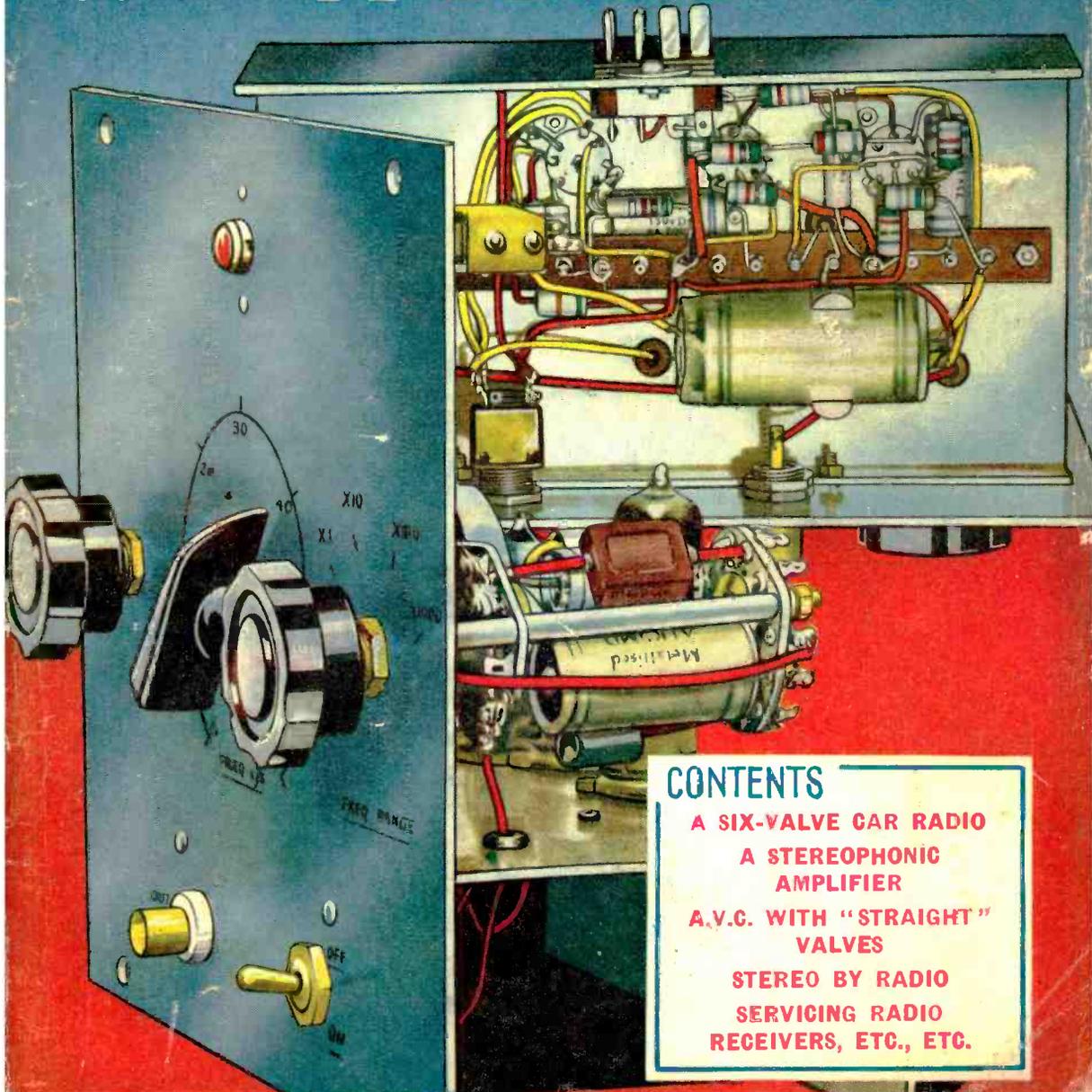


# AN AUDIO SIGNAL GENERATOR

# PRACTICAL 13

# WIRELESS

MARCH  
1959  
EDITOR: F.J. CAMM



## CONTENTS

A SIX-VALVE CAR RADIO

A STEREOPHONIC  
AMPLIFIER

A.V.C. WITH "STRAIGHT"  
VALVES

STEREO BY RADIO

SERVICING RADIO  
RECEIVERS, ETC., ETC.



## COSSOR OSCILLOSCOPE

A truly magnificent first grade L.F. oscilloscope incorporating a hard valve time base, speeds 1.5-40 milliseconds, easily extended for a few shillings to 3 c.p.s. to 30 kc/s. speeds. Has high-class amplifier with fine and coarse gain controls. Brightness and focus controls, X & Y shifts. 115 v. & 230 v. Mains power pack fully fuse protected. Employs 2½ in. tube ACR 10 size 19 in. x 7 in. x 12 in. Only 20 in stock so first come first served. Genuinely cost £59 each, our price **£14.0.0** Carr. 15/-.

### HEADPHONES. BRAND NEW.

American, chamois padded (as illus.), moving-coil 100 ohms, 25/- U.S.A. light weight, Type H.S.30, 15/-. Low resistance 120 ohms, 6/6. High resistance, 12/6. P. & P. 1/6 on each.

**RECEIVER R1155.** This magnificent receiver covers 5 ranges: 75-200 kc/s, 200-500 kc/s, 600-1,500 kc/s, 3-7.5 Mc/s, 7.5-18.5 Mc/s. Fully tested before despatch. Complete with circuit and instruction booklet, £8.10.0. Carriage 10/-.

**BUILD AN F.M. TUNER** with this **MINIATURE 373 I.F. STRIP 9.72 MC/S.** Complete with 6 valves, 3 EF91, 2 EP92, 1 EB91, F.T.s, etc., supplied with circuit and complete conversion to F.M. Tuner details. The best buy of the year at 40/- with valves. 12/6 less valves. P. & P. 2/6.

**PORTABLE AMPLIFIER. PRINTED CIRCUIT.** Size 6½ in. wide, 2½ in. deep, 3 in. high. Will suit all crystal pick-ups. Output 3 watts. Uses UCL82 output, UY85 rectifier. Volume and tone controls. With circuit diagram. **ONLY 45/-.** 7 in. x 4 in. elliptical speaker for above, 14/6.

**WHEATSTONE BRIDGE.** Consisting of four stud switches: 0-210 ohms. Galvanometer centre zero F.S.D. 2.5 mA. Ranges easily extended. Housed in oak cabinet 16 x 7½ x 6 in. Complete with instructions, 22/6. P. & P. 2/6.

**H.R.O. SENIOR RECEIVERS.** 50 kc/s.-30 Mc/s. Complete with all valves, 4 Frequency coil sets, "5" meter, crystal gate, matching mains power pack. Fully tested and supplied ready for immediate operation. We are proud to offer these magnificent receivers at only **£16.19.6.** Carr. 20/6.

**ACCUMULATORS.** 2 volts 16 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc. Brand new. Original cartons. Size 4 in. x 7 in. x 2 in., 5/6 each. P. & P. 1/6. 3 for 15/-. P. & P. 3/6. 6 for 27/6. P. & P. 5/-.



### POLICE-AIRCRAFT-HAM U.S.A. RECEIVER BC624

This is a must for all intelligent radio enthusiasts. Complete receiver covering 100-156 Mc/s, has no less than 10 valves, is a superhet with R.F., 31.F.s second det., and O/P stages, perfect for 2 metres. Power requirements 300 volts 60 mA. and 12 v. at 1.7 amps. Supplied with full operating details and circuit, etc., all for only 30/- P.P. 5/-. Mains power pack kit, 42/6.

**TRANSMITTER BC625** used with above receiver, covers 100-156 Mc/s. will deliver 15 watts, consists of seven valves (2-832), 3 for modulation, 4 for R.F. Complete with operating details and circuits, only 45/- P.P. 5/-. Complete Trans./Receiver Assembly, 70/- Carr. 10/-.

### WALKIE/TALKIE SET



**ONLY 60/- EACH** P. & P. 4/-

Consisting of transceiver covering 7.4-9 Mc/s, range up to 10 miles, complete with 5 valves, headphones, microphone, junction box & 6ft. telescopic aerial. Only requires 120 v. & 3 v. dry battery. These magnificent Walkie/Talkie sets (as used by H.M. Forces) are ideal for any application and can be operated with ease by young and old alike.

**TWO FOR £6** POST FREE.

### SOLDERING IRONS

230-250 volts instrument type, 25 watts. complete with neon indicator. Brand new 16/6. P.P. 2/6.

### INTERCOM

The perfect system for 2-way conversation offering 101 uses. This amazing offer consists of 2 Dynamic Sound Powered Microphone Receivers and 15 yards of twin wire.

**ONLY 8/6 PER PAIR** P. & P. 1/6.

- No Batteries
- No Soldering
- Just connect and use.

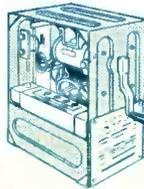
### RECTIFIER BARGAINS

Mains (doubler) 300 volts per section at 120 mA., 5/- each. P. P. 1/6. Two (full wave) for 8/- P.P. 2/-.

### SUPPLY UNIT No. 5

Contains Hand Generator giving 6 v. output with overload cut-out, ideal to boost a flat car battery; 6 volt Vibrator Pack giving 3 volts and 150 volts with output leads, plugs, etc., for Army 38 and 18 sets; Battery box for three 2 v. accumulators. This is a fully portable and multi-purpose power supply unit. **BRAND NEW.**

**ONLY 30/-** Carr. Paid.



### AERIAL VARIOMETERS.

These magnificent instruments will enable you to re-ceive maximum signal strength on all S.W. receivers. Precision calibrated control. Complete with connection details, 12/6. P. & P. 2/6.



**T.C.S. TRANSMITTER.** Covering 1.5-12 Mc/s (160-80-40 metres) consists of V.F.O. Buffer, Doubler, P.A. with internal push/pull modulator, and provision for V.F.O. or crystal control on 4 channels. Output 40 w. phone. 100 w. C.W. Complete with aerial current and plate current meters. £9.10.0. Carr. 15/-.

**R.B.Z. PORTABLE RECEIVER.** Covering 5 to 13 Mc/s. Only 9 in. long, 2½ in. wide, 1½ in. deep, weight 30oz. 5 valve permeability tuned superhet receiver. Incorporates on/off gain and frequency controls. Complete with headphones, aerial, matching battery container, canvas case and 55 page instruction book. Operates from standard dry batt. Brand new. Fully guar. Ready for immediate operation. **Only £5.** P. & P. 5/- (Batteries 12/8 extra.)

**WESTINGHOUSE J.50 PEN-CIL RECTIFIERS.** 500 v. 5 mA., 5/- P. & P. 1/-.

**SEE AT NIGHT!** Yes, it's true! With this complete Infra-Red night driving installation you can see at night and in fog yet the operator cannot be seen. Comprises adjustable long vision binoculars, 12 v. power pack, control unit, connecting cables. Can be assembled within minutes. Govt. acquisition, £200. Brand new, boxed, £6.10.0. Carr. 10/-.

**MICROPHONES. BRAND NEW.** Throat, magnetic, 4/6; No. 8 carbon with switch, 6/6; No. 7 moving coil, 8/6.

**INFRA RED MONOCULAR.** Ideal for night viewing, etc. Complete with push-button zamboni pile power unit and focus lens. Brand new in beautiful leather carrying case. Originally cost Govt. £40. **OUR PRICE 17/6.** P. & P. 2/6.



32a, COPTIC STREET, LONDON, W.C.1.  
87, TOTTENHAM CT. RD., LONDON, W.C.1.  
Telephone: MUSeum 9607.

All post orders and correspondence to:  
(Dept. 'P') 32a, Coptic Street, London, W.C.1.

# ADVANCE YOUR CAREER through a SHORT SERVICE COMMISSION\*

Have you recently qualified—or hope to do so soon? Then a R.A.F. Short Service Commission can bring you greater all-round technical and executive experience than almost any civilian appointment.

With ever-growing aircraft, missile, electronic and nuclear developments, a Technical Officer in the Royal Air Force today has almost unlimited scope. The work is interesting, responsible and, above all, *varied*.

## 2 SCHEMES OF ENTRY

**For men with  
engineering qualifications  
(especially electrical)**

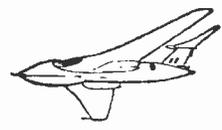
Commissions are for 3 to 6 years. Minimum requirements are a Higher National Certificate in Electrical or Mechanical Engineering and G.C.E., or equivalent, in English Language at 'O' level. By joining at 21, you could be earning over £1,250 (including full allowances) by 27, if married. The upper age limit for entry is under 37.

**For men under 21  
without  
technical qualifications**

Commissions are for 5 to 8 years. Minimum requirements: G.C.E., or equivalent, with passes in English Language and four other subjects, which must include Pure and Applied Mathematics and Physics at 'A' level. Join at 20 and, by 26, you could be earning, if married, over £1,100 a year (including full allowances).

With both schemes you must, of course, be physically fit. They also offer the possibility of extending a Short Service Commission or converting to a Permanent Commission, leading to higher ranks; and if you return to industry, there are special facilities to help you obtain a post in line with your age and added experience.

This is a fine way to help your future career, gain executive experience, see something of the world—and be well-paid while you are doing it! Write *now* for full details to Air Ministry (P.W.213), Adastral House, London W.C.1.

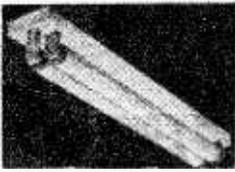


# THE ROYAL AIR FORCE

\*IF YOU ARE A GRADUATE with a Science or Engineering degree, and under 30, you can apply for a R.A.F. Permanent Commission straight away. Write for details of the fine career prospects and pay offered.



**Fluorescent Lighting**



Complete lighting fittings. Built-in ballast and starters—stove enamelled white and ready to work. Ideal kitchen, workshop—anywhere.  
 14 in. 20 approximately 27in. long complete with two 20W tubes. 49/6.  
 Single 40 approximately 4ft. long complete with one 40W tube. 39/6.  
 Inductor 80 approximately 5ft. long complete with one 80W tube. 59/6.  
 Carriage and insurance up to 150 miles 5/8. up to 250 miles 7/6.  
 21in. Miniature complete with 13 watt tube. Ideal for showcase or position where miniature fitting is required. Complete with latest 1in. diameter tube. 49/6 each.

**Why Mend Fuses ?**

To prevent this bothersome time loser we can offer a 230 v. A.C. Circuit Breaker which will stand loads up to 10 Amps. but will trip on short circuit. It is an ideal unit for controlling a work bench, as it is also an on/off switch. New U.S. surplus, reference No. M418082, probably cost at least £4 each, limited quantity only—27/6 each, plus 2/- post and packing.

**Hi-Fi Snip  
Infinite Wall Baffle**



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

**Unused and Boxed Valves**

OZ4	9/-	6D6	6/6	7B5	12/6
1A4	9/-	6P5	9/6	7C7	12/6
1A6	9/-	6P6	7/6	7D5	9/6
1F7	12/6	6P7	12/6	7D3	9/6
1L18	8/6	6P8	9/6	7H7	8/-
1L16	8/6	6P32	10/6	7K8	12/6
1N50	3/6	6C6	7/6	7R7	10/-
1LD5	3/6	6H6	2/6	7S7	10/-
1T4	7/6	6J5	5/6	12H6	8/6
1R5	7/6	6J7	6/-	12SH7	8/6
1S5	7/6	6K6	7/-	12SJ7	8/6
1T5	8/-	6K7	5/-	12SK7	8/6
2A5	12/6	6L5	9/-	25B5	12/6
2A6	12/6	6L6	9/-	25	10/-
2A7	12/6	6L7	10/7	27	10/-
2D13C	5/-	6N7	8/6	28D7	3/6
2X2	4/6	6E7	9/-	31	7/6
3A4	7/-	6R7	8/-	32E	7/6
3D6	5/-	6SA7	8/-	34	12/6
3Q4	7/6	6SC7	8/-	39/44	10/-
4D1	2/6	6SH7	6/-	41E	9/6
5U4	8/-	6SJ7	8/6	42	8/-
5Z3	12/-	6SK7	6/-	43	10/-
5Z4	9/6	6SL7	5/-	57	10/-
6A6	12/6	6SN7	7/6	58	10/-
6AG5	6/6	6SQ7	9/-	71	9/6
6AC7	6/6	6SS7	9/-	75	12/6
6A8	10/-	6T7	12/6	77	8/6
6B4	5/-	6U5	8/6	83	12/6
6B7	10/6	6V6	8/6	94	8/6
6B9	4/6	6V5	6/6	807	8/6
6BQ6	12/6	6V6	9/-	954	3/6
6C4	6/6	6Z5	15/-	1625	10/6
6C8	6/6	7A2	12/6	805	80/-
6C8	5/-	7A7	9/6	913	90/-

Good range of British Valves kept at all addresses.

**TWO OUTSTANDING METERS  
The Taylor Meter Model 100A**

All the advantages of a valve voltmeter but none of its disadvantages. It is, in fact, the only meter in the world with a sensitivity of 100,000 ohms per Volt and all these other features :

- D.C. Current—2 microamp to 10 Amps. D.C. in 8 ranges.
- D.C. Volts—10 microvolt to 25 KV. in 8 ranges (25 KV. with external adaptor Optional extra).
- A.C. Volts—0.2.5 KV. A.C. in 6 ranges.
- Ohms—0-200 Megs. in 4 ranges (self-contained).
- 5 ranges of decibels.
- 5 ranges of output.
- 5in. mirror scale movement.
- Automatic cut-out for meter protection.
- Reverse polarity switch.
- Truly a fine instrument moderately priced at £31.10.0.
- Non-callers add 10/- carriage and insurance.



**The Taylor Meter Model 127A**

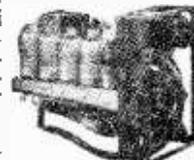
A pocket size meter but with a big scale and a sensitivity of 20,000 Ohms per volt D.C., therefore an ideal unit for television servicing—robustly made and complete with leads and prods—20 ranges as follows :

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



**THIS MONTH'S SNIP**  
 High output car battery charger. Gives quick (car start charge) or trickle charge. Input standard A.C. mains, output 6 or 12 volt at 1.2i or 4 amps. With meter and variable charge selector. Complete in hammer finish louvered case. Only 75/- plus 4/6 carriage, or 10/- deposit and 8 fortnightly payments of 9/-. New and unused, guaranteed for 2 years.

**Complete Walkie-Talkie 25/-**



This is the 46 Walkie-Talkie. It has a range of approx. 5 miles—just right for search parties, fire brigades, etc. Operates from dry batteries. Complete with six valves and in metal case. Size approx. 12in. x 6in. x 3in. Complete but less crystal, not tested nor guaranteed, 25/-, plus 2/6 carriage.

**Break-up Bargain**

- The unit 35/5 less valves and I.F. strip. This contains components valued at at least £10 as follows :-
- 20 Paper tubular condensers up to 1 mfd.
  - 40 Carbon Resistors many high stability.
  - 40 Silver Mica Condensers.
  - 30 R.F. Chokes.
  - 13 Octal Valve Holders.
  - 1 Yaxley Switch.
  - 1 A.F. Choke.
  - 2 Miniature Variable Condensers.
  - 1 Transformer.
  - 2 Mansbridge Condensers.
  - 1 Useful chassis size 18in. x 11in. x 7in. with
- plus hundreds of miscellaneous items, nuts, bolts, washers, tag strips, I.F. sockets, etc. All for 6/6. plus 5/- carriage up to 250 miles.

**FOR ADDRESSES SEE  
OPPOSITE PAGE**

**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.

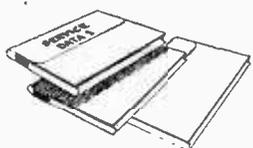


**W.D. Circuit Details**

Diagrams and other information extracted from official manuals. All 1/6 per copy, 12 for 15/-.

- A.1134 R.109
- BC.348 HRO Receiver
- BC.312 R29/ARC5
- R.103A H1116A
- EA.342 R.A.1B
- RA.1B AR88D
- R.208 AN/APA-1
- R.1155 78
- R.1124A 78
- R-1132A, R-1491 R.T.18
- R.1147 CAY-46-AAM-
- R-1234A RADAR
- R-1082 A.S.B.-3
- R-1355 Indicator 62A
- B.C.1208-A.B Indicator A.S.B.3
- B-455-A (or-B) Indicator 82
- B-454-A (or-B) Indicator 6K.
- B-463-M-A (or-B) R.F. unit 24
- Transmitter T1154 R.F. unit 25
- Fifty-eight walkie R.F. unit 26
- talkie R.F. unit 27
- Frequency meter Wireless set No. 19
- B.C. 221 Demobbed valves

**T.V. Service Sheets**



150 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc. £1.10.0 post free.

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

Ranges : D.C. volts 0.5- 0.50- 0.100- 0.500- 0.1000- A.C. volts 0.5- 0.500- 0.100- 0.500- 0.1000- D.C. milliamps 0.5- 0.100- 0.500- Ohms 0.50-0.000 with internal batteries. 0.500-0.000 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.



**Metal Rectifier**

80 mA. 300 volt, 3/6 each, plus 5. post 1/-.

**Novelty Radio**

Completely wired tunable medium and long wave, originally intended for BTG valves and external batteries but could easily be converted for transistors with internal batteries. Less valves and speaker, otherwise complete, 15/-, plus 1/8 postage.



**Multi-Purpose Mains Transformer**

Heavy duty construction, must have cost at least £3 to make. Offered at a snip price of 14/6.

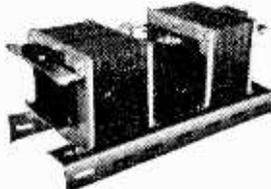
- Specification :-  
 Primary Standard 230 v.  
 Secondary 1. 660 v.-200 mA. centre tapped.  
 Secondary 2. 80 v.-100 mA.  
 Secondary 3. 23 v.-750 mA.  
 Secondary 4. 7 v.-5 amp. centre tapped.  
 Secondary 5. 5 v.-3 amp.

In addition there is a window space for extra L.T. windings, winding ratio is 2:1 turns per volt. Weight of transformer is 12 lb., size approximately 6in. x 4in. x 4in. Connections all brought out to terminals on bakelite panel. We have only 500 of these, so order at once to avoid disappointment. Non-callers add 3/6 postage please.

**"Dim and Full" Switch**

Particularly useful for controlling photo-flood lamps which have only a short life at full brilliance. This toggle switch has three positions the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operational shots. Also useful for controlling night lights, heaters, etc., etc. Price 2/6 each. S. post 9d. Circuit diagram included.

**Mains Isolation Transformer**



Makes servicing safe. Input tapped 200-250 v., output tapped 200-250 v. Rated at 500 watts, intermittent rating 2,000 watts. Screens for suppressing mains interference. Size approximately 4in. x 6in. x 6in., weight approximately 40lbs. Price £5.12.6. Carriage and insurance 7/6 (up to 250 miles).

**Avo Prodclips**



The advantage of these test prods is that by pressing the trigger at the side they become crocodile clips and can be left in circuit. This is a great time saver when servicing. Price 15/- pair.

**Miniature Microphone**

American made. Dynamic type, real bargain at 1/6. Plus 6d. postage.

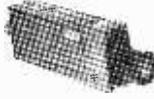


**Headphones**

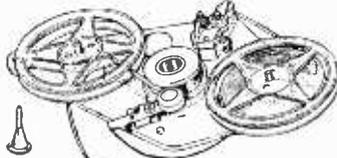
Ex-Government low resistance, perfect, 7/6 pair. Plus 1/6 postage.

**Cine Cameras**

16 min. motorised (24VAC) for 16 frames per second, contains fine F.8.5 triple anastigmatic lens and spool to carry 25ft. of film - probable cost around £150, brand new and in sealed carton £6.10.0 or 20/- deposit and 13 fortnightly payments of 10/- post and insurance 3/6.



**Gram into Tape Recorder**

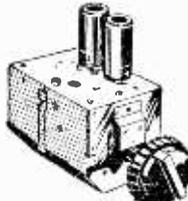


Convert your Record Player or Radiogram into a Tape Recorder. Can be fitted in a few seconds and then you have immediately all the facilities afforded by a normal Tape Recorder, i.e., record playback, erase, rewind, etc. As illustrated. But less pre-amp (circuit diagram of suitable pre-amps included) only 7.10.0, or 10/- down and 16 weekly payments of 10/-.

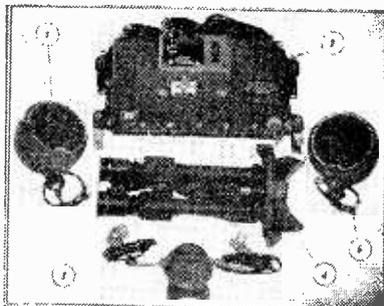


Non-callers please add 5/- carriage and insurance. With pre-amp £13/2/6 or £1 down and 26 weekly payments of 10/-.

**LATEST TYPE Turret Tuner**



Brand new stock, not surplus, with coils for Band I and III complete with valves. Model 1 I.F. output 33/38 Mc/s. Series heaters Model 2 I.F. output 16/19 Mc/s. Parallel heaters. With instructions and circuit diagram. 79/6. With knobs 3/6 extra, post and insurance 2/6.



**TABBY EQUIPMENT COMPLETE**

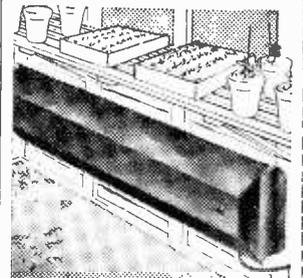
Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, powerpack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order - £6.19.6 or 10/- deposit and 15 fortnightly payments of 10/-.

Definitely your last chance! We still have a few of the R208 Communication Receivers (Spintak Specials) and if you hurry your order to us you may be in time - but please act promptly. Price for tested receiver is £6.19.6, or 10/- deposit and 16 weekly payments of 10/-, plus 15/- carriage.



Wrap your heater cable around the pipes in your loft to prevent a freeze-up. With full instructions. 16 yds. 9/6.

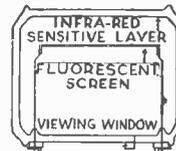
**Convector Heater**



Convector heater. Made from heavy gauge sheet steel (galvanised). For greenhouse, workshop, aviary, etc. 500 watts, £1 12/6; 1,000 watt, £2 10/-; 1,000 watt with wired, but separate thermostat, £3 17/6. 2K watt free standing or wall mounting, £3 19/6; 2K watt with built-in thermostat, £4 19/6. Carriage and insurance 5/- per heater. ALL ARE GUARANTEED FOR 5 YEARS.

**Yaxley Switches**

3 Pole 2 way	1/6
12 Pole 2 way	2/-
3 Pole 3 way	1/6
9 Pole 3 way	2/-
2 Pole 4 way	2/-
6 Pole 4 way	2/6
4 Pole 5 way	2/6
2 Pole 6 way	2/6
1 Pole 7 way	2/6
1 Pole 11 way	2/6
2 Pole 11 way	3/6
1 Pole 12 way	3/6
2 Pole 12 way	4/6
6 Position Shorting	2/-



"Sniper-scope" 5/- only.

"Cats eye" used for seeing in the dark. Will work burglar alarms, counting circuits, smoke detectors and the hundred and one other devices as will the simpler type of photo cell. Price 5/- each. Post and ins., 1/- Data will be supplied with cells if required.

Long, Medium and Short Wave Coil Pack. An exceptionally well made coil pack which covers the standard long, medium and short wavebands for 465 kc. I.F., complete with diagram of connections. 14/6, plus 1/6 postage and insurance - limited quantity only. Neon Lamp, midget wire ended. Ideal for making mains tester or for any of the dozen-and-one applications to which a neon can be put. 2/-.

All items advertised can be obtained from the following Companies.

- If ordering by post, address your order to the Company nearest to you and please include postage.
- Electronics (Eastbourne), Ltd., 66, Grove Rd., Eastbourne. Phone: Eastbourne 6565. Half day Wednesday.
  - Electronics (Ruislip) Ltd., 42-46, Windmill Hill, Ruislip, Middx. Phone: RUISLIP 5780. Half day, Wednesday.
  - Electronics (Croydon) Ltd., 266, London Road, Croydon, S. Cro. Phone: CRO 6558. Half day, Wednesday.
  - Electronics (Finsbury Park), Ltd., 29, Stroud Green Rd., Finsbury Park, N.4. Phone: ARCHWAY 1049. Half day, Thursday.

# BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS. 38 CHALCOT ROAD, LONDON, N.W.1. Telephone: PRIMROSE 9090.

EXPRESS SERVICE! C.O.D. ORDERS RECEIVED BY 3.30 P.M., EITHER BY LETTER, PHONE OR WIRE, DESPATCHED THE SAME AFTERNOON, ALL ORDERS RECEIVED BY FIRST POST DESPATCHED SAME DAY.

ANY ORDER UP TO £10 INSURED AGAINST DAMAGE IN TRANSIT FOR ONLY 6d. EXTRA. ORDERS OVER £10 INSURED FREE.

0B2	17/6	6C4	7/-	6V6GTG	8/-	19H1	10/-	9003	5/6	DK96	10/-	EL32	5/6	KT263	10/6	QP21	7/-	UCF80	23/-
0Z4	6/-	6C5	6/6	6X4	7/-	20D1	16/-	9006	6/-	DL2	15/-	EL33	20/2	L63	6/-	QP25	15/-	UCH21	24/4
1A3	3/-	6C6	6/6	6X5GT	6/6	20D2	27/10	AC/PEN (5	DL33	9/6	EL34	17/6	LN152	14/-	QS150/15		UCH42	11/-	
1A5	6/-	6C8	12/6	6Z4/84	12/6	20F2	27/10	or 7 pin)	DL66	15/-	EL38	27/10	LZ319	9/-			UCH81	11/6	
1C5	12/6	6C9	12/6	6J30L2	10/-	20L1	27/10	AC2PEN	DL92	7/6	EL41	11/-	MH4	7/-	QV04/7	15/-	UCL82	15/6	
1D5	17/6	6C10	12/6	7A7	12/6	20P1	27/10		DL94	9/-	EL42	11/6	MHD4	25/9	R2	10/-	UCL83	25/9	
1D6	10/6	6CD6G	3/4	7B7	8/6	20P3	24/4	AC2PEN/	DL96	10/6	EL81	15/-	MHL4	7/6	R12	10/6	UF1	9/-	
1H5GT	11/-	6CH6	12/6	7C5	8/-	20P4	27/10	DD	DL10	10/6	EL84	10/6	MHLD6	12/6	R18	17/6	UF42	19/6	
1L4	6/6	6D3	20/11	7C6	8/-	20P5	24/4	AC4PEN	DM70	8/6	EL91	5/-	ML4	12/6	R19	25/11	UF80	10/6	
1LD5	5/-	6D6	6/6	7D5	24/4	25A6G	20/2		EAS0	2/-	EL95	10/6	ML6	6/6	SD6	12/7	UF85	10/6	
1LN5	5/-	6E5	12/6	7H7	8/-	25L6GT	10/-	ACSPEN	EAT76	9/6	EM34	10/-	MPT4 (5 or	SP4(7)	15/-	UF86	24/4		
1NSGT	11/-	6F1	27/10	7R7	12/6	25Y5	10/6		EABC80	9/-	EM71	24/4	7 pin)	24/4	SP41	3/6	UF89	10/6	
1R5	8/-	6F6G	7/-	757	10/6	25Y5GT	10/-	ACSPEN/	EAC91	7/6	EM80	10/6	MU14	10/-	SP42	12/6	UL41	10/6	
1S5	8/-	6F6GTM	8/-	7V7	8/6	25Z5	10/6	DD	DF27	10/6	EM81	10/6	MX40	27/10	SP61	3/6	UL44	27/10	
1T4	6/6	6F8	12/6	7Y4	8/-	25Z4G	10/-	AC6PEN	EB34	2/6	EN31	34/9	N37	20/11	ST55	27/10	UL46	15/-	
1U5	10/-	6F11	18/1	8D2	3/6	25Z6G	10/-	AC/HLL	EB41	8/6	EY51	10/6	N75	18/1	SU61	10/6	UL84	11/6	
2A7	10/6	6F12	7/6	8D3	7/6	25Z6GT		DD	EL5-	EB91	6/6	EY83	17/5	N168	19/6	T41	24/4	UM4	12/1
2C26	4/-	6F13	12/6	9D2	4/-			AC/PA	8/-	EB33	7/6	EY86	14/6	N308	21/7	TDD4	25/9	URIC	17/5
2D13C	7/6	6F14	27/10	10C1	15/-	27S5	20/11	AC/TP	34/9	EB41	10/-	EZ35	6/6	OA70	5/-	TDD13C		UU6	20/11
2P	27/10	6F15	16/-	10C2	27/10	28D7	7/-	AC/VP1		EB81	14/8	EZ40	8/-	OA71	6/-			UU8	27/10
2X2	4/6	6F16	9/6	10F1	19/6	30C1	9/-			EBF80	10/-	EZ41	10/-	OC72	30	TH48	27/10	UYIN	17/5
3A4	7/-	6F17	12/6	10F9	11/6	30F5	8/-	AC/VP2		EBF89	9/6	EZ80	9/6	P61	3/6	TH41	27/10	UY21	17/1
3A5	12/6	6F32	10/6	10F18	12/6	30FL1	10/-			EBL21	24/4	EZ81	9/-	PABC80		TH233	34/9	UY41	8/6
3B7	12/6	6F33	7/6	10LD3	8/6	30L1	9/-	AL60	10/-	EBL31	24/4	FC2A	25/9		15/-	TH231	20/-	UY85	10/6
3D6	5/-	6G6	6/6	10LD11	16/9	30P12	12/6	ATP4	5/-	EC52	5/6	FC4	27/10	PCC84	9/6	TP22	15/-	VLS492A	23
3Q4	7/6	6H6GTG	3/-	10P13	17/6	30P16	10/-	AZ1	17/5	EC54	6/-	FC13	27/10	PCC85	12/6	TP25	19/6	VMP4G	15/-
3Q5GT	9/6	6H6GTM	3/6	10P14	20/2	30P11	12/6	AZ31	10/6	EC70	12/6	FC13C	27/10	PCF80	9/6	TP2620	34/9	VP2(7)	12/6
3S4	7/6	6J5G	5/-	11D3	25/9	31	7/6	AZ41	14/8	ECC31	15/-	FW4/500		PCF82	12/6	TY86(7)	11/1	VP4(7)	15/-
3V4	9/6	6J5GTG	5/6	11E3	15/-	33A/158M		B36	25/9	ECC32	10/6		10/-	PCL82	12/6	U12/11	12/1	VP4B	24/4
5R4G	17/6	6J5GTM	6/-	12A6	6/6			BL63	7/6	ECC33	8/6	FW4/800		PCL83	14/-	U16	12/-	VP13C	7/6
5U4G	8/6	6J6	5/6	12AC6	16/-	35/51	12/6	C1	12/6	ECC34	25/9		10/-	PEN4DD		U18/20	10/-	VP23	6/6
5V4G	11/6	6J7G	6/-	12AD6	18/-	35L6GT	9/6	C1C	12/6	ECC35	8/6	GZ30	10/6		27/10	U22	8/-	VP41	6/6
5X4G	12/6	6J7GT	10/6	12AE6	14/8	35W4	8/6	CB11	27/10	ECC81	8/-	GZ32	12/6	PEN25	20/11	U24	31/4	VR105/30	
5Y3G	8/6	6K6GT	8/-	12AH7	8/-	35Z3	10/6	CB13	24/4	ECC82	7/6	GZ34	14/-	PEN36C		U25	24/4		9/-
5Y3GT	8/6	6K7G	5/-	12AH8	10/6	35Z4	7/6	CCH35	24/4	ECC83	10/-	H30	5/-		24/4	U26	12/6	VR150/30	
5Y4	12/6	6K7GT	6/-	12AT6	10/6	35Z5GT	9/-	CK506	6/6	ECC84	10/6	H63	12/6	PEN40DD		U31	10/-		9/-
5Z3	12/6	6K8G	8/-	12AT7	8/-	41MTL	8/-	CK523	6/6	ECC85	9/6	HABC80			25/-	U33	27/10	VT61A	5/-
5Z4G	10/6	6K8GTG	7/6	12AU6	24/4	42	24/4	CL33	20/2	ECC91	5/6		13/6	PEN44		U35	27/10	VT501	5/-
5Z4GT	12/6		11/-	12AU7	7/6	43	24/4	CV63	10/6	ECF80	13/6	HK90	10/-		27/10	U37	27/10	W61M	27/10
6A7	27/10	6K25	20/11	12AX7	10/-	50C5	12/6	CV85	12/6	ECF82	13/6	HL133DD		PEN45	19/6	U43	10/6	W76	7/6
6A8	10/-	6L1	24/4	12BA6	9/-	50CD6G		CV271	10/6	ECH3	27/10		12/6	PEN45DD		U45	10/6	W81M	6/-
6AB7	8/-	6L6G	9/6	12BE6	10/-		31/4	CV428	30/-	ECH21	24/4	HL23	10/6		27/10	U50	8/-	W107	12/6
6AB8	14/-	6L7GT	12/6	12BH7	22/3	50L6GT	9/6	CY1	17/5	ECH35	9/6	HL23DD		PEN46	7/6	U52	8/6	W229	19/6
6AC7	6/6	6L18	13/-	12C8	15/-	53KU	20/11	CY31	17/5	ECH42	9/6		18/1	PEN383	24/4	U76	7/6	X31	27/10
6AG5	6/6	6L19	24/4	12E1	30/-	72	4/6	D1	7/6	ECH81	9/-	HL41	12/6	PEN453DD		U78	7/6	X41	27/10
6AJ8	9/-	6LD20	16/9	12J5GT	4/6	75	25/9	D15	10/6	ECL80	14/-	HL41DD			34/9	U107	17/5	X42	27/10
6AK5	8/-	6N7	8/-	12J7GT	10/6	77	8/-	D42	10/6	ECL82	12/6		20/2	PEN/DD		U191	20/11	X61	12/6
6AK8	9/-	6P25	24/4	12K5	18/10	78	8/6	D63	5/-	EF9	24/4	HL42DD		4020	27/10	U251	15/-	X61M	27/10
6AL5	6/6	6P28	27/10	12K7GT	7/6	80	9/-	D77	6/6	EF22	14/-		20/2	PL33	20/2	U281	20/11	X63	10/-
6AM6	7/6	6O7G	10/-	12K8GT	14/-	85A2	15/-	DAC32	11/-	EF36	6/-	HN309	25/9	PL36	24/4	U282	23/8	X65	12/6
6AQ5	8/6	6O7GT	11/-	12Q0GT	7/6	150B2	15/-	DAF91	8/6	EF37A	8/6	HVR2	20/2	PL38	27/10	U301	24/4	X66	12/6
6AT6	6/6	6R7G	10/-	12SA7	8/6	185B7	34/9	DAF96	10/-	EF39	6/-	HVR2A	6/-	PL81	16/-	U329	15/-	X76M	14/-
6AU6	10/6	6SA7GT	8/6	12SC7	8/6	185BTA	34/9	DD41	14/8	EF40	15/-	KF35	8/6	PL82	10/-	U339	20/11	X78	22/3
6B4G	6/6	6SC7	10/6	12SG7	8/6	203THA		DDT4	25/9	EF41	9/6	KK32	23/-	PL83	11/6	U404	10/6	X109	18/1
6B7	10/6	6SGGT	8/-	12SH7	8/6		27/10	DF33	11/-	EF42	12/6	KL35	8/6	PM2B	12/6	U401	31/4	XD(1.5)	6/6
6BBG	4/6	6SH7	8/-	12SJ7	8/6	220TH	25/9	DF91	6/6	EF50(A)	7/-	K72	5/-	PM12	6/6	U4020	17/5	XFG1	18/-
6BBGTM	5/-	6S17	8/-	12SK7	8/6	40CDPENA		DF96	10/6	EF50(E)	5/-	KT33C	10/6	PM12M	6/6	UABC80		XYF12	6/6
6BA6	7/6	6SK7GT	8/-	12SQ7	12/6		24/4	DH63	10/-	EF54	5/-	KT36	27/10	PX4	34/9			XH(1.5)	6/6
6BE6	7/6	6SL7GT	8/-	12SR7	8/6	807	7/6	DH53(M)		EF73	10/6	KT41	27/10	PX25	62/7	UAF42	10/6	XSG(1.5)	6/6
6BG6G	24/4	6SN7GT	7/6	12Y4	10/6	956	3/6		17/6	EF80	8/-	KT44	15/-	PY31	17/5	UB41	12/7		6/6
6BH6	9/-	6SQ7GT	9/-	12A7	17/-	1821	17/5	DH76	7/6	EF85	7/6	KT61	20/2	PY32	20/11	UBC41	10/-	Y63	7/6
6B16	7/6	6S5T	8/-	15D1	27/10	4033L	12/6	DH77	8/6	EF86	14/-	KT63	7/-	PY80	8/-	UBC81	14/8	Z63	10/6
6BR7	11/6	6U4GT	12/6	18	24/4	5763	12/6	DIH107	14/8	EF89	10/-	KTV61	8/6	PY81	9/-	UBF80	9/6	Z66	20/2
6BW6	9/6	6U5G	7/6	19AQ5	11/-	7193	5/-	DK32	23/-	EF91	7/6	KTV62	8/6	PY82	9/-	UBF89	10/6	Z77	7/6
6BW7	8/-	6U7G	8/6	19B6G6		7475	7/6	DK91	8/-	EF92	5/6	KTV63	8/6	PY83	9/6	UBL21	24/4	Z719	8/-
6BX6	8/-	6V6G	7/-		24/4	9002	5/6	DK92	10/6	EK32	8/6	KTZ41	8/-	PZ30	20/11	UCC85	10/6	Z729	14/-

## NEW METAL RECTIFIERS—FULLY GUARANTEED

DRM-1B	15/4	RM-3	9/6	WX3	3/6	14A100	27/-	14RA 1-2-8-2	19/-	16RE 2-1-8-1	8/6
DRM-2B	16/2	RM-4	18/-	WX4	3/6	14A124	28/-	14RA 1-2-8-3	23/6	18RA 1-1-8-1	4/6
DRM-3B	23/3	RM-5	24/-	WX6	3/6	14A163	38/-	14RA 2-1-16-1	21/-	18RA 1-1-16-1	6/6
RM-O	7/11	W4	3/6	14A86	18/-	14B130	35/-	16RC 1-1-16-1	8/6	18RA 1-2-8-1	11/-
RM-1	7/-	W6	3/6	14A97	25/-	14B261	11/6	16RD 2-2-8-1	12/-	18RD 2-2-8-1	15/-
RM-2	7/6										

# The "NEW" 1959

## Stern's "fidelity" TAPE RECORDER

### for truly "Hi-Fi" Recordings

#### IT INCORPORATES

- The latest COLLARO TRANSCRIPTOR TAPE DECK.
- The model HF/TR3 "fidelity" AMPLIFIER. (Described below.)
- ROLA/CELESTION 10in. x 6 P.M. Speaker.
- 1,200 reel EMI tape.
- ACOS Crystal Microphone.

BEFORE CHOOSING YOUR TAPE RECORDER YOU SHOULD HEAR THIS MODEL—TRULY "HI-FI" RECORDINGS ARE OBTAINABLE and it is comparable to much higher-priced Recorders.  
Alternatively send S.A.E. for ILLUSTRATED LEAFLET.

(Plus £1/10/0 Carriage and Insurance, of which £1 is refunded on return of Packing Case.)

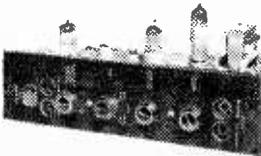
### THE MODEL HF/TR3 TAPE AMPLIFIER

#### INCORPORATING

3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE 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 11in. x 6in. x 6in. Can be supplied for use with Truvox—Collaro—Lanc—Brenell or Motek Decks. Please specify which.

Send S.A.E. for leaflet or 2/6 for the complete Assembly Manual.



## HOME CONSTRUCTORS YOU CAN BUILD THIS PORTABLE TAPE RECORDER from £41.10.0

#### WE OFFER YOU THIS SELECTION

- (a) The PORTABLE CASE illustrated here (£5.0.0), 1,200ft. E.M.I. TAPE (£1.15.0), ACOS CRYSTAL MIKE (£1.15.0), ROLA 10in. x 6in. LOUD-SPEAKER (£1.10.0). ALL FOR **£9.0.0**

AVAILABLE ON HIRE PURCHASE WITH (b) or (d) below:

(b) The COLLARO MK. IV TAPE DECK (£25.0.0) and the HF/TR3 AMPLIFIER Assembled and Tested. FOR **£36.0.0**

H.P. Deposit £7.4.0 and 12 months of £2.12.6.

(c) As in (b) above, but HF/TR3 supplied as **£32.10.0**

COMPLETE KIT OF PARTS.....

(d) The TRUVOX MK. IV TAPE DECK incorporating Precision Rev. Counter (£30.9.0) and the HF/TR3 AMPLIFIER **£41.10.0**

Assembled and Tested.....

H.P. Deposit £8.6.0 and 12 months of £3.0.10.

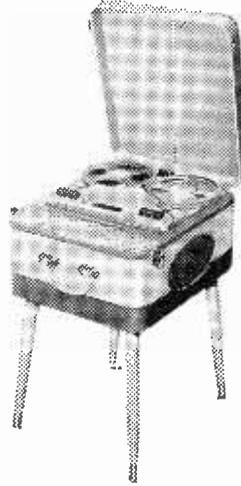
(e) As in (d) above, but the HF/TR3 supplied as **£38.0.0**

COMPLETE KIT OF PARTS.....

(Carriage and Insurance on above quotes 10/- extra.)

NOTE: Messrs. Collaro when supplying the MK. IV Deck do not wire up the Deck Switches. We will do this at charge of £1.0.0, or supply a Wiring Diagram to the Home Constructor.

Please send S.A.E. with all correspondence.



PRICE  
**£49.10.0**

Terms: Dep. £9.15.0 and 12 monthly payments of £3.12.7 or Dep. £16.10.0 and 12 monthly payments of £3.0.6.

THE LEGS SHOWN IN THE ILLUSTRATION ARE READILY DETACHABLE, AND ARE AN OPTIONAL EXTRA AT £1.2.6.

### THE NEW MULLARD TYPE "C" TAPE PRE-AMPLIFIER-ERASE UNIT

INCORPORATING THE NEW FERROXUCUBE POT CORE PUSH-PULL OSCILLATOR and 3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE POT CORE INDUCTOR.

PRICES... INCLUDING SEPARATE SMALL POWER SUPPLY

COMPLETE KIT OF PARTS **£14.0.0**

ASSEMBLED AND TESTED **£17.0.0**

Deposit £3.8.0 and 12 months of £1.4.11.

ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT

FOR **£11.15.0** and **£14.10.0** respectively.

(Carriage and Insurance is 5/- extra.)

WHEN ORDERING PLEASE STATE MAKE OF TAPE DECK TO BE USED. We present this "Hi-Fi" Pre-amplifier strictly to Mullard's specification incorporating ONLY NEW HIGH-GRADE COMPONENTS and the SPECIFIED NEW MULLARD VALVES. It comprises a COMPLETELY SELF-CONTAINED UNIT, all components and valves being contained in a well-ventilated Box-Chassis neatly finished in Hammered Gold with a very attractively engraved PERSEFX FRONT PANEL.



TO ADD FULL TAPE RECORDING FACILITIES To any modern "Hi-Fi" AUDIO AMPLIFIER (such as our Mullard "5-10" and 2 valve Pre-amplifier) ... ALL YOU NEED IS ... THE TYPE "C" PRE-AMPLIFIER and a TAPE DECK ... WE OFFER—

(a) The COLLARO MK. IV TAPE DECK and the MULLARD TYPE "C" PRE-AMPLIFIER with Power Unit Assembled and Tested **£37.0.0**

H.P. Deposit £7.8.0 and 12 months of £2.14.3.

(b) As in (a) above but the Type "C" supplied as COMPLETE KIT OF PARTS..... **£34.0.0**

(c) The TRUVOX MK. IV TAPE DECK incorporating Precision Rev. Counter, and the MULLARD TYPE "C" PRE-AMPLIFIER with Power Unit Assembled and Tested **£42.10.0**

H.P. Deposit £8.10.0 and 12 months of £3.2.4.

(d) As in (c) above but the TYPE "C" supplied as COMPLETE KIT OF PARTS..... **£39.10.0**

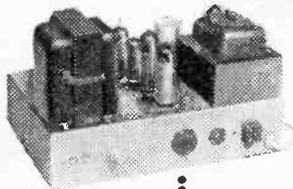
(Carriage and Insurance on above quotes 10/- extra.)

**STERN RADIO LTD.**  
109 & 115 FLEET ST., LONDON, E.C.4  
Telephone: FLEET STREET 5612/3/4

## AMPLIFIERS PRE-AMPLIFIERS FOR THE "HI-FI" ENTHUSIAST

## MULLARD DESIGNS FOR THE HOME CONSTRUCTOR

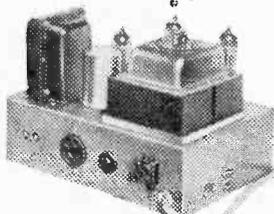
**THE VERY  
POPULAR  
MULLARD  
"5-10" MAIN  
AMPLIFIER**



**MULLARD'S  
NEW, 2-STAGE  
PRE-AMPLIFIER  
TONE CONTROL**



**THE NEW  
MULLARD 3-3  
MAIN  
AMPLIFIER**



Undoubtedly the most successful amplifier yet designed, and used in conjunction with the new Mullard Pre-amplifier, an undistorted power output of up to 10 watts is obtained. Thoroughly recommended to the "Hi-Fi" enthusiast who contemplates a very high quality home installation. In addition the versatility of the equipment makes it quite suitable for use in small halls, etc. We supply complete to MULLARD'S Specification with specified valves and components and including the latest PARMEKO Ultra-linear Output Transformer and the PARMEKO Mains Transformer which has power available to drive Radio Tuning Unit.

**COMPLETE KIT £10.0.0** Alternatively we supply **£11.10.0**  
OF PARTS ASSEMBLED & TESTED  
(Carriage & Insurance 5/- extra.)

**THIS "5-10" with the latest PARTRIDGE for £1.6.0 extra**  
**ULTRA-LINEAR OUTPUT TRANSFORMER**

A completely new design employing two EF86 valves, and in particular designed to operate with the Mullard range of Power Amplifiers, but also perfectly suitable for other makes, etc.

- Equalisation for the latest R.I.A.A. characteristics.
- Input for variable reluctance. ● Magnetic Pick-Ups.
- Input for Crystal Pick-Ups. ● Input for Tape replay.
- (a) Direct from High Impedance Tape Head.
- (b) From a Tape Amplifier or Pre-amplifier.

- Sensitive Microphone Channel.
- Wide range Bass and TREBLE Controls.
- Attractive Perspex front control panel.
- Our Kit is strictly to MULLARD'S SPECIFICATION.

**COMPLETE KIT OF £6.6.0** Alternatively we supply **£8.0.0**  
PARTS ASSEMBLED & TESTED  
(Carriage & Insurance 5/- extra.)

Based entirely on the present very popular "3-3" model and designed to operate in conjunction with the new 2-stage PRE-AMPLIFIER (shown left) thus providing all the facilities associated with the more expensive "Hi-Fi" Equipment. We recommend it as the IDEAL HOME INSTALLATION where very high quality is desired at the lower volume level (up to 3 watts). We supply completely to MULLARD'S SPECIFICATION including the latest PARMEKO Output Transformer, specified Valves and Components. Has power available to drive a Radio Tuning Unit.

**COMPLETE KIT OF £7.0.0** Alternatively we supply **£8.0.0**  
PARTS ASSEMBLED & TESTED  
(Carriage & Insurance 5/- extra.)

Please enclose S.A.E. if ILLUSTRATED and DESCRIPTIVE LEAFLETS are required; the ASSEMBLY MANUALS, containing Practical Drawings, etc., are available at 1/6 each.

Only NEW HIGH GRADE Components and MULLARD VALVES are supplied with these Kits—

### SPECIAL PRICE REDUCTIONS . . .

- (a) The COMPLETE KIT OF PARTS to build both the "3-3" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT **£12.10.0**  
(b) The COMPLETE KIT OF PARTS to build the "5-10" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT **£15.15.0**  
PRICES FOR THE "5-10" ARE SUBJECT TO £1.6.0 EXTRA IF THE PARTRIDGE TRANSFORMER IS REQUIRED.

(a) The "3-3" and the 2-STAGE PRE-AMPLIFIER **£15.0.0**  
both ASSEMBLED and TESTED

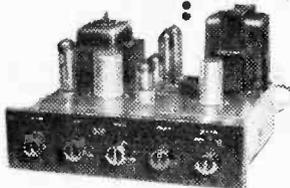
H.P.: DEPOSIT £3.0.0 and 12 Monthly Payments of £1.2.0.

(b) The "5-10" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED **£18.18.0**

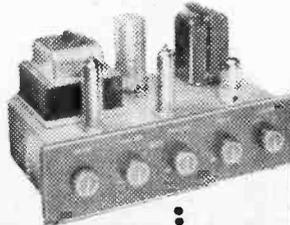
H.P.: DEPOSIT £3.16.0 and 12 Monthly Payments of £1.7.8.  
When ordering include an extra 7/6 to cover Carriage and Insurance.

### MODEL 510/RC

**THE NEW  
COMPLETE  
MULLARD 5-10  
AMPLIFIER**



**THE NEW  
COMPLETE  
MULLARD 3-3**



Designed for a simple domestic installation with Genuine High Quality reproduction up to a maximum of 10 watts. Separate BASS and TREBLE Controls are incorporated with switched inputs for 78 and L.P. Records plus Radio Tuning Unit. We incorporate SPECIFIED COMPONENTS and NEW MULLARD VALVES. We also give the purchaser the choice of two of the best ULTRA-LINEAR OUTPUT TRANSFORMERS made—first the latest by PARMEKO LTD. and also the latest by PARTRIDGE (£1.6.0 extra). We also supply the PARMEKO MAINS TRANSFORMER and this has extra power available to supply a Radio Tuning Unit. The Control Unit can easily be detached from the Amplifier Chassis for use in a remote position.

**COMPLETE KIT OF PARTS £11.10.0** Alternatively we supply **£13.10.0**  
(PARMEKO Transformer) ASSEMBLED and TESTED

H.P. Terms: Dep. £2.14.0 and 12 Monthly Payments of 19.10.  
Send S.A.E. for ILLUSTRATED LEAFLET or 1/6 for the ASSEMBLY MANUAL.

**THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION**

**COMPLETE KIT £7.10.0** Alternatively supplied ASSEMBLED OF PARTS and FULLY TESTED **£8.19.6**  
(plus 6/6 coverage and insurance)

H.P. Terms: Dep. £2.0.0 and 8 Months of £1.0.0.

Developed from the very popular 3-valve 2-watt Amplifier designed in the Mullard Laboratories. Our kit is complete to MULLARD'S SPECIFICATION including supply of specified components, Mullard valves and a PARMEKO OUTPUT TRANSFORMER. Send S.A.E. for leaflet or 1/6 for ASSEMBLY MANUAL.

# STERN RADIO LTD.

# STERN'S FOR STEREO

OUR POPULAR MULLARD MAIN AMPLIFIERS ARE RECOMMENDED FOR USE WITH THE DULCI STEREO PRE-AMPLIFIERS

THE "STEREO EIGHT" PRE-AMPLIFIER  
**£23.2.0**  
(Carr. & Ins. 5/- extra.)



THE "STEREO TWO" PRE-AMPLIFIER  
**£9.9.0**  
(Carr. & Ins. 5/- extra.)

Both Pre-amplifiers can be supplied to correctly operate with our very popular MULLARD "3-3" and "5-10" MAIN AMPLIFIERS (described opposite). For Stereo reproduction TWO Main Amplifiers are necessary, but for normal "Hi-Fi" reproduction the "Stereo Eight" and the "Stereo Two" are perfectly suitable to operate with ONE Main Amplifier and the second Main Amplifier can then be added at any time, thus transforming a standard "Hi-Fi" installation over to Stereo.

## WE OFFER PRE-AMPLIFIER AND AMPLIFIER AT SPECIALLY REDUCED PRICES

Send S.A.E. for full details.  
OTHER STEREO EQUIPMENT AVAILABLE:  
GRAM UNITS fitted with Stereo cartridge by . . . GARRARD-COLLARO LENC0-B.S.R.  
HIRE PURCHASE TERMS ARE AVAILABLE.

## TO MODERNISE YOUR OLD RADIOGRAM

### THE NEW ARMSTRONG "JUBILEE"

A.M./F.M. RADIOGRAM CHASSIS

PRICE **£30.9.0**

(Plus 7/6 Carr. and Ins.)

HIRE PURCHASE: Deposit £6.2.0. 12 Months at £2.4.8.

Messrs. Armstrong have always been associated with very high-class equipment, and this chassis is undoubtedly one of the best they have ever produced.

#### MAIN FEATURES

- 6 watts push-pull output with negative feedback.
- 9 valves and 2 diodes.
- Full F.M. band (87-108 Mc/s) plus medium and long waves.
- Automatic frequency control on F.M.
- Adjustable Ferrite rod aerial on A.M. bands.
- Tape playback and record facilities.
- Two compensated pick-up inputs.
- Frequency response 30-22,000 cps. ± 2 dB.
- Separate wide-range bass and treble controls.
- Output impedance for 3, 7-1, and 15-ohm SPEAKERS.
- Tuning Indicator.
- Size of chassis 12in. x 8in. x 7in. high.

## THE DULCI MODEL H.4/PP AM/FM RADIOGRAM CHASSIS

A 4 Waveband Receiver Designed for first-rate reproduction of Radio and Gram. (Plus 7/6 Carr. & Ins.) **£29.3.10**

H.P. TERMS: Deposit £5/18/10 and 12 months at £2/2/10.

#### BRIEF SPECIFICATIONS

- Covers Short, Medium, Long and F.M. Wavebands.
- Employs Full A.V.C.
- The latest 8-valve line-up.
- Excellent Tone range up to 4 watts output.
- Internal Aerial for local stations.
- Overall size 12in. x 8in. x 7in. high.
- For 3 or 15 ohm P.M. Speakers.
- "Magic Eye" Tuning Indicator.
- PUSH-PULL Ultra Linear Output up to 8 Watts.

## THE DULCI MODEL H.4/2 INCORPORATING OWN POWER SUPPLY

is in Stock. Specifically designed for operation with High Fidelity Amplifiers and capable of very high performance on Long, Medium and Short Wavebands plus the complete VHF FM Transmissions. Thoroughly recommended where a complete self-powered "All Wave" Tuner is wanted.

PRICE **£24.19.0** (Plus 7/6 Carr. & Ins.)

HIRE PURCHASE: Deposit £5 and 12 months at £11 16 7. A fully illustrated leaflet is available, please enclose S.A.E.

## A SPECIAL CASH ONLY OFFER !!

This very attractive PORTABLE AMPLIFIER (ASK 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 Maroon and Grey Rexine.

WE ALSO SUPPLY SEPARATELY—

- (a) The 2-stage (plus Rectifier) AMPLIFIER **£4.2.6**
- (b) THE PORTABLE CARRYING CASE **£3.17.6**
- (c) P.M. SPEAKER **18/9**



Offer a COMPLETE KIT OF PARTS FOR ONLY **£2.19.6**

EASY-TO-FOLLOW ASSEMBLY INSTRUCTIONS ARE INCLUDED. Will charge 6 or 12 volt Batteries at max. 2 1/2 amps. The design incorporates Ballast Resistor and Fuse, and we supply complete with Metal Box container.

**109 & 115 FLEET ST., LONDON, E.C.4**

Telephone: FLEET STREET 5812/3/4

# !!! RECORD PLAYERS !!!

THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES!!!

SEND S.A.E. FOR ILLUSTRATED LEAFLET A FEW CASH BARGAINS

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



**£6.19.6**

The COLLARO "CONQUEST" 4-speed Autochanger, Studio Pick-up **£7.19.6**

The latest COLLARO "CONTINENTAL" 4-speed MIXER Autochanger, Studio "O" Pick-up **£8.19.6**

The COLLARO 4-speed Single Record Player, Studio Pick-up **£6.19.6**

THE NEW B.S.R. Model UA12 is in Stock. A 4 "SPEED" MIXER AUTOCHANGER. **£8.19.6**

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records **£11.17.6**

B.S.R. MODEL TU9 4-speed Single Record Player, complete with separate Crystal Pick-up **£4.10.0**

(This high output Pick-up is available separately for £1/12/6.)  
Carriage and Insurance on each above 5/- extra.

## HIGH FIDELITY UNITS IN STOCK

The latest GARRARD TRANSCRIPTION MOTOR "301" with Stroboscopically marked turntable **£28.0.11**

The new GARRARD Model 4HF High-quality Single Record Player fitted with the latest T.P.A.12 Pick-up Arm and G.C.8. Crystal Cartridge **£19.7.10**

As above but fitted with the G.M.C.5 Moving Coil Pick-up and T.P.1 Transformer **£27.14.7**

GARRARD Model T.A.M.K. II Single Record Player fitted with high output Crystal Pick-up detachable Head **£9.15.8**

The GARRARD T.P.A.12 TRANSCRIPTION PICK-UP ARM is available separately or with Crystal or Moving Coil Pick-up Heads.

GARRARD AUTOCHANGERS AVAILABLE FROM STOCK. Send S.A.E. For Leaflet.

NEW HIRE PURCHASE TERMS ARE AVAILABLE ON ALL EQUIPMENT VALUE £9.0.0 AND OVER.

## STERN'S MK. II fidelity P.M. TUNING UNIT

PRICE **£15.0.0**  
(Plus 5/- Carr. & Ins.)

HIRE PURCHASE: Deposit £3.0.0 and 12 Monthly Payments of £1.2.0.

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP comprising ECC85, 2 type EF85s (or EF85s) EM84 Tuning Indicator, plus 2 type O.A.79s Germanium Diodes. 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 £11.0.0 (Plus 5/- Carr. & Ins.) Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6. This contains easily followed PRACTICAL DIAGRAMS together with relative instructions.



## HOME CONSTRUCTORS

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, Pre-amplifiers, Tuning Units, Record Players, etc. All models are very easily assembled, in fact, only a screwdriver is required. Fully illustrated leaflets are available, including complete specifications of the various STENTORIAN LOUDSPEAKERS. PLEASE, ENCLOSE S.A.E. WITH ALL CORRESPONDENCE.



# A SMALL DEPOSIT will bring you enough parts to make a complete TRANSISTOR POCKET RADIO

(Size  $5\frac{3}{4} \times 3\frac{1}{4} \times 1\frac{1}{4}$ ) using a printed circuit

★ Send for FREE PRICE LIST (all parts sold separately) and/or 3/- for new simplified instruction booklet with suggested circuits and assembly details.

OUR CIRCUITS OFFER  
HIGH SENSITIVITY  
HIGH SELECTIVITY

using

R.F. Transistors 1 GN. each  
L.F. Transistors, 10/- each  
all specially selected to give  
HIGH OVERALL GAIN with A.V.C.

FULL MEDIUM & LONG WAVE COVERAGE

for as little as **£9.19.6**

- Miniature loudspeakers, only  $\frac{1}{8}$  in. deep x  $2\frac{1}{2}$  in. diam. **27/6**
- Miniature oscillator and i.f. coils,  $\frac{1}{8}$  in. high,  $\frac{3}{8}$  in. diam. **8/-**
- Jackson 00 twin gang tuning condenser with intersection screen **10/6**
- Attractive high impact polystyrene cabinet with fittings for tuner, trimmers, speaker and circuit board **12/6**

MANY OTHER SUB-MINIATURE COMPONENTS AVAILABLE

**SPECIALISED ELECTRONIC COMPONENTS LTD** 8 Eccleston Square · London · SW1

MAIL ORDERS ONLY

## YOURS FOR 10% DEPOSIT

Detailed below is a selection of equipment available on easy repayment terms.

Whatever your requirement—we stock it.

	Cash	Deposit	12 M'thly payments of	18 M'thly payments of
<b>AMPLIFIERS &amp; CONTROL UNITS</b>				
<b>Acoustical Quad.</b>				
Mk. II	£42 0 0	£4 4 0	£3 12 6	£2 10 6
<b>Leak TL12 and Point One C/U</b>				
	£31 10 0	£3 3 0	£2 14 4	£1 17 10
Rogers Junior MK. II	£28 0 0	£2 16 0	£2 8 4	£1 13 7
<b>LOUDSPEAKER ENCLOSURES COMPLETE &amp; SPEAKER UNITS</b>				
Wharfedale SFB3	£39 10 0	£4 0 0	£3 8 1	£2 7 4
Goodmans Sherwood I	£32 11 0	£3 6 0	£2 16 1	£1 19 0
<b>Acoustical Electrostatic</b>				
	£52 0 0	£5 4 0	£4 7 5	£2 19 10
Goodmans Axiom 300	£11 5 9	£1 4 0	19 4	13 6
Wharfedale Super 12FS/AL	£17 10 0	£1 15 3	£1 10 2	£1 1 0
Goodmans Stereophonic Bowt Unit	£8 8 0			
<b>TAPE RECORDERS</b>				
Grundig TK35	£86 2 0	£8 13 6	£7 8 5	£5 3 3
Ferragraph 3AN	£82 19 0	£8 9 0	£6 19 0	£4 15 3
Sound 555	£68 5 0	£6 17 3	£5 17 3	£4 1 10
Elizabethan Essex	£68 5 0	£6 17 3	£5 17 8	£4 1 10
Brennell 3 Star	£69 18 0	£6 8 0	£5 1 9	£3 7 5
Grundig TK20	£51 12 0	£5 12 0	£4 11 6	£3 2 8
Felefunken KL75K	£52 10 0	£5 5 0	£4 8 3	£3 0 5
Sound 444	£47 5 0	£4 14 6	£4 1 6	£2 16 9
Elizabethan Escort	£47 5 0	£4 14 6	£4 1 6	£2 16 9
Sound Belle	£27 6 0	£2 16 0	£2 5 9	£1 11 4
*Complete with Microphone.				
<b>TURNTABLE UNITS AND P/U</b>				
Garrard 301 Stroboscopic	£28 0 11	£2 17 6	£2 8 3	£1 13 7
Connoisseur Type B	£29 5 3	£2 0 0	£2 10 4	£1 15 0
Lenco GL58/1RD (with Stereo P/U)	£29 3 10	£2 19 6	£2 10 1	£1 14 11
Decca Stereo P/U	£22 0 0	£2 4 0	£1 18 0	£1 6 5

**The Radio Centre** E & G THE RADIO CENTRE LTD.  
33 Tottenham Court Road, London, W.1.  
Tel.: MUSeum 6667. YOUR TAPE RECORDER CENTRE

## FREE TO AMBITIOUS ENGINEERS!

This 148-page Book

Have you sent for your copy?



### 'ENGINEERING OPPORTUNITIES'

is a highly informative guide to the best-paid Engineering posts. It tells you how you can quickly prepare at home on "NO PASS—NO FEE" terms for a recognised engineering qualification, outlines the widest range of modern Home-Study Courses in all branches of Engineering and explains the benefits of our Employment Dept. If you're earning less than £20 a week you cannot afford to miss reading this unique book. Send for your copy to-day—FREE.

--- FREE COUPON ---  
Please send me your FREE 148-page "ENGINEERING OPPORTUNITIES"

NAME .....  
ADDRESS .....

Subject or Exam, that interests me.....  
British Institute of Engineering Technology,  
408 B, College House, 29-31, Wright's Lane,  
Kensington, W. 8.

### WHICH IS YOUR PET SUBJECT?

Mechanical Eng.  
Electrical Eng.  
Civil Engineering  
Radio Engineering  
Automobile Eng.  
Aeronautical Eng.  
Production Eng.  
Building, Plastics, Draughtsmanship, Television, etc.

### GET SOME LETTERS AFTER YOUR NAME!

A.M.I.Mech.E.  
A.M.I.C.E.  
A.M.I.P.E.  
A.M.I.M.I.  
L.I.O.B.  
A.F.R.Ae.S.  
B.Sc.  
A.M.Brit.I.R.E.  
CITY & GUILDS  
GEN. CERT.  
OF EDUCATION  
etc., etc.

**BIET**



**VALVES**

**Guaranteed  
All Tested  
Before  
Dispatch.**

**LARGEST RANGE OF RECEIVING VALVES IN THE NORTH OF ENGLAND. ALL AVAILABLE EX-STOCK. RETURN POST SERVICE.**

AC6PEN 6/6	FW4/50010/-	UAF42 9/6
AC1P 8/9	GZ32 12/-	UBC41 10/-
AC/TH1 3/9	H30 5/-	UBF80 9/6
ATP4 3/6	HL23DD 8/6	UCC84 9/6
AZ31 1/5	K40N 9/-	20/11
CBL1 11/-	KF35 8/6	UCF80 23/-
CBL31 24/4	KLL32 8/6	UCH42 10/6
CCH35 24/4	KT24 5/-	UCH81 11/6
CL4 12/6	KT33C 10/-	UCL83 17/6
CL3 20/2	KT55 11/-	UF41 10/6
CY31 12/-	KT66 5/-	UF85 10/6
DAF96 10/6	KTW61 6/6	UFR9 10/6
DF96 10/6	KTW63 7/6	UL41 10/6
HD63 9/6	KT241 5/-	UL44 27/10
DK96 10/6	MH41 7/9	UL46 24/4
DL96 10/6	MSP4 10/-	UL84 11/6
DM70 8/6	MSP4/5 10/6	UU6 20/11
EA50 1/6	MSP4/7 10/6	UU8 27/10
EAB80 10/6	N37 18/1	UY9 8/6
EAF42 10/6	OF55 10/-	UY41 8/6
EB34 2/-	N78 12/6	UY85 10/-
EB41 9/6	OZ4 5/6	UP13C 3/6
EBC33 7/6	P61 3/6	VP23 6/6
EBC41 10/-	PCC84 10/-	VP41 8/6
EBF80 10/6	PCF80 13/6	VR105/30/8-
EBF89 18/1	PCF82 12/6	VR116 4/-
EBL21 24/4	PCL82 12/6	VR150/309/-
EBL31 24/4	PCL83 14/6	VU120A 3/6
ECC84 10/3	PL38 20/-	VU39 (MU) 6/6
ECC85 9/6	PL81 16/-	12/14 8/9
ECF80 13/6	PL82 8/6	VUI11 2/6
ECF82 13/6	PL83 11/6	W77 8/6
ECH21 24/4	PX25 12/6	W729 11/-
ECH35 10/6	PY80 9/-	X78 15/-
ECH42 10/6	PY81 10/-	X79 11/6
ECH81 11/-	PY82 9/-	Y63 9/6
ECL80 13/6	PY83 10/-	Z309 9/6
ECL82 13/6	PZ30 20/11	Z359 9/6
EF36 6/-	PEN4DD 27/10	Z759 9/6
EF37A 12/-	PEN4VA 15/-	IA3 3/6
EF39 6/6	PEN4VA IA5GT 6/-	IA7 12/6
EF40 14/6	PEN25 5/-	IC2 11/6
EF41 9/9	PEN44 27/10	IC5GT 12/6
EF42 11/-	PEN46 7/-	ID5 12/6
EF50 4/-	PEN220A ID6 12/6	IH5GT 10/6
EF54 6/-	PEN4 4/-	IA4 6/6
EF80 8/6	PENA4 15/-	IN5 10/6
EF85 9/-	QP21 7/6	IR5 8/6
EF86 14/6	SP41 3/-	IS4 9/6
EF89 10/6	SP61 3/-	IS5 7/6
EK32 8/6	T41 24/4	IS5 7/6
EL32 5/6	TP22 8/-	IT4 7/-
EL33 15/-	TP25 27/10	IU5 7/6
EL38 27/10	U10 10/6	2C26 1/6
EL41 11/-	U22 8/-	2X2 4/6
EL42 12/-	U25 15/-	3A4 7/-
EL84 10/6	U26 12/6	3A8GT 6/-
EL91 7/6	U37 27/10	3D6 5/-
EM34 9/-	U45 15/-	3Q4 9/-
EM80 10/6	U50 8/-	3Q5GT 9/6
EM81 11/6	U403 17/5	3S4 8/6
EY51 13/6	U404 11/10	3V4 9/-
EY86 13/6	U801 31/4	4D1 3/-
EZ40 9/-	UABC80 5Y3G 8/-	5R4GY 9/6
EZ80 8/9	5Y3G 8/-	5U4G 8/-
EZ81 11/10	5Y3GT 8/-	5Y3G 8/-
EZ90 8/-	5Y3GT 8/-	7B7 8/6
E1148 2/-		7B8 7/6
		7C5 8/-

5Z4G 10/-	7C6 8/-
6A7 12/6	7D6 13/6
6A8G 10/-	7H7 9/-
6AC7 6/6	7Q7 9/-
6AG5 5/6	7S7 9/6
6AK5 6/6	7Y4 8/6
6AL5 6/6	8D2 2/9
6AM6 7/6	9D2 3/6
6AQ5 7/6	10F1 (New) 24/6
6AT6 8/6	
6AU6 10/6	10F1 (Sec-onds) 15/-
6B4 5/-	12A6 6/6
6B8G 4/-	12AH8 11/6
6BA6 7/6	12AT6 10/6
6BE6 8/-	12AT7 9/-
6BG6 24/4	12AU6 10/6
6BH6 16/-	12AU7 8/-
6BJ6 9/-	12AX7 9/-
6BR7 11/6	12BA6 9/-
6BV6 8/6	12BE6 9/-
6BV7 8/6	12C8 9/-
6C4 7/-	12C8 9/-
6C5GT 6/6	12H6GT 3/-
6C6 5/-	12J5GT 4/6
6C8G 5/-	12J7GT 10/6
6CD6 31/4	12K7GT 7/6
6D6 5/-	12K8GT 13/6
6F1 14/-	12Q7GT 7/6
6F6G 7/6	12SG7 7/6
6F6M 7/6	12SH7 5/6
6F13 12/6	12S17 8/-
6F15 14/-	12SK7 6/-
6H6 2/6	12SL7 8/-
6H6GT 2/6	12SN7GT 15/-
6J5M 6/6	12SQ7 8/6
6J6 6/-	14S7 14/6
6J7G 6/6	15D2 7/9
6J7M 9/-	20D1 16/-
6K6GT 7/-	20F2 27/10
6K7G 5/-	20P1 27/10
6K7M 6/9	20P3 24/4
6K8G 8/6	20P5 20/11
6K8GT 10/-	25A6G 11/6
6K25 20/11	25L6GT 10/-
6L6 (Metal) 9/-	25Y5 9/9
6L6G 7/6	25Y5G 9/9
6L7 7/6	25Z4 9/6
6L18 13/6	25Z5 10/-
6N7 7/6	25Z6 10/-
6P28 27/10	30F5 9/6
6Q7G 9/-	30FL1 11/6
6Q7GT 9/-	30P4 21/7
6SA7GT 8/-	30P12 12/6
6S7G 7/6	30PL1 12/6
6SH7 6/-	35L6GT 9/6
6S17 8/6	35W4 8/6
6SK7 5/-	35Z4GT 8/-
6SL7GT 8/-	35Z5GT 9/-
6SN7GT 7/6	42 8/-
6SQ7 9/3	50C5 11/6
6U4GT 12/6	50L6GT 8/6
6U5/6G5 18/1	75 11/6
6U5G 8/6	80 7/6
6U7G 8/6	77 8/6
6V6G 7/-	142BT 3/6
6V6GT 7/-	210DDT 4/6
6V6M 9/6	210VPT 3/6
6X4 7/6	807 6/6
6X5GT 7/-	954 2/-
6/30L2 11/6	955 4/9
7B7 8/6	956 3/6
7B8 7/6	9001 5/6
7C5 8/-	9002 5/6
	9004 5/6
	9006 5/6

**NORMAN SILICONE COATED MAINS DROPPER RESISTORS**

Available in the following .3 amp. 1,000 ohms, 6/- types:

<b>Midget Type</b>	each	<b>Long Type</b>
.1 amp. 2,000 ohms,	5/3	.2 amp. 1,000 ohms, 6/-
.15 amp. 1,500 ohms,	5/3	.3 amp. 1,000 ohms, 6/-

These droppers have a fixed clip at each end and 2 slider clips.

**VOLUME CONTROLS CARBON TRACK**  
Claroostat 37

Dimensions: 1 1/4" diameter, depth of case without switch 19/32". Spindle diameter 1", length 2 1/4", with full length flat. Type 37, less Switch, available in 5k, 10k, 25k, 50k.

100k, 1/2 meg., 1 meg., 1 meg., 2 meg. ... 2/10 each  
37S. As above but with Double Pole Switch 4/6 each

**RANGE OF 1/2 WATT 1% RESISTORS HIGH STAB**  
10 meg ohms. 1k ohms. 100 ohms. 120 ohms. 12k. 1-2k ohms. 1-2 meg ohms. 150 ohms. 15k ohms. 12k ohms. 180 ohms. 2 meg ohms. 220 ohms. 220k ohms. 2.2 meg ohms. 330k ohms. 33 ohms. 33k ohms. 3.3 meg ohms. 330k ohms. 330 ohms. 3.3k ohms. 3.9 meg ohms. 3.9k ohms. 39k ohms. 4.7 meg ohms. 470k ohms. 4.7k ohms. 47k ohms. 470 ohms. 47 ohms. 5k ohms. 50k ohms. 500 ohms. 500k ohms. 680k ohms. 6.8k ohms. 6.8 meg ohms. 68k ohms. 68 ohms. 820 ohms. 900k ohms. 9k ohms. 90k ohms. ALL 2/- EACH.

**DOUBLE POTENTIOMETERS**

500K + 500K LINEAR	...	...	...	...	each
250K + 250K LOG.	...	...	...	...	6/6
1 MEG + 1 MEG LINEAR	...	...	...	...	6/6

**T.V. ESCUTCHEONS**  
12" And 17" Types, 7/6 each.

**EXPANDED METAL ANODISED GOLD** 12" x 12", 5/- PIECE.

**TYGAN**  
VARIOUS SHADES, 3/- PER SQUARE FOOT.

**1 lb. REELS CORED SOLDER**, 7/6 per lb.

**CO-AXIAL CABLE 75**, Semi Air Spaced, 6d. yard.

**MINIATURE I.F. TRANSFORMERS**, 465 Kc/s. 9/- pair.

**HEATER TRANSFORMERS**, 6.3 v., 1 1/2 amps, 6/9. 6.3 v., 3 amps., 10/-.

**WAFER SWITCHES**  
1 pole 12 way, 3/- ea. 2 pole 6 way, 3/- ea.  
3 pole 4 way, 3/- ea. 4 pole 3 way, 3/- ea.  
4 pole 4 way, 4/6 ea.

**L.T. METAL RECTIFIERS—FULL WAVE**  
12 volt 1 amp., 4/3; 12 volt 2 amp., 7/-; 12 volt 3 amp., 10/-; 12 volt 4 amp., 12/6; 12 volt 6 amp., 15/9. Order now, we do not expect these rectifiers to last long at these give-away prices.

**ACOS MICROPHONE MIC 33-1**. Crystal, hand or tabe use. Omnidirectional, brand new in sealed carton, listed 50/-, 29/6 each. P. & P. 1/6.

**ACOS MICROPHONE 39-1**. Pencil-stick crystal hand Mic. Listed 105/-. Special price 59/6. P. & P. 1/6.

**OUR 1958/59 FULLY ILLUSTRATED CATALOGUE**  
Of Components and Accessories—invaluable for enthusiasts and engineers—is now available. Send 1/- in stamps for your copy.

**CABLE T.R.S. FLEXIBLE**  
23/36 3-core flexible cable suitable for all portable tools, etc. 25 yard coil £1. Shorter lengths at 1/- yard.



**103 LEEDS TERRACE  
WINTOUN STREET  
LEEDS 7**

**TERMS**: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 1/-; 20/- add 1/6; 40/- add 2/-; £5 add 3/- unless otherwise stated. Minimum C.O.D. fee and postage 3/-. All single valves postage 6d. Personal Shoppers Monday-Friday 9 a.m. to 5 p.m. Saturday 10 a.m. to 1 p.m.

## AMPLIFIERS

12 months' guarantee

### PORTABLE

#### AMPLIFIER MARK D.1, 59/6

Brand new. Latest design with printed circuit. Dimensions 7in. x 2½in. x 5in. A.C. only. Mains isolated. 2-3 watts output. Incorporating EL84 as high gain output valve. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

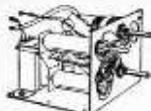
#### PORTABLE AMPLIFIER MARK D.2, 79/6

Printed circuit. Latest design. Dimensions 7in. x 2½in. x 5in. A.C. only. Mains isolated 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve giving higher undistorted output. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

#### PORTABLE AMPLIFIER MARK D.3, 89/6

De luxe model. Printed circuit. Latest design. Dimensions 7in. x 2½in. x 5in. A.C. only. Mains isolated 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve giving higher undistorted output. Volume, treble and bass control. Knobs 3/6 extra. P. & P. 3/6.

#### PORTABLE AMPLIFIER MARK D.4, 69/6



Brand new. By famous manufacturer. Especially built for portable record players. Dimensions 4½in. x 3½in. x 4in. A.C. only. 2 valves: EL84 as high gain output valve; EZ80 as rectifier. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

## RECORD PLAYER CABINETS

79/6



(R.P.4)

Stylish cabinet by famous manufacturer. Cloth covered in contrasting colours (red and grey). Grilled front controls panel. Size 15 x 19 x 8½in. deep. Beautifully made. A cabinet of which you can really be proud. Takes 4-speed B.S.R. Autochanger. 6½in. round or elliptical speaker. Room for any amplifier of your own choice. Carr. & Ins. 4/6.

69/6



(R.P.2)

A beautifully styled cabinet. Made by a famous manufacturer. In polka dot grey cloth with clipped lid and carrying handle. Size 16 x 14½ x 8½in. deep. Will take B.S.R. Monarch 4-speed Autochanger and 4 x 7in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins. 4/6.

79/6



(R.P.3)

A practical cabinet, nicely designed, cloth covered two-tone (brown and coffee). Size 15 x 17 x 8in. deep. Takes B.S.R. 4-speed Autochanger and 6½in. round or elliptical speaker. Carr. & Ins. 4/6.

49/6



(R.P.1)

A delightful-looking cabinet, 14½ x 17½ x 8½in., in two-tone leatherette. Will take a B.S.R. Monarch 4-speed Autochanger and 6½in. round speaker. Carr. & Ins. 4/6.



**B.S.R.**  
4-SPEED  
AUTOCHANGER,  
**£6.19.6**

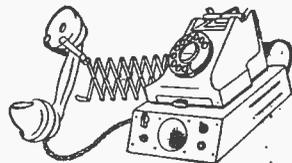
Incorporating auto and manual control complete with turnover crystal p.u. and sapphire stylus. P.P. & Ins. 5/6.

#### COLLARO 4-SPEED AUTOCHANGER, **£7.19.6**

Incorporating auto and manual control complete with studio crystal p.u. and sapphire stylus. P.P. & Ins. 5/6.

## Televox Telephone Amplifier

89/6



Invaluable in a noisy office or workshop. 3 valves: UY41; UF41; UL41. 3in. speaker and a suction type vibration microphone. A.C./D.C. Size of amplifier 7 x 11 x 3in. Fits any type of G.P.O. telephone. P. P. & Ins. 4/6.

# DUKE

DEPT.

621/3, ROMFORD ROAD,  
SEND FOR FREE  
CLOSED ON

Tel: 11.F.

49/6



(R.P.6)

Elegant cabinet, cloth covered in grey or red with sunken control panel and speaker fret. Size 13 x 17 x 8in. deep. Takes a B.S.R. Monarch 4-speed Autochanger. 7 x 4in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins. 4/6.

## STEREOPHONIC AMPLIFIERS, £7.19.6

12 months' guarantee

Beautifully made for portable stereophonic record players. Latest design with printed circuit. Dimensions 3 x 5½ x 9½in. A.C. only. Mains isolated. Twin amplifiers each side giving 3-4 watts output. Incorporating ECL82 triode pentode valve. Full tone, volume and balance controls. Complete and ready to fit. Knobs 3/6 per set extra. P.P. & Ins. 4/6.

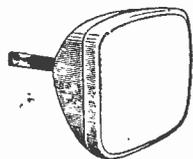
**B.S.R. FUL-FI** crystal turnover cartridges, 19/6. Brand new. Including sapphire needles for L.P. and Standard giving fullest range and finest tone obtainable for any player. Can be fitted to all standard pick-up arms. P. & P. 9d.

## EXTENSION SPEAKERS, 19/9

Polished wood cabinet of attractive appearance. Fitted with 8in. P.M. Speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms). Switch and flex included. Ins. Carr. 3/6.

8in. P.M. Speakers, 8/9. 4 x 7in. elliptical speakers, 19/6. 6½in. P.M. Speakers, 12/6. Postage 2/9.





## BETTERED IMPROVED VACUUM T.V. TUBES

17in. Rect. £7.10.0  
14in. Rect. £5.10.0

### 12 MONTHS' GUARANTEE

Our 12 months' guarantee (6 months' full replacement, 6 months' progressive) illustrates our wholehearted confidence in the Tubes we offer. We sell many hundreds a week throughout the country and have done so for the past 7 years. Many of them go to the Trade, i.e., to Insurance Companies, Renters and Retailers who are thoroughly satisfied with our supplies. Remember, they also hold a 10 days' money-back guarantee.

9in., 10in., 14in., 15in. & 16in. Round Tubes. Our special offer of these sizes, £5; 12in. T.V. Tubes. £6. Three months' guarantee on round tubes. Ins. Carr. 15/6.

**EXPRESS DESPATCH SERVICE.** Please phone to confirm Tube in stock. Send Telegraph Money Order. Tube despatched Passenger Train same day.

## Sound and Vision Strip, 25/6

Plessey. Tested. I.F.s 10.5 Mc/s sound, 14 Mc/s vision. 8-valveholders. Less valves. Size 8½ x 5 x 4½in. Circuit incl. The former unit plugs directly into this chassis. P. & P. 2/6.

**SOUND AND VISION STRIP, 5/9** Salvaged. Complete sound and vision strip. 8 valveholders. Less valves. I.F.s 16-19.5 Mc/s. Size 8½ x 4½ x 4½in. Drawings free with order. P. & P. 2/6.

**SOUND AND VISION STRIP, 5/9.** Salvaged. Superhet. 8 valveholders. Less valves. I.F.s 7.25 Mc/s sound, 10.75 Mc/s vision. Vision complete from input up to video output. Sound complete from input to A.F. Amplifier. P. & P. 2/6.

# & CO.

D.3  
MANOR PARK, E.12  
CATALOGUE

THURSDAY 1 p.m.

600/13

**TIME BASE, 4/9.** Containing scanning coils, focus unit, line transformer, etc. Less valves. Drawings free with order. P. & P. 2/6.

## HOME RADIO, 79/6

A.C./D.C. Universal mains 5-valve octal superhet; 3 waveband receiver can be adapted to gram. p.u. In attractive wooden cabinet 9½ x 18½ x 11½in. Ins. Carr. 7/6.



## Power Pack and Amplifier 19/6

R.F. E.H.T. Not tested. Amplifier stage 6V6 with O.P. trans. 3 ohms matching. Smoothed H.T. 350 volt at 250 m.a., 6.3 v. at 5 amp., 22 v. at 3 amp., 6.3 v. at 4 amp. and 4 v. centre tapped. Less valves. Drawings free. Size 14½ x 9 x 7in. Ins. Carr. 5/6.

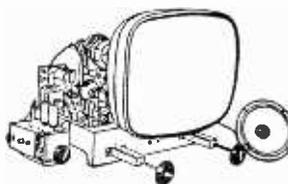
## POWER PACK AND AMPLIFIER 9/9

Output stage PEN45. O.P. trans. choke. Smoothed H.T. 325 volt at 250 m.a. 4 v. at 5 amp., 6.3 v. at 5 amp., 4 v. at 5 amp. centre tapped. Valve base for rectifier, Octal or 4 pin. Output is taken from standard plugs. Less valves. Ins. Carr. 5/6.

## POWER PACK AND AMPLIFIER 19/6

Tested. Output stage 6V6 with O.P. trans. 3 ohms choke. Smoothed H.T. 350 v. at 250 m.a. 6.3 v. at 5 amp., 22 v. at 3 amp., 6.3 v. at 4 amp. and 4 v. centre tapped. Less valves. Ins. Carr. 5/6.

## 17in. T.V. Chassis, Tube and Speaker, 16 Gns.



17in. Rectangular Tube on modified chassis. Supplied as single chassis covering B.B.C. channels 1-5, or, incorporating Turret Tuner which can be added as an extra at our special price to chassis purchasers of 50/-, giving choice of any 2 channels (B.B.C. and I.T.A.). Extra channels can be supplied at 7/6 each. Chassis size 12 x 14½ x 11in., less valves. Similar chassis are

used by well-known companies because of their stability and reliability. With Tube & Speaker (less valves), 16 guineas. Complete and working with valves and Turret Tuner, 24 guineas. 12 months' guarantee on the Tubes; 3 months' guarantee on the valves and chassis. Ins. Carr. (incl. Tube), 25/-.

## 14in. T.V. Chassis, Tube and Speaker, 11 Gns.

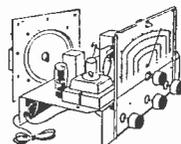
As above. With 14in. Rectangular Tube. 12 months' guarantee on Tube, 3 months' guarantee on chassis and valves. Chassis with Tube & Speaker (less valves), 11 guineas. Complete and working with valves and Turret Tuner, 19 guineas. Ins. Carr. (incl. Tube), 25/-.

## Popular 12in. Plessey T.V. Chassis, 39/6

This is a real bargain for anyone wanting to make up their own T.V. at a very low cost. I.F.s 10.5-14 Mc/s. Simply adapted for a 12 channel Turret Tuner and can be modified to take a larger tube. A chassis in one unit. Untested. Less valves, tube, speaker and scanning coils. (All can be supplied as extras.) Circuit diagram available at 3/6 or free with order. Carr. & Ins. 10/6.

## Super Chassis, 99/6

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. Carr. 5/6.



## SOLO SOLDERING TOOL, 12/6



110 v., 6 v. or 12 v. (special adaptor for 200/240 v. 10/- extra). Automatic solder feed including a 20 ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 2/9.

**SOLDER REELS, 1/6** On plastic spools. 60/40 3-core Ersin. 20ft. for 1/6. Will fit the Solo Tool. Post 4d.

## ★ Heater Transformers



**Heater Transformer, 12/9.** 12 volt at ½ amp. 0-200-250 volts primary. P. & P. 1/9.

**Heater Transformer, 3/9.** 2-1 Ratio or 1-2 Ratio auto transformer. 2 volt at 1.4 amp. primary, 4 volt secondary. P. & P. 1/9.

## ★ Mains Transformers ★

**Drop Through Type, 12/9.** 350-0-350 volts at 250 m.a., 6.3 volt at 4 amp., 6.3. volt at 4 amp., 4 volt at 3 amp., 22 volt at 3 amp., 4 volt centre tapped at 1.5 amp. Primary 200-250 volt. 50 cycles. P. & P. 3/9.

**Drop Through Type, 12/9.** 350-0-350 volts at 250 m.a. 6.3 volts at 5 amp., 4 volt at 4 amp., 4 volt at 7 amp., 4 volt centre tapped at 1 amp. Primary 200-250 volt. 50 cycles. P. & P. 3/9.

**Upright Type, 3/9.** 350-0-350 volt at 80 m.a. 12 volt at 1.5 amp., 4 volt at 2 amp. Primary 100-120-200-250 volt. Fully shrouded. Ideal for mains auto transformers. P. & P. 2/9.

**O.P. TRANS., 1/3.** Standard size 2-5 ohms. Post 1/- 20 for £1. P. & P. 5/6.

**TERMS AVAILABLE OPEN ALL DAY SATURDAY**

Brand new, individually checked and guaranteed

# VALVES

A792	4/6	DET19	1/6	H30	5/-
A800	4/6	DET20	2/6	H63	3/6
A863	4/6	DH76	4/9	HL4	3/6
A864	4/6	DLS10	4/6	HP4101	6/-
A950	4/6	E1148	2/-	KBC32	5/-
AC/DD	2/6	E1323	1/9	KF35	5/-
AC/HL	2/6	EA50	1/6	KR6/1	3/6
AC/P	2/6	EAC91	4/6	KRN2A	15/6
AC/PI	2/6	EB34	1/9	KRN3	15/6
AC6/PEN	5/-	EBC33	6/-	KT2	4/-
		EC52	4/6	KT30	7/-
AC/SP3	4/6	EC54	3/6	KT31	8/-
AR6	2/6	ECC32	4/-	KT33	7/-
ARP3	3/-	ECC91	5/-	KT41	9/-
ARP4	3/3	EF8	6/-	KTW63	6/6
ARP12	3/-	EF22	7/3	L30	4/-
ARP24	3/6	EF36	5/-	L55B	12/-
ARP34	4/6	EF39	5/6	L57B	12/-
ATP4	3/-	EF50	3/-	MH4	4/-
ATP7	5/6	EF55	6/-	MH40	6/6
B30	3/6	EF91	7/-	MH41	6/6
BL63	6/6	EF92	7/-	MH46	6/6
D41	3/3	EL32	4/6	MHLD6	4/6
D77	3/-	EL91	7/4	ML4	4/6
DD1	4/6	EY91	4/6	ML6	6/6
DD620	4/6	FA15	4/-	MPT42	9/-
DET18	3/6	GDT-4B	4/-	MS/PEN	6/-

MS/PENB	6/-	STV280/40	14/-	2D4A	4/-	616	5/-	12SH7	4/9	803	22/6
N34	8/-	SU2150A	3/-	2X2	4/-	6K7G	4/-	12S17	6/-	805	30/-
NR15A	3/-			3A4	6/6	6K7GT	6/-	12SK7	5/-	807	30/-
NR61	7/-			3B24	3/-	6K8G	7/-	12SL7	7/-	807BR	6/6
NT37		TT11	4/9	3E29	3/-	6K8GT	8/-	12SWR7	6/-	813	70/-
(4033A)	14/-	U8	12/6	(829B)	75/-	6L5G	6/-	15D2	6/-	815	80/-
NT62A	4/-	V885	5/-	4A1	4/6	6L6	10/-	15E	8/-	843	7/6
OD3	6/-	V1906	4/6	4D1	2/6	6L6E	8/6	15R	7/6	872A	35/-
OZ4	5/-	V2023	8/-	5T4	10/-	6L6CA	8/6	19E2	5/-	954	2/-
OZ4A	5/-	V2D33B	8/-	5U4G	7/-	6L34	4/6	28D7	30/-	956	6/-
P61	2/6	VR99	8/-	5Z3	8/6	6N7GT	7/-	35T	30/-	1625	4/6
PEN46	5/9	VR150/30	6/6	6A6	5/-	6SA7	7/-	39/44	6/6	1626	4/6
PEN141	4/-			6AB7	5/-	6SC7GT	7/-	41FP	1/9	1629	4/6
PEN220A	3/-	VS110	4/-	6AC7	5/-	68G7	7/-	45	7/-	1629	1/9
PEN1340	6/-	VT25	8/6	6AG5	5/6	68H7	5/-	53A	3/-	1629	1/9
PENDD/		VU33	2/6	6AG7	8/6	68T	7/6	58	6/-	1629	1/9
		VU111	3/-	6AK6	7/6	68K7	5/6	59	6/6	1629	1/9
PM4DX	3/-	VU120A	3/-	6AL5	5/6	68L7GT	7/-	71A	4/6	1629	1/9
PM202	7/6	W31	7/-	6AM5	8/6	68N7	5/6	76	9/-	1629	1/9
PT15	8/-	W42	7/-	6AM6	7/-	68N7GT	5/6	77	6/-	1629	1/9
PT15H	7/6	Y66	8/-	6B6G	4/6	68Q7	6/6	82	8/-	1629	1/9
QP21	6/-	Z21	6/-	6BB	6/-	68S7	8/-	83	12/-	1629	1/9
QP25	5/3	Z31	6/-	6BBG	3/6	68T	6/-	83V	12/-	1629	1/9
RG1-240A	17/6	IA3	3/6	6CA	5/6	6X5G	6/-	87	6/-	1629	1/9
		IA5GT	5/-	6C5	6/-	8D2	2/6	210LF	3/-	1629	1/9
RG3-250	17/6	IB23	11/-	6C6	4/6	9D2	3/-	210VPT	3/-	1629	1/9
		IB24	11/-	6C8G	5/-	11E2	5/-	217C	17/6	1629	1/9
RG4-1250	17/6	IB26	11/-	6D6	5/-	11E3	5/-	220VSG	3/-	1629	1/9
		IB32	10/-	6F6	7/-	12A6	5/-	350B	8/-	1629	1/9
RK34	3/-	IDBGT	6/-	6F6G	5/-	12AH7	7/-	446A	14/-	1629	1/9
RKR72	5/6	IL4	4/-	6F8G	8/-	12C8	7/6	446B	14/-	1629	1/9
RKR73	5/6	ILD5	3/6	6F12	7/6	12E1	22/6	705A	17/6	1629	1/9
SP4B	7/6	ILN5	5/-	6G6G	3/6	12H6	2/6	715B	9/6	1629	1/9
SP13C	4/6	2A3	8/-	6H6	2/3	12J5GT	3/6	717A	8/6	1629	1/9
SP41	2/9	2A6	7/-	6H6GT	1/9	12SG7	6/6	801	6/-	1629	1/9
SP61	2/9	2C34	2/6	6J5	5/-					1629	1/9

All Orders below 10/-. P. & P. 1/-; over 10/-, 1/6; Orders over £2 P. & P. free.

Brand new original spare parts for AR88 Receivers. Please see advert. Dec. issue.

**HRO. Mains. 150/230 v. Power Supply Unit.** complete with valve, checked, £3.9.6. P. & P. 2/6.

**High Resistance Headphones.** 4,000 ohms. Brand new, ex W.D. boxed. Type DHR. 10/6 per pair. P. & P. 1/-.

**Low Resistance Headphones.** brand new, type CLR. 5/- DLR. 6/6 per pair. P. & P. 1/-.

**Modulation Transformers** (U.S.A. Collins), primary imp. 6,000 ohms. C.T., secondary 6,000 ohms, 20 W., 9/6 each. Post free.

**Microphone Transformers.** Balanced input 30 or 250 ohms. U.S.A. manufacture, 7/6. P. & P. 1/6.

**813, Ceramic Valveholders,** 3/- each. P. & P. 1/6.

**Marconi Signal Generator.** TFI44G: 85 kc/s, 25 Mc/s. Made up to new standard. £70, delivered free.

**Halicrafter's S27 Receivers,** 27-143 Mc/s. Fully reconditioned, £30.10.0, delivered free.

**Telephone Hand Set.** Standard G.P.O. type. New, 10/-. P. & P. 1/-.

**AR88D and L.F. Receivers,** completely overhauled and tuned, £60 and £57.10.0 respectively. Completely rebuilt with P.V.C. wiring, £85.

**Rotary Converter Unit.** Input 11.5-12.5 v. D.C. Output 330 v. 200 m.A. D.C.. 30/- Postage and packing 15/-.

**Tannoy Loudspeakers.** New, 15/- P. & P. 3/-.

**Thermo Couple Heating Element** 75 amps in bakelite housing. Made by General Electric, 10/- P. & P. 1/-.

Complete set of strong aerial rods (American), screw in. Type MP49, 50, 51, 52, 53. Total length 15ft. 10in. top diameter 0.615in., bottom diameter

**P. C. RADIO LTD.**  
170 GOLDHAWK RD.,  
W.12 SHEPHERDS BUSH 4946

PERSONAL CALLERS WELCOME

0.185in., together with much aerial base. MP37 with ceramic insulator. Ideal for car or roof insulation. £2.10.0, post free.

**R.C.A. Master Oscillator** (V.F.O.) with stability of 0.0007%. Frequency range 2-20 Mc/s with built-in constant frequency tone generator. Regulated A.C. power supply 115/230 v. and fitted with plate and volt meters. Valves line-up: Electronic coupled oscillation 3Q5(2). Buffer amplifier—807, tone generator—6AB7(1), 6F6(1), regulated power supply—5U4(2), 6Y6(5), 1852(1), VR150/30(2). Brand new, complete in grey crackle steel cabinet size 67in. x 22in. x 17in. Fitted with full-length door at rear with standard 19in. panels. Can be used as complete TX with existing 807 output. The bottom half of the cabinet with 3 blank panels being empty ready for installation of complete R.F. modulator and power unit, thus making a complete totally enclosed compact TX. Circuit diagrams and working instructions supplied. Price complete with valves, £27.10.0 ea. Supplies strictly limited.

World Radio Handbook, 1959, by Hans Johansen, 14.6. Postage 1/-.  
R.S.G.B. Radio Amateurs Call Book, 1959, 3/6. Postage 6d.  
Oscilloscope Equipment, Circuits for the Constructor, by Easterling, 5/-. Postage 6d.  
T.V. Engineers' Pocket Book, 2nd Edition, by Hawker, 12/6. Postage 9d.  
Guide to Broadcasting Stations, by Wireless World, 1959, 2/6. Postage 6d.  
Radio Valve Data, by Wireless World, 5/-. Postage 8d.  
T.V. Fault Finding, by Radio Constructor, 5/-. Postage 6d.  
A Guide to Amateur Radio, 1959, by R.S.G.B. 3/6. Postage 6d.  
We also have a full range of Slide Rules and Drawing Instrument Sets. Send for list.

## UNIVERSAL BOOK CO.

12 Little Newport Street, London, W.C.2  
(adjoining Lisle Street)

## SPARKS' DATA SHEETS present 'THE AMAZING "COX'N" A.C./D.C. 3

A truly "Hot" design which will give unlimited New Thrills and Interest on 10 TO 220 METRES

Amateurs, S.W. Broadcasts, Ships, Aeroplanes, Trawlers and Lihners, etc. Unique Cathode Regen. circuit ensures highest efficiency with simplicity. Full-size Data Sheet plus instructions. 3/3 Post Free. All Components, Chassis and Coil available.

## THE "331" A.C. SHORT WAVE 4 VALVE T.R.F. RX.

High efficiency with perfect stability and simplicity of control. 10 to 220 metres. Switched Coils. Separate Power Pack. Data Sheet 22in. x 27in. with full instructions. 3/6 Post Free. Components available.

L. ORMOND SPARKS (P).  
Valley Road, Corfe Castle, Dorset.

## ROTARY SWITCHES

Superior Wafer Switch, Spindle Type. Renowned Manufacturer. Unopened boxes. Offered at fraction of cost.

Single Pole. 8 pos., 2/- each. 18/- doz. 3 Pole. 3 Pos. (2 Bank), 2/6 each. 22/- doz. 3 Pole. 3 Pos. (3 Bank), 3/- each. 30/- doz. 4 of each type (12 switches), 25/-.

### HEADPHONES

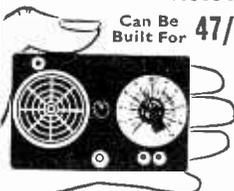
High Resistance. Top Quality. boxed. 18/6. Single C.L.R. Earphone with Headband & Lead (S.G.B.), 3/6. (Ideal for Crystal Set). Telephones, 30/- Postage and Packing extra 1/6 per item. High Quality Short Wave Components. Stamped envelope for list.

**H.A.C. PRODUCTS (Components) Dept.**  
11, Old Bond St., London, W.1.

# QUICK, EFFICIENT UP-TO-DATE COMPONENT SERVICE!

### TWO-TRANSISTOR POCKET SET

Can Be Built For **47/6**



**BUILD THE "SKY PIXIE" VEST-POCKET TWO-TRANSISTOR PLUS DIODE RADIO** which gives a superb performance and is highly sensitive. Size only 4 1/2 in. x 3 1/2 in. x 1 in., weight under 7oz.—yet it is a **THREE-STAGE** receiver covering all medium waves, working entirely off a tiny "penlight" battery. Every part tested before despatch! **SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS.** Total building cost including case, transistors, etc.—**ONLY 47/6** with plans, Postage, etc. **RUSH YOUR ORDER TODAY!**

everything down to the last nut and bolt—**ONLY 47/6** with plans, Postage, etc. **RUSH YOUR ORDER TODAY!**

### POCKET VALVE RADIO

Can Be Built For **37/6**

Anyone Can Build This Beautiful Precision Pocket Radio In One Hour. No knowledge whatever needed, our Simple, Pictorial Plans take you step by step! You can't go wrong. Remarkably sensitive—covers all medium waves, incl. Luxembourg, Home, Light. Size only 2 1/2 in. x 3 in. x 5 1/2 in. Not a Toy! But a Real Valve Radio! Uses self-contained battery and is a really personal-phone, pocket radio with Detachable Rod Aerial. **IDEAL FOR BEDROOM, GARDEN, etc.** We can supply all the parts necessary, including Case, Screws, Easy Step-by-Step Plans—in fact everything for the Special Price of 37/6. (Plus 2/6 post, etc.) **BUILD YOURS NOW!** (All parts sold separately.) Priced parts list, etc., 1/8. Big demand certain—Send Today! C.O.D. 2/- extra.



## RECORD CHANGER AND PLAYER BARGAINS!

**B.S.R. MONARCH**, 4-speed, mixer auto-changer unit, model U.A.S. Fully complete with crystal pickup, etc. Brand new—Limited Stocks Only. **GIFT 23/19/6.** (Plus post and packing, 5/-) **LATEST "COLLARO"** 4-speed auto-changer, with Hi-Fi, pickup. Complete in maker's sealed cartons. **BARGAIN 47/19/6.** (Plus post and packing, 4/-) **"COLLARO" JUNIOR**, 4-speed, single player, with crystal pickup, using H.F.59 cartridge. **OUR PRICE 92/6.** (Plus 4/- post and packing.)

Choice of beautiful walnut veneered cabinet or ivory or brown bakelite. This is the 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 easy-to-follow plans—in fact, everything! Parts tested before despatch! Uses standard octal-tube valves. For A.C. mains 200-250 volts (low running costs—approximately 18 watts/h). Size 12 in. x 6 in. x 5 in. **BUILD PLANS, ETC., 45/7/6.** (Post and packing 3/6.) Parts sold separately. Priced parts list and plans 1/8. C.O.D. 2/- extra.

### Can Be Built For 107/6



### COMPONENT BARGAINS!

Red-Spot Transistors, tested, 8/6.  
White-Spot Transistors, tested, 15/-.  
Also all Mullard and standard types stocked.

Moving Coil P.M. Speakers. 2 1/2 in. 17/6;  
3 1/2 in. 19/6; 5 in. 17/6; 8 in. 19/6.

**ALL TYPES OF COMPONENTS STOCKED AT COMPETITION PRICES**

### PRINTED CIRCUIT POCKET SET

**BUILD THIS 3 TRANSISTOR POCKET RADIO... PRINTED CIRCUIT VERSION!** The "Companion" is comparable in sensitivity to a three-valve battery set, it is exceptionally small in size (4 1/2 in. x 2 in. x 1 1/2 in.) and is a self-contained pocket radio that does not need aerial or earth. It has built-in speaker and covers medium and long waves. This unique little set **CAN BE BUILT FOR ONLY 97/6. EVERYTHING INCLUDED!** (Plus post and packing 2/6.) All parts sold separately. Price list, etc., 6d. C.O.D. 2/- extra.

### PRINTED CIRCUIT POCKET SUPERHET

**BUILD THIS PROFESSIONAL-LOOKING, FIRST-CLASS 6 TRANSISTOR POCKET SUPERHET THE "TRANSIDYNE."** Size only 6 1/2 in. x 3 1/2 in. x 1 1/2 in. Beautiful red and cream plastic case with engraved dial. Set weighs only 200g. with batteries! Covers medium and long waves. Works off two No. 8 batteries. The second I.F. Stage is reflexed to give additional audio gain. In-built ferrite rod aerial and 2 1/2 in. P.M. speaker. This TRANSIDYNE is probably the best yet of its kind, it is simple to build and really sensitive. **ALL COMPONENTS INCLUDING CABINET, PRINTED CIRCUIT, TRANSISTORS—IN FACT EVERYTHING CAN BE SUPPLIED FOR 111/5-.** (Plus post and packing 2/6.) (All parts sold separately. Price list, circuit, etc., 1d.) C.O.D. 2/- extra.

### CAN BE BUILT FOR 47/6

Build this exceptionally sensitive high efficiency Penicils radio. Uses unique assembly system and can be built by anyone without any radio knowledge whatever in 45 minutes. Handsome black-enameled steel case with specially made black and gold dial with stations printed. Size of radio only 6 1/2 in. x 5 in. x 3 in. Covers all Medium and Long waves—uses only one all-try battery. H.T. consumption only 1 to 1.5 mA. Uses personal phone. Ideal for Bedroom, Garden, Holiday, etc. **BUILD THE "SKYROMA" NOW!** Total building cost—everything down to last nut and bolt—47/6 (Postage etc., 2/-)—with full set of clear, easy-to-follow plans. (Parts sold separately. Priced Parts Lists & Plans 1/6d.) C.O.D. 2/- extra.

### READ WHAT OTHERS SAY!

"I WAS SURPRISED AT THE NUMBER OF STATIONS..."  
L. D. C., of Worcester, writes, "—Just a few lines to let you know how pleased I am with the midget portable radio. I was surprised at the number of stations I could get, with a clear performance. The price was a real bargain. Have you lists of other bargains? If so, please send them..."

"I MUST SAY I AM VERY PLEASED..."  
J. W. S., of Scarborough, Yorks, writes, "—I feel I must say I am very pleased in the way you do business and if at any time I require anything, or can recommend you to anyone, I will not hesitate to help you..."

"I'VE HEARD MUCH PRAISE OF THEM..."  
J. E., of Hilton, Nr. Derby, writes, "—I would like one of your portable radio kits as I've heard much praise of them..."

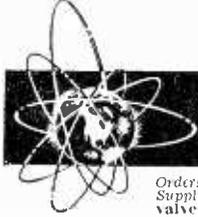
"THIRTY-TWO STATIONS RECEIVED..."  
J. R., of Oxley, writes, "—Yesterday evening on the Medium Wave-band, between 10 p.m. and 10.30 p.m., I counted 32 distinguishable stations! I am very pleased with the set, which is well worth the money..."

"MY DEEPEST ADMIRATION..."  
J. R., of North Shields, Northumberland, writes, "—The honest and direct dealing of your firm has earned from me my deepest admiration..."

"ITS PERFORMANCE IS ALMOST UNBELIEVABLE..."  
E. P., of Ipswich, writes, "—For so small a set I think it is a wonderful station getter with ample volume on all. Its performance is almost unbelievable, and it is a very convenient little set giving me stations I've never been able to get on a larger set."

### THIS TRANSISTOR SET CAN BE BUILT FOR ONLY 29/6

**VERY SPECIAL OFFER WHILE STOCK OF PARTS LASTS!**—The "Sky-Scout" Pocket two-stage transistor set, size only 4 1/2 in. x 3 1/2 in. x 4 1/2 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 & Plans, 1/8. **VERY SIMPLE TO BUILD.**



## CONCORD ELECTRONICS

69, PRESTON STREET, BRIGHTON

Dept. PW5

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.

## TRAWLERS BAND RII55s.

The latest version of this famous Communications Receiver to be released by the Air Ministry. Covers 5 wave ranges: 18.5-7.5 Mc/s., 7.5-3.0 Mc/s., 3.0-1.5 Mc/s., 1.5 Mc/s.-600 kc/s., 500-200 kc/s. As used by Coastal Command, Air-Sea Rescue Launches, etc. All sets thoroughly tested and in perfect working order before despatch, and on demonstration to callers. Have had slight use, but are in excellent condition. ONLY £12/19/6. "B" Models also available. As above but instead of 3.0-1.5 Mc/s. band has 200-75 kc/s. coverage. ONLY £7/19/6.

**A.C. MAINS POWER PACK OUTPUT STAGE**, in black crackle case to match, enabling it to be operated immediately, by just plugging in, without any modification. Supplied with built-in 8in. F.M. speaker. £6/10/.

**DEDUCT 10/- IF PURCHASING RECEIVER AND POWER PACK TOGETHER.**

Send S.A.E. for illustrated leaflet, or 1/3 for 14-page booklet which gives technical information, circuits, etc., and is supplied free with each receiver. Add carriage 10/6 for Receiver, 5/- for Power Unit.

## OSCILLOSCOPE UNIT

American Loran Indicator APN4. A magnificent piece of equipment which is recommended as a basis for the WIRELESS WORLD TELEVISION OSCILLOSCOPE, a copy of which publication is supplied with each unit, and gives full details of necessary modifications. Contains 5in. Cathode Ray Tube type 5CP1 and Screen, 14 valves 6SN7, 3 of 6SL7, 8 of 6H6, 1 of 6B37, 100 kc/s Crystal, and hundreds of condensers, resistors, etc. BRAND NEW IN MAKER'S CASES. ONLY £5.19.6 (carriage 10/6).

## AMPLIFIER N24

Manufactured for the Admiralty in 1952 by Burndept, this utilises 4 valves, 1 each 6Z4G - 6V6G - 6J6C - 6J5G, and high quality components such as "C" Core Transformers and Block Paper Smoothing Condensers. Has A.C. Mains Pack for nominal 110/230 volts. Provision for 600 ohms or High Impedance Input, and has Output to 600 ohms Line. For normal use only requires changing Output Transformer. Can be used for speech or Music, giving High Quality Reproduction. Output approximately 4 watts. Enclosed in metal case, and designed for Standard 19in. Rack Mounting, having grey front panel size 19in. x 7in. with Chromium Handles. All connections to rear panel, front having "On/Off" Switch, Gain Control, Indicator Light, Fuses and Valve Inspection Panel. BRAND NEW IN MAKER'S PACKING. ONLY £4/9/6 (carriage 10/6).

**IRO MAINS POWER UNITS.** Input 115/230 volts A.C./D.C. output (fully smoothed) 230 volts 75 mA., and 6.2 volts 3.5 amps. Complete in black crackle case. ONLY 69/6 (carriage 3/6).

**POWER UNITS TYPE 234.** Primary Input 200/250 v. 50 cycles. Outputs of 250 v. 100 mA. and 6.3 v. 4 amps. Fitted double smoothing. For normal rack mounting (or bench use) having grey front panel size 19in. x 7in. BRAND NEW. ONLY 59/6 (carriage, etc., 7/6).

**12 VOLTS AMERICAN DYNAMOTOR.** Delivers 220 volts at 100 mills. Ideal for running Car Radio or Electric Shaver, etc., from Car Battery. ONLY 32/6.

**6 v. VIBRATOR PACKS.** Output approx. 130 v. at 30 mA., fully filtered and smoothed. Complete. BRAND NEW. ONLY 12/6.

**RI155 SUPER SLOW-MOTION TUNING ASSEMBLY.** As used on all late model 1155s. Easily fitted to "A" sets, etc. BRAND NEW. ONLY 12/6.

**EHT TRANSFORMERS.** 5.5 kV. (Rect.) with 2 v. 1 a., 79/6. 7 kV. (Rect.) with 2 v. 1 a., 89/6. 2.5 kV. (Rect.) with 2-0-2 v. 1.1 a., 2-0-2 v. 2 a. (for VCR97 tube, etc.), 42/6 (postage 2/- per trans.).

**POCKET VOLTMETERS.** Read 0-15 volts and 0-300 volts A.C. or D.C. BRAND NEW AND UNUSED. ONLY 13/6.

**CRYSTALS.** British Standards 2-pin 500 kc/s., 15/-. Miniature 200 kc/s., 10/-.

**ROLA 6in. P.M. SPEAKER.** Mounted in grey crackled metal cabinet 9in. x 9in. x 4 1/2in., with volume-control. Ideal for use with receiver, or as extension. BRAND NEW. ONLY 27/6. (Post 2/6).

**MAINS ISOLATING TRANSFORMER.** Manufactured by Vortexion. Fully shrouded. Will provide true 1:1 ratio from nominal 230 v. Primary. Rated at 100 watts. BRAND NEW. ONLY 22/6. (Post 2/6).

**SPRAGUE CONDENSERS.** Metal cased, wire ends. New .01 mfd. 1,000 volt, and 1 mfd. 500 volt, 7/6 per dozen. Special quotes for quantities.

## HARRIS ELECTRONICS

(LONDON) LTD.

138 Gray's Inn Road, London, W.C.1.

(Phone TERminus 7937)

Please include carriage costs on All items.

(Open until 1 p.m. Saturdays. We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.)

a straightforward guide to  
the principles of television

## A FIRST COURSE IN TELEVISION

By "Decibel." This new book not only deals in a simple manner with the reception of television pictures but also explains how the signals originate and the techniques involved in the transmission of pictures by television—including colour transmission. Written by the author of that best seller—*A First Course in Wireless*, this handy book can be followed easily by the interested amateur as well as those engaged in, or studying for employment in, broadcasting and the servicing of receivers. From booksellers, 15/- net.

**PITMAN** | TECHNICAL BOOKS

Parker St., Kingsway, London, W.C.2.

## SOLDERING EQUIPMENT

BY



**PRECISION  
SOLDERING  
INSTRUMENTS  
for the ELECTRONICS  
INDUSTRY**

- Comprehensive range
- Robust & Reliable
- Light weight
- Rapid heating
- Bit sizes 3/32in. to 3/8in.
- 'Permabit' or Copper bits
- All voltage ranges 6/7v. to 230/250 v.
- Prices from 19/6

Illustrated is the 25w. 3/16in. replaceable bit model with safety shield.

British and Foreign Patents. Registered designs. Suppliers to H.M. and Foreign Governments. Agents throughout the world.

Brochure No. S.10 sent free on request.

Sole proprietors and manufacturers:

**LIGHT SOLDERING DEVELOPMENTS  
LIMITED**

106 George Street, Croydon, Surrey.

Phone: CROYdon 8589 Grams: Litesold Croydon



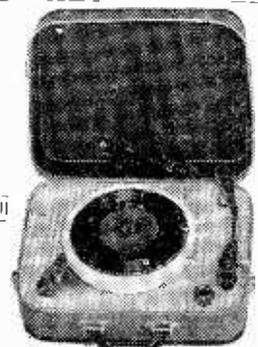
...another TRS Winner



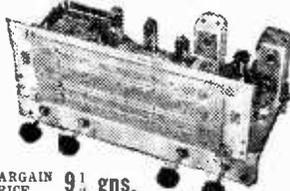
Latest 4-sp. BSR Player Unit and P.U. ... £4.12.6 carr. 3/6  
 2 v. Amplifier wired complete with speaker, etc., on Mounting Board ... £3. 5.0 carr. 2/6  
 Contemporary styled lightweight case in Maroon and Grey. 14 1/2 in. x 11 1/2 in. x 6 in. ... £1. 7.6 carr. 2/6

SPECIAL OFFER

all 3 units only £9 carr. 4/6



ALL-WAVE RADIOGRAM CHASSIS 3 WAVEBANDS 5 VALVES



S.W. 16 m.—59 m. LATEST MIDGET  
 M.W. 200 m.—500 m. B.V.A.  
 L.W. 800 m.—2,000 m. SERIES

Brand new and guar. A.C. 200-250 v., 4 pos. W.C. sw. Short-Medium-Long-gram. P.C. socket. High Q first core coils. Latest circuit technique, delayed AVC and neg. feedback O/P 4 watts. Chassis size 12 1/2 x 5 1/2 x 2 1/2 in. Dial 10 in. x 4 1/2 in. Hor. or Vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. Sensitivity and Quality at Low Cost. Carr. and ins. 4/6.

7 Valve De Luxe, push-pull EL41 version, 7 watt output, with H-Duty Output Transformer, £12.10.0. Carr. & ins. 5/-.

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends	32+32/350 v. H.E.C. 6 0
25.50 v. T.C.C.	1/8 Can Types, Clips 3d. ea.
50.50 v. T.C.C.	2/- 8.500 v. Dub.
100.25 v. 2,450 v.	2/- 8+8.450 v. T.C.C.
8/450 v. T.C.C.	2/- 8+16.450 v. Hunts
8+8/450 v. B.E.C.	2/- 16+16.450 v. T.C.C.
8+16/450 v. T.C.C.	4/6 32+32/275 v. Hunts
16/450 v. B.E.C.	3/6 32+32/450 v. T.C.C.
16/500 v. Dub.	4/- 250/350 v. B.E.C.
16+16.450 v. T.C.C.	6/6 60/350 v. T.C.C.
32/500 v. B.E.C.	4/- 60+100/350 v. B.E.C.
32/500 v. Dub.	5/- 60+250/275 v. B.E.C.
50+50.350 v. B.E.C.	6/6 100+200/275 v. B.E.C.

MULLARD 3-3 QUALITY AMPLIFIER.—A first-class Hi-Fi Companion Unit to the Jagan Tuner. H-Duty Mains Trans. allows for H.T. and L.T. Power supply. Mullard's latest circuit, 3 valve, 3 watt. Freq. response 40 c/s-20 Kc/s + or -1db with special sectionalised O/P/T. Trans. Punched Chassis, all components, valves, etc. Only £6.10.0. Ready wired and tested, 8 gns. Carr. and ins. 4/6.

SENERCEL RECTIFIERS. E.H.T. Type Fly-back Voltages. K3/25 2 kv., 5/-; K3/40 3.2 kv., 6/9; K3/45 3.6 kv., 7/3; K3/50 4 kv., 7/9; K3.100 8 kv., 13/6. MAINS TYPES.—RM1, 125 v. 60 mA., 4/9; RM2 125 v. 100 mA., 5/6; RM3 125 v. 120 mA., 4/6; RM4 250 v. 250 mA., 16/-; RM4B type 270 mA., 7/6; RM5, 250 v. 200 mA., 21/-.

SPEAKER FRET.—Expanded Bronze anodised metal 8 x 8 in., 2/3; 12 x 8 in., 3/-; 12 x 12 in., 4/6; 12 x 15 in., 6/-; 24 x 12 in., 9/4, etc.

TYGAN FRET (Murphy pattern) 12 x 12 in., 2/-; 12 x 15 in., 3/-; 12 x 24 in., 4/2, etc.

SPEAKERS P.M. 3 ohm 2 1/2 in. Elac. 16.6. 3 1/2 in. Goodman, 18.8. 5 in. R. & A., 17.6. 6 in. Celestion, 18.6. 7 x 4 in. Goodman, 18.6. 8 in. Rola, 20/- 8 in. Special Cine 6 in., 21.6. 10 in. R. & A., 25/-.

EMITAPE Recording Tape ALL NEW & BOXED. Type 88 (Stand). Type 99 (Long Play). 3 in. ... 17.0/1. 7/- 2500ft., 9/- 5 in. ... 400ft., 19/- 850ft., 24/- 7 in. ... 250ft., 24.6 1,200ft., 21.6 1,800ft., 15/- Spare Reels (Unboxed) 7 in. metal, 1 1/2; 7 in. plastic (EMD), 3.6.

RECORDING TAPE.—1,200 ft. on 7 in. Plastic reel, 88 type. Hi Quality Product. Each boxed, 22.6.

NEW REDUCED PRICES!

80 OHM CO-AX CABLE

Semi-air-spaced, low-loss, high quality 80 ohm co-axial. Stranded conductor, standard 1/4 in. Famous make. ONLY 8d. per yard. See what you save by ordering: 20 yds. ... 12.6 40 yds. ... 20/- Carr. 1/6. Carr. 2/-

TRANSFORMER & COIL WINDING CAPACITY AVAILABLE FOR PROTOTYPES & SMALL RUNS

BARGAIN 9 1/2 gns. PRICE or 10 in. speakers to match, 20/- and 25/- P. & P. 1/6

CONVERTER ACCESSORIES

Band 1-Band 3 Cross-over Unit, 7.6. Var. Attenuators 6db-36db., 7.6. BBC Pattern Filter, 8.6. Band 3 Aerials—outside single Dipole with 4 vds. coax., etc., 13.9. 3 Element Beam, 25/- 3 Element, 22.6.

VOLUME CONTROLS

10,000 ohms—2 Megohms. All long spindles. Morganite Midget type. 1 1/4 in. diameter. Guar. 1 year. Log. or Lin. Ratios. Less Sw. 3/-. D.P. Sw. 4.8.

RECORD PLAYER CABINETS

Contemporary Cabinet style, resin Price covered cabinet £3.3.0. in. fawn and Carr. and brown with cream interior. Size 14 1/2 x 13 1/2 x 14 1/2 in. Fitted with all accessories, including speaker, battle board and anodised metal net. Space available for all modern amplifiers and autochangers, etc. Uncut record player mounting board 14 x 1 1/2 in. supplied.



2-valve AMPLIFIER Mk. 2

Latest developed circuit giving a higher fidelity response and greater output (2.5 watts) using twin size valve EL182 and neg. feedback Tone Control. Complete with knobs wired and tested with 6 in. speaker, etc., ready to fit in above cabinet. Only £3.19.6. Carr. 2/6.

RECORD PLAYER BARGAINS

New Reduced Prices!

SINGLE PLAYERS 4-speed BSR (TU9), 92.8. 4-speed COLLARO JUNIOR, 80/- 4-speed GARRARD (4 S.P.), £7.15.0. GARRARD (TA Mk. II), £9.5.0. Carr. and Ins. 3/6.

AUTOCHANGERS 4-speed BSR (UAS), £8.19.6. 4-speed COLLARO, £7.19.6. GARRARD (RC121) Mk. II) Plug-in head, stereo adapted, 10 gns. BSR U412 latest stereo model, 10 gns. Carr. and Ins. 4/6. All above units are latest 4-speed models, fitted lightweight crystal pickup and twin sapphire styl. Complete and ready to use.

FINEST SELECTION AVAILABLE—ALL BRAND NEW AND GUAR.

C.R.T. Heater Isolation Transformers

New Improved types—mains prim. 200/250 v. tapped.

All Isolation Transformers now supplied with alternative no boost plus 25%, and plus 50% boost taps, at no extra charge.

2V.	2A type 12/6 (P. & P. 1/6)
3V.	5A " 12/6 "
10V.	3A " 12/6 "
13V.	3A " 12/6 "

Other voltages in course of production. Small size and light terminated for easy fitting.

JASON F.M. TUNER UNIT 87-105 Mc/s.

Designer Approved Kit of parts to build this modern highly successful unit, drilled chassis and superior type diat. Coils, cone, and all quality components, etc., for only 5 gns., 19s. free. Set of 4 spec. EP9Bs or equiv. valves, 30/- post free. Illustrated hand-book with full details, 2/- post free. FREE WITH KIT. 48 hr. alignment service, 7.6 plus 2/- P. & P.

NEW BOXED VALVES GUARANTEED ALL

1R5, 1T4 7/6	DF96	9/-	EP41	10/6	PCP82	10/6	
1R5, 1R4 7/6	DK96	9/-	EP80	10/6	PLC83	12/6	
3R4, 3V3 8/-	DL96	9/-	EP86	14/6	PL81	14/6	
3Z1	9/6	35L6	10/6	EP91	9/6	PL82	10/6
6AT6	8/6	EAB/80	9/6	EL41	10/6	PL83	11/6
6K7	6/6	EP91	6/6	EL84	11/6	PSY60	9/6
6K8	8/6	EB/41	10/6	EM83	11/6	PSY1	9/6
6Q7	8/6	ECC83	9/6	EY51	12/6	PSY8	10/6
6N7	8/6	ECC84	12/6	EY86	14/6	PSY8	10/6
6X6	7/6	EP/80	12/6	EZ40	8/6	U22	8/6
6X4	7/6	EP/82	12/6	EZ80	8/6	U25	15/6
6X6	7/6	ECH42	10/6	EZ81	8/6	U41R	10/6
7Y5	9/-	ECH81	10/6	U14	9/6	UF41	10/6
7Y4	8/6	ECL80	12/6	UCS4	10/6	UL41	10/6
DA996	9/-	ECL82	12/6	UCF80	10/6	UY41	8/6

SPECIAL PRICE PER SET

1R5, 1T4, 1R5, 1R4 or 3R4, ...	... 27.6
DK96, DF96, DA996, DL96, ...	... 35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ...	... 35/-

RE-GUNNED TV TUBES

GENUINE OFFER

New Heater, Cathode and Gun Assembly can now be fitted to your old Tube—Reconditioned virtually as new. Fully guaranteed to highest standards—as used by our own Service Dept.

12 in. £8. 14 in. £10.0. 17 in. £10. Regret only Mullard and Mazda types at present. Delivery approx. 7 days. Carr. & ins. 12/6.

Listed above are only a few items from our very large stock. Send 3d. stamp today for Complete Bargain List.

Terms: C.W.O. or C.O.D. Kindly make cheques, P.O.s, etc., payable to T.R.S. Post/Packings up to 1/6 7d., 1/6 1/2, 3/6, 1/6, 5/6, 2/-, 10/6, 2/9. Hours: 9 a.m.-6 p.m. 1 p.m. Wed. Open all day Saturday.



RADIO COMPONENT SPECIALISTS (Est. 1946)

70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY (THO 2188)  
 50 yards Thornton Heath Station.  
 Buses: 130A, 133, 159, 166 and 190

# R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250 v., 50 c/s. Guaranteed 12 months.

## ASSEMBLED CHARGERS

6 v. 1 amp.....	19/9
6 v. or 12 v. 1 amp.....	27/9
6 v. 2 amps.....	29/9
6 v. or 12 v. 2 amps.....	38/9
6 v. or 12 v. 4 amps.....	56/9

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

## SELENIUM RECTIFIERS

<b>F.W. BRIDGE TYPES</b>	
6/12 v. 1 a. 3111 L.T. Types H.W.	1/11
6/12 v. 2 a. 732-2 v. i. a.	1/11
6/12 v. 3 a. 9/96/12 v. i. a. H.W. 2/9	
<b>1311 H.T. Types H.W.</b>	
6/12 v. 6 a. 1711 150 v. 40 mA.	3/9
6/12 v. 10 a. 125/9 250 v. 50 mA.	5/9
6/12 v. 15 a. 35/9 250 v. 80 mA.	7/9
24 v. 2 a. 14/9 250 v. 80 mA.	7/9
24 v. 6 a. 26/9 250 v. 250 mA.	11/9



## 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. Louvered steel case with stoved blue hammer finished. Fused 75/- and ready for mains and output leads. Credit Terms: Deposit 14/11 and 5 monthly payments 14/11.

## ASSEMBLED CHARGER

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

## BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case, Fuses, Fuse-holders, Grommets, panels and circuit. Carr. 3/6 extra.  
6 v. or 12 v. 1 amp..... 22/9  
As above, with Ammeter... 32/9  
6 v. 2 amps..... 25/9  
6 v. or 12 v. 2 amps. inclusive of Ammeter..... 41/6  
6 v. or 12 v. 4 amps..... 53/9  
**BATTERY CHARGER KIT**  
6/12 v. 6 amp. consisting of F.W. Bridge Rectifier, Mains Trans. and Ammeter. 49/9. Post and packing 4/6.

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

Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s. Screened.

## TOP SHROUDED DROP THROUGH

250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 a.....	16/9
350-0-350 v. 100 mA. 6.3 v. 2 a. 5 v. 2 a.....	18/9
250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	23/9
300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	23/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	23/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 4 a. C.T. 0-4-5 v. 3 a.....	23/9
350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a.....	29/9

## FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA. 6.3 v. 2 a. 5 v. 2 a.....	
Midget type 21-3-31n.....	17/6
250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	26/9
300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	26/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a.....	26/9
300-0-300 v. 130 mA. 6.3 v. 4 a. 6.3 v. 1 a. for Mullard 510 Amplifier.....	35/9
350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a.....	33/9
350-0-350 v. 150 mA. 6.3 v. 2 a. 6.3 v. 2 a. 5 v. 3 a.....	35/9

## 425-0-425 v. 200 mA. 6.3 v. 4 a. C.T. Suitable Williamson Amplifier. etc.....

35/9 49/9

## 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; 0-4-6.3 v. 2 a. 7/9; 12 v. 1 a. 7/11; 6.3 v. 3 a. 8/11; 6.3 v. 6 a. 17/8; 12 v. 3 a. or 24 v. 1.5 a. 17/6.

## CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries: 0-9-15 v. 1 a. 11/9; 0-9-15 v. 3 a. 16/9; 0-9-15 v. 5 a. 19/9; 0-9-15 v. 6 a. 23/9.

## SMOOTHING CHOKES

150 mA. 7-10 H 250 ohms.....	11/9
100 mA. 100 H 200 ohms.....	8/9
80 mA. 10 H 350 ohms.....	5/9
60 mA. 10 H 400 ohms.....	4/11

## OUTPUT TRANSFORMERS

Midget Battery Pentode 6E61 for 3S1, etc..... 3/9  
Small Pentode. 5,000  $\Omega$  to 3  $\Omega$ ..... 3/9  
Small Pentode 7,000  $\Omega$  to 3  $\Omega$ ..... 3/9  
Standard Pentode 5,000  $\Omega$  to 3  $\Omega$ ..... 4/9  
Standard Pentode 7,000  $\Omega$  to 3  $\Omega$ ..... 4/9  
10,000  $\Omega$  to 3  $\Omega$ ..... 4/9  
Push-Pull 10-12 watts 6V6 to 3  $\Omega$  or 15  $\Omega$ ..... 15/9  
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15  $\Omega$ ..... 16/9  
Push-Pull EL84 to 3 or 15  $\Omega$ ..... 16/9  
Push-Pull 15-18 watts. 6L6, KT66..... 22/9  
Push-Pull for Mullard 510 Ultra Linear..... 29/9  
Push-Pull 20 watts. sectionally wound 6L6, KT66, etc., to 3 to 15  $\Omega$ ..... 47/9

## ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s.  
12 v. 40 mA. 5-0-5 v. 1 a. .... 15/9  
80 v. 15 mA. 4-0-4 v. 500 mA. .... 9/9

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

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 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.

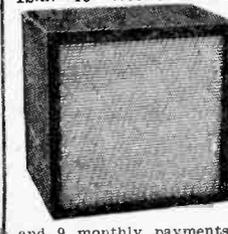
VERS normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions. 49/9. or ready for use. 59/6.

## STEREOPHONIC EQUIPMENT AT SPECIAL PRICES

(a) Linear L33 Stereo Amplifier. 7 GNS.; (b) Star Galaxy Auto-Changer fitted Turn-over head for Stereo. Long Playing and Standard Records. £8.19.6. Carr. 4/6; (c) Matched 12in. P.M. Speakers in polished Walnut finished wood cabinets. £6.15.0 per pair; (d) Cabinet Speakers, illustrated below. £9.19.0 pair; (e) Matched High Flux 8in. P.M. Speakers in polished Walnut veneered Cabinets. £3.19.9 pair; (f) Matched 6in. K.A. P.M. Speakers in polished veneered Walnut cabinet. £3.10.0 pair; or (a), (b) and (c) 19 gns., carr. 15/-; (a), (b) and (d) 22 gns., carr. 15/-; (a), (b) and (e) 18 gns., carr. 15/-; (a), (b) and (f) 17 gns., carr. 15/-.

## 12in. 10 WATT HIGH QUALITY LOUD-SPEAKERS IN POLISHED WALNUT FINISHED CABINET

Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only £4.19.6 Carr. 5/-. Terms: Deposit 11/- and 9 monthly payments of 11/-.



D.C. SUPPLY KIT. 12 v. 1 a. consisting of partially drilled metal case, mains trans., F.W. Bridge Rectifier, 2 fuse-holders and fuses. Change Direction switch, variable Speed regulator and circuit. For 200-250 v. A.C. mains. Suitable Electric Trains, etc. Limited number available at 29/9.

ACOS CRYSTAL 'MIKE' INSERTS. Approx. 1in. square. Fly lead connections. Only 5/11 each. Brand New. Round type approx. 1 1/2in. diam. Ex-equipment, tested. 4/11 each.



LUCAS 6 v. 22 A. H.V. MOTOR-CAR BATTERY. Brand New. Sealed List price £31.11. Limited number available at only 29/9. Carr. 4/6.

PORTABLE CABINETS. High Quality Finish. Rains covered. Attractive design. Inside measurements: 17in. x 12 1/2in. x 8 1/2in. High. Clearance above base-board 5 1/2in. Below 2 1/2in. 69/9 each. Or size 14 1/2in. x 13 1/2in. x 6 1/2in. only 47/9.

SPECIAL OFFER. Above cabinet. LG3 Amplifier, B.S.R. Changer and 6in. P.M. Speaker. 13 GNS. Carr. 19/-.

## THE SKYFOUR T.R.F. RECEIVER.

A design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion anode bend detector. Power pentode output. Valve line-up 6K7, 6SP6, 6V6G. Selectivity and quality are well up to standard, and simplicity of construction is a special feature. Point-to-Point wiring diagrams, instructions and parts lists. 1/8. Maximum building costs £4.19.6, inc. attractive Brown or Cream Bakelite or Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2in.

14 WATT AMPLIFIERS. Unused and in good order but store soiled. For 200-250 v. A.C. mains input. Outputs for 3 and 15 ohm speaker. Inputs for "mike" and Gram. Limited number complete with valves. Only 6 GNS., carr. 5/-.

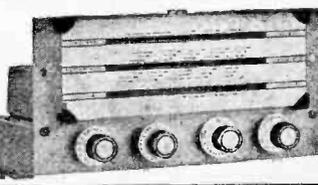
## EXTENSION SPEAKERS

Ready for use in walnut veneered cabinet. 6in. 2-3 ohms, 29/11  
8in. 2-3 ohms 35/9.  
Very limited number



## AMFM RADIOGRAM CHASSIS HIGH QUALITY 6-8 WATT PUSH-PULL OUTPUT

For 200-250 v. Mains. Long wave. Medium, P.M. and Gram. Complete with 8 B.V.A. valves. Guaranteed 12 months. Only 22 GNS. Or Deposit £2.12.0 and 9 monthly payments of £2.12.0.



**R.S.C. A8 ULTRA LINEAR 12 WATT AMPLIFIER**

High fidelity Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages, high sensitivity, includes 5 valves (807 outputs). 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 +3 db. 30-30,000 c/c.s. Six negative feedback loops. Hum level 71 db. down. ONLY 70 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs.

For STANDARD or LONG - PLAYING RECORDS. For MUSICAL INSTRUMENTS such as GUITARS, etc. OUTPUT SOCKET with plug provides 300 v. 20 mA. and 6.3 v. 1.5a. For supply of a RADIO FEEDER UNIT. Size approx. 12-9 7/16". For A.C. mains 200-250 v. 50 c/c.s. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value. at £7/15/- or factory built 45.- extra. Carriage 10/-.

**£7-15-0**

If required lowered metal cover with 2

**COLLARO RC54 3-SPEED AUTO-CHANGERS** with Studio pick-up. Brand new. For 110 v. 50 c.p.s. A.C. mains. Price with 110 v. to 220-250 v. Auto Trans. only £5/19/6. Carr. 5/6.

**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 £7/19/6. Carr. 5/6.

**COLLARO 4-SPEED SINGLE PLAYER** with separate pick-up, as fitted RC57. For 200-250 v. A.C. mains. £4/10/0. Post 3/9.

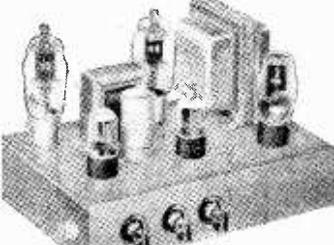
**PICK-UP ARMS** complete with Hi-Fi turnover crystal head. Acos GP54. Limited number brand new, perfect, at approx. half price. Only 95/9.

**LG3 MINIATURE 2-3 WATT GRAM AMPLIFIER.** For use with above or any other single or auto-change units. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Overall size 6 1/4 x 4 1/2". Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 55/9.

**SUPERHIT 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.C.H. Sw. incorporates Gram position. Controls are Tuning, W.C.H. and Vol. Only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-5 7/16" high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration. 2/6. Total building cost £4 15/- For descriptive leaflet send S.A.E.

**LINEAR L45 MINIATURE 4.5 WATT QUALITY AMPLIFIER.** Suitable for use with Collaro, B.S.R. or any other record playing unit, and most microphones. Negative feedback 12 db. Separate Bass and Treble Controls. A.C. mains input of 200-250 v. 50 c/c.s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5 5/16" high. Output for 2-3 ohm speaker. Guaranteed for 12 months. Only £5 19/6. Send S.A.E. for illustrated leaflet. Credit Terms. Deposit 22/6 and 5 monthly payments of 22/6.

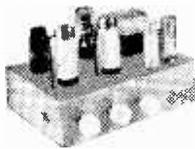
**LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER.** For 200-250 v. A.C. mains. Valves ECC83, ECC83, EL94, EL84, E281 miniature Mullard. Self-contained Pre-amp. Tone Control stage, and separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets are provided. Output Matchings for 3 and 15 ohm speakers. Only 12 4/8" x 4 1/2" or Deposit 22/6 plus 10/- and 12 monthly payments of 22/6. Send S.A.E. for leaflet.



carrying handles can be supplied for 18/9. Additional input sockets, with associate Vol. control so that two different inputs such as Gram and 'Mike' or Tape and Radio can be mixed, can be provided for 13/- extra. Guaranteed 12 months. TERMS on assembled two input model: DEPOSIT 18/9 and 12 monthly payments. 18/9. **HIGH FIDELITY MICROPHONES and SPEAKERS** in stock. Keep cash prices or credit terms if supplied with amplifier.

**R.S.C. 4.5 WATT A5 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/c.s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4/15/-, 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.



**LINEAR STEREOPHONIC L/3 3+3 WATT QUALITY AMPLIFIER**

Output 6 watts when not used with stereo head. For 200-250 v. 50 c.p.s. A.C. mains. Ganged controls. Volume and Tone. Outputs matched by preset balance control. For use with 2 matched 3 ohm speakers. Only requires connecting to Pick-up speakers and mains point. Sensitivity 159 m.v. Supplied with guarantee and instructions. Send S.A.E. for leaflet. Terms available.

**7 GNS.**

Terms: C.W.O. or C.O.D. No C.O.D. under 21. All goods supplied subject to terms and guarantee as detailed in current catalogue. Open 9 to 6; Weds. until 1 p.m. Catalogue 6d. Trade supplied. S.A.E. with all enquiries.

**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/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, ECC83, 807, 807, C233. 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/c.s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied. 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.

**11 GNS.**

Carr. 10/-

**LINEAR 50 WATT HIGH FIDELITY AMPLIFIER.** Sensitivity 25 millivolts for full output. Suitable for any kind of microphone or pick-up. Output Matchings for 3 and 15 ohm speakers. Brand New. Guaranteed 12 months. For 200-250 v. A.C. mains. Only 19 gns. Carr. 15/-. Terms available. Twin handled cover available at 25/- Send S.A.E. for leaflet.

**LINEAR L745 HIGH QUALITY TAPE DECK AMPLIFIER.** With "built in" power pack and output Ready for stage. For Tape Decks Use ONLY with High or Low Impedance. Playback and Erase Heads, such as Lane. 12 GNS. Carr. 7/6 extra. For A.C. Mains 200-250 v. 50 c/c.s. Linear Frequency response of +3 db. 50,000 c/c.s. Negative feedback equalisation. Illustrated leaflet 6d.

**SPEAKERS.** All 2-3 ohms, suitable for use with LG3, L45, A5 or A7 amplifiers. 5in. Goodmans, 17/9. 7 x 4in. Elliptical Elac, 19/9. 6in. Goodmans, 17/9. 6in. Rola, 19/9. 10in. R.A., 27/9. 10 x 6in. Elliptical Goodmans, 29/6. 12in. Plessey, 29/11. 10in. W.B. 'Stentorian' 3 or 15 ohms type HF1012 10 watts, hi-fidelity type. Recommended for use with our A8 Amplifier, £4/10/9. 12in. Plessey 3 ohms 10 watts (12,000 lines), 59/6.

**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. Rated 10 watts. Price only £5 17/6.

**ACOS HGP59 Hi-Fi Crystal Cartridges.** (Turnover type with sapphire stylus.) Standard replacement for Garrard and B.S.R. only 19/9.

**R.S.C. 3-4 WATT A7 HIGH-GAIN AMPLIFIER**

For 230/250 v. 50 c/c.s. Mains input. Appearance and Specification, with exception of output wattage, as A5. Complete Kit with diagrams, £3/15/-. Assembled 22/6 extra. Carr. 3/6.

**RADIO SUPPLY CO. (LEEDS) LTD.** Mail Orders to 29/31 Moorfield Rd., Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1.



*Made for music*

**EF86**

Low hum, low noise voltage amplifying pentode.

**ECC83**

High  $\mu$  double triode with separate cathodes.

**EZ81**

Full wave indirectly heated rectifier with maximum output of 150 mA.

**GZ34**

Full wave indirectly heated rectifier with maximum output of 250 mA at  $V_a$  (r.m.s.) = 2 x 450V.



Mullard Audio Valves have been acclaimed for their superiority all over the world, and are fitted by leading equipment manufacturers both in this country and overseas.

Whether you buy or build your audio equipment, make sure it is fitted with Mullard Audio Valves.

**EL34**

Output pentode with 25W maximum anode dissipation.

**EL84**

Output pentode with 12W maximum anode dissipation.



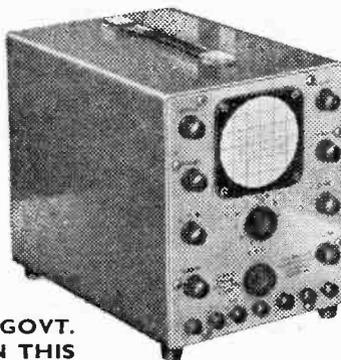
MULLARD LTD., MULLARD HOUSE, TORRINGTON PLACE, LONDON W.C.1. MVM 412

## Treco Scope

The **TRESCOPE**, designed around a most modern 3" cathode ray tube and new type valves, meets all the requirements for a high performance and versatile general purpose oscilloscope. Its overall size is 7" x 8 $\frac{1}{2}$ " x 11" and the specification, too comprehensive to be fully given here, is contained in our illustrated brochure, a copy of which will gladly be sent on receipt of S.A.E.

**\* NOT A SINGLE ITEM OF GOVT. SURPLUS STOCK IS USED IN THIS INSTRUMENT.**

## LOW PRICE\* HIGH PERFORMANCE VERSATILITY



**CONTROLS**: brilliance, focus, X shift, Y shift, coarse time base, fine time base, synchronisation, Y amplitude, X amplitude, Y input selector switch.

**FACILITIES**: Y plates via (1) high gain amplifier, (2) low gain negative feedback amplifier, (3) isolating condenser, (4) isolating condenser and attenuator. Hard valve time base covering 5 c.p.s., to 150 kc/s. X plate deflection from external source via X amplifier. Synchronisation via sync., amplifier at Y or other frequencies. 50 c.p.s., calibrating voltage. Brilliance modulation. Flyback suppression.

The Treco scope is guaranteed for 12 months.

PRICE: £17.17.0 or £22.0 down and 12 monthly payments of £1.9.7.  
Postage and packing 6/-.

**THE RANGE ELECTRONICS COMPANY**  
CORMORANT WORKS, LETT ROAD, LONDON, E.15  
Phone: MARYland 5266.

# PRACTICAL WIRELESS

EVERY MONTH

VOL. XXXV, No. 627, MARCH 1959

COMMENTS OF THE MONTH

EDITOR : F. J. CAMM

27th YEAR  
OF ISSUE

BY THE EDITOR

## THE GROWTH OF THE CLUBS

THERE was a noticeable increase in club activity during the past year. Old clubs which have waxed and waned have again sprung into life and new clubs are being formed every month. Readers will have noticed the increased amount of space we are now devoting to club reports, and it is in this connection that we ask club secretaries to co-operate with us by sending in reports not later than the 10th of the month for publication in the following month's issue. Time, tide and printers wait for no man and reports which arrive after the deadline are scrapped. It is unfortunately true that some club secretaries are lax and presume that there is some elasticity about press dates. There is none. We mention this point because occasionally we receive a complaint from a club secretary that his report has been omitted, but the fault lies with him. We are anxious to encourage the club movement and we make no charge for the insertion of club reports. It is not too much to ask that club secretaries co-operate with us. Another point: it would be a convenience if club reports were prepared in the style in which we print them. Remember when writing reports that they should contain matter of general interest to other readers. A report that a lecture was given on such and such a date by Mr. So-and-so is already well known to local members. Try to extract from the speaker's remarks some fact or facts of general interest to other readers. If the club issues a club magazine, we are always glad to have copies for reference. There are many clubs in existence which do not circulate a monthly report to the press; we hope that they will now do so. There are many readers who wish to join a club and write asking for details of one in their area. We are engaged upon compiling a directory of radio clubs so that we will be able to put readers on to the nearest club secretary. We hope that every club secretary will forward us details giving the name of the club, meeting place, time and frequency of meeting, membership qualifications, annual subscription, etc. A book of rules for filing purposes would be welcome. We are also glad to receive and to publish photographs of any interesting club events, such as a field day, practical demonstrations, etc.

### START OF VOL. 35

WITH this issue, we commence the 27th year of publication with a larger circulation than ever before, and it is still rising. We have the largest circulation of any technical radio journal, and it is pleasant to receive letters from time to time from readers who have been with us from the start. Home construction is as virile as ever. Needless to say, the index to the past volume is in course of preparation and an announcement will be made as soon as this is ready.

### "THE PRACTICAL HOUSEHOLDER" EXHIBITION

A FINAL reminder that the exhibition organised by our companion journal, *The Practical Householder*, opens at Earls Court, on Wednesday, February 18th, and extends to Saturday, February 28th. A free ticket is printed in every copy of the March issue which is now on sale.—F. J. C.

*Our next issue, dated April, will be published on March 6th*

Editorial and Advertisement Offices :

PRACTICAL WIRELESS

George Newnes, Ltd., Tower House,  
Southampton Street, Strand, W.C.2.

© George Newnes Ltd., 1959.

Phone : Temple Bar 4363.  
Telegrams : Newnes, Rand, London.  
Registered at the G.P.O. for transmission by Canadian Magazine Post.

### SUBSCRIPTION RATES

including postage for one year

Inland - - - 19s. per annum  
Abroad - - 17s. 6d. per annum  
Canada - - - 16s. per annum

### CONTENTS :

	Page
Editorial ... ..	19
Round the World of Wireless ...	20
A Stereophonic Amplifier ...	22
A Six-valve Car Radio ...	24
A Push-button Multi-range Testmeter ... ..	27
Printed Circuits—II ... ..	29
A.V.C. With "Straight" Valves ... ..	34
On Your Wavelength ...	35
Servicing Radio Receivers ...	36
Stereo by Radio ... ..	41
Thermistors in Practice ...	43
A Wide range Audio Signal Generator ... ..	46
An Economy Mains Trans- portable ... ..	50
Basic Theory for Construc- tors—II ... ..	55
Transmitting Topics ... ..	59
News from the Clubs ... ..	64
News from the Trade ... ..	67
Programme Pointers ... ..	71
Open to Discussion ... ..	72

The Editor will be pleased to consider articles of a practical nature. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Copyright in all drawings, photographs and articles published in PRACTICAL WIRELESS is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden. PRACTICAL WIRELESS incorporates "Amateur Wireless."

# ROUND THE WORLD OF WIRELESS

## Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of November, 1958, 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 ... ..	979,166
Home Counties ... ..	974,824
Midland... ..	717,162
North Eastern ... ..	879,125
North Western ... ..	678,995
South Western... ..	592,046
Wales and Border Counties...	367,669
<b>Total England and Wales ...</b>	<b>5,188,987</b>
Scotland ... ..	632,892
Northern Ireland ... ..	171,377
<b>Grand Total ... ..</b>	<b>5,993,256</b>

## Tape Recorder Amalgamation

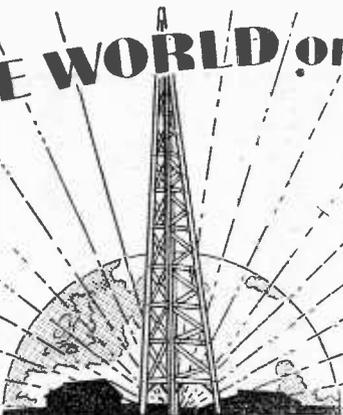
RECORD HOUSING LIMITED, the London firm of hi-fi cabinet manufacturers, have taken over the whole of the distribution and sales organisation of Magnafon Tape Recorders.

Four models are marketed—the lightweight Courier, with the Motek deck; the Courier Stereo; the Diplomat high fidelity recorder with the latest Collaro Mark IV deck and the new Magnafon "Adadek," which can be plugged into any radio, radiogram or amplifier. Special screw-in legs are available for all these models in order to turn them into console sets.

The instruments first appeared in a new range of cabinets specially designed for the 1958 Radio Show.

## New Isle of Wight Ship-shore Service

A NEW ship-shore service, operating from the Isle of Wight, has now come into use. It is the third in the chain of ship-shore V.H.F. stations operated by the Post Office and provides similar facilities to those already in use in the Firth of Clyde and at North Foreland.



By "QUESTOR"

V.H.F. radiotelephone communication between telephone subscribers in the United Kingdom and suitably equipped ships of all nationalities are now available in the approaches to Southampton and the English Channel within about 50 miles of St. Catherine's Point.

Shore equipment is on St. Boniface Down, near Ventnor, and the calls are handled by the existing Post Office coast radio station at Niton. The equipment complies with inter-

nationally recommended engineering standards, and uses frequency modulation. The frequencies employed give a single-frequency calling channel on 156.8 Mc/s, and a two-frequency traffic channel using 161.85 Mc/s for transmission and 157.25 Mc/s for reception. The use of these frequencies has been agreed internationally for radio services of this kind.

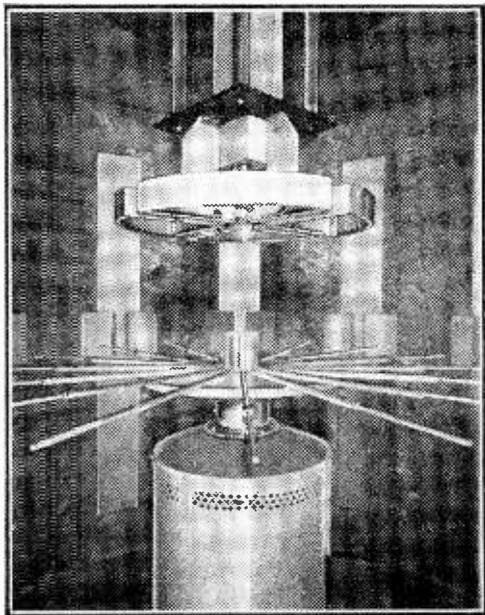
Charges for a 3-minute call is 6s. 6d. for the combined coast station and ship charges, plus a landline charge of 6d. or 2s. 6d., depending on the distance between

Niton and the telephone subscriber. Further services are planned from the existing coast radio stations at Lands End and Humber (Mablethorpe).

## Marconi VOR for U.K. Network

FOLLOWING an exhaustive evaluation of V.H.F. Omnidirectional Radio Range (VOR) equipment, the Ministry of Supply has ordered eleven complete VOR installations from Marconi's Wireless Telegraph Company, on behalf of the Ministry of Transport and Civil Aviation. These installations will be distributed at selected points on the U.K.'s airways to provide a nation-wide navigational system for suitably equipped aircraft.

The Marconi VOR complies fully with the specification of the International Civil Aviation Organisation. It operates on the



The aerial system of the Marconi VOR installed in the aerial tower.

internationally agreed frequency range of 112-118 Mc/s. with a power output of 200 watts.

A specially designed flat-roofed building is normally employed for installation. This enables the aerial and associated counterpoise aerial to be mounted on the flat roof surface, the aerial changeover unit and the phase unit to be mounted on a wall of the building, and the remaining units in standard cabinets on the floor space. Each of the two transmitters is assembled in a cabinet 6ft. high. The remaining units are assembled in 3ft. 6in. cabinets which are normally placed between the transmitter cabinets.

**Valve Design Technique**

**T**HE English Electric Valve Co., Ltd., are holding a private exhibition at the Kensington Palace Hotel from March 17th to 21st, both dates inclusive.

The display will consist of all that is modern in valve design technique in the world of radar, communication, transmitting, broadcasting—both sound and vision—and instrumentation, together with new types of storage tubes. They will be pleased to welcome any readers who may wish to come.

**BBC Engineering Division Appointment**

**T**HE BBC announces the appointment of Mr. M. Taylor, A.M.I.E.E., as Engineer-in-Charge of the Lisnagarvey Transmitting Station near Belfast, Northern Ireland, in succession to Mr. J. P. McCurdy who is retiring after thirty-four years' service.

Mr. McCurdy started his career with the BBC at Belfast in 1924. He joined the staff of the Lisnagarvey Transmitting Station in 1935 and became Engineer-in-Charge in 1942.

**Mr. R. A. Rennie**

**M**R. R. A. RENNIE has also been appointed to the BBC Engineering Division as Engineer-in-Charge (Sound), Glasgow, in succession to Mr. J. G. W. Thompson, who has retired after thirty-four years' service. Mr. Thompson started his career with the Corporation in 1924 at Edinburgh. He became Assistant Engineer-in-Charge at the Glasgow Studios in 1942 and Engineer-in-Charge in 1955.



*Listening to tape recordings are John Borwick who presents the programme "Sound", and Marguerite Cutforth, the producer.*

Mr. Rennie joined the Corporation at the Aberdeen Studios in 1941. Since 1952 he has been in the Sound Section of the Planning and Installation Department in London, from where he takes up his present appointment.

**B.I.R.E.**

**T**HE following Institution meetings will be held during February:

**London.** At London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1. Medical Electronics Group, Friday, February 13th, 6.30 p.m. "Some Instrumentation Problems in Medical Electronics with particular reference to Electromyography," by Peter Styles. Institution Meeting, Wednesday, February 25th, 6.30 p.m. "Patents and the Radio Engineer," by E. D. Swann.

**Audio Again at Radio Show**

**P**LANS for the National Radio and Television Exhibition to be held at Earls Court, London, from August 26th to

September 5th, 1959, include an audio hall on a larger scale than 1958.

The audio hall, which was an innovation at the last radio show, was regarded as one of its most successful features, and according to attendance survey, was visited by more than one quarter of a million people.

**The Programme "Sound"**

**I**N January last a new fortnightly series began in the BBC Network Three. The series contains practical help and examples of first-class recording and news of the latest and most novel developments of interest to amateur tape recording enthusiasts and hi-fi fans.

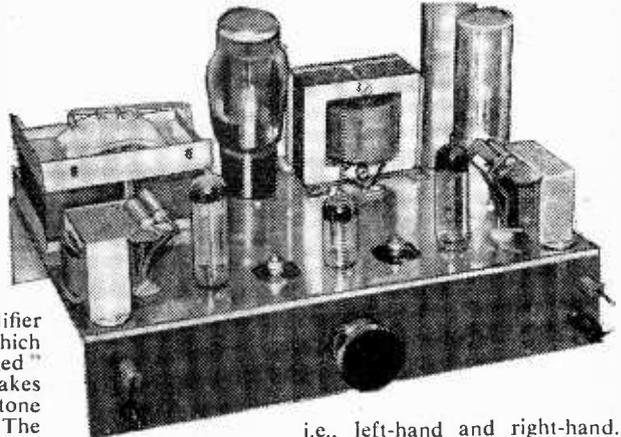
**Educational Filmstrips**

**M**ULLARD EDUCATIONAL SERVICE announces a new series of filmstrips dealing with the history and basic principles of scientific developments. Details are obtainable from Unicorn Head Visual Aids Ltd., 42, Westminster Place Gardens, S.W.1.

# A STEREOPHONIC AMPLIFIER

AN ECONOMICAL CIRCUIT DESIGN  
INCORPORATING TWO OUTPUT  
VALVES WITH ONE DOUBLE-TRIODE  
VALVE FOR THE TWO DRIVER  
STAGES

By D. J. Hussey



THE only critical parts in this amplifier are the two output transformers which need to be identical. A "rugged" power pack is required as the amplifier takes about 100 mA H.T. current. An Elstone SR250 mains transformer is used. The

i.e., left-hand and right-hand.

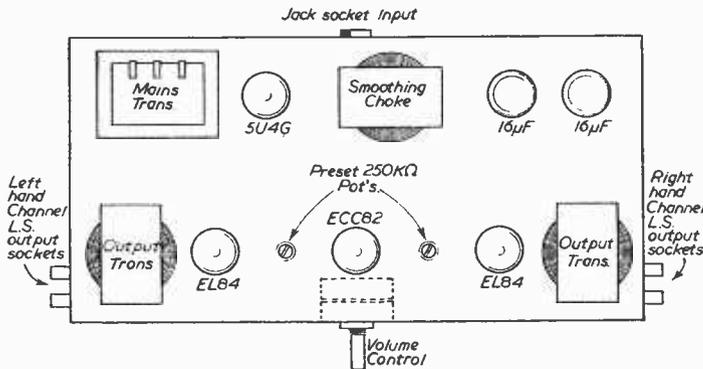


Fig. 1.—The chassis layout.

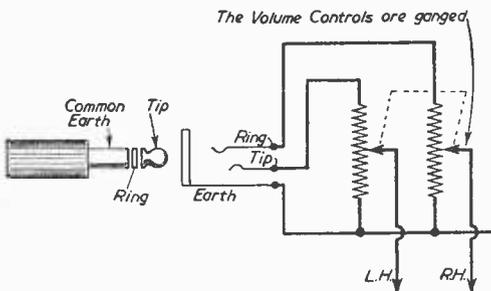
rectifier valve is a 5V4G. The D.C. resistance of the smoothing choke should not exceed 100 ohms. Reservoir and smoothing capacitors of 16  $\mu$ F each were found to be adequate. The amplifier was arranged in the manner shown (Fig. 1) to discriminate between the two channels,

## The Circuit

As the two channels are identical it will suffice to describe only one. The signal from the pick-up is applied to the grid of the A.F. amplifier (half of an ECC82 valve) and from the anode of this valve it passes via a capacitor to a 250 kilohm potentiometer. The signal passes then to a pentode output stage using an EL84 valve in a conventional circuit.

The H.T. decoupling between the A.F. and output stages was introduced to minimise hum. With no input, and the volume control at maximum, the hum level is practically inaudible. In the input circuit a three-way jack plug and socket were used for the pick-up connections (Fig. 2). The chassis layout is not critical but some effort should be made to separate the power supplies from the amplifier.

Care should be taken with the screening of the



An aid to the P.U. connections:—  
R for ring and Right Hand channel  
T for tip and "The other" (L.H. channel)

Fig. 2.—Wiring of the jack plug and socket.

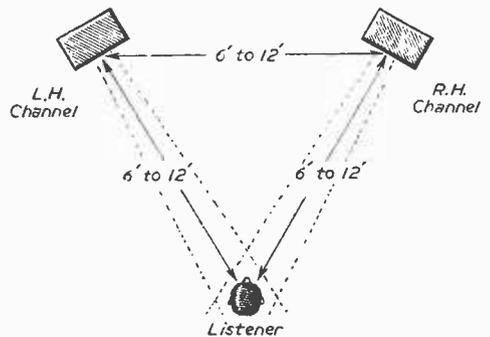


Fig. 3.—The positioning of the loudspeakers.

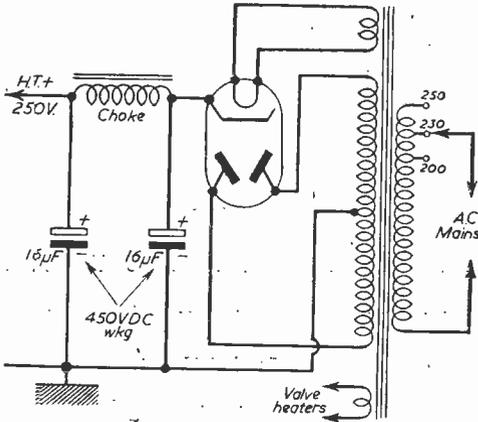


Fig. 4.—Circuit of the power supply.

Note: The cathode of the 5V4G is joined internally to the side of the heater connected to pin 8.

input leads, and the phasing of the loudspeakers. The circuit is otherwise extremely simple to set up. The fixed tone correction capacitors across the O.P. transformers can be adjusted according to personal preference.

**Operation**

Connect up the pick-up as shown: make sure that the loudspeakers are connected and switch on the amplifier. Play a stereo record—preferably a "demonstration" type—and turn up the two preset 250 kilohm pots (clockwise). The loudspeakers should be six to 12 feet apart and the listener should be six to 12 feet from them, as shown in Fig. 3.

The demonstration record enables the amplifier channels to be balanced using one of the two preset controls. If the test frequency or speech should be coming from between the two loudspeakers but appears to be coming from the left (or right), turn down the left (or right) preset control until the sound appears to come from the correct location. The ganged volume control is used in the same way as a normal volume control. If balance is unobtainable, reverse the

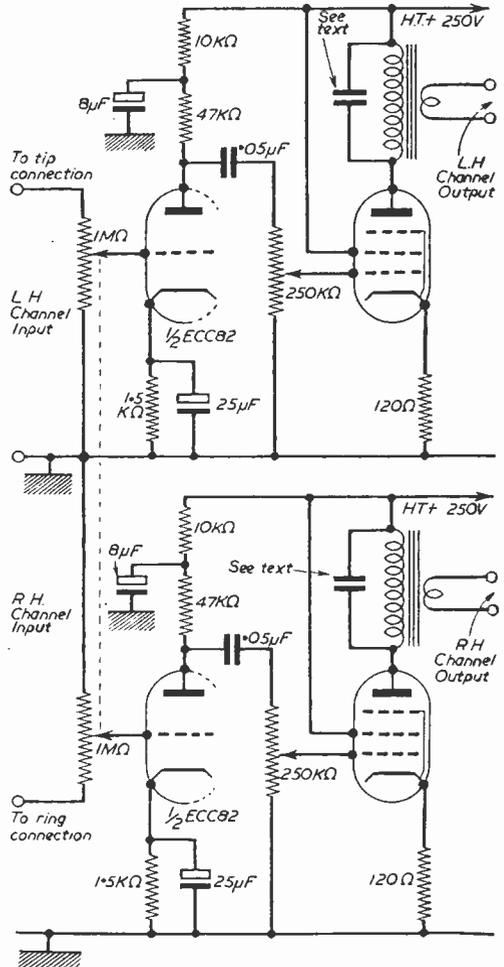


Fig. 5.—Circuit of the two-channel amplifier.

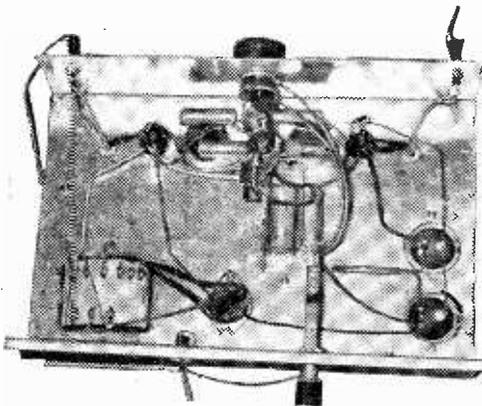
connections to one of the loudspeakers. This reverses the phase of the current through that loudspeaker and the two will then be operating in phase, enabling balance to be obtained.

**Loudspeakers**

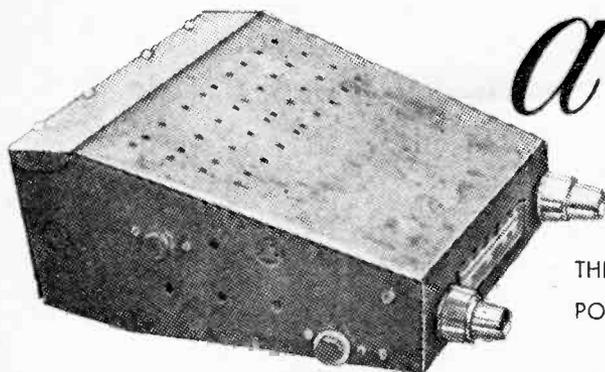
The two loudspeakers should, if possible, be identical, otherwise it may be difficult to secure balanced conditions. If you do not possess, or cannot afford to buy identical loudspeakers, use the one which has the better treble response for the left-hand channel, since in, for example, orchestral recordings, the higher pitched stringed instruments are positioned towards the left-hand side and the cellos and double-basses towards the right-hand side.

**Results**

Although this amplifier is inexpensive when compared with some of the elaborate high-fidelity apparatus which is now displayed in the windows of radio dealers' shops, it will be found to give results which are quite satisfactory, even to those with critical ears.



View of the underchassis.



# A Six Valve Car Radio

THIS SET IS BUILT IN TWO UNITS: THE POWER PACK AND THE RECEIVER PROPER

By T. Murphy

**T**HE car radio about to be described was designed around a circuit that I constructed about four years ago, giving excellent results as a domestic receiver.

There have been some slight modifications to the R.F. amp and frequency changer stages to accommodate the Osborn coils.

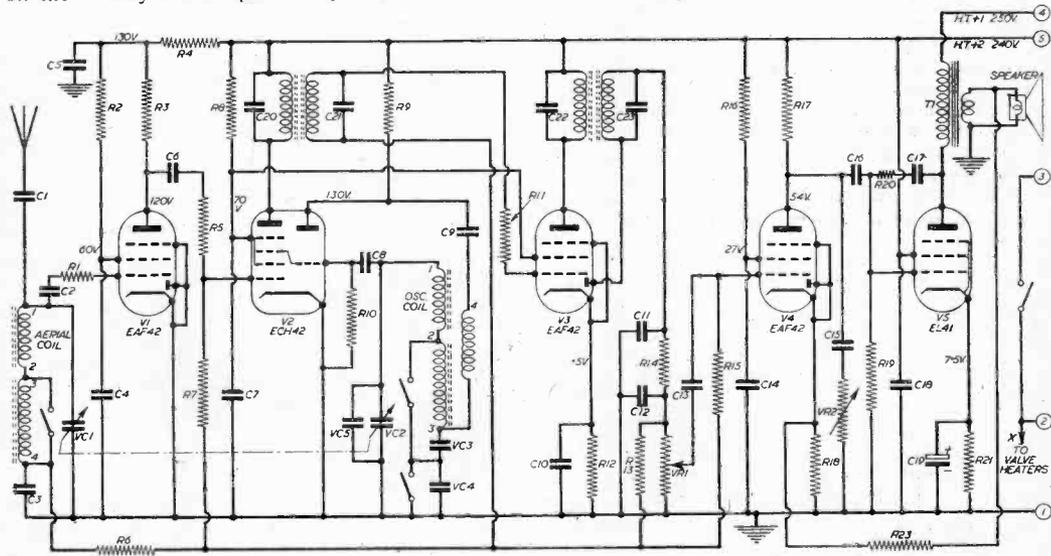
It was decided to use the single diode-pentode var- $\mu$  type valve EAF42. This has been used in three stages and if one of them goes low, the positions can be changed. The frequency changer is conventional, using an ECH42. An EL41 was chosen for its greater output, in preference to the EL42, although the latter nearly gained preference owing to its low heater current. Throughout in the design, and in the choice of valves, the drain on the battery was of prime importance.

where cruising speeds were more than 60 m.p.h. and although this car is prone to wind noise at high speeds, the output was always available for comfortable listening.

If space is available, an 8in. or 9in.  $\times$  5in. speaker could be used to advantage.

### Noise

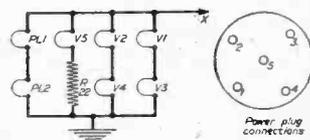
Vibrator noise is practically non-existent and ignition suppression is excellent. The output is extremely good (A.V.C. action) under all but the very worst conditions. Selectivity is also excellent, and tuning quite sharp, a necessity on a small dial. The receiver will, in fact, give results in many cases which are superior to those obtained with more expensive ready-built sets.



This is approximately 2.7 amps. when on full load, delivering 270 v. at 50 mA, and supplying heaters.

The set has been in continuous use in a Morris Minor for about nine months; prior to that it was on bench test for about two-three months. It has been used in the car on 350 mile journeys

Fig. 1.—Theoretical circuit of the receiver section.



RESISTORS	
All $\frac{1}{2}$ watt except where stated.	
R1	3.3 k $\Omega$ V1 grid
R2	100 k $\Omega$ V1 screen
R3	3.9 k $\Omega$ V1 anode
R4	33 k $\Omega$ (1 watt) V1 H.T. dropper
R5	3.3 k $\Omega$ V2 grid
R6	330 k $\Omega$ A.V.C.
R7	1 M $\Omega$ A.V.C.
R8	68 k $\Omega$ V2 & V3 screen dropper
R9	18 k $\Omega$ V2 osc. anode
R10	47 k $\Omega$ V2 osc. grid
R11	3.3 k $\Omega$ V3 grid
R12	330 $\Omega$ V3 cathode
R13	1 M $\Omega$ A.V.C.
R14	47 k $\Omega$ R.F. filter
R15	1 M $\Omega$ V4 grid to A.V.C.
R16	680 k $\Omega$ V4 screen dropper
R17	180 k $\Omega$ V4 anode
R18	10 $\Omega$ V4 cathode
R19	1 M $\Omega$ V5 grid
R20	3.3 M $\Omega$ V5 anode to grid (anti-parasitic)
R21	170 $\Omega$ (1 watt) V5 cathode
R22	8.2 $\Omega$ (4 watt) V5 series heater
R23	180 k $\Omega$ Feedback from output trans. to V4 cathode
VR1, VR2.—500 k, 100 k, c/w On, Off. Code V105 (Code V100 see text). All resistors $\frac{1}{2}$ watt except where indicated. Low-resistance high wattage types available from H. E. Smith, Edgware Rd., London. Chrome knobs, 2 inner, 2 outer, c/w telescopic spindles. Small dial. 4 small brass pulleys. 4 and 6 B.A. countersunk screws. 4 panel bushes. Valve-holders, valves, loudspeaker, etc. (see text).	

CONDENSERS, ETC.		
I.F.T.'s	R.S. Midget	Matched Pair
C1	100 pF	Ceramic Tubular
C2	100 pF	" "
C3	.05 $\mu$ F	Paper (Hunts)
C4	.01 $\mu$ F	Ceramic Tubular
C5	.01 $\mu$ F	" "
C6	100 pF	" "
C7	.01 $\mu$ F	" "
C8	100 pF	" "
C9	100 pF	" "
C10	.1 $\mu$ F	Paper 250 V/W
C11	200 pF	Ceramic Tubular
C12	200 pF	" "
C13	.01 $\mu$ F	Paper 250 V/W
C14	.01 $\mu$ F	" "
C15	.001 $\mu$ F	" "
C16	.01 $\mu$ F	" "
C17	470 pF	Ceramic Disc
C18	.01 $\mu$ F	Ceramic Tubular
C19	25 $\mu$ F 25 V/W Electro.	
All Radio Spares Midget. Clyne-Radio, London. Plugs and sockets. C/W covers, 2 of each, type M.5, 1 of M.3A.		
VC1 } .0005 $\mu$ F Miniature Tuning Condenser.		
VC2 }		
VC3—250 pF Medium Wave Oscillator Padder.		
VC4—500 pF Long Wave Oscillator Padder.		
VC5—3-30 pF Oscillator Trimmer.		
Coils—Osmer Q.A.170 and QOS.170.		
Switch—3-pole, 2-way Miniature. (4-pole shown, but one is idle.) Osmer Limited.		

**Construction**

The set is constructed in two separate units—the power unit, which is fixed under the bonnet, and the R.F. and audio amplifier unit in a case fitted under the dashboard.

If it is so desired the power supply could also be fitted under the dashboard behind the radio unit. The speaker is fitted external with a three-pin miniature plug and socket. This offers a choice of speakers and mounting positions.

If desired V1 and V4 may be EF41 Pentodes. It has also been found that the set is quite stable using 6F13s for V1 and V4, but since the circuit was designed around the variable  $\mu$  EAF42s it is

VALVES	
V1	EAF42 (may be EF41).
V2	ECH42.
V3	EAF42.
V4	EAF42 (may be EF41).
V5	EL41.
Valve Bases, 5, type B8A.	
Speaker—6 in. x 4in. Elliptical, 3 $\Omega$ . Relda Radio Ltd., London.	
Output Transformer—Miniature EL41 to 3 $\Omega$ . Osmer Limited.	

suggested that they be used. Although the ECH42 has a slightly higher current rating than V4, the series heating chain is direct, no damage being sustained by V4.

**Layout**

The only thing to guard against in the component layout is that the position of V4 is not confused with V3, owing to the latter's position relative to V5.

**The Radio Unit**

The chassis, switch, coil pack group and front panel are made from 18 s.w.g. aluminium. The case bottom, top, sides and back are made from 22 s.w.g. tinned steel. All bolts from the outside case are 4 or 6 B.A. countersunk types, with the exception of 10 PK self-tapping 6 B.A.  $\times$   $\frac{1}{4}$ in. screws holding the front cover and

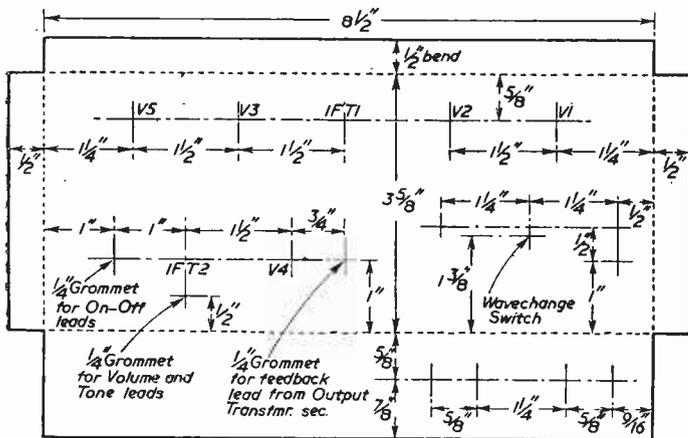


Fig. 2.—Details of the chassis carrying the valves, etc.

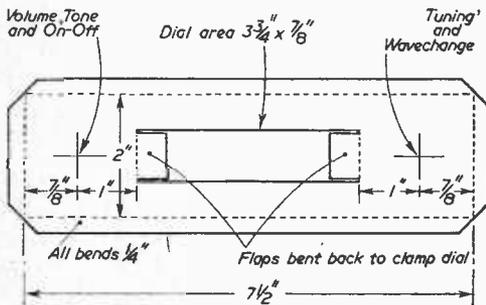


Fig. 3.—Details of the front

dial assembly *in situ*. The case is bent and drilled as shown, the sides being soldered to the base. Here a high wattage iron is necessary.

Applying soldering fluid to both edges to be soldered, just tack the inner edge down, check for squareness at the back then tack down, if all is well apply a few spots of solder at odd places along the intended joint. Having secured the side to the base, press the edges close together to get as tight a joint as possible. Having completed the inside, attention can be turned to the outside. Gently tap the base edge to the side to get as tight a joint as possible, then solder up the outside. If perfection

is aimed at, plumbers lead can then be liberally applied to the joint and filed down to hide from the outside all traces of a joint as was done in my case. It goes without saying, of course, that all holes are drilled prior to soldering, except the smaller ones. Even then, if a block of wood is cut to size and fitted inside the case, the possibility of cracking the joints is removed. The sides can be welded on or riveted. My case bending was done with the aid of a vice, a pair of angle iron pieces, a hammer and a small wrench. It will be found that this case will fit most modern cars. Having completed the case it can be painted inside with "blackboard black" and the outside finished crackle black or any colour scheme to match up the car. The top cover is secured to the case by 6 B.A.  $\frac{1}{4}$  in. PK screws approx.  $1\frac{1}{2}$  in. intervals. The back is also secured by 6 B.A.  $\frac{1}{4}$  in. PK screws. Approximately 36 of these are required.

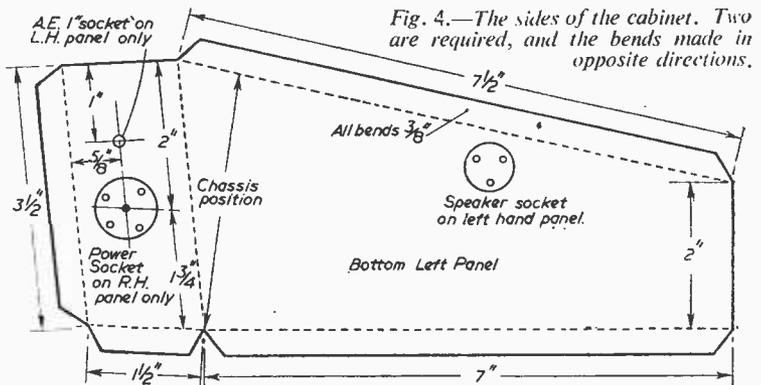


Fig. 4.—The sides of the cabinet. Two are required, and the bends made in opposite directions.

The volume and tone control spindles must be carefully shortened. They are mounted on a bracket approximately  $1\frac{1}{2}$  in. long,  $\frac{1}{4}$  in. wide and  $\frac{1}{4}$  in. thick. This bracket is mounted on the base close to the front panel so that about three threads are protruding through the front panel, later to be locked to front panel by an additional nut. This shaft may come through the front panel via a rubber grommet if so desired. The base of this bracket had a 4 B.A. oval hole to assist in any slight misalignment, and final tightening was carried out with the dial plate *in situ*. The inner shaft is cut to length after fitting the controls to the bracket.

#### Fitting the Tuning Device

Now comes the most tricky bit of the whole assembly, fitting the tuning drive gear and wave-change controls. The gang condenser is controlled by the inner knob for finer tuning. Fitted to the gang shaft is a 6:1 reduction drive; this drive is secured to the base by a small bracket. Fitted to the other end of the reduction drive is a constructional toy gear,  $\frac{1}{4}$  in. face,  $\frac{1}{2}$  in. tooth length (Part No. 26A). This gear is bored out  $\frac{1}{4}$  in. for about two-thirds its depth, the other end of this gear is drilled out a little less than one-third its depth to  $\frac{3}{16}$  in. to act as a bush for the tuner control rod.

(To be continued)

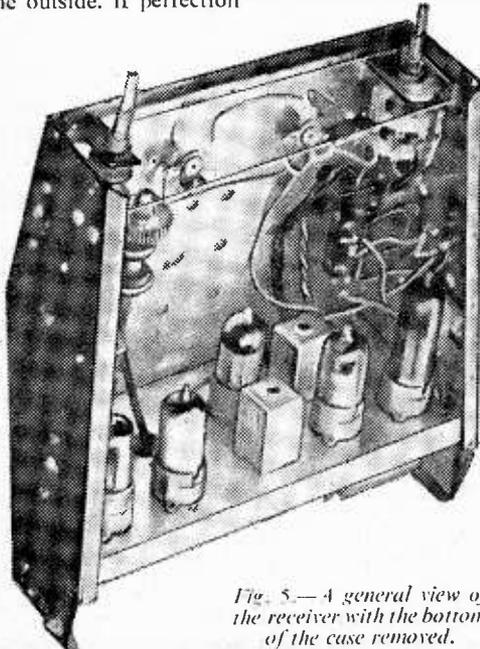
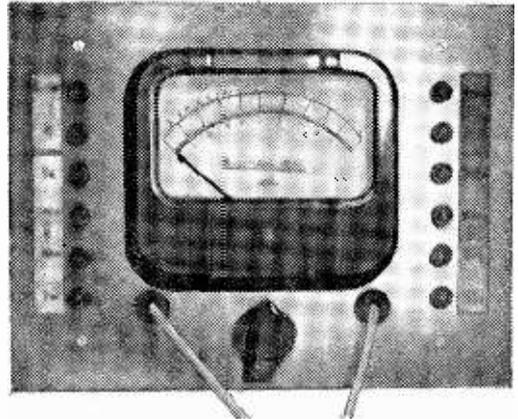


Fig. 5.—A general view of the receiver with the bottom of the case removed.

# A Push-button Multi-range Testmeter

IN THIS SECOND ARTICLE THE SWITCHING IS EXPLAINED

By Hugh Guy



THE table mentioned last month is given below and shows the calibration of a 100Ω, 1 mA meter. for resistance measurement.

The details given so far should equip each reader with enough information to enable him to construct a multi-range instrument around any moving coil milliammeter provided its sensitivity and resistance are known.

The multipliers and shunts thus deduced will suit an instrument which uses either rotary or push-button switching.

Rx. ohms	0	100Ω	250Ω	500Ω	1k	1.5	2k
D.mA.	1	.938	.857	.75	.6	.5	.43
Rx. ohms	3k	4k	5k	10k	20k	50k	100k
D.mA.	.33	.27	.23	.13	.07	.03	.015

For the reader who intends to proceed with the push-button design. all the resistance values have been calculated for a meter with a 1 mA movement of 100Ω resistance, giving a ready-made design to construct.

### Switch Details

There appears to be a large variety of push-button switch banks available on the surplus market, several different versions of which would be suitable for the instrument described here. Two switch banks are required, and for the sake of simplicity they are identical.

The switch specification is as follows. Six switches on each bank; and the contact arrangement is 4 double pole double throw; 2 pole double throw; and double pole single throw.

A close examination of the contact arrangement of the switch bank illustrated in circuit form in Fig. 6 shows that there are differences in the two switches which make

other push-button combinations suitable and a detailed switch specification for each bank of six may be compiled from the circuit.

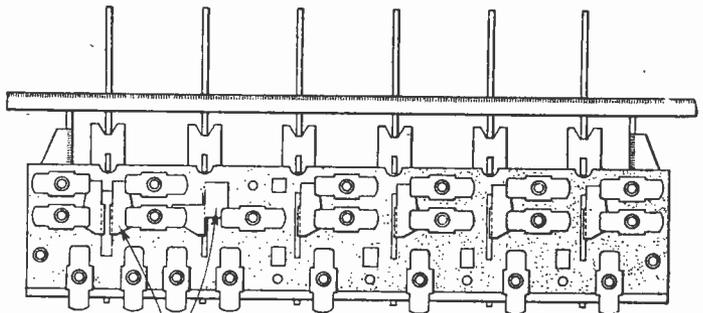
One side of the six-bank push-button combination is shown in the view in Fig. 7. The top contact of each set (with the exception of the second set from the left in the view shown) is normally "made" to the contact immediately below it. This middle contact is like the wiper, or armature, of the rotary type of switch. When the switch is operated, the wiper contact moves down to link the middle and corresponding bottom contact. Hence the latter is the "normally open" contact of the equivalent rotary switch.

The second set from the left shown in the figure is rather different in that the wiper contact links the appropriate bottom two contacts when it is operated.

The position of this switch and that of the first one are interchanged on the other side of the bank to give a three-pole action to each of the first two switches.

This is made clearer in the wiring diagram of Fig. 8 which shows the tag panels of each of the two switches as they would appear if hinged outwards from the back of the respective switch banks. The moving contacts are not shown for the sake of clarity.

The components list gives the values of the shunts and multipliers required for all ranges of the instrument designed around the commonly



Contact arrangement for these sets reversed on other side of switch

Fig. 7.—View of one side of the six-bank push-button combination.

available 0.1 mA meter of 100 ohms resistance. However, a great variety of meters is available on the surplus and other markets and to suit the current and resistance requirements of these the formulæ given earlier must be used to calculate the values of the appropriate multipliers and shunts.

One additional resistance not accounted for in these formulæ is the one labelled R1 in Fig. 6. Its value is determined by the ratio of the two resistance scales. If one assumes that the ratio of the larger-to-smaller resistance ranges is  $N$ —in the case of the particular design described here  $N$  is 100—then if the total meter circuit resistance is  $R$  ( $R$  is 1.5k in Fig. 5) R1 is given by

$$R1 = \frac{R}{N-1}$$

Used with the circuit of Fig. 5 therefore R1 would be 15.15 $\Omega$ . In practice a 15 ohm resistor is used, the extra 0.15 $\Omega$  being contributed by unavoidable switch contact resistance.

#### Tolerance

This resistor should be of 1 per cent. or 2 per cent. tolerance and a high stability component, as should all the multiplier resistors R5 to R10 inclusive. The components list gives their wattage rating and also suitable alternative pairs of preferred values of resistance which in general will be more readily available at component retailers than their single equivalent resistors. These pairs of resistors will, when the two are connected in parallel, give the required value of multiplier to within very close limits. These close tolerance high stability resistors are not expensive.

It will be seen that the value of the shunts is very low and consequently they are most conveniently provided by hand-made resistors wound either with Eureka resistance wire, or, if it is preferred, with insulated copper wire. Copper wire is less preferable owing to the variation of its resistance with temperature, but provided the current flowing through it does not heat the shunt made with it, it should prove quite satisfactory.

The required lengths of wire for the three shunts R2, R3, R4, wound in either Eureka resistance wire or copper wire will be given in the next article.

With the wiring shown in Fig. 6 last month, on the 0 to 1 k range the meter current is in the reverse direction. This can be corrected by a rearrangement of the wiring associated with S2a and S2b. (The wiring in Fig. 8 above is correct.) (To be continued)

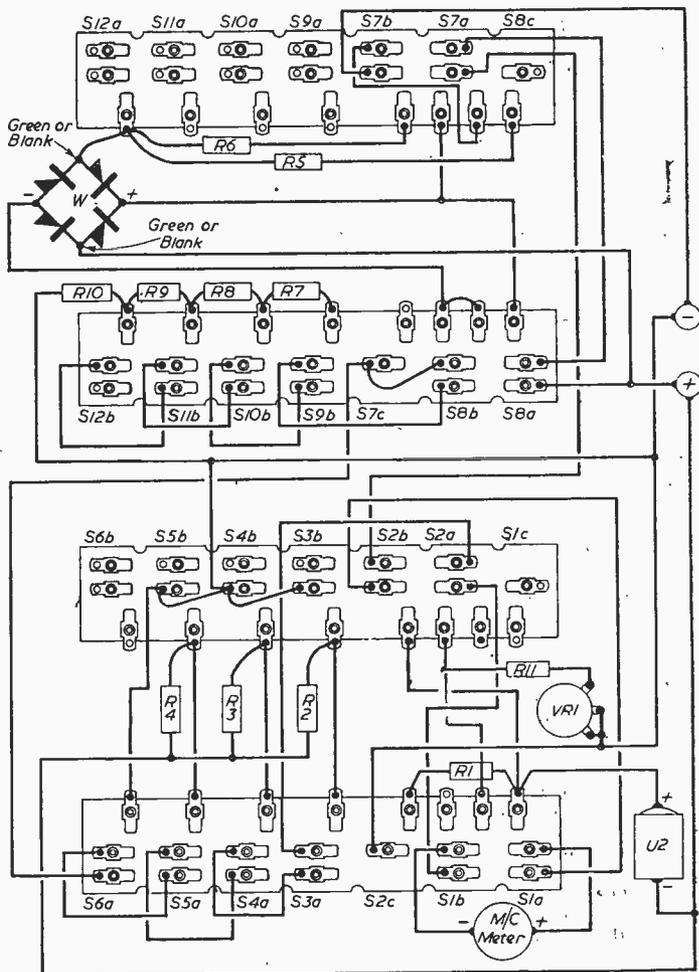


Fig. 8.—Complete wiring diagram.

#### COMPONENTS LIST

- R1—15  $\Omega$
- R2—0.1001  $\Omega$  WW
- R3—1.01  $\Omega$  WW } See text.
- R4—11.11  $\Omega$  WW }
- R5—270k.
- R6—8.2k.
- R7—200k or 270k and 820k in parallel.
- R8—91k or 220k and 150k in parallel.
- R9—6.8k.
- R10—22k/3.3k in parallel.
- R11—1.2k 5%  $\frac{1}{2}$  watt carbon.
- VR1—250  $\Omega$  WW, Pot.
- All resistors 1 w. 1% High Stability unless otherwise stated.
- Two six-bank push-button switches (see text).
- 0.1 mA. M.C. meter 100  $\Omega$  or other (see text).
- 0.1 mA. Meter bridge rectifier, or other to suit meter.
- One red, one black terminal.
- Toggle DPCO switch (optional—see text).
- 1.5v. cell—U2, and fixing clip.
- Tag strips, single strand inter-connecting wire, fixing nuts and screws, solder, etc.

# PRINTED CIRCUITS

No. 2.—DESIGNING A TRANSISTORISED AUDIO AMPLIFIER

By W. G. F. Roberts

**B**EFORE proceeding to design a printed circuit it must be remembered that a printed circuit is not easily or cheaply capable of modification, and thus the circuit diagram itself must be right before an attempt is made to convert to printed circuit. Thus, the circuit must be made to work on the bench first. A very important point often neglected by the amateur is the necessity to make the circuit work with mains variations of, say,  $\pm 20$  per cent., or.

This enables the circuit to be tried in its final form. Later on, we shall see how this is done. To assist in design work on, say, computers, a special printed circuit, called a "panic plate" is sometimes used. Fig. 5 shows one of these circuits. A number of copper patches with holes are provided, across which small components, such as resistors, capacitors, diodes, and transistors, are connected. The example shown plugs into a standard assembly alongside conventional printed circuit panels.

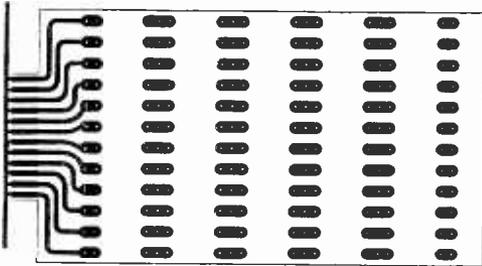


Fig. 5.—A "panic plate."

if working from a battery, with a reduction of 50 per cent. during the life of the battery.

### Component Selection

Having evolved the circuit, it is then necessary to choose the components to be used, for their size and terminal disposition is a fundamental consideration in the design of the printed circuit. The manufacturer of radio or other electronic equipment in quantity has a decided advantage here over the amateur. He has available the latest catalogues of a wide range of component manufacturers, and, if he cannot select the component he requires from them, he can have it designed and manufactured. The amateur, however, must obtain his parts from his usual supplier, or adapt those from his own junk-box.

Having obtained both the circuit and the components, some designers wish to try the circuit in its final form before preparing the master drawing. One method is to obtain a piece of 1/16in. bakelite board, drill holes, and mount the components. Wiring is done on the reverse side of the board with tinned copper wire.

One further consideration remains before design is started: that of size. Clearly, the selected size must be large enough to hold the components, but there may be considerations imposed by the equipment in which the circuit has to be fitted. For example, the designer of the printed circuit for a miniature radio may be told to keep his circuit within a size of, say, 6in.  $\times$  3in., and, with a maximum depth of 1½in., find space for a battery, loudspeaker and aerial.

### Component Positioning

The first step is to examine the theoretical circuit. As an example, a transistor audio amplifier, with 100 mW output has been chosen. Examination of Fig. 6 shows that at four points A, B, C and D, wires cross over. Points A and B are linked by a resistor, and, clearly, this resistor could bridge across the wires leading to the 100  $\Omega$  and 5.6  $\Omega$  resistors. A similar argument might, at first, be thought to apply to the cross-overs C and D, but this assumption is not

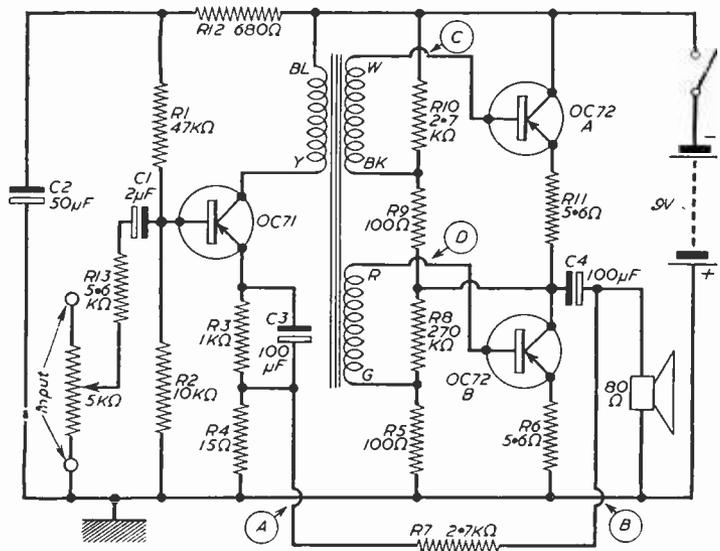


Fig. 6.—Circuit of amplifier.

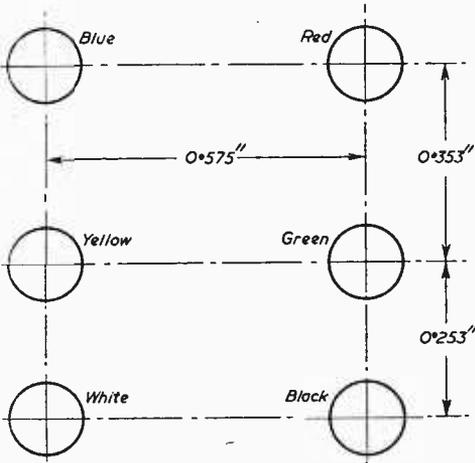


Fig. 7.—Transformer piercing.

justified as the transformer terminals are not in the same position as on the theoretical circuit. The transformer chosen is a Fortiphone Type L442.

The connections are as shown in Fig. 7, which also shows the panel drilling for the component, viewed from the printed circuit side. The relevant part of the circuit diagram is then sketched around these, as in Fig. 8, and it is obvious that crossovers can be avoided by returning a 9-volt lead between the two rows of the terminals. We can note that, if it is wished to have both OC72's below the transformer, the connection from the red terminal can pass as shown by the dotted line. This conversion of a theoretical symbol to a practical form is a valuable aid in printed circuit design. Suppose, for example, we wish to design a printed circuit using an ECC81 or 12AT7. On the left of Fig. 9 is shown the normal valve symbol, and, on the right, how it should be drawn to show the base

connections for printed circuitry. There is, of course, no need to attempt to draw the valve electrodes.

**Drawing Out the Circuit**

What we have done, then, is to analyse the circuit preparatory to making a printed circuit of it. It would be possible to redraw the circuit diagram from the conclusions drawn, but this is hardly necessary, as we have our notes available to make the printed circuit master. The next step is to list the components to be used, and obtain them to examine their size and determine the mounting centres. The resistors in our example all mount on 0.8in. centres; the 2  $\mu$ F capacitor is the same, and the 50  $\mu$ F and 100  $\mu$ F mount on 1in. The transformer is as shown in Fig. 7, and the transistors have flying leads. The volume control (which also carries the battery switch), R13, the loudspeaker, and the battery, are not on the circuit. A piece of squared paper (1/10in. squares) is used for drawing out the design. With the aid of the data previously obtained, and the theoretical circuit, the printed circuit pattern can be roughed out. Do not, of course, forget that

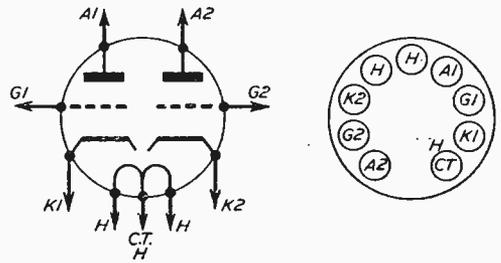


Fig. 9.—Valve connections.

the components are on the other side of the board to the printed circuit. The rough sketch of the chosen circuit is shown on Fig. 10.

At this stage a "bread-board" version of the circuit can be made. A suitable piece of 1/16in. bakelite or perspex is obtained, and squared paper, suitably cut, attached to it by tabs of transparent tape. The drilling centres are then punched through the paper with a centre punch, the paper removed, and the panel drilled. The components are then inserted, and held by bending over the wires or any other convenient method. Using the paper circuit as a guide, wiring is then completed in bare tinned copper wire of about 24 s.w.g. The circuit can then be tried out. This is important for the amateur, as it would cost him about £3 to have a printed circuit made. In fact, he may be satisfied with having produced a simulated printed circuit in this manner.

**The Master Drawing**

Next a master drawing is prepared (Fig. 11). This is done on white cardboard of a special type known as Bristol Board, obtainable from any artists' supplier. In industry, boards are sometimes used with a blue grid overprinted with lines spaced 0.3in. apart. This is to allow the drawing to be three times full size, to improve

(Continued on page 33)

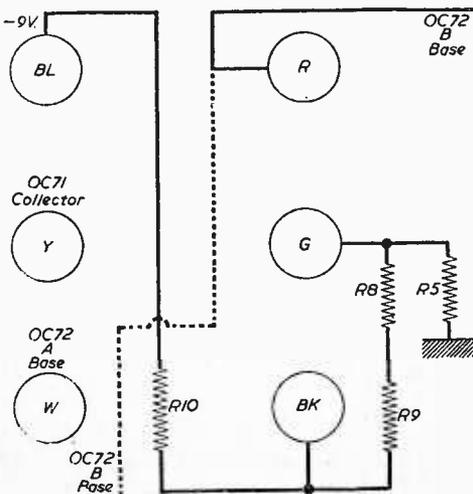


Fig. 8.—Transformer circuit.

**C.R.T. ISOLATION TRANSFORMER**  
**Type A.** Low leakage windings. Optional 25% or 50% boost on secondary. 2 v. or 4 v. or 6.3 v. or 19.5 v. or 13.5 v. with mains primaries ... .. 12/6.  
**TYPE A2.** High quality. Low capacity, 10.15 pF. Optional boost 25%, 50%, 75% ... 16 8 each.  
**Type B.** Mains input. Mains Output.  
 2, 4, 6.3, 7.3, 10 and 13 volts.  
 Boost 25% and 50%. Low capacity 21/-.

**TRIMMERS.** Ceramic. 30, 50, 70 pF. 91. : 100 pF. 150 pF. 1/3 : 250 pF. 1/6 : 500 pF. 750 pF. 1/2 pF.  
**RESISTORS.** Preferred values. 10 ohms to 10 meg. 1/4 w. 41. : 1 w. 64. : 1 1/2 w. 84. : 2 w. 117. **HIGH STABILITY.** 1/4 w. 1%. 2/- Preferred values. 100  $\Omega$  to 10 meg. Ditto, 5%. 100  $\Omega$  to 5 meg. 9d. 9d.  
**WIRE-WOUND RESISTORS** (1 watt) 25 ohms-10,000 ohms 1/6 15 watt 1/2 15,000 ohms-50,000 ohms, 5 w. 1/3 : 10 w. 2/3.

**12/6 PURETONE RECORDING TAPE**  
 1.23/10 on standard 7" Metal reels.  
 Spare Reels 7" Plastic 4" metal, 2/3.  
**SUPERIOR 1,200 F. Plastic Tape on 7" Plastic Reels, Quality Guaranteed, 21/-.**  
 "Instant" Bulk Tape Eraser, 200 250 v. A.C. for any make or size of tape. 2/8.

**O.P. TRANSFORMERS.** Heavy Duty 50 mA., 4/6. Multitap, push-pull, 7/6. Miniature, 3/4, etc., 4/6. **F.F. CHOKES** 15/10 H. 60/65 mA., 5/-; 10 H. 85 mA., 10/6; 10 H. 150 mA., 14/-.

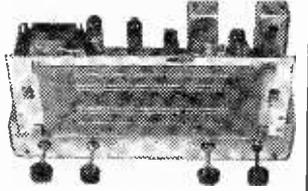
**MAINS TRANSFORMERS 200 250 v. A.C. STANDARD.** 250-0-250, 80 mA., 6.3 v. 3.5 v. Tapped 4 v. 4. Rectifier 6.3 v. 1. a. 5 v. 2. a. or 4 v. 2. a. ditto, 350-0-350 ... 22/8  
**MINIATURE.** 200 v. 20 mA., 6.3 v. 1. a. 10/6  
**MIDGET.** 220 v. 45 mA., 6.3 v. 2. a. 15/8  
**SMALL.** 220-0-220, 50 mA., 6.3 v. 3. a. 17/6  
**STANDARD.** 250-0-250, 65 mA., 6.3 v. 3. a. 17/8  
**HEATER TRANS.** 6.3 v. 1 1/2 amp. ... 7/6  
 Ditto, Tapped sec. 2, 4, 6.3 v. 1 1/2 amp. 8/6  
 Ditto, sec. 6.3 v. 3 amp. ... 10/6

**ALADDIN FORMERS** and caps. 1in. 8d. : 2in. 10d. 3in. FORMERS 6937/8 and Caps 7V12. 2in. sq. x 2 1/2in. and 1in. sq. x 1 1/2in. 2/- ea. with covers.  
**TYANA.** Midget Soldering Iron. 200/220 v. or 220 250 v. 16/9. Famous Instrument from 17/6.  
**MAINS DROPPERS.** 3in. x 1 1/2in. All. 5/11s. 6.5 amp. 750 ohms. 4/3. 0.2 amp. 1,000 ohms. 4/3. **LINE COORD.** 3 amp., 60 ohms per foot. 2d. per 100 ohms per foot. 2-way. 6d. per foot. 3-way. 7d. per 100 ohms per foot. 3 OHM. 2 1/2in. x 5 1/2in. 17/6. 4in. Plessey. 12. 3in. x 1 1/2in. Goodmans, 21/6. 6 1/2in. Goodmans, 19/6. 10in. R. & A. 30/- T.S.I. Tweeter, L4175. 8/6. 12in. Plessey, 30/- **STENTORIAN HP1012** 16in. to 15 ohm 10 v. 99/6 12in. Baker 15 watt 3 ohms, or 15 ohms, 105/- **CRYSTAL DIODES** G.E.C. 2/- GEM34, 4/- **HIGH RESISTANCE PHONES.** 4,000 ohms, 18/6 **MIKE TRANSF.** 30 : 1, 3/9 ea. : 100 : 1, Potted, 10/6. **SWITCH CLEANER** Fluid squirt sprout. 4/3 Tin. **TWIN GANG TUNING CONDENSERS.** 305 pf. miniature 1 1/2 x 1 1/2in. 10in. 1005 Standard with trimmers, 9/-; less trimmers, 8/-; midget, 7/6. **SINGLE.** 50 pf., 2/6; 100 pf., 7/-; 150 pf., 8/6. **SOLED dielectric** 100, 300, 500 pf., 3/8. **SPEAKER FRET.** Expanded Metal Silver. 15in. x 9 1/2in. 2/- each.  
**GOLD CLOTH.** 17in. x 25in. 5/-; 22in. x 35in. 10/- **Tyran** 4 1/2in. dia. 10/- R.F. : 2 1/2in. wide, 5/- 11.

All Boxed **VALVES** 90-day Guarantee.

1R5	8/6	6X8	9/6	6A103	11/6	1ABC30	
1R5	8/6	6U6	10/6		10/8		12/6
1T4	8/6	6N7M	7/6	6P01	8/6	6HVR2	7/6
2X2	8/6	6Y2	10/6	6BC33	8/6	6MU11	10/6
2X4	8/6	6A1	7/6	6R14	10/6	6P1	8/6
3V4	8/6	6B7JM	10/6	6BF90	10/6	6PC84	12/6
5C4	8/6	6SN7	8/6	6Y34	12/6	6P080	11/6
5Y3	8/6	6V90A	7/6	6Y90	11/6	6CL82	11/6
5Z4	10/6	6X4	7/6	6Y42	10/6	6PL33	6/6
6AB6	8/6	6X5	7/6	6Y42	12/6	6PL32	10/6
6B8	8/6	62AER	10/6	6E70	7/6	6Y80	10/6
6BE2	7/6	62A77	9/6	6E11	10/6	6Y81	10/6
6BR6	10/6	62A77	9/6	6E70	5/6	6Y82	10/6
6BW6	10/6	62A77	9/6	6E70	10/6	6A61	5/6
6G6	7/6	62B25	10/6	6E70	8/6	6UC41	10/6
6G9	6/6	62B25	10/6	6E70	8/6	6UC42	10/6
6H6	3/6	62Q7	8/6	6EL2	5/6	6U41	10/6
6H5	6/6	65156	9/6	6E184	10/6	6U41	10/6
6J6	7/6	63524	9/6	6EM81	12/6	6UY1	10/6
6K7	8/6	89	10/6	6Z10	10/6	12/6	10/6
6K9	6/6	951	10/6	6Y42	9/6	6Y81	8/6
6K7	5/6	EA50	1/6	6E1148	1/6	6YR150	8/6

**FINEST VALUE**



**1959 RADIOGRAM CHASSIS**  
**THREE WAVEBANDS FIVE VALVES**  
 S.W. 16 m.-50 m. LATEST MULLARD M.W. 200 m.-750 m. ECH42, EF41, EB31, L.W. 800 m.-2,000 m. EL41, EZ40, 12-month guarantee.  
 A.C. 200/250 v. 4-way switch; Short-Medium-Long-Grass. A.V.C. and Negative feedback 4.2 watts. Chassis 1 1/2 x 6 1/2 x 2 1/2in. Glass dial 12 1/2 x 2 1/2in. horizontal or vertical. 10in. x 4 1/2in. 2 Pilot Lamps, Four Knobs Walnut or Ivory. Aligned and calibrated. Isolated Chassis.

**£9.10** Carr. & Ins. 4/6.

TERMS: Dep. £3.5.0 and five monthly of £1. MATCHED SPEAKERS FOR ABOVE CHASSIS. 8in., 17/6; 10in., 25/-; 12in., 30/-.



**UAS World's Finest 4-Speed Autochanger**  
**OUR PRICE £6.19.6**

TERMS: Dep. £3.10.0 and four monthly of £1. Stereo Model UA12 £11.17.6

**COLLARO LATEST MODEL HIGH-FIDELITY AUTOCHANGER 4-SPEEDS-10 RECORDS**  
 With Studio "O" pick-up  
**BRAND NEW IN MAKER'S BOXES**  
**OUR PRICE £7.19.6** post free.

**BUILD THIS REPRODUCER BARGAIN SINGLE PLAYER KIT**

Ready for immediate assembly.  
 4-speed Collaro "Junior" Unit..... £4 12 6  
 Handsome case, 17 1/2 x 12 1/2 x 7 1/2in. with room to play 12 in. records ... £2 5 0  
 Ready-built 3-watt amplifier with two valves and loudspeaker..... £3 12 0  
**£9.15.0** complete kit post free.

**ALUMINIUM CHASSIS.** 18 s.w.g. un drilled. With 4 sides, riveted corners and lattice fixing holes, 2 1/2in. sides, 7 x 4in., 4/6; 9 x 7in., 5/9; 11 x 7in., 6/9; 15 x 9in., 8/6; 14 x 11in., 10/6; 15 x 14in., 12/6; 18 x 16 x 5in., 16 8.

**TRANSISTORS, GENUINE PVE GOLTOP.** Audio, 10 -. R.F. (3 Mvcs average), 18 - Power, 20 -. Complete data sheets supplied.

**HANDY VOLT METERS.** 0-25 v. and 0-250 v., D.C. with leads and leather case, 0/6.

**CRYSTAL MIKE INSERT** by Acos, precision engineer. Size only 1/2in. x 3 1/2in. 6/6.

**HI-GAIN BAND 3 I.T.A. PRE-AMP KIT.** Cascade circuit with valve 12X7A. Price 29/6. With Power Pack, 49/6. Plans only 6d.  
 Band 1 B.B.C. version same price.

**TELETRON "TRANSIDYNE"**  
**MIDGET SUPERHET PORTABLE 6" x 4" x 1 1/2"**  
 6 transistors, printed circuit. Ferrite aerial. All parts and cabinet, £11.19.6.  
 We include 6 Pys (Logo Transistors) for maximum performance. Plan 9d.

**GARRARD 45P. SINGLE PLAYER**

**AUDIO PERFECTION**

Designed to play 16, 43, 43, 73 r.m.m. Records 7in., 10in., 12in. Lightweight Xial pick-up. G22 turnover head, two separate sapphire styl. **OUR PRICE £8.0.0** each. Post Free.  
 De luxe cabinet, quality amplifier and 6 1/2 in. speaker. £8.15.0 or complete kit, £14.10.0.

**Volume Controls 80 ohm COAXIAL CABLE**

Long spindles. Guaranteed 1 year. Midget 5K ohms to 2 Meg. No Sw. D.P. No. 4/9  
 Linear or Log Tracks. Air Spaced. 1/6 5d.

**COAX PLUGS ... 1/-**  
**DOUBLE SOCKET ... 1/3**  
**SOCKET ... 1/-**  
**OUTLET ... 4/6**  
**BALANCED TWIN FEEDER YD. 6d.** 50 or 250 ohms. **DITTO SCREENED** per yd. 1/6. 80 ohms only. **WIRE-WOUND POTS. 3 WATT.** Pre-set Mini. T.V. Type. All values 25 ohms to 30 K. 3 - ca. 50 K. 4 - Carbon 50 K. to 1 M. 3 - J. **WIRE-WOUND 4 WATT.** Pots. 2 1/2in. Spindle. Values, 100 ohms to 50 K. 5/6; 100 K. 6/6. **CONDENSERS.** New Stock. .001 mfd. 7 kV. T.C.C. 5/8; Ditto, 20 kv., 9/6; 100 pf. to 500 pf. Micas, 6d.; Tubular 500 v. .001 to .01 mfd., 9d.; .05, 1 - 1 - 25, 1/6; 5,350 v. 1.29, 1,350 v. 9d.; .01-2,000 v., 1/9; 1 mfd., 2,000 volts, 3/6. **CERAMIC CONDS.** 500 v., 3 pf. to .01 mfd., 10d. **SILVER MICA CONDENSERS.** 100% 5 pf. to 500 pf. 1 - 600 pf. to 3,000 pf., 1/3. Close tolerance ( $\pm 1$  pf.) 1.5 pf. to 47 pf., 1/6. 100 to 1% 50 pf. to 815 pf., 1/9; 1,000 pf. to 3,000 pf., 2/-.

**I.F. TRANSFORMERS 7/6 pair.**  
 465 Kc's Slug Tuning Miniature Can. 2 1/2in. x 1 1/2in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.  
 Weatite M800 I.F. 465 Kc's. 12/3 per pair.  
 Weatite 550 I.F. 465 Kc's. 12/8 per pair.

**NEW ELECTROLYTICS. FAMOUS MAKES**

**TUBULAR TUBULAR CAN TYPES**  
 1.250v. 2 - 61 350v. 5 8 500v. 3 -  
 2.450v. 2 3100 25v. 2 - 16 500v. 4/-  
 4.450v. 2 3100 25v. 2 6 32 350v. 4/-  
 8.450v. 2 3500 12v. 3 100 250v. 11/6  
 8.500v. 2 9.8 4 4.500v. 4/8 2,500 3v. 4/-  
 16.450v. 3 8.4 4.500v. 5 - 6,000.6v. 5/-  
 16.500v. 4 8.4 15 450v. 5 - 32.4 32 250v. 4/-  
 22 150v. 5 6.8 16 500v. 5 6.20 4 50 25v. 7/-  
 25.250v. 1 9.16 16 450v. 5 6.14 4 20 25v. 7/6  
 24.250v. 1 10.2 32 250v. 4.18 14 120 250v. 11/6  
 50.50v. 2 - 2 - 22 500v. 7/8 100 4 200 350v. 12/6  
**SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGE.** K2325 5 kV, 5-type, K940 5.2 kv., 7/-; K945 3.6 kv., 7/8; K950 4 kv., 8/-; K3100 8 kv., 14 8; 50 cps. voltage, 20% of above. **MAINS TUBE SELENIUM** 300 v. 85 mA., 7/6. **CONTACT COILED** 250 v. 50 mA., 7/6; 60 mA., 8/6; 85 mA., 9/6.  
**COILS** Weatite "D" type, 2 1/2" each. Osom Midget "O" type, just dust core from 4 -. All ranges. **TELETRON.** R. & Mel. T.R.P. with reaction, 3/6. **FERRITE ROD AERIALS.** 50 v., 8 v. M. 1. 1. 1. 2. 8. **T.R.P. COILS A/H.F.** 7 1/2" pair. H.F. CHOKES, 2/6. **FERRITE ROD** 7in. x 3/8in. dia., 2/6.

**JASON F.M. TUNER COIL SET, 26" H.F.** coil, aerial coil, Oscillator coil, two I.F. trans, 10/7 Me's. Ratio Detector and beat chafe. Circuit book using four 6AM6, 2-  
**COMPLETE JASON F.M. KIT WITH VALVES, £8.10.0.** Fringe area kit, 22/8 extra.  
**MULLARD 45 AMPIFIER READY BUILT.** Spare Power for 45 Amp. £7.17.8.

**FULL WAVE BRIDGE SELENIUM RECTIFIERS:** 250 v. 11 amp., 8/9; 2 a. 11 1/2 a., 17/6  
**CHARGER TRANSFORMERS.** Tapped input 200/250 v. for charging at 2, 6 or 12 v., 11 amps., 15/6; 2 amp., 17/6; 4 amps., 22/8. Circuit included.  
**VALVE and T.V. TUBE** equivalent books, 5/-  
**TOGGLE SWITCHES.** S.P. 2 -, D.P. 3, 8. (I.P. D.T. 4.)  
**WAVELENGTH SWITCHES**  
 2 p. 4-way 2 water long spindle ... 6/6  
 2 p. 2-way, or 3 p. 2-way short spindle ... 2/6  
 2 p. 6-way, 4 p. 2-way, 4 p. 3-way long spindle... 3/8  
 3 p. 4-way, or 1 p. 12-way long spindle ... 3/6  
**VALVEHOLDERS.** Pvc. Ins. Oct. 6d. EF50, 1/3.50, 6d. B12A, CRT, 1 1/2. Eng. and Amer. 4, 5, 6, 7 and 9 pin. 1 -/. **MOULDED MAZDA** and Int. Oct. 1/6. BTG, BSA, BSG, B9A, 9d. BTG with can., 1/6. B9A with can., 2/6. **CERAMIC B150,** BTG, B9A, Int. Oct. 1 -/. BTG with can., 1/9.

**RADIO COMPONENT SPECIALISTS** OUR ONLY ADDRESS  
**337 WHITEHORSE RD., WEST CROYDON**

THO 1665. Buses 133 or 68. 48-hour service. P. & P. 1/-, over £2 free. (Export Extra). C.O.D. 1/5. (Wed. 1 p.m.) Catalogue 5d.

# WEYRAD

## COILS AND TRANSFORMERS FOR A 2-WAVE TRANSISTOR SUPERHET WITH PRINTED CIRCUIT AND FERRITE ROD AERIAL

### LONG AND MEDIUM WAVE AERIAL—RA2W

On 6in. rod, 7/16in. diameter, flying lead connections, 208 pF tuning ... .. 12/6

### OSCILLATOR COIL—P50/1AC

Medium wave in screening can. For 176 pF tuning condenser ... .. 5/4

### 1st AND 2nd I.F. TRANSFORMERS—P50/2CC

470 Kc/s operation with 250 pF tuning in cans. 11/16in. diameter by 3/4in. high ... .. 5/7

### 3rd I.F. TRANSFORMER—P50/3CC

Last stage transformer to feed diode detector. Size as P50/2 ... .. 6/-

### DRIVER TRANSFORMER—LFDT1

Fully enclosed with six connecting tags—case 11/16in. square by 1 1/8in. high ... .. 17/6

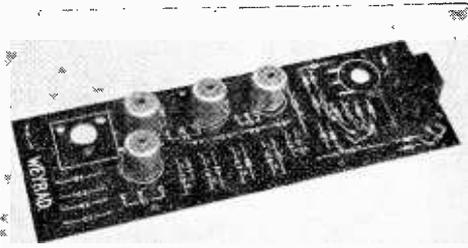
### PRINTED CIRCUIT—PCAI

Size 2 3/4in. x 8 1/2in. Ready drilled and printed with component positions ... .. 9/6

THESE COMPONENTS ARE APPROVED BY TRANSISTOR MAKERS AND PERFORMANCE IS GUARANTEED.

Constructor's Booklet with full details, 2/-.

**WEYMOUTH RADIO MANUFACTURING CO., LTD.**  
CRESCENT STREET, WEYMOUTH, DORSET



# ELGE RADIO PEN

*Versatile pocket  
Fault  
Finder*

For  
Radio  
Television  
Amplifiers  
Transmitters  
Electronic  
Equipment

Combined  
Neon-Tester and  
Saw-tooth Generator

### Ideal for on-the-spot

- Voltage measurements :
- Signal tracing (A.F., I.F., R.F.) :
- Valve and component checking :
- Polarity and mains indications :
- Spark plug testing.

**An Invaluable  
Field-Service Aid**

Price  
**24/-**

**MERCIA ENTERPRISES LIMITED**  
Godiva House, Allesley Old Road, Coventry

S.A.E. for illustrated leaflet. Trade Enquiries invited.

# ADCOLA

(Regd. Trade Mark)

## SOLDERING EQUIPMENT

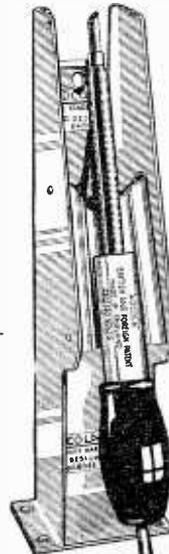
### ILLUSTRATED

3/16" Detachable  
bit type (List  
No. 64)

Protective Shield  
(List No. 68)

Catalogues sent  
**FREE**

Telephones :  
MACaulay 4272  
& 3101



British and  
Foreign Pats.

Reg. Designs,  
etc.

Head Office, Sales :

**ADCOLA  
PRODUCTS  
LTD.**

Gauden Road,  
Clapham High  
St., London,  
S.W.4

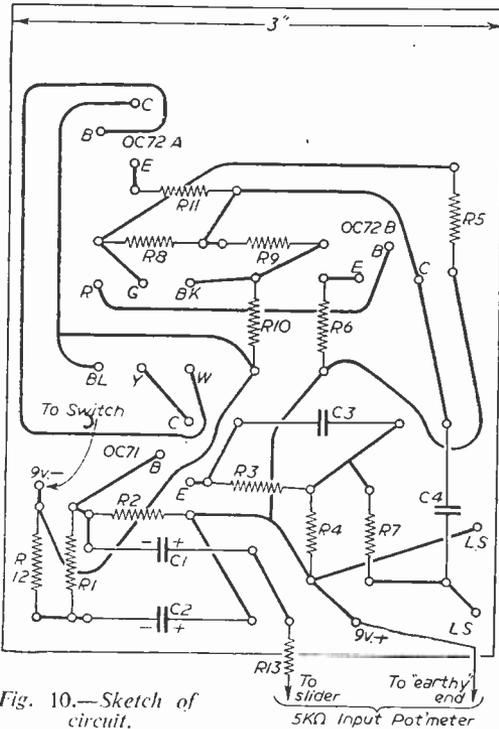


Fig. 10.—Sketch of circuit.

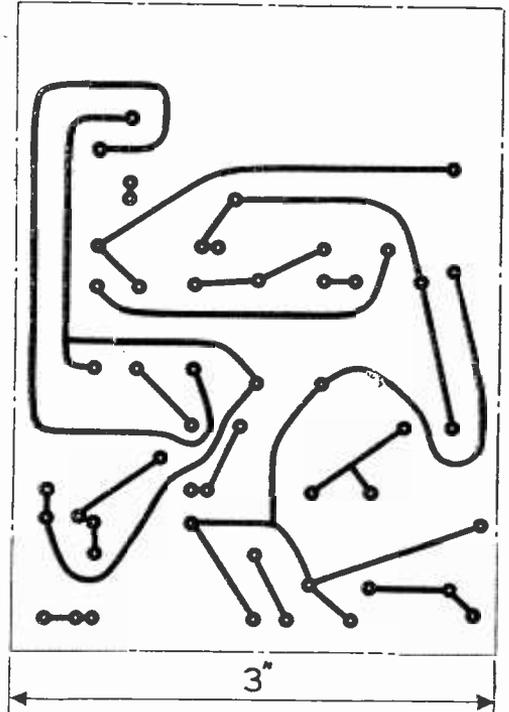


Fig. 11.—Master drawing.

definition and accuracy. The blue grid disappears during subsequent photographic processing. The pencil sketch is then transferred to the new scale, and the printed circuit drawn, bearing in mind all the rules laid down in the first article of this series.

Various aids are available for the draughtsman at this stage, as well as the graticuled board. Self-adhesive black circles are provided for component centres, and similar tape for the connecting lines can be obtained in any width required from a small machine at his side. A basic outline of any standard connections, etc., may be pre-printed on his board. Remaining parts of the drawing are done by painting in process black which is obtainable from most artists' colourmen. Indian ink is not used, as its shiny surface interferes with later camera work. Naturally, if the special aids mentioned are not available, the whole drawing is done in process black. Corrections are made by painting over with a special white preparation or with the more easily obtained Chinese White oil colour. The master drawing of the circuit is shown in Fig. 11.

**Layout**

It will be seen that whilst the printed circuit wires run in any direction, the components are all parallel to the edges of the circuit board. This has no technical advantage, but, wherever possible, an orderly layout of components is better to look at, and a neat and workmanlike appearance is part of good engineering design.

Before leaving the subject of masters, mention must be made of a material known as

"Astracscribe" used in industry for very large circuits. This is a plastic foil sheet, sometimes used on its own for printed circuit masters, as it is more stable dimensionally than Bristol Board. It is coated on one side with a non-actinic orange lacquer. The printed circuit is then "drawn" full size in negative form by scraping away the lacquer. A retouching fluid is available to cope with errors.

Having obtained the master drawing, the next step is to consider how the circuits are made. This will form the subject of the next article in the series.

**PRACTICAL TELEVISION**

February Issue

NOW ON SALE, PRICE 1s. 3d.

AN IMPROVED VIDEO AMPLIFIER  
THE "SOFT" C.R. TUBE  
ANALYSING AND SERVICING TV  
RECEIVERS

TELEVISION AND THE FILM INDUSTRY  
EXPERIMENTAL COLOUR TV  
SIDELINES OF TELEVISION

Regular features include *Telenews, Your Problems Solved, Underneath the Dipole, News from the Trade, etc.*

# A.V.C. WITH "STRAIGHT" VALVES

VARYING SCREEN GRID VOLTAGES TO ALTER GAIN

By James Kaye

**T**HE normal variable slope or variable-mu valve can have its gain altered by a change in the D.C. potential of the grid of the valve. Where the screen of the valve is fed via a feed resistor the valve compensates to quite an extent for the change in grid bias because the screen voltage rises. A rise in screen voltage increases the gain of the valve.

## Obtaining the Control Voltage

During the last war the EF50 valve was introduced, and with it a circuit for the application of A.V.C. to the screen of the valve. Although the valve was a high slope "straight" type, varying the screen potential altered the gain. Thus A.V.C. can be obtained with straight valves, but the difficulty lies in obtaining the varying potential for the screened grid. The normal rectifier circuit gives the correct polarity, but if this is applied to a valve control grid to amplify it.

resistance such as 10 M $\Omega$  and should preferably be fed by way of a Pi network with a large time constant. R1 is the value of screen resistor that would normally be used for the screen supply of the combination of valves used. R2 should be of such a value that it passes about 5 to 10 mA. (the more current the better). R3 should be such that the valve will be nearly cut off, R4—a 500 or 1,000 ohms wire-wound pot. is for setting the A.V.C. delay characteristic. With the valve not cut off, there will be no A.V.C. delay, but if it is cut off the voltage in excess of cut-off will be the A.V.C. delay voltage.

## Action of Circuit

A positive signal is rectified and applied to the grid of the valve. This has the effect of overcoming the cut-off and allowing the valve to pass current and so increase the voltage drop across R1. The larger the positive voltage applied to the grid then the larger the drop across R1 and the lower the gain of the controlled valves. The capacitor from the anode of the valve to chassis should be about 0.1  $\mu$ F of ample working voltage. Separate decoupling between the screens of the valves fed can also be used to good effect.

A simple and inexpensive circuit is shown in Fig. 2 and two similar valves can be used for it. It can be fed off the normal negative A.V.C. line to increase A.V.C. efficiency in the receiver with the normal types of variable-mu valve—or used with straight valves. The circuit has only two resistors: R1 must allow for the triode to take some current, as well as feed the screens of the controlled valves. R2 must act both to couple the cathodes and over bias both valves considerably—the values of both these resistors will have to be found by experiment. When the negative control voltage is applied the current through V1 falls, reducing the voltage across R2 and in consequence the bias on V2. This latter then takes more current and reduces the screen voltages of the controlled valves. As stated the circuit values will depend on the valves used and will have to be found by trial and error.

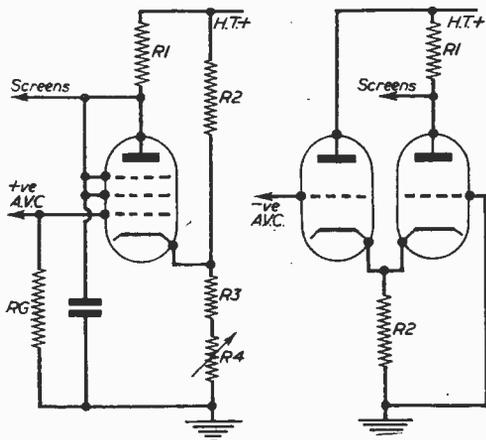


Fig. 1 (left) and Fig. 2 (right) give circuits for screen controlled A.V.C.

the polarity is reversed. Thus, a positive voltage is required to feed to a valve—or a polarity reversing device is necessary. The first is simple: the normal type of A.V.C. detector circuit is used from the I.F. valve anode, but the diode is reversed. This cannot be done with the normal double-diode-triode, but it can be achieved by the use of either a separate double-diode or one of the modern triple-diode-triodes such as the Mullard EABC80.

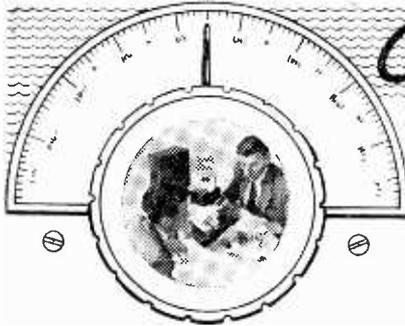
## Circuit

In Fig. 1 is shown a simple circuit for screen control. The component values will depend to a very large extent on the valves available. The control valve can be almost any type strapped as a triode, a high slope triode, R.F. pentode, or even (and best of all) a high slope output valve. The grid is returned to earth by a suitable high

## JOIN THE PRACTICAL GROUP

Edited by F. J. CAMM

PRACTICAL WIRELESS ... ..	1/3
PRACTICAL TELEVISION ... ..	1/3
PRACTICAL HOUSEHOLDER ... ..	1/3
PRACTICAL MECHANICS ... ..	1/3
PRACTICAL MOTORIST & MOTOR CYCLIST ... ..	1/3



# On Your Wavelength

BY THERMION

ing voice and a background of din created by strumming on a draining board is not singing, nor music.

## "Educating Archie"

I PRESUME that the Research Department of the BBC has taken a measure of the popularity of *Educating Archie* sometime, and have facts to support the continuation of this inane programme with its plethora of feeble jokes and thin humour. I took a consensus of opinion the other day among a circle of my friends and found that not one liked this programme and I am wondering whether you agree with me. I see no purpose in having a ventriloquial act on sound radio. The part of the dummy could be better performed by a human being. Indeed, Archie sounds as if he is a real person. If the programme is wanted, it should be confined to television.

## Programmes for Tape and Hi-fi Enthusiasts

ALL readers interested in tape recording and high fidelity will welcome the new series of programmes on sound which started on January 5th on Network 3. The BBC, in its announcement stated that the large and ever-growing body of enthusiasts for hi-fi sound reproduction and tape recording are to have their own programme entitled "Sound." It will consist of practical help and examples of first-class recordings and news of the latest developments. It will be 2 half-hour programme once a fortnight on Mondays at 6.45 p.m. on Network 3. On the Mondays in the weeks between, recorded repeats of the previous Monday's live programme will be broadcast at the same time.

Specialist dealers in tape and hi-fi will especially welcome this programme for it will be a great sales aid.

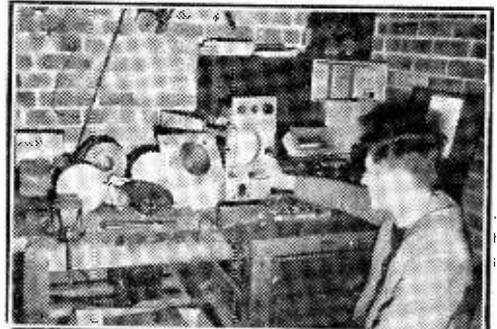
## How Many Valves in Push-pull?

ONE of my older readers, Mr. A. Brook, of Hastings, says that it is rather more than 33 years ago since he first read my writings in this journal. He remains a reader and marvels at the fact that I am still able to keep my beard from getting tangled in the wheels of my bath-chair! I am delighted to say, however, that I have not yet reached that stage of decrepitude where I need a wheeled aid. I am pleased also to be able to say that I have never grown one of those revolting hirsute appendages known as a beard—an affectation now adopted by large numbers of young men to give, in conjunction with horn-rimmed spectacles, an owl-like and professorial vaneer to an otherwise vapid and vacuous countenance. The radio trade is full of bearded youths, anxious to impress. Of course, they all smoke pipes as well to increase the illusion of "the thinker." Nor have I ever grown a moustache, being too fond of soup for either.

Mr. Brook asks me how many valves in all can be operated in parallel push-pull, ignoring problems of capacity which this might cause, in either audio or R.F. amplifiers. Whilst my own experience is limited to four valves, there is really no practical limit, although I cannot for the life of me understand why anyone should want to use more than four. This is a problem, however, which readers might like to debate.

## Slanguage

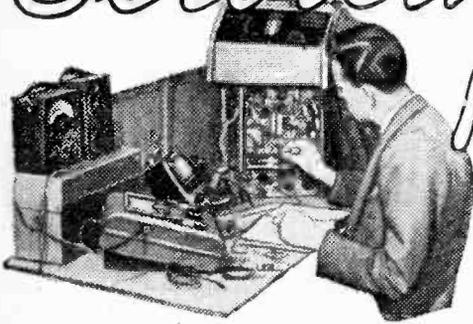
I HAD no idea so many people were taking note of the slipshod and would-be superior pronunciation used by announcers and artists. Some gems have reached me: Storbins (St. Albans); Mawbra (Marlborough); and Soresbery (Salisbury). It is impossible to distinguish between a BBC Malden and Morden, since they are both pronounced similarly. Evidently, this mispronunciation confuses other members of the BBC staff, for it is said that one producer required a fanfare as incidental music for a play. The record library supplied a record of a mechanical organ and shouts of "roll up"—a fanfare, which shows the danger of messing about with vowel sounds. The general tendency of artists to imitate negro pronunciation is adding to the confusion. No one could be more of a Cockney than Master T. Steele. He, however, must refer to "Mar Bebbey," uttered in a staccato fashion when he is really referring to some lady friend. These pop singers should remember that a bawl-



Mr. P. R. Thompson of Taunton, Somerset in his den.

It is known that there are at least 250,000 home tape recorders in use in this country and the number is increasing daily. The potential audience is therefore large.

# Servicing Radio Receivers



BUSH MODEL VHF61

By Gordon J. King, A.M.I.P.R.E.

**T**HIS is a table model catering for the long and medium wave and V.H.F./F.M. bands. Piano keys are adopted for waveband and gram selection and for switching the receiver off,

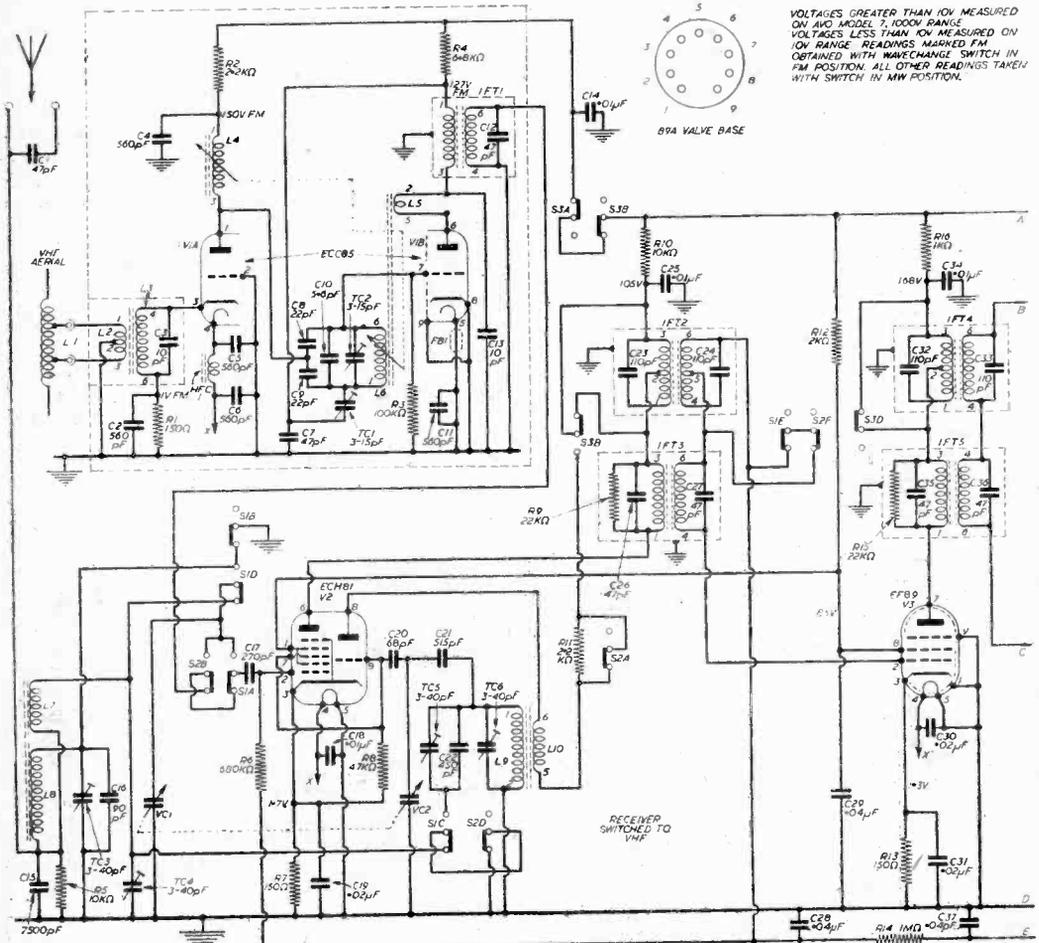


Fig. 1 (a)—Circuit of F.M. R.F. and frequency-changer stages; A.M. frequency-changer stage and common I.F. amplifier. Note: The F.M. tuner unit (V1A and V1B) is used in several other models and, if heaters are wired in series, C11 is used as a heater by-pass capacitor.

while two concentric controls provide for the adjustment of volume and tone. The V.H.F. tuning drive is coupled to the tuning capacitor spindle and the tuning control knob is thus common to both the A.M. and F.M. services.

With the application of negative feedback over the audio stages, a low distortion audio output of approximately 2.5 watts is given by the EL84 output valve. Facilities are provided for the connection of a high impedance (crystal) pick-up and for an extension permanent magnet loud-speaker having a speech coil impedance in the region of 2.5 ohms. An internal ferrite rod aerial for A.M. reception is permanently connected in circuit, but a socket is provided for the connection of an external aerial. For F.M. a loaded dipole is fitted to the back of the cabinet which, if required, can be connected to the V.H.F. aerial sockets by way of the 80-ohm feeder provided. In areas of weak V.H.F. signal, reception is much improved by abandoning the internal dipole and using a good indoor or outside aerial.

The receiver is suitable for use on A.C. supplies only (40-100 c/s), but can be adjusted over the ranges of 100-120 volts and 200-250 volts. Mains consumption is approximately 65 watts.

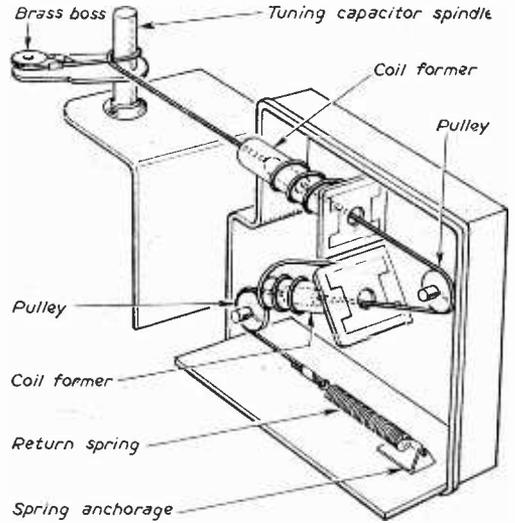


Fig. 2.—V.H.F. tuning cord drive.

**Valve Line-up**

The circuit operates in two modes, one when switched to the long and medium bands and the other when switched to V.H.F. When switched to L.W. or M.W. the valve line-up is as follows: ECH81 (V2) frequency changer; EF89 (V3) first I.F. amplifier; EF89 (V4) second I.F. amplifier; EABC80 (V5) A.M. detector, A.G.C. diode and audio amplifier; EM81 (V6) tuning indicator;

EL84 (V7) output; EZ80 (V8) full-wave H.T. rectifier.

When switched to V.H.F. the circuit is slightly modified, the V.H.F. tuner is brought into circuit and the valve line-up is as follows: ECC85 (V1 in the tuner) V.H.F. amplifier and frequency changer; ECH81 (V2) heptode section as first I.F. amplifier; EF89 (V3) second I.F. amplifier; EF89 (V4) third I.F. amplifier; EABC80 (V5) ratio detector and audio amplifier; EM81 (V6) tuning

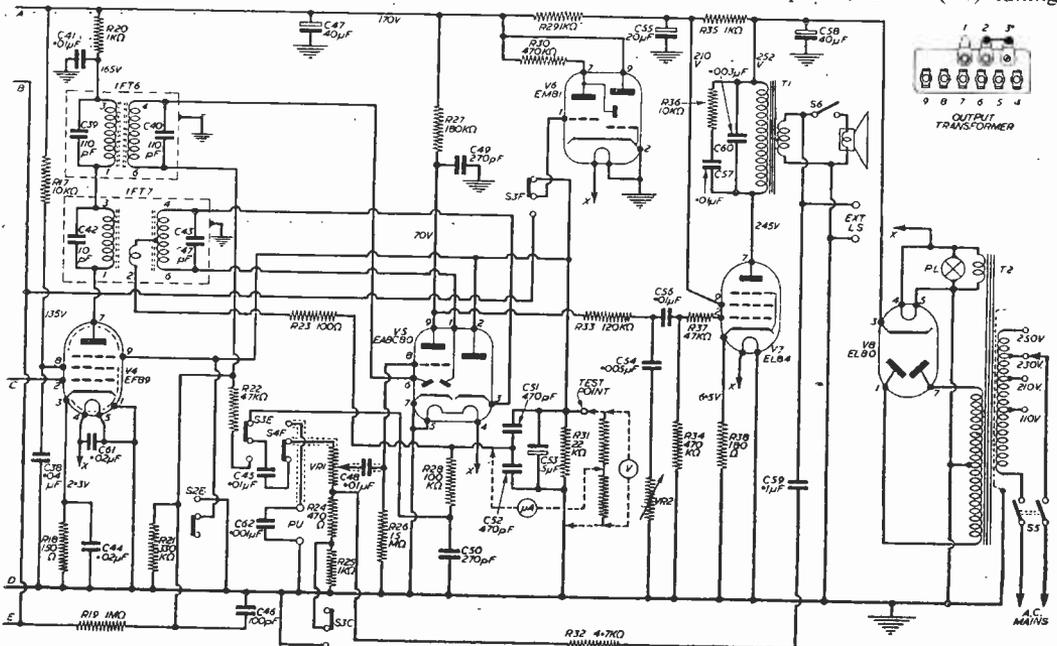


Fig. 1 (b).—Circuit of detector and output stages, power-pack and tuning indicator.

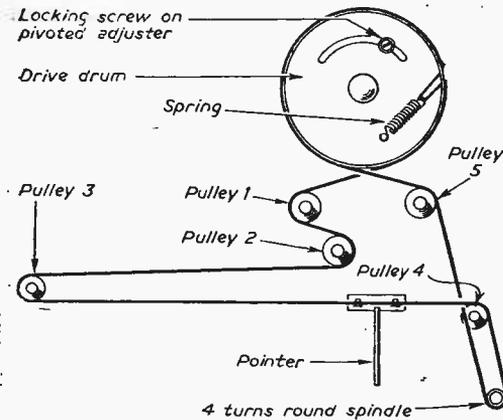


Fig. 3.—A.M. tuning cord drive.

indicator; EL84 (V7) output; EZ80 (V8) full-wave H.T. rectifier.

### The Circuit

The valves as detailed above are numbered in accord with the circuit in Fig. 1. A fairly conventional arrangement is utilised, though the additional I.F. stage is worthy of note since it goes far in increasing the overall sensitivity, and renders the receiver useful in areas of weak V.H.F. signal.

When the receiver is switched to V.H.F., as shown in the circuit, the V.H.F. tuner is energised from the H.T. line via switches S3A and S4B and the I.F. output (10.7 Mc/s) is connected to the control grid of the heptode section of V2 via S2B and S1A. The triode A.M. oscillator is also muted by the opening of S3B, while the secondary of the A.M. I.F. transformer IFT2 and the primary of the A.M. I.F. transformer IFT4 are short circuited by switches S1E, S2F and S3D.

The A.F. signal from the ratio detector is developed across C50 and fed through S3E, C45 and S4F to the volume control VR1. From here the required level of signal is selected and fed through C48 to the grid of V5 triode. From the anode of this valve section, the amplified A.F. signal is applied to the output valve in the usual manner.

The rectified carrier voltage appearing across R31 is applied to the tuning indicator V6 via S3F. The voltage at this point is also applied to the suppressor grid of the third I.F. amplifier valve V4 to provide a form of A.G.C. De-emphasis is provided by R28 and C50, and further tone correction is given by the tone control VR2 and C54.

The V.H.F. tuner is contained within a separate box and the tuning is achieved by means of spring-loaded dust-iron cores which traverse the oscillator and R.F. anode coils. The movement of the cores is controlled by means of a drive cord coupled to the spindle of the A.M. tuning capacitor. The arrangement is clearly illustrated in Fig. 2. In the event of a breakage of the drive cord or tuning cores, the manufacturer recommends the replacement of the complete drive cord and core assembly (part No. AP24888).

When the receiver is switched to the L.W. or M.W. bands, the V.H.F. tuner is disconnected and the A.M. oscillator is energised. The shorts from across the A.M./I.F. transformers are removed and the receiver functions as a conventional A.M. model, but with two I.F. stages.

The A.M. detector load is R21, and the A.F. signal here is conveyed to the grid of V5 triode section as before by S3E changing over. The suppressor grid of V4 is earthed by S2E and the control voltage for the tuning indicator V6 is taken from the A.G.C. line, which itself is fed from the detector load. A.G.C. bias is applied to both I.F. stages and to the frequency changer.

Current feedback is applied to the output valve by the omission of a cathode bypass capacitor and voltage feedback is taken from the secondary of the output transformer, through C59 and R32, to the control grid circuit of V5 triode. The voltage feedback is somewhat frequency selective, being greater at the higher frequencies owing to the reducing reactance of C59 as the frequency is increased. The A.F. response is smoothed and controlled by the components across the primary of the output transformer.

### Servicing Notes

In the event of failure of the A.M. drive cord, a good quality nylon drive cord should be used as a replacement, or the complete clip and drive cord assembly (part No. P1940) should be obtained from the makers, and should be installed in accord with the diagram in Fig. 3.

The scale lamp is rated at 6.5 volts 0.3 amp. and this can also be obtained from the makers under part No. AP18628.

### Complete Failure

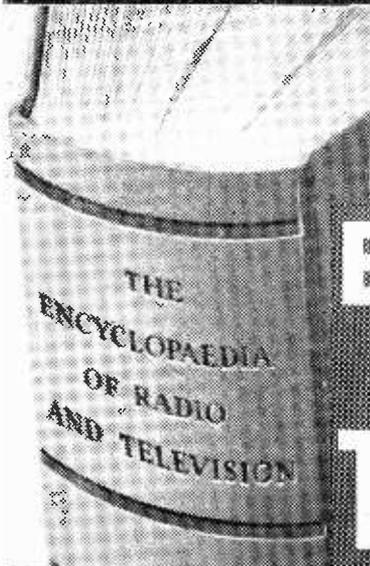
Lack of signals on all bands should lead first to a check of the H.T. line voltage across C47. If there is no voltage here, but there is voltage across C55, the trouble is caused by open-circuit of R29 and a possible short in C47. If voltage is present at the cathode (pin 3) of the rectifier V8, but is missing from across C55, R35 should be suspected for open-circuit: these filter resistors often go open-circuit, but are easy to test.

If H.T. is available all the way through the receiver, the A.F. stages can be quickly checked by putting a finger on the centre tag of the volume control when the control is turned full on. If this does not result in a loud hum from the loudspeaker, then the trouble lies in V5 or V7 or in the associated circuits. Open-circuits of R27 or of the primary of the output transformer gives this symptom. There is also the possibility, of course, that the loudspeaker speech coil is open-circuit or that the speaker is disconnected from the secondary circuit; a check should be made of the speaker switch.

If the A.F. stages are working correctly, a fault is present in stages V2, V3 or V4. Valve trouble is the most likely cause, and this will destroy the operation of the tuning indicator, though this may work normally on tuning a station even if the A.F. section is defective, provided the diodes in V5 are in good working order.

(Continued on page 52) -

**AMAZING OFFER To "Practical Wireless" READERS!**



**YOURS on 7 DAYS' FREE APPROVAL!**

**ENCYCLOPAEDIA of RADIO and TELEVISION**

Up to the Minute!  
Comprehensive! Authoritative!

**736 PAGES**  
**Nearly 800**  
**SPECIALLY PREPARED ILLUSTRATIONS**

**OVER 3,000 A-Z ENTRIES**

Aerials; Amplification; Attenuation; Audio-Frequency Transmission; Automatic Gain Control; Broadcasting; Communication Systems; Colour Television; Detection; Direction-finding; Distortion; Electrical Machinery; Electrical Recording; Feedback; Feeders; Interference; Loudspeakers; Measuring Instruments; Modulation; Oscillators; Power Distribution; Power Supply; Public-address equipment; Pulse Code Modulation; Radar; Ratcheting; Receivers; Rectification; Relay systems; Senders; Stereophonic Reproduction; Symbols, Abbreviations; Testing and Fault Tracing; Tilt and Bend; Tuning; Transmission (general); Valves; Vision Frequency Transmission; VHF; Wave Propagation; etc.

**THE ESSENTIAL REFERENCE for AMATEUR or ENGINEER**

Here's the complete A-Z guide, packed with clear explanations, latest information and valuable reference data, that meets the practical man's every need! Essential to the enthusiastic amateur, practising radio engineer, apprentice or student. Over 3,000 easy-to-follow entries deal thoroughly with every aspect of the theory and practice of television, radio, radar, etc. *New edition, brought up to date by the inclusion of an appendix covering recent developments.* Special reference section gives useful formulae, abacs, etc. The most remarkable value in any work of this type ever published! 736 pages. Over 300,000 words. Nearly 800 illus. De Luxe Edition, handsomely and strongly bound, yours (if kept) for only 30/- (cash price), or 11/6 down and 2 monthly payments of 10/- (31/6).



**DO THIS NOW!** To accept this great offer, simply fill in form and post in 2d. stamped, unsealed envelope to Dept. E.B.26, People's Home Library, Odhams Press Ltd., Basted, Sevenoaks, Kent. Book comes to you ON APPROVAL —if satisfied you send remittance (full cash or down payment)—otherwise you return book within 8 days. Offer applies in U.K. only (not Fire), closes Mar. 31.

**POST FORM TODAY! SEND NO MONEY NOW!**

To: Dept. E.B.26, People's Home Library, Odhams Press Ltd., Basted, Sevenoaks, Kent. Please send me, WITHOUT OBLIGATION TO PURCHASE, "Encyclopaedia of Radio & Television." I will EITHER return the book in good condition, postage paid, within 8 days. OR send down payment of 11/6 eight days after delivery, followed by 2 monthly instalments of 10/- (31/6). ALTERNATIVELY, I will send the cash price of 30/- eight days after delivery.

Signature..... Occupation.....  
 (Persons under 21 will be sent a Guarantor Form.) Age, if under 21.....  
 Put tick where applicable: Cash  Terms  Householder  Lodgings   
 Furnished Premis.  Unfurnished Premis.  Hotel  Liv: with Parents

NAME..... USE BLOCK LETTERS BELOW  
 Full Postal ADDRESS.....

E.B.26/March, '59 Firmly affix 2d. stamp in margin

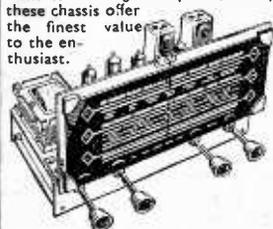
# KINGSMERE SUPPLIES LIMITED

All Goods Post Free. (Export extra.)

MAIL ORDER HOUSE

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

Built to the highest specifications, these chassis offer the finest value to the enthusiast.



**ALL BRITISH RADIOGRAM CHASSIS. 3 WAVEBANDS 5 MULLARD VALVES**  
**ECH42, EF41, EBC41, EL41, EZ40.**  
 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. feedback. 4 watts. Chassis size 13½ x 6 x 8in. high. Aligned and calibrated ready for use. Quality at Low Cost. Chassis isolated. H. P. Dep. £5 and five monthly of £1.

**OUR PRICE £9-9-0**

Matched Speakers, 5in., 6in. x 4in., 6½in., 8in. 17/6 ea. 10in. 25/-.

90-DAY GUARANTEE		VALVES		ALL BRAND NEW	
6/6	7/6	1/6	5/6		
SU4	3A5	954	IT4		
6K8G	6Q7G	EA50	6K6GT		
6N7M	12AX7	E1148	807		
6V6G	EF41	6H6GT	SP61		
6X5G	EL84	2/6	EF92		
6AM6	EZ40	6K7G	6AC7M		

**SPECIAL PRICE PER SET**

6K8G, 6K7G, 6Q7G, 6V6G, 6X5G... 27/6  
 IR5, IT4, IS5, 3V4 ... 25/-  
 Matched Pairs 6V6G ... 12/6  
 Valve Boxes, All Sizes ... 2/- doz.  
 Carbon Pots, 5K to 2M, 3/-; DP, 4/-.

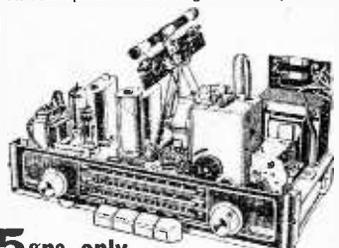
**BSR 4-SPEED SINGLE PLAYER Model TU9.** Our bargain price, 95/-, with cut out mounting board, 12½in. x 16½in.

**CONTINENTAL SIEMENS "NORA" AM-FM RADIOGRAM CHASSIS (Leaflet S.A.E.)**

MADE IN WEST GERMANY  
 CANCELLED EXPORT TO U.S.A.  
 5 Valves ECC85, ECI181, EF89, EABC80, EL95.  
 Plus full wave metal rectifier.

Free of Interference, Jamming and Whistles. Circuit of latest technique, covers entire V.H.F., F.M.—MEDIUM and LONG WAVE. Ferrite Aerial. Gram. Pick-Up switching. Tone and Volume controls. 3 watts. Music and Speech—intimate and clear. Size 12½in. x 7½in. x 6½in. A.C. 100/250. FULL GUARANTEE.

H. P. Dep. £8-10 and eight monthly of £1.



**15 gns. only**

Speakers, 5in., 6½in., 8in: 17/6, 10in. 25/-.

**FOAMCOURT WAYE, FERRING, WORTHING, SUSSEX**

## Build your own TAPE RECORDER "ASPDEN" Tape Deck and Amplifier Kits



**TAPE DECKS.** 2-speed, twin track, easy to assemble kits with finest motor. Ferrucube heads and full instructions.

Model 582 for 5in. spools, kit £8.5.0.  
 Model 782 for 7in. spools, kit £9.5.0.  
 Either model assembled and tested, 30/- extra.

**AMPLIFIER kit,** 2½ watt, record, replay, 2 recording positions, neon indicator, etc., £5.18.0. Power Pack kit for above, £2.18.6 (both without valves). Carr. and packing extra.

Mr. R. White of Omagh, N. Ireland, writes:  
 "The performance of the recorder is very good, and I recommend it to all those who wish to get first class performance at approx. half the cost."  
 Mr. W. R. J., of Kent, writes:  
 "... and I am amazed at the surprisingly first class quality that the amplifier performs."

Build your recorder now.

Send STAMP for full particulars to:—

**W. S. ASPDEN** Stanley Works, Clevedon Road, Blackpool, Lancs.

## REPANCO

HIGH GAIN TRANSISTOR COMPONENTS

STANDARD RANGE

**Ferrite Slab Aerials Type FS2.** Designed for Long and Medium Wave reception with transistor portable superhet receivers. Slab size 5½in. x ¾in. x 5/32in. Complete with fixing brackets, 13/6.  
**Combined Oscillator and 1st I.F. Transformer Type OT1.** 13/16in. sq. x 1½in. I.F. Frequency 315 Kc/s., 11/6.  
**2nd I.F. Transformer (315 Kc/s.) Type TT2,** 5/-.  
**3rd I.F. Transformer (315 Kc/s.) Type TT3,** 5/-.  
 I.F. Transformers enclosed in iron dust pots with slug tuning.  
**Push Pull Interstage Transformer Type TT4.** Ratio 1 : 1 C.T. Stack size 1½in. x 1 1/16in. x 7/16in., 8/6.  
**Push Pull Output Transformer Type TT5.** Ratio 15 : 1 C.T. Size as TT4. Matched to 3 ohm speaker, 8/-.

**MINIATURE RANGE.—For pocket receivers.**

**Ferrite Slab Aerial Type FS3.** Medium Wave only. With fixing grommets. Size 3in. x ¾in. x 5/32in., 7/6.  
**Oscillator Coil Type X08.** Medium Wave only. Overall size ¾in. dia. x 1in. Enclosed in Ferrite pots, 5/-.  
**I.F. Transformer Type XT6.** Suitable for 1st and 2nd I.F. 455 Kc/s. Size ¾in. sq. x 11/16in., 10/-.  
**I.F. Transformer Type XT7.** Designed for 3rd I.F.T. or detector I.F.T. 455 Kc/s. Size as XT6, 10/-.  
**Push Pull Interstage Transformer Type TT9.** Ratio 1 : 1 C.T. Radiometal Core. Size ¾in. x ¾in. x 13/32in., 12/6.  
**Push Pull Output Transformer Type TT10.** Ratio 8 : 1 C.T. Matched to 3 ohm speaker. Size as TT9, 12/6.  
 Practical and Theoretical circuits enclosed with each Repanco Transistor Component.

**JUST RELEASED. "THE MAJOR-7"** a new portable transistor receiver. Size 9in. x 7in. x 4in. Send 1/9 P.O. for instructions.

Mail Order and Trade:  
**RADIO EXPERIMENTAL PRODUCTS, LTD.**  
 33 Much Park St.  
 COVENTRY  
 Tel.: 62572

Wholesale Enquiries and Export:  
**REPANCO, LTD.**  
 O'Brien's Buildings  
 203-269 Foleshill Rd.  
 COVENTRY  
 Tel.: 40594

# STEREO BY RADIO

PRESENT-DAY METHODS USING TWO TRANSMITTERS

By J. Booth

**I**T is now general knowledge that when two or more separate and quite independent audio channels are used to record and reproduce, say an orchestra, so that the original spaciousness and perspective of the complex sound are re-created by the loudspeaker system in the listening room, the result is said to be stereophonic sound.

Present stereo practice, from the domestic angle, makes use of just two channels. At the transmitting end two microphones are placed in such a way that one is more responsive to sounds originating from the right-hand side of the source of sound, while the other is more responsive to sounds originating from the left-hand side. Eventually the signals are fed to two separate loudspeakers, these being arranged in the listening room to give the best stereo illusion (see Fig. 1).

### Two Radio Channels

There are no great problems involved in the broadcasting of stereo sound, and a method which has been adopted experimentally both in this country and in the U.S.A. calls for the use of two independent radio channels and transmitters at the sending end and two receivers at the listening end. This is very expensive as it calls for duplicated equipment throughout the chain, as can be seen from Fig. 2. Nevertheless, the method does serve to illustrate the feasibility of stereo broadcasting.

Over the past several months, the BBC has been actively engaged in stereo broadcasting experiments. Television and V.H.F. channels and medium wavelengths have been utilised in various combinations to carry the right-hand and left-hand stereo signals so that the greatest number of listeners could participate in the experiment.

A further series of tests at fortnightly intervals between 10.15 and 11.15 a.m. on Saturdays are being carried out by the BBC at the time of writing. Both medium-wave and V.H.F. Network Three transmitters are used for the left-hand channel, while the BBC television sound transmitters are used for the right-hand channel.

Readers can participate in these experimental stereo transmissions by using a TV receiver and either an ordinary broadcast receiver, tuned to M.W., or a V.H.F. receiver. The loudspeakers of the two receivers should be spaced by about 6ft. to 8ft. and the listener should be approximately equidistant from each. For the best stereo illusion, the quality and level of the sound from each loudspeaker should be matched as far as possible.

Because the phase difference between the signals in each channel has a governing effect on the stereo illusion, the use of two transmitters far removed from each other may disturb this phase relationship and detract from the quality

of the stereo. This is, at least, one shortcoming of stereo broadcasting from separate transmitters which are not co-sited.

In America, two separately owned F.M. stations sometimes get together so that one station broadcasts the sound of one channel, while the sound of the other channel is being broadcast by the other station. The idea is the same as the experiments of the BBC, of course, but in America the difficulties must be greater as the stations are not under a common control.

A regular service adopting a method using two transmitters is hardly good economics, and is very unlikely to be employed. There is also the question of compatibility, for if stereo was not required by a listener, tuning in to just one of the stereo channels would give him only one half of the available audio signal, which would not be the same as a balanced single-channel broadcast.

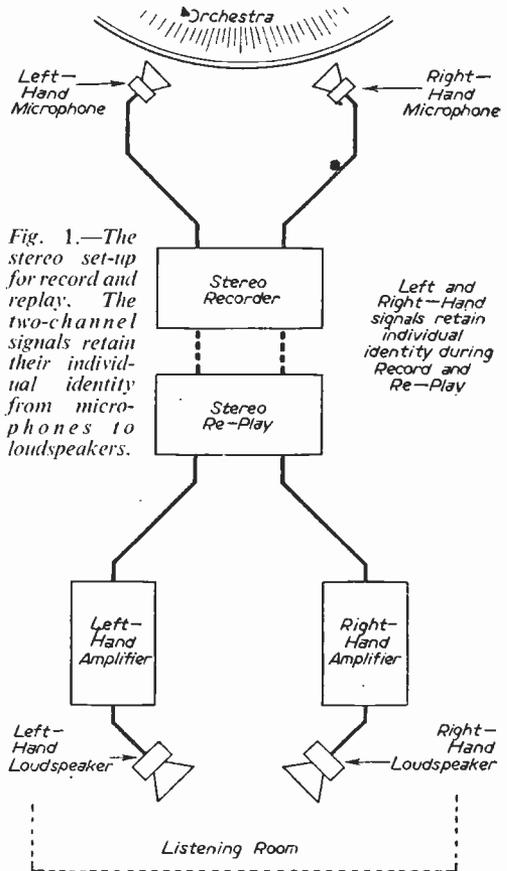
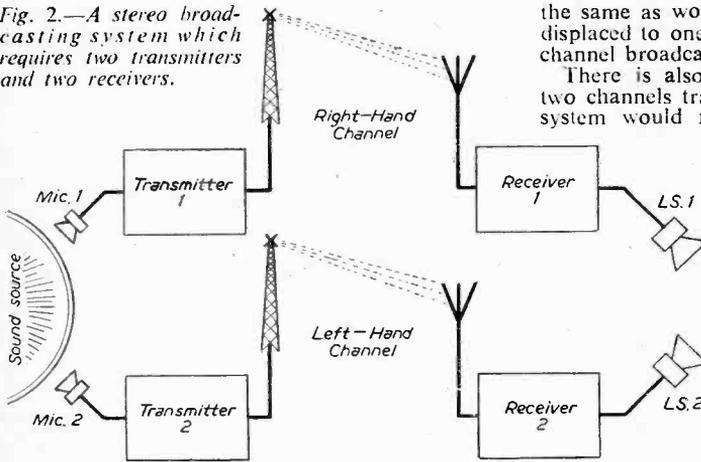


Fig. 1.—The stereo set-up for record and replay. The two-channel signals retain their individual identity from microphones to loudspeakers.

Fig. 2.—A stereo broadcasting system which requires two transmitters and two receivers.



### Two Audio Channels on a Common Carrier

There is no undue difficulty in carrying two (or more) audio channels by way of a single transmitter using only one carrier. This technique is not new by any means, and represents the basis of multi-channel radio links. It obviously has potentialities with regard to stereo broadcasting, and has been the subject of many experiments in America. The system is usually referred to as "multiplex" broadcasting. One channel is transmitted by the F.M. or A.M. station in the ordinary manner, while the other channel modulates a sub-carrier which is not at a very high frequency, but is outside the audio spectrum. A sub-carrier in the region of 50 kc/s is quite common. This modulated sub-carrier is itself then caused to modulate the main carrier along with the modulation of the normally transmitted channel.

At the receiving end, an ordinary receiver, tuned to the station carrier, would reproduce the audio which was normally modulated. The sub-carrier would also be demodulated by the receiver, but since this is well above the audio spectrum it would not be heard and would, in any case, be highly attenuated by the receiver's detector and A.F. section filters.

In order to extract the intelligence of the channel carried by the sub-carrier, the demodulated sub-carrier present at the receiver's detector would have to be directed into a further detector circuit. The audio output of this circuit would be fed into a second A.F. amplifier and loud-speaker system to match those of the receiver proper. The arrangement is illustrated in Fig. 3.

While the general idea is admirably suitable for stereo broadcasting, it again suffers from the drawback of incompatibility: an ordinary receiver tuned to the station would reproduce only the signal in one channel—this being the right-hand channel in Fig. 3. The reproduction would not be unduly mutilated, of course, but it would lack balance, exactly

the same as would occur if the microphone were displaced to one side of an orchestra on a single-channel broadcasting system.

There is also the question of bandwidth, for two channels transmitted by the simple multiplex system would require at least twice the bandwidth of a single-channel system. From the aspect of the power radiated from the transmitter, this may well introduce a power reduction of some four times (6 db power).

### Sum and Difference Method

In order to render this stereo broadcasting system compatible, experiments are being carried out in the U.S.A. at the present time on what is known as the sum and difference method. A sub-carrier is used as before, but

the transmitter is modulated in the normal way with the *sum* of the signals in the two channels. This sum signal is equivalent to that from a correctly balanced single-channel system.

The signals in the two channels are also subtracted from each other to produce a *difference* signal, and it is this signal which is used to modulate the sub-carrier. In order to take advantage of the stereo feature of the transmission, it is necessary to employ a decoding arrangement and an additional audio channel at the receiver, as before. The decoder serves to recover the difference signals and combine them in correct proportion to the audio in the two receiver channels so as to secure the correct stereo illusion.

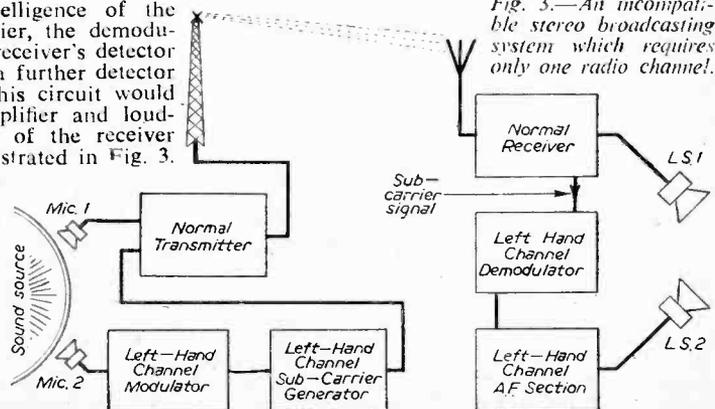
### Percival Method

Experiments along these lines are also going on in this country in the research laboratories of E.M.I. under the direction of Dr. W. S. Percival, who has devised a compatible stereo broadcasting system which differs somewhat from that developed in America.

In order to secure compatibility, the signals in

(Continued on page 56)

Fig. 3.—An incompatible stereo broadcasting system which requires only one radio channel.



# THE THERMISTOR IN PRACTICE

THESE HEAT-SENSITIVE DEVICES ARE WIDELY USED TO-DAY

By James Seaforth

**A** THERMISTOR of the form adopted in radio and television receivers looks rather like a carbon resistor which has dissipated power far in excess of its wattage rating. Indeed, it may well be taken for such an ill-used component by the novice enthusiast when it is first discovered in a set which is being investigated for total failure.

The fact that it gets very hot may also heighten the impression that overloading as the result of a circuit fault is to blame—it being assumed that the high temperature was responsible for the removal of the paint colour markings.

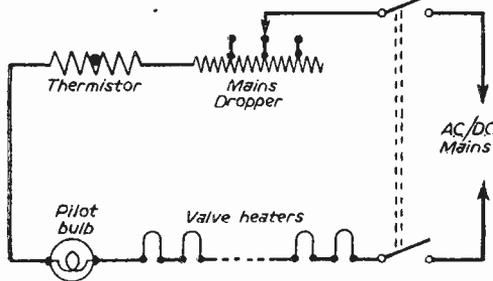


Fig. 1.—A series-connected thermistor avoids current surges in a heater chain.

It should be known that thermistors are designed to get very hot and this is the reason why they are devoid of paint and identification marks, which would not survive when the component is put into service.

### Temperature Sensitive

A thermistor is in essence a resistor, but it differs from the normal run of resistors inasmuch as its value decreases greatly as its temperature increases. It is thus highly heat sensitive and is endowed with a negative temperature coefficient of resistance.

It may be utilised in one of two ways. In one way the component's sensitivity to temperature change may be exploited for the controlling of a current which is actually present in the thermistor and causing it to heat. And in the other way the component's change in resistance owing to variation in ambient temperature may be used to stabilise a secondary circuit of which the resistance has a tendency to drift in the opposite direction.

A thermistor is invariably introduced into a series-connected heater chain (see Fig. 1). Heaters used in valves have a positive temperature coefficient of resistance. This means that when the heater is cold its resistive value is considerably below its normal operating value when hot. With series-connected heaters the chain current is governed by the value of the ballast or mains dropping resistor, and this is calculated in accord with the heater current of the valves.

Thus, when the set is first switched on, the heater resistance is well below normal and the chain current starts off at an abnormally high value and falls off gradually to normal as the heaters increase in resistance. This is not too bad if the heaters increase in resistance together and in step as they warm up. Unfortunately, this does not usually happen, and one or two heaters may reach normal operating temperature and resistance some time before the others when the chain current is high. Since less voltage is dropped by the valves still warming up, an excessive voltage is developed across the valves which have gained their normal temperature and resistance, which means that their heaters are somewhat overloaded which is likely to result in premature failure.

This can be avoided by the use of a series-connected thermistor. The relatively high resistance of the component when cold serves to limit the heater chain current initially flowing through it, but it inevitably warms up and gradually decreases in resistance as the valve heaters increase in resistance. The positive temperature coefficient of the resistance of the heater chain is thus neutralised by the negative temperature coefficient of resistance of the thermistor and harmful current surges are in this way eliminated.

To cater for the variation in valve heating time within a large chain of valves such as is present in television receivers, it is sometimes necessary to shunt the thermistor with a wire-wound resistor of a certain value so as to delay the drop in thermistor resistance until the heaters have had an opportunity to become temperature stable. The value of the shunt resistor is not sufficiently low to permit the passage of a substantial current before the thermistor's resistance drops to its hot value, but it is low enough when cold to bypass some of the chain current away

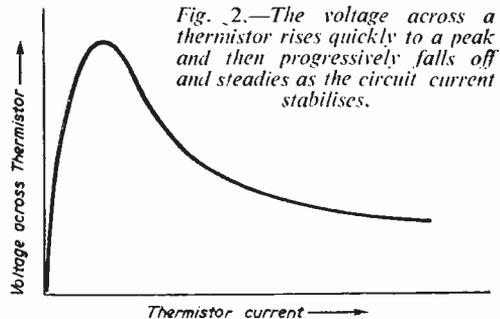


Fig. 2.—The voltage across a thermistor rises quickly to a peak and then progressively falls off and steadies as the circuit current stabilises.

from the thermistor and thus delay its warming up time.

The cold resistance of a thermistor may be several thousand ohms—the Brimistor CZ1 is 3,000 ohms at 20 deg. C.—but only tens of ohms when hot and passing maximum current.

The hotter that a thermistor becomes the lower falls its resistance, and if the current were not

limited by some means it would get red hot and collapse. In a limited current circuit, however, the voltage across the thermistor rises quickly to a peak and then progressively falls off and steadies as the circuit current stabilises. This is shown in Fig. 2.

#### Pilot Bulb Shunt

If a pilot bulb which is connected in a heater chain fails the chain is broken and the heaters go out. This is less liable to happen if a series thermistor is adopted as current surges are then almost eliminated. To prevent a pilot bulb from being over-run a wire-wound resistor is invariably connected in shunt so that the bulb is protected from the full chain current—a portion of it then being bypassed by the shunt resistor.

Should the bulb fail under such a condition, though, the heaters will continue to be energised since the shunt resistor will maintain chain continuity, but they will then be under-run owing to the extra resistance which will be wholly effective in the chain. By utilising a thermistor as a bulb shunt the trouble is avoided, for in the event of bulb failure the thermistor will quickly heat up and its very low hot resistance will have little or no effect on the chain current. A type CZ3 Brimistor is suitable for this application, provided the heater current does not exceed 0.2 ampere.

#### Rectifier Valve and Reservoir Capacitor Protection

A thermistor is highly suitable as a surge-limiting device in H.T. rectifier circuits. Normally, when high value electrolytics are employed, especially for reservoir capacitors, the switch-on current may be excessive and lead to flashing in the rectifier and excessive loading on the electrolytics. The inclusion of a thermistor, as shown in Fig. 3, gives the components a longer life. A

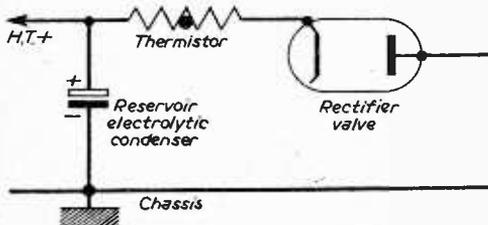


Fig. 3.—A thermistor serves as an efficient surge-limiter.

type CZ1/A is suitable for D.C. up to 100 mA, a type CZ6 for 100 to 200 mA and a type C4 for D.C. exceeding 200 mA.

#### H.T. Voltage Delay

If a directly-heated H.T. rectifier valve is employed, the voltage across the electrolytic capacitors may rise to a dangerously high level during the period before the indirectly heated valves pass current. When the valves conduct, of course, the H.T. circuit is loaded and the voltage falls below the open-circuit voltage level.

Usually, this is taken care of by the use of an indirectly heated rectifier, but there may be a time when the correct valve is not available and a directly heated substitute is contemplated.

A voltage delay comparable with an indirectly heated valve can be accomplished with a directly heated valve by the inclusion of a thermistor in the rectifier circuit as shown in Fig. 4.

When selecting a thermistor for this application, due consideration must be given to the fact that the R.M.S. current in the H.T. secondary tap will be approximately 1.6 times the D.C. output current at the rectifier heater.

#### Compensation for Increase in Resistance of Coils

With the older-style television receiver in which a focus coil is used, readjustment of the focus control is invariably necessary to combat focus drift which occurs progressively as the temperature

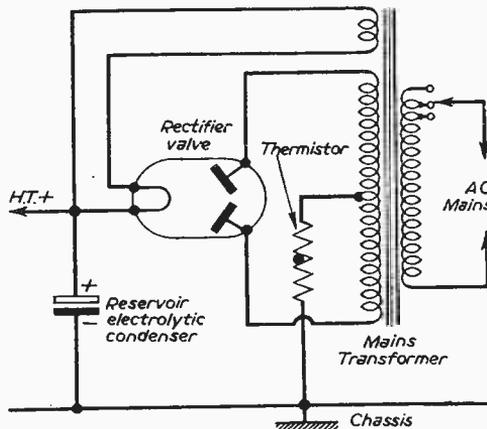


Fig. 4.—A voltage delay is given to a directly-heated H.T. rectifier by the introduction of a thermistor in the circuit, as shown.

of the coil increases. The coil, being wound with copper wire, increases in resistance as it warms up and the coil current falls as a consequence, thereby altering the focusing field.

Focus stability can be accomplished by the insertion of a thermistor in the circuit of the focus coil, as shown in Fig. 5. In this case, however, it is necessary to place the thermistor snugly against the focus coil so that its change in temperature is efficiently transferred to the thermistor.

Thus, as the coil and thermistor warm up, the coil resistance increase is neutralised by the decrease in resistance of the thermistor, and in this way the current and the focusing field are stabilised.

It will, of course, be appreciated that exact compensation demands that the fall in thermistor resistance will be precisely the same as the increase in coil resistance over the range of temperature variation encountered. To provide such a balance it may be necessary to shunt the thermistor with a compensating resistor (shown in broken line in Fig. 5). Another balancing artifice which has been satisfactorily adopted by the author resolves to the adjustment of the characteristic of the thermistor by filing away small portions of the composition until the coefficient characteristics of the thermistor and coil match in opposition.

The thermistor should be dressed in a thin insulating material and strapped tightly to the outside of the focus coil by empire tape.

The thermistor is capable of providing similar compensation to other sections of the receiver where temperature change alters the circuit parameters. For example, temperature increase of the frame scanning coils and frame output transformer often results in a reduction in frame scan amplitude, necessitating frequent adjustment of the height control. A thermistor thermally coupled to the offending winding or windings and introduced into the frame circuit where its resistance variation will combat the rise in coil resistance solves the problem. In this respect, it is often possible to insert the thermistor in the cathode circuit of the frame amplifier valve provided it is suitably "padded" with a resistor to make up the correct nominal value of cathode resistance. Brimistor type CZ2 or CZ3 units are suitable for the above applications.

**Transistor Applications**

Transistors themselves are heat sensitive, and as a result large and disturbing variations in their operating currents may well occur when operating under differing temperature conditions. The thermistor is an ideal agent for eliminating this trouble. In Fig. 6 is shown a transistor-amplifier stage, in which a thermistor is employed in the base bias stabilising network. As the transistor

temperature increases the collector current would normally increase, but this is offset by the thermistor which serves to reduce the base bias current.

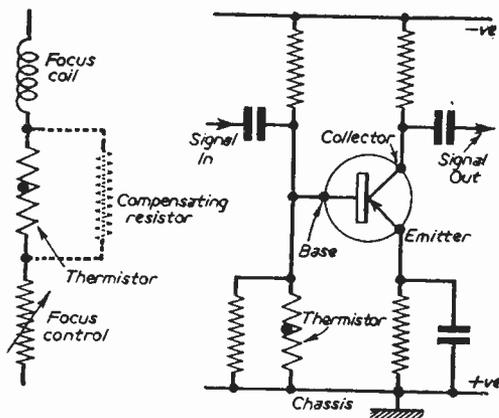


Fig. 5 (Left).—A thermistor is highly suitable for stabilising the current in a focus coil.  
 Fig. 6 (Right).—A suitable thermistor in the base potential divider of a transistor serves to offset the increase in collector current with temperature increase.

**BICC Polypole Coupler Systems**

BRITISH INSULATED CABLES LIMITED have introduced polypole coupler systems to provide the equipment designer with everything necessary for the reliable interconnection of electronic and similar types of equipment. Typical applications are studio, outside broadcast and industrial television camera chains (including colour), ground radar, radio relay links and specialised signalling, remote control, observation and measuring equipment.

**Main Components**

The main components of BICC polypole coupler systems are multicore cables terminated with moulded-on couplers, and appropriate panel-mounting units to which terminated cables may be connected. Cable couplers normally consist of a robust moulding which both holds the individual plug and socket contacts in position, and also provides a firm anchor for the cable. This moulding is, in turn, encased in a strong metallic housing. The cable couplers include straight and right-angled types, and in some flanges are incorporated for permanent mounting. At the

point of entry into coupler the cable is also protected against severe bending either by a substantial rubber muff or, in some cases, by a tough epoxy moulding. Panel-mounting couplers are provided with mounting flanges and are fitted with short flexible insulated tails of appropriate types.

Couplers are normally of the plug and socket type, although alternative dual-purpose designs which are identical and interconnectable are available for some systems. For both types lengths of cable may be connected one to another to increase the distance between units of equipment.

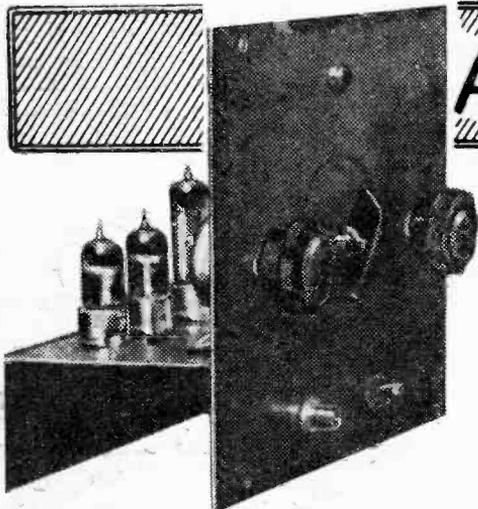
For some types of coupler, equivalent demountable versions are available, thus facilitating rapid repairs especially in countries overseas, when the return of couplers to Great Britain may be difficult or expensive. Nevertheless, BICC moulded couplers in general are more robust, better able to withstand vibrations when used with mobile equipment, have superior electrical properties and are less susceptible to moisture ingress, than are the demountable types.

**Joined by Lock Rings**

The couplers are joined together by lock rings on the socket-type couplers which engage screw threads on the metal housings of the plug type and thus provide the force necessary to engage or disengage the coupler contacts. Where necessary, special tools are available and should be used to ensure that the couplers are properly engaged. In order to ensure correct connections, couplers of a given system are made with specific and selective keyway arrangements. If required, protective caps of either metal or moulded polythene can be supplied.



A BICC 37-wav, moulded-on polypole coupler.



# A WIDE-RANGE AUD.

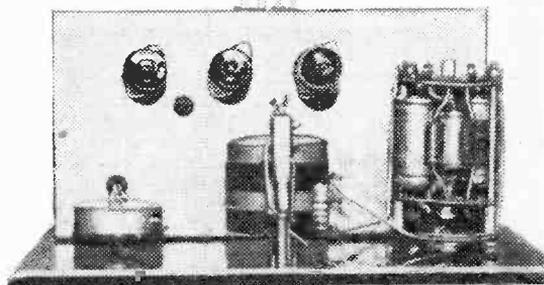
THIS UNIT COVERS 6 TO 70,000 C/S IN FOUR

two sets of switched condensers; the variable ganged resistors and their associated series limiters; the cathode load of the first valve and the thermistor.

More accurate setting of the frequency is possible if continuously variable capacitors are used in conjunction with switched, fixed resistors; this method was, however, discarded on the grounds that a 4-gang variable condenser would

**T**HE usual signal generator coverage of 20-20,000 c/s is no longer sufficient with the introduction of hi-fi amplifiers, magnetic tape recorders and the like. The circuit to be described has a coverage of 6-70,000 c/s and it is found that in particular the extended high frequency range is very useful for covering the bias and erase frequencies of magnetic tape recorders.

The circuit also has the advantage of simplicity and can be built into a small compact unit.



View from above.

### Circuit Description

The chosen circuit is basically a relatively low impedance Wien Bridge network, formed by the

be needed which would be clumsy and prone to pick-up.

It was therefore decided to use ganged potenti-

*Notes*  
All resistors are 1/4 watt unless otherwise stated  
Coupling condensers are 250volts working

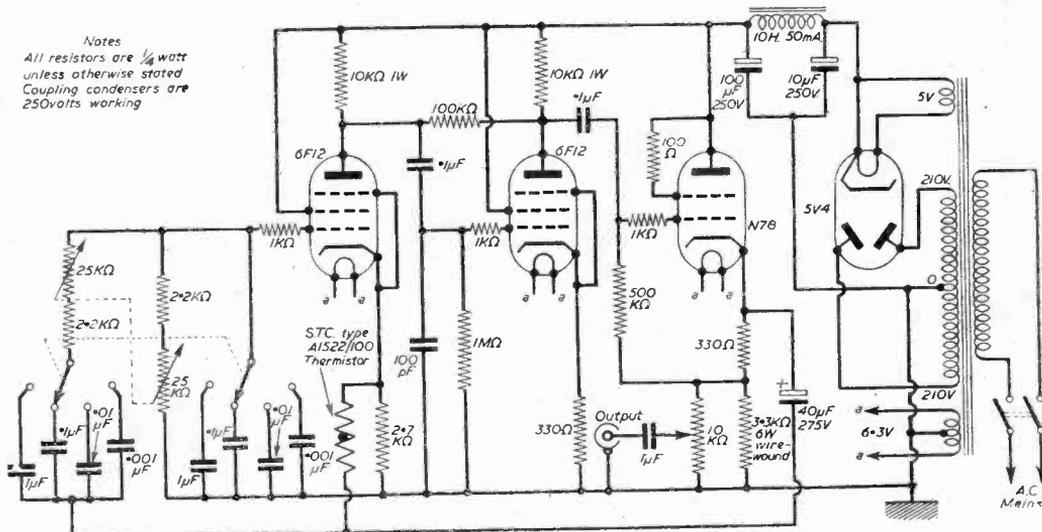


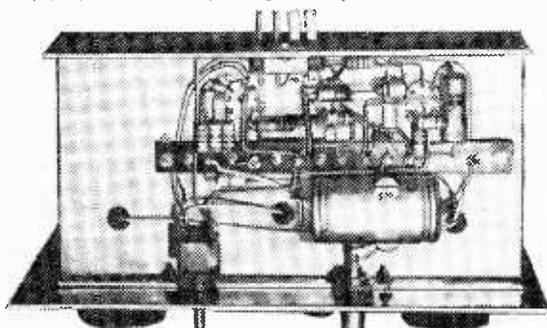
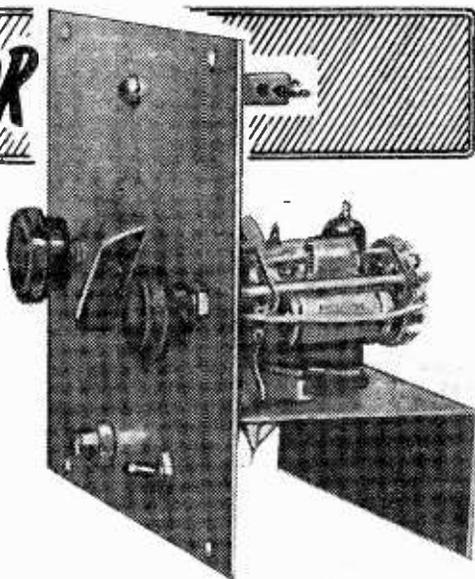
Fig. 1.—The complete circuit diagram of the signal generator.

# SIGNAL GENERATOR

RANGES By K. J. Clark, B.Sc., A.M.Inst.E.

eters of value chosen so that the smallest value of capacity required for the high frequency range is still large enough to avoid instability owing to stray capacity occurring.

The values finally chosen are as shown: 25 kΩ ganged potentiometers, with a fixed series limiting resistor of 2.2 kΩ, together with condenser values of 1.0 μF, .1 μF, .01 μF, .001 μF. These provide frequency ranges of 6-70 c/s, 60-700 c/s, 600-7,000 c/s, 6,000-70,000 c/s respectively. The switched



Underchassis view.

condensers are a coarse range control and the ganged potentiometers a fine control.

Special precautions are taken to ensure constant amplitude over the entire frequency range; namely the insertion of a cathode follower and a thermistor. The output is fed via the cathode follower V3 ensuring a low output impedance. Thus any variation of the output load has only a small effect on the oscillator and amplifier circuits. A

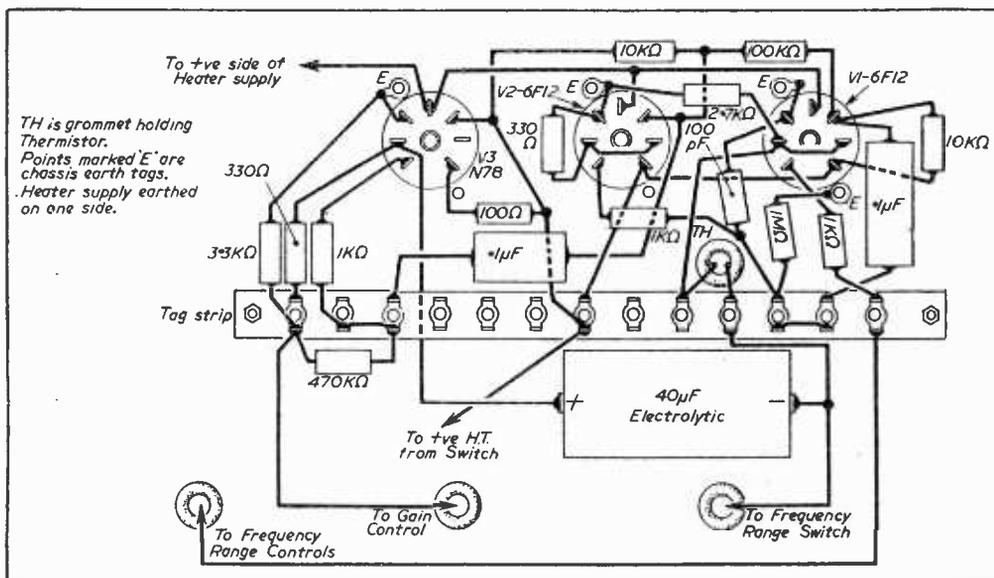


Fig. 2.—Underchassis wiring of the unit.

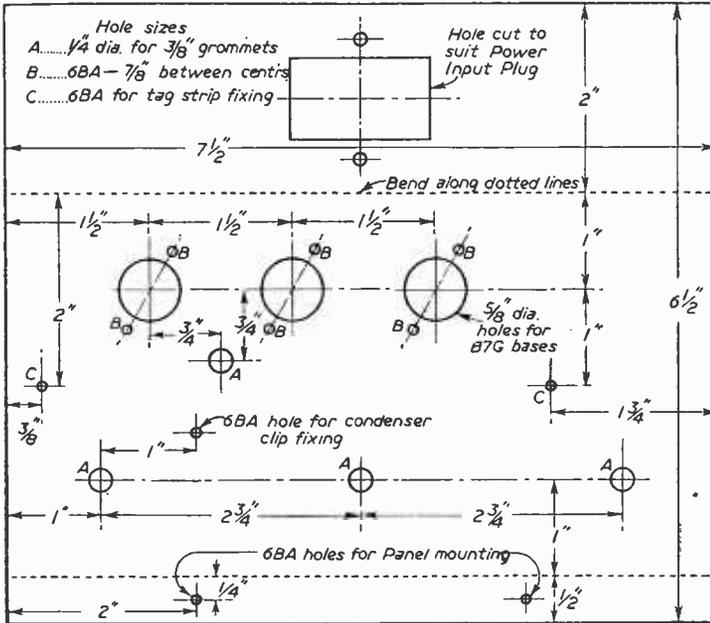


Fig. 3.—Details for the drilling of the chassis.

further small degree of control is provided by the thermistor, resulting in constant amplitude and also very good waveform shape, this being a pure sine wave.

The choice of valves is by no means critical, since any high-slope pentode may be used for the amplifiers V1 and V2 and similarly any high-slope output valve may be used as the cathode follower. Both are simple circuits having, in addition to the normal arrangement, feed-back loops in the anode of the amplifier valve and in the cathode of the output cathode-follower.

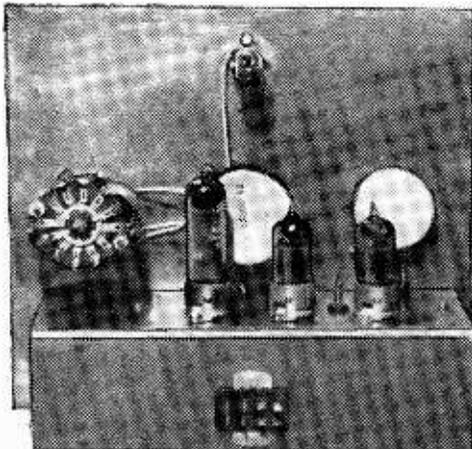
It should, however, be noted that a fairly high-power output valve should be used since a large

voltage swing is needed so that, on switching on, the thermistor is forced past the peak of its characteristic curve when it will operate correctly.

The 40  $\mu$ F feed-back capacitor is of such a high value because of the need to maintain good waveform shape at very low frequencies. It was decided to use an electrolytic to reduce the physical size of this component. Provided that a high voltage type is used as specified there will be no deterioration in waveform, which could be brought about through leakage in the condenser. The case of this electrolytic should, of course, be insulated from the chassis.

**Output**

The output from this circuit may be summarised as follows: a pure sine wave, continuously variable over a frequency range of



View from the rear.

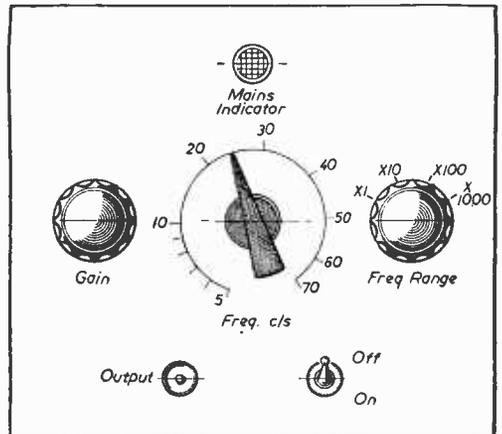


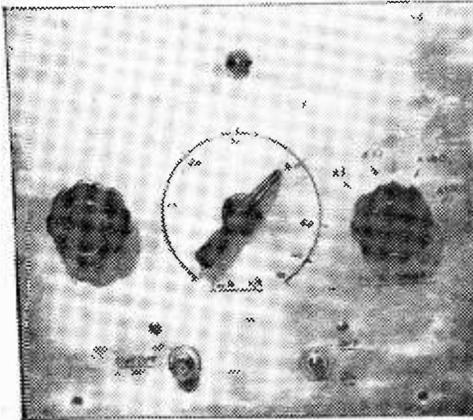
Fig. 4.—The front panel.

6-70,000 c/s. An amplitude of up to approximately 45 volts, peak-to-peak, is provided at the relatively low output impedance of approximately 200 ohms. Harmonic distortion and amplitude variation is negligible over the entire range: two very desirable factors in testing high-fidelity equipment.

Amplitude control is effected by the addition of a 10 k $\Omega$  potentiometer in the output cathode of the cathode-follower.

**Calibration**

The unit is capable of operating to a very high degree of accuracy and stability. The accuracy



The front panel.

actually obtained depends only on the degree of calibration accuracy. Probably the simplest way is to measure the frequency of the output waveform by displaying the output on an oscilloscope, proceeding as follows:

1. Fit the two .01  $\mu\text{F}$  condensers, which should be 1 per cent. and preferably matched.

2. Read off frequencies for various positions of the ganged potentiometer, marking the positions and noting the values.

3. Mark the scale calibrations from 6-70 c/s according to the positions found above.

Note that the frequencies actually measured were in the range 600-7,000 c/s, since 1 per cent. condensers value .01  $\mu\text{F}$  are readily available, but the actual scale markings are made one hundredth of

these values so that the coarse range switch may then be simply marked x1, x10, x100, x1,000.

4. Fit condensers into the other ranges of very slightly lower values than those stated so that padding with parallel condensers will bring them into line.

5. Switch to the first range, select a frequency near the centre of the dial and add padding condensers until the correct frequency value to match the marked scale is obtained. The calibration may then be assumed to be correct over the rest of the range.

6. Repeat this for the remaining two ranges, remembering the multiplication factor of 10 between each range. Only one spot frequency check is necessary on each range.

7. Mark the coarse range switch with the multiplication factors as above.

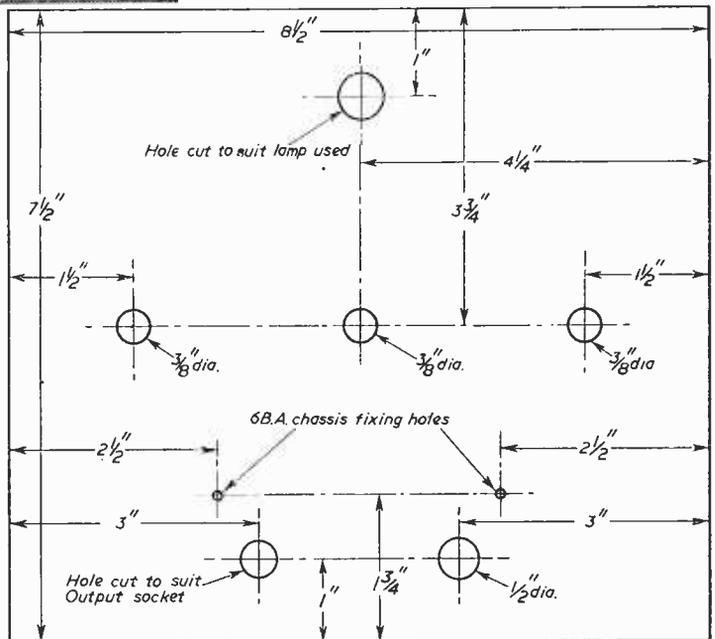
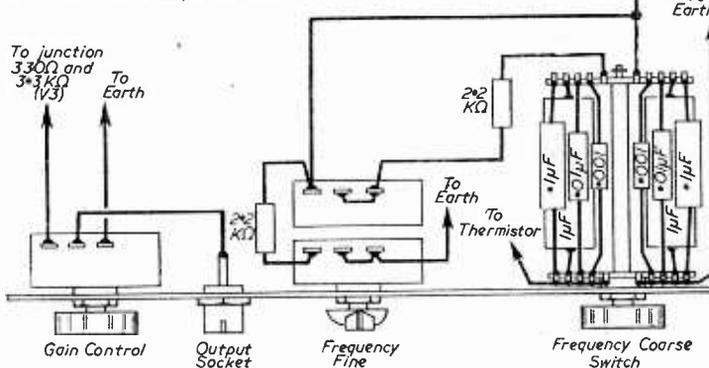


Fig. 5.—Drilling of front panel.

Wiring to On-Off Switch and Mains Indicator Lamp not shown

Fig. 6 (Below).—Wiring above the chassis.



Construction

The lay-out is in no way critical and no special precautions need be taken (except that the 1 k $\Omega$  grid stoppers should be as near to the valve bases as possible). Power supplies are entirely conventional as shown in the circuit. The output of the mains transformer may be anywhere in the range 200-0-200 to 250-0-250 volts without affecting the performance to any degree. The smoothing capacitor is large to bypass low frequencies.

# An Economy Mains Transportable

No. 3.—FINAL DETAILS OF THE RECEIVER

By R. Hindle

(Concluded from page 984 of the February issue)

IT will be found that to make the spindle coincide with the hole the tuning capacitor has to be mounted a little way clear of the chassis. The mounting is by three tapped holes on the capacitor frame and the method adopted is to cut three  $\frac{3}{8}$  in. lengths of screwed rod (the capacitor used is tapped for 4 B.A.). These are screwed into the mounting holes taking care that they do not project through the frame and foul the vanes, and a lock nut run on and screwed up to the frame on the underneath so as to hold the rod firmly in place. Another nut placed loosely on each bolt can be adjusted until the component is level and at the right height when fitted in the mounting holes on the chassis. The whole is locked into position by means of a further nut on each bolt underneath the chassis so that the final appearance is as in Fig. 4.

Leaving the tuning capacitor mounted in position, the backplate of the dial should be removed temporarily and the drive drum slipped on to the shaft, locking it centrally over the drive cord holes with the break in the rim at the bottom nearest the chassis. The driving spindle is mounted so that the part that takes the cord is in line with the cord holes and the drum and the cord can then be placed into position, passing the cord round the drive spindle twice, up through the holes, round the drum until the two ends meet at the bottom of the drum; then both ends come up through the break in the rim and are fixed to the cord spring so that this will keep the cord taut. The drum should be locked to the capacitor spindle by means of the lock screws so that the vanes are at the middle of their run when the drum is in the position specified.

The only components mounted on top of the chassis are the I.F. transformers, tuning capacitor, heater transformer, output transformer, speaker and twin electrolytic capacitor C12, C13. The smoothing choke goes inside the chassis and is

mounted on the rear wall, and the mains rectifier is bolted to the underneath of the chassis so that its base is in good thermal contact with the metal of the chassis. An aluminium bracket is made to hold the strip of trimmers facing the open end of the chassis alongside the wavechange switch. Two tag strips, each with two tags and earth are fitted in the positions indicated in the wiring diagram. One fixes on one of the tuning capacitor bolts and the other is fixed by means of one of the bolts for the holder of V4. A soldering tag is used for earthing components associated with V1, V2 and V3, this being in each case fixed by means of one of the valve-holder bolts in the position shown on the wiring diagram.

## Wiring

Before commencing wiring it is as well to try the chassis in the cabinet in order to ensure that no mechanical snags are going to arise. It is easier to deal with these at this early stage than when the chassis has been completely wired.

Fig. 3 gave the wiring of the chassis. As usual, it is recommended that the heater and mains wiring be done first, using well insulated wire for the latter and keeping these leads in close proximity to the chassis. Signal leads, on the other hand, take the most direct route from place to place, and do not necessarily follow the route indicated on the diagram because inevitably when an attempt is made to draw the connections the run has to be changed somewhat for the purposes of clarity. The diagram gives the positions of tag strips and earthing tags.

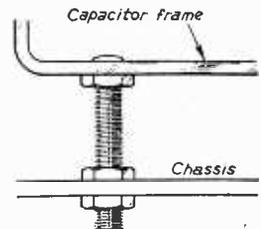
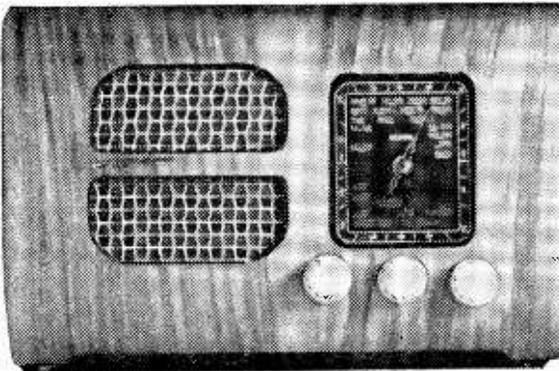


Fig. 4.—Fixing the tuning capacitor.



A view of the finished receiver.

## Precautions with A.C./D.C. Technique

There are some precautions that must be taken in the case of a receiver in which the chassis is connected to the mains as in the present design, but if these are taken there is no undue risk. Some of these have to be taken in the course of construction. A back is provided for the cabinet and, of course, this must be fitted when the receiver is in use. The spindles of the controls are in metallic connection with the chassis. If the knobs fit snugly to the chassis it is a good idea to cut a felt washer to fit behind each; a very slight pressure on the knob against the washer whilst tightening the grub screw will then seal the gap between knob and cabinet. Where the knob cannot be fitted snugly in this way the method

used is to wrap a piece of transparent sticky tape around the spindle. Unless the tops of the grub screws sink well into the knob so that they cannot be touched, the holes over these screws should be filled with wax. The constructor will have to carry out some adjustments with the chassis out of its cabinet, so he must remember not to touch it with his hands without disconnecting the mains. Trimming tools used for adjustment are insulated; if proper tools are not available they can be improvised by using a piece of plastic knitting needle or similar material filed to the shape of a screwdriver blade at one end.

### Operating the Receiver

Wiring should be carefully checked before attempting to apply power to the receiver. When satisfied on this score, testing and alignment can proceed. Remember all the time that mains is connected to the chassis. As the dial is not fixed to the chassis it is necessary to mark on the backplate the positions to be used in alignment. Only two points are needed, one at the upper end of the dial and one at the lower end. If a signal generator is to be used it is convenient to make one point the harmonic of the other so that it is then unnecessary to adjust the generator during the course of the alignment. Conveniently, 450 metres and 225 metres are used for this purpose, because both these points are marked on the dial, and by tuning the generator to 450 metres the other position is the second harmonic. Of course, if alignment is to be done without a signal generator it will be necessary to take the wavelengths of two stations that are generally received at good strength and as near as possible to the two wavelengths specified above. It would be as well to purchase the I.F. transformers pre-aligned so that very little adjustment will be needed. Having determined the wavelengths on which alignment is to take place, the chassis is fitted into place in the cabinet and the tuner adjusted to the correct place on the dial. Now withdraw the chassis and place a small pencil mark to indicate the position of the pointer on the dial backplate. Repeat this operation for the other frequency to be used for alignment. This step is not necessary, of course, if the dial is fixed to the chassis.

### Alignment

The first step in alignment is to adjust the I.F. transformers. If a signal generator is available set up these for 465 kc/s; otherwise it will be necessary to obtain a signal before adjusting. (If the I.F. transformers are pre-aligned, this should be possible.)

If it is impossible to obtain a signal on the ferrite rod aerial at this stage, an aerial can be connected to the end of the medium-wave aerial coil remote from earth, and, of course, the wave-change switch must be set to medium waves. Now tune in any signal and adjust the I.F. transformers for maximum signal. There are no A.V.C. complications in this receiver and the optimum point should be clearly defined. Of course, if a signal generator was used these circuits will have been set up previously and will

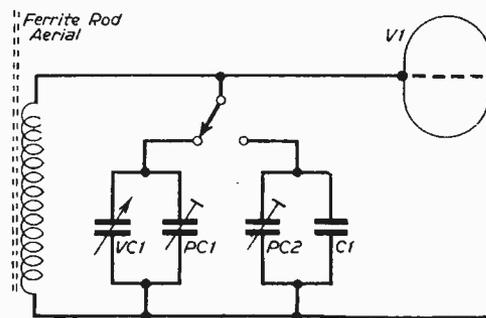


Fig. 5.—Modification to give M.W. pre-tuned station.

not now need to be re-adjusted. Now tune in the signal to be used for alignment at the upper wavelength end and adjust the core of the oscillator coil for maximum. Turning to the signal at the lower wavelength end, the oscillator trimmer is adjusted for maximum, and these two adjustments are made alternately until no further improvement can be achieved. Now remove the aerial if one has been used and align the aerial circuit in a similar way, sliding the medium-wave coil on the ferrite rod aerial for maximum at the upper wavelength position and adjusting the aerial trimmer at the lower wavelength position. Take great care in adjusting the ferrite rod coil in view of the connection of the mains to the chassis, and use an insulated tool for this and other adjustments.

### Long Waves

When satisfied with the medium-wave setting turn to the long waves. From now on no further adjustment of the medium-wave circuits must be made; the two long-wave trimmers only must be adjusted. In order to ensure that only these are moved it is as well to mark clearly the four trimmers. An aerial can again be brought into use if the long-wave station cannot be heard—there will be no purpose in turning the tuning capacitor control as it will have no effect and the signal is searched for by adjusting the long-wave oscillator trimmer. When the station is heard both oscillator and aerial trimmer are adjusted for maximum signal. If the station comes in with either trimmer at maximum or minimum it will be necessary to alter the value of the fixed capacitors already fitted across that trimmer—if the trimmer is screwed right in for maximum results the equivalent fixed capacitor should be changed for one about 50 pF larger, or if it is screwed out the fixed capacitor needs to be 50 pF smaller.

### M.W. Light Programme

The constructor may have no need for long wave for the Light programme, in which case he could get the same facilities by providing preset tuning for the medium-wave Light programme. The fixed capacitor C4 will now be less in value than that quoted, the actual size depending on the particular conditions, but will probably be no more than 30 pF and so only small sizes need be tried; it might be found that the trimmer by itself suffices. Only a medium-wave winding

will be needed on the ferrite rod aerial and the switch SW1 (a). will have to be wired to the circuit given in Fig. 5. Once more, C1 will be only small.

A refinement that the constructor may wish to have is a dial light; the position of this is indicated on the circuit diagram but not on the wiring diagram. If this is needed a wire should be run from the side of the 6.3 v. winding of the mains transformer remote from earth and taken through one of the holes through the chassis. A holder of the clip-on variety was used for the prototype. A small bracket of aluminium was made and bolted in one of the holes on the dial backplate. This was of such a size that the holder would fit on it and when so fixed hold the dial light just over the backplate. When the chassis was then placed in the cabinet the glass dial was adequately lit.

#### Adjustment of Receiver

During the adjustment of the receiver it is necessary to have the ferrite rod accessible so that the coils can be adjusted. It will be noticed that the beginning of each winding is connected to earth. This lead is placed on the component itself so that there are only three leads from the receiver to the rod. These should be left long enough for the aerial to be mounted inside, but at the top of the cabinet. Having done this, during tests, the aerial can be left lying on the

bench but this must be done carefully so that the windings are not damaged and it should not be dragged about by the leads when moving the chassis. Also, it must not be allowed to come into contact with any earthed object because one end is connected to one side of the mains. The two clips are screwed to the top of the cabinet so that the aerial can clip into them.

It should be remembered that the proximity of metal will affect the inductance of the coils and will upset the adjustment, so keep it clear of the chassis. If this precaution is taken it is unlikely that the change resulting from moving the aerial into its place inside the cabinet will cause the need for further adjustment. The ferrite rod aerial is directional, of course, and so it should be turned until the best signal is obtained and when making the preliminary search for stations this factor should be in mind. In practice it is found that the ferrite rod tends to be almost unidirectional and so if one maximum is not good enough, results may be improved by turning the aerial through 180 degrees. Incidentally this directional effect can be put to good use to reduce interference, and also in the comparatively rare cases where the signal picked up is large enough to overload the receiver, the input may be reduced by turning the aerial away from the direction of maximum signal.

Note that an earth connection must not be fitted to this receiver.

## SERVICING RADIO RECEIVERS

(Continued from page 38)

If the F.M. section operates, but the A.M. section is dead, the fault possibly lies in the A.M. oscillator, and if the triode anode voltage is normal, V2 should be checked by substitution. There is also the possibility that C20 or C21 is open-circuit.

If the A.M. section operates, but the F.M. section is dead, the V.H.F. tuner or the switching is at fault. V1 should first be checked by substitution, and if the fault is still present, a continuity test should be made across the associated switches.

#### Distortion

A frequent cause is low emission of V7 or low H.T. voltage due to a faulty rectifier, but a leak in C56 will considerably upset the valve's bias and result in the same symptom and almost certainly ruin the output valve at the same time. R27 increasing in value is another cause of the trouble, as also is emission failure of V5 triode.

Modulation hum on a V.H.F. signal is sometimes promoted by trouble in the diodes of V5. A substitution check of the valve soon proves this, however. A constant mains hum (100 c/s) should lead immediately to a check of the smoothing capacitors.

A test point is available for the connecting of instruments during the alignment operation. This is shown on the circuit. Two matched 47 k resistors are connected in series between the test point and chassis and the voltage across them

is metered, a maximum indication being obtained when the signal and I.F. circuits are brought into correct tune. The discriminator is adjusted for zero indication on a current meter connected between the junction of the resistors and point B on the circuit.

## Publication Received

**BRANS RADIO TUBE VADE MECUM.** Many of our readers are now familiar with this publication. This is the 14th edition and has 464 pages, including 47 pages of wiring diagrams for valve bases. The valves are tabulated in both numerical and alphabetical order, and to avoid thousands of repetitions of types which are really identical, but which have been given special initials by their makers preceding the actual type number, these initials have been omitted. Symbols and abbreviations have been restricted to a very small number. These are given on a bookmark, which can be laid out next to the tables, thereby simplifying consultation. Written and published by P. H. Brans, at 32s., it is available from Messrs. Bailey Bros. & Swinfen Ltd., London, W.C.1.

### PRACTICAL WIRELESS CIRCUITS

16th Edition

By F. J. CANN

17/6, by post 19/-

From

GEORGE NEWNES, LTD.,

Tower House, Southampton Street, Strand, W.C.2.

# Radar or Radio -



# TRAIN WITH THE ROYAL AIR FORCE



There are immediate vacancies today for Radar and Wireless Mechanics in the Royal Air Force. This is an increasingly important job in the R.A.F. and a responsible one, because there is a constantly growing range of vital equipment to be maintained and serviced—including that used for bombing and for the navigation, detection, interception and control of aircraft and the latest guided missiles.

## *A life of opportunity!*

You get a full training in servicing many types of radar or radio. Your work is full of interest—particularly if you are keen on television or radio. Promotion is rapid for the right man. Pay and allowances are better than ever before; for example, a married Corporal can earn £14. 12s. 10d. a week including full allowances. There's a month's leave a year, the chance to travel and see something of the world and all the wider interests of life in the modern Service. This is not just a job but a *career*—with good prospects. Post the coupon for details now!

**TO** The Officer Commanding, R.A.F. Central Recruiting Office (P.W.56), Victory House, Kingsway, London, W.C.2.

Please send me

R.A.F. Ground Trade leaflets A.M.P. 347 and Inf. 263. I understand that this puts me under NO OBLIGATION.

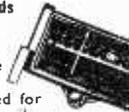
NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

Date of Birth \_\_\_\_\_

*Applicants from British Isles only.*

 <p><b>"Q Coils"</b> All ranges Adjustable iron dust cores With full circuit Amazing efficiency</p>	 <p><b>Potted 5/- Coils</b> Ensure selectivity Supraphet, T.R.F. For Sets or Tuners</p>	<p><b>Collaro TAPE COILS</b> Officially recommended Bias Osc., QT9, 7/6 Push-pull circuit, 7/6 Bias Filter, QT6, 7/6 Treble Boost, QT7, 27/6</p>	<p><b>STOP!</b> T.V. Patterning easy to fit <b>SIMPLE REMEDY 10/-</b></p>
<p><b>STEEP CUT Whistle Filter 7/6</b> (Circuit supplied) <b>Scratch Filter Coil</b> Cut-off 5-13 Kc/s. Essential for all older records, 10/6</p>	<p><b>DUAL RANGE COILS</b> T.R.F., 5/6, 10/6 pr. T.R.F. with reaction, 7/6 Super-het., 12/6 pr. All high performance coils</p>	<p>Ideal for normal reception areas <b>Mini-Magic F.M. Tuner Kit</b> Coils only £2.12.6 Complete £4-10-0</p>	<p><b>"W. WORLD" 7 TRANSISTOR PORTABLE</b> Booklet. 2/9, including price list. Coils as specified, inclgd. F. rod, 42/6 set.</p> <p><b>SUB-MINIATURE</b> M.W. L.W. Trawler W. High Q with ferrite core 5/- High performance guaranteed</p>
<p><b>FERRITE ROD AERIALS</b> M.W. 8/9. Trawler, 8/9 M. &amp; L.W., 12/9 M., L. &amp; Tr., 15/6</p>	<p><b>I.T.A. Converter</b> To fit inside T.V. FOR ALL SETS KIT Complete 65/- Very efficient £4</p>	<p><b>DIAL ASSEMBLY</b> 6 W/bands 24/6 complete Calibrated for Osamor coils</p> 	<p><b>THE WONDER 1v. SHORT WAVER</b> World Wide Reception KIT 57/6 *Phones, 20/- extra</p>
<p><b>SUB-MINIATURE COILS</b> For Transistor Circuits. Potted, Ferrite Core—Canned Size 5/8in. x 11/16in. ... Guaranteed High "Q" ... 1st., 2nd., 3rd., I.F. (465 Kc/s) 7/6 Oscillator Coil ... 7/6</p>	<p><b>Coils for Car Radio Circuits</b> including "Hybrid" (Valve-transistor)</p>	<p><b>COILS for A.M. &amp; F.M. &amp; Crystal Tuners</b> for hi-fi amplifier circuits</p>	<p>Very "Hi Q" Standard <b>Midget I.F. Trans. 14/6</b> With ferrite cores per pair. Pre-aligned</p> <p><b>F.M. COILS FOR OSMOR</b> "Wireless World" &amp; many other circuits From Radio Press</p>

**FREE!**

OSMOR COILS are regularly used and recommended by designers writing in "Practical Wireless," "Wireless World" and "Radio Constructor." Why not follow the experts?

Please State your current interests for special attention. ★



Send 1/- (stamps) for fully descriptive literature AND OSMOR DESIGNS—5-Valve S'Het. Miniature ditto, Battery and Battery/Mains Receiver, Mains T.R.F. S'Het. and T.R.F. Feeders, Band 3 Converters, F.M. Tuners, Wiring Diagrams, Chassis Templates, Coil and Coilpack information and price lists and information on circuits in "Wireless World," "Practical Wireless," "Radio Constructor." Full Circuits included.  
PW31, 418 BRIGHTON RD., SOUTH CROYDON, SURREY



**STAR STRUCK WITH MOTEK**

The Motek deck has interstellar grace. Its Star features form a brilliant constellation which is bound to attract. Motek is five stars high. Stellations: Push Button Operation, Counter, Safety Erase Button, Pause Control, Three Speeds.

Details on request.  
Patents Pending.  
LIST 21  
GNS

Keep your TAPES ON MOTEK.

**MODERN TECHNIQUES**  
Wedmore Street, London, N.19. Tel. : ARCHway 3114.  
DHB,6353

**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 —

only **32/6** complete

**PIFCO LTD.**  
WATLING STREET · MANCHESTER · 4.

NEW SERIES

# Basic Theory For Constructors

## No. 2.—POTENTIAL DIVIDERS AND BRIDGE CIRCUITS

By G. Palmer

**W**E have now graduated to the stage where we are able to compute the resultant value of resistors connected in series and parallel, and we are able to discover the current flowing in the various branches of a resistive network, the voltage developed across the circuit resistors and the power dissipated in them individually. We have, in fact, sufficient knowledge to solve quite a number of simple problems which are likely to be encountered in resistive networks associated with radio circuits.

Before we attempt to investigate definite examples of this nature, there are first a few more basic laws that we should consider. There is, for instance, the potential divider.

### The Potential Divider

In its simplest form, the resistive potential divider is shown in Fig. 1. As will be seen, it consists of two resistors connected in series across a source of voltage (in this case a battery). The

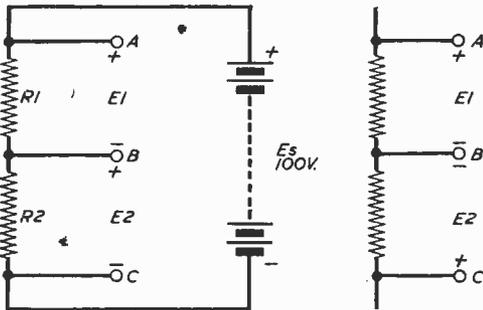


Fig. 1 (Left).—Simple potential-divider circuit. Here the voltages  $E_1$  and  $E_2$  are series-aiding, i.e.,  $E_s = E_1 + E_2$ .

Fig. 2 (Right).—The voltages  $E_1$  and  $E_2$  are added in opposition in this circuit. That is, the smaller voltage is taken from the greater voltage.

potential across the network is thus divided, in terms of  $E_1$  and  $E_2$ , in proportion to the values selected for resistors  $R_1$  and  $R_2$ .

It becomes easy to calculate  $E_1$  and  $E_2$  when it is realised that these potentials are simply those developed across the associated resistors. For example,  $E_1$  is the voltage developed across  $R_1$  and  $E_2$  is the voltage developed across  $R_2$ . We have given the supply as 100 v. Now if we make  $R_1$  and  $R_2$  both 500 ohms, we have a total resistance of 1,000 ohms (1 k) across the battery. This means that a current of 100 mA (0.1 A) is flowing through the circuit, thereby causing 50 v. to be developed across both  $R_1$  and  $R_2$ . This is as would be expected, of course, since the sum of  $E_1$  and  $E_2$  must equal the supply voltage, which is 100 v.

At this stage it is desirable to consider the

polarity of the potentials across the resistors. It will be seen that if  $E_1$  is equal to  $E_2$ , then the combined voltage across terminals A-C would be zero. If  $E_1$  were greater than  $E_2$ , then the total voltage would be equal to  $(E_1 - E_2)$ . The production of voltages in opposition across series-connected resistors need not concern us at the present time, the idea being at this stage to understand how the polarity can affect the magnitude of the total voltage.

In the potential divider in Fig. 1 we discover that resistors of like value give at their junction in relation to either terminal equal voltages, both being exactly half of the supply voltage, with a series-aiding (positive to negative) polarity. In order to save all the trouble of working out the circuit current and then finding the voltage developed across the potential-divider resistors, a simple formula can be used.

Let us suppose that we require to find the voltage  $E_2$ . Since the voltage is proportional to the resistive value  $R_2$ , we can say that  $E_2 = \frac{(R_2 \times E_s)}{(R_1 + R_2)}$  where  $E_s$  is the supply voltage.

Let us suppose that we require to find the voltage  $E_1$ . Since the voltage is proportional to the resistive value  $R_1$ , we can say that  $E_1 = \frac{(R_1 \times E_s)}{(R_1 + R_2)}$

The resistor at the top of the fraction should represent that across which it is required to find the voltage. If  $R_1$  and  $R_2$  in Fig. 1 are each 500 ohms, we have  $E_1 = (500 \times 100)/(500 + 500)$ , which gives 50 v.; similarly,  $E_2 = (500 \times 100)/(500 + 500)$ , again giving 50 v.

If  $R_1$  is 20 ohms and  $R_2$  80 ohms, then  $E_1 = (20 \times 100)/(20 + 80)$ , which works out to 20 v., while  $E_2 = (80 \times 100)/(20 + 80)$ , which gives 80 v. Thus  $(E_1 + E_2)$  gives the applied 100 v.

If we like we can look at it as a fraction in relation to the applied voltage: for example, the

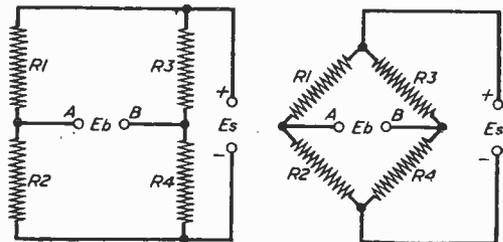


Fig. 3(a) (Left).—A bridge network can be considered as two potential-dividers connected across a common supply voltage.

Fig. 3(b) (Right).—The circuit is redrawn in the accepted manner.

voltage across R2 is  $R2/(R1 + R2)$  of the applied voltage, or the voltage across R1 is  $R1/(R1 + R2)$  of the applied voltage.

### Bridge Network

In Fig. 3(a) we find two potential dividers connected across a common supply voltage  $E_s$ . From our knowledge to date, we will realise that, provided the ratio of R3 to R4 is exactly the same as the ratio of R1 to R2, the voltage across R1

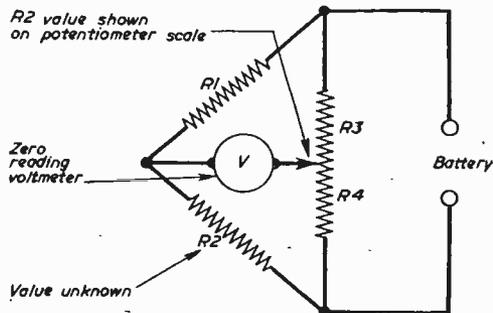


Fig. 4.—An adjustable bridge circuit which can be used for the measurement of a resistor of unknown value.

will be the same as the voltage across R3, and the voltage across R2 will be the same as the voltage across R4.

This means that the potential at terminal A with respect to either side of  $E_s$  will be exactly the same as the potential at terminal B. The potential between the terminals will therefore be zero, so if a voltmeter or current meter were connected across them it would indicate zero voltage or current.

This is known as the condition of *balance*, which exists when  $R1/R2 = R3/R4$  and is the expression invariably adopted when bridge circuits are discussed. The circuit is redrawn in Fig. 3(b) in conformity with the generally accepted presentation of the network, although it will be noticed that it is exactly the same as the circuit in Fig. 3(a).

When a bridge circuit is off balance a potential will exist across the output terminals' (this being represented by  $E_b$  in the diagrams), while the polarity of the potential will depend on the relative balance of the two ratios  $R1/R2$  and  $R3/R4$  in relation to the supply polarity.

Let us assume that initially the circuit is in perfect balance and that a centre-zero voltmeter connected across terminals A-B is steady at the zero point. Now, if the value of R4 is reduced, the voltage across R4 will also reduce, the bridge will go out of balance and the potential at terminal B with respect to terminal A will be negative, as indicated by the swing of the voltmeter from zero.

If, on the other hand, the value of R4 is increased, then the voltmeter will swing the other side of the zero mark, meaning that terminal B is positive with respect to terminal A. The degree of deflection (that is, potential across the

terminals) will depend on the extent of the unbalance and the voltage  $E_s$ .

The bridge circuit is often used for the accurate determination of the value of a resistor (capacitor or inductor) by using a common resistor for positions R3 and R4 and a slider on the resistor to select the point of balance. The idea is shown in Fig. 4, in which R3/R4 is really a potentiometer (an adjustable potential divider), and either R1 or R2 is a resistor of accurately known value. The resistor not used then represents the resistor of unknown value.

Let it be supposed that R2 is the unknown value, then the slider is used to alter R3/R4 for zero reading on the voltmeter. At this point the ratio of R3/R4 can be read from a scale associated with the potentiometer pointer. As stated earlier, R1 is a resistor of accurately known value. Then from the ratio  $R3/R4 = R1/R2$ , the unknown resistor (R1) may be found.

(To be continued)

## Stereo by Radio

(Continued from page 42)

the two channels together are used to modulate the transmitter in the usual manner, so that a stereo broadcast picked-up by an ordinary receiver would provide a correctly balanced single-channel output.

The signals in the two channels are also subtracted one from the other to provide the directional intelligence, and it is this signal which, in essence, represents the difference between a stereo and a single-channel broadcast. This signal is caused to modulate a sub-carrier, as we have already considered, and the modulated sub-carrier is added at the transmitter to the signals representative of the two channels. The transmitter is thus modulated by the two-channel signals and the sub-carrier, which itself is modulated by the directional signal.

Experiments have proved that the bandwidth of the directional signal can be much curtailed without detracting severely from the quality of the stereo reproduction. The reduced bandwidth also avoids undue reduction in transmitter power, with a consequent avoidance of loss of range of an existing transmitter when it is modified to cater for stereo broadcasts.

A receiver suitable for taking advantage of the stereo feature of the broadcasts would, of course, require a decoder for extracting the directional signal as well as two A.F. channels and loudspeakers.

## Book Received

**THE RIGHT WAY TO TAPE RECORD.** By Laurence Mallory. 128 pp. 24 illustrations. Published by Eliot Right Way Books. Price 7/6.

Amongst the contents of this interesting book are: How the Tape Recorder Works, Microphones, Recording in a Room, Music at Home, Sound Effects, Location Recording, Editing, etc., Points to Consider When Buying, Glossary.

# RETURN-OF-POST SERVICE

## ILLUSTRATED LISTS.

We now have available separate illustrated lists on all of the following:—

**GRAMOPHONE EQUIPMENT.**—This list details no less than 14 different items including Record Changers, Single Record Players and Transcription Units. Some at special prices.  
**READY BUILT AMPLIFIERS.**—Hi-Fi and less expensive popular types.  
**TEST GEAR.**—Test Meters, Signal Generators, etc., by AVO, Pullin and Taylor.

**LOUDSPEAKERS.**—Full details of Goodmans, Whiteley, Wharfedale, G.E.C and Elac types which we stock.

**TAPE DECKS.**—All the popular makes including a special offer.

**RECORDING TAPES.**—We have a very wide range of tape and accessories by all the well-known makers. Any of these lists will be sent free upon request.

## GRAMOPHONE EQUIPMENT

	Cash Price	Deposit	Hire Purchase Mthly. Pmts.
<b>RECORD CHANGERS</b>			
COLLARO, Conquest	£9.19. 6	£1.10. 6	6 of £1.10. 8
GARRARD, RC121/4	£10.15. 0	£1.12. 0	6 of £1.13. 0
GARRARD, RC88/4	£14.19. 6	£2. 5. 6	6 of £2. 5. 7
BSR UA9 Monarch	£9.12. 6	£1. 4. 6	6 of £1. 7. 2
BSR UA12 Monarch	£9.19. 6	£1.10. 6	6 of £1.10. 8
<b>SINGLE RECORD PLAYERS</b>			
COLLARO 4564	£7.19. 6	£1. 5. 6	6 of £1. 4.13
GARRARD, T.Mk. 2	£9.15. 8	£1.10. 2	6 of £1.10. 1
GARRARD 4NP	£7.19. 6	£1. 5. 6	6 of £1. 4.10
BSR TU9	£4.15. 0	£1. 5. 0	3 of £1. 6. 8
<b>TRANSCRIPTION UNITS</b>			
COLLARO, 4TR/200	£19.10. 0	£2. 0. 0	12 of £1.13. 9
COLLARO, 4TR/200 Motor	£14.11. 0	£2. 2. 0	6 of £2. 5. 5
GARRARD, 4HF with GCB PU	£19. 7.10	£1.18.10	12 of £1.13.10
GARRARD, 301 Motor	£26. 8. 3	£2.12. 3	12 of £2. 3. 8

All the above are fitted with Monaural cartridges. Some can be supplied with Stereo inserts and details are given in our illustrated list of Gramophone Equipment.

## LATEST TEST METERS

	Cash Price	Deposit	Hire Purchase Mthly. Pmts.
AVO Model 8	£23.10.0	£2. 7.0	12 of £1.18. 9
AVO Model 8 leather case	8 with		
AVO Model 7	£26.10.0	£2.13.0	12 of £2. 3. 9
AVO Model 7 with leather case	£19.10.0	£1.18.0	12 of £1.12. 2
AVO Multimeter	£22.10.0	£2. 5.0	12 of £1.17. 1
AVO Multimeter with case	£9.10.0	£1. 8.0	6 of £1. 9. 6
TAYLOR Model 71A	£11. 2.6	£1.13.6	6 of £1.14. 0
PULLIN Series 100	£12.10.0	£1.17.6	6 of £1.18. 2
TAYLOR MONTROSE	£12. 7.8	£1.16.6	6 of £1.16.10
PIFCO All-in-One	£23.10.0	£1. 0.0	3 of £1. 0. 0
	£1.12.6		

## MULLARD TAPE C AMPLIFIER

Kits for the new version now available. Send for list. Kit available for converting old model to new version. Send for details.

## READY-BUILT AMPLIFIERS

	Cash Price	Deposit	Hire Purchase Mthly. Pmts.
QUAD. Main Amplifier and Control Unit	£42. 0.0	£4. 4.0	12 of £3. 9. 4
LEAK, TL12 Plus Main Amp.	£19.18.0	£1.18.0	12 of £1.11. 2
LEAK, Variostep III Pre-Amp.	£15.15.0	£1.12.0	12 of £1. 5.11
LEAK, Point One Plus Pre-Amp.	£12.12.0	£2. 0.0	6 of £1.18. 1
LEAK, TL12 and Variostep III	£34.13.0	£3.11.0	12 of £2.17. 0
LEAK, TL12 and Point One	£31.10.0	£3. 2.0	12 of £2.12. 0
TRIPLE TONE, Hi-Fi Major	£15.18.9	£1.10.9	12 of £1. 6. 4
TRIPLE TONE Popular	£6.19.6	£1. 1.6	6 of £1. 2. 2
ASV Hi-Gain	£3.19.6	£1. 3.6	3 of £1. 2. 0

## AMPLIFIER KITS

**MULLARD 510 AND GEC 912 PLUS**  
 We carry full stocks for all versions of these popular Amplifiers and our price lists are available free.

**MULLARD 2 VALVE Hi-Fi AMPLIFIER**  
 Latest Mullard circuit for use with the 510 Amplifier. Booklet giving full details now available 1/3 post free. Complete Kit, including drilled chassis and control panel. £5.12.0. H.P. Terms. Deposit 19/- and six monthly payments of £1.1.4.

**CONSOR 2 VALVE AMPLIFIER**  
 Ready built, supplied with valves, speaker and separate tweeter for home assembly on baffle or in cabinet. Complete instructions included. £9.15.0. H.P. Terms. Deposit £1.9.6 and six monthly payments of £1.10.1.

**HIRE PURCHASE.** H.P. Terms are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5% but minimum charge 10/- Six months: Deposit 3/- in the £. Service charge 7½% but minimum charge 15/-. Twelve months: Deposit 2/- in the £. Service charge 10% but minimum charge 20/-.

## JASON FM TUNER KITS

There are no less than six different Jason F.M. Tuner Kits now available to the Home Constructor. Full details are given here and individual lists on any are available free. **MOST IMPORTANT.** We take great pains to see that the kits we supply are absolutely complete in every detail and also that all components supplied are entirely suitable in every way. This accounts for differences in price you may notice between our prices and those of some of our competitors. THIS SHOULD BE BORNE IN MIND WHEN COMPARING PRICES.

### STANDARD TUNERS

**STANDARD TUNER.** The very popular tuner which is supplied with a chassis assembly fitted with a gold hammer finish front panel and glass dial. Employs four EF91 valves. External power supply is required. Kits from £5.19.6.

**STANDARD TUNER IN SHELF MOUNTING CASE.** This is a new version of the above tuner. The circuit has been brought up to date and is built into the very attractive shelf mounting case of the new Fringe Tuner mentioned below. The circuit uses four EF90 valves and the power supply can be built into the case if desired. Kits from £7.19.6.

**MERCURY SWITCHED TUNER.** This is a tuner in chassis form which has a three position switch for the three BBC programmes. Uses one ECF30 and four EF90 valves. External power supply is required. Kits from £9.19.0.

### FRINGE TUNERS

**FRINGE VERSION OF THE STANDARD TUNER.** This is a fringe version of the Standard Tuner described above. Has a chassis assembly fitted with a gold hammer finish panel and glass dial. Employs one EF90 and four EF91 valves. Kits from £5.0.0. External power supply required.

**NEW FRINGE TUNER IN SHELF MOUNTING CASE.** This is an entirely new Fringe Tuner and is supplied complete with a very attractive green shelf mounting case with Perspex dial. The tuner is fitted with variable AFC. Internal power supply if desired. Valves used are One ECC81 and five EF90. Kits from £10.5.0.

### TV SOUND/FM SWITCHED TUNER

This tuner, also supplied in an attractive shelf mounting case, has a TV Type Coil Turret fitted to provide TV sound from any BBC or ITV Sound channel as well as the three BBC F.M. programmes. Fitted with internal power supply. Valves. One ECC84. One ECF80. One EF90. One EF89. One EM81 and one E280. Kits from £15.15.0.

### JASON STEREO KITS

We now stock these Kits and detailed price lists are available on request.

## BRAUN TRANSISTOR PORTABLE

Ready built (not a kit). This new transistor Pocket Portable is highly sensitive and gives excellent reproduction. In grey plastic case, size 6" x 3½" x 1½". Fully tunable over medium and long waves. Six transistors are used with a printed circuit. Price £20.9.6. Terms. Deposit £2.1.6 and twelve monthly payments of £1.15.4. Illustrated leaflet available.

Terms of Business—Cash with order or C.O.D. Postage extra under £3. We charge C.O.D. orders as follows. Up to £3. postage and C.O.D. fee minimum 2/8. Over £3 and under £5. C.O.D. fee only 1/6. Over £5 no charge.

# WATTS RADIO (MAIL ORDER) LTD.

54 CHURCH STREET, WEYBRIDGE, SURREY.

Telephone: Weybridge 4556

PLEASE NOTE. POSTAL BUSINESS ONLY FROM THIS ADDRESS.

# Printed Circuit reliability for the **Mullard** **3/3 AMPLIFIER** STRAIGHT OR STEREO

FIRST-TIME EVER  
TO BE APPROVED  
TO MULLARD  
SPECIFICATION



### Performance Details

Frequency response virtually linear  
from 20 to 30,000c.p.s.  $\pm$  1db.  
Tone Control —  
Max. Bass boost—15db at 70c.p.s.  
Max. Treble cut—20db at 10,000c.p.s.  
Overloading occurs at about 3.5w.  
Hum and noise at least 70db below 3w.  
Sensitivity—Radio—100m/v for 3w.  
Gram—100-150m/v for 3w.  
Dimensions of amplifier chassis—  
 $4\frac{1}{8}'' \times 7\frac{1}{2}'' \times 3\frac{3}{4}''$

- NO WIRING**
- ★
- SPEEDS ASSEMBLY**
- ★
- REDUCES SIZE**
- ★
- ENSURES ACCURACY**
- ★
- COMPLETE DATA SHEET**
- for only

Bribond Printed Circuits revolutionise chassis assembly, providing error-free connecting without wiring and component deck ready drilled. Size is under half that of conventional assembly as smaller components are used. Complete absence of wiring ensures maximum efficiency on first test! You can build this famous amplifier with Bribond help. You need only a screwdriver and soldering iron. Bribond supply the printed circuit for only 1/6, post paid and full component list with assembly instructions for amplifier and power pack for only 1/6. Send now for this data and see how easy printed circuits make it. Use the coupon below today!

### Two in tandem provide stereo

Two Mullard 3/3 Amplifiers provide twin-channel reproduction for stereophonic sound (with a larger transformer in the Power Pack) giving 6 watts total output. So if you build one 3/3 Amplifier now, you can extend to stereo whenever you wish! Bribond also make a Printed Circuit base for the Mullard 5/10 Amplifier, too! Complete Data Sheets are available for these for 1/6 each. It pays to contact Bribond and be really up-to-date in construction methods!

# 1/6 BRIBOND PRINTED CIRCUITS

POST NOW

To BRIBOND LTD., BURGESS HILL, SUSSEX

Please send Printed Circuit Component/Assembly Data for—

- Mullard 3/3 Amplifier & Power Pack
- Mullard 3/3 Twin Channel Stereo
- Mullard 5/10 Amplifier

for which I enclose P.O. for ..... (1/6 each)

Name .....

Address .....

## THE E.M.I. COLLEGE OF ELECTRONICS

10 PEMBRIDGE SQUARE W.2

Propose to commence a further One Year Course in Radio and Television on 14th April 1959. After 29th July 1959 the E.M.I. College of Electronics will cease to exist and students will be accepted by the Pembridge College of Electronics, 34a, Hereford Road, London W.2. Same staff, equipment and syllabus, will be used by both Colleges.

Details and enrolment forms may be obtained from

The Registrar, Dept. No. 32  
10 PEMBRIDGE SQUARE  
LONDON W.2

IA/66

## REPANCO HIGH GAIN COILS

- Dual Range Crystal Set Coil, Type DRX1 ... .. 2/6
- Dual Range Coil with Reaction, Type DRR2 ... .. 4/-
- Matched Pair Dual Range T.R.F. Coils, Type DRM3, pair ... .. 8/-
- Pair Dual Range Superhet Coils, Type SH4, pair ... .. 8/-
- Miniature Iron Dust Cored Coils, Type "R" ... ..
- Range Aerial H.T. Osc.
- 800-1,000m. RA1 RHF1 RO1
- 190-350m. RA2 RHF2 RO2
- 70-230m. RA1 RHF3 RO3
- 15-50m. RA4 RHF4 RO4
- Ferrite Rod Aerial, Dual Range Type FR1 ... .. 12/6
- Miniature I.F. Transformers, Type MSE (465 Kc/s), pair 12/6
- Standard I.F. Transformers, Type TCG (465 Kc/s), pair 13/6

- REPAFCO "EASY-TO-BUILD" RECEIVERS  
Constructors' Envelopes of easy wiring plans, instructions and detailed price lists of components.
- REPAFCO ONE-VALVE ... .. Envelope 9d.  
Beginner's Dual-range Radio Set for use with headphones. ... .. (post 3d.)
- REPAFCO FM TUNER UNIT ... .. Env. 1/6  
Using 4EF91, 1EB91, 1EM30 Valves, Ratio Detector ... .. (post 2d.)
- REPAFCO "THREE DEE" ... .. Envelope 9d.  
Dual-range Transistor Radio using 3 Transistors and Crystal Diode, Amazing loud-speaker reception from 1/2 volt battery supply. ... .. (post 2d.)
- REPAFCO "TRANSEVEN" ... .. Envelope 1/6  
A new 7 Transistor superhet Portable with preset station tuning. ... .. (post 2d.)
- REPAFCO "MINT" ... .. Envelope 1/6  
The amazing new transistor pocket portable radio with all the technical features of a standard receiver. Seven transistors, superhet circuit, fully tunable over medium wave. Size 5 1/2" x 3 1/2" x 1 1/2". ... .. (post 2d.)

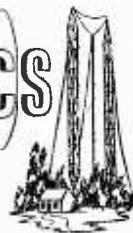
**JUST RELEASED!** A new comprehensive component catalogue for the radio enthusiast. With 59 pages and over 200 illustrations this offer should not be missed. Send 2-postal order now. (Post free.)

**RADIO EXPERIMENTAL PRODUCTS LIMITED**  
33, MUCH PARK STREET, COVENTRY  
Telephone 62572

# TRANSMITTING TOPICS

## FUNDAMENTALS OF OPERATING

By O. J. Russell, B.Sc.(Hons.), G3BHJ



**T**HE beginner is often overwhelmed by advice on operating methods, only to hear some of the advisers blithely ignoring their own good advice when on the air. A small sprinkling of common sense is advisable, as many statements have been made and repeated without any examination of the feasibility or otherwise of the recommendations. One such recommendation concerns the CQ call. We all know the fatuity of the long drawn out CQ. Operators on all bands can hear "lids" churning out endless strings of CQ's before signing their call-signs. Thirty, forty and even fifty CQ's may be heard before the operator signs. Often QSB takes the signal below audibility when the call-sign is sent, while some get so hypnotised by sending a long string of CQ's that they forget to give a call-sign at all, and send the "K" signal without a clue as to who or what they are. Thus determined to end this menace at the source, many writers have advised the "snappy" CQ, or the celebrated "three times three" CQ.

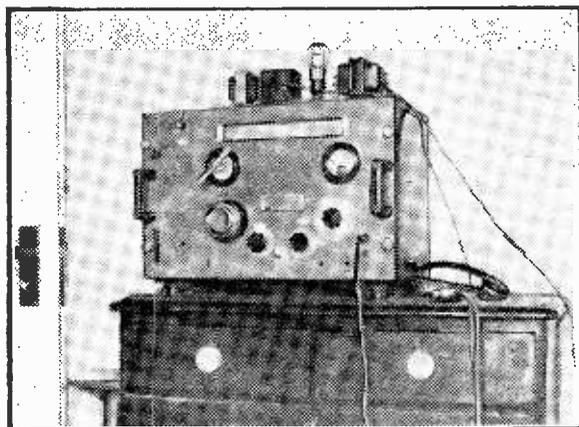
### Calling "CQ"

The "three times three" CQ method is to call "CQ" three times and give the call-sign three times. Thus on CW: "CQ CQ CQ de G3BHJ G3BHJ G3BHJ K." Purists, of course, sign "AR K," but this adds little information, and a straight "K" (meaning "invitation to transmit") is perfectly adequate. Anyone trying the "three times three" procedure will be very lucky if they receive a reply to such a CQ call. On the DX bands a reply would generally be a miracle—at any rate for a G operator. For G operators on the DX bands, more contacts will result by calling DX stations who are calling CQ than vice versa. The writer calls CQ about once for thirty QSO's, and has log pages devoid of any CQ calls at all. However, a CQ call, particularly on the L.F. bands is often in order. The "three times three" procedure is not very efficient. Generally the newcomer, having read up extensively on "operating procedure for the beginner," and anxious to do the right thing and avoid overlong CQ calls may persist with this procedure. Having tried one "three times three" call, he tries another and another and another and so on until he gets a contact. By this time he has sent "CQ" some twenty times and his own call twenty times.

### "Nine Plus Three" CQ Call

This is *not* surprising. The object of communication of any kind is to transmit information. The amateur calling "CQ" is trying to inform fellow amateurs that he

wants a contact. Thus, the information is divided into "CQ"—the information that a contact is wanted—and secondly his call-sign so that his identity is indicated to any amateur who might wish to contact him. On the basis of Information Theory, the "three times three" CQ call is ridiculously proportioned. Thus "CQ" sent three times represents six morse symbols. However, "de G3BHJ G3BHJ G3BHJ K" represents eighteen morse symbols. Thus, roughly speaking the "three times three" call devotes 24 per cent. of the transmission time to the important information that G3BHJ wants a contact, and 76 per cent. of the time to letting an amateur know that G3BHJ is on the air. If we devote an equal time to the "CQ" and to the call-sign, we need roughly eight or nine "CQ" signals to the triple call-sign ending. Such a CQ call balances the time between the two pieces of information. Thus the "Nine plus three" CQ call is recommended as a logical and time saving method of getting a contact *if* one has to call CQ. Anyone persisting with the "three plus three" method will discover that he has to make several of such calls before getting a contact, and a "nine plus three" call of nine CQ's and three call-signs will win hands down. Under average conditions, an operator tunes around until he hears a station calling CQ, and listens for the call-sign. With the "three times three" call, he has exactly five seconds out of some twenty seconds to hear that C.W. is being called, that is at a code speed of twelve words per minute. If we are dealing with a brisk 24 w.p.m. sender, some 2½ seconds of CQ are available to an amateur tuning the band to hear that a CQ is being called.



A Short-wave set owned by L. Hayward, of Swanage.

This points up the absurdity of the "three times three" call as a communication measure under average conditions. Moreover the suggested "Nine times three" call of nine CQ's to a three sent call-sign only occupies some thirty seconds in all even at a very moderate C.W. sending speed. Thus the "Nine times three" call occupies little time, but *does* inform a tuning amateur that a CQ call is in progress some 15 seconds rather than the 5 seconds allocated to the "CQ" by the same code speed "three times three" call.

#### "Tail-ending"

Some contacts start with a CQ call, but this is not invariably so. Thus, stations keeping a regular schedule call each other. Also, a station may "tail end" on a contact just ending. This is common with many operators, though this may very easily become a pernicious habit. Thus every time an operator in QSO signs over to the station he is working, "tail enders" may jump in with a frantic call to the station being worked. This most often occurs when some choice piece of rare DX is being worked. Under such conditions "tail enders" may become a nuisance particularly if they make long drawn out tail-end transmissions. The only possible type of

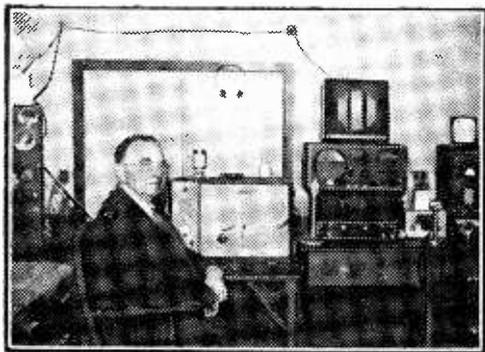
rate a rapid "single switch" change-over, is necessary. By making a quick "is that Roger break" one can get a quick "Roger" and be away to the next contest contact without laborious "over to you" procedures. In any case in a phone contact there is no need to say "well back to you then" or "over to you G7XX from G3BHJ. Key please," when "G7XX from G3BHJ over" is sufficient, with four words doing the work of eight. However repetition is not to be despised, as under heavy QRM conditions repetition may be needed to exchange reports. Repetitions should be used only when needed, as when copy is solid it is extremely irritating.

When calling a station, a "three times three" call is almost always sufficient. With good conditions a DX station may be raised by giving its call *once* followed by your own call three times. Some quiet amusement may be obtained by calling a station with a "once times three" call and enter into QSO while other stations are still calling. Moreover a short call to a DX station may be repeated if it does not reply immediately, so that by quick calls and listening between calls one can avoid QRM should the station reply to another station. It should be noted that when calling a specific station, the "three times three" call . . . thus "ZX7ZX ZX7ZX ZX7ZX de G3BHJ G3BHJ G3BHJ K" balances evenly the information content between who is calling and who is being called and is thus an efficient means of calling.

#### Different Operating Conditions

However, the operator will find contest operating conditions very different from "normal" or semi-normal DX operating. Thus the contest contact is strictly functional, and must be restricted to the minimum necessary for passing the signal report and serial number requisite for the contact. In the CW contest, operating skill is developed to a fine art in order to obtain as many points as possible as accurately and cleanly as possible in the shortest time. For obvious reasons poor CW operators do not participate in CW contests. Many operators are so scared of the machine gun fire exchanges of fast bug key operators that they do not enter such contests. But, participation in such contests is one sure way of developing speed and accuracy in CW operating. One does not have to be a .30 w.p.m. bug key addict to participate. Many such CW contests have plenty of room for the average CW operator to participate without necessarily being a high speed merchant. This applies particularly to DX contests where a G contact might give valuable bonus points to a DX station. Having to slow down (QRS) for a slow CW operator would be preferable to the DX operator rather than losing a bonus multiplier. One should call the station at the speed at which you want a reply. A fumbled call sent faster than your comfortable operating maximum, will cause more confusion than a confident solid call sent at your comfortable working speed. If the C.W. operator is a good operator he will reply to you at the speed you call him—that is he will recognise that the slow call is from a slow operator and will

(Continued on page 63)



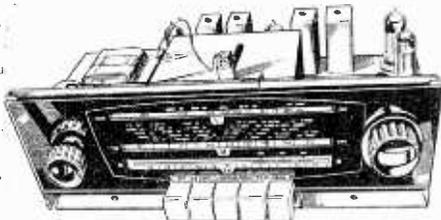
The radio shack of C. H. Jervis, in the village of Rio Seco, just outside Punta Arenas, Chile.

"tail end" is a quick and snappy one. Thus on C.W. a single "de G3BHJ" or on phone "G3BHJ on the frequency" is enough.

#### Contest Work

The operator will learn, of course, to suit his operating to the conditions of the moment. Thus engaging in a ragchew or "standard type" QSO is perfectly in order for a normal QSO. When a piece of choice DX is eagerly handing out "rubber stamp" contacts to an anxious horde of DXers, the correct answer is a similar rubber stamp reply. Moreover, phone and C.W. operating have different procedures for different times. Contest operating is a case in point. No operator is going to make any sort of score with sloppy long drawn out operating. It is noteworthy, too, that under normal QSO conditions, names, reports and QTH's are repeated several times. Under contest conditions even if these are sent once the operator gets them, However for contest and for snappy operating generally a fast break-in procedure or at any

**WONDERFUL OFFER OF A.M.-F.M. CHASSIS AT £14. (P. & P. 10/-)**



Why buy a F.M. Tuner at the same price? Tapped input 220-225 v. and 226-250 v. A.C. ONLY. Chassis size 15" x 6 1/2" x 5 1/2" high. New manufacture. Dial 14 1/2" x 4" in gold, red and deep brown. 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 & O.P. Transformer. Covers 1,000-1,900 M.; 200-500 M.; 88-99 Mc/s. Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85. Speaker & Cabinet to fit, polished, with back, 70/-.

Payments of 38/-, or with Cabinet & Speaker £6 down

TERMS:—(Chassis) £5 down+carr. and 5 Monthly Payments of £2.



**PORTABLE RADIO SET**  
Battery Operated  
Price £8.8.0

(Post and packing 7/- extra) This set uses the usual range of valves (DK96 range) for battery operated portables.

Batteries required are DM526 and H1184. The

case is light tan, rexine covered, 13 1/2 in. x 9 in. x 4 1/2 in. high. Good volume from the 5 in. speaker, and the general quality equal to that of most of this type of receiver priced at 50% more.

**AUTOMATIC RECORD CHANGERS COLLAR CONQUEST**

with manual play also. Turnover crystal pick-up, 4-speed, A.C. mains 200-250 v., see illus. Buy for your friends as well. Box of 4 B.S.R. Monarch for only £26 (carr. £1).

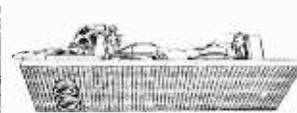


£8.10.0 (5/- p. & p.)

**GENERAL-PURPOSE AMPLIFIER** using 6K6 and two 6K7 valves. Rexine carrying cabinet 13" high x 12" x 5". Two inputs, 4 controls. Vol. (1st input); vol. (2nd input); treble tone; base tone. 200-250 v. A.C. double-wound transformer; 3 w. 8" speaker; metal rectifier. Bargain price of £4.15.0 (5/- carr.). Brand New, as are all goods offered by us.

**ADMIRALTY TIMEBASE UNIT** (unused) in cast box. 10 valves; 6 EF50 and 1 each VR54, VR92, VU120 and 5Z4G. Resistors (36), potentiometers (8), block condensers (4), etc., etc. New condition in original waterproof transit case. 35/- to clear (7/6 carr.).

**AERIALS.** FM Aerials single dipole room mtg., 17/6; ditto loft mtg., 20/-; "H" with chimney lashings, 65/- Co-axial low loss cable 8d. yard or 20 yds. 12/6, all these items carriage paid.

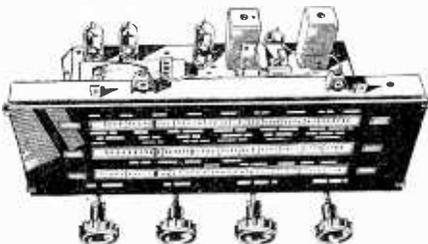


**GRAMOPHONE AMPLIFIER** with 5 in. SPEAKER. On Fabric - covered Baffle 12 1/2" x 5". Mains and Output Transformers. Metal

Rectifier. ECL82 Valve. Tone and Volume Controls. On-off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. ONLY 60/- (Post 3/-). Useful for Stereo.

**BUILD YOUR OWN RECORD PLAYER AT COST OF £8.2.0.** Rexine cabinet to take above amplifier, 42/- (post 3/6); B.S.R. Regent 3-speed single player to fit cabinet, 60/- (post 3/6); all items supplied separately. Carr. on all 3 items ordered together, 4/6. Completed player as above, £9.15.6 (carr. 4/6).

**A FEW ONLY COMPLETE CAR RADIOS.** Brand new in original boxes, made for one of the "Big Four" by famous manufacturer. L.M. and M.W.; complete with wing-mounting aerial. 6 volt (dropper for 12 v. 6/- extra). ONLY £16.10.0 carr. pd.



**OFFER OF RADIOGRAM CHASSIS.** Chassis 13" x 7 1/2" x 8" high. Covers 800-2,000 M.; 190-550 M.; 18-55 M. Mains trans. 200/210; 220/230 v.; 240/250 v. A.C.; Gram. socket and Aer. and Ea.; with o.p. trans.; 4 knobs; On-Off/Tone; Vol.; W-ch.; Tune. With new Mullard valves; ECH81; EBF80; EF41; EL41; EZ40. Dial 13" x 5". ONLY £7.15.0 (7/6 p. and p.). Fully guaranteed. Cabinet and 6 1/2" Speaker, 62/-.

**LOUDSPEAKERS**—Rola 10,000 line (2-3 ohm), 3 1/2" square, 15/- (1/-); 8" x 5" Celestion elliptical 20/- (1/6); 6 1/2" circ. 14/6 (1/6); all 2-3 ohm. (p. & p. in brackets). BRAND NEW.

**BATTERY ELIMINATOR.** Converts your Battery Set to Mains. For 4 Low Consumption Valves (DK96 range). 90 v. 15 ma. and 1.4 v. 250 ma., 42/6 (2/6 post). 200-250 v. A.C. Size 5 1/2" x 3 1/2" x 2".

Send 6d. (stamps will do) for our illustrated catalogue of the above items and others. Posted Orders to Worthing, please. Delivery by return. Terms:—One-third down and balance plus 7/6 in four equal monthly payments. Postage with down payment. (C.O.D. 2/- extra.)

**SEE SPECIAL TERMS FOR A.M./F.M. CHASSIS.** Large selection of complete radiograms ready built in cabinets, with 4 speed autochanger. Write for details, prices from £30 for AM only or £35 for AM/FM.

**GLADSTONE RADIO**—25, Wordsworth Road, Worthing, Sussex, Tel.: 235; 82B, High Street, Camberley, Surrey, Tel.: 2633; 3, Church Road, Redfield, Bristol, 5, Tel.: 51207.

# Armstrong new

Introduce another great addition to their range of radiogram chassis



price 28 guineas

Post this coupon or write for descriptive literature and details of Home Trial facilities. Hire Purchase Terms and Guarantee or call at our Holloway Showroom for full, unhurried demonstration and professional advice on your installation. Open 9-6 Weekdays and 9-5 Sats.

NAME .....

ADDRESS.....

PM4

# STEREO 44

## RADIOGRAM CHASSIS

This latest model has been ingeniously designed for use as the basis of a complete monaural and stereophonic reproducing system. Whether you want stereo as well as monaural now, or monaural now and stereo later, it is the ideal solution. Even if you are not sure whether you will ever want a stereo system, the Stereo 44 provides full monaural facilities for radio, tape and gramophone reproduction and is an insurance against a possible change of mind about stereo in the future.

8 watts output, 4 watts on each channel. ● 20 dB negative feedback on each channel. ● Full FM band (87-108 mc/s) and medium band. ● Stereo and monaural inputs for all crystal pick-ups. ● Stereo and monaural tape record and playback facilities. ● Mullard EL84 output valves. ● Separate wide range bass and treble ganged controls. ● Dual volume control. ● 3, 7½ and 15 ohms speaker outputs on each channel. ● Satinised brass dial escutcheon and veneered fascia board available. ● Size of chassis 12in. x 8in. x 7in. high.

The name ARMSTRONG is the registered trade mark of

ARMSTRONG WIRELESS & TELEVISION CO., LTD.  
WALTERS ROAD, LONDON, N.7. Tel. NOR. 3213.

### RST

#### MAIL ORDER DEPARTMENT

211 Streatham Road, Mitcham, Surrey.  
ALL VALVES LISTED ARE NEW STOCK  
o Terms C.A.W.O. or C.O.D. Postage 3d. per valve.  
MITCHAM 6201.

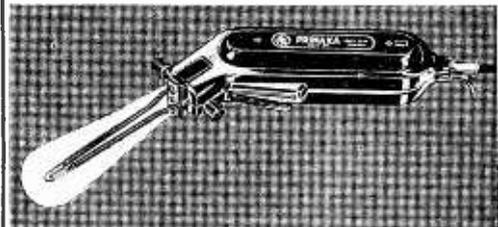
AZ11 10/6	EF85 7/6	N153 11/3	UCL33	6K7 4/6
B75 8/6	EF86 12/-	N154 11/3	6K7GT 10/-	6K3GT
DAF31 9/-	EF89 10/-	N727 8/6	UF41 9/-	6L1 12/3
DAF33 9/6	EF91 8/6	PCC4 11/6	UF89 10/-	6L6G 7/6
DD320 10/6	EF95 14/-	PCF30	UI41 9/6	6L18 12/6
DF91 8/6	FL42 10/-		UL91 9/-	6L19 21/-
DH71 9/8	HL84 9/-	PCF82	UY41 7/6	6N7G/GT
DK31 9/-	LL9 8/6		UY85 8/-	W81M 8/6
EAB33	EM80 10/-	PCL82	VP4B 17/6	W142 9/-
	EM81 11/8		W81M 8/6	W19 8/6
EAF42 10/-	EY81 10/-	PCL83	W19 8/6	W27 8/6
EB31 5/9	EY84 13/-		W27 8/6	X78 19/-
EBC41 9/3	EY86 14/6	PENA4	X78 19/-	X79 17/-
EBF3 9/3	EZ15 9/-		X79 17/-	Z21 10/6
EBF3 9/3	EZ15 8/6	PEN4VA	Z21 10/6	Z77 10/6
EC91 8/9	EZ41 8/-		Z77 10/6	Z152 8/6
ECC33 8/8	EZ41 10/6	PL76 15/-	Z152 8/6	Z159 8/6
ECC31 8/8	EZ89 9/-	PL81 14/-	Z159 8/6	IR5 9/-
ECC31 9/-	EZ91 8/-	PL82 10/-	IR5 9/-	5Y3GT 8/6
ECC84 10/-	FC2 14/8	PL83 14/-	5Y3GT 8/6	5Z4G 10/-
ECC85 10/6	FC4 23/6	PL83 14/-	5Z4G 10/-	6A8GT
ECF33	FC13 14/8	PY81 9/6	6A8GT	6AL5 10/-
	FC13C 19/6	PY82 8/6	6AL5 10/-	6AM6 9/-
ECF32 12/6	GZ32 13/6	PY83 8/6	6AM6 9/-	6AN5 5/-
ECF32 12/6	H3 4/9	R10 22/-	6AN5 5/-	6AQ5 7/6
ECH35 12/8	H81 10/-	R19 19/-	6AQ5 7/6	6BA5 8/6
ECH42 9/3	HBC30 8/-	TD1 15/-	6BA5 8/6	6B2 8/6
ECH31 9/3	HL1 22/6	TP22 12/6	6B2 8/6	6B6 5/6
ECL32 12/6	HL133D	U142 8/6	6B6 5/6	6B7 7/6
	HL133D	U147 9/9	6B7 7/6	6BR7 12/-
ECL32 12/6	KT33C 12/6	U153 9/6	6BR7 12/-	6BW6 8/6
	KT65 18/6	UABC80	6BW6 8/6	6BW7 9/6
EF37A 10/3	LZ319 12/6		6BW7 9/6	6BX3 8/6
EF19 15/-	MKT45	UAF4210/-	6BX3 8/6	6C2 9/6
EF11 9/8	ML1 12/6	UBC4 8/6	6C2 9/6	6F1 19/6
EF42 12/-	MSP1 15/-	UBF30 9/6	6F1 19/6	6F12 8/6
EF50 (A)	MU14 10/-	UCH42	6F12 8/6	6F13 18/6
	MX49 15/-		6F13 18/6	6J5C 8/6
EF30 8/-	N142 9/6	UCH81	6J5C 8/6	6J7GT 10/-

Quotations given for any types not listed. Obsolete and old types a speciality.

### YOU SEE WHERE YOU SOLDER!

# PRIMAXA TWIN SPOTLIGHT

## SOLDERING GUN! 99/6 Post free



The Primaxa Model 100 carries its own spotlight system with two magnifying lenses in bulbs for uniform and shadow-free illumination of the soldering spot. It is a **HEAVY DUTY** solderer, with increased soldering power and is ready for action in 6 seconds. Can be used intermittently without overheating. Available in 110, 200/220, 220/250v. for A.C. only. 50/60 cycles (100 watts).

#### SHORT TECHNICAL DATA

Power Consumption, 100 watts. Heating Time, 6 secs. Effective Area, 1/64 sq. in. Weight, 34 ozs. Cable length, 6 ft.

#### ONE YEAR'S GUARANTEE!

(Not for soldering bits and bulbs)

Sole Distributors:  
**S. KEMPNER LTD.** 29 PADDINGTON STREET,  
LONDON W.1.  
Phone: HUNTER 0755.

not confuse you with a fast reply. It should be noted that fast C.W. sending is not necessarily an indication of a good C.W. operator. Much fast C.W. if taken down *as sent* is gibberish. Whilst there are some extremely good operators who send an effortless stream of fast C.W. that is readable with little strain, there are many others who send a fast, jerky stream of alleged morse that is very tiring to copy. The hallmark of good, fast C.W. is that it is readable without undue strain.

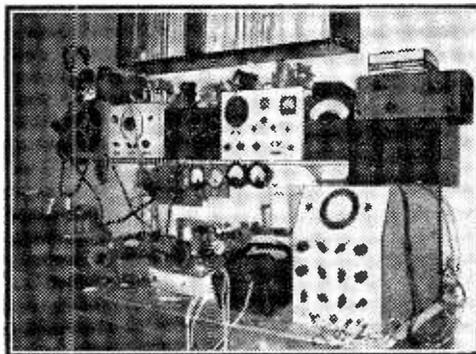
### Slower Operators

One can easily discover the good and bad C.W. operators by a little listening. The object of operating is to do so well whatever your speed. Thus while listening round in a contest one will find several operators occupying spots in the band. After working one station they will send a single "QRZ?" and work another and another station in a stream. Obviously if such an operator is heard working without trouble a stream of stations, a slow operator would be well advised not to add to the QRM by putting in a call. If you do put in a call a "one by one" or a "one by two" exchange of call-signs is all that is needed. More repetition of call-signs is unnecessary QRM, as the DX contestant is probably through with one station and starting with another while you are still calling him! Thus if you really are a slow C.W. man, wait till the heat of the contest has died down a little, and search for some contestant who is having to call "QRZ" several times to get replies, or who has to call "CQ TEST" a few times for each reply. He is obviously scoring slowly, and would be very glad for a contest QSO. Thus when you hear "CQCQCQ TEST de VZ1A VZ1A" drop on the frequency with a snappy "VZ1A de G3BHJ G3BHJ K." This should produce the reply "G3BHJ de VZ1A UR RST 579 312 579 312 579 312 BK." This, of course, is your signal report plus the contest serial number. That is, this contact is the three hundred and twelfth that the DX station has had in the contest. All you need to send now is "R" to indicate you have received all OK, pass on your report and serial number, and confirm the report and serial the DX station has sent to you. Thus: "R. UR RST 579001 579001 579001. QSL UR RST 579312 579312. VZ1A de G3BHJ K." This should receive a "G3BHJ de VZ1A QSL UR 579001 579001 BK." Drop in with an "R" to indicate the DX operator has reported your "number to him" correctly, and leave the frequency to him. Thus a maximum of "R CUL GL CTST ES 73 VZ1A de G3BHJ SK" should be sent, indicating report and check received correctly, "see you later" (after the contest), "good luck in the contest" and "best wishes." This example will be regarded as extremely long winded by some operators, who, by utilising the "break" symbol, would reduce call-sign and other exchanges to the barest minimum, but it will be appreciated that under contest conditions where QRM may be prevalent, a fast "break" procedure may minimise QRM and time.

### "Dxpeditions"

We come now to the present day phenomenon

of DX operating, the "Dxpedition." One or more amateurs may make a special trip to some island or other locality and "put it on the air" for a limited period. Generally the spot chosen represents a "new country" for DXCC and other certificate purposes, so that the object of these tactics is to give as many contacts as possible in the time available. Also, if the expedition has been at all publicised, hordes of amateurs are, of course, waiting to call it. This immediately creates the well known "pile-up." Hearing a "pile-up" in progress is often the first indication to many that a rare area is on the air via a Dxpedition. In fact a casual listener may tune



The electronics lab. of S. Villa of Malta.

across such a pile-up without learning which station is operating. To save time, the DX station may reply to a calling station and go on to work another without indicating its own call-sign; or the stations working the DX station may omit the DX station's call and merely give their own. This procedure is very often encountered, although it is against licence regulations. Thus the DX station may give a single "QRZ" and the band in the immediate neighbourhood at once erupts with stations calling the DX. The DX station logs the call-sign of one station calling and may reply as follows: "G3BHJ RST 579 579 579 BK." The station "worked" replies "R RST 589 589 589 73 BK." This may be followed "R 73 QRZ." and a further station is then immediately worked and so on. In this fashion some hundred "contacts" per hour are handed out. Diligent listening over a period may be necessary to identify the "DX," as a call-sign may be sent only occasionally.

### Procedure

In such DX pile-ups, the laborious over repetition of call-signs is very definitely not recommended. It will be appreciated that generally there may be hundreds of stations calling the DX station, so that snappy procedure is necessary. Moreover, any given operator wishing to contact the DX station may have to standby on the frequency waiting for the "QRX" signal before calling the DX station. With contacts being made at a high rate, with average luck one does not have to wait too long for a brief contact with the Dxpedition station.



#### BRADFORD AMATEUR RADIO SOCIETY

Hon. Sec.: David M. Pratt (G3KEP), "Glenluce," Lyndale Road, Eldwick, Bingley, Yorkshire.

**I**N December we had a very successful Social Evening. Many prizes were presented for the games played, in the form of chocolates for the ladies, and radio components supplied from a radio and television manufacturing firm for the men.

This was followed by a very interesting lecture by Arthur Bailey (G3IBN) on Resistor/Capacitor Bridges with demonstrations. On December 30th, R.S.G.B. and Mullard films were shown at the Annual Film Meeting.

Forthcoming meetings:

February 10th.—Colour Television. Dr. G. N. Patchett (at the Bradford Institute of Technology).

February 24th.—Transmitter Design and Construction. D. M. Pratt (G3KEP).

March 10th.—Junk Sale.

March 24th.—Annual General Meeting.

Unless otherwise stated, meetings are held at 7.30 p.m. at Cambridge House, 66, Little Horton Lane, Bradford. 5. We welcome to our meetings anyone interested in radio or television.

#### BURY RADIO SOCIETY

Hon. Sec.: Mrs. Jean Hodgkins (G3JZP), 24, Beryl Avenue, Tottington, Nr. Bury, Lancs.

**T**HE above Society meets at 8 p.m. at the George Hotel, Kay Gardens, Bury, on the second Tuesday of every month.

Forthcoming meetings:

February 10th.—Construction Practice, a talk by Mr. A. Moss (G8VF).

March 10th.—Jodrell Bank, a talk by a member of the staff. Since the Society was re-formed three years ago, the membership has almost doubled and covers a large area of East Lancashire. Newcomers are always welcome and copies of the Society's 1959 programme may be obtained from the Hon. Sec.

#### CRAY VALLEY RADIO CLUB

Hon. Sec.: W. E. Sutton, G3FW1, 30, Sherwood Park Avenue, Sidcup, Kent.

**T**HE February meeting of the above Radio Club will be held at the Station Hotel, Sidcup, at 8.0 p.m. on Tuesday. February 24th, when Rowley G. Shears, G8KW, will talk about "K.W. Products."

The Annual General Meeting of the club will be held on Tuesday, March 24th, at 8 p.m., also at the Station Hotel, Sidcup.

Readers are always welcome visitors to our meetings which are held on the fourth Tuesday of each month at 8 p.m. at the Station Hotel, Sidcup.

#### OVERSTONE AMATEUR RADIO SOCIETY (O.A.R.S.)

Hon. Sec.: G. C. George, 75, Broadway, Northampton.

**T**HIS club has been meeting weekly for the last six months. Subjects which have been discussed include General Radio Theory, Antennae, etc.

The club also took part in the recent 160 metre CW contest, using the call sign G3KQH (J. R. Hunt—president). It caters mainly for the younger radio-minded enthusiasts in the districts around Northampton.

#### THE SLADE RADIO SOCIETY

Hon. Sec.: C. N. Smart, 110, Woolmore Road, Erdington, Birmingham.

**T**HE following meetings will be held during the first quarter:—  
February 13th.—"The Human Ear," by Mr. C. Naylor Strong.

February 27th.—"Round the Local Hams," a talk by Mr. C. H. Young (G2AK, member), with colour slides of many Midland amateur radio stations.

March 6th.—Special Mullard Film Show at the Y.M.C.A., Snow Hill, Birmingham, at which will be screened "The Manufacture of Junction Transistors" and other films.

March 13th.—"V.H.F. Business Radio," by Mr. J. F. Moseley, of Messrs. Pye Telecommunications, Ltd., with a sound film.

March 27th.—"The Construction and Use of Test Equipment" by Mr. T. J. Hayward (G3HHD) and Mr. G. Nicholson (G3HKC) (members).

**Club Station Activities.**—The Club Station (G3JBN), at The Church House, is available for the use of members for constructional purposes. Instructional morse classes are held on every Wednesday at 7.45 p.m. Slow morse transmissions are radiated on the air each Tuesday evening from Station G3AVJ on 1.9 Mc/s, at 8 p.m.

The headquarters are: The Church House, High Street, Erdington, Birmingham, 23, although the activities of the Society may be obtained from the Hon. Sec. Visitors to the meetings, which commence at 7.45 p.m. prompt, and to the Club Station are cordially welcome.

#### TEES SIDE AMATEUR RADIO CLUB

Hon. Sec.: Allan Layton (G3JMO), 12, Endsleigh Drive, Acklam, Middlesbrough, Yorks.

**T**HE notice given about the Club Dinner in no small way led to our having a record attendance of 46 local "hams."

The dinner was very well supported and was a success. Our new catering arrangements proved satisfactory, and it was voted a "good night." Messrs. Viners (Middlesbrough) Ltd., who advertise in the PRACTICAL WIRELESS from time to time, provided the top raffle prize, a "ball and biscuit" type Aco crystal microphone, and this, together with the draw prize of a £1 Premium Bond, were both won by guests, not club members!

G3LCZ, Tom, brought down his new shiny Vanguard transmitter (how heavy they are!), a very fine rig indeed, and was the centre of much attention all the evening. He wired the kit himself; it worked fine and was not difficult to do.

One or two pieces of gear and some valves (including two 829B's) changed hands on the swap table. The 829B's vanished before the dinner was served, G3HAE, Les, knew about that; he was looking for them all the evening, but they had gone for good!

G3INP, Bill, who has been very ill, was back with us again, fit and well, but G2CKN, Reg, is still in hospital but much improved.

We have a meeting on February 20th. We hope to arrange a stereo demonstration if we can. All these at our club H.Q., Settlement House, Newport Road, Middlesbrough.

#### TORBAY AMATEUR RADIO SOCIETY

Hon. Sec.: L. H. Webber (G3GDW), 43, Lime Tree Walk, Newton Abbot.

**A**T the December meeting members warmly applauded the generous gift of a new Model 40 Avometer from the company to help the society in its hospital work. The sum of £5 4s. was raised by a junk sale and members were told of the Ham Hop Club activities. A brief demonstration of tape recording was given by Mr. R. D. Knappe, who lectured on technical aspects of this activity at the January meeting.

#### WEST LANCS RADIO SOCIETY

Hon. Sec.: A. Crighton, 77, Myers Road West, Great Crosby, Lancs.

**C**LUB now well-established in new headquarters at "Colony," Crosby Road South, Waterloo, Liverpool, 22.

Weekly meetings: Tuesday, 8.30 p.m. Theory and Morse classes. Alternate weeks. Programme: February 10th, Discussion T.V.I. February 17th: "Practical Alignment" G3F2G. February 24th Morse Procedure, G3GST. New members and visitors always welcome.

#### HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, G3MDW.

**A**T the monthly meeting of the Halifax and District Amateur Radio Society on January 6th, held at the Sportsman Inn, Ogden, a very useful lecture was given to a good attendance of members by Mr. Duncan Enoch, G3KLZ, whose subject was Fault Finding Made Easy. The meeting was presided over by Mr. A. Robinson, G3MDW.

The future programme of the club is February, DX Expeditions by Mr. M. Whittaker, G3IGW.

March Hi-Fi Reproduction by Mr. Falkus of Fane Acoustics Ltd.

April. Quiz on Licence Conditions.

May. Junk Sale.

June. Recorded Lecture on Aerials.

#### THE BRITISH AMATEUR TELEVISION CLUB

Change of Address

The new address of the Hon. Sec.: D. S. Reid, M.A., is:—149, Ongar Road, Brentwood, Essex.

#### BRIGHTON & DISTRICT RADIO CLUB

Hon. Sec.: E. Roberts, 9, Clifton Hill, Brighton, 1.

**C**LUB meetings are now held on Wednesdays, at 8 p.m. at the "Eagle Inn," Gloucester Road, Brighton, 1, and future events include:

February 11th.—"Automatic Telephone Exchange Systems," by E. Roberts.

February 18th.—National Field Day Discussion.

February 25th.—"DX Operating," by C. T. Fairchild (G3YY).

# HOME RADIO OF MITCHAM

(Dept. P), 187 LONDON ROAD, MITCHAM, SURREY. MIT 3282  
 Shop Hours: 9 a.m.—6.30 p.m. Wednesday 9 a.m.—1 p.m.

We are stockists for:—EDDYSTONE, PANDA, ARMSTRONG, DULCI, DENGCO, JACKSON BROS., WB STENTORIAN, REPANCO, TELETRON, GOODMAN'S, OSMOR, WHARFEDALE, GRAYSHAW, BULGIN, etc.

## SOLDERING IRONS



Brand new Remploy instrument soldering irons. Ideal for all radio work. 3/16in. detachable bit, neon indicator lamp in handle which is specially shaped to prevent accidental burns to bench. Limited quantity only at SPECIAL PRICE **18/6** (22C-240 volts).  
 plus 18d. postage.



## MICROPHONES

Brand new boxed ACOS 33-2 hand or desk bowl microphones with switch. High quality omnidirectional crystal type suitable for all tape recorders, amplifiers, etc. Flat response 30-7,000 cycles. Usual price 50/-. Our Special Price **35/-**

## HEADPHONES



The best headphone offer ever made. Don't miss this bargain, cannot be repeated once stocks sold. Brand new lightweight high resistance phones in makers' boxes. 4,000 ohms resistance. Usual price 45/-. OUR SPECIAL PRICE **15/-**  
 Add 1/- post.

## "THE CHOICE OF THE CONNOISSEUR"



## BAKERS (Selhurst) LOUDSPEAKERS

Fully damp and rust proof and completely tropicalised. Rigid die-cast chassis and massive high flux magnets. The first and foremost name in high quality moving coil loudspeakers.

- 12in. Stalwart with foam suspension ... **£6.15.0.**  
 plus 3/6 post.
  - 12in. De Luxe with foam suspension ... **£8.12.6.**  
 plus 3/6 post.
- Details of full range and specifications sent on request.

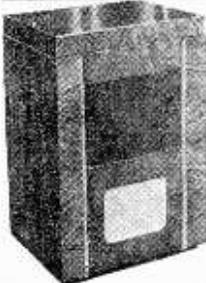
## MULLARD "FIVE-TEN" AMPLIFIER

Still the most outstanding and popular Hi-Fi amplifier kit Available with controls on main amplifier as shown or with separate pre-amplifier. The perfect basis for a home Hi-Fi system whether monaural or stereo. Full constructional data in "High Quality Sound Reproduction." Book price 3/6 plus 9d. post.

We also stock parts for the Mullard '3-3' and the Type 'C' tape amplifiers.



## CABINETS



A full range of beautifully finished cabinets for speakers, amplifiers, record units, tuners, etc. Prices from **£5.10.0.** Send 3d. stamp for fully illustrated leaflets including the new "Prelude" contemporary models. These cabinets are packed flat in cartons and can be quickly and easily assembled with only a screw-driver. Despatch by return. Carriage charge 5/-. (U.K. only.)

## TELETRON "TRANSIDYNE"

6 transistor pocket portable with printed circuit

Build this wonderful little pocket set for your holidays. Really easy to build with fully punched printed circuit and all components carded and labelled. Excellent results on Medium and Long Wave. Works from two No. 8 batteries. Genuine Pye "Gold-top" transistors supplied in kit. Full constructional data and price list 9d. Complete kit, **£12.19.6.**



## COSSOR AMPLIFIER & F.M. RECEIVER KITS

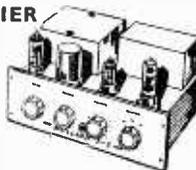


These two kits set a new standard in high quality presentation. Every item is supplied down to the last nut and bolt and very precise and fully illustrated building instructions are included. Printed circuits. Model 562K. 3 watt high quality amplifier complete with speaker and tweeter. PRICE, **£9.15.0.**

Model 701K. Complete F.M./VHF receiver with output stage and loudspeaker. PRICE, **£15.15.0.**

## MULLARD '3-3' AMPLIFIER

Complete ready built amplifier with separate Bass, Treble and Volume controls. Really amazing quality and performance. Ideal for gramophone, radio, microphone or guitar input. PRICE ONLY **£8.8.0** Post and packing 2/6.



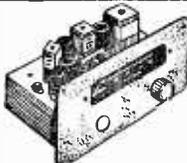
A further delivery of the latest lightweight pick-ups with Hi-G crystal cartridge and sapphire stylus. Turn-over for 78 and L.P. records. PRICE ONLY **35/-**, plus 9d. post.



## SPECIAL OFFERS

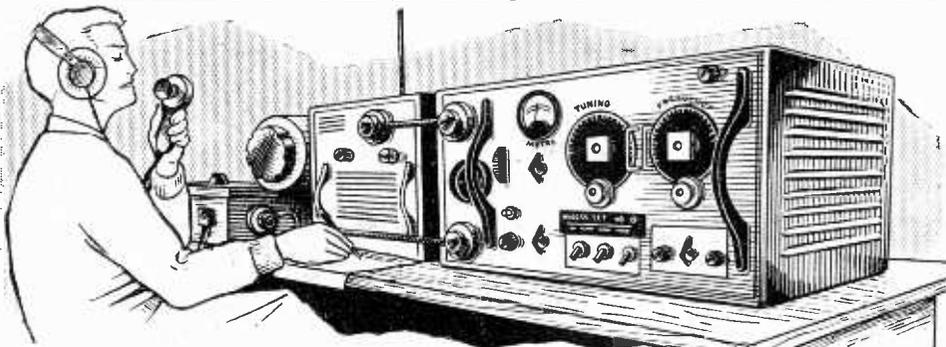
1,200 ft. PVC recording tape on plastic spool, 20/-. Acos crystal microphone inserts, 5/-. TCC 16 mfd. 350 v. small tubulars, 1/6 B9G ceramic valveholders (EF50), per dozen, 2/6. 4-gang 350 pf. tuning condensers, 5/-. Special AM/FM gang condenser with gear drive, 11/6. TCC .1 mfd. 500 v. type 543, per dozen, 7/6. Colvorn SK slider resistors CLR801, 1/-, 6-way bakelite connecting blocks, 1/-. Please add a little for postage and packing.

## JASON FM TUNER



Enjoy crystal clear Hi-Fi reception with the ever-popular JASON FM tuner kit. All parts are standard and available from stock. Full constructional data, point to point wiring diagrams and price list in RR2, price 2/6, post paid. Complete kit, **£7.7.6.** We also stock all the parts for the "Mercury" switched FM tuner. list on request with S.A.E.

# WIRELESS SET No. 19 STATION



★ Undoubtedly the finest Transmitter/Receiver Installation available at such a low price. The installation as supplied comprises a complete Trans/Receiver covering 2 to 8 Mc/s. (150 to 37.5 metres) in 2 bands; and uses 15 valves. 12 and 24 volts rotary power pack feeding L.T., H.T. and E.H.T. voltage requirements. Aerial variometer. Control boxes. Moving coil headphones and microphone Morse key assembly. 12ft. whip aerial and base, connecting leads and mounting platform.

COMPLETE installation as illustrated, with full circuit and instruction book offered at ONLY

## £9.0.0

Carr. 20/-.

For other bargains see our advt. inside front cover illus. cat. 1/3 Post Free.

★ THE TRANSMITTER incorporates: receiver oscillator, heterodyne oscillator and mixer, buffer, power amplifier, modulator and A.F. oscillator, grid bias, automatic drive control.

★ THE RECEIVER is a superheterodyne type incorporating: signal frequency, oscillator frequency changer, I.F. amplifier, detector AVC audio amplifier, heterodyne oscillators (BFO).

★ THE WIRELESS SET No. 19 incorporates a V.H.F. Transmitter/Receiver covering 230 to 242 Mc/s. and an intercom. system. Tuning meter giving aerial and all voltage readings.

## REDA RADIO LTD.

All post orders to: Dept. "P," 32A, COPTIC ST., LONDON, W.C.1.  
Also at 87, TOTTENHAM CT. RD., W.1. Tel.: MUSeum 9607.

## FIRST-CLASS RADIO COURSES...

### GET A CERTIFICATE!

QUALIFY AT HOME—IN SPARE TIME

After brief, interesting study—undertaken at home in your spare time—YOU can secure your professional qualification. Prepare for YOUR share in the post-war boom in Radio. Let us show you how!

### FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success-compelling qualifications as A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs, Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship (all branches), etc., together with particulars of our remarkable Guarantee of SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.

FOUNDED 1863—OVER  
150,000 SUCCESSES

NATIONAL INSTITUTE OF  
ENGINEERING  
(Dept. 461), 148, HOLBORN,  
LONDON, E.C.1.

## SERVICING TRANSISTOR RADIOS

23/-. By L. D'Airo Postage 1/-

A GUIDE TO AMATEUR RADIO.

An R.S.G.B. Pub. 3/6. Postage 6d

WORLD RADIO HANDBOOK FOR LISTENERS. 1959 ed. 14/6. Postage 1/-.

HOW TO GET THE BEST OUT OF YOUR TAPE RECORDER.

By P. J. Guy. 8/6. Postage 6d.

AUDIO MEASUREMENTS. By N. H. Crowhurst. 23/-. Postage 1/-.

AN ELECTRONIC ORGAN FOR THE HOME CONSTRUCTOR.

By A. Douglas. 15/-. Postage 9d.

LOUDSPEAKERS. By G. A. Briggs. 19/6. Postage 1/3.

RADIO VALVE DATA. 6th ed. "W.W." 5/-. Postage 9d

## THE MODERN BOOK CO.

BRITAIN'S LARGEST STOCKISTS  
of British and American Technical Books

19-23 PRAD STREET,  
LONDON, W.2.

Complete catalogue 6d.  
Phone: PADdington 4185.  
Open 6 days 9-6 p.m.

## SAVE 1/- IN EVERY £1

NEW 5 POINT PLAN TO SAVE MONEY

On receipt of 1/6 you will receive:

- ★ OUR NEW 60-PAGE CATALOGUE with over 240 illustrations
- ★ Full Details of our AMAZING CREDIT COUPON SCHEME saving 1/- in every pound.
- ★ Details of our BARGAIN OFFERS not advertised elsewhere.
- ★ New STREAMLINED return of post service.
- ★ REGULAR lists of the LATEST COMPONENTS, etc.

### Genuine British Transistors

EDISWAN XB 101	10/-
WHITE SPOT	12/6
RED SPOT	7/6
GREEN/YELLOW	7/6
RED/YELLOW	15/-
CRYSTAL DIODES	1/-

Also all Mullard & Mazda Types.  
3 TRANSISTOR CIRCUIT 11d. KIT 73 6.  
DENCO 6 TRANSISTOR CIRCUIT 8d.  
FULL KIT £11 3 6 (or £8 10 - less Transistors) THIS IS OUR BEST YET.

Resistors: All Values 10%, 1 watt. 6d.  
ELECTROLYTICS—GUARANTEED  
16 mfd. 450 v. 150 mA. 1 1/2" x 1", 2 1/4 each.  
8-3 mfd. 450 v. 100 mA. 1 1/2" x 1", 2/3.  
8-16 mfd. 450 v. 100 mA. 1 1/2" x 1", 2/3.  
50 mfd. 50 v. 1/8. 25 mfd. 25 v. 1/8.  
ALL PRICES ARE POST PAID.  
TERMS: C.W.O. or C.O.D. (over £2).

OAKFIELD RADIO  
"The Transistor People."

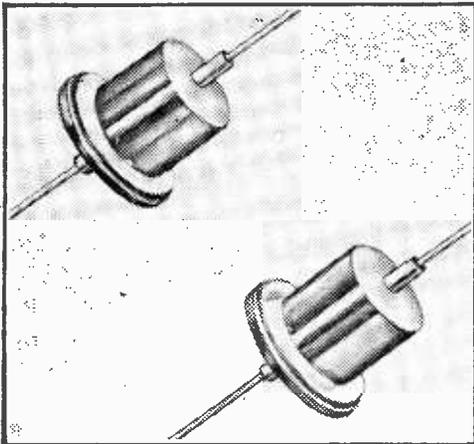
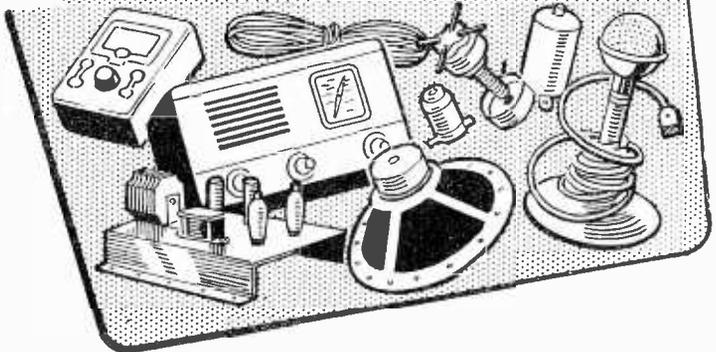
44 OAKFIELD ROAD, STOCKPORT

# NEWS FROM THE TRADE

LATEST DEVELOPMENTS  
IN RECEIVERS AND  
COMPONENTS

## SIMET SILICON RECTIFIERS

FOLLOWING the licensing agreement between The Plessey Company Limited and General Instruments Corporation, Plessey of Vicarage Lane, Ilford, Essex, announce the first series of a new range of Simet silicon rectifiers. To be known as the "G" series, they are hermetically sealed, medium power rectifiers, designed to operate in ambient temperatures between  $-55^{\circ}\text{C}$  and  $+150^{\circ}\text{C}$ , and are suitable



Simet silicon rectifiers "G" series.

for a wide range of applications including magnetic amplifiers and D.C. blocking. The series covers the range 100-1,000 peak inverse volts, 400-750 mA ( $25^{\circ}\text{C}$  rating) and up to 250 mA at  $150^{\circ}\text{C}$ . Long life and stable operation at temperatures up to  $150^{\circ}\text{C}$  is claimed.

## TRANSISTOR RANGE FOR THE HOME CONSTRUCTOR

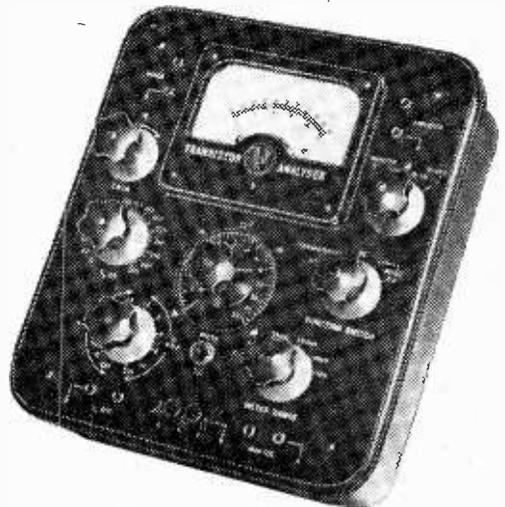
INCREASED demand from home constructors and experimenters for economically priced quality transistors is met by the Ediswan-Mazda XA103 (list price 15s.) and XA104 (list price 18s.) transistors, now made available through dealers.

To complete the range the Ediswan-Mazda XB102 and XB104 are now available at the much reduced list price of 10s. XA103 is an I.F. amplifier with minimum common base cut-off frequency of 2 Mc/s. Maximum peak or mean collector-to-emitter voltage is 12 v., and minimum small signal current gain is 15. XA104 is a general

purpose R.F. transistor, frequency changer and/or oscillator for long and medium wavebands with minimum common base cut-off frequency of 4 Mc/s. Maximum peak or mean collector-to-emitter voltage is 12 v., and minimum small signal current gain is 18. XB102 and XB104 are general purpose audio transistors with a maximum peak or mean collector-to-emitter voltage of 16 v. The range of small signal current gain is 18.47. The maximum collector dissipation of XB102 at  $25^{\circ}\text{C}$  is 150 mW, at  $45^{\circ}\text{C}$  is 90 mW; of XB104 at  $25^{\circ}\text{C}$  is 120 mW, at  $45^{\circ}\text{C}$  is 60 mW.

## TRANSISTOR ANALYSER

A PORTABLE, compact, battery operated transistor tester suitable for testing small and medium n-p-n or p-n-p transistors either *in situ* or removed from associated apparatus is made by Avo Ltd., 92/96, Vauxhall Bridge Road, S.W.1. The instrument is suitable for taking  $I_b/I_c$  characteristics with a choice of  $V_c$  with the transistor in the grounded emitter configuration.  $\beta$  can be measured at any predetermined



The Avo transistor analyser.

point on the  $I_b/I_c$  characteristic and  $I_{c0}$  is directly indicated in  $\mu A$ .

Provision has been made for the measurement of transistor noise by comparing peak noise over the approximate range 100 c/s-10 kc/s. with an equivalent input signal calibrated in  $m\mu A$  from the internal 1,000 c/s oscillator. The instrument can also be used as a multi-range test meter for servicing transistorised apparatus.

### FERRITE ISOLATORS

MARCONI'S WIRELESS TELEGRAPH COMPANY are manufacturing a range of ferrite isolators as components for use in the main microwave communication frequency bands. As British made components for these frequency bands are not readily obtainable through the normal trade channels in this country it has been decided to make them available to the electronics industry. At present orders can be accepted for the following range:

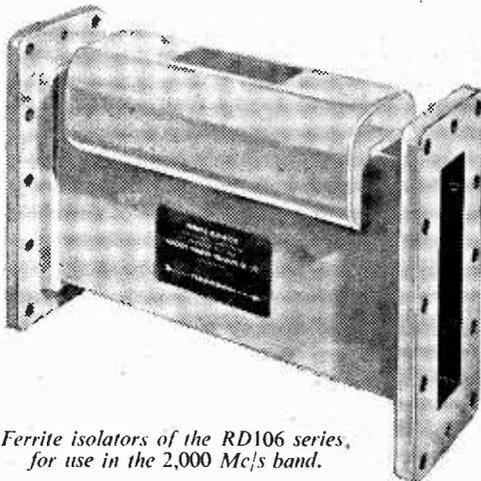
Series RD 103 for the 4,000 Mc/s band.

Series RD 105 for the X-band.

Series RD 106 for the 2,000 Mc/s band.

Research is continuing to develop other specialised components difficult to obtain.

Ferrite isolators are "one way streets" in microwave transmission lines, permitting propagation of energy in one direction, and absorbing energy reflected at any mismatch travelling in the opposite direction. The isolators in the Marconi series employ resonance absorption of spinning



*Ferrite isolators of the RD106 series, for use in the 2,000 Mc/s band.*

electrons which precess in a static magnetic field. Two notable features of the isolators are the very good wide-band match effected with adjoining transmission lines and their ability to operate in a wide temperature range without significant deterioration in performance.

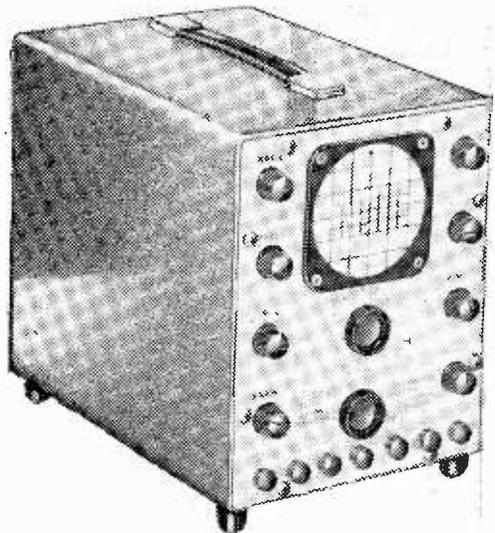
The field of application of these components extends from microwave test benches to microwave multichannel and colour television links. They are particularly valuable in test equipment to isolate reflecting loads from sensitive oscillators, the frequency of which would be affected by such reflections. By using these new isolators the

performance of microwave links can be greatly improved to carry a substantially increased number of channels or colour television channels.

The components are manufactured to fine limits. For example, the tolerance of the standing wave ratio is 1.05 to 1.02 or better. This ensures that the equipment in which the components will be used will conform to C.C.A.R. recommendations.

### THE TRESCOSCOPE

THIS is a general purpose, high performance oscilloscope designed around a first-grade 3in. cathode ray tube type 3AFP1. It is suitable for use by radio and television service engineers, amateur experimenters, and has many applications in industry.



*The Trescoscope.*

It is housed in a well-proportioned cabinet which is fitted with a carrying handle and feet, and is attractively finished in a scratch resisting grey hammer cellulose. The tube face is protected by a transparent perspex graticule ruled horizontally and vertically to provide a convenient reference for the measurement of trace amplitude. All input terminals are keyed into the front panel to prevent over-turning and subsequent loosening. They are fitted with captive insulated heads which cannot be removed and lost. The cabinet and all metalwork is of steel, the main chassis and C.R.T. bulkhead being suitably treated to prevent corrosion and rust.

The instrument utilises BVA valves, and it is manufactured by The Range Electronics Co., Cormorant Works, Lett Road, E.15.

### A 12v. VALVE-TRANSISTOR CAR RADIO

REGARDING the above article which appeared in the January issue, will readers please note that the continuation line was inadvertently inserted. The article was concluded in that issue.

THE BIGGEST MONEY MAKER EVER!

NEWNES

# Radio & Television Servicing

## NEW 1959 EDITION

This year Newnes RADIO & TELEVISION SERVICING is bigger and has more valuable features than ever. Send To-day!

Here, ready for the Radio and Television service man are over 4,250 circuit, component and layout diagrams—TV receivers and converters from single station to *latest* 13-channel printed circuit models, including transportables and combined TV/FM sets. Also Radios including Transistor and VHF/FM models, Radiograms, Portables, Transistor Personals, Tape Recorders, Car Radios, Record Reproducers (including Stereo). **And in addition**—Large Quick-reference Fold-out Charts—TV Trouble Tracing; Servicing VHF/FM and AM/FM receivers; Servicing Printed Circuit Equipment; Servicing Transistorised Equipment. Also data on Colour Codes, Valve and Picture Tubes, etc.

### SERVICING DATA FOR ALL THESE MAKES—

Ace, Alba, Ambassador, Argosy, Armstrong, Baird, Banner, Beethoven, Berec, Brayhead, Bush, Champion, Collaro, Cossor, Cyldon, Decca, Defiant, E.A.R., Eddystone, Ekco, E.M.I., English Electric, Ever Ready, Ferguson, Ferranti, G.E.C., Grundig, H.M.V., Invicta, K-B, McCarthy, McMichael, Marconiphone, Masteradio, Motorola, Murphy, Pageant, Pam, Perdio, Peto Scott, Philco, Philips, Pilot, Portadyne, Pye, Pye Telecommunications, Radiomobile, Rainbow, Raymond, Regentone, R.G.D., Roberts' Radio, Sobell, Spencer-West, Stella, Strad, Ultra, Valradio, Vidor, Walter, Webcor, White-Ibbotson.

### POST COUPON NOW!

George Newnes, Ltd., 15-17 Long Acre, London, W.C.99.  
Send me RADIO AND T.V. SERVICING without obligation to purchase. I will return it in 8 days or send 10/- deposit 8 days after delivery, then fifteen monthly subscriptions of 15/- paying £11 15s. 0d. in all. Cash price in 8 days is £11 5s. 0d.

Name.....

Address.....

Occupation .....

Your Signature.....

(Or your parent signs if you are under 21)

Tick (✓) where applicable

HouseOWNER	<input type="checkbox"/>
Householder ..	<input type="checkbox"/>
Living with Parents	<input type="checkbox"/>
Lodging Address	<input type="checkbox"/>

RV17

**EXAMINE IT AT HOME**

**FREE FOR 7 DAYS**

**OVER 2,300 POPULAR MODELS**

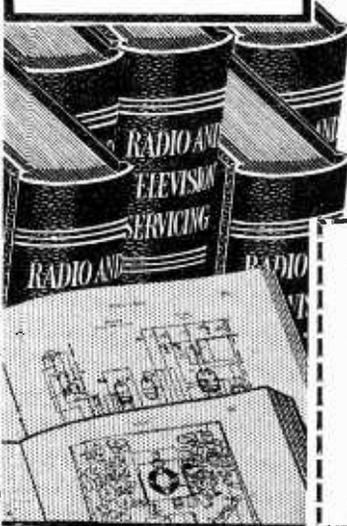
**7 VOLUMES**

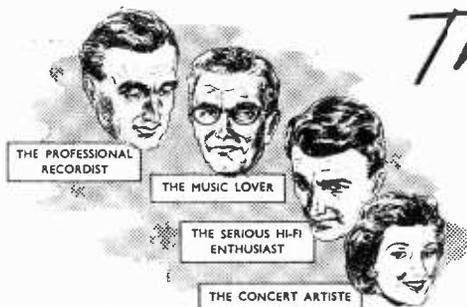
**4,250**

**CIRCUIT, COMPONENT AND CHASSIS DIAGRAMS**

**4,150 PAGES**

Every purchaser receives **2 YEARS' FREE POSTAL ADVISORY SERVICE** AND VOLUME OF NEW MODELS EVERY YEAR at concessionary price, to keep you up to date.

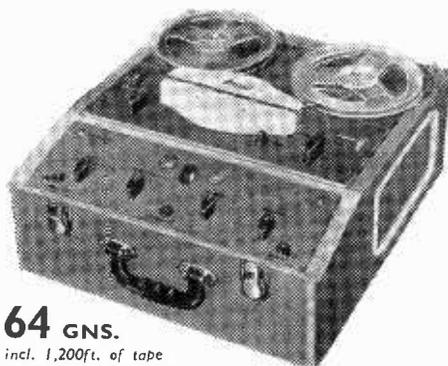




# They ALL choose the *Brenell* MARK 5

With its outstanding features, its versatility in operation and application, what more can be said—there's no finer value for the money!

- ★ Four recording speeds. 1 $\frac{1}{2}$ , 3 $\frac{1}{2}$ , 7 $\frac{1}{2}$  and 15, giving an exceptionally wide frequency range.
- ★ Permits use of 8 $\frac{1}{2}$  in. reels. (2,400ft. of L.P. tape at 1 $\frac{1}{2}$  i.p.s., plays over 8 hours.)
- ★ Three independent motors (B.T.H.).
- ★ Special foolproof interlocking controls. Instant stop without spillage. Pause control. Digital rev. counter. High quality amplifier. Recording level indicator. Monitoring facilities. Azimuth head adjustment. Provision for extra sound heads. Fast re-wind (1,200ft. in 45 secs.). Coloured signal lights.



**64 GNS.**

incl. 1,200ft. of tape

Because the Mark 5 is of unit construction the following can be supplied as separate items for incorporation in your own equipment.

Tape Deck with provision for extra heads	28 gns.
Tape Pre-amplifier Type T.P.2	17 gns.
Power Unit T.U.2	£4.18.0
Stereo Rec./Playback (including mounting rack)	£93.16.0

*Brenell* PERFORMANCE  
IS TRUE-TO-LIFE PERFORMANCE

Details from Sole Manufacturers.

**BRENELL ENGINEERING CO. LTD.**, 1a, Doughty Street, London, W.C.1. Tel.: CHA 5809 & HOL 7359 GDI3.

## LOUDSPEAKERS

5th EDITION  
OCTOBER, 1958

by G. A. BRIGGS

assisted by

R. E. COOKE, B.Sc., (Eng.)

PRICE 19/6 (20/9 post free)

### Letter from Chicago

I found the 5th Edition of Loudspeakers so interesting I could not put it down, and read it cover to cover on the day I received it. I especially enjoyed chapter one and the details of your early trials in manufacturing. All the material is very interesting; the style is clear and appealing, and the book is short.

On the other hand, one reading does not extract all the information contained in it. I find that I refer to your books again and again; they often contain a clearer treatment on acoustical problems than can be found in the standard reference texts.

17th November, 1958 R.F.F.

**Wharfedale**  
WIRELESS WORKS LTD  
IDLE BRADFORD YORKS

Tele: Idle 1235 6  
Grams: 'Wharfedel'  
Idle, Bradford

## G2AK: This Month's Bargains

### SPECIAL OFFER

12 v. Miniature Rotary Convertors. Only 4 $\frac{1}{2}$  in. x 2 $\frac{1}{2}$  in. Output 360 v. 30 mA. or 310 v. 70 mA. 'NEW LOW PRICE 12/6 ea. or 22/6 pr., p. & p. 1/6.

**VOLTMETERS.** Dual range 0.5 v. and 0.100 v. voltmeters. M.C. 1,000  $\Omega$ /v. Ranges easily extended. With test prods and leads. Complete in solid leather carrying case, 6 $\frac{1}{2}$  in. x 5 in. x 2 $\frac{1}{2}$  in. A gift at 25/- post free.

**B.S.R. MONARCH UAB RECORD CHANGERS.** New mfr.'s stock. Manual and Auto. Full Hi-Fi cartridge. List £9 15.0. OUR PRICE £7.15.0. carriage paid

**HEADPHONES.** H.R. Type 4,000 ohms. very sensitive. Only 12/6 pr. Post 1/6. C.L.R. type (low res.), 8/6. Post 1/6.

**SHADED POLE MOTORS** for Tape decks or gram. units. 3-hole fixing. Twin Coil closed field type; 200/240 v. 50 c/s. 15/- ea. or 27/6 for 2, p. & p. 2/-

**ACOS MIC 33/2.** New in maker's cartons. List 55/- OUR PRICE 35/- P. & P. 1/6.

**AERIAL WIRE.** Copper, 7.25 stranded; 140ft., 10/-; 70ft., 5/-, Hard Drawn 14g.: 140ft., 17/-; 70ft., 8/6. P. & P. 2/-.

**RIBBED GLASS 3in. AERIAL INSULATORS.** 1/6 ea., or 6 for 7/6. P. & P. 1/6.

**CONDENSERS.** 8  $\mu$ F 600 v. Trop. 750 v. normal condensers. NEW, ex W.D. stocks, 5/6. P. & P. 1/6.

**ABSORPTION WAVEMETERS,** 3 to 35 Mc/s in 3 switched bands. Complete with indicator bulb. 17/6 post free.

Send for our NEW 56-page  
ILLUSTRATED CATALOGUE  
P.O. or stamps, 1/6.

## CHAS. H. YOUNG LTD.

Dept. 'P', 110, Dale End, Birmingham, 4. (CEN 1635)  
No C.O.D. on orders under £1.

Please Print Your Name and Address

# Programme Pointers

OUR CRITIC, MAURICE REEVE, REVIEWS SOME RECENT PROGRAMMES

**T**HOMAS DEKKER'S *The Shoemaker's Holiday*—the first in a series of British Drama 1600-1642—gave a delightful picture of bygone days when smells and plagues were rife and street criers part of the daily scene. The denizens of Holborn and Fleet Street could well nigh shake hands across the road from their top windows whilst those who chafed under such restrictions might quit on the *Mayflower*, shortly to set sail. Sir Donald Wolfit headed a long cast of citizens and scallywags and the play moved with speed and gusto.

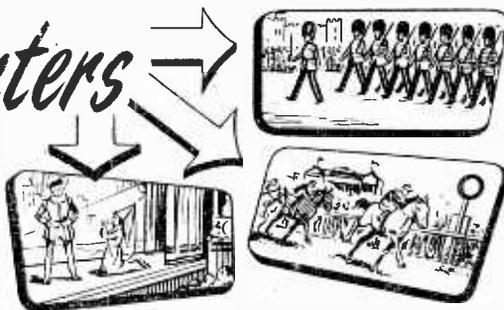
If not wholly changed, another scene which has at least been radically altered is that which forms the setting for Dame Ethel Smyth's charming and nostalgic opera, *The Boatswain's Mate*. Set to a story by W. W. Jacobs, it was given a repeat broadcast. The piece is set outside and in *The Beehive*, a country inn, at the opening of this century. Stanford Robinson and the Northern Orchestra and singers, with Alexander Young, Dennis Bowen, Margaret Ritchie, Mildred Watson and Scott Joynt, gave a spirited and sparkling performance—adjectival similes appropriate to *The Beehive*!

The BBC have often been very kind to a composer, a work or a performer, without which patronage a thin time might have ensued. For some time now the lucky one has been the Scandinavian composer, Carl Nielsen, and very lucky he is. His symphonies bear the not unsuitable titles of the "indistinguishable," etc. I prefer to know them as "the indigestible," "the incomprehensible" or "the incredible." May Mr. Nielsen's period of favour soon be over!

Now we come to the main work in the programme! This is a favourite remark of concert programme announcers. How embarrassing it must be for modern composers with a work of some magnitude that happens to lie beside one of the hoary old classics!

## Plays

*The Importance of Being Earnest* is one of a small band of works which age cannot wither nor custom stale its infinite variety. Rising above either "whodunit" sensation or sticky, cloying passion, it enables us to lean back and relish its pearls of wit and its masterly craftsmanship. "World Theatre" did it very well indeed, with Robert Eddison as John Worthing, Peter Cook as Algernon, Joan Matheson as Lady Bracknell, Beryl Calder as Cecily, Monica Grey as Gwendoline and James Thomason as Canon Chasuble in the principal parts. Produced by Martyn C. Webster, it rolled along to everyone's delight and joy.



## Good Entertainment

A newspaper story is always good entertainment. The rushing hither and thither, the great machines at work and the frantic grabs for scoops, have a fascination all their own. It only wants a beautiful secretary—blonde, maybe, but not dumb—and the picture is complete. *The Fielding Story* was a very good one. Edward Chapman as the paper owner, showed, with terrifying realism, how far some papers will go to get a sensational front page. Whilst James McKechnie, as his editor, fought for a greater degree of decency and respect for a woman's rights.

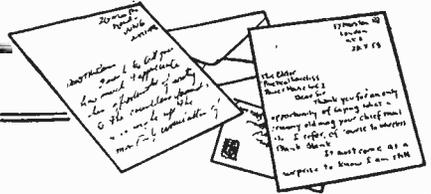
## Mendelssohn

Little is known of Mendelssohn's *Midsummer Night's Dream* music—that marvellous outpouring of a lad of seventeen, resumed and completed fifteen years later as though no break had occurred—than what is heard in the concert hall namely the overture and the scherzo. Not even the peerless Wedding March is heard outside a church. So the BBC Northern Orchestra, in the *Music to Remember* series, under Stanford Robinson, and with the Northern singers, did a service in giving the whole of this wonderful music. Robert Irwin linked the numbers with a helpful and well composed narrative. *The Dream* without Mendelssohn is surely like Dickens without Phiz or lamb without mint sauce: not quite complete!

Speaking personally, I would like to see a second series of *The Verdict of the Court* started. I thought that those now concluded were both excellent entertainment and important instruction in the mind and working of the course of justice. They gave us the "whodunit" of real life, which must always be superior to the manufactured article. Congratulations to scriptwriter Jenifer Wayne, narrator James McKechnie, producer Joe Burroughs and the cast.

*Noah*, by the French playwright André Obey, featured Sir Ralph Richardson. Needless to say, it was the story of the flood in modern language. I was surprised to read in the *Radio Times* that Sir Ralph wanted particularly to play the part. Not that the piece was without interest or not worth doing, far from it. But to me Sir Ralph was lost in it: wasted. The sounds of hammering at the commencement, when the ark is under construction, sounded more like a child knocking up a toy with some odd pieces of wood. Percy Edwards must have had a grand time imitating all the birds and animals in creation.

# Open to Discussion



The Editor does not necessarily agree with opinions expressed by his correspondents.

## Live Chassis Circuits

**SIR.**—Very frequently on looking through articles on live-chassis circuits one sees the warning to connect the chassis itself to the neutral side of the mains to minimise the risk of shock to the operator or experimenter. However, it seems to me that one very important point is never mentioned in these same articles—namely, that the pin on a mains socket labelled N is only too often carrying 240 volts! Having had this brought to my notice the hard way, I checked several installations and found a very high percentage wrongly wired. And this applied even to a large scientific department installed, at least in theory, by competent electricians.

Could I take this chance, therefore, to warn especially the younger experimenter that it is not safe to assume that the neutral pin on his house circuit is not carrying high voltages. Obviously, the experienced Ham has checked all his wiring, but he is also the very man who has the knowledge not to take chances with the mains. The beginner can easily check his wall socket by using a neon screwdriver, a tool that is a good investment for the few shillings it costs.—W. SINCLAIR (Edinburgh).

## Electronic Organ

**SIR.**—I feel sure that the last item in Mr. R. H. Cowtan's letter in PRACTICAL WIRELESS, December issue, must have made many organ fans think. No doubt all of us at some time have had microphones in our American organs or harmoniums. Many, too, will have meddled with the electronic organ keyboard, advanced in design or otherwise, but the words "So later I made every reed one plate of a condenser microphone, etc., etc." must be of especial interest to many of us. Mr. Cowtan has wet our lips. I wonder if he or your organ enthusiasts would give us an article on this application.—O. PENNOCK (Hartlepool).

## Long-wave Reception

**SIR.**—I have been following the correspondence on long-wave reception in PRACTICAL WIRELESS with great interest. May I, a mere woman reader, add a word too?

Much of the enjoyment I obtain from listening-

in, is derived from long-wave programmes and particularly from France 1 (Inter.) with its excellent fare.

Long may our radio manufacturers continue to supply us with sets incorporating long waves.—MISS M. MARSHALL (London, N.W.3).

## "Beginner's Constructional Course"

**SIR.**—In answer to Mr. M. J. Redman's letter (December, 1958), I also made the three-valve receiver described in the "Beginner's Constructional Course." I am 14½ years old and had success with each stage built.

I am looking forward to the multi-range meter to be described, as mentioned in October PRACTICAL WIRELESS.

I have been having PRACTICAL WIRELESS for a year now and find it most informa-

tive.—J. STEVENSON (Birmingham).

## Stereo Reproduction

**SIR.**—I have recently written two letters for the Open to Discussion columns and am told there are three of all good things, so may I crave space to reply to G. R. (S.W.3), January issue.

First, let me advise him to read, or re-read, the article by A. M. St. Clair in the July number of PRACTICAL WIRELESS and also your editorial in that number. I, too, fancy this subject is somewhat exaggerated. In modern jargon, there is the matter of "creating markets" as, for instance, persuading girls to daub their mouths with a mass of fat and colour. Stereophonic sound will depend a very great deal on the size, shape and acoustics of your room while the listener must sit at the apex of an equilateral triangle.

I had a long experience in the research department of one of the largest radio manufacturers and between the two wars we investigated many things, including stereophonic sound, for the subject is by no means new. It takes all sorts to make a world and this is how I see it after a life experience in the reproduction of sound.

Let us suppose we have an orchestra on a platform twenty feet wide, the listener sits at the apex of his triangle, twenty feet in front. His right ear will hear first the instruments on the extreme right and gradually on, across to the left-hand side, the volume becoming very slightly less as he proceeds to the left, but the journey

(Continued on page 75)

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 the coupon from page iii of cover.

# BUILD YOUR OWN TAPE RECORDER

## The TRUVOX way

Take 1 Truvox Mk. III or Mk. IV Tape Deck (available from 23 gns.), and 1 Truvox Type "K" Amplifier (available from 19 gns.), add 1 loudspeaker and cabinet and you not only have the thrill of owning a tape recorder that is well up to semi-professional standards, but the added satisfaction of having built it to suit, exactly, your own requirements.

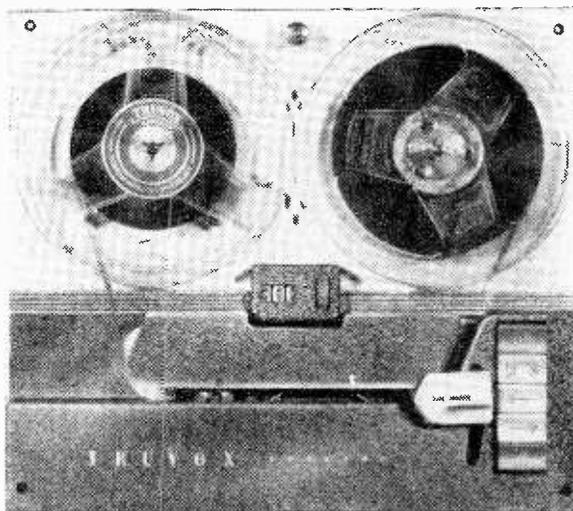
*You can build your own amplifier from the circuitry supplied FREE with each Tape Deck.*

## GO STEREO WITH TRUVOX

Truvox Tape Decks can be supplied fitted with a stereophonic head at an extra charge. Add a second loudspeaker and amplifier and you'll have all the thrill of stereophony in your own home.

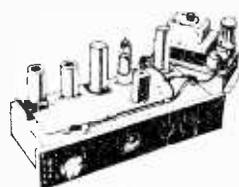
TRUVOX TAPE RECORDER COMPONENTS ARE AVAILABLE AT YOUR LOCAL STOCKISTS—SEND FOR FULL TECHNICAL DETAILS.

**TRUVOX LIMITED**  
NEASDEN LANE, LONDON, N.W.10. Telephone: Gladstone 6455.

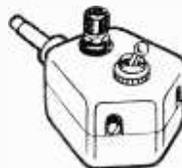


TRUVOX Tape Deck Mk. IV.

TRUVOX TYPE "K" Amplifier accurately matched to Truvox Tape Decks.



TRUVOX Radio Jack for direct radio reception and programme recording.



TRUVOX Stereophonic Head for replay of pre-recorded stereophonic tapes.



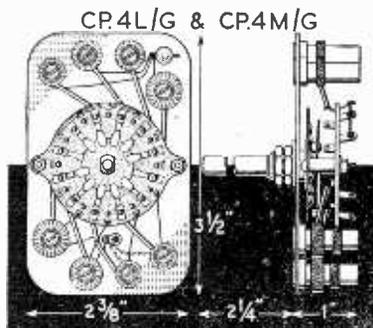
# MAXI-Q COIL PACKS..

CP.3/370pF and CP.3/500pF. These 3-waveband Coil Packs are available for use with either 370pF or 500pF tuning condensers. The coverages are: long wave 800-2,000 metres, medium wave 200-550 metres, short wave 16-50 metres. Designed for use with Jackson Bros. Full Vision Drive or SL.8 Spin Wheel Drive. Retail price of each unit 32/-. plus 12/9 P.T., total 44/9.

CP.3/G. As above but with Gram. position, suitable for use with 500pF tuning condenser. 39/-. plus 15/7 P.T., total 54/7.

CP.3 F. This Coil Pack is for use with a 500pF tuning condenser and covers the standard long, medium and short wavebands with the addition of the band 50-160 metres. This covers the trawler band, aeronautical and the 80 and 160 metre amateur bands. 49/-. plus 19/7 P.T., total 68/7.

CP.3F/G. As CP.3 F but with Gram. position. 57/-. plus 22/9 P.T., total 79/9.  
CP.4/L and CP.4 M. These compact 4-station Coil Packs are available for either 1 long wave and 3 medium wave stations (CP.4/L) or 4 medium wave stations (CP.4-M). They are fully wired and require only four connections for use with any standard frequency changer valve. 25/-. plus 10/- P.T., total 35/-.  
CP.4L/G and CP.4M/G. As CP.4 L and CP.4 M but with provision for Gram. position. 31/-. plus 12/5 P.T., total 43/5.



See Technical Bulletin DTB.9 for details of all Coil Packs—1/6

GENERAL CATALOGUE covering technical information on full range of components. 1/3 in stamps.

TRADING TERMS for direct postal orders, C.W.O. plus appropriate postal charges. Please send S.A.E. with all enquiries.

## DENCO (CLACTION) LTD. (Dept. P.W.), 357/9 Old Road, Clacton-on-Sea, Essex

STOP PRESS: WF1388, Push Pull Bias and Erase Tape Deck Oscillator Coil for the New Mullard Type "C" Tape Amplifier, PRICE 29/6.

## NEW! TAYLORMETER Model I27A

20,000 o.p.v.

HIGH SENSITIVITY!!  
POCKET SIZE!!

Performance equal to a  
high priced instrument

OUTSTANDING FEATURES:

Sensitivity 20,000 o.p.v.  
D.C. 1,000 o.p.v. A.C.

20 Ranges.

D.C. Current 50μA, 1mA,  
10mA, 100mA, 1 Amp.

Volts D.C. 0.3, 2.5, 10, 25,  
100, 250, 1,000V. (25kV. by  
probe).

Volts A.C. 10, 25, 100, 250, 1,000.

3 Resistance Ranges from 0-20 megohms (self-contained).

40μA Meter 31° arc. Accuracy D.C. 3%, A.C. 4%,  
Ohms 5%.

Dimensions 5 1/2" x 3 1/2" x 1 1/4". Price: £10.0.0  
Weight 140z.

Hire Purchase or Credit Sale Terms available.  
Write for full details:

**TAYLOR ELECTRICAL INSTRUMENTS LIMITED**  
MONTROSE AVENUE, SLOUGH, BUCKS.

Telephone: Slough 21381 . . . . . Cables: Taylins, Slough



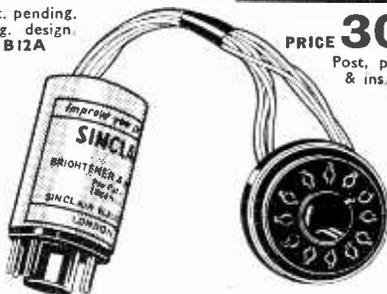
## A NEW LEASE OF LIFE

FOR YOUR T.V. TUBE AND  
RESTORATION OF BRIGHTNESS

Pat. pending.  
Reg. design.  
B12A

PRICE 30/-

Post, packing  
& ins. 2/6.



● NO SOLDERING ● NO WIRING ● JUST PLUG IN  
● IT'S AUTOMATIC ● IT'S GUARANTEED!

Unlike valves, over 80% of T.V. tubes can be made to give extra useful life and service (for months and months or even years) with these amazing truly successful plug-in booster units. We can now offer these units for all makes of T.V. sets and tubes A.C. or A.C./D.C. when operating off A.C. mains.

Important. When ordering, state make and model No. of set and tube.

Terms P.O. C.W.O. (C.O.D. charges 1/4 extra). Money refunded if returned in good condition within 7 days.

**SINCLAIR ELECTRONICS,**

Dept. P.W.

18, NEWPORT COURT, CHARING CROSS  
ROAD, W.C.2.



completely destroyed by a piercing TV whistle from a set placed to back up to mine through the wall, but I seem to be the offender by daring to complain! It is the old story of the strongest getting their own way, with the makers of TV sets having bludgeoned the authorities into allowing low standards of construction, with widespread radio interference.—F. J. LORD (Stamford).

#### "Arrangements"

SIR.—As a consistent reader of "On Your Wavelength" for many years, I find Therrmion's pages again and again re-echo my own sentiments.

In some previous issues of PRACTICAL WIRELESS he has dealt with the question of "arrangements," and at first I agreed with him 100 per cent. Composers' tunes are distorted, almost out of all recognition. Most of the music so tampered with has been with us some time, and we look forward to hearing it from time to time like an old and trusted friend, and usually when it has been arranged or tampered with, our old friend turns out to have gone berserk.—R. MANCHESTER (Bucks).

#### "Servicing Without Instruments"

SIR.—Although Gordon Cole's article (Servicing Without Instruments) was in factual detail substantially correct, I cannot but help feeling uneasy that beginners should be taught such methods prior to using the more orthodox servicing techniques.

A suitable test-meter can be bought for about thirty shillings, or the would-be experimenter can make one of those which are periodically described in your pages for much less. With such a meter a much more comprehensive check can be made upon a receiver, and I feel sure that the genuinely interested novice would be far better off by finding his way about his set with the aid of a meter, than by relying on the oft-doubtful indications of odd sparks, hums, clicks, etc. After all, if the experimenter is genuine, then he will get himself a test-meter sooner or later, and the sooner the better. If he is merely one of those "I know how to do this, its kids stuff" people, then I strongly recommend that his talents will be better employed in repainting the kitchen.

I must correct Mr. Cole on one point though, experienced constructor or novice, professional or amateur, one must check for overheating before switching on a faulty receiver.—P. R. WILLIAMS (East Molesey).

#### Comments on Letter "Servicing Without Instruments"

THE author states:—"I have read with interest the comments of P. R. Williams, and I should like to emphasise that my article "Servicing Without Instruments" was in no way meant to disparage the use of conventional servicing techniques.

Indeed, I agree fully with Mr. Williams that the serious experimenter should make all effort to acquire a suitable testmeter as early as possible in his career, but I would qualify this by

saying that considered attention should be given to this purchase, as the employment of an instrument of low sensitivity may bewilder rather than assist the beginner, and a meter in the price range intimated by Mr. Williams may well be of that kind.

However, as revealed by the correspondence which is directed to our query department, there are legions of beginners and experimenters not possessing an instrument of this kind and yet whose interest in radio is far in advance of that required to incite "repainting the kitchen."

It was towards these interests that the article was primarily directed. Having gleaned a fair understanding of circuits from being a reader of PRACTICAL WIRELESS, a normally non-practising enthusiast may well be successful in the repair of his own receiver by following the lines given in the article. The enthusiast may then decide to construct or purchase an instrument to aid him in more detailed work as his practical interest heightens.

Nevertheless, it is truly surprising just how much information on a faulty set can be obtained without the help of instruments if the "clicks" and "sparks" are interpreted with care.

In conclusion, I would say that it is perfectly safe to check for slight overheating of components with a receiver actually switched on. This can save time without being dangerous. A receiver possessing a serious short, giving rise to an excessive and rapid rise in component temperature, would, in any case, hardly lend itself to this test, as either the component would burn out almost immediately, thereby revealing the approximate location of the trouble, or the fuse, if fitted, would blow, indicating the definite need for checking for a short."

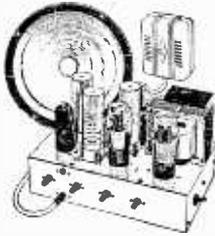
#### Novice Licence

SIR.—I am baffled by the repeated demands in "Open to Discussion" for the institution of a Novice Licence. Have the would-be "novices" never heard of the Amateur Sound Licence issued by the P.M.G. which costs £2 annually, and is granted after satisfying the authorities that one possesses elementary radio knowledge and can send and receive morse at 12 words per minute?

I am left with one conclusion: the aspirants to a Novice Licence are looking for an easier road to their objective than that which exists at present. They simply cannot be bothered to acquire the elementary principles necessary for the issue of an orthodox licence.

If some of the writers in "Open to Discussion" who have pleaded for a Novice Licence during the last six or seven years had spent as much time reading basic theory as they have obviously spent in thinking up some of the far-fetched, naïve and impracticable ideas as grounds for such a licence, then they would by now be experienced transmitting operators.

I shall be pleased to assist, in any way I can, anyone who genuinely would like to obtain an Amateur Sound Licence. There are only two requirements: enthusiasm and average intelligence.—J. D. PEARSON, G3KOC (Barrow-on-Humber).



**8-WATT PUSH-PULL COMPLETE WITH CRYSTAL MIKE AND LOUDSPEAKER**

A.C. mains 100/250 v. Size 10 1/2 in. x 6 1/2 in. x 2 1/2 in. Incorporating 6 valves, H.F. pen. 2 triodes, 2 output pens., and rectifier. For use with all makes and types of pick-up and mike. Negative feed back. Two inputs, mike and gram, and controls for same. Separate controls for Bass and Treble lift. For use with Std. or L.P. records, musical instruments such as Guitars, etc. **£4.19.6** Plus P. & P. 7/6. Or 35/- deposit Plus P. & P. 7/6, and 3 monthly payments of 25/-.

or 35/- deposit Plus P. & P. 7/6, and 3 monthly payments of 25/-.

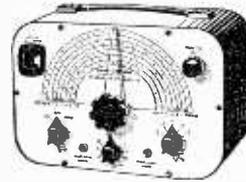
**PORTABLE AMPLIFIER**

Size 6 1/2 in. long, 5 1/2 in. high, 2 1/2 in. deep. Will suit any type of crystal pick-up. Output approx. 2 watts. Incorporating ECC83 double triode, Cossor 142BT output pentode and contact-cooled rectifier. Fully isolated mains transformer for 230/250 A.C. mains. Base, treble and volume controls.

**49/6** Plus P. & P. 3/6. 5 1/2 in. SPEAKER with O.P. TRANSFORMER, purchased with the above, 18/6, plus P. & P. 1/6.



**SIGNAL GENERATORS**

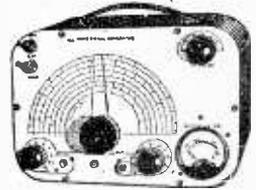


Cash **£8.19.6** or 25/- deposit and 6 monthly payments of 21/6. Post and Packing 5/- extra.

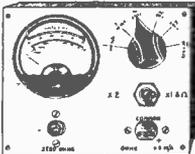
Coverage 100 Kc/s-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Metal case 10 in. x 6 1/2 in. x 5 1/2 in., grey hammer finish. Incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250 v. Internal Modulation of 400 c.p.s. to a depth of 30%; Modulated or unmodulated 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 Kc/s-84 Mc/s. Metal case 10 in. x 6 1/2 in. x 4 1/2 in. Size of scale, 6 1/2 in. x 3 1/2 in. 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.F. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%.



**AC/DC POCKET MULTI-METER KIT**



Comprising 2 in. moving coil meter, scale calibrated in AC/DC volts, ohms and milliamps. Voltage range AC/DC 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel range switch, wire-wound pot (for ohms zero setting), toggle switch, resistor and rectifier. In grey hammer finish case.

**19/6** Plus P. & P. 1/6 Built and tested 7/6 extra.

Point to point wiring diagram 1/-, free with kit.

**2 Valve and rectifier AMPLIFIER KIT**

Approx. output 2 watts, negative feedback, tone and volume controls. All the parts to make above less chassis speaker and O.P. transformer. (2 of these would be suitable for stereo-phonics.) **19.6**, P. & P. 3/-.

**B.S.R. MONARCH**



**UA8** 4-speed, plays 10 records 12 in., 10 in. or 7 in. at 33, 45 or 78 r.p.m. Intermixes 7 in., 10 in. and 12 in. records of the same speed. Has manual play position; colour brown. Dimensions: 12 1/2 x 10 1/2 in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Full-Fi turnover crystal head.

**£6.19.6** Plus 5/- Postage & Packing. Or 25/- deposit and P. & P. 5/- and 5 monthly payments of 27/-.

**COLLARO MIXER 4-SPEED AUTOMATIC CHANGER**



Model 457. Type "O" Pickup, size 12 in. x 13 1/2 in. Minimum clearance above baseboard 5 in., below 2 1/2 in., 10 records, A.C. mains 200-250 v. Turnover crystal head. BRAND NEW. Fully guaranteed. 25/- deposit plus P. & P. 5/- and 7 monthly payments of 25/-.

Cash **£8.19.6** Plus P. & P. 5/-

**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, 350-0-350 v. 250 ma., 6.3 v., 7 amp., 5 v., 2 amp., 19/6. Postage and packing on the above 3/-.



**PLAYER CABINET**

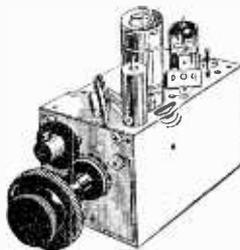
Finished in 2 tone leatherette, will take B.S.R. UA8, with room for amplifier and 7 x 4 speaker. Overall size 15 1/2 in. x 13 1/2 in. x 9 1/2 in.

**£2.19.6** Plus 5/- P. & P.

**13 CHANNEL TUNER**

I.F. 34-38 Mc/s. complete with PCF80 and PCC84. These have been removed from chassis.

**19/6** Plus P. & P. 2/6. Knobs 3/6 extra.



**RADIO & T.V. COMPONENTS (Acton) LTD.**

23 HIGH STREET, ACTON, LONDON, W.3.

All enquiries S.A.E.

Goods not dispatched outside U.K.

**CONSTRUCTORS' PORTABLE PARCEL**



Comprising case, chassis, top plate, scale, 5 in. P.M. speaker with O.P. trans., twin gang, 2 470 Kc/s. I.F.s., trimmers, four valve holders, wave-change switch and volume control with switch. **39/6** Plus 3/6 Postage & Packing.

## SOUND RECORDING

TAPE/DISC/TAPE Transfer, 1,800ft. LP new tape, 37/6. Mixer Units for quality work. SOUND NEWS, 10, Clifford St., London. W.1.

## SALE OF TAPES

Surplus quantity of brand new 650' tapes available on reels in boxes. 11/6 per reel, postage free, for a minimum order of four reels. Single reels may be called for at 12/6 each. Three days' money back guarantee if dissatisfied.

STANLEY SCHOFIELD PRODUCTIONS LTD., 6, 7 & 8, OLD BOND STREET, LONDON, W.1. MAYfair 4642/3

## RECEIVERS &amp; COMPONENTS

POWER IN PACKETS.—87 x 64 x 4½ H.T.s. 10/9; 87½ x 101.011. 4/6 each; 3 for 12v. 145 Kallium type. 10/6; all inc. p. and p. Send 1/- for super catalogue, refundable on first purchase, or stamp for latest supplement showing Telephone Gear/Test Sets, Relays, Control Units, Micro Switches, etc. We are temporarily out of stock of the following: 120v., 162 x 12 x 3v., 150 x 3v. H.T.s. DIGGINS, 129 133, Radnor St., Hulme, Manchester.

## FM-AM STEREO

## Radiogram chassis-CB8

Paired output, 4 W. used on radio. A hand-built quality receiver. Only £20, with 2 speakers.

BEL SOUND PRODUCTS CO. Marlborough Yard, London, N.19.

COMPONENTS, Valves, Tubes, etc. Write or phone for free list. ARION TELEVISION, 4, Maxted Rd., Peckham, S.E.15. (New X 7152.)

SPEAKER REPAIRS. Cones/Fields fitted. Clock Coils Wound. L.S. REPAIRS, Pluckley, Ashford, Kent.

## ANNAKIN

## The Fane 12" H.D. LOUDSPEAKER

Response 30-5,000 c.p.s. Rated 20 watts. Flux density 12,000 gauss. Total flux 160,000 lines. Impedance 15 ohms. The 2in. speech coil, curvilinear cone and polyurethane foam plastic surround give extra large excursions without introducing harmonic distortion. Heavy aluminium chassis. Dustproof. Tropicalised. Ideal for bass unit in multi-speaker Hi-Fi systems. An outstanding speaker at 29 (carriage paid in U.K.). Leaflet on request.

Electrolytics, 50 mfd., 50 v., 1.11; 25/25 v., 13; 8.450 v., 2/1; 16/450 v., 2.11. Post on each 9d.

Valveholders, Int. octal, amp. 8d.; B3A, cer. skirt, 9d.; B9A, amp., 9d.; Mazda octal, 3d., post extra.

Bendix TA.12.G Trann. 25 each, carr. 15/-.

Receiver R28-ARC.5, 45/- each, carr. 5/-.

Trann Unit No. 84. Only 35/6 each, post 3/6.

Power Unit No. 743. 6 in. in. 253 v. out., 25/-, carr. 5/-.

Monitor Xtal No. 4A. 103-130 mcs., 55/-, carr. 7/6.

Test Set Type 350. Only 32/-, carr. 5/-.

Power Units No. 234, 234A or B. May be less meter. 50/- each, carr. 7/6.

Indicating Unit CRT-1, 30/-, carr. 6/-.

Regret NO EXPORT ORDERS.

Above prices mainland only. S.A.E. for lists.

25 ASHFIELD PLACE, OTLEY, YORKS.

RATES: 5/6 per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., Strand, London, W.C.2.

## PETHERICKS RADIO SUPPLIES

9a, WESTCOMBE, BIDEFORD, N. DEVON

MIDGET TRANSISTOR SET. All parts and plan, 29/6 post paid.

TRANSISTORS, Red Spot, 7/6. Green/Yellow 7/6. Red/Yellow, 15/-.

SPECIAL R.F.—Gold Spot, 18/6.

CRYSTAL DIODES, 1/-, 10/6 doz.

CRYSTAL SET COILS. M. & L., with circuit, 2/6.

V.C.T. LOOPSTICK M.W. COIL with Transistor Circuit, 4/6 each.

SUPERHET COILS. M.L.L., 8/- pr.

T.R.F. COILS. M.L.L., 8/- pr.

REACTION CONDENSERS, .0001, .0003, .0005, all 4/- each. Midget Type, .0005, 4/-.

MICROPHONE INSERTS, 4/9. High Quality Bargain.

POCKET TEST METERS. Eight Ranges, 50/-.

All Prices Are Post Paid.

PLEASE PRINT NAME AND ADDRESS

MAINS FROM 12V. CAR BATTERY. American Dynamotor Unit, runs 200/250 AC/DC radios, televisions, tape recorders, etc., from 12v. car battery, continuous duty, perfect, cost 225. 80/-; s.a.e. full details. SCIENTIFIC PRODUCTS, Cleveleys, Lancs.

MIDDLESBROUGH. Largest stocks on N-East coast. Radio, TV, components, FM Kits, Gram. Cabinets, Tape Decks, Leak Amplifiers, Valves, etc. Callers only. PALMERS, 106, Newport Road. (Phone: 3095.)

TELEVISIONS. 9in. models. £7/10/-; 12in. models, £13/10/-; 12in., 5-channel models, £19/10/- each, all working, carriage paid. Send for list. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

## P. HARRIS ORGANFORD DORSET

AMERICAN 5 in. HI-FLUX P.M. SPEAKERS, in 6 in. dia. metal cabinets, ideal for cars. 25/- (3/6). AMERICAN POLICE CAR TRANSMITTERS for 6 v. input, 30-40 Mc/s F.M. crystal controlled. Output 30 watts, £12/10/- (30/-).

AMERICAN PORTABLE TRANS-MITTER RECEIVERS for 6, 12 or 24 v. input, 27/38 Mc/s F.M. crystal controlled. Output 2 watts, £17/10/- (20/-).

DST-100 RECEIVERS, £18/10/- (30/-).

5 ft. DIAPYNE AMERICAN 21 in. TUBULAR MAST SECTIONS, telescopic, 12/6 (75% reduction on quantity). AMERICAN

75 in. PLYWOOD MASTS, with all fittings, 25/- (special). TBS TRANS-

MITTERS, new, less valves, 60/80 Mc/s, £4/10/- (30/-). TBS RECEIVERS, 60/80 Mc/s, new, less valves, £4/10/- (30/-).

WODEN CHOKES, 20 H.A., 400 m/a, 20/- (5/-). RECTIFIERS in cabinets, 100/250 v. A.C. to 110 v. 700 m/a, 50/- (10/-). MODULA-

TION TRANSFORMERS, Woden 85 watt audio, pri. 1700 and 2,500 ohms C.T., sec. 5,000 and 6,000 ohms C.T., 20 lb., 45/- (7/6).

G.E.C., 200 watt audio 2-TZ-40 inco. 2=35T, 65/- (4/-). 6 ft. BENDIX TRANSMITTER

CABINETS, totally enclosed, full length rear door, takes standard rack panels, 26 (20/-). L.H.F. POWER UNITS, 230 v. A.C. to 3,000 v. 500 m/a, smoothed, 3 cwt., 225 (special).

Amounts in brackets are carriage England and Wales. \* Includes 10/- returnable case. 49-page list over 1,000 different items available.

We have vast stocks of "bits and pieces." Please send your requirements—we can probably help.

## METERS (NEW BOXED M.O.S.)

Ammeters, 6" round, switchboard mounting, moving iron, 50 cycles, A.C. scaled 0-50. Price 24, postage 3/6. Ammeters 2" round, moving coil, complete with shunt, 5 m/a basic movement, scaled 0-20. Price 10/6, postage 1/6. Voltmeters, moving coil, 2" round, 10,000 ohms resistance, scaled 0-50. Price 10/6, postage 1/6. Voltmeters, 2" round, moving iron, 50 cycles, scaled 0-300. Price 17/6, postage 1/6. Frequency meters, 4 1/2" dial, 4/6.

SPEED ELECTRICS, Church Street, Basford, Nottingham.

## FOR SALE

100 BAYS of brand new adjustable steel Shelving 72in. high x 34in. wide x 12in. deep; stove enamelled, dark green; sent unassembled; 6-shelf Bay, £3/15/-; sample delivered free; quantity discounts. N. C. BROWN, LTD. Eagle Steelworks, Heywood, Lancs. (Tel.: 69018.)

SEND 4d. STAMPS for Hi-fi guide. Finest chassis, cabinets and grams. Unique easy terms. M. RICHARDS, Dunkeld, Carvoza Rd., Truro, Cornwall.

AMAZING OFFER.—Originally £40-2100 each. Ekco Pye. H.M.V., Marconi, Philips, Murphy, etc., 9-10in. Televisions, complete, not working. 50/- each; carriage paid; immediate dispatch; 12in., £5/5/-; 15in., £9; Philips 17in. Projection Televisions, £9/15/-; TOMLINS, 127, Brockley Rise, London, S.E.23.

AMERICAN MAGAZINES. Year's subscription. "Audiocraft," 32/6; "Radio Electronics," 35/6; "Audio," 35/-. Specimens 4/- each. Full catalogue free. WILLEN LTD. (Dept. 40), 9, Drapers Gardens, London, E.C.2.

SATISFACTION OR MONEY BACK GUARANTEE on all goods if returned unused within 14 days.

## TV SETS

5-CHANNEL T.V.s. Table models, tested picture before dispatch, all good tubes, tuneable all B.B.C. stations, all top makes, 25, (carr. etc., 10/-).

13-CHANNEL T.V.s. Complete of a 5-channel B.B.C. T.V. with separate mains-driven Band III converter (new, listed 2/6). £11, (carr. etc., 10/-). STAAR GALAXY SPARES, 1990's available, low prices. S.A.E. list.

## TV TUBES

FACTORY REVACUUMED. ALL GUARANTEED 6 MONTHS. Carriage and insurance 12/6.

Due to the increasing demand for our superior television tubes and the small number of returns we are now able to effect a substantial reduction in their prices. Nearly all types of Mullard, Mazda, Brimar, Cosor, Eniscop, Emitron, Ferranti, Cathodion, G.E.C., available ex-stock.

All 9in. £2/15/- All 12in., 14in., £3/19/- and 10in. 25/- 15in., 16in.

Except those listed under "Types."

CRM 123, MW31/16, MW31/74, 3 3/4, 3/32, CRM143, MW 4 1/2, CRM152, All Mullard 14in., 44 10/-

All 17in. £4/15/- 21in. £7/10/-

Types.

TRANSISTORS, Red Spot, L.H.F., 7/-; White Spot, R.P., 12/6. Latest "Top Hat" Ediswan X1610, 12/6. S.A.E. details.

GUARANTEED P.M. SPEAKERS.

Standard 3 ohms, ex-equipment, tested, top makes, performance guaranteed. 5in., 9/-; 6 1/2in., 9/-; 7 x 4in., 12/-; 8in., 8/-; 10 x 6in., 14/-; 10in., 14/-.

RECTIFIERS, Selenium, 12V. 1A., 5/-; 12V. 2A., 7/6; 12V. 31A., 9/6; 250V. 50mA., 5/-; 250V. 25V. mA., 12/6; contact coated, 250V. 50mA., 7/6;

250V. 250mA., 19/-; 250V. 300mA., 23/-.

All Items test 5/- and post free for a dozen.

Post 1/3 in 21. Min. 4d. No C.O.D., 10,000 SNIPS

FOR CALLERS.

## TECHNICAL TRADING CO.

350/352, FRATTON ROAD, PORTSMOUTH

**FOR SALE (Continued)**

**RADIO SERVICING FOR AMATEURS 4/-.** Send for list of Radio, Television, Electronics Books. All types of Service Sheets for sale and hire; s.a.e. enquiries. **HAMILTON RADIO**, BSM/DATA.2, London, W.C.1.

**CO SPEAKER CABINETS** and others: shop soiled, prototypes, reject finish, etc., from 5/- to 80/-. New units available if required. See by appointment weekdays until 6.30 p.m. and Saturday mornings. (Tel.: ENF 8262.) 2, Sarnesfield Rd., Enfield, Middx.

**MAINS RADIO IN YOUR CAR.** complete unit, runs 200/250 AC/DC radio, television, tape recorders, etc., from 12v. battery, perfect, cost £25. 80/-; stamp full details. **SCIENTIFIC PRODUCTS**, Cleveleys, Lancs.

**TELEVISION SETS.**—Learn to Service on the genuine articles—part exchange Receivers complete with tube, valves and cabinet. £4 each, postage and packing 15/- extra. Order now whilst stocks last. Send P.O. or c.o.d. to: **DEWAR'S RADIO**, 102, Grove Lane, Birmingham, 21.

**FOCUS MAGNET 9/9**

Brand new. 38 mm. Incorporating picture shift control. P. & P. 1/3.

**SCANNING COILS 10/6**

Low impedance. 38 mm. Brand new. P. & P. 1/3.

**COLVERN PRESET POTENTIOMETERS 2/9**

Brand new. 200 ohms. 10 k. & 20 k. P. & P. 6d.

**DUKE & CO.** (Dept. D3), 621/3, Romford Road, Manor Park, E.12. Tel. ILF 6001/3.

**HIGH-QUALITY Stereo Amplifier**, mounted on vynair-covered baffle with speaker and full set of controls; also Extension Speaker in neat cabinet. Collaro Stereo Autochanger. £19/19/-; **BASILDON RADIO CO. LTD.**, 73, Cricketers Lane, Herongate, Essex. (Telephone: Herongate 214.)

**VALVES:** 6F1, 10F1, 6F13, 6L18/19, UL44/46, 10/- each; EP80, UL41, UP42, etc., 7/- each; EP50, 2/6 each, postage paid. Many obsolete types in stock. Recording Tape, high quality plastic on standard spools. 1,200ft., 19/6. **R.R.V.F.**, 24, Avon Rd., Chelmsford, Essex.

**A. L. STAMFORD LTD.** present the New "QP" range

Products in this special range are Quality Produced, Veneered in "Tola" and polished to shades of Walnut, Mahogany and Oak (Light Oak excepted). No modifications or cutouts can be made. Delivery England and Wales 12/6. Scotland and N. Ireland 25/-. **EQUIPMENT SUPPLIED.**

**QP7E** Size 2x 16 x 33in. high. Price £14/19/6 or £25/- Dep. and 9 Monthly Payments of 30/6.



Write for our New Illustrated Catalogues to: **A. L. STAMFORD LTD.** (Dept. D29) Showrooms: 84-86 and 98, Weymouth Terrace, Off Hackney Road, London, E.2

**GUARANTEED 3 MONTHS. 24 HOUR SERVICE**

Free Transit Insurance. Satisfaction or Money Back Guarantee on goods if returned unused within 14 days.

1A3	2/60A1	4/6	EB3C	9/-	PC85	11/6	
1A7	14/60D2	3/6	EB3C33	6/6	PC85	10/6	
1C5GT	12/-	10C1	9/-	EB3C41	9/-	PC85	9/6
1C6	6/-	10C2	12/6	EB3F80	8/-	PC85	12/6
1H57	10/6	10F1	9/6	EB3F99	9/6	PC85	12/6
114	5/6	10F9	10/6	EBL131	12/6	PC85	11/6
115	4/6	10L11	12/6	EBL141	11/6	PC85	16/6
11C6	5/-	10P13	11/-	EC52	4/-	PCN25	5/6
1LN5	4/6	10P14	12/-	EC91	4/6	PCN45	12/6
1N5GT	10/6	12AT6	9/6	EC931	11/-	PCN46	6/6
1R5	7/6	12AT7	7/6	EC932	9/6	PCN93	9/6
1R5	7/6	12AT7	6/6	EC933	7/6	PCN43	10/6
1T4	6/-	12AX7	8/6	EC934	9/-		12/6
2A7	9/-	12BA6	8/6	EC931	7/6	PL33	11/6
3Q35GT	9/-	12BE6	9/-	EC962	6/6	PL36	16/6
384	7/6	12BH7	9/6	EC983	8/-	PL38	12/6
3V4	4/6	12CGT	8/6	EC984	6/6	PL41	14/6
4D1	2/6	12K7GT	6/6	EC985	9/-	PL82	9/6
5R4G	12/6	12K8GT	6/6	EC991	4/6	PL84	10/6
5U4G	7/6		13/6	EC980	12/6	PY31	8/6
5V4G	10/6	12Q7GT	8/6	EC982	11/6	PY80	8/6
6C3	7/6	12Q7M	7/6	EC985	9/6	PY81	8/6
5Y3GT	8/-	14P6	7/6	EC942	9/-	PY82	9/6
5Z4G	9/15	6/-	EC941	9/-	PY83	9/6	
5Z4GT	11/18	6/-	EC940	11/-	PZ30	12/6	
5A6	8/-	20D1	9/6	EC982	12/6	SD6	7/6
6AB8	12/6	20F2	9/6	EF36	4/-	SP48	9/6
6AG7M	5/-	20L1	13/6	EF37	7/6	SP49	9/6
6AG5	5/-	20P1	14/6	EF39	5/-	SP41	3/6
6AK5	7/6	19G3GT	6/6	EF40	14/6	SP61	3/6
6AL5	4/6	25A6G	8/-	EF41	9/6	T41	9/6
6AM6	5/-	25L6GT	9/6	EF42	11/6	TH30C	14/6
6AT5	7/6	25Y54	9/6	EF50(AM)	TH33	9/6	
6AV6	8/6	25Z4G	8/6	EF50	4/9	U2	12/6
6B7A	9/-	25Z5	8/6	EF50(RED)	U24	12/6	
6B8G	4/-	30C1	9/-		4/-	U25	17/6
6BA6	4/-	30FL1	9/6	EF50(BR)	U26	13/6	
6BB6	6/-	30L1	8/6		3/6	U31	8/6
6BB7	11/-	35	9/6	EF54	3/6	U33	9/6
6BW7	6/-	35W4	8/6	EF59	7/6	U51	6/6
6BW7	8/-	35L6GT	9/6	EF85	7/6	U51	6/6
6BX6	6/-	35Z4GT	6/6	EF86	16/6	U52	6/6
6C4	4/6	35Z5GT	8/6	EF89	9/6	U52	9/6
6C5GT	5/6	36	7/6	EF91	5/6	U201	7/6
6C6	4/6	37	7/6	EF92	5/6	U281	7/6
6C9	9/6	38	7/6	EF95	7/6	U400	9/6
6C9B	11/-	39	7/6	EL32	4/-	U404	7/6
6D2	5/6	35L6GT	9/6	EL33	11/6	U801	16/6
6D4	2/6	42	7/6	EL37	9/6	UAB30	6/6
6D6	5/6	43	7/6	EL41	9/6		10/6
6F9G	7/6	44	7/6	EL44	10/6	UAF42	6/6
6F1	9/6	45	7/6	EL85	12/6	UB41	9/6
6F12	6/6	46	7/6	EM34	8/6	UBC41	8/6
6F13	9/6	56	7/6	EM80	10/6	UBF80	8/6
6F14	11/6	71A	4/-	EM81	10/6	UBF89	9/6
6F15	11/6	76	7/6	EM83	19/6	UC85	10/6
6F33	6/6	77	6/6	EV51 (small)	UCF81	9/6	
6H6M	2/6	80	6/6		10/6	UCF82	9/6
6H6T	2/6	83	6/6	EV86	13/6	UCF82	9/6
6J36	3/6	185BT	16/6	EZ40	8/6	UC81	10/6
6J37	4/6	185TE	5/6	EZ41	10/6	UC82	14/6
6J38	5/6	188	15/6	EZ80	9/6	UF41	4/6
6J6	4/6	5763	6/6	EZ81	9/6	UF42	9/6
6J7G	5/-	AC-P	6/-	FW4 500	UF80	10/6	
6K6GT	7/6	AC5 PEN	9/6		UF85	10/6	
6K7G	5/6	B36	11/6	GZ32	10/6	UCF86	16/6
6K8G	7/6	CL1	12/6	HL23D11	UCF87	16/6	
6K8GT	10/6	CL31	12/6	HL41D11	UL41	8/6	
6K25	9/-	CL33	11/6		UL44	9/6	
6L1	15/6	D15	5/6	HL133D11	UL84	10/6	
6L6A	8/6	D77	4/6		UL89	10/6	
6L7M	6/6	D93(MET)	4/6	JVR2A	5/6	UT6	6/6
6L18	9/6	4/-	KB32	7/6	UT7	9/6	
6L19	11/6	D152	4/-	KF35	7/6	UT8	12/6
6L19Z	9/6	DAC32	10/6	KK32	7/6	UT9	11/6
6L20	11/6	DAP91	8/6	KL35	7/6	UT41	8/6
9Q7G	9/6	DAR95	9/6	SR30	9/6	UT85	6/6
9Q7GT	10/6	DD41	4/6	KT36	11/6	VP41	6/6
68A7M	7/6	DF33	10/6	KT44	12/6	VP133	10/6
68G7M	5/6	DH66	9/6	KT45	9/6	VR105	30/6
68J7M	7/6	DH63	9/6	KT81	9/6	VR106	7/6
68K7GT	7/6	DH77	9/6	KT86	9/6	VR150	6/6
68L7GT	7/6	DH147	9/6	KT81	6/6		7/6
68N7GT	5/6	DK92	10/6	KT63	7/6	W76	6/6
68Q4T	11/6	DK96	9/6	KT263	7/6	W77	5/6
6V8G	6/-	DL35	11/6	KL33	3/6	X65	11/6
6X9GT	7/6	DL82	9/6	LN152	11/6	X66	11/6
8X4	6/6	DL92	9/6	LN219	9/6		6/6
8X5GT	6/6	DL94	9/6	MS-PEN	9/6	X78	10/6
7A7	11/6	D196	9/6	MU14	9/6	X79	9/6
7B7	8/-	DN143	8/6	N37	9/6	Z63	7/6
7C5	8/-	EA50	1/-	N78	11/6	Z66	9/6
7C6	7/6	EABC90	9/6	N108	11/6	Z77	5/6
7H7	7/6	EAC91	6/6	P2	6/6	Z152	8/6
787	10/6	EAF42	8/6	P41	4/6	Z719	7/6
7V7	8/-	EB34	1/6	P61	2/6	U2152	8/6
7Y4	8/-	EB41	7/6	PC84	8/6	Z77	6/6
8A1	4/6	EB91	4/6	PC84	8/6	Z77	6/6

Post, per valve, 6d. 2-6 9d.; 7-11 1/-.  
12-PAGE LIST OF 750 SHIPS FOR 6d.  
All items less 5%, and post free for a dozen.  
**TECHNICAL TRADING CO.**  
350/352, Fratton Road, Portsmouth

**WANTED**

**ALL TYPES OF Valves wanted.** PL81, ECL80, EY51, U25, PCF80, PZ30, U901, etc., etc., best cash price by return. **STAN WILLETT'S**, 43, Spion Lane, West Bromwich, Staffs. (Tel: WES 2392.)

**A PROMPT CASH OFFER** for your surplus Brand New Valves, Speakers, Components, Test Instruments, etc. R.H.S., 155, Swan Arcade, Bradford, 1.

**URGENTLY REQUIRED.** Radio or Electrical Goods of all types, large or small lots. We collect and pay cash. 22, Latham Ave., Morecambe, Lancs.

**WANTED.** Service Sheets and Manuals: highest prices paid; no quantity too large or small. **SULTAN RADIO**, 23b, Albert St., Tunbridge Wells, Kent.

**URGENTLY REQUIRED,** new Radio, Television or Industrial Valves. Also old and obsolete types. Cash prices offered for any quantity. Write, call or phone: MIT 6202, 201, Streamham Road, Mitcham, Surrey.

**WANTED.**—1931 Inventors' Exhibition Programme: £1 for 1st copy. **COPLEY**, St. Ives, Hunts.

**WANTED VALVES**

All types for prompt cash. Must be new. State quantity.

**WILLIAM CARVIS LTD.**  
103, North Street, Leeds, 7.

**MISCELLANEOUS**

**MAKING YOUR OWN TELESCOPES.** Enlargers, Projectors, Viewers, Microscopes, Episcopes, etc., then our booklets "How to Use Ex-Gov. Lenses and Prisms," Nos. 1 and 2 at 2/6 ea. will show you easily and quickly how to achieve the finest possible results at lowest possible cost. The most comprehensive lists of optical and scientific equipment in the British Isles is free for s.a.e. **H. W. ENGLISH**, Rayleigh Rd., Hutton, Brentwood, Essex.

**SERVICE SHEETS**

**SERVICE SHEETS** for sale and hire. Radio/TV. S.A.E. enquiries. **J. PALMER**, 32, Neasden Lane, N.W.10.

**SERVICE SHEETS.** Radio T.V., 5,000 models. List 1/-; s.a.e. enquiries. **TELRAY**, 11, Maudland Bk., Preston.

**SERVICE SHEETS** for sale TV 4/-, Radio 3/-; immediate delivery S.A.E. with inquiry. **SULTAN RADIO**, 23b, Albert St., Tunbridge Wells, Kent.

**SERVICE SHEETS AND VALVES**

S.A.E. enquiries. **NEW VALVES**, Guaranteed 3 months, return of post. ECH21, N30, U37, 6BGGG, EL38, GZ34, EF86, EL34, EL37, 6LD20, 6L1, 12C8, 15/- each; EEC81, EL84, EZ80, EC83, KCF30, KF35, PL82, 10/6 each; GZ32, ECF80, 13/- each.

**JOHN GILBERT RADIO**

20, Extension Shepherds Bush Market, London, W.12. Phone: SH 8052.  
(Continued overleaf)

**SERVICE SHEETS (Continued)**

**SERVICE SHEETS.**—We have the largest stock of Radio and TV Service Sheets in the country for sale at 4/- ea. Why tolerate delay in obtaining Service Sheets when we will dispatch by return. S.A.E. with enquiries, please. S. P. DISTRIBUTORS, 11, Old Bond St., London, W.1.

**SITUATIONS VACANT**

**LABORATORY TECHNICIAN** required in Department of Aircraft Electrical Engineering, to assist in the construction, development and testing of equipment for teaching, research and instrumentation. Candidates should have good practical knowledge of electronics and be interested in improving their theoretical knowledge. Good working conditions, generous holidays, staff superannuation and sick pay scheme, assisted travel. Wage between £9/17/8 and £11/17/8, rising with service to £13/4/8, for a 44-hour week of 5 days. Application forms from CHIEF CLERK, The College of Aeronautics, Cranfield, Bletchley, Bucks.

**A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, G.C.E., etc.** bring high pay and security. "No pass—no fee" terms. Over 95% successes. For details of exams and courses in all branches of Engineering, Building, Electronics, etc., write for 148-page handbook, free. B.I.E.T. (Dept. 242B), London, W.8.

**THERE** is a national shortage of Mercantile Radio Officers. Why not make Communications your career? You can be assured of a sea-going appointment after qualifying at The School of Marine Radio and Radar (A.S.T.), Hamble, Southampton. For details, apply Commandant, quoting A.12.

**CITY AND GUILDS** (Electrical, etc.) on "No pass—no fee" terms. Over 95% successes. For details of Electrical Engineering, Applied Electronics, Automation, etc., send for our 148-page handbook, free and post free. B.I.E.T. (Dept. 242a), 29, Wright's Lane, London, W.8.

**T/V AND RADIO, A.M.Brit.I.R.E., City and Guilds, R.T.E.B., Cert.** etc., on "No pass—no fee" terms. Over 95% successes. For details of Exams and Courses (including practical apparatus) in all branches of Radio, T/V and Electronics, write for 148-page handbook, free. B.I.E.T. (Dept. 242C), 29, Wright's Lane, London, W.8.

**EDUCATIONAL**

**WIRELESS.** See the world as a Radio Officer in the Merchant Navy; short training period; low fees; scholarships, etc., available. Boarding and Day students. Stamp for prospectus. WIRELESS COLLEGE, Colwyn Bay.

**II+ EXAMINATION**

Time is vital to your child. Write NOW for FREE 24-page GUIDE and Test stating age of child to (Dept. M.8), MERCER'S CORRESPONDENCE COLLEGE, 69 Wimpole Street, London, W.1.

**INCORPORATED** Practical Radio Engineers home study courses of radio and TV engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text is free. The "Practical Radio Engineer" journal, sample copy 2/-, 6,000 Alignment Peaks for Superhets, 5/9. Membership and Entry Conditions booklet, 1/-, all post free from the SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

**THERE** is a national shortage of Mercantile Radio Officers. Why not make Communications your career? You can be assured of a sea-going appointment after qualifying at The School of Marine Radio and Radar (A.S.T.), Hamble, Southampton. For details, apply Commandant, quoting A.12.

**Special This Month Only**

1W 1", High Stability Resistors. 100 K. 5K, 9K, 10K, 15K, 50K, 90K, 100K 150K, 225K, 500K, 900K, 1M, 2M, 10M, only 1/6d. each, brand new.

**Precision Wirewound Resistors**

Eureka wound on strip. 1 to 1,000 ohms. 1%, 2%, 3%, 0.2% + 0.01 ohm 4/3. 1 to 5K, 1%, 3%, 1%, 3/6, 0.2%, 4/9, 5K to 20K 1%, 4%, 1%, 4/3, 0.2%, 6/-, Ni-Cr wound, 20 to 50K 1%, 4/-; 50 to 100K 1%, 4/6. Your value wound to order. All 1W.

**Rectifiers.** Salford Bridge Meter type, 1 or 1mA 7/6; 5mA 7/6. Contact Cooled 250V mA 7/6.

**Multimeter Circuits.** For 500 uA meter, 13, 25 or 40 range. For 1mA meter, 13 or 25 range. For 100 uA meter 25 range. All A.C./D.C. 9d. each, 2/6 the six.

**Decade Capacity Box.** 0-1.11 uF 2". in 0.001 uF 2% steps. Silver Mica throughout. 25-100. Postage extra. S.A.E. with enquiries please.

**PLANET INSTRUMENT CO., 25, DOMINION AVENUE, LEEDS 7**

**FM and HI-FI Components**

- DENCO F.M. TUNER Circuits... 1s. 6d.
- RADIO CONST'NTR. F.M. " " 2s. 0d.
- MULLARD AMPLIFIERS " " 3s. 6d.
- G.E.C. 912 PLUS AMPLIFIER " " 4s. 0d.
- JUPITER STEREO UNIT " " 2s. 6d.

Separate price lists available on request to J. T. FILMER 82, DARTFORD RD., DARTFORD, KENT. Tel. Dartford 4057.

**COVENTRY RADIO**

Audio & Component Specialists Est. 1955 189-191, Dunstable Rd., Luton, Beds. HI-FI EQUIPMENT CABINETS IN STOCK

- Record Housing: Nordic Range in Oak, Walnut, Mahogany.
- Speaker Enclosure... .. £5.17.6
  - Equipment Cabinet... .. £5.19.6
  - Record Cabinet (150 records)... .. £4.17.6
  - Continental Bench... .. £4.17.6
  - Polensie Hi-Fi Cabinet... .. £19.19.0
  - W.B. Prelude Speaker Cabinet... .. £11.10.0
  - W.B. Prelude Equipment Cabinet... .. £13.13.0
  - W.B. Prelude Corner Speaker Cabinet... .. £10.10.0
  - W.B. Table Equipment Cabinet... .. £9.19.6
  - W.B. Senior Hi-Fi Console... .. £16.16.0
  - W.B. Junior Hi-Fi Console... .. £12.12.0
  - W.B. Junior Base Reflex... .. £9. 8.0
  - W.B. Standard Base Reflex... .. £10.10.0
  - W.B. Senior Base Reflex Corner... .. £11.11.0
  - B.K. AUDIO PLAN
  - B.K. Speaker Cabinet... .. £16.19.6
  - B.K. Equipment Cabinet... .. £17.19.8
  - E.K. Record Cabinet... .. £16.16.0
  - B.K. Continental Bench 48in... .. £7. 7.0
  - B.K. Continental Bench 72in... .. £13.13.0
  - B.K. Set 4 Legs tlb & glide feet... .. £2. 2.0
  - B.K. Set 4 Legs Plain Ebonised... .. 19.8
  - SOUTHDOWN HI-FI Cabinet... .. £29.10.0
  - R.C.A. Lowboy Cabinet... .. £18.10.0
  - HEALS Chairside for Quad... .. £29.15.0
  - HEALS Chairside... .. £37. 0.0
  - BREARCLIFFE Equipment Cabinet... .. £30. 9.0
  - ARMSTRONG Equipment Cabinet... .. £34.19.0
- Leaflets available on request.

**be TRANSISTORWISE!  
be POCKET-WISE!**



**"RECO" MIDDY TRANSISTOR ONE KIT**

(Medium and Long Waves) or Medium and Short, waves. 4 1/2" x 3 1/2" x 7/8"

Sensitivity control for weak stations, vari-Q ferrite rod aerial for maximum gain, with "Sonotone" miniature earphone and battery. 37/6, p.p. 2/-.

**"RECO" MIDDY TRANSISTOR TWO KIT** (Medium and Long Waves) or Medium and Short Waves.

Variable sensitivity controlled receiver with high-Q ferrite rod aerial. Complete with "Sonotone" miniature earphone and battery. 55/-.

**"RECO" MIDDY TRANSIGEN THREE KIT** (Medium and Long Waves)

Sensitivity control for maximum gain in poor reception areas. Quality "Sonotone" miniature earphone. Attractive case. Portable complete kit with battery. 72/-, p.p. 2/6.



**"RECO" TRANSIGEN THREE KIT**

(Medium and Long Waves)

Size 6 1/2" x 4 1/2" x 1 1/2". Entirely self contained (no external aerial required). Features oscillating detector stage using red yellow spot transistor and two green yellow spot, with optional balanced armature reproducer or "Sonotone" super dynamic miniature earpiece with moulded ear insert. On test, this receiver tuned in the "Third," "Home," "Light" and after dark, Radio Luxembourg, A.F.N., Radio Eireann and many others. The receiver was tested at approximately 50 miles from the nearest transmitter. Complete kit, 75/-, p.p. 2/6.

**"RECO" SUPER TRANSIGEN FOUR KIT**

Fitted 2 1/2in. loudspeaker and class A output stage. 99/6, p.p. 2/6.

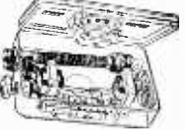


**"RECO" SUPER TRANSIGEN THREE KIT**

(Medium, Long and Two Short Wave Bands)

Our latest receiver kit, balanced armature reproducer or "Sonotone" super dynamic miniature earphone giving improved tonal quality. Ferrite rod aerial for sensitivity. Sensitivity control for distant stations. A fine transistor kit complete with 1.5-volt battery. 75/-.

**"RECO" PUSH-PULL FOUR KIT**



As above but with push-pull output stage and 2 1/2in. loudspeaker which fits under red plastic speaker grille. 99/6, p.p. 2/6. (Size 6 1/2" x 4 1/2" x 1 1/2").

**PRACTICAL WIRING DIAGRAMS, PARTS PRICE LIST, ETC., FREE WITH KITS OR 1/3 each. AFTER SALES SERVICE**

**RADIO EXCHANGE CO.** (Dept. P.W.), 27, Harpur Street, Bedford Telephone 2367.

# SKILLED MEN!

## USE YOUR KNOWLEDGE IN A WORTHWHILE JOB

VACANCIES  
FOR  
LINEMEN  
DRIVERS  
DISPATCH RIDERS  
DRAUGHTSMEN  
DRIVER  
ELECTRICIANS  
RADIO  
MECHANICS  
TECHNICAL  
STOREMEN  
TELEGRAPH  
MECHANICS  
OPERATORS  
in  
**THE ROYAL  
SIGNALS**

*Up to £25 tax-free Bonus  
plus first-rate wages for  
two weeks of your time*

**A**RE you in a skilled trade? Then you can probably add a tidy sum to your income by joining the Army Emergency Reserve. For one thing, you get pay and allowances at full Regular Army rates whilst in camp. And the more your skill's worth in civilian work, the higher your Army rank and pay. Better still, you also get £9-£25 bonus tax-free.

For this you just spend 14 days a year at a camp, working on your own speciality. And money's not the only profit you get from that. You get a grand refresher course, giving you a lot of new ideas, and putting you right in touch with the latest Army developments. And you get a welcome break from the usual routine, with sports, games and a great social life. For the place is full of people with the same interests as yourself. Don't miss this chance! Send off the coupon now to: H.Q. A.E.R. (R. Sigs.), Blacon Camp, Chester.

**POST THIS OFF RIGHT AWAY!**

*Please send me—without obligation—the illustrated booklet telling me  
all about the Army Emergency Reserve.*

NAME .....

ADDRESS .....

TRADE ..... (PW/AER)

# EDDY'S (Notm.) LTD.

(Dept. P.W.)

172, ALFRETON ROAD, NOTTINGHAM

**ACOS CRYSTAL TURNOVER PICK-UPS.** 2 sapphire styli, 29/11. Post 2/6.  
**TRANSISTORS.** Yellow/Green Spot, 6/11.

**TRANSISTORS.** R.F. Yellow/Red Spot, 13/11. Post 4d.

**SUB MINIATURE TRANSISTORS CONDENSERS.** 1.6 mfd. 5 mfd. 10 mfd. 16 mfd. 32 mfd., 2/6 each. Post 4d.

**JACK PLUGS.** Standard type, 1/11. Post 4d.

**MORSE TAPPERS.** Plated contacts, adjustable gaps, Heavy duty. Good quality. Special price, 3/6. Post, etc. 9d.

**ACOS CRYSTAL MIKE INSERTS, 4/11.** High quality. Can be used for Tape Recorders, Baby Alarms, etc. Post 6d.

**MIDGET BATTERY ELIMINATORS.** To convert most types portables to mains operation, 57/6. Post 2/6. Size 3.7in x 2.5in. x 1.8in. Smaller than H.T. battery alone. (Please state make and Model No.)

**SINGLE PIECE THROAT MIKES, 1/- each.** Post 6d. Can be used for electrifying Musical instruments, etc.

**NEON MAINSTESTER/SCREW-DRIVER, 4/6 each.** Post 6d.

**GERMANIUM DIODES, 1/- each, 10/- dozen.** Post 4d.

**CONDENSERS TUBULAR WIRE END.** (Not Ex-Govt.). 8 mfd. 450 v., 1/9. 8-8 mfd. 450 v., 2/6. 16 mfd. 450 v., 2/9. 16-16 mfd. 450 v., 4/3. 32-32 mfd. 350 v., 4/9. 32 mfd. 450 v., 3/9. 16-8 mfd. 450 v., 3/9. 25 x 25 mfd. Midget, 1/3. 50-50 mfd. 400 v., 6/11. Post 6d.

**B.S.R. MONARCH 4-Speed AUTOMATIC RECORD CHANGER.** Type UA8. Complete with High Fidelity Turnover Head Type TC9. Capacity of 10 records, plays 12in., 10in., 7in. intermixed in any order. 78, 45, 33 and 16 rpm. For A.C. mains 100-250 volts. £6.19.6. Post, etc. 5/-.

**RECORDING TAPE.** 1,200 ft. Plastic Reels, 10/11. Post, etc. 9d.

ALL ABOVE ARE NEW AND GUARANTEED.

## VALVES

### NEW AND SURPLUS GUARANTEED

1D5	10/-	6K8G	7/6	AZ31	10/-
1R5	7/6	6L6G	6/11	DAF96	8/6
1S5	7/-	6SN7GT	5/11	DF96	8/6
1T4	5/6	6V6G	5/9	DK96	8/6
3D5	4/9	6V6GT	6/6	DL96	8/6
5U4G	6/6	6XS5GT	6/6	DM70	7/6
6AG5	5/-	25A6G	11/6	EF80	7/11
6B8G	2/11	807(B)	3/9	L63	6/-
6Bj6	8/6	807 (U.S.A.)		PCC84	8/6
6C4	3/11	954	1/6	PCF80	9/-
5F1	12/6	955	3/11	PCL82	12/6
6F13	12/6	956	2/11	PY81	8/11
6K7G	2/11	AZ1	12/6	TDD4	12/6

All tested before Despatch.

C.W.O. or C.O.D. only. S.A.E. with all enquiries. Postage and packing 6d. per valve extra. Over £3 Free. Any parcel insured against damage in transit, for only 6d. extra per order. All uninsured parcels at customers risk.

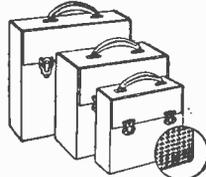
★ SEND 1/- FOR 56-PAGE ILLUSTRATED CATALOGUE.

# P. P. COMPONENTS LTD. (Dept. P.W.3)

219, ILFORD LANE, ILFORD, ESSEX.

Telephone ILF. 0295.

## ★ EASTER GIFTS FOR YOU ★



**RECORD CASES.** Beautifully made. Leatherette covered. Hinged top for easy access to record. Plated clip fasteners. This strong modern case is hardwearing and washable. Carrying all your records including very expensive long players safely to parties and record sessions.

- Size—12in. holding 40 records—48/-.
- Size—12in. holding 25 records—32/6.
- Size—10in. (Ideal 7in.) holding 30 records—37/6.
- Size—7in. holding 40 records—32/6.
- Size—7in. holding 25 records—28/6.

P. & P. 2/6.

### RECORD PLAYER CABINETS

**796.** Stylish cabinet by famous manufacturer. Cloth covered in contrasting colours (Red and Grey). Grilled front control panel. Size 15in. x 15in. x 8in. deep. Beautifully made. A cabinet of which you can be really proud. Takes 4-speed B.S.R. Monarch auto-player and a 6in. round or elliptical speaker. Room for only one amplifier of your own choice. P. & P. 4/6.

**798.** A delightful-looking cabinet in two-tone leatherette. Size 14in. x 17in. x 3in. Will take B.S.R. Monarch 4-speed autochanger and 6in. round speaker. P. & P. 4/6. 59/6. A well-designed cabinet in brown leatherette. Strong clip fasteners, easy carrying handle. Takes B.S.R. Monarch 4-speed autochanger and space for a 4in. x 6in. elliptical speaker. Can be made up into an ideal Record Player. Size 16in. x 14in. x 6in. deep. P. & P. 4/6.

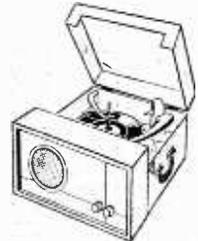
**RECORD PLAYER CABINETS, 49/9.** A practical cabinet, nicely designed, leatherette covered two-tone (Brown and Coffee). Size 15in. x 17in. x 8in. deep. Takes B.S.R. 4-speed autochanger and 6in. round or elliptical speaker. Carr. and ins. 4/6.

**ELAC FOCUS MAGNET, 5/9.** 35-38 mm. Permanent magnet type. Salvage. P. & P. 1/6.

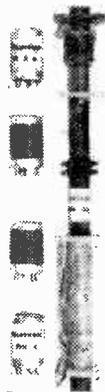
**ELAC FOCUS MAGNET, 12/9.** Brand new. 35-33 mm. P. & P. 1/9.

**PLESSEY FOCUS MAGNET, 5/9.** 35 mm. Permanent magnet type. Salvage. P. & P. 1/9.

STAMP FOR CATALOGUE. REGRET U.K. ONLY.



## TELETRON MINIATURE TRANSISTOR SUPERHET COIL KIT,



42/-

470 k/c

I.F. Transformers & Osc. coil, in screening cans  $\frac{1}{2}$ in. x  $\frac{1}{2}$ in. dia. Dual wave Ferrite rod aerial  $\frac{5}{8}$ in. x  $\frac{5}{16}$ in. dia. For the TRANSIDYNE printed circuit Superhet. ★ 6 Transistors. ★ P.P. output. ★ A.G.C. ★ Reflex. Full constructional folder, 9d. All component parts available from advertisers. Push-pull and single ended Tapo oscillator coils available for most decks at 8/6 each. Bias rejector coils and top lift inductors. Dual range and Xtal diode coils, etc. Lists, 6d.

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

## ALFRED PADGETT

40 MEADOW LANE, LEEDS, 11

Tel. : CLECKHEATON 90

12in. T.V. Chassis complete with focus coil, etc., less valves 15/-, Carr. 5/-. Ultra, Plessey, Banner, Marconi, etc.

12in. Table T.V. Cabinets 5/-. Carr. 6/-, 12in. Console Cabinet 20/-. Post 9d. Mazda, Mullard or Marconi. All tested up to standard.

We can supply any valve removed from 10in. and 12in. T.V. chassis for 8/6 each. EF80 4/-, 6AM6 3/-. Post 9d. Mazda, Mullard or Marconi. All tested up to standard.

New 3BP1 Tube 10/-. Post 2/6. Base and screen for tube 4/-. Post 2/6. Or complete 13/-.

New Mixed Pots. Wire and carbon. 5/- doz. Post free.

New Valves. U50 6/6. 5Z4 6/6. X63 6/6. DH63 6/6. U14 6/6. KTW61 2/-. 6K7 2/-. 554 1/-. 6H6 6d. EF50 1/9. Red EF50 2/6. VR65 1/-. VR92 6d. 2X2 1/-. VR137 6d. HL2 1/3. Post 9d. per valve.

Electronic Scrap. Units, Receivers, Transmitters, spares of all kinds. Sold by weight. Half cwt. 10/- net. Carr. 12/-.

19in. Table T.V. Sets. Good workers. Tubes O.K., all BBC stations, 28/10/-, Carr. and insurance 17/-. Cash refunded if not 100% happy.

New Magic Eye. Removed from equipment Type Y.65 complete with base, resistors and panel bracket 5/-. Post 1/3.

New Pots. Less switch 250K preset or 1in. spindle 6d. each. Post 9d. 4/6 doz. Post free.

New Co-ax. Cable. 75 ohms. multi-strand B.B.C. or I.T.V. worth 1/3 per yard. Our price 6d. per yard. Any length cut. Post free.

Visit the City's new acoustically designed  
**HI-FI Centre**

COME AND HEAR THE LEADING MAKES IN AMPLIFIERS AND TUNERS

**AMPLIFIERS BY**  
 VERDIK  
 ARMSTRONG  
 ROGERS  
 DULCI

GOODSELL  
 QUAD  
 LEAK  
 W.B., etc.

**V.H.F. TUNERS BY**  
 ARMSTRONG  
 LEAK  
 QUAD

ROGERS, etc.

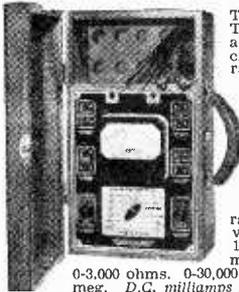
T.S.L.  
 DULCI  
 GCOSELL

**HI-FI SPEAKERS BY**  
 GOODMAN  
 PLESSEY  
 WHARFEDALE

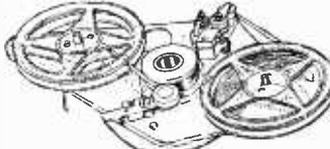
W.B.  
 T.S.L.  
 G.E.C.

LORENZ, etc.

**A GIFT FOR THE SERVICE MAN  
 BRAND NEW IN WOODEN CASE**



The Weston Model 772 Type 6 super sensitive analyser. This precision designed multi-range test instrument has a large visible finely divided scale giving some of the range shown. *Range:* D.C. volts 20,000 ohms per volt, or 1,000 per volt, 2.5 volt range 50,000 ohms, 10 volt range 200,000 ohms, 50 volt range 1 megohm, 250 volt range 5 megohms, 1,000 volt range 20 megohms. *Ohms:* 0-3,000 ohms, 0-30,000 ohms, 0-3 meg, 0-30 meg. *D.C. millamps:* 10, 50, 250 IM/A or 50 m croamps. *A.C. volts:* 1,000 ohms per volt. **ONLY £12.10.0.** plus post and pkg. 7/6.



**ADAPT YOUR GRAM INTO A TAPE RECORDER**

giving the results of a normal tape recorder, and gram deck  
**£7.10.0** Suitable pre-amp control unit  
 £5.12.6 P. & P. extra.

**ORIGINAL COST OVER £12**

**A REPEAT OFFER AT A STILL GREATER REDUCTION**  
 Limited quantity of this famous maker's 9" tube, round face white fluorescent 4V heater, 1 A. heater current, Max. Anode voltage 7 KV. Now **Only £2.19.6.** Crating and Carriage 11/6.

**Electronics FLEET ST. Ltd**

Dept. E, 152/3, FLEET STREET, LONDON, E.C.4  
 Business Hours: Weekdays 9-6. Saturdays 9-1. Tel.: FLEet 2833

**A television course  
 for you to study at home**

*Entirely new! Practical!  
 Bang up to date!*

**THE FAMOUS BENNETT COLLEGE OFFERS YOU THIS**

An entirely new course of study based upon up-to-date techniques has now been prepared by The Bennett College.

The course is non-mathematical and contains clear diagrams, starting from the very beginning (even including the basic principles of sound radio receivers, if desired) and covering all that you need to know!

This is what you've been looking for! A home-study course includes: production

of the signal, scanning and reproduction of picture from signal. Aerials, types and purpose. The cathode-ray tube. Time-base oscillators, and output circuits. Synchronisation. Video frequency amplifiers. The TV tuner, turret, incremental, etc. Television test gear. Television faults.

*For more details, fill in the coupon below. Your studies cost little, the book you need is included in the cost.*

To THE BENNETT COLLEGE (Dept. C104TV, Sheffield)

Please send me details of the new  
 TELEVISION SERVICING COURSE

NAME .....

ADDRESS .....

AGE .....

**BUILD YOUR OWN**



**MAYKIT  
 CAR RADIO**

- HYBRID DESIGN—5 VALVE SUPERHET, TRANSISTOR AND PRINTED CIRCUIT
- STANDARD SIZE 7" x 2"—12v. BATTERY
- ALL NEW COMPONENTS—AVAILABLE SEPARATELY OR IN COMPLETE PACK

First and only DO-IT-YOURSELF Car Radio. Uses new B-trim low volt. valves, no vibrator. Printed circuit and power transistor. Negligible "fade" and no "buzz." Only 1.5 amp. consumption. Complete with chassis assembly, filter box and output stage including elliptical loudspeaker and detailed instructions.

Save £s only **£13.10.0** plus 5/- p. & p.

Cash with order  
 or write for **BUY-AS-YOU-BUILD** details.

**Dept. N., MAYRA ELECTRONICS LTD.**  
 551 Holloway Road . London N19 Tel. ARC 5615

## PREMIER RADIO COMPANY

Tel.: AMBassador 4033

B. H. MORRIS &amp; CO. (RADIO) LTD.

Tel.: MUS. 3451

**207 EDGWARE RD., LONDON, W.2 & 23 TOTTENHAM COURT RD., LONDON, W.1**


### The "Petite" PORTABLE

MAY BE BUILT FOR

# £7.7.0

Plus p. &amp; p. 3'.

Batteries Extra. H.T. 10' (type B126) or equivalent. L.T. 1.6 (type AD35) or equivalent.

\*Size only 8in. x 8in. x 4 1/2in.

\*Instruction book 1 s.

PREMIER BATTERY ELIMINATOR, housed in 20 container's which are approx. the same size as AD35 and B126 Batteries. Kit 37/6 plus 2 - p. & p.

These two receivers use the latest type circuitry and are fitted into attractive cabinets 12in. x 6in. x 5 1/2in. in either walnut or ivory bakelite or wood (1' extra). Individual instructions books 1' - each, post free.

**2 BAND T.R.F. £5.10.0**  
MAY BE BUILT FOR

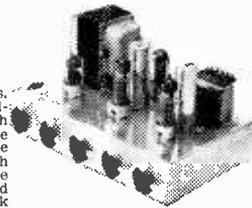
**3 BAND SUPERHET £7.7.0**  
MAY BE BUILT FOR

Postage &amp; Packing 3' (either kit)

**ADDRESS ALL MAIL ORDER ENQUIRIES TO: (Dept. P.W.) 207 EDGWARE RD., LONDON, W.2**

### THE PREMIER 7 WATT STEREOPHONIC AMPLIFIER KIT

This amplifier uses 2-ECL82 valves, 1-12AX7 valve, 1-EZ80 valve rectifier. Provision is made for both 3 ohms and 15 ohms speakers. The base and treble tone controls are ranged and balance is achieved with a separate control. Parts may be assembled on a gold hammered finished chassis, with a black perspex dial with gold lettering. Complete set of parts. Price £7.19.6 plus 5/- p.p. or assembled £8.19.6. Instruction booklet, 1'.

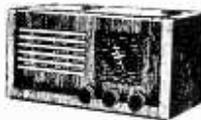


### THE PREMIER 3 + 3 STEREOPHONIC AMPLIFIER KIT

This amplifier uses 2-ECL82 valves and EZ80 rectifier. Ganged tone & volume controls together with a balance control are provided. Complete set of parts. Price £6.6.0 or assembled £7.7.0. Instruction booklet, 1'.



**GENEROUS H.P. TERMS  
AVAILABLE, MINIMUM  
DEPOSIT NOW ONLY  
10% - REPAYMENTS TO  
SUIT YOUR POCKET.**



## LYONS RADIO

LTD.

Dept. M.P., 3, GOLDHAWK ROAD,  
SHEPHERDS BUSH, LONDON, W.12

Telephone: SHEpherds Bush 1721

**DYNAMOTOR BLOWER.**—Rotary converters mounted on base plate with blower fan, fitted to one end which, if desired, can easily be removed. Rated at 18v. D.C. input for 400v. D.C. output. Operate quite well from 12v. D.C. input producing approx. 220v. D.C. output at 80 mA. Overall height from base 4 1/2in. x 9in. long x 4 1/2in. New condition. PRICE ONLY 17/6, post 3/6.

**CABLE BARGAINS.**—Electricians Cable brand new to B.S. Spec., P.V.C. insulation. 7/023 twin with earth, 1.7 yard. 3/036 twin with earth, 1 1/2 yard. 3/029 twin with earth, 10 1/2 yard. 3/029 twin, 9ft. per yard. Any length cut. Add for carriage up to 25 yds. 2/6. 25-50 yds. 3/6. Over 50 yds. 5/-. Orders over £5 carriage free. 5-way cable, each conductor 3/012 tinned copper, rubber insulated and colour coded, synthetic outer insulation, ex-Govt. origin. Sold 100 yd. coils only. PRICE ONLY 35/- per coil, carriage paid.

**ENGINE DRIVEN ALTERNATORS.**—Type U2, Air Min. Ref. 5U/2617, 1,200 to 2,400 cycles excitation 24v. D.C. As new and unused. PRICE 35/-, carriage 5/-.

**L.T. TRANSFORMERS.**—Primary 180' 230v. 50 cps. Secondary 4.2v. at 10 A. twice. Size 6 x 6 x 5 1/2in. Ex-Govt. as new. PRICE ONLY 17/6, post 3/6.

**UNIVERSAL MEASURING BRIDGES.**—Ex-Govt. by Mullards, measure 0.1 ohms to 10 megohms and 10 pF. to 10 mfd. Can also be used to calculate power factor, for percentage tolerance measurement and with the use of external standards for the measurement of inductance. Operate from 100 to 250v. 50 cps. A.C. mains. Supplied in good working order with instructions. PRICE ONLY £7, post 3/6.

**VALVES.**—As new, mostly ex-Govt., all retested before despatch, at very keen prices. Send S.A.E. for list.

## TRANSISTOR SUPPLIES

Red Spots, 7/-; White Spots, 10/-;  
Yell./Green, 7/3; Yell./Red, 15/-;  
Ediswan XA102 (8 M/cs), 40/-; XA104  
(6 M/cs), 18/-; XA103 (4 M/cs), 15/-;  
XB104, 10/-; Mullard OC71, 24/-;  
OC72, 30/- (Matched Pairs, £3); OC45,  
35/-; OC44, (12 M/cs), 40/-; Newmarket  
V1510P, 20/-; V1520P, 39/-; V1530P,  
48/-; V1520IP, 25/-.

**ELECTROLYTICS.** Sub-Min, 3/- each  
(15 volt), 2, 5, 8, 25, 50µF. **Ardente  
Trans.**, D239 and D240, 8/6; T1079, 12/-;  
D131 and D132, 12/9. **Mullard Trans.**  
Amplifier Transformers, 13/6 and  
18/6.

**BARGAIN LINES** (Post Free).—  
Phones (High R. Ex-Govt.), 10/6;  
Power Hand Mikes, 6/6; Super Co-ax,  
8d. yard; Var. Condensers, .003 AIR,  
4/-; .0005, 6/6; Morse Keys, 3/3.

**TERMS.**—Cash with order. Post Extra.  
Morco Reflex Circuit—Best 2 Transistor. Send 8d. stamps for our Notes.

### MORCO EXPERIMENTAL SUPPLIES

8 & 10, Granville St., Sheffield, 2  
Tel.: 27461

## Forrest

Transistor Transformers for  
Quality Equipment

**H. W. FORREST (Transformers) Ltd.**

349, Haslucks Green Road, Shirley,  
Solihull, Warwicks. Tel.: SHIRLEY 2483.

## LISTEN TO THE WORLD

### WITH THE "COMET" SHORT-WAVE RECEIVER

Using the "Comet" one-valve short-wave receiver it is possible to hear amateur transmissions and broadcast programmes from all over the world. These include sports events, news reports and variety shows.

The "Comet" kit of parts is complete down to the last nut and bolt, and is accompanied by full instructions. Send stamped, addressed envelope for descriptive Folders and Price List.

### CENTRAL RADIO SALES,

11, Small St., Bristol, 1.

This Offer Applies only to Gt. Britain and Northern Ireland.

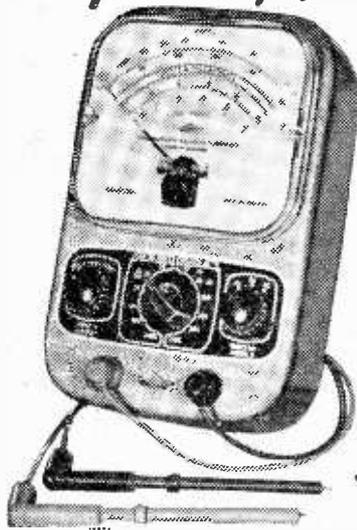
## TELEVISION

The advance of Radio Technique will offer unlimited opportunities of high pay and secure posts for those Radio Engineers who have had the foresight to become technically qualified. How you can do this quickly and easily in your spare time is fully explained in our unique handbook.

Full details are given of A.M.Brit.I.R.E., City & Guilds Exams., and particulars of up-to-date courses in Wireless Engineering, Radio Servicing, Short Waves, Television, Mathematics, etc., etc. We guarantee "NO PASS—NO FEE." Prepare for to-morrow's opportunities and future competition by sending for this very informative 148-page guide NOW—FREE! and without obligation.

**BRITISH INSTITUTE OF  
ENGINEERING TECHNOLOGY**  
(Dept. 248), COLLEGE HOUSE,  
29-31, Wright's Lane, Kensington, W.8

# Why save up for a test set?



## -you can have one NOW

Don't be at a loss waiting for a test set until you have sufficient money saved to buy one. You can have one of the well-known M.I.P. Series 100 Multi-Range test sets sent to you almost at once. A deposit of 47/6 secures. Balance payable over 6 or 12 months. Cash price £12.7.6.

### Extended Terms

Deposit 47/6 and 6 monthly payments of £1.15.0  
or  
Deposit 47/6 and 12 monthly payments of 17/11

### ★ 21 SELF-CONTAINED RANGES ★

10-1,000 d.c. volts. 10-1,000 a.c. volts. 100 Microamps to 500 Milliamps d.c. 100 Microamps a.c. 0 to 1 Megohm. 0 to 10,000 ohms.

All voltage measurements a.c. and d.c. are at 10,000 ohms per volt.



## MULTI-RANGE TEST SET - SERIES 100

MEASURING INSTRUMENTS (PULLIN) LTD.  
Electrin Works, Winchester St., Acton, London, W.3.  
Please send illustrated leaflet of the Series 100 Test Set with details of new easy payments scheme

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

E359

GD.23

### POST COUPON FOR FULL DETAILS

## EXPRESS ELECTRONICS ROSEDENE LABORATORIES KINGSWOOD WAY, SELSDON, SURREY

### VALVES NEW, TESTED AND GUARANTEED

1A06	9/-	4BAW	7/-	12Q7GT	10/-	EABCS0	8/6	N17	7/6
1C1	7/6	6BR6	7/-	12K7GT	6/9	EB91	8/6	N18	8/-
1C2	9/-	6BR7	10/6	12K8GT	12/8	EBG41	10/-	N19	8/-
1C3	8/6	6BW6	7/6	12Q7GT	7/6	EBF80	9/6	PCCS4	9/-
1F1	8/6	6BW7	7/-	16A5	9/-	ECU81	7/6	PCF80	9/-
1F3	7/6	6C10	9/-	25A6G	10/6	ECU82	7/6	PCF82	10/6
1F10	8/6	6C16	7/-	25L6GT	7/6	ECU83	7/6	PL38	22/6
1F19	7/6	6D2	5/6	25Z6G	9/-	ECU84	9/6	PL82	9/-
1L4	6/6	6F12	6/6	35L6GT	9/-	ECF80	10/6	PY81	8/6
1P1	8/6	6J5G	5/6	35Z6GT	8/6	ECF82	10/6	PZ30	17/6
1P10	7/6	6J7GT	8/6	35Z6GT	8/6	ECI42	8/-	U52	6/6
1P11	8/-	6K7G	2/6	5763	10/6	EGH81	8/-	U76	7/6
1R5	7/6	6K8G	7/6	DAP91	7/6	EL180	13/6	U78	7/-
1R7	7/6	6L6G	10/6	DAP96	8/6	EP41	9/-	UCB41	8/6
1T4	7/6	6Q7GT	8/6	DF91	7/6	EP80	8/6	UCB42	9/-
1T5	6/-	6R7GT	7/6	DF96	8/6	EP86	12/-	UCF41	8/6
3A5	10/6	6SN7GT	8/-	DH76	7/6	EP91	6/6	UL41	10/-
3Q4	8/-	6SN95	7/6	DH77	5/6	EP92	5/6	UX41	7/6
3R4	7/6	6X4	7/-	DH132	8/6	EL58	22/6	W76	6/9
3V4	8/-	6X5GT	8/6	DH150	10/-	EL41	10/-	W142	8/6
3Z4G	9/6	8D1	6/6	DK91	7/6	EL84	8/6	X17	7/6
5Z4G	9/6	12AH8	10/6	DK92	9/-	EL91	10/6	X18	9/-
6AK6	8/6	12AT6	8/6	DK96	8/6	EZ40	7/6	X142	9/-
6AL3	5/6	12AT7	7/6	DL92	7/6	EZ80	8/-	X150	9/-
6AM6	8/6	12AX7	7/6	DL94	8/-	EZ81	8/-	Z77	6/6
6AT6	7/-	12AX7	7/6	DL96	8/6	KT38C	8/6	ZM17	7/6

VOLUME CONTROLS MIDGET SIZE LONG SPINDLES D.P. switch, 3 9. S.P. 3 3. No S.W., 2 6. Values 10K to 2M.

### MATCHED PAIRS

EL84 21/-, 6V6G 17/-, KT66 27/6, 6BW6 18/- per pair. Push Pull O.P. Transformers for above 3-15 ohm 14/6.

### SETS OF VALVES

DK91, DF91, DAP91, DL92 or DL94	27/6
DK96, DF96, DAP96, DL96	35/-
1R5, 1T4, 1R5, 3R4 or 3V4	27/6
6R9, 6K7, 6Q7, 6V6, 5Z4G or 6X4G	27/6

Postage and packing 6d. Over £1 post free. C.O.D. 2/6

## SOUTHERN RADIO'S WIRELESS BARGAINS

**TRANSRECEIVERS.** Type " 38 " (Walkie-Talkie) 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/-; HAVERSACKS, 5/-; VALVES, A.R.P.12, 4/6; A.T.P.4, 3/6. Set of FIVE VALVES, 19/- the set.

**TRANSRECEIVERS.** Type " 18 " Mark III. Two Units (Receiver and Sender). Six Valves, Micrometer, etc. Metal Case. Un-tested. No guarantee, but COMPLETE. £2 18s. 6d.

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

**RESISTANCES.** 100 Assorted useful values. New wire end, 12/6 **CONDENSERS.** 100 Assorted. Mica, Tubular, etc. NEW. 15/- **LUBFRA HOLE CUTTERS.** Adjustable 1" to 3 1/2". For Metal, Plastic, etc. 7/-

**QUARTZ CRYSTALS.** Types F.T.241 and F.T.243, 2-pin, 1" 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.24) 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.

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

**STAR IDENTIFIERS.** Type I A-N Covers both Hemispheres. 5/6

**CONTACTOR TIME SWITCHES.** 2 Impulses per sec., in case 11/6

**REMOTE CONTACTOR.** For use with above. 7/6

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

**MORSE PRACTICE SET.** TAPPER with BUZZER on Base. Complete with Battery, BRAND NEW. 12/6

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

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

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

**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.

# Best Buy at Britain's

**TERRANTI TESTMETER TYPE Q.** An extremely compact self-contained multimeter. Volts 0 to 50, 150, 600 AC/DC, with additional 0-3 v. DC, and 0-15 v. AC ranges; milliamps 0 to 7.5, 30, 150 and 750 DC; ohms 0-25 K ohms. Accuracy BSS first grade, 500 ohms per volt. Knife-edge pointer and clearly calibrated 2 1/2 in. scale. Complete with leads, prods, battery and instructions. In fitted velvet-lined 1 1/2 x 7 x 3 in. case. Brand new condition, perfect working order. 72/6, post 2/6.

**R.F. UNITS.** R.F.24, 12/6; R.F.26, 17/6; R.F.27, 22/6; Condition as new. Post each, 3/6.

**CR100 COMMUNICATIONS RECEIVERS.** Covers 60 kc-30 Mc/s in 6 bands. 11 valves. 2 R.F. and 3 I.F. stages. Crystal gate, BFO, etc. Ready for 200-250 v. A.C. mains, 21 watts output for 3 ohms speaker. SUPERB CONDITION AND OUTSTANDING PERFORMANCE for ONLY £21. S.A.E. for illustrated details.

**CR100 SPARES KITS.** 15 valves. 2 of U50, DH63, KT63, X66 and 7 KT61. Output transformer, resistors, condensers, electrolytics, lamps. ALL BRAND NEW, 59/6, post 4/6.

**HRO COMMUNICATIONS RECEIVERS,** complete with 9 coils. From 18 gms. S.A.E. for full particulars.

**RT155B,** with latest drive, first-class condition, £7.19.6. R1155L, £12.19.6. S.A.E. for full particulars.

**MOVING COIL PHONES.**—Finest quality Canadian, with Chamois ear-muffs and leather covered headband. With lead and jack plug. Noise excluding, supremely comfortable. 19/6, post 2/6.

**IN WITA LOUSPEAKERS.**—Good quality 10 in. unit (impedance 3 ohms) in wooden cabinet 17 x 17 x 6 in. Complete with 50 ft. lead and jack plug. BRAND NEW, 39/6, carr. 5/6.

**WESTON E772 ANALYSERS.**—Multimeter. Current, 0 to 100 microamps 1, 10, 50, 100, 500 mA. D.C. 0 to 1, 1.5 Amps. A.C. volts, 0 to 2.5, 10, 50, 250, 1,000. D.C. and A.C. Resistance 0 to 100, 1,000, 100 K, 10 Megohms. Complete in "Rexine" covered carrying case, with leads and battery. Guaranteed, £5.19.6, carr. 4/6.

**AMERICAN MULTIMETERS,** by Precision, U.S.A. 400 microamps basic, A.C. and D.C. volts to 6,000 D.C., milliamps to 600. Ohms to 5 Megs., 20 ranges in all. In polished wooden case, 7 1/2 x 6 1/2. Complete with leads, batteries and instructions. Tested and guaranteed, £5.19.6, post 3/6.

**TRANSFORMER BARGAIN.**—Input 0-200/250 tapped. Outputs 250-0-250 v. 80 mAmps; 5 v. 2 Amps; 6.3 v. 4.5 Amps. Upright mtg. BRAND NEW, Boxed, Ex-Admiralty, made 1952. A fine 50 c/s. mains tranny for ONLY 16/6. Post FREE.

**PLEASE ADD POSTAGE OR CARRIAGE ON ALL ITEMS**

**CHARLES BRITAIN (RADIO) LTD.**

11 Upper Saint Martin's Lane, London, W.C.2

TEMPle Bar 0545

Shop Hours 9-6 p.m. (9-1 p.m. Thursday). Open All Day Saturday.

# BARGAINS IN RECORDER TAPES

Save yourself £££'s with our brand  
NEW Magnetic Recording Tape

	Normal price	Our price	YOU SAVE
5" STANDARD	21/-	15/-	6/-
5" L.P.	29/-	20/-	9/-
7" STANDARD	35/-	25/-	10/-
7" L.P.	50/-	37/-	13/-



Cash with order. P. & P. 2/6  
3 or more post free. Money back guarantee.

Trade enquiries invited  
**PRESTO SUPPLIES**

Dept. P.W., 145 HAMMOND STREET, PRESTON, LANCASHIRE

# CHILD'S PLAY?

Yes! Anyone can build professional equipment without test gear! Over 100,000 enthusiasts have benefited from our Home Radio Constructor's Handbook, which gives full parts lists, circuits, etc., of many receivers, tape recorder, oscilloscope, feeder units, communications set, hi-fi amplifiers, power pack, crystal set, etc. (including "P.W." Coronets). Packed also with data, construction, soldering and servicing hints, facts, formulae, colour code, etc. "Easy-as-A.B.C." FULL SIZED p-p. Construction sheets are available FREE with orders. Even the beginner gets professional results first time! This claim confirmed by many hundreds of genuine testimonials received. Introduced virtually at printing cost, we invite you to send 3/- TO-DAY for your copy. Don't delay.

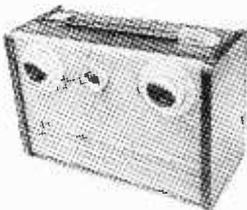
NOWHERE IS THERE A BOOK SO VALUABLE TO THE NOVICE CONSTRUCTOR AND EXPERT!

**RODING LABORATORIES**

Hurn Airport, Christchurch Hants.

# THE WAVEMASTER

TRANSISTOR PORTABLE



**AN OLYMPIC WINNER**

Pick of the World's Stations at your finger-tips. Long and Medium Wavebands. Comprehensive assembly data and Components Lists, 1/6. Complete Receivers Available.

**OLYMPIC RADIO COMPONENTS, LTD.**

224, Hornsey Road, Holloway, N.7.

# Morse Code operating . . . as a PROFESSION

45 years of teaching Morse Code is proof of the efficiency of the Candler system. Send 3d. stamp for Payment Plans and full details of all Courses. **CANDLER SYSTEM CO. Dept. 5LO, 52b, Abingdon Road, London, W.3. Candler System Co., Denver, Colorado, U.S.A.**

# ASTRAL RADIO PRODUCTS

**COIL PACKS.** L/M/S, 36/-, post 1/-.  
**"HOME RADIO."** 32-page illustrated booklet. Simple wiring instructions for Crystal Set, 1, 2, 3 Valves; 2/-, post 3d.  
**TRF COILS.** 7/-, pr., post 6d.  
**WAVE HF Coil with REACTION.** Specified for 'Summer All Dry Portable', 'A.C. Double Triode 1,' etc., 4/6, post 3d.  
**IFTs Miniature,** 1" x 1 1/2" x 2 1/2" in cans. Extra high 'Q.' Special offer, 9/-, pr., post 6d.  
**Crystal Set Coils.** L & M.W., 2/6, post 2d.  
82 Centurion Road, Brighton

# CONSTRUCTIONAL DETAILS AND PRICE LISTS

REP Valve ...	9d.	Trans-7	... 1/6
3 BEE ...	...	Mafor-7	... 1/6
Mini-7 ...	...	F.M. Tuner	... 1/6
	...	Highwayman...	1/6

Please add 3d. postage.

**FULL RANGE OF T.S.L. HIGH STABILITY 1/2 WATT 10% RESISTORS**  
6d. each. Any Quantity Post Free.

Gold Spot (V6R2) Transistors	...	24/-	
Red/Yellow Transistors	...	21/-	
Green/Yellow Transistors	...	10/-	Post
White Spot Transistors	...	17/6	Free
S.T.C. T53 Transistors	...	13/6	
Red Spot Transistors	...	9/-	
W.B. 2 1/2 inch Speaker	...	22/-	
Celestion 2 1/2 inch Speaker	...	29/-	Post
Sub-miniature Electrolytics	...	Free	Free
1, 5 and 8 mfd., 15 v.w.	...	3/- each	
Telephone "Transidyne" six transistor pocket radio. Complete Kit.	£11/10/6.	p.p. 2/6.	All parts sold separately.
Teletron HAX coils.	MW. 3/-.	LW. 3/6.	

# Q-MAX CUTTERS

1 in. and 1 1/2 in. ... 12/6 Key 1/- ... 6d. Postage each  
1 1/2 in. and 1 3/4 in. ... 13/9 Key 1/- ... 6d. Postage each  
1 in., 1 1/2 in., 1 3/4 in. 16" Key 1/6 ... Cutter.  
Miniature Single Ended Transistor Output Transformer, 7/6.  
All Enquiries Welcome  
Send 1/- P.O. for 56 page illustrated catalogue  
**FAIRDEAL RADIO (Dept. P.W.),**  
73 WEST DERBY RD., LIVERPOOL, 6.  
Tel: Anfield 5235

# WIRING ACCESSORIES

Return of Post Service. Lowest possible prices consistent with high quality. Money back guarantee.

**PVC Cable Flat Twin Twin with E.3 Core**

1.044	£2. 1. 8	£2.15. 1	£2.19. 4
3.029	£2.14. 2	£2. 8.11	£3.19. 0
3.036	£3.16. 5	£4.10. 9	£5.10. 10
7.029	£4.19.11	£6. 1.11	£6.18. 3

# TRS CABLE

1.044	£2. 3. 5	£2.13.11	£3. 0.10
3.029	£2.15. 9	£3. 6.10	£4. 5. 4
3.036	£3.15. 2	£4. 6. 5	£5. 8. 2
7.029	£4.13.10	£5.18. 2	£6.16. 7

Prices per 100 yds. All sizes stocked. Supplied in 25, 50, 75 or 100 yd. lengths. 7.029 and above cut to length—no cutting charge. Carriage paid on all orders over £2. Full range of accessories available. Send for complete lists.

# F. HUNT & CO. STEPCOTE HILL, EXETER.

Phone: Exeter 56687.

# CHASSIS

18 swg Aluminium. Strengthened corners. All 2 1/2" deep.  
8" x 4" 4/3  
7 1/2" x 5 1/2" 5/6  
10" x 7 1/2" 6/6  
14" x 9" 11/-  
11" x 7 1/2" 7/6  
12" x 6" 8/-  
14" x 9" 11/-  
Prompt service. Add 1/- post and pack. Orders over £1 post free. Any published chassis available. Enquiries invited.

**Westnam & Bradley, Dept. AX BRISTOL ROAD, MALMESBURY. WILTS.**

**RADIO SUPPLY CO.**

(LEEDS) LTD., Dept. C, 5 & 7 COUNTY (MECCA) ARCADE, BRIGGATE, LEEDS, 1

Terms: C.A.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2. 2/9 under £5.

**EX-GOVT. METAL BLOCK PAPER CONDENSERS.** 500 v. 8-10 mfd., 3/9.

**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 2/9 postage. 2 v. 16 a.h. **EX-GOVT. ACCUMULATORS.** New, boxed. Only 5/6 each, 3 for 15/-, post 2/6. 6 for 27/6, carr. 3/6.

**EX-GOVT. VALVES (NEW)**

1R5	7/9	6SLGT	8/9	6L6G	11/9	EF91	8/9
1T4	7/9	6SN7GT	8/9	807	7/9	EL32	3/9
1S5	7/9	GAT6	7/9	15D2	4/9	KT44	8/9
354	8/9	6J5	5/9	35Z4GT	8/9	KT61	9/9
5Y3G	9/9	6J6	4/9	MH4	4/9	EZ90	6/9
5U4G	8/9	6V6	7/9	ECC83	9/9	EL84	10/6
5Z4G	9/9	6X4	8/9	ECC91	4/9	MU12/14	9/9
6K7G	5/9	6X5GT	8/9	EF90	7/9	FW4/500	9/9
6S7JGT	6/9			EB91	4/9	SP61	2/9

**VOLUME CONTROLS** with long (1 1/2 in. diam.) spindles all values less switch, 2/9, with switch, 3/9.

**EX-GOVT. SMOOTHING CHOKES**

250 mA. 20 H 200 ohms	19/9	<b>RE-ENTRANT</b>	SPRINTS.	Tannoy.	8
200 mA. 3-5 H Parmeko 50 ohms	9/9		watt. 7-5 ohms.	Only	150 mA. 10 H 100 ohms
150 mA. 10 H 100 ohms	11/9		25/- each.		120 mA. 12 H 100 ohms
100 mA. 5 H 100 ohms	9/9		<b>5 COILED FLEX.</b>		100 mA. 5 H 100 ohms
80 mA. 20 H 900 ohms	3/11		Rubber insulated.		80 mA. 20 H 900 ohms
60 mA. 5-10 H	6/9		14/36. 1/3 yd. 50/-	50	60 mA. 5-10 H
	2/11		yds. 4/-	44 per 100 yds.	

**CO-AXIAL CABLE.** 75 ohm. 1/2 in., 84. yd. Twin-Screened Feeder 114. yd.

**JUNCTION TRANSISTORS.** Brand new R.F. type. 17/6. A.F., 7/6.

**EX-GOVT. MAINS TRANSFORMERS.** All 200-250 v. 50 c/s  
Pr. 0-110-200-230-250 v., 275-0-275 v. 100 mA., 6.3 v. 7 a.,  
5 v. 3 a. .... 21/9  
230-0-230 v. 80 mA., 12.6 v. 1.5 a., 5 v. 2 a. .... 11/9  
250-0-250 v. 150 mA., 5 v. 3 a. .... 16/9  
350-0-350 v. 180 mA., 6.3 v. 3 a., 5 v. 3 a. .... 27/9  
450-0-450 v. 250 mA., 6.3 v. 3 a., 6.3 v. 1 a., 5 v. 6 a. .... 49/9  
12.5 v. 3 a., 5 v. 3 a. .... 12/9

**HEADPHONES.** Brand new. Low resistance. Only 6/9 pr.  
**VIBRATORS.** Oak and Wearite synchronous 7-pin 2 v., 7/9. 6 v., 8/9. New.

GARRARD TA Mk. 2 4-speed Single Record Unit with GC P.U.	£9 15 8
GARRARD. RC121/4D Mk. 11. 4-speed Auto-changer with GC8 Pick-up	£13 13 10
GARRARD 4 H.F. 4-speed Single Record Unit with TPA12 Transcription Arm and G.C.8 Pick-up	£19 7 10
W.B. PRELUDE Bass Reflex Console Cabinet	£11 11 0
W.B. PRELUDE Hi-Fi Console Cabinet (houses tape-deck, amplifier, tuner, etc.)	£13 13 0
W.B. T359 cone Tweeter	£1 15 0
W.B. H.F. 1016 Speaker	£8 0 0
W.B. H.F. 1012 Speaker	£4 19 9
COSSOR 3 valve 3 watt Amplifier Kit, complete with 2 speakers	£9 15 0
COSSOR 6 valve FM Receiver Kit, with 10in. x 6in. speaker	£15 15 0
COLLARO Mk. IV Tape Transcriptors	£25 0 0
AVO MULTIMINOR	£9 10 0
Teletron TRANSIDYNE 6 Transistor 2-wave Pocket Receiver Kit	£11 15 0
TRANSISTORS. Yell./Gr. Spot (A.F.), 10/-; Yell./Red Spot (R.F.), 15/-; Mullard OC70, 21/-; OC71, 24/-; OC72, 30/-; OC44, 40/-	

ALL The Above Items Sent Carriage Paid.  
COMPONENTS are still available for all OSRAM and MULLARD Circuits.

Send 9d. in stamps for Illustrated List.

**L. F. HANNEY**  
77 LOWER BRISTOL ROAD, BATH

Let **I.C.S.** train YOU!

COURSES ON:—

- RADIO and TELEVISION
  - SERVICING : ELECTRONICS
- EXAMINATION COURSES FOR:—

- P.M.G.'s Certificate (Marine Radio Operators)
  - C. & G. Radio Amateurs' Exam. (Amateurs' Transmitting Licence)
  - C. & G. Radio Servicing Certificate (RTEB) 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 success. You learn at home in your own time, under expert tuition. Moderate fees include all books.

**LEARN - AS - YOU - BUILD**

**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

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

**5-VALVE SUPERHET RECEIVER**

**RF/AF SIGNAL GENERATOR**

Post this Coupon **TODAY!** for FREE book on careers in Radio, etc., and full details of I.C.S. Courses.

**INTERNATIONAL CORRESPONDENCE SCHOOLS**

Dept. 171J, International Buildings, Kingsway, London, W.C.2

Name..... Age.....  
(Block Letters please)

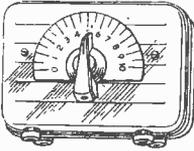
Address .....

Occupation.....-3-59

**INTERNATIONAL CORRESPONDENCE SCHOOLS**

# YOU can build any of these at Low Cost!

## A MINI TRANSISTOR RADIO



**AN IDEAL PRESENT**  
A two-stage highly sensitive circuit uses a new super high gain transistor coil and mini tuning Total build-ing costs **37/6**  
Includes Plastic case mini ear-piece. Batter-ies etc. All parts sold separately.  
Get your order in while prices are low. Send 2/- for wiring diagram and component price list.

Ideal for:  
● Late night listening.  
● Children's nursery, etc.

## TRANSISTOR POCKET RADIO

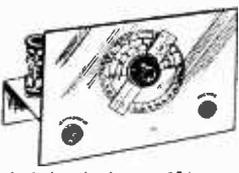


The ideal low cost transistor pocket radio for the beginner. The Two-Stage circuit utilizes the new R.C.S. VARILOOPSTICK transistor coil. A specially designed miniature .0005 tuning condenser permits the receiver to be in a case which fits in the palm of your hand. Works for months off small battery costing **30/-**  
7d. Can be built in 30 minutes. PRICE  
All components are sold separately, full construction data, including plan to parts for 2/-.

## WORLD WIDE SHORT-WAVE RADIO

EXPLORE THE WORLD ON SHORT WAVES!

Can be built for from our list of components **35/-** which can all be purchased separately, covers 10-100 metres and is capable of receiving speech and music from all over the world. Price includes the famous 954 acorn valve and one coil covering 40-100 metres. Provision is made to increase to two or three valves and all components are colour coded. Send 2/- for point to point wiring diagram, layout and price list.



## PERSONAL PORTABLE RADIO

THE SET FOR PERSONAL LISTENING

This little set was designed to give you a real personal portable radio that you can listen to anywhere without disturbing others. Use it on camping trips, in bed, in your office. Supplied with detachable rod aerial, it covers all the medium waves 200-500 metres. Average building **35/-** time one hour. PRICE  
Send 2/- for specification, point to point circuit and parts price list.



Post and packing : Under 10/- add 9d. : under 40/- add 1/6 : over POST FREE.

R.C.S. PRODUCTS (RADIO) LTD., 11, OLIVER ROAD, LONDON, E.17. (Mail Order only)

## CABINETS & HI-FI EQUIPMENT

We can supply any Cabinet to your own specification.



### "The Serenade" £13.19.6

Veneered with finest selected walnut, beautifully polished to a medium shade; this attractive cabinet has generous storage space, with motor board sliding out smoothly on metal rollers. We can also supply and fit this or any of our large range of cabinets with the latest Hi-Fi amplifiers, tuners, transcription units, record changers, speakers, etc.  
Write for our NEW 24 page fully illustrated catalogue of cabinets and details of our complete range of chassis, autochangers, tape decks, speakers, etc., all available on easy terms.

### LEWIS RADIO

120 (PW39); Green Lanes, Palmers Green London, N.13. BOWes Park 1155/6 (Nr. The Cock Tavern)

## 1-Finger Pianist

Build your own electronic keyboard and play everything! Send for free leaflet. Guitar, cello, flute and trumpet are all easy. Write now...

C & S, 10 Duke St., Darlington, Co. Durham

## A Complete Service . . .

Apart from making chassis, panels and rotary switches to individual requirements we supply all the "odds and ends," including bolts, nuts, capacitors, resistors, transistor components, valves and items for the service engineer and constructor by the leading makers. By return of post service.

### CATALOGUE No. 11

56 pages with 108 photographic illustrations with over 2,000 new guaranteed lines by leading makers, 9d. post free. You cannot afford to be without it.

### BARGAIN LIST No. 14

Containing sale and "odd items" at greatly reduced prices for the radio constructor, short wave listener and amateur transmitter. Free on request for limited period.

## SOUTHERN RADIO & ELECTRICAL SUPPLIES

So-Rad Works, Redlynch, Salisbury, Wilts.

## BENSON'S BARGAINS

**RELAYS**, 12/21 v. coil: 4 make, 4 break contacts (10 amp. rated) by Magnetic Devices, 7/6. U.S.A. Semi-rotary action, DPDT heavy silver contacts: SPDT & SPST lesser contacts. 12 volt, 7/6. **SWITCHES**, toggle, U.S.A., DPDT, 1/6. **COMMAND RECEIVERS**, brand new, 6 valves, met. wave (0.52-1.2 mc/s), 97/6; usk 92/6 (post 3/6). Conversion data & circ. to CAR RADIO, 1/6. **I.P. STRIP 373**, new, with valves, 37/6. **VIBRATORS**, Mallory G634C 12 v. 4-pin, 7/6. **R.F.28, R.F.27**, good cond., 18/- (p.p. 3/6). **DYNAMOTORS** (post 3/6): 12 v. to 250 v. 65 mA. and 6.5 v. 2.5 A., 11/6; 6 v. to 250 v. 80 mA., 12/6. **METAL RECTIFIERS**: 240 v. 100 mA., 4/-; 240 v. 30 mA., 3/6; 1,000 v. 30 mA., 7/6. **CHOKES** L.F., 10H, 120 mA., Screened, 7/6; 5 H. 200 mA., 4/6. **R1155S** new condition, tested, with handbook, 27.10.0 (Rail 10/-). **SCR522** Modulation or Driver Trans., either, 7/6. **VARIOMETERS** (19 set), new, 15/- **INDICATORS** with C.K.T.s VCR530 and VCR139A, 10 valves, etc., 50/- (rail 8/6). Single 6Hn. C.R.T., 10 valves 50/- (rail 7/6). **CONVERTERS** (PART 2), 24 v. 8/-; to 30 v. A.C. 4 A., 40/- (rail 7/6). Mic inserts, G.P.O. carbon, 2/6. **EARPIECES**, inserts, bal. armature type, 2/6. **MORSE TRAINER SET** with buzzer and key wired for 41 v. battery, 8/6. **DRIVES**: slow-motion, Admiralty 200:1 ratio, sealed 0-10h, 5/6. **R1155 S.M.** "N" type, new, 10/6. **VIBRAPAK**, 5 v. D.C. to 250 v. 60 mA., smoothed case, 22/6. 12 v. to 250 v. 60 mA., 20/- (p.p. 3/6). **METERS**, contain 2 separate micro-amp. movements and 2 neons, new, 8/6. Crossover needle (L.R.) 100µA each section; New, 12/6 or 10/6. x 2, 8/6. **RESISTORS**, vitreous, 41 wall, most values from 1 k. to 100 k., each 9d. **AMPLIFIERS** (Turbo) with 2/7C5, 1/7E7 and 7Y4, 25/- **METERS**, 2in. round flush, M.C. 100, 200, 300, 500 mA. each, 8/6; 1 mA., 17/6; 8 A., T.C.; 8/-; 3Hn., 1 mA. (40 ohm), scaled 0.05, 0.10, 0.15, 0.30, 55/- **VALVEHOLDERS**, U.S.A. Octal, doz., 4/- **POTENTIOMETERS**, 100 k. or 500 k., new, doz. 5/- **AERIAL MAST STAYS**, 40ft., multi-strand toughened copper, cleated, 4/- **LIST AND ENQUIRIES**: S.A.E. please. Terms, C.W.O. Postage extra. Immediate dispatch.

Caters and Post. **W. A. BENSON**  
136, Rathbone Road, Liverpool, 15. **SEP 6853.**  
Caters: **SUPERADIO** (Whitechapel) LTD.  
(P.W.) 116 Whitechapel, LiverPool, 2. **ROY 1130.**

# NEW "hico"

## PRECISION TEST GEAR KITS

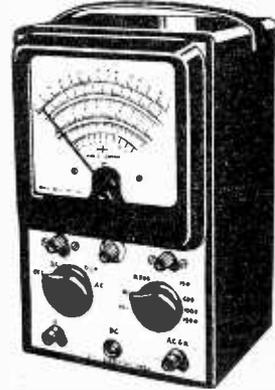
★ Rugged printed circuits ★ Professional appearance ★ Easy-read open scales

**357-S A.C./D.C. VALVE VOLTMETER** illustrated opposite. Wide range. High Sensitivity. 28 ranges—D.C. and A.C. volts 0-1.5, 5, 15, 50, 150, 500 and 1,500 AND A.C. peak to peak volts to 4,200 sine or complex wave. 0.1 ohm to 1,000 megohm. Decibel scale and centre zero. 11 megohm input impedance. Complete with test leads and probes, £15.0.0. Post Free. Accessory probes: R.F. to 200 megacycles type PRF-17, £1.17.6 extra. High Voltage probe type PHF-4 to 30 kV, £1.11.6 extra.

**324-A AUDIO VALVE VOLTMETER**, similar to illustration, features wide response (substantially flat from 10 c.p.s. to 200 K/cs) and high sensitivity. A.C. from 1 millivolt to 300 volts in 10 ranges. Decibel ranges -52 to +52 db. Input impedance 1 megohm. Essential for testing servicing aligning and experimenting in all audio applications. 1% precision resistors. Complete kit (includes everything), £17.10.0. Post Free.

Both kits use 4½ in. 200 microamp moving coil meters and contain everything necessary for construction—you only need the tools. Well written easy to follow instruction manuals tell you why as well as how. We guarantee all parts (including valves) for 9 months. Ask for further details. Deferred terms with pleasure.

**HOWARD INSTRUMENTS LIMITED, Main Road, Radcliffe-on-Trent, Notts.**



READY SOON :—

- OSCILLOSCOPE
- ELECTRONIC SWITCH
- R-C-L BRIDGE
- ELECTRONIC ORGAN

Now in its second revised and enlarged edition... the book for every television engineer, serviceman and dealer. Planned for on-the-spot use!

# TELEVISION ENGINEER'S POCKET BOOK

Edited by J. P. Hawker

This new and enlarged edition has been extensively revised to cover recent developments especially changes in receiver technique since the inception of the I.T.A. network on Band 3. Information is included on standards and waveforms; British TV network (including field-strength maps); basic circuitry; the sound channel; projection television; Band III conversions; installing and servicing; aerials; interference; fault tracing; and valve and picture tube data, colour codes, intermediate frequencies, etc. This book will meet the practical needs of all concerned with the repair and maintenance of modern television receivers.

252 pages . over 200 illustrations.

Only 12s. 6d. from ALL BOOKSELLERS

... or in case of difficulty 13s. 6d. from GEORGE NEWNES LTD., Tower House, Southampton Street, London, W.C.2.

NEWNES

# VALVES • SAME DAY SERVICE

All Guaranteed New and Boxed

1.4 v. midget. 1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DK92. DL92, DL94; ANY 4 for 27.6.

1A7GT	16.6	6V6GT	7/6	DCC90	10/6	EF91	6/9	PY82	8/6
1D5	9/6	6X4	6/9	DF33	10/6	EF92	5/-	PY83	8/6
1H5GT	10/6	6X5GT	6/-	DF91	6/3	EL33	10/9	PZ30	18/-
1N5GT	10/6	7B7	9/-	DF96	8/6	EL38	22/6	SP61	3/6
1R5	8/-	7C5	8/-	DH76	7/-	EL41	9/6	U25	15/-
1S4	10/-	7C6	8/-	DH77	7/3	EL42	11/6	U50	7/6
1S5	7/6	7H7	8/-	DK32	16/6	EL84	8/9	U52	7/-
1T4	6/3	7B7	9/9	DK91	8/-	EM80	9/8	U76	7/6
1U5	6/6	7Y4	8/-	DK92	8/6	EM81	9/6	U78	6/9
3A5	10/6	10F9	10/6	DK96	8/6	EM84	13/6	UABC80	9/-
3Q4	8/6	12A8H	9/-	DL33	9/-	EY51	11/6	UAF42	9/6
3S4	7/6	12AT7	8/-	DL35	14/6	EY86	12/6	UBC41	8/6
3V4	8/6	12AU7	7/6	DL92	7/6	EZ40	7/9	UBF80	9/6
5U4G	7/-	12AX7	8/-	DL94	8/6	EZ41	10/-	UBF89	9/6
5V4C	11/-	12BA6	8/-	DL96	8/6	EZ90	7/-	UCB84	18/6
5Y3GT	7/6	12K7GT	7/-	EABC80	9/9	EZ81	8/6	UCB85	9/6
5Z4G	9/6	12K8GT	12/6	EAF42	9/6	FWA 500	10/6	UCF40	19/6
6AL5	5/6	12Q7GT	7/-	EB91	5/6	GZ32	11/-	UCH42	9/6
6AM5	5/-	14S7	15/9	EBC33	7/-	KT33C	8/6	UCH81	9/6
6AM6	6/9	18AQ5	7/6	EC41	14/6	KT41	14/6	UCL82	13/-
6AQ5	7/-	2A6G	11/-	EFB80	8/9	KT63	6/6	UCL83	15/6
6AT8	7/3	25Z4G	9/-	ECC81	8/-	MH4	6/-	UF41	9/3
6BA6	7/6	26Z6GT	9/-	ECC82	7/6	MU14	9/6	UF42	15/-
6BE6	7/-	35L6GT	10/-	ECC83	8/-	N18	8/6	UF89	9/6
6BH6	8/-	3Z4GT	7/6	ECC84	8/6	PCB84	9/-	UL41	9/3
6B16	6/-	3Z5GT	8/6	ECC85	9/6	PCF80	9/-	UL44	22/6
6BR7	10/6	43	12/6	EFC80	11/6	PCL82	12/-	UL84	8/6
6BW7	7/6	50CD6G	26/9	EFC82	11/6	PCL83	11/6	UR1C	9/6
6CD6G	26/9	50L6GT	8/6	ECH35	10/-	PCL83	14/6	UY1N	12/6
6F8G	6/6	AC/VP1	13/6	ECH42	9/6	PEN44	11/-	UY21	14/-
6K7C	4/6	AZ1	12/6	ECH81	8/6	PEB86C	9/6	UY41	7/-
6K7GT	6/-	B36	15/6	ECL80	11/6	PEN46	6/-	UY85	7/6
6K8G	7/9	CL33	16/9	ECL82	12/6	PL38	22/6	VMP4G	13/6
6L16	12/3	CY31	12/6	EF39	5/6	PL81	15/-	VP4B	9/6
6Q7GT	8/6	D77	5/6	EF41	9/6	PL82	8/6	VP41	6/-
6SL7GT	7/-	DAC32	10/6	EF42	11/6	PL83	10/6	VF1321	21/-
6SN7GT	7/6	DAP91	7/6	EF80	7/6	PY90	8/-	WU6	7/-
6D4GT	11/-	DAF96	8/6	EF86	13/6	PY81	8/6	W77	5/-
6V6G	6/6							Z77	6/9

Postage 6d. per valve extra. Any Parcel Insured Against Damage in Transit 6d. extra.

## READERS RADIO

24, COLBERG PLACE, STAMFORD HILL, LONDON, N.16. STA 4587

## ADVISORY SERVICE

We offer a complete before and after sales service. Our advice is ALWAYS available and freely given, BUYING or NOT!

Whether expert or novice, let our extensive experience ensure your success.

## AERIALS

An even wider range. We select the ever popular I.T.V. add-ons to illustrate our bargains.

5 ELEMENT. Complete with universal clamp and stand-off arm. Still unbeatable, 39/6. Also at 45/-.

8 ELEMENT. As above, 51/6. Also at 62/6.

Easifix. All aerials pre-assembled and collapsed for transit.

Easimod. All single aerials can be modified to "double" arrays if desired.

Tokiteasi. DO be careful on the roof. DON'T wear crepe soles in wet weather. (Better still wait for good weather).

NOTE.—Efficiency and gain of aerials depends on number of elements, spacing, siting, etc., and hardly varies with PRICE which concerns finish, long term durability and patent assembly methods. DO write us for aerial advice if in doubt.

## CABLE & ACCESSORIES

CO-AXIAL. Hi-grade, low loss, suitable all normal purposes. Expanded polythene type. 8d. per yd. any length.

SEMI-AIRSPACED. A "must" for long runs in fringe areas. ("Don't spoil the ship," etc.). 1/6 per yd. any length.

DIPLEXERS (junction boxes). Indoor type, 10/3. Outdoor type, 13/-.

IF-IN-DOUBT. Use a separate download for I.T.V. with a skirting board "diplexer" if necessary.

## TURRET TUNERS

Still available. The famous "Brayhead" at £6.19.6.

Easifix. Over 600 models convertible to I.T.V. by simple "plug-in" technique.

SUCCESSFUL! We have received very many appreciative letters. Our supplementary advice ensures success.

## CONVERTERS (external)

£6.19.6. Accessories, 7/6.

Our external converter gives the very simplest conversion to I.T.V.

Handsome appearance.

Easifix (in fact, dead easifix!) Place on top of T.V. and connect up as per our instructions.

Efficient. 2 valve circuit. Best on the market at the price. Definitely superior to the cheap 1 valve efforts.

## AMPLIFIER KITS

Our DO-IT-YOURSELF amplifier. After exhaustive tests we have selected the famous Cossor 562KX.

Definitely the job for novice or expert. Not a "lash-up" but the real thing. OUR SUPPLEMENTARY ADVICE ensures success.

Printed circuit technique giving HI-FI 3 watts output.

Twin Loudspeakers. Suitable all inputs.

Illustrated step-by-step advice. Everything except the cabinet! £9.15.0 tax paid.

## RADIO KITS (F.M./V.H.F.)

Our DO-IT-YOURSELF radio. Again, after many tests, we have selected the famous Cossor 701K.

Everything except the cabinet for a 6 valve V.H.F./F.M. radio.

Pre-aligned R.F. and I.F. stages. (Expensive test gear not required).

10in. Elliptical loudspeaker.

Illustrated construction manual plus our Supplementary Advice. £15.15.0 tax paid.

## AUTOCHANGERS

The famous and reliable MONARCH UA8.

Multi-speed, multi-play. Hi-Fi turnover cartridge.

Note our price. £6.19.6. (List £9.15.0).

Convert your old "gram" or build your own "player."

## TERMS OF BUSINESS

Cash with order or C.O.D. (2/6 extra.)

Extended credit on expensive items. Write us in confidence.

Carriage free above £5 except aerials and autochangers.

Packing and carriage Aerials: 5 EL. (2/6); 8 EL. (3/6); Others (5/-); Autochangers (7/6).

If in doubt about carriage, terms, etc., or if needing advice, WRITE US FIRST.

# WILSON

48, CATHAY, BRISTOL, I.

TEL. 57819 or 26242.

## "PYE" 10" HIGH QUALITY SPEAKER

Supplied in magnificent cabinet complete with 30ft. of lead and plug. Ideal for HI-FI and Stereo. Used by the Ministry with the finest communication receivers. Satisfaction guaranteed. Brand New in original packing. 45/- each, carriage 5/-.

## 18 SET 38 SET. GENERATOR AND SUPPLY UNIT

This Unit supplies H.T. and L.T. to these popular Transreceivers from 6 v. D.C. source and contains Hand Generator charging 6 v. Accumulators with small Vibrator Pack supplying 150 v. This Brand New Unit is offered at only 30/- carriage paid.

## COMPLETE No. 1 HEADGEAR

Brand New. Consists of low impedance padded headphones and No. 7 hand microphone with moving coil insert. Price 10/- P. & P. 3/6.

## MICROPHONES

All Brand New with cord and plug.

No. 8. With Blue Carbon insert 8/6 each. No. 3A. With Refillable Carbon insert. Finished in Red and Black bakelite with white mouthpiece. 5/- each.

AMERICAN No. 7. Moving coil. Tested. Only 6/6 each.

TANNOY. Power Microphones. 10/- each.

No. 4A. 18 Set Type, 5/- each. ENGLISH THROAT Microphones 4/6 each.

Please add post and packing 1/6 on each.

## NEW CRYSTAL MICROPHONES

Miniature continental lapel mike with rubber suction pad. Ideal for Tape recording and most amplifiers. Supplied in presentation case for only 37/6 post paid.

"ACOS" Stick Microphone. Current manufacture. Only a few of these £5.00 mikes offered at only 52/6 post paid.

## HOOVER ROTARY TRANSFORMERS



12 v. input, 500 v. output at 85 mA. or 6 v. input, 250 output at 75 mA.

Now offered at only

10/6

EACH

P. & P. 2/-.

Order now while stocks last!

## HEADPHONES

D.L.R.J. Low resistance with cord and plug. 3/6. P. & P. 2/-.

CHAMMOIS PADDED. Most comfortable type ever manufactured. Low resistance, moving coil. 25/- P. & P. 2/6.

D.H.T. Balanced armature. high resist. Only 12/6. P. & P. 2/-.

D.L.R. No. 5. Balanced armature. low resist. Only 7/6. P. & P. 2/-.

H.S.30. American lightweight with miniature earpieces. Only 15/- P. & P. 2/-.

## MINIATURE YANKEE

## SHORT-WAVE RECEIVER TYPE RBZ

Covering 5-13 Mc/s. Supplied in excellent working order, complete with haversack, headphones, aerial lead, and full instruction booklet. Size including haversack 6" x 9" x 2". Price 5 gns., post paid. Batteries 15/- extra.

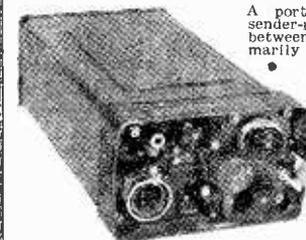
## SCR 522—2 METRE INSTALLATION

Complete V.H.F. Transmitter Receiver consisting of an automatically tuned, 4-channel, crystal-controlled transmitter receiver, covering 100-156 Mc/s. amplitude modulated voice giving output of 12 watts. Consisting of 18 valves: 2-832, 3-12A6, 1-6G6, 2-6SST, 1-12L5, 1-12C8, 1-9002, 3-9003, 1-12AH7, 3-12SG7. Power requirements 300 volts H.T. and 12 volts L.T. Housed in black metal case. Size 12 1/2 in. x 18 in. x 9 1/2 in. Complete Transmitter Receiver only. Supplied complete with full operating details and circuit diagram.

70/-

Carr. 10/-

## WIRELESS SET No. 46



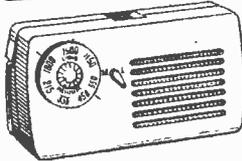
A portable R.T. and M.C.W. sender-receiver for frequencies between 3.6 and 9.1 Mc/s. Primarily a man-pack set, it is especially adaptable for use under difficult conditions, such as those prevailing during landing operations. Fixed crystal controlled tuning is employed on both sender and receiver, with a switch for three alternative channels. Thus, the usual "tuning in" and netting operations are eliminated. These sets are supplied complete with all valves but less crystal, which can be obtained to suit your own requirements. Price, including circuit diagram, 45/- P. & P. 4/-.

# B. ADLER & SONS

(RADIO) LTD.

KING'S HEAD YARD, COPTIC ST., LONDON, W.C.1  
CALLERS WELCOME TEL: MUS 9505

# LASKY'S RADIO



## You can build this 6 TRANSISTOR POCKET RADIO

for £9/19/6 plus 3/6 post.  
Printed Circuit construction. A FULL medium and long wave superhet using very latest components including 6 transistors, 2 1/2 in. moving coil speaker and in-built Ferrite aerial. Handsome cream or coloured plastic case, 5 1/2 x 3 1/4 x 1 1/2 in., weight 12 ozs. Full assembly instructions supplied.

Demonstrated at either address.  
All components available separately.

## LASKY'S F.M. TUNER

Printed Circuit version of the G.E.C. 912 "F.M.Plus." Can be built for £7/19/6 plus 3/6 post.

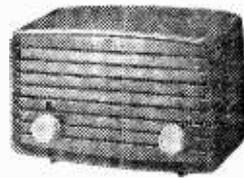
# "Easy-to-Build" Radios

Complete Parcels. All components available separately.  
**CIRCUIT DIAGRAM & BUILDING INSTRUCTIONS**  
FOR ANY OF THESE, 1/6 each, post free.



## TRANSISTOR PORTABLE

Uses 7 transistors and 1 germanium diode. Can be built complete for £9/19/6 plus 3/6 post.



## MIDGET T.R.F.

For 200/250 v. A.C. mains, med. & long wave. Uses 2 double-purpose valves. Can be built complete for £4/19/6 plus 5/- post.



## 4-VALVE S/HET PORTABLE

Med. & long wave. BATTERY version can be built for 7 Gns. plus 3/6 post (only batteries extra).

MAINS/BATTERY version can be built complete for 9 Gns. plus 3/6 post.

**TRANSISTOR AUDIO AMPLIFIER**  
200/250 milliwatts. Can be built complete for 79/6 plus 3/6 post.  
**TRANSISTOR SUPERHET TUNER**  
Battery operated. Can be built complete for £5/12/9 plus 3/6 post.

## LASKY'S (HARROW ROAD) LTD.

42, TOTTENHAM COURT ROAD, W.I.  
370, HARROW ROAD, PADDINGTON, W.9.

Telephone: MUSEUM 2605.  
LAD. 4075 and CUN. 1979.

Open all day SATURDAY. Half-day Thursday.

PLEASE ADDRESS ALL MAIL ORDERS TO HARROW ROAD.

## TESTOSCOPE MAINS TESTER



For high and low voltage testing.  
Standard Model: range 100/850 volts A.C. or D.C. Dual Model: range 130 and 100/850 volts A.C. or D.C.  
Write for interesting leaflet 29F.

**Runbaken**  
MADE IN SWITZERLAND

"Hints on Electrical Testing," now available, 1/- post free.

## The "TYANA" Standard Soldering Iron

- Adjustable Bit.
  - Weight approx. 4 oz.
  - Heating Time 3 min.
  - Standard Voltage Ranges.
- 40 Watt economy Consumption  
16/9. Replacement Elements and Bits always available.



## "DIPLOMA" HEADPHONES

Lightweight High Resistance (4,000 ohms). Complete with cord. 17/6. Ideal for CRYSTAL SETS and also for use with TAPE RECORDERS.

KENROY LIMITED, 152/297 UPPER ST., ISLINGTON, LONDON, N.1  
Telephone: Canonbury 4905-4663

## H.A.C. SHORT-WAVE EQUIPMENT

Noted for over 20 years for S.W. Receivers and Kits of Quality.

Improved designs with Denco coils: As supplied to Technical Colleges, etc.  
One-Valve Kit, Model "C." Price 25/-  
Two-Valve Kit, Model "L." Price 50/-  
New Addition: Model "K."  
Super sensitive "All Dry" Receiver. Special incl. price. Complete Kit, 77/-

All kits complete with all components, accessories and full instructions. Before ordering call and inspect a demonstration receiver, or send stamped, addressed envelope for descriptive catalogue and order form.

"H.A.C." SHORT-WAVE PRODUCTS  
(Dept. TR), 11, Old Bond Street, London, W.1.

## RES/CAP. BRIDGE 35/-

p. & p. 2/-  
Checks all types of resistors, condensers & RANGES

Built in 1 hour. Direct reading  
**READY CALIBRATED**  
Stamp for details of this and other kits.  
**RADIO MAIL (Dept. PL)**  
Raleigh Mews, Raleigh Street, Nottingham

## RADIO AND TELEVISION COMPONENTS

We operate a prompt and efficient MAIL-ORDER Service. 3d. stamp (only) for Catalogue.

**JAMES H. MARTIN & CO.**  
FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCs.

## B.B.C.-I.T.V.-F.M. AERIALS

B.B.C. (Band 1).—Telescopic loft, 10/8. External S/D, 23/6. "X" Chimney unit, 75/-.  
I.T.V. (Band 3).—3-element loft array, 24/-; 5-element, 32/6. Wall mounting, 3-element, 33/9; 5-element, 41/3.  
Combined B.B.C.-I.T.V. Loft 1+3 element, 41/3; 1+5 element, 46/9. Wall mounting, 1+3 element, 50/3; 1+5 element, 53/9. Belling "Golden V" room aerial, 42/-.  
Antiference "V" 25/-.  
F.M. (Band 2).—Loft "H," 23/-; 3-element, 52/6. S/D loft, 12/6. External S.D., 26/3. State channel when ordering.  
C.W.O. or C.O.D. P/P 2/6. Coaxial cable, 8d. 3d. Coaxial plugs 1/3. Send 6d. stamps for Illustrated Lists.  
K.V.A. ELECTRONICS (Dept. F.W.), 3B, Godstone Road, Kenley, Surre.

**COMPARE THIS PRICE!**

**A COMPLETE RECEIVER!**

**MAINS OPERATED PORTABLE RADIO**

- ★ FIVE VALVE SUPERHET
- ★ BUILT IN FRAME AERIAL
- ★ ALL MARCONI VALVES
- ★ SLOW MOTION TUNING
- ★ 7 x 4 inch ELLIPTICAL SPEAKER
- ★ GRAMOPHONE PICK-UP SOCKETS
- ★ SIZE 10 x 10 x 4 inches.
- ★ MAINS 200/240 v. A.C./D.C.

The product of a well-known radio manufacturer: Gives world-wide coverage on all wavebands.

The ideal unit for a radio-gram or portable radio

Models available:

Type C—

Medium wave, 180 to 550 metres.  
Short Wave, 10 to 30 metres (30 to 10 Mc/s) in two wavebands.  
Gramophone.

Type D—

Medium Wave, 180 to 550 metres.  
Long Wave, 800 to 2,000 metres.  
Short Wave, 15 to 50 metres (6 to 20 Mc/s).  
Gramophone.

**£7.12.6** Post 3/6. (BOTH MODELS)  
PORTABLE POLISHED WOOD CABINET, 27/6.  
SUPER REXINE PORTABLE CABINET, 37/6

GUARANTEED BRAND NEW AND IN PERFECT WORKING ORDER

**A.C./D.C. 200/250V Portable-Gram AMPLIFIER**

Completely assembled on baffle board size 12½" x 4½" depth 3" Containing two Mullard valves type UL84 and UY85, Elac 7" x 4" elliptical speaker, volume control, tone control. Nothing else to buy, just plug in to mains and connect your pick-up to amplifier.

Absolute bargain **67/6** Carr. 2/-.

**RECORD PLAYERS**

**COLLARO CONQUEST.**—4-speed auto-changer with light-weight turnover crystal pick-up and manual control.

**£7/19/6** P.P. 4/6.

**COLLARO** 4-speed single player with crystal turnover head.

**£6/19/6** P.P. 3/6.

**B.S.R.** 4-speed auto-changer with light-weight turnover crystal pick-up head. **£6/19/6** P.P. 4/-.

EACH OF THE ABOVE RECORD PLAYERS INCORPORATE THE LATEST FEATURES:

- ★ LIGHT WEIGHT ACTION. ★ LONG PLAYING LIFE.
- ★ EASE OF FITTING AND USE ★ FULLY GUARANTEED.

**R.C.A. RIBBON MICROPHONES**

Brand new. desk type with lead.

ONLY **65/-** P.P. 1/-.

**STROBE UNIT**

Complete with: 6—EF50; 5—EA50; SP61. Relays etc.

**35/-** P.P. 2/6.

**TYPE 25 SWITCHED R.F. UNITS**

Tuning 30 to 40 Mc/s. Includes 3 SP61's. Circuit 9d.

Carriage 2/6 **10/-**

**TYPE 26.**—Variable tuning, 50 to 65 Mc/s. Including 2 EF54's and 1 EC52. Circuit 9d.

Carriage 2/6. **25/-**

**426 CONTROL UNIT**

Includes: 4—EF50; 2—SP61; EB34; multibank switches; pots; transformer, etc.

ONLY **30/-** P.P. 3/-.

**CRYSTAL MIC. INSERTS**

½ in. Square ... 3/6 1½ in. Round (Acos) ... 7/6

½ in. Round (Acos) ... 5/- 2½ Round (Acos) ... 12/6

Moulded plastic hand mic case suitable for any of above, only 2/6 P.P. 6d. per item.

LARGEST RANGE IN COUNTRY OF CRYSTALS, VALVES AND TRANSISTORS. SEND FOR FREE LISTS.

**THE NEW MULLARD 3-3 HI-FI AMPLIFIER**

- ★ 3 watts output.
- ★ Separate bass and treble controls.
- ★ Radio and pick-up input.
- ★ Radio/record balance control.
- ★ Overall size 10½ x 8½ x 3½ in.

This is the new super all enclosed model; a hi-fi amplifier at a reasonable price. **£8/8/-**, p.p. 3/-.

**VIBRATOR PACKS.** Input 6V d.c. Output approx. 100V. d.c. at 30 mA, fully smoothed and r.f. filtered. Size 6½" x 5" x 2". Fitted with Mallory 629C vibrator. BRAND NEW. Boxed. 12/6.

**PACKARD-BELL PRE-AMP.**

Complete in screened case with 6SL7GT; 28D7; relay; leads; jack plug. etc. Handbook.

BRAND NEW. ONLY **12/6** P.P. 2/-.

**MORSE PRACTICE BUZZER UNITS**

Ready wired on board, complete with key.

ONLY **4/6** P.P. 11/6.

Headphones 7/6 pair. Requires 4½ volt battery.

**"373" MINIATURE I.F. STRIP 10.72 MC/S**



The ideal F.M. conversion unit as described in "P.W." April/May, 1957. Complete with 6 valves, three EF91's, two EF92's and one EB91.I.F.T's, etc., in absolutely new condition. With circuit and conversion data.

**12/6** (less valves) **37/6** (with valves)

Postage and packing 2/6 (either type) FM AT ITS CHEAPEST!

**PYE 45 Mc/s. STRIP TYPE 3583**

Complete with 12 valves. 10-EF50; EB34; EA50, with modification data; For TV Sound Strip.

ABSOLUTE BARGAIN **39/6** Carriage 4/6.

**DYNAMOTORS**

12 volts D.C. input. 220 volts, 165 mA. output. **32/6**, Post FREE.

**ROTARY CONVERTER**

24 v. D.C. to 230 v. A.C. 50 cycles. 100 watts. Brand new and unused. **£5.10.0** Carr. 7/6.

**COMPONENT CHASSIS**

Chassis board filled with high-stability resistors; condensers; unistors (S.T.C.); V/H, etc. **5/-** P.P. 1/-.

3-12-way switches with indicators; resistors; condensers; unistors (S.T.C.) on panel, etc. **5/-** P.P. 1/-.

SEE OUTSIDE BACK COVER FOR MORE BARGAINS. →

**HENRY'S (RADIO) LTD. (Dept. P.W.M)**

Opposite Edgware Road Tube Station. PADDington 1008/9

5, HARRINGTON ROAD, EDGWARE ROAD, PADDINGTON, LONDON W.2.

OPEN MONDAY to SAT. 9-6. THURS. 1 o'clock.

# Practical Wireless BLUEPRINT SERVICE

## PRACTICAL WIRELESS

	<i>No. of Blueprint</i>
<b>CRYSTAL SETS</b>	
2/- each	
Crystal Receiver ...	PW71*
The "Junior" Crystal Set ...	PW94*
2/6 each	
Dual - Wave "Crystal Diode" ...	PW95*

## STRAIGHT SETS

Battery Operated	
One-valve : 2/6 each	
The "Pyramid" One-valver (HF Pen) ...	PW93*
The Modern One-valver ...	PW96*
Two-valve : 2/6 each	
The Signet Two (D & LF) ...	PW76*
3/6 each	
Modern Two-valver (two band receiver) ...	PW98*
Three-valve : 2/6 each	
Summit Three (HF, Pen, D, Pen) ...	PW37*
The "Rapid" Straight 3 (D, 2 LF (RC & Trans)) ...	PW82*
F. J. Camm's "Sprite" Three (HF, Pen, D, Tet) ...	PW87*
3/6 each	
The All-dry Three ...	PW97*
Four-valve : 2/6 each	
Fury Four Super (SG, SG, D, Pen) ...	PW34C*

### Mains Operated

Two-valve : 2/6 each	
Selectone A.C. Radiogram Two (D, Pow) ...	PW19*
Three-valve : 4/- each	
A.C. Band-Pass 3 ...	PW99*
Four-valve : 2/6 each	
A.C. Fury Four (SG, SG, D, Pen) ...	PW20*
A.C. Hall - Mark (HF, Pen, D, Push Pull) ...	PW45*

## SUPERHETS

Battery Sets : 2/6 each	
F. J. Camm's 2-valve Superhet ...	PW52*
Mains Operated : 4/- each	
"Coronet" A.C.4 ...	PW100*
AC/DC "Coronet" Four ...	PW101*

*No. of  
Blueprint*

## SHORT-WAVE SETS

Battery Operated	
One-valve : 2/6 each	
Simple S.W. One-valver ...	PW88*
Two-valve : 2/6 each	
Midget Short-wave Two (D, Pen) ...	PW38A*
Three-valve : 2/6 each	
Experimenter's Short-wave Three (SG, D, Pow) ...	PW30A*
The Perfect 3 (D, 2 LF (RC and Trans)) ...	PW63*
The Band-spread S.W. Three (HF, Pen, D (Pen), Pen) ...	PW68*

## MISCELLANEOUS

2/6 each	
S.W. Converter-Adapter (1 valve) ...	PW48A*
The P.W. 3-speed Autogram ... (2 sheets), 8/-*	
The P.W. Monophonic Electronic Organ (2 sheets), 8/-	

## TELEVISION

The "Argus" (6in. C.R. Tube) 3/-*	
The "Simplex" ... 3/6*	
The P.T. Band III Converter 1/6*	

*All the following blueprints, as well as the PRACTICAL WIRELESS numbers below 94, are pre-war designs, kept in circulation for those amateurs who wish to utilise old components which they may have in their "spares" box. The majority of the components for these receivers are no longer stocked by retailers.*

## AMATEUR WIRELESS AND WIRELESS MAGAZINE

### STRAIGHT SETS

Battery Operated	
One-valve : 2/6	
B.B.C. Special One-valver ...	AW387*
Mains Operated	
Two-valve : 2/6 each	
Consoelectric Two (D, Pen), A.C. ...	AW403

## SPECIAL NOTE

THESE blueprints are drawn full size. The issues containing descriptions of these sets are now out of print, but an asterisk 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 appears. Thus P.W. refers to PRACTICAL WIRELESS, A.W. to Amateur Wireless, W.M. 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.

*No. of  
Blueprints*

## SHORT-WAVE SETS

Battery Operated	
One-valve : 2/6 each	
S.W. One-valver for American ...	AW429*
Two-valve : 2/6 each	
Ultra-short Battery Two (SG, det Pen) ...	WM402*
Four-valve : 3/6 each	
A.W. Short Wave World-beater (HF, Pen, D, RC, Trans) ...	AW436*
Standard Four-valver Short-waver (SG, D, LF, P) ...	WM383*

### Mains Operated

Four-valve : 3/6	
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ...	WM391*

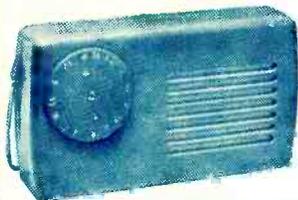
## MISCELLANEOUS

Enthusiast's Power Amplifier (10 Watts) (3/6)	WM387*
Listener's 5-watt A.C. Amplifier (3/6) ...	WM392*
De Luxe Concert A.C. Electrogram (2/6) ...	WM403*

## QUERY COUPON

This coupon is available until Mar. 6th 1959, and must accompany all Queries sent in accord with the notice on our "Open to Discussion" page. PRACTICAL WIRELESS, MAR. 1959.

# NEW! THE "QUINTET" TRANSISTOR-5



A FIVE TRANSISTOR POCKET SUPERHET ON PERDIO PRINTED CIRCUIT, USING EDISWAN TRANSISTORS.

Size  $5\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{1}{4}$  in.  
Weight: 12 ozs.

Total cost, including EDISWAN transistors, cabinet, etc., **£8.10.0**, P.P. 2/6.  
ALL ITEMS SOLD SEPARATELY

★ Easy to follow printed circuit.

★ 5 EDISWAN transistors.

★ Full medium wave coverage.

★ Full speaker output.

★ Attractive Plastic Case (Red, Blue or Cream).

★ Long life battery.

★ Built-in ferrite aerial.

★ Complete building instruction.

## "THE TRANSISTOR-8"

Push-Pull Portable Superhet.

This Portable 8 Transistor Superhet is tunable for both Medium and Long Waves and is comparable in performance to any equivalent Commercial Transistor Set. Call and Hear Demonstration Model.

- ★ 8 EDISWAN Transistors.
- ★ 250 Milliwatts Output Push-Pull.
- ★ All components identified.
- ★ Medium and Long Waves.
- ★ Internal Ferrite Rod Aerial.
- ★ 7 x 4 in. Elliptical Speaker.
- ★ Drilled chassis  $8\frac{1}{2} \times 2\frac{1}{2}$  in.
- ★ Point-to-Point Wiring and Practical Layout.
- ★ Economical. Powered by  $7\frac{1}{2}$  v. battery.
- ★ Highly sensitive.
- ★ Attractive lightweight contemporary case. In various colours.

COMBINED PORTABLE/CAR RADIO

Two sets for the price of one.

We can supply all these items including Cabinet for £11.10.0, P.P. 2/6. All parts sold separately. Circuit diagrams and shopping list free.



Size  $9 \times 7 \times 3\frac{1}{4}$  in.  
Weight: 4 lbs.

Car Radio Conversion Components, 8/- extra.  
A.V.C., 5/9 extra. 325 mW. version, 40/- extra.

## NEW TYPE TRANSISTORS — PRICE REDUCTIONS

JUNCTION TYPE P.N.P.

EDISWAN XA104 6 Mc/s. osc./mixer: R.F. amplifier ...	18/-
" XA103 4 Mc/s. I.F. and R.F. amplifier ...	15/-
" XB104 1 Mc/s. Audio output and driver ...	10/-
(A pair in push-pull will give up to 250 mW. audio output.)	
Continental OC44 12 Mc/s. osc./mixer: R.F. amp. ...	30/-
" OC45 6 Mc/s. I.F. and R.F. amp. ...	25/-
" OC72 325 mW in push-pull ...	20/-
Red Spot 800 Kc/s. Audio Amplifier ...	7/6
White Spot 2 to 5 Mc/s. R.F. and I.F. amp. ...	12/6
Green/Yellow 600 Kc/s. Audio Amplifier ...	7/6
Red/Yellow 1.5 to 8 Mc/s. R.F. and I.F. amp. ...	15/-

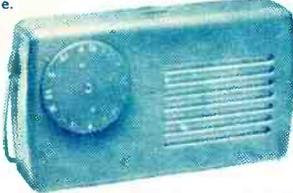
NEWMARKET POWER TRANSISTORS IN STOCK.

FULL TRADE DISCOUNTS.

LARGE RANGE OF SUB-MINIATURE TRANSISTOR COMPONENTS IN STOCK: SEND FOR NEW FREE LIST.

## SIX TRANSISTOR POCKET-SUPERHET

- ★ Medium and Long Wave.
- ★ 6 Selected Transistors.
- ★ Printed Circuit.
- ★ Internal Ferrite Aerial.
- ★ 30 ohms Speaker.
- ★ Instruction Booklet.
- ★ Low consumption.
- ★ Attractive Plastic Cabinet (Red, Blue and White colours).
- ★ 9 v. P.P.4 Battery.
- ★ Easy to Build.



All items supplied special inclusive price of £9/19/6. P.P. 2/6.

This set is an ideal Portable. Highly sensitive, selective, combining latest features with simplicity in construction giving amazing results.

ALL COMPONENTS SOLD SEPARATELY. SEND FOR LISTS.

## MAJOR-2



- ★ 4-stage reflex circuit.
- ★ Variable tuning over medium waves.
- ★ Highly sensitive.
- ★ No aerial or earth.
- ★ Home, Light and Third.
- ★ Economical.
- ★ Drilled and mounted chassis.
- ★ Size  $4\frac{1}{2} \times 3 \times 1\frac{1}{4}$  in.
- ★ Internal ferrite aerial.
- ★ Weight less than 4 ozs.
- ★ Complete layout diagram.
- ★ May be built in 1 hour.

All items can be supplied, including EDISWAN transistors, battery, case and personal 'phone, etc., for 72/6, post free. All components sold separately. Circuit and shopping list FREE. Call and Hear Demonstration Model.

## MINOR-1



- ★ Variable tuning over medium waves.
- ★ 3-stage reflex circuit.
- ★ Highly sensitive.
- ★ Internal ferrite aerial.
- ★ Drilled chassis.
- ★ Long-life battery.
- ★ Complete constructional details.
- ★ Size only  $3 \times 2 \times \frac{3}{4}$  in.

Total cost, including transistor, personal miniature 'phone, case, battery and complete circuit and layout diagrams, 52/6 post free. All components sold separately. Circuit and shopping list FREE.

SEE OTHER ADVT. INSIDE

### TRANSISTOR SQUARE WAVE GENERATOR

2.5 Kc/s. Complete Kit with 2 Transistors, Components. Circuit and plastic case.

20/-

### TRANSISTOR SIGNAL TRACER

Complete Kit with 2 Transistors, Components, Phones and Circuit and plastic case.

37/6

**HENRY'S (RADIO) LTD. (Dept. P.W.M.)**  
Opposite Edgware Road Tube Station. PADDINGTON 1008/9.

5, HARROW ROAD, EDGWARE ROAD, PADDINGTON, LONDON, W.2.  
OPEN MONDAY to SAT. 9-6, THURS. 1 o'clock.