washington, at 6 a.m. at almost loudspeaker strength on this set—one 1L4 with G2 strapped to anode to make it a detector. Other stations came in at surprising strength from many parts of the world, some audible with phones held about six inches away from my ears. Is this something missed in the past, or is it known but discarded. I can hardly believe such a remarkably good circuit would not be published, as this one beats any other one valve circuit I have ever used, and I have tried them all out. With 15 turns of 16 gauge silver plated wire on a 2 1/2 in. diameter low-loss former, the turns taking up 3 in. length of coil, any part can be used for either of the three circuits, and some arrangements produce overlapping of two or three all using some of the turns at the same time. The set is stable and reaction almost perfect in operation; and by shorting turns it can be taken down from about 60 metres to below 12 metres with ease, and alterations can be made almost instantly, giving the ideal infinite variability without changing coils, or switching. The parts used are the minimum, and no screening appears to be necessary, provided tuning is set accurately. I should be grateful to know whether this is a "find" or something discarded years ago, and also for details of Voice of America, Washington, wavelength and power used. The other strongest station would probably be China from the type of music heard. Many others also failed to declare their origin during my brief periods of testing by day and night. By adding a one valve power amplifier and loudspeaker I expect to get results equal to my Superhet, but much purer. For the first time I can hear the deep, low orchestra notes as well as the high notes, and all done on one 1L4 valve.—W. H. M. GOODWIN (Nyanza, Kenya).

## TRANSISTORISED SUPER REGENERATOR

**SIR,**—Yesterday as I was about to construct a suitable version of the "Transistorised Super Regenerator" (page 1039, April 1960 issue) with the idea of experimenting with it as a short range 27Mc/s Radio/Control receiver, I was surprised

to notice so many errors in the circuit diagram, that I hastily read through the article to see if you were offering a suitable transistor for these higher frequencies as a prize for the reader who spotted the most errors. But alas no! Concerning the first transistor TR1 the emitter and the collector seem obviously transposed in the diagram. With this error corrected the collector of TR1 will at least be at its correct potential. I have always been under the impression that a transistor will not oscillate and rectify at the same time therefore would not a more sensitive receiver result if the emitter instead of the base was earthed, and a diode and R.F. choke were suitably connected to the "livelier" base of the TR1. However, I may be wrong as I have not yet had occasion to experiment with these higher frequencies. The collector of TR2, is also shown receiving a positive potential, an error which, if carried out in practice, would of course ruin the transistor. The battery connections too seem muddled and the single pole switch S1, serves only one battery whilst the other would be always in current. Finally it seems that the two batteries B1 and B2 are transposed in the diagram. Surely the larger battery should supply the collectors? What's that—it does. Then why is it shown at the bottom of the circuit diagram where the smaller battery normally is? And why is TR1 shown "upside down". Oh dear, I see it all now! Yet it has been necessary for me to write all this nonsense and to waste so much of your time reading it, for the penny to drop and for the light to dawn, for it is clear now that the only error in the diagram is that caused by your wicked printer, in transposing the potential signs of the 3 volt battery, B1. Please forgive me and him.—F. G. SMITH (Bideford).

## MAINS POLARITY

**SIR,**—Referring to my letter "Mains Polarity" in "Open to Discussion" (your issue March, 1960), I should have stated that there are two types of miniature circuit breakers which are now being installed on some new electrical installations, one type is the ordinary miniature circuit breaker, and the other is the earth leakage circuit breaker which can be used on installations in rural and country areas where earthing facilities are poor. It is the earth leakage circuit breaker type which I should have referred to in my letter.

It does appear that this is the type of circuit breaker which could be effective if the A.C. radio set with three core lead is connected to the earth (that is using the earth wire of the three core lead and connecting same to the earth terminal of the plug), therefore using the earth of the socket outlet for earthing the apparatus. If an independent outside earth were used for earthing the same

*(Continued on page 180)*



## LETTERS TO THE EDITOR

*(Continued from page 178)*

apparatus, then there would be a parallel earth created, depending on the resistance of the two earths. Therefore, in this case it would appear to affect the operation of the earth leakage circuit breaker. One well known maker of earth leakage circuit breakers states regarding parallel earth paths:—

"It is often found in practice that fortuitous or deliberate parallel earth paths exist between the protected metalwork and earth in addition to the Earth Leakage Circuit Breaker earth. Whatever the resistance of these parallel earth paths, full protection against dangerous fault voltages will always be afforded by the circuit breaker providing it is connected up correctly and operates when the test button is depressed."

As regards the ordinary miniature circuit breaker, if earthing of the socket outlets in the installation is correct, also the earthing of other apparatus if connected to a good earth, if in any apparatus relying on such good earths a fault developed from the live side to the earth of the apparatus it should then operate the miniature circuit breaker, even if another independent earth is connected to such apparatus. As space does not permit me to give full technical details, readers who are interested in miniature circuit breakers and earth leakage circuit breakers could get some valuable information from Chilton Electric Products Ltd., Hungerford, Berks, or J. A. Crabtree and Co. Ltd., Lincoln Works, Walsall. They are two well known firms who manufacture such circuit breakers. I may add that miniature circuit breakers are being used extensively these days on all types of installations.—A. DEARDEN (Johannesburg, S. Africa).

**THE "OLD DAYS"**

SIR,—Much has been said concerning the old and new generations of wireless constructors, now is the time that I would like to say my piece. In the March edition A. Trowbridge wrote attacking soldering. In the modern world of wireless soldering is an essential, it makes small light, strong and very neat joints. Mr. Trowbridge states that "many amateurs have no facilities for soldering. How so? It cannot be for the cost of a soldering iron and solder, for an electric soldering iron can be purchased from an advertiser in PRACTICAL WIRELESS for 16/9, and a gas heated iron can be purchased at any ironmongers for 2/6. I therefore conclude that this statement relates to the absence of power supplies in some districts, but amateurs in these districts are few and far between, but if the need arises a battery soldering iron can be purchased cheaply.

The next statement in Mr. Trowbridge's letter reports that many amateurs are not allowed to solder. Again how so? The only reasonable excuse would seem to be that of age and this can be remedied by waiting for some time. The correspondent then goes on to condemn many of the modern components on the grounds of "impressiveness". Just who is Mr. Trowbridge hoping to impress? Condensers he asserts were interesting pieces of equipment; anyone who can find more interest in a foil covered jam-jar with efficient terminals than in a finely constructed modern condenser is away behind times. He also states his modern

impression of a condenser to be "a plain common roll, covered in paraffin wax and with a wire sticking out each end". But there are many other types of condenser, disc, ceramic, can electrolytic . . . etc. Mr. Trowbridge complains of the lack of attractive cartons. In modern times condensers are sold for their use and not the carton, which is probably discarded in any case. The old resistances had metal cones at each end and fitted into clips which were then fixed to the base board, but in a modern set there may be upwards of fifty resistances and that means fifty clips which can be replaced by 6d. worth of solder, that means a large saving in money. Transformers were magnificent and iron shrouded; magnificent probably meaning that they weighed about five pounds, what is the use of using a huge component where a small one with probably more efficiency could be used. I therefore suggest that these transformers are buried in their iron shrouds. Coils were composite and shielded triumphs. They were probably wound on twelve inch diameter formers and needed much more efficient shielding than would a modern component of similar performance. The larger a chassis the harder it becomes to store and the harder one has to fight wives and mothers who are not at all impressed. As for Mr. Trowbridge's assertion that modern chassis contain wires and components in a jumbled heap I would say that if he looks carefully he will see a method in the madness.—J. M. CHESWORTH (Wallasey, Cheshire).

**THE R1155**

SIR,—I recently acquired an R1155 and would be very grateful if anyone could lend me a copy of PRACTICAL WIRELESS Sept./Oct. 1956 which I understand is now out of print, or any other data concerning the R1155. I have a power pack and the details of a 1.6 to 3.0Mc/s and 18.5 to 31.5Mc/s converter, and "S" meter. I would also like to correspond with another SWL of my own age who has an R1155 and who is interested in making additional equipment for the set. I hope to make radio my future career and find your magazine very interesting and helpful.—J. A. ROSE (104 Mount Grace Road, Potters Bar, Middx.).


**TEST SET 43**

SIR,—I wonder if any of your readers have converted "Test Set 43" to a general purpose scope, and would they be so kind to send me any details they have. I will pay postage. — A. C. WOODLEY (194 Allenby Road, Southall Middx.).

**CORRESPONDENCE WANTED**

SIR,—I am 14 years old and have been interested in radio construction for several years. I have an amateur receiver and would like to correspond with an aspiring amateur of the same age as myself. —A. GRAY (39 Cardowan Drive, Stepps, Glasgow E.3.).

SIR,—I am 14 years old and I am very interested in radio. I would like to communicate with others of around my age. I have been reading PRACTICAL WIRELESS for about two years. Has anyone a circuit of a radio receiver using 56B and 56C valves.—P. BEESLEY (42 Croydon Road, Penge, S.E.20).

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(continued)

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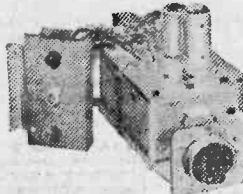
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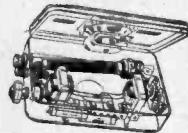
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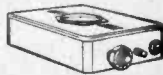


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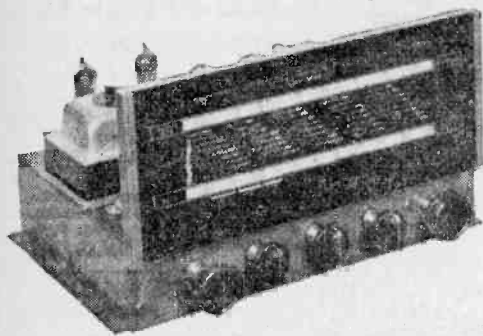
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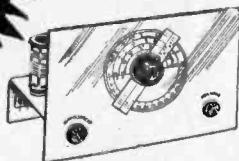
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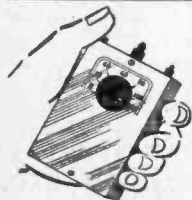
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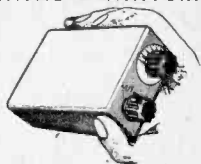
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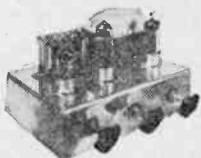
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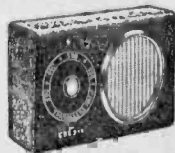


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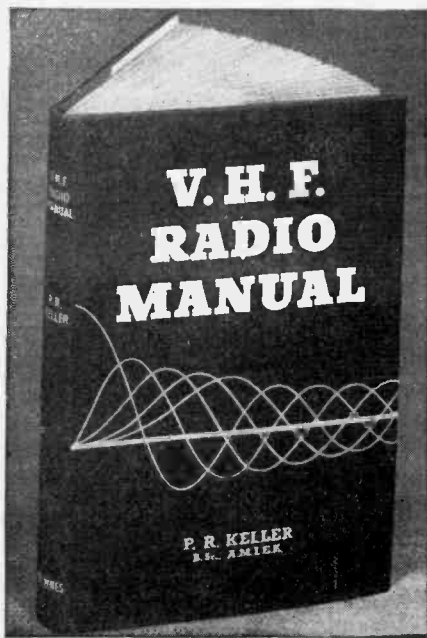
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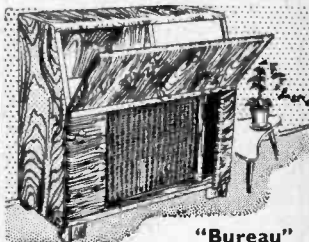
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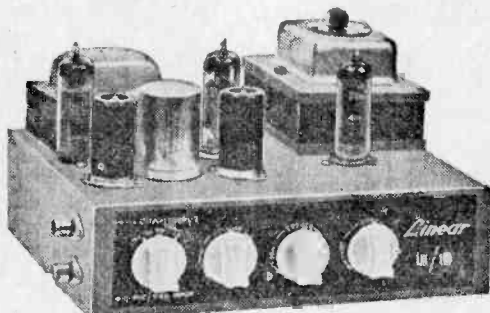
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1SS 6/6	6AL5 5/-	6R7 6/-	7S7 9/-	35Z5 8/6	DAC32 10/-	FC4 10/-	PP36 10/-
1T4 6/-	6AM5 5/-	6SA7 6/-	7Y4 7/-	43 7/6	DAF91 7/-	FW4/800 10/-	OP25 12/6
3A4 7/-	6AM6 5/-	6SC7GT 7/6	9D6 5/-	43 10/-	DF91 7/-	GZ32 10/-	OP25 6/6
3A5 9/-	6B8C 4/6	6SG7 6/6	12AH7 6/-	50B5 10/-	DH63 7/6	GL23 11/-	SP4 10/-
3D6 4/6	6BR7 12/6	6SH7 5/-	12AU5 9/-	50C5 10/-	DK32 12/6	HZ34 10/-	TDD4 10/-
3Q4 7/6	6BW6 8/6	6S17 6/-	12BE6 10/-	75 10/-	DK40 10/-	KT33C 6/6	U50 6/-
3Q5 9/-	6C4 5/-	6SK7 6/-	12I7 10/-	80 8/6	DK91 7/-	8/6	UCH42 10/-
3S4 7/-	6D6 6/6	6SL7 6/-	12K8 10/-	83V 10/-			

Special reductions for sets of valves. Send for free list. P.P. 6d. per valve. Orders above £3 post free. C.O.D. or C.W.O.

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FREE COMPLETE LIST AND DATA ON REQUEST. FULLY GUARANTEED EDISWAN

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XC121 400mW Push-Pull Pairs ...	34/- pr.
XC101 325mW in Push-Pull ...	32/- pr.
XA104 6 Mc/s osc/mixer, R.F. ...	18/- ea.
XA103 4 Mc/s R.F., I.F. amp. ...	15/- ea.
XB104 Audio Output Driver ...	10/- ea.
XB104 Pairs, 250mW Output ...	20/- pr.
XA102 9 Mc/s osc/mixer, R.F. ...	26/- ea.
XA101 5 Mc/s, R.F., I.F., amp. ...	23/- ea.
XC131 Matched prs., 500mW ...	34/- pr.

### SEMICONDUCTORS

SB078 20 Mc/s Short Wave, R.F. ...	10/- ea.
SB305 25 Mc/s Radio Control ...	15/- ea.
SB231 30 Mc/s Radio Control ...	22/6 ea.
SB231R 35 Mc/s, H.F. osc/mixer ...	30/- ea.

Above are direct equivalents of SB344; SB100; SB101, etc.

### MULLARD

OC72 Power Driver ...	16/- ea.
OC45 6 Mc/s, R.F., I.F. ...	18/6 ea.
OC71 Audio Driver ...	10/- ea.
OC72 400mW Push-Pull Pairs ...	30/- pr.
OC170 70 Mc/s Short Wave ...	35/- ea.
OC139 N.P.N. 4 Mc/s ...	66/- ea.
OC140 N.P.N. 6 Mc/s ...	72/- ea.
OC16 Power Output ...	54/- ea.
OC76 R.C. Switching ...	15/- ea.

### SURPLUS

Red Spot Audio Driver ...	5/- ea.
White Spot R.F., I.F., amp. ...	7/6 ea.
Photo-Transistor (General) ...	10/- ea.

### NEWMARKET

V15/10P Power Output, 2 watt ...	15/- ea.
V15/20P High Gain Power ...	39/- ea.
V15/10P Up to 10 watt pairs ...	30/- pr.
V15/201P Intermediate Power ...	25/- ea.
V30/30P High Gain Power ...	57/- ea.

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Transistor Reductions when purchased in sets. Send for New List.

WE ARE ABLE TO SUPPLY MOST OF THE COMPONENTS USED ON CIRCUITS PUBLISHED IN THIS AND OTHER MAGAZINES AND BOOKLETS. WHERE THE EXACT ITEM IS NOT AVAILABLE WE CAN RECOMMEND A SUITABLE SUBSTITUTE.

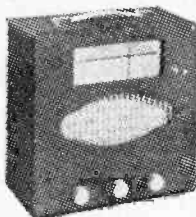
TRADE INQUIRIES INVITED ON ALL ITEMS AND DO-IT-YOURSELF UNITS

## 8-IN. R.C.A. SPEAKER

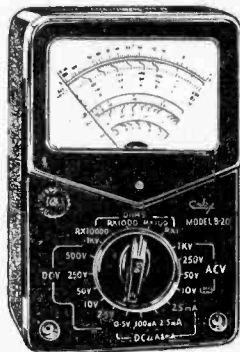
Complete in Black Crackle Case. 3 ohms High-Flux Speaker, 45/-, P.P. 2/6.

## SUB-MIN. TRANSISTOR CONDENSERS

2mfd 1 1/2VW; 4mfd 6VW, 2/- ea. 2mfd 9VW; 8mfd; 10mfd; 6mfd; 50mfd, 2/3 ea. 500mfd 6VW, 1/6; 500mfd 25VW, 3/-  
Complete list by return of post.



Chassis Size 10 x 10 x 4in.



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ACOS AND OTHER WELL-KNOWN MAKES. BRAND NEW.

3/4in. Square ...	3/6
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All guaranteed. P.P. 6d. any type. Acos 39-1 Stick Mic. 39/6, P.P. 1/6 Acos 40 Desk Mic. 25/-, P.P. 1/6

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- ★ 3 Wavebands (10 to 550 metres)—650 kc/s to 2 Mc/s, 3 to 11 Mc/s, 11 Mc/s to 30 Mc/s.
- ★ 5-valve Marconi Superhet.
- ★ A.C./D.C. 200 to 250 v. mains.
- ★ 7 x 4in. Speaker, ★ Gram. input.
- ★ Slow-motion Drive. ★ Frame Aerial.

NOW £6.15.6 P.P. 3/6. Inc. Speaker. OR COMPLETE IN PORTABLE CABINET, £7.12.6, P.P. 4/-

- ★ ALTERNATIVE MODEL: MEDIUM, LONG AND SHORT. IDEAL GRAM CHASSIS.

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## BRAND NEW "POCKET TESTMETERS"

Ideal for Radio, TV Servicing, Amplifier, Equipment Testing and all Transistor work. Use them for checking: car electrical wiring, household wiring, batteries, model railways, etc.

— FULLY GUARANTEED —

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SEE BACK PAGE

# Practical Wireless

## BLUEPRINT

## SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, an asterisk in the list below denotes that constructional details are available free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to

PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

### SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Title	Number	Price
-------	--------	-------

### CRYSTAL SETS

Junior Crystal Set ... ..	PW94*	2/-
Dual-wave Crystal Diode ... ..	PW95*	2/6

### STRAIGHT SETS

#### Battery Operated

Modern One-valver ... ..	PW96*	2/6
All-dry Three ... ..	PW97*	3/6
Modern Two-valver ... ..	PW98*	3/6

### SUPERHETS

#### Mains Operated

A.C. Band-pass Three ... ..	PW99*	4/-
A.C. Coronet-4 ... ..	PW100*	4/-
A.C./D.C. Coronet ... ..	PW101*	4/-

### MISCELLANEOUS

The PW 3-speed Autogram ... ..	—*	8/-
The PW Monophonic Electronic Organ ... ..	—	8/-

### TELEVISION

The PT Band III Converter ... ..	—*	1/6
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Title	Number	Price
-------	--------	-------

A.C. Fury Four ... ..	PW20*	2/6
Experimenter's Short Wave ... ..	PW30a*	2/6
Midget Short Wave Two ... ..	PW38a*	2/6
Band-Spread Three (Battery) ... ..	PW68*	2/6
Crystal Receiver ... ..	PW71*	2/-
Signet Two (Battery) ... ..	PW76*	2/6
Simple S.W. One-valver ... ..	PW88*	2/6
Pyramid One-valver ... ..	PW93*	2/6

BBC Special One-valver ... ..	AW387*	2/6
Short-Wave Two ... ..	AW429*	2/6
Short-Wave World Beater ... ..	AW436*	3/6

Standard Four Valve S.W. ... ..	WM383*	3/6
Enthusiast's Power Amplifier ... ..	WM387*	3/6
Standard Four Valve ... ..	WM391*	3/6
Listener's 5-Watt Amplifier ... ..	WM392*	3/6

### TELEVISION

Argus Television Receiver ... ..	—*	3/-
Simplex Television Receiver ... ..	—*	3/6

### QUERY COUPON

This coupon is available until 7th June, 1960 and must accompany all queries in accordance with the notice on our "Open to Discussion" page.

PRACTICAL WIRELESS, JUNE, 1960

# Just right for a day's outing

## "CONTINENTAL-6" Combined Portable/Car Radio

MEDIUM AND LONG WAVE FULL TUNING

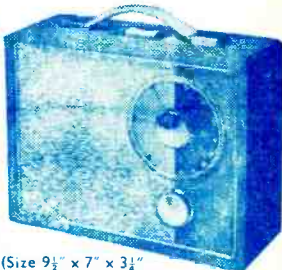
- ★ Plessey Printed Circuit
- ★ 6 Top Grade Ediswan Transistors
- ★ 5" High Fidelity Speaker
- ★ 400mW Push-Pull Output
- ★ Internal Ferrite Aerial
- ★ Slow Motion Tuning
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- ★ Printed Circuit marked with Component Numbers
- ★ Double Tuned I.F.s
- ★ All Components Guaranteed

Total Cost of all Components

**£11.10.0** p.p. 3/6

including Cabinet, Battery, Transistors, Car Radio, AVC and all necessary items.

A highly sensitive and selective portable fully tunable on medium and long waves. Performs equally well as a car radio. Low running costs, good looks and care of construction combine to produce a radio equal to commercial receivers in the 20 gns. class.



(Size 9½" x 7" x 3½"  
Weight 4 lbs.)

★ For Style, Quality Performance and Value for Money

All components available separately. Send for descriptive leaflet and prices. CALL FOR DEMONSTRATION

All Components for the Popular "TRANSISTOR 8" £10.19.6 P.P. 2/6. FREE BOOKLET

### NO EXTERNAL AERIAL OR EARTH — NO REACTION CONTROLS

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(Two-transistor Pocket Radio)



**69/6** TOTAL COST  
P.P. 1/6

ILLUSTRATED BOOKLET FREE: All components sold separately. Ideal for Beginner. GOOD RECEPTION ANYWHERE!

- ★ 4-stage reflex!
- ★ Medium wave: tunable!
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- ★ No aerial or earth!
- ★ Complete layout!
- ★ Over 6 months on one battery.
- ★ 4½ x 3 x 1½ in.
- ★ Weight only 4 ozs.
- ★ Personal 'phone.

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(THREE TRANSISTOR POCKET RADIO)



(As Described in "R.C." Sept. '59)

TOTAL **87/6** P.P. 1/6 NEW BOOKLET FREE  
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- ★ 5-stage Reflex Circuit.
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- ★ Medium Wave Tuning.
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TRANSISTORS

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WHITE SPOT

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6½ x 3½ x 1½ in.

- ★ Medium and Long Waves.
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- ★ All Ediswan transistors.
- ★ Marked printed circuit.
- ★ Illustrated instructions.

Includes cabinet, battery, transistors, etc. FREE LEAFLET, BOOKLET 1/- POST FREE

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1.3 volts, 500 mA/H  
Size ¾ in. diam. x ¾ in. length.  
ONLY 1/3 ea. P.P. 3d. ea.  
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IDEAL FOR ALL TRANSISTOR WORK

### TELESCOPIC CHROME AERIALS

7-Sections, 3ft. 6ins. open; 6ins. closed. Ideal for Portable Receivers, Walkie-talkies, Radio Control, etc. 12/6, P.P. 1/-.

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2-Transistor Push-Pull Amplifier for use with Major 2 or 3 or Similar. All parts with 3-inch Speaker, etc. 59/6, P.P. 1/6.

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Harmonic Output 450 Kc/s. to 3 Mc/s or more. Ideal for Radio Testing, etc. All components, 25/-, P.P. 1/-.

### "PRACTICAL TRANSISTOR CIRCUITS"

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2-Transistor Unit. Size 4½ x 3 x 1½ in. Headphone output. 37/6, P.P. 1/6 or 32/6, P.P. 1/6 Less Phones.

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For use with "Continental". Works from 12-volt supply. Overall size 4½ x 3½ x 2½ in. All parts with Power transistor, less speaker, 52/6, P.P. 2/-.

All Sizes of Speakers in Stock

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