OCTOBER 1962

# Practical WIRELESS

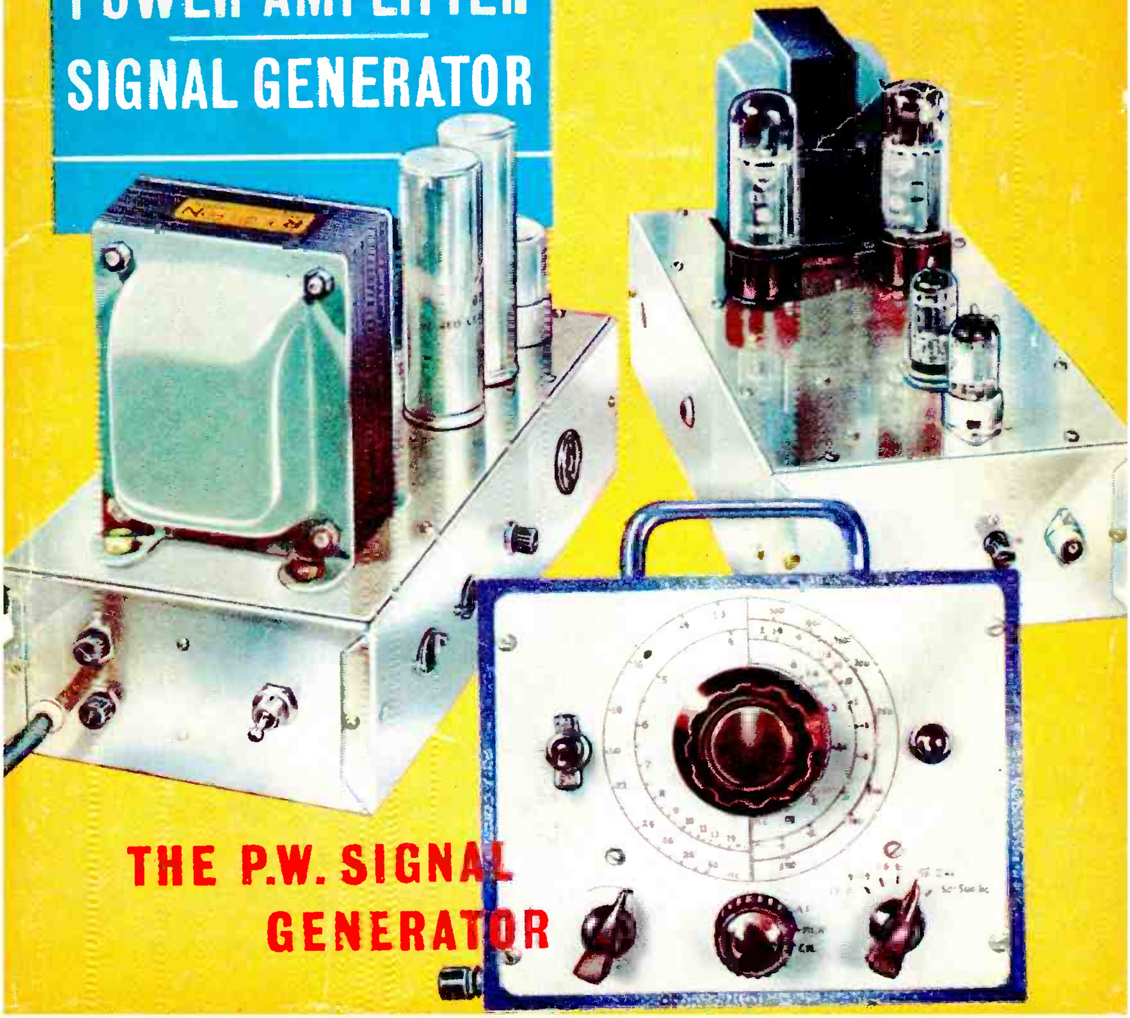
2/-

**FREE** inside!

## BLUEPRINT for POWER AMPLIFIER

## SIGNAL GENERATOR

## THE STRAND AMPLIFIER



## THE P.W. SIGNAL GENERATOR

Tel: Mitcham 6202

Open Daily to Callers

# R S T

All Valves Brand New and Fully Guaranteed

## 211 STREATHAM ROAD, MITCHAM, SURREY

*Special 24 Hour Express Mail Order Service*

AC2PEN 21/-
AC2PEN DD 21/-
ACTP 32/-
ACVP1 17/6
AZ1 15/-
AZ31 10/-
B36 10/-
C1C 12/6
CBL31 21/-
CCH35 21/-
CL33 18/6
CY1 15/-
CY31 15/9
D77 4/-
DAC32 9/6
DAF91 7/6
DAF96 8/9
DCC90 14/6
DF33 10/-
DF91 4/-
DF92 7/-
DF96 8/6
DF97 9/6
DH63 6/-
DH77 7/-
DK32 11/6
DK91 8/-
DK92 8/6
DK96 8/6
DL33 8/6
DL35 10/6
DL92 7/6
DL93 7/-
DL94 8/-
DL96 8/6
EA50 2/-
EABC80 6/-
EAC91 4/-
EAF42 9/6
EB34 2/6
EB41 7/6
EB91 4/-
EBC3 21/-
EBC33 4/6
EBC41 9/-
EBC81 10/-
EBF80 8/6
EBF83 8/6
EBF89 8/6
EBL1 22/6
EBL21 22/-
EBL31 21/6
ECC34 15/-
ECC35 8/-
ECC40 21/-
ECC81 5/9
ECC82 8/6
ECC83 7/6
ECC84 8/6
ECC85 8/-

ECC88 17/6
ECC91 4/-
ECF80 8/6
ECF82 8/6
ECH3 21/-
ECH21 22/-
ECH42 9/6
ECH35 10/-
ECH81 8/-
ECH83 8/6
ECL80 9/-
ECL81 10/-
ECL82 9/6
ECL83 12/-
EF6 21/-
EF9 21/-
EF22 14/-
EF36 4/-
EF37 8/-
EF37A 8/-
EF39 4/-
EF40 15/-
EF41 8/-
EF42 10/-
EF50A 4/-
EF50E 3/6
EF80 5/-
EF85 5/-
EF86 10/6
EF89 9/-
EF91 4/-
EF92 4/-
EF95 7/6
EF97 12/6
EF98 10/-
EF183 18/-
EF184 14/-
EK32 8/6
EL2 21/-
EL3 21/-
EL6 21/-
EL32 4/6
EL33 10/-
EL34 15/-
EL35 10/-
EL37 17/6
EL38 21/-
EL41 10/-
EL42 10/-
EL81 12/6
EL84 6/9
EL85 10/-
EL90 8/6
EL91 4/-
EL95 10/6
EM80 8/6
EM81 8/6
EM84 9/6
EM85 10/-
EY51 8/6
EY81 8/6
EY83 15/-

EY86 8/6
EZ35 6/-
EZ40 7/-
EZ41 7/-
EZ80 7/-
EZ81 7/-
EZ90 7/-
E1148 2/-
FC2 21/-
FC2A 21/-
FC4 15/-
FC13 21/-
FC13C 21/-
FW4 500 9/-
FW4/800 9/-
GZ30 10/6
GZ32 10/6
GZ33 19/3
GZ34 13/6
GZ37 19/3
HABC80 10/-
HL41DD 8/6
HL92 8/6
HL133DD 10/-
HN309 22/6
IW4/350 10/-
IW4/500 10/-
KT33C 8/-
KT36 17/6
KT55 17/6
KT61 9/6
KT66 15/-
KT76 10/-
KT81 15/-
L63 5/-
LN152 9/-
LN309 12/6
LZ319 12/6
MKT4 17/6
MS4B 17/6
MVSPEN 17/6
MVSPENB 17/6
MU14 9/-
MX40 15/-
N18 8/-
N37 14/-
N78 17/6
N108 18/-
N308 20/-
N339 30/-
N369 10/6
OD3 5/-
OZ4 5/6
P2 10/-
PABC80 13/-
PCC84 9/-
PCC85 9/6
PCC88 15/-
PCC89 9/6

PCF80 9/6
PCF82 7/-
PCF84 16/-
PCF86 15/-
PCL82 9/6
PCL83 12/6
PCL84 10/6
PCL85 16/-
PENA4 17/6
PENB4 17/6
PEN4DD 25/-
PEN4VA 17/6
PEN36C 21/-
PEN45 10/-
PEN45DD 25/-
PEN46 5/-
PEN453DD 27/6
PENDD4020 25/-
PL33 15/-
PL36 15/-
PL38 21/-
PL81 12/-
PL82 8/-
PL83 10/6
PL84 9/-
PL820 18/-
PM24M 13/6
PX4 15/-
PX25 25/-
PY31 15/-
PY32 12/6
PY80 7/6
PY81 7/6
PY82 7/6
PY83 8/6
PZ30 18/6
QS95/10 10/-
QS150/15 10/-
R2 10/-
R3 10/-
R12 8/6
R16 17/6
R19 19/-
R20 19/-
S130 7/6
SP41 3/6
SP61 3/6
SU2150 25/-
SU2150A 25/-
T41 15/-
TDD4 12/6
TDD13C 17/6
TH41 27/6
TY86F 12/6
U10 9/-

U12 9/-
U14 9/-
U22 8/-
U24 21/-
U25 12/6
U26 10/-
U27 8/-
U31 9/-
U35 17/6
U37 17/6
U43 8/6
U45 10/-
U47 12/6
U50 7/6
U52 4/-
U76 7/6
U78 4/6
U191 15/-
U251 12/6
U281 18/-
U282 19/6
U301 22/6
U329 12/6
U339 15/-
U403 10/-
U404 10/-
U801 29/-
UABC80 7/-
UAF42 8/6
UB41 7/6
UBC41 8/6
UBC81 10/-
UBF80 8/6
UBF89 7/6
UBL21 21/-
UCC84 10/6
UCC85 7/6
UCF80 13/6
UCH21 21/-
UCH42 9/6
UCH81 8/-
UCL82 10/-
UCL83 13/6
UF41 7/6
UF42 7/6
UF80 7/-
UF85 7/6
UF86 12/6
UF89 6/6
UL41 8/6
UL44 21/-
UL46 14/6
UL84 7/-
UL85 7/6
UM80 10/6
URIC 15/-
UU6 19/-
UU8 21/-
UU9 7/6
UYIN 12/6
UY21 15/6
UY41 7/6

UY85 7/-
VMS4B 12/6
VP4 15/-
VP4A 17/6
VP4B 17/6
VR105/30 7/-
VR150/30 7/-
VU39 9/-
VU111 2/6
VU120 2/6
W61 11/-
W76 5/-
W77 4/-
W81 6/-
W81M 6/-
X17 8/6
X18 9/-
X41 15/-
X61 12/6
X61M 22/6
X65 12/6
X76 12/6
X76M 12/6
X78 21/-
X79 21/-
Y61 10/-
Y66 9/6
Z63 7/6
Z66 10/-
Z77 4/-
Z152 5/-
ZD17 8/-
ZD152 8/6
OZ4 5/-
1A7 11/6
1C1 8/6
1C2 9/-
1C3 9/6
1C5 10/6
1D5 8/6
1D6 10/-
1H5 9/6
1L4 5/-
1LN5 4/6
1N5 9/6
1R5 7/6
1S4 8/-
1S5 7/6
1T4 4/-
1U5 5/9
3A4 5/-
3A5 10/6
3Q4 8/-
3Q5 9/-
3S4 7/-
3V4 8/-
5U4 4/-
5V4 7/9
5Y3 8/6
5Y3GT 8/6
5Z4 9/6
5Z4GT 12/6

6A7 9/-
6A8G 8/6
6A8GT 13/6
6AB8 9/-
6AJ8 9/6
6AK5 5/-
6AK8 7/6
6AL5 6/-
6AM5 5/-
6AM6 4/-
6AN5 7/6
6AQ5 6/6
6AQ8 9/3
6AT6 6/-
6AU6 9/-
6B8G 3/-
6BA6 6/-
6BE6 6/-
6BG6G 17/6
6BH6 8/-
6BJ6 6/-
6BQ7A 12/6
6BR7 12/6
6BS7 12/6
6BW6 7/-
6BW7 5/-
6BX6 5/-
6C4 3/6
6C5GT 8/-
6C6 6/6
6C9 12/6
6CD6G 32/-
6CH6 10/-
6D2 4/-
6D6 5/6
6E5 10/-
6F1 10/6
6F6 6/9
6F11 10/-
6F12 4/-
6F13 10/-
6F14 10/-
6F15 12/6
6F19 12/6
6F23 10/6
6F33 5/6
6H6 2/-
6J5 4/6
6J5GT 4/6
6J6 3/6
6J7 5/-
6J7GT 7/6
6K7 2/-
6K7GT 8/6
6K8 5/-
6K8GT 9/6
6K25 18/-
6L1 13/-
6L6 7/6
6L18 10/-
6L19 17/6
6LD20 14/-

6P25 10/6
6P28 17/6
6Q7 6/6
6Q7GT 8/6
6SA7 7/-
6SG7 7/-
6SH7 6/-
6SJ7 6/6
6SK7 5/6
6SL7GT 6/-
6SN7GT 5/6
6SQ7 8/6
6U4GT 10/-
6U5G 7/6
6V6 4/6
6V6GT 8/-
6X4 4/6
6X5 7/6
6X5GT 8/6
6X6 15/-
630L2 10/-
7B5 12/6
7B6 10/-
7B7 8/6
7B8 8/-
7C5 8/-
7C7 8/-
7D3 15/-
7D5 15/-
7D6 15/-
7D8 15/-
7H7 7/6
7K7 8/6
7Q7 10/-
7Y4 7/6
8D3 4/-
9BW6 12/6
10C1 12/6
10C2 17/6
10F1 15/-
10F3 15/-
10F9 12/6
10LD11 15/-
10LD12 10/-
10P13 15/-
10P14 19/-
10P18 15/-
11D3 23/6
11D5 23/6
12A6 6/6
12AH8 9/-
12AT6 7/6
12AT7 5/-
12AU7 8/6
12AX7 7/6
12AU6 17/6
12BA6 7/6
12BE6 7/6
12BH7 10/-
12C8 8/6
12J5GT 4/-
12J7GT 8/6

12K7GT 5/-
12K8GT 10/-
12Q7GT 6/6
12SA7 8/6
12SK7 6/-
12SQ7 8/6
12SL7 8/-
12SN7 10/-
13D3 12/6
14H7 10/-
14R7 10/-
14S7 15/-
19AQ5 8/-
19B6G 21/-
20D1 10/-
20F2 17/6
20L1 17/6
20P1 25/-
20P3 25/-
20P4 22/-
20P5 25/-
21B6 12/-
25A6 8/-
25L6 8/-
25Y5 8/-
25Z4 7/6
25Z5 8/-
25Z6 8/-
27SU 17/6
30C1 9/6
30F5 10/-
30FL1 10/6
30L1 9/6
30L15 11/6
30P4 21/-
30P12 10/-
30P16 9/-
30PL1 15/-
30PL13 12/6
35L6GT 8/6
35W4 7/6
35Z3 16/-
35Z4 7/6
35Z5 8/6
40SUA 15/-
41STH 21/-
42 12/6
50C5 10/-
50L6 8/6
50CD6G 36/6
53KU 12/6
75 8/-
78 7/6
80 9/-
85A2 12/6
185BT 30/-
305 9/6
807BR 5/-

### METAL RECTIFIERS

| | | | | | | |
|---|---|---|---|---|---|---|
| RM1 | 5/3 | 14RA 1-2-8-2 | 17/6 (FC31) | 14A97 | 25/- |
| RM2 | 7/6 | 16RC 1-1-16-1 | 8/6 | 14A100 | 27/- |
| RM3 | 7/9 | 14RA 1-2-8-3 | 19/- (FC31) | 16RD 2-2-8-1 | 12/- |
| RM4 | 14/- | 18RA 1-1-16-1 | 6/6 (FC116) | 16RE 2-1-8-1 | 8/6 |
| RM5 | 19/6 | 18RA 1-2-8-1 | 11/- | 18RA 1-1-8-1 | 4/6 |
| 14A86 | 17/6 | 18RD 2-2-8-1 | 15/- (FC124) | | |

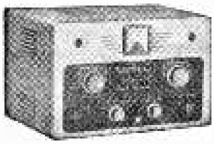
### SPECIAL OFFER

EABC80 6/-, EAC91 4/-, EB91 4/-, EBF89 8/6, ECC81 5/9, ECC85 8/-, ECC91 4/-, ECH81 8/-, EBC33 4/6, EF39 4/-, EF50 3/6, EF80 5/-, EF85 5/-, EF91 4/-, DF91 4/-, EL84 6/9, PCC89 9/6, PL84 9/-, UABC80 7/-, UBF89 7/6, UF41 7/6, UL41 8/6, UF89 6/6, UL84 7/-, UY85 7/-, W81 6/-, OZ4 5/-, 5U4 4/-, 6AQ5 6/6, 6BA6 6/-, 6BE6 6/-, 6D2 4/-, 6K7 2/-, 6K8 5/-, 6L6 7/6, 6Q7 6/6, 6SL7 6/6, 6SN7 5/6, 6V6 4/6, 8D3 4/-, 807 5/-, 12AT7 5/-, 12AH8 9/-, 12BA6 7/6, 12BE6 7/6, 12K7 5/-, 12Q7 6/6.

**TERMS OF BUSINESS C.W.O. or C.O.D. 3/2 PACKING CHARGE ON ALL C.O.D. ORDERS. POSTAGE 6d. PER VALVE**

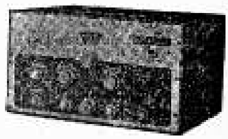
**OBSOLETE VALVES A SPECIALITY. QUOTATIONS GIVEN ON ANY TYPE NOT LISTED**

*Easy-to-build kit-sets of* **Heathkit** (DAYSTROM) *highest quality at lowest cost*


DX-40U

**AMATEUR TRANSMITTER. Model DX-40U.** Self-contained. 80-10 m. Power input 75 w. C.W., 60 w. peak, C.C. phone. Output 40 w. to aerial. Provision for V.F.O. **£33.19.0**

**AMATEUR TRANSMITTER. Model DX-100U** Covers all amateur bands, 160-10 m. 150 w. D.C. input. Self contained with power supply. Modulator, V.F.O. **£74.19.0**


DX-100U

**AUDIO SIGNAL GENERATOR. Model AG-9U.** 10 c/s-100 kc/s, switch selected. Distortion less than 0.1%. 10 v. sine wave output metered in volts and dB's ... ... ... **£21.9.6**

**VALVE VOLTMETER. Model V-7A.** Measures volts to 1,500 (D.C. and R.M.S.) and 4,000 pk to pk. Res. 0.1Ω-1,000 MΩ. D.C. input impeded. 11 MΩ. With test prods, leads and standardising battery ... ... ... ... ... ... ... **£13.18.6**

**R.F. SIGNAL GENERATOR. Model RF-1U.** Gives accurate source of R.F. up to 100 Mc/s on fundamentals and 200 Mc/s on harmonics. Up to 100 mV output on all bands. ... **£12.15.6**

**SINGLE SIDEBAND ADAPTOR, Model SB-10U**


SB-10U

May be used with most A.M. transmitters. Less than 3W R.F. input power required for 10W output. Operation on 80, 40, 20, 15 and 10m bands on USB, LSB or DSB **£39.5.0**

**HI-FI 18W STEREO AMPLIFIER Model S-99.** Ganged controls. Stereo/mono gram, radio and tape recorder inputs. Push-button selection. Printed circuit construction ... ... **£27.19.6**


S-99

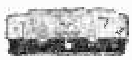
**HI-FI AM/FM TUNER.** Tuning range: FM: 88-108 Mc/s. AM: 16-50, 200-550, 900-2,000 m. Tuning heart (£5.5.6 incl. P.T.) and I.F. amplifier (£20.13.0) sold separately. Printed circuit board ... ... Total **£25.18.6**


AM/FM Tuner

**SHORTWAVE TRANSISTOR PORTABLE. Model RSW-1.** Two short bands, trawler and medium **£22.8.0**

**6-TRANSISTOR PORTABLE. Model UXR-1.** Prealigned I.F. transformers, printed circuit, 7 x 4in., high flux speaker. Real hide case ... ... **£14.3.0**

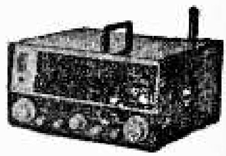
**TAPE RECORDING/PLAYBACK AMPLIFIER** Stereo (TA-1S) ... **£24.10.0** Monaural (TA-1M) **£19.2.6**


TA-1S

**5in. OSCILLOSCOPE. Model O-12U.** Wideband amplifiers essential for TV servicing. F.M. alignment, etc. Vertical freq. response 3 c/s-5 Mc/s without extra switching. T/B covers 10 c/s-500 kc/s in 5 ranges ... ... ... ... ... ... **£38.10.0**

**PORTABLE SERVICE OSCILLOSCOPE. Model OS-1.** Compact portable scope ideal for servicing and general work. Y amplifier sensitivity 10 mV/cm; response. 3 dB 10 c/s-2.5 Mc/s. Time base 15 c/s-150 kc/s. Printed circuits. Case 7⅜ x 4¾ x 12½in. long. Wt. only 10½lb. ... ... ... ... ... **£19.19.0**

**THE "MOHICAN" GENERAL COVERAGE RECEIVER, Model GC-1U. Fully Transistorised** Including 4 piezo-electric transfilters. Excellent portable or general purpose receiver for the amateur and short-wave listener. **£39.17.6**


GC-1U

**VAR. FREQ. OSCILLATOR. Model VF-1U** Calibrated 160-10 m. fundamentals 160 and 40 m. Ideal DX-40U and similar transmitters. **£11.17.6**

**HI-FI F.M. TUNER.** Tuning range 88-108 Mc/s. Tuning Unit (FMT-4U) with 10.7 Mc/s I.F. output (£3.2.0 inc. P.T.) I.F. Amplifier (FMA-4U) complete with cabinet and valves (£12.6.0) ... ... ... Total **£15.8.0**

**6-W STEREO AMPLIFIER. Model S-33.** 3 w/chl inputs for radio-tape and gram., Stereo or Mono ganged controls. Sensitivity 200 mV. ... ... **£13.7.6**

**SINGLE CHANNEL AMPLIFIER. Model MA-12.** 10-12 watt Hi-Fi amplifier. Extremely low distortion and wide frequency range ... ... ... **£11.9.6**

**STEREO CONTROL UNIT USC-1.** Luxury model with press-button inputs to suit any pick-up or tuner and most tapeheads. Output 1.3 v. R.M.S. per channel. Printed circuit construction. **£19.10.0**

Money Saving "PACKAGED DEALS" of Complete Stereo Equipment from **£46.6.0**

**HI-FI SPEAKER SYSTEM. Model SSU-1.** Ducted-port bass reflex cabinet "in white." Two speakers. Pedestal model £11.19.6. Bookcase model. **£11.5.0**


MALVERN

**HI-FI EQUIPMENT CABINETS.** Range available to meet various needs. Details on request. (MALVERN equipment cabinet illustrated on the left) from **£11.12.6 to £18.10.0.**

**STEREO HEAD PREAMPLIFIER USP-1.** Ideal for boosting tape-head output and low output pick-ups (e.g. Decca ffss) **£7.7.6**

**"COTSWOLD" HI-FI SPEAKER SYSTEM.** Acoustically designed enclosure "in the white" 26 x 23 x 15½in. 12in. bass speaker with 2in. speech coil, elliptical middle speaker. Pressure unit covers the full freq. range of 30-20,000 c/s., complete with cross-over unit, level control, etc. **£23.4.0**

AUDIO & DO-IT-YOURSELF accessories also available


COTSWOLD

*Assembled models also available—prices on request.*
*Deferred terms available over £10. Free Delivery U.K.*

Please send me FREE CATALOGUE (Yes/No)________

Full details of model(s)________

NAME ________

ADDRESS ________

PW10

# DAYSTROM LTD.

**Dept. P.W.10, GLOUCESTER, ENGLAND**

A member of the Daystrom Group, manufacturers of the WORLD'S LARGEST-SELLING ELECTRONIC KITS

R.S.C. (Manchester) LTD. ADDRESSES AT TOP OF ADJOINING PAGE R.S.C. (Manchester) LTD. →

# AUDIOTRON HI-FI TAPE RECORDER KIT 25½ GNS. Carr. 17/6

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

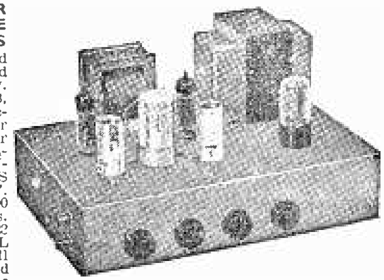
Incorporating the latest Collaro Studio Tape Transcriptor. The Audiotrine High Quality Tape Amplifier with negative feedback equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best quality Tape and a Handsome Portable carrying Cabinet with latest attractive two-tone polychrome finish. size 14½ x 15 x 8¼in. high, and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.A.E. for leaflets.

**ONLY 3 PAIRS OF SOLDERED JOINTS PLUS MAINS**

**H.P. TERMS.** Deposit £2.13.9 and 12 monthly payments of 44/-. Cash price if settled in 3 months. Or supplied less Tape Deck. Cash 13 gns. Carr., 10/-. Or deposit 2 gns., and 12 monthly payments of 23/9.

## HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

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



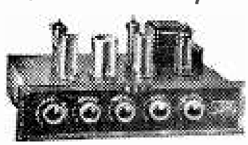
Two input sockets with associated controls allow mixing of "mike" and gram. as in A10. High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, EZ81. High Quality sectionally wound output transformer specially designed for Ultra Linear operation and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut". Frequency response ± 3 D.B. 30-30,000 c/s. Six negative feedback loops. Hum level 60 D.B. down. ONLY 22 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs. For **STANDARD or LONG PLAYING RECORDS.** For **MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS**, etc. **OUTPUT SOCKET** with plug provides 300 v. 30 mA, and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-250 v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/-

(Or factory built 51/- extra).

If required louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS. DEPOSIT 24/9, and 9 monthly payments of 24/9.** Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets. Speaker. Microphones, etc., with cash and credit terms.

**HI-FI CRYSTAL PICK-UP HEADS.** (Cartridges.) Acos. Standard replacement for Garrard, B.S.R. and Collaro, 19/9. Acos Stereo-Monaural 49/9. Ronette Stereo-Monaural 59/6.
**BRADMATIC RECORDING HEADS.** High Impedance Record/Playback 22/-. Low Impedance Erase. 12/6.
**PICK-UP ARMS.** Complete with latest Acos/hi-fi Turnover head and rest. Only 29/11.
**CRYSTAL MICROPHONES.** Hand type NP110 14/9. R.T.C. 19/9. Acos Mic 40 25/9, Acos Mic 45 29/9. Stick type Acos 39-1 39/9. BM3 with neck band and heavy table stand 59/9. Lapel type 35/9.
**COLLARO JUNIOR** 4-speed Single Player Unit and Crystal Pick-up with hi-fi Turnover head. Only £3.19.6.
**COLLARO CONQUEST 4-SPEED AUTO-CHANGER**, with high fidelity Studio pick-up. Latest model. For 200-250 v. 50 c.p.s. A.C. mains. Our price £6.19.6. Carr. 5/6.
**COLLARO RC 457 4-SPEED MIXER AUTO-CHANGERS.** Turnover Studio head, for 200-250 v. A.C. £7.19.6. Carr. 4/6.
**B.S.R. UA8 4-speed AUTO-CHANGERS** with hi-fi turnover head. £6.19.6. Carr. 4/6.
**GL3A MINIATURE 2-3 WATT GRAM AMPLIFIER.** For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. A.C. mains. Size 11½ x 2½ x 2½in. Controls: Vol. and Tone with switch. Only 59/6.

## R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER



A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts, suitable for all crystal stereo heads. Ganged Bass and Treble Control give equal variation of "lift" and "cut". Provision is made for use as straight (monaural) 10-watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, EZ81. Outputs for 2-3ohm speakers. Point-to-Point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. **8 Gns.** Full constructional details and price list 2/6. Carr. 10/-.
Kit can be assembled, ready to use, 59/6 extra.

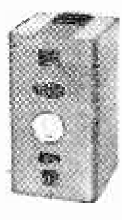
## R.S.C. BATTERY CHARGING EQUIPMENT

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

**HEAVY DUTY CHARGER KIT** 6/12 v. 6 amps. variable output. Consisting of Mains Transformer 0-200-230-250 v.: F.W. (Bridge) Selenium Rectifier: Ammeter, Variable Charge Rate Selector Panels, Plugs, Fuses, Fuseholder and circuit, 59/9. Carr. 4/6.

**CHARGER KIT.** 12v. 14 amp. or 24v. 7 amp. Consisting of mains trans. 200-230- 250 v., F.W. (Bridge) selenium Rectifier, F Ammeter, Fuses, Variable Resistor and Circuit. Only 6 gns. Carr. 15/-. Please state if 12v. or 24v. kit required.

**SOLDERING IRONS.** 230-250 v. 30 watts. First quality. For Radio work, 19/9. Spare elements and bits available.



**Assembled 6/12v. 4-5 amps.** Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finished. Fused and ready for use with mains and output leads. **69/9** Carr. 5/-. Terms: Deposit 13/3 and 5 monthly payments 13/3. 6/12 v. 3a., all facilities as above. Only 59/9. carr. 3/9.

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

**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.

| | |
|---|---|
| 6v. or 12v. 1 amp. | 24/9 |
| As above, with Ammeters | 29/9 |
| 6 v. 2 amps. | 25/9 |
| 6v. or 12v. 2 amps. | 31/6 |
| 6 v. or 12 v. 2 amps. inclusive of Ammeter | 42/9 |
| 6 v. or 12 v. 4 amps. | 49/9 |
| 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector | 59/9 |

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

## R.SC. MAINS TRANSFORMERS (FULLY GUARANTEED)

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

**TOP SHROUDED DROP THROUGH**

| | |
|---|---|
| 250-0-250v. 70mA. 6.3v. 2a, 0-5-6.3v. 2a | 17/9 |
| 350-0-350v. 80mA, 6.3v. 2a, 5v. 2a | 18/9 |
| 250-0-250v. 100mA, 6.3v. 2a, 6.3v. 1a | 21/9 |
| 250-0-250v. 100mA, 6.3v. 3.5a, C.T. | 19/9 |
| 250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a | 25/9 |
| 300-0-300v. 130mA, 6.3v. 4a, 6.3v. 1a, for Mullard 510 Amplifier | 29/9 |
| 300-0-300v. 100mA, 6.3v. 4a. 0-5-6.3v. 3a. | 26/9 |
| 350-0-350v. 100mA, 6.3v. 4a, 5v. 3a | 26/9 |
| 350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a. | 29/9 |

**FULLY SHROUDED UPRIGHT**

| | |
|---|---|
| 250-0-250v. 60mA, 6.3v. 2a, 0-5-6.3v. 2a, Midget type 2½-3-3in. | 17/11 |
| 250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a. | 27/9 |
| 300-0-300v. 100mA, 6.3v. 4a, 5v. 3a | 27/11 |
| 300-0-300v. 130mA, 6.3v. 4a, C.T. 6.3v. 1a, for Mullard Amplifier | 33/9 |
| 350-0-350v. 100mA, 6.3v. 4a, 5v. 3a | 27/11 |
| 350-0-350v. 150mA, 6.3v. 4a, 5v. 3a | 35/9 |
| 425-0-425v. 200mA. 6.3v. 4a, C.T. 5v. 3a | 55/- |

**FULLY SHROUDED (continued)—**

| | |
|---|---|
| 425-0-425v. 200mA, 6.3v. 4a, C.T., 6.3v. 4a C.T., 5v. 3a. | 59/9 |
| 450-0-450v. 250mA, 6.3v. 4a C.T. 5v. 3a | 69/9 |

**OUTPUT TRANSFORMERS**

| | |
|---|---|
| Midget Battery Pentode 66 : 1 for 3S4, etc. | 4/6 |
| Small Pentode, 5000Ω to 3Ω | 4/6 |
| Small Pentode 7/8,000Ω to 3Ω | 4/6 |
| Standard Pentode 5,000 to 3Ω | 5/9 |
| Standard Pentode 7,000 to 3Ω | 5/9 |
| 10,000Ω to 3Ω | 5/9 |
| Push-Pull 8 watts, EL84, or 6V6 to 3Ω or matched to 15Ω | 9/9 |
| Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5-8 or 15Ω | 19/9 |
| Following types for 3 and 15Ω speakers: | |
| Push-Pull 10-12 watts 6V6 or EL84 | 18/9 |
| 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, EL34, etc. | 49/9 |

**MIDGET MAINS** Primaries 200-250 v. 50 c/s.

| | |
|---|---|
| 250 v. 60 mA, 6.3 v. 2a | 11/9 |
| 250-0-250 v. 60 mA, 6.3 v. 2a. | 12/11 |

Both above size 2¾ x 2¾ x 2¼ins.

**FILAMENT TRANSFORMERS** All with 200-250 v. 50 c/s. primaries 6.3 v. 1.5a, 5/9; 6.3 v. 2 a, 7/6; 0-4-6.3 v. 2a, 7/9; 12 v. 1 a., 7/11; 6.3 v. 3 a, 8/11; 6.3 v. 6 a, 17/6; 12 v. 1.5 a. twice, 17/6.

**SMOOTHING CHOKES**

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

**CHARGER TRANSFORMERS** All with 200-230-250 v. 50 c/s Primaries: 0-9-15 v. 1½ a. 12/9; 0-9-15 v. 2 a. 14/9; 0-9-15 v. 3 a., 16/9; 0-9-15 v. 5 a, 19/9; 0-9-15 v, 6 a, 23/9; 0-9-15 v. 8 a, 28/9.

**AUTO (Step up/Step down) TRANS.** 0-110/120-230/250 v. 50-80 watts, 13/9; 250 watts, 39/9; 150 watts, 27/9.

**MICROPHONE TRANSFORMERS** 120 : 1 high grade, clamped, 6/9; 120 : 1 Potted. Mu-metal screened. 8/9.

# ★ VALVES ★
## by return of post

**10% DISCOUNT**
SPECIAL OFFER TO PURCHASERS of any SIX VALVES marked in black type (15% in dozen). Post: 1 valve, 6d., 2-11, 1/-.

**NEW LOW PRICES GUARANTEED 3 MONTHS**

FREE TRANSIT INSURANCE. All valves are new or of fully guaranteed ex-Government or ex-equipment origin. Satisfaction or Money back Guarantee on Goods if returned unused within 14 days.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OZ4 | 5/- | 6AG7 | 7/6 | 6J5GT | 4/- | 7A7 | 8/6 | 12K8GT | 9/6 | 35Z5GT | 8/- |
| 1A5GT | 5/- | 6AK5 | 5/- | 6J6 | 4/- | 7B6 | 9/- | 12Q7GT | 5/- | 41 | 7/6 |
| 1A7GT | 11/- | 6AL5 | 3/- | 6J7 | 8/6 | 7B7 | 7/9 | 12SA7 | 7/- | 42 | 7/6 |
| 1C5GT | 9/- | 6AM6 | 3/- | 6J7G | 4/9 | 7C5 | 7/3 | 12SG7 | 5/- | 50C5 | 9/- |
| 1D5 | 8/- | 6AQ5 | 6/- | 6J7GT | 7/6 | 7C6 | 7/6 | 12SH7 | 3/6 | 50CD6 | 19/- |
| 1D6 | 9/9 | 6AT6 | 5/9 | 6J8 | 9/6 | 7H7 | 7/3 | 12SJ7 | 5/6 | 50L6GT | 8/6 |
| 1H5GT | 9/9 | 6AU6 | 7/6 | 6K6GT | 6/6 | 7K7 | 9/6 | 12SK7 | 4/9 | 52KU | 10/6 |
| 1L4 | 3/3 | 6B7 | 8/6 | 6K7 | 5/9 | 7Q7 | 8/6 | 12SN7GT | 7/9 | 53KU | 10/6 |
| 1LD5 | 3/6 | 6B8G | 8/- | 6K7G | 2/6 | 7R7 | 1/6 | 13D3 | 9/- | 61SPT | 11/- |
| 1LN5 | 4/9 | 6BA6 | 5/9 | 6K7GT | 4/6 | 7S7 | 9/- | 14S7 | 14/9 | 62BT | 13/6 |
| 1N5GT | 9/9 | 6BE8 | 5/9 | 6K8GT | 8/9 | 7V7 | 7/9 | 19AQ5 | 7/6 | 75 | 6/6 |
| 1R5 | 5/6 | 6BG6G | 15/- | 6K25 | 7/6 | 7Y4 | 6/9 | 19BG6 | 19/- | 78 | 6/6 |
| 1S4 | 8/- | 6BH6 | 6/- | 6L1 | 12/6 | 7Z4 | 7/- | 20D1 | 9/6 | 80 | 5/9 |
| 1S5 | 4/6 | 6BJ6 | 6/- | 6L6G | 6/6 | 8D3 | 3/- | 20F2 | 9/6 | 83 | 9/6 |
| 1T4 | 3/6 | 6BR7 | 9/6 | 6L18 | 9/- | 10C1 | 11/6 | 20L1 | 16/- | 185BT | 19/6 |
| 2A3 | 6/6 | 6BW6 | 7/6 | 6L19 | 11/- | 10C2 | 14/6 | 20P1 | 8/9 | 803 | 19/- |
| 2A7 | 9/6 | 6BW7 | 5/6 | 6LD3 | 8/- | 10C14 | 8/- | 20P3 | 12/6 | 807(A) | 5/6 |
| 3A4 | 4/9 | 6BX6 | 4/9 | 6LD12 | 6/9 | 10F1 | 5/9 | 20P4 | 18/- | 808 | 7/6 |
| 3A5 | 9/- | 6C4 | 3/6 | 6LD20 | 7/9 | 10F9 | 10/6 | 20P5 | 15/- | 813 | 55/- |
| 3D6 | 4/6 | 6C5 | 5/6 | 6N7 | 7/6 | 10F18 | 10/- | 25A6G | 8/- | 832 | 14/- |
| 3Q4 | 7/- | 6C6 | 3/9 | 6P1 | 7/6 | 10L14 | 7/- | 25L6G | 6/9 | 866A | 11/6 |
| 3Q5GT | 8/- | 6C9 | 11/- | 6P25 | 8/6 | 10LD3 | 7/9 | 25L6GT | 7/9 | 954 | 2/- |
| 3S4 | 6/- | 6CD6G | 19/6 | 6P28 | 12/6 | 10LD11 | 14/6 | 25Y5G | 8/- | 956 | 2/6 |
| 3V4 | 6/9 | 6CH6 | 7/6 | 6Q7G | 6/- | 10LD12 | 8/- | 25Z4G | 7/- | 1265 | 5/9 |
| 5R4GY | 12/6 | 6D2 | 8/- | 6Q7GT | 8/6 | 10P13 | 11/- | 25Z5 | 8/- | 9001 | 4/- |
| 5T4 | 8/- | 6D3 | 9/6 | 6R7G | 8/6 | 10P14 | 9/- | 25Z6G | 8/- | 9002 | 4/9 |
| 5U4G | 4/9 | 6D6 | 4/3 | 6SA7 | 5/6 | 10P18 | 7/- | 30C1 | 7/- | ATP4 | 2/9 |
| 5V4G | 7/9 | 6F1 | 4/9 | 6SG7 | 4/9 | 12A6 | 1/9 | 30C15 | 11/6 | AZ31 | 8/- |
| 5Y3G | 5/9 | 6F6G | 5/9 | 6SH7 | 3/- | 12AH8 | 9/- | 30F5 | 6/- | AZ41 | 11/- |
| 5Y3GT | 5/9 | 6F12 | 3/- | 6SK7 | 5/- | 12AT6 | 7/6 | 30FL1 | 9/6 | B36 | 7/9 |
| 5Y4G | 11/- | 6F13 | 6/9 | 6SL7GT | 5/9 | 12AT7 | 5/6 | 30L1 | 6/9 | C1C | 9/6 |
| 5Z4 | 11/- | 6F14 | 9/6 | 6SN7GT | 4/6 | 12AU6 | 9/6 | 30L15 | 9/6 | CBL1 | 26/6 |
| 5Z4G | 7/6 | 6F15 | 9/6 | 6SQ7 | 5/9 | 12AU7 | 6/- | 30P4 | 9/6 | CBL31 | 21/- |
| 5Z4GT | 11/- | 6F16 | 8/- | 6SS7 | 3/6 | 12AX6 | 6/6 | 30P12 | 7/6 | CCH35 | 14/- |
| 6/30L2 | 9/- | 6F19 | 6/6 | 6U4GT | 10/6 | 12BA6 | 7/6 | 30P16 | 6/6 | CL33 | 9/6 |
| 6A6 | 4/9 | 6F23 | 6/6 | 6V6G | 5/- | 12BE6 | 7/6 | 30P19 | 17/6 | CY31 | 9/- |
| 6A7 | 10/- | 6F24 | 12/- | 6V6GT | 6/- | 12BH7 | 9/9 | 30PL1 | 9/6 | D77 | 3/6 |
| 6A8G | 8/6 | 6F25 | 13/- | 6X2 | 7/9 | 12C8 | 6/6 | 30PL13 | 13/- | D152 | 5/9 |
| 6A8GT | 13/6 | 6F32 | 6/6 | 6X4 | 5/- | 12E1 | 17/6 | 35L6GT | 8/6 | DA30 | 12/6 |
| 6AB8 | 7/- | 6F33 | 6/6 | 6X5G | 5/- | 12J7GT | 9/- | 35T | 25/- | DAC32 | 9/9 |
| 6AC7 | 8/3 | 6J5 | 4/3 | 6X5GT | 5/6 | 12K7GT | 4/9 | 35W4 | 6/9 | DAF91 | 4/6 |
| 6AG5 | 3/- | 6J5G | 3/- | 6Y6G | 7/6 | 12K8 | 11/- | 35Z4GT | 5/6 | DAF96 | 7/3 |

## FRUSTRATED EXPORT ORDER

Amazing Value, Top Quality, Factory Fresh Standard Superhet, plus Magic Eye Sets of Valves:—

ECH81 EBC81 EZ81 EF89 EL84 EM84 All for ONLY **35/-** Post Free

Satisfaction Guaranteed. This works out at only 5/10 per valve. FM Valve Kits as above plus ECC85 42/- post free.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DET19 | 2/9 | ECC83 | 6/6 | EL91 | 4/- | N78 | 13/- | R19 | 11/- | UCH81 | 8/- |
| DF33 | 9/9 | ECC84 | 8/- | EM80 | 7/9 | N108 | 16/- | SP41 | 2/6 | UCL82 | 9/9 |
| DF91 | 3/6 | ECC85 | 7/9 | EM81 | 8/6 | N152 | 8/6 | SP61 | 2/6 | UCL83 | 13/6 |
| DF96 | 7/3 | ECC89 | 16/- | EM84 | 9/- | P41 | 4/6 | SU25 | 16/- | UF41 | 7/6 |
| DF97 | 8/6 | ECC91 | 4/- | EM85 | 10/- | P61 | 2/9 | SU2150 | 4/6 | UF42 | 5/6 |
| DH63 | 6/- | ECF80 | 8/6 | EN31 | 16/- | PABC80 | | 141 | 7/6 | UF80 | 7/- |
| DH76 | 5/- | ECF82 | 8/6 | EY51 | 7/9 | | 11/6 | TDD4 | 7/6 | UF85 | 7/6 |
| DK32 | 11/- | ECH21 | 12/6 | EY86 | 7/6 | PCC84 | 6/9 | U14 | 8/- | UF86 | 14/6 |
| DK91 | 5/6 | ECH35 | 7/6 | EZ35 | 6/6 | PCC85 | 8/9 | U18 | 8/- | UF89 | 7/- |
| DK92 | 7/- | ECH42 | 8/6 | EZ36 | 6/6 | PCC88 | 14/- | U22 | 6/9 | UL41 | 7/- |
| DK96 | 7/3 | ECH81 | 7/9 | EZ40 | 6/6 | PCC89 | 9/- | U24 | 16/- | UL44 | 11/- |
| DL33 | 8/- | ECH83 | 8/3 | EZ41 | 7/- | PCC189 | 13/6 | U25 | 11/6 | UL46 | 9/9 |
| DL35 | 9/- | ECL80 | 6/- | EZ80 | 6/- | PCF80 | 7/- | U26 | 9/9 | UL84 | 7/- |
| DL65 | 6/- | ECL82 | 9/6 | EZ81 | 6/6 | PCF82 | 7/3 | U31 | 7/- | UM80 | 9/6 |
| DL75 | 6/- | ECL83 | 11/7 | FW4/500 | 8/- | PCF84 | 16/- | U33 | 14/- | URIC | 8/- |
| DL82 | 9/- | ECL86 | 10/6 | FW4/800 | 8/- | PCF86 | 12/6 | U35 | 12/6 | UU6 | 12/6 |
| DL91 | 8/- | EF22 | 7/- | GT1C | 7/- | PCL82 | 7/3 | U37 | 26/- | UU7 | 9/6 |
| DL92 | 6/- | EF36 | 3/3 | GZ32 | 8/9 | PCL83 | 10/6 | U50 | 5/9 | UU8 | 17/- |
| DL94 | 6/9 | EF39 | 4/6 | GZ34 | 12/6 | PCL84 | 7/6 | U52 | 4/9 | UY1N | 11/- |
| DL96 | 7/3 | EF40 | 12/- | HL41DD | | PCL85 | 11/6 | U76 | 5/6 | UY21 | 11/- |
| EABC80 | 6/9 | EF41 | 8/- | | 8/3 | PCL86 | 12/6 | U78 | 5/- | UY41 | 6/- |
| EAC91 | 4/6 | EF42 | 7/6 | HN309 | [illegible] | PEN45 | 8/6 | U191 | 12/6 | UY85 | 6/6 |
| EAF42 | 8/- | EF50-BR | 2/- | HVR2 | 10/6 | PEN46 | 5/- | U281 | 9/6 | VP41 | 5/6 |
| EB41 | 7/- | USA | 3/- | IW4/350 | 7/6 | PL33 | 8/3 | U282 | 15/- | VR105 | 6/9 |
| EB91 | 3/- | EF54 | 3/3 | IW4/500 | 7/6 | PL36 | 9/6 | U301 | 15/- | VR150 | 6/9 |
| EBC33 | 4/9 | EF80 | 4/9 | KLL32 | 8/6 | PL38 | 16/6 | U309 | 6/9 | W61M | 11/- |
| EBC41 | 8/- | EF85 | 6/6 | KT32 | 6/9 | PL81 | 8/6 | U329 | 6/9 | W76 | 4/9 |
| EBC81 | 7/9 | EF86 | 9/- | KT33C | 4/6 | PL82 | 6/6 | U339 | 11/- | W81 | 7/3 |
| EBF80 | 7/9 | EF89 | 6/9 | KT36 | 12/6 | PL83 | 6/6 | U801 | 19/- | X61M | 11/- |
| EBF83 | 9/6 | EF91 | 3/- | KT44 | 7/6 | PL84 | 8/- | UABC80 | 8/- | X63 | 8/6 |
| EBF89 | 3/6 | EF92 | 4/6 | KT45 | 8/6 | PL820 | 8/6 | UAF42 | 7/9 | X65 | 11/- |
| EBL21 | 12/6 | EF96 | 3/- | KT61 | 8/6 | PX4 | 12/6 | UB41 | 7/9 | X66 | 11/- |
| EBL31 | 17/6 | EF183 | 14/- | KT63 | 5/6 | PX25 | 9/6 | UBC41 | 7/9 | X76M | 11/- |
| EC91 | 4/6 | EF184 | 12/- | KT76 | 8/6 | PY31 | 9/- | UBC81 | 9/6 | X78 | 21/- |
| ECC31 | 7/6 | EL32 | 4/6 | KTW61 | 5/6 | PY32 | 10/- | UBF80 | 8/- | X79 | 16/6 |
| ECC32 | 4/- | EL33 | 7/9 | KTW62 | 5/6 | PY80 | 6/9 | UBF89 | 7/6 | X81M | 9/- |
| ECC33 | 4/6 | EL35 | 7/- | KTW63 | 5/9 | PY81 | [illegible] | UBL21 | 14/6 | Y63 | 6/3 |
| ECC34 | 9/- | EL41 | 8/- | KTZ63 | 5/6 | PY82 | 6/- | UCC84 | 14/6 | Z63 | 4/9 |
| ECC35 | 6/- | EL42 | 8/9 | L63 | 2/9 | PY83 | 7/- | UCC85 | 7/- | Z66 | 9/6 |
| ECC40 | 14/- | EL81 | 11/- | LN152 | 7/- | PY88 | 9/9 | UCF80 | 15/- | Z152 | 4/9 |
| ECC81 | 5/6 | EL83 | 11/- | MU14 | 7/6 | PZ30 | 9/6 | UCH21 | 12/- | Z719 | 4/9 |
| ECC82 | 6/- | EL84 | 7/- | N37 | 11/- | R18 | 11/- | UCH42 | 7/3 | ZD152 | 7/9 |

# Tubes

HIGHEST QUALITY— COMPARE OUR PRICES

Carr. & Ins. 12/6

MOST MULLARD, MAZDA, COSSOR, EMITRON, EMISCOPE, BRIMAR, FERRANTI TYPES. PROCESSED IN OUR OWN FACTORY

| GUARANTEED | 6 Months | 12 Months |
|---|---|---|
| 12in. | £2. 0.0 | £3. 5.0 |
| 14in. | £2.10.0 | £3.15.0 |
| 15/17in. | £3. 5.0 | £4.10.0 |
| 21in. | £3.15.0 | £5.15.0 |

**NEW TYPES**
MW 31/74 £4-0-0
MW 36/24 £5-0-0
CRM 172 MW 43/64 £6-0-0

## TUBE SNIPS

Due to huge Bulk Special Purchase we are offering MW 31/74 Tubes at the unrepeatable price of 29/-. MW 36/24 ditto, 39/-. P.P. 12/6. The above are guaranteed for 6 months.

**CO-AX**, standard and low loss, 25 yds., 12/6, 50 yds., 22/6; 100 yds., 42/6. Co-ax Plugs 1/3. Wall outlet boxes 3/6.

**4-SPEED RECORD PLAYERS.** Latest Turntable, together with lightweight Staar Galaxy dual sapphire crystal turnover pick-up head. Amazing value (pick-up only 19/-). £3.10.0. Carr. 3/-.

**P.M. SPEAKERS.** 3 ohm, top makes. Performance guaranteed. 6½in., 8in., 8/-, 5in. 7 x 4in., 11/-.

## 13 CHANNEL T.V.s

**Table Models, Famous Makes. Absolutely Complete.** These sets are unequalled in value due to huge purchase direct from source. They are untested, and not guaranteed to be in working order. Carr. etc., 15/-.

12in. **£2.19.0** 14in. **£4.19.0**

**TRANSISTOR PORTABLES.** Med. and Long. 6 + diode lightweight approx. 1lb., slightly larger than pocket set, but much greater volume, better quality, complete battery, amazing sensitivity worth £11. Our price only £6.19.0.

**F.M. TUNER KITS.** Well-known make. Comprising F.M. Tuning Head, guaranteed none drift. Frequency coverage 88-100 Mc/s. OA81 balanced diode output, Magic Eye Tuning, Two I.F. Stages and discriminate, £6.9.6.

**P.V.C. CONNECTING WIRE.** 100 yds. 30 mil: Special Price 7/6. 200 yds. 30 mil; special price, 12/6. 25ft. Coil, 1/-, 5 Coils different colours, 4/-. Connecting flex. Prices as above.

**TRANSISTORS.** Red spot 3/6 ea. White Spot 4/6 ea. Yellow Spot 2/9 ea. Germanium diodes 9d. ea., 8/- doz.

**TAG STRIPS.** From 3 way to 12 way. Mixed parcels of 25—3/9. The best and cheapest way to buy!

**VALVE HOLDERS.** B7G, 6d. ea., Screened 8d. ea. B9A, 6d. ea., screened 8d. ea.

## 4 watt AMPLIFIERS

Further delivery of these excellent units to hand complete with 6F3 amplifier 20P3 output and UU9 rectifier. Easily converted into high gain unit, complete with good quality, 8in. speaker in attractive two tone bakelite case easily converted for guitars, record players, baby alarms, mic. amplifiers. Carr. Packing, etc. 7/6. **19/-**

**ASSAULT CABLE.** 1,000 yds. Covered Steel Telephone Wire. Ideal for gardening, 9/-. P.P. 4/-.

**TRANSISTOR INTERCOM.** High sensitivity, complete with batteries, usually £9. DISCOUNT PRICE £4.19.0.

## B.B.C./I.T.A. TUNERS

Famous makes complete with PCF80, PCC84 valves, 38 M/c I.F.

Fantastic value **19/-**

**CONDENSERS.** 25 Mixed, Electrolytic, Many popular sizes. List Value £5, Our Price 10/-.

**GET 15.** G.E.C. High Power, Contact cooled, manufacture matched pr Transistor with Push-Pull Input & Output Transformers, with complete 1 watt ampl. circuit. Knock out price 29/-.

**NEW SPEAKER CABINETS,** covered in attractive Rexine, Gold Metal front 11/-. Or complete with 7 x 4 Speaker, 19/-. P.P. 1/6.

**UA20 Autochangers.** Latest B.S.R. 10 mixed records. Brand New. Unrepeatable, £6.19.0. Also UA14. A Proven Choice £7.19.0. P.P. 4/-.

**"GARRARD"** Slimline. Very latest Compact Autochanger. Just released. Amazing value, £8.19.0. Also available, Garrard Model 209, £9.17.6. P.P. 4/-.

**100 RESISTORS 6/6**

**100 CONDENSERS 10/-**

Miniature Ceramic and Silver Mica Condensers 3 pF to 5,000 pF. LIST VALUE OVER £5.

**IVORY/GOLD KNOBS** 1" Diameter, half price 1/2, 5 for 4/6; 1¼" 1/3, 5 for 5/-.

Post: 2 lbs. 2/-, 4 lbs. 2/6, 7 lbs. 3/6, 15 lbs. 4/-, etc. No C.O.D. ALL ITEMS LESS 5% AND POST FREE IN DOZENS. LIST OF 1000 SNIPS, 6d.

# TECHNICAL TRADING CO.

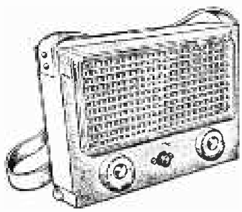
RETAIL SHOP 350-352 FRATTON ROAD, PORTSMOUTH

MAIL ORDER ONLY DEVONIAN COURT, PARK CRESCENT PLACE, BRIGHTON 7, SUSSEX

# SETTING A NEW STANDARD FOR DISCRIMINATING CONSTRUCTORS
# HUNDREDS OF TESTIMONIALS PROVE THE EFFICIENCY OF OUR DESIGNS

## THE SUPER SEVEN EASILY THE BEST

(7 Transistors plus 2 Diodes)



- ★ 2 R.F. STAGES.
- ★ Mullard and Surface Barrier Transistors.
- ★ Coverage of Medium, Long Waves, Trawler Band
- ★ Use as domestic radio, car radio or fit with strap for carry-about.
- ★ No aerial required except for use as car radio.
- ★ 3-inch speaker but will drive a larger speaker.
- ★ 400 milliwatts output stage.

SIZE: 7½ x 5½ x 1½in.

May be built for **£6.9.6** plus 3/6 post, etc.

**PARTS PRICE LIST AND EASY BUILD PLANS 2/-**

## THE EASY-BUILD-7

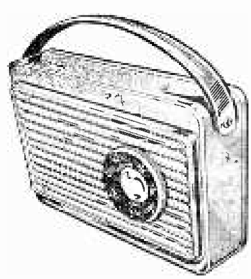
MED/L.W.

Case as Super Seven.

Simple construction for beginners. 7 transistors plus 2 diodes. Performance will amaze you. May be built for ONLY £5.19.6. P.P. 3/6. Parts price list and building plans 2/-.

## NEW TRANSONA-6

(6 Transistors, plus 2 Diodes)
M/L & T. BAND



400 Mw Mullard push-pull output Transistors. Powerful magnet 3in. high grade speaker. Push-pull transformers. This is a top performing receiver. Many stations listed in one evening including Luxembourg loud and clear. A pleasure to listen to. **FERRITE ROD AERIAL.** All parts sold separately, including pale blue gleaming polystyrene case with duo-diffusion grilles in red. Uses 9 volt battery. Sockets for car aerial.

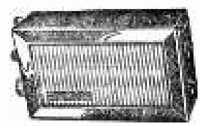
Total building cost **£4.19.6** P.P. 3/-. Size 6½ x 4½ x 1¼in.

*"Agreeably surprised with Trawler Band reception. Luxembourg as loud as local. Your easy build diagram helped a lot . . . my first attempt."—H. S., Penzance, Cornwall (poor reception area).*

**PARTS PRICE LIST AND EASY BUILD PLANS 1/6**

## BEGINNERS POCKET 5

(MW/LW and TRAWLER BAND)
(5 Transistors, plus 2 Diodes)

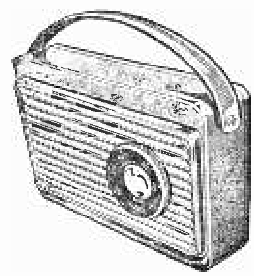


Designed round supersensitive **FERRITE ROD AERIAL** and 3in. moving coil speaker. Attractive case in black with speaker grille in red. On test Home, Light, Radio Luxembourg and many Continental stations were received.

Total cost of all parts **£2.19.6** P.P. 3/-

**EASY BUILD PLANS AND PARTS PRICE LIST 1/6**

## THE MELODY SIX



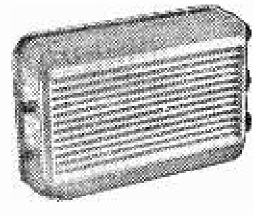
- ★ Ferrite road aerial.
- ★ 6 new type transistors and top quality components. Attractive case in blue and red and carrying strap with gold trim.
- ★ 3in. Speaker.
- ★ M.W/L.W.

**£3.19.6**
P.P. 3/-

Components price list and plans, 2/-.

## BEGINNERS PUSH-PULL FIVE

(5 Transistors, plus Diode)



- ★ M/C Speaker, 2½in.
- ★ Ferrite rod aerial.
- ★ Tuning condenser.
- ★ Volume/oscillator control.
- ★ Case with speaker grille in red.
- ★ Fully tunable over med/long waves.
- ★ Simple assembly diagrams.
- ★ 250 Milliwatts output stage.
- ★ Can be built for **59/6** P.P. 3/-, or with 3in. speaker 68/-
- ★ PARTS PRICE LIST, etc. 2/-.

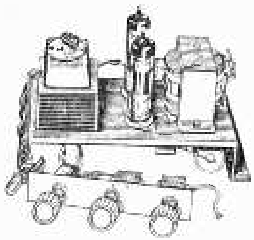
**AFTER SALES SERVICE**

NAME AND ADDRESS
CAPITAL LETTERS PLEASE

# RADIO EXCHANGE COMPANY

27 HARPUR STREET, BEDFORD
(Opposite Co-op)

PHONE 2367 10 a.m. to 1 p.m. SAT



# SPECIAL OFFER!

## 6 Watt Push-Pull Amplifier

2 ECL82 metal rec., separate bass and treble cont. on aux. panel. Made for one of the largest manufacturers of record players. Used in 30 gn. unit. Size 7 x 4in. panel, 6 x 1½in. 3 ohm output, trans. included.

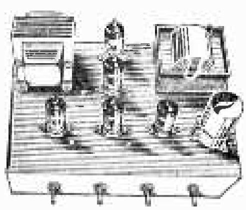
Our Price **£4.9.6** Post 4/-

## TAPE DECKS

**B.S.R. Monardeck**
(Single speed) 3¾in. per sec., simple control, uses 5¾in. spools, **£6.15.0,** plus 5/6 carr. and ins. (Tapes extra.)

**COLLARO STUDIO DECK**
£10.10.0, plus 5/6 carr. and ins. (Tapes extra).

## 10/14 WATT HI-FI AMPLIFIER KIT



A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and announcements to follow each other. Fully shrouded ultra output transformer (to match 3-15 speaker) and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. (Simple instruction booklet 1/6, free with kit).

ONLY **£6.19.6** P. & P. 6/6.

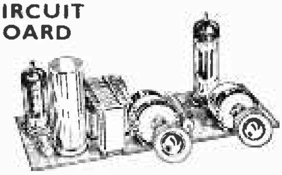
## LOUDSPEAKERS

All 3 ohm impedance.

| | |
|---|---|
| 2½in. | 12/6 |
| 5in. | 12/6 |
| 6½in. | 15/- |
| 12in. | 27/6 |
| Goodmans 5in. tweeter | 10/6 |
| E.M.I. 2½in. tweeter | 10/6 |
| Goodmans 8in. x 5in. middle register speaker | 10/6 |
| E.M.I. 13½in. x 8½in. high flux | 32/6 |
| Rola Celestion, approx. 9in. x 6in., middle register speaker | 10/6 |

P. & P. 1/6 per Speaker.

## AMPLIFIER ON PRINTED CIRCUIT BOARD

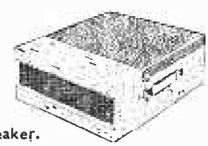


Two valve. UY85, UL84 with O.P. trans., use with 80 volt tap off motor. **39/6.**
Two valve. UY85, UCL82, 3 watts output. O.P. trans., use as above, **49/6.** P.P. 2/6 on above. Dropper res. for filaments if required, **2/6.**

## B.S.R. AUTO UNITS

160 v. Suitable for use with above. (Slightly soiled.) **£5.5.0.** P. & P. 5/-.

## LARGE CABINET



Suitable for above two items. Complete with 3 ohm speaker. **£3.9.6.** Carr. 5/-.

**Superior Cabinet.** Similar to above to take 8 x 5in. speaker, with motor board, will accommodate BSR UA14 or UA16. **£3.9.6.** Carr. 5/6. Speaker 15/- extra. P. & P. 1/6 extra.

## WODEN TRANSFORMERS

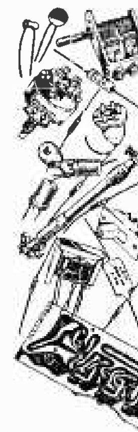
(Ex equip.). 200-240 v. input. Output 12 v. 1 amp., tapped 1, 8 and 10 v. Ideal for model railways and chargers. **8/6,** P.P. 2/-.

**Colvern Wire Wound Potentiometers.** 3in. 10 ohm 1 amp. Suitable for above. 5/-. P. & P. 1/-.

## LARGE WODEN MAINS TRANSFORMER

220/240 v. input. Output 40 v. at 3 amps. tapped 30 and 35 v. H.T. voltages 300 v. 100 mA. tapped 10 v. 150 v., 230 v., 260 v., also 90 v. 100 mA., 350 v., tapped at 200 v. 100 mA. Size 4½ x 5 x 5in. Weight approx. 12 lb. **20/-** each. P. & P. 5/-.

## 6 TRANSISTOR AND DIODE SUPERHET



A first class 2 waveband transistor superhet in kit form. ● Printed circuit panel (size 8½ x 2¾in.) ● 3 pre-aligned. I.F. transformers. ● High-gain Ferrite rod aerial. ● First-grade G.E.C. transistors. ● Car aerial winding. ● Push-pull output. ● All parts down to the minutest item with simple instructions.

ONLY **£4.5.0** P. & P. 2/6

2½in. 35 ohm speaker, **10/6;** 3½in. 35 ohms speaker **16/6;** 35 ohm 5in. P.M. **18/6;** 7 x 4in. 35 ohms speaker **21/-.** P. & P. 1/6 per speaker.

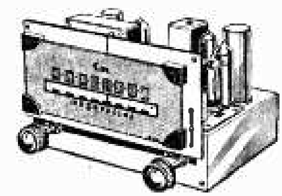
## PORTABLE CABINET

Size approx. 9½ x 6¾ x 3½in. Suitable for above using 3½in. speaker. **25/-.** P. & P. 2/-.

## COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 I.F. transformers, one oscillator coil, one driver transformer and wound Ferrite aerial (med., long and aerial coupling), **28/6** complete, post 1/-. 6 transistor printed circuit, board to match, **8/6,** post 9d. Circuit diagram **1/6** extra.

## HARVERSON'S F.M. TUNER



● F.M. tuning head by famous maker. ● Guaranteed non-drift. ● Permeability tuning. ● Frequency coverage 88-100 mc/s. ● OA81 balanced diode output. ● Two I.F. stages and discriminator. ● Attractive maroon and gold dial (7 x 3in. glass). ● Self powered, using a good quality mains transformer and valve rectifier. ● Valves used ECC85, two EF80s, and EZ80 (rectifier). ● Fully drilled chassis. ● Size of completed tuner 8 x 6 x 5½in. ● All parts sold separately. **£5.19.6,** plus 8/6 P.P. and ins. Circuit diagram and illustrations 1/6 P. free.

**As above** but complete with magic eye, front panel and brackets. **£6.12.6.** P. & P. 8/6.

**As above** but with output stage (ECL82) and tone control. **£7.7.0.** P. & P. 8/6.

**Handsome Metal Cabinets.** Choice of Grey, Black or Green. **17/6** extra.

## TRANSISTORS

All Post Free.

GET15 (Matched Pair), **15/-.** OC71 ...... **5/-**
OC72 ...... **6/-** OC76 ...... **6/-** OC34 ...... **9/-**
PXA101 ..... **6/6** XA103 ...... **6/6** V15/10p ..... **12/6**

Set of Mullard 6 transistors **25/-.** Set of G.E.C. 1,874; 2,873; 3, S1 or GET114 **20/-.**

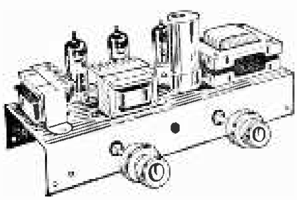
# HARVERSON SURPLUS CO. LTD.

## RECORD PLAYER AMPLIFIER

★ 2 watt output.
★ Ready built with valves and 6½in. speaker, tone and volume controls. Mounted on panel 13 x 7½.

75/-. P. & P. 2/-.

## STEREO AMPLIFIER Bargain Offer



★ 4 watts per channel.
★ Full tone and volume controls.
★ Complete with sockets, etc.

**89/6** P. & P. 2/6.

## QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. This amplifier (which is used in a 29gn. record player) employs ECC83, EL84, EZ80 valves. Bass, treble and volume. On/off controls.

PRICE **69/6** P. & P. 3/6.

DITTO. Mounted on board with output transformer and 6½ in. speaker. Complete at **89/6** P. & P. 4/6.

## 4-SPEED PLAYER UNIT BARGAINS

### SINGLE PLAYERS

Garrard TA Mk. 2, £7.15.0. B.S.R. TU/12, £3.15.0. Carr. 3/6 on each.

### AUTO CHANGERS

B.S.R. UA14, £6.19.6. Latest B.S.R. UA16, £7.19.6. Latest Garrard "Auto-Slim," £7.15.0. Latest Garrard "Auto-Slim" de luxe, £11.9.6.

Carr. 5/- on each.

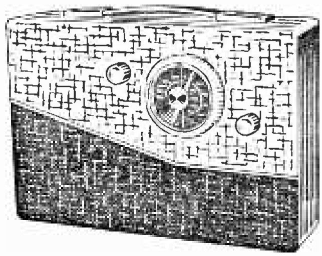
**SEND STAMP FOR OUR SURPLUS VALVE LIST.**

# *Dear Reader . . .*

We are now reorganised in our new premises and offer a RETURN OF POST SERVICE!

## *Order with Confidence!!*

## 6 TRANSISTOR AND TWO DIODES RECEIVER

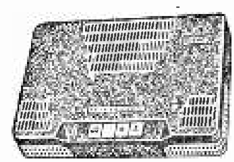


Easy to build, using 6 super transistors and 2 diodes 750 M/W output, full medium and long wave coverage, printed circuit, 5in. speaker, prealigned IFTS & OSC. Very fine tuning, ferrite aerial with car aerial socket, attractive 2-colour cabinet. Simple to follow instructions with circuit, everything complete

**£8.19.6** P. & P. 3/6. Battery 3/6.

## THIS MONTH'S BARGAIN!

**TELEFUNKEN HI-FI STEREO AMPLIFIER LATEST MODEL S82.** 110/250 v. A.C. input. 5 watt undistorted output (10 watts nominal). Size 12 x 9 x 2in. Weight 9 lb. Complete with spec. and instructions.



**£6.19.6** Carr. 5/-.

# SPECIAL OFFERS!

**MIDGET 2 GANG CONDENSERS.** Capacity 195 and 100 PF. Polystyrene case with built in trimmers. Size ¾ x ¾ x ½in. Not used but removed from P/C Boards. 2 for 9/-. Plus 1/- P. & P.

**ACOS CRYSTAL MIKES.** Hi-imp., 18/6. P. & P. 1/6.

**4 MFD MANSBRIDGE PAPER CONDENSERS.** Ideal for Crossover Units. 4/6 each. P. & P. 1/-.

**TRANSISTOR DRIVER and O/P TRANSFORMERS.** (Tapped 3 ohms and 15 ohm o/p), plus 4 suitable Transistors giving approx. 1 watt o/p. 30/-. P. & P. 2/-.

**MAINS TRANSFORMERS**

Tapped Primary. ½ wave or Bridge Rectifier. Secondary 250 v. at 75 m/a 6.3 volts at 2 amps. 7/6 each. P. & P. 3/-.

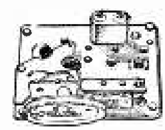
**3 PUSH-BUTTON TRANSISTOR SWITCH.** D.P.—D.T. Each Switch 5/6 plus 1/- P. & P.

**FOR PERSONAL CALLERS ONLY.**

SELECTION OF RADIO-GRAM CABINETS

From £3.3.0 each.

## F.M. TUNER HEAD



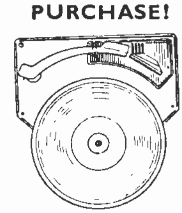
A permeability tuned tuner head by a famous maker, supplied without valve (ECC85) and drum and spindle, 18/6, plus 1/9 P. & P. Valve 8/6 extra. Drum and spindle 3/6 extra.

## E.M.I. 4-speed Player and P.U.

Heavy 8¾in. metal turntable. Low flutter performance 200/250V shaded motor with tap at 80V for amplifier valve filament if required. Turnover LP/78 head.

PRICE 79/6
Plus 4/6 P. & P.

## SPECIAL PURCHASE!



E.M.I. 4-speed. 9 v. battery operated Record Player Unit. Mounted on unit plate. Complete with turnover head and sapphire stylii.

**69/6** P. & P. 3/6.

**WE STOCK GOOD COMPANION AND MARTIN RECORDER KITS.**

# 170, HIGH STREET, MERTON, S.W.19

CHE 3985/6

Open all day Saturday. Early Closing Wed., 1 p.m. A few minutes from South Wimbledon Tube Station.

# BENTLEY ACOUSTIC CORPORATION LTD.

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

**EXPRESS POSTAL SERVICE! ALL ORDERS DESPATCHED SAME DAY AS RECEIVED. FOR ONLY 2/6 EXTRA TELEPHONE FOR THAT URGENT ORDER TO BE DESPATCHED IMMEDIATELY BY OUR SPECIAL C.O.D. SERVICE**

**ANY ORDER INSURED AGAINST DAMAGE IN TRANSIT FOR ONLY 6d. EXTRA.**

| | |
|---|---|
| OA2 | 17/6 |
| OB2 | 17/6 |
| OZ4 | 5/- |
| 1A3 | 3/- |
| 1A5 | 6/- |
| 1A7 | 12/- |
| 1C1 | 6/6 |
| 1C2 | 9/- |
| 1C3 | 8/6 |
| 1C5 | 12/6 |
| 1C6 | 10/6 |
| 1D5 | 13/2 |
| 1D6 | 10/6 |
| 1F1 | 8/6 |
| 1F2 | 3/6 |
| 1F3 | 3/6 |
| 1F7 | 15/- |
| 1FD9 | 6/- |
| 1G5 | 17/6 |
| 1H5 | 10/6 |
| 1L4 | 3/6 |
| 1LA6 | 16/10 |
| 1LD5 | 5/- |
| 1LN5 | 5/- |
| 1N5 | 10/6 |
| 1P1 | 8/6 |
| 1P10 | 7/- |
| 1P11 | 7/6 |
| 1R5 | 6/6 |
| 1S4 | 9/- |
| 1S5 | 6/- |
| 1T2 | 25/11 |
| 1T4 | 3/6 |
| 1U4 | 12/6 |
| 1U5 | 6/- |
| 2A7 | 10/6 |
| 2C26 | 4/- |
| 2D13C | 7/6 |
| 2D21 | 15/- |
| 2P | 25/11 |
| 2X2 | 25/11 |
| 3A4 | 6/- |
| 3A5 | 10/6 |
| 3B7 | 12/6 |
| 3D6 | 5/- |
| 3Q4 | 7/6 |
| 3Q5 | 9/6 |
| 3S4 | 7/- |
| 3V4 | 7/6 |
| 4D1 | 7/6 |
| 5R4GY | 17/6 |
| 5U4G | 6/6 |
| 5V4G | 10/- |
| 5Y3 | 6/6 |
| 5Y4 | 12/6 |
| 5Z3 | 19/5 |
| 5Z4 | 9/- |
| 6/30L2 | 10/- |
| 6A7 | 10/6 |
| 6A8 | 9/- |
| 6AB7 | 8/- |
| 6AC7 | 4/- |
| 6AG5 | 5/6 |
| 6AG7 | 7/6 |
| 6AJ5 | 8/6 |
| 6AK5 | 8/- |
| 6AK6 | 12/6 |
| 6AK8 | 9/- |
| 6AL5 | 4/- |
| 6AM5 | 5/- |
| 6AM6 | 4/6 |
| 6AQ5 | 7/6 |
| 6AR6 | 20/- |
| 6AT6 | 7/- |
| 6AU6 | 10/- |
| 6AV6 | 12/4 |
| 6B7 | 10/6 |
| 6B8 | 5/- |
| 6BA6 | 7/6 |
| 6BE6 | 6/- |
| 6BG6G | 22/6 |
| 6BH6 | 8/- |
| 6BJ6 | 6/- |

| | |
|---|---|
| 6BQ5 | 7/6 |
| 6BQ7A | 15/- |
| 6BR7 | 12/6 |
| 6BR8 | 18/2 |
| 6BS7 | 25/- |
| 6BW6 | 8/6 |
| 6BW7 | 6/- |
| 6BX6 | 6/- |
| 6C4 | 5/- |
| 6C5 | 6/6 |
| 6C6 | 6/6 |
| 6C8 | 12/6 |
| 6C9 | 13/6 |
| 6C10 | 9/6 |
| 6C12 | 13/7 |
| 6CD6G | 35/8 |
| 6CH6 | 9/- |
| 6CW4 | 24/- |
| 6D1 | 2/- |
| 6D3 | 19/5 |
| 6D6 | 6/6 |
| 6D8 | 15/- |
| 6E5 | 12/6 |
| 6F1 | 25/11 |
| 6F5 | 12/6 |
| 6F6G | 7/- |
| 6F6GT | 8/- |
| 6F8 | 12/6 |
| 6F11 | 17/9 |
| 6F12 | 4/6 |
| 6F13 | 11/6 |
| 6F14 | 25/11 |
| 6F15 | 14/11 |
| 6F16 | 9/6 |
| 6F17 | 12/6 |
| 6F18 | 14/11 |
| 6F19 | 6/- |
| 6F23 | 10/6 |
| 6F24 | 12/6 |
| 6F32 | 10/6 |
| 6F33 | 7/6 |
| 6G6 | 6/6 |
| 6H6 | 3/- |
| 6J5G | 5/- |
| 6J5GT | 6/- |
| 6J6 | 5/6 |
| 6J7G | 6/- |
| 6J7GT | 10/6 |
| 6J8 | 12/6 |
| 6K6 | 8/- |
| 6K7G | 5/- |
| 6K7GT | 6/- |
| 6K8G | 6/6 |
| 6K8GT | 10/6 |
| 6K25 | 19/5 |
| 6L1 | 22/8 |
| 6L6G | 8/- |
| 6L6M | 10/6 |
| 6L7GT | 7/0 |
| 6L18 | 13/- |
| 6L19 | 22/8 |
| 6LD3 | 8/6 |
| 6LD13 | 11/8 |
| 6LD20 | 15/7 |
| 6N7GT | 8/- |
| 6P1 | 13/2 |
| 6P25 | 12/6 |
| 6P26 | 19/5 |
| 6P28 | 25/11 |
| 6Q7G | 6/6 |
| 6Q7GT | 11/- |
| 6R7G | 10/- |
| 6R7GT | 11/- |
| 6SA7 | 8/6 |
| 6SC7 | 7/6 |
| 6SG7 | 8/- |
| 6SH7 | 8/- |
| 6SJ7 | 8/- |
| 6SK7 | 6/- |
| 6SL7 | 6/6 |
| 6SN7 | 5/6 |
| 6SQ7 | 9/- |
| 6SR7 | 12/6 |

| | |
|---|---|
| 6SS7 | 8/- |
| 6U4GT | 12/6 |
| 6U5G | 7/6 |
| 6U7G | 8/6 |
| 6V6G | 7/- |
| 6V6GT | 8/6 |
| 6X4 | 5/- |
| 6X5 | 6/- |
| 7B6 | 20/9 |
| 7B7 | 8/6 |
| 7C5 | 8/- |
| 7C6 | 8/- |
| 7H7 | 8/- |
| 7S7 | 9/6 |
| 7Y4 | 7/6 |
| 8D2 | 3/6 |
| 8D3 | 4/6 |
| 9BW6 | 14/11 |
| 9D2 | 4/- |
| 9D7 | 13/7 |
| 10C1 | 13/- |
| 10C2 | 25/11 |
| 10D1 | 7/6 |
| 10D2 | 11/8 |
| 10F1 | 25/11 |
| 10F9 | 11/6 |
| 10F18 | 12/6 |
| 10LD3 | 8/6 |
| 10LD11 | 15/7 |
| 10P13 | 15/- |
| 10P14 | 18/9 |
| 11E1 | 17/6 |
| 11E3 | 15/- |
| 12A6 | 6/- |
| 12A8 | 16/6 |
| 12AC6 | 14/11 |
| 12AD6 | 16/10 |
| 12AE6 | 13/7 |
| 12AH7 | 8/- |
| 12AH8 | 12/6 |
| 12AT6 | 7/0 |
| 12AT7 | 6/- |
| 12AU6 | 22/8 |
| 12AU7 | 6/6 |
| 12AV6 | 12/4 |
| 12AX7 | 7/6 |
| 12BA6 | 8/- |
| 12BE6 | 9/- |
| 12BH7 | 20/9 |
| 12E1 | 30/- |
| 12H6 | 3/- |
| 12J5GT | 4/6 |
| 12J7GT | 9/6 |
| 12K5 | 17/6 |
| 12K7GT | 5/6 |
| 12K8GT | 14/- |
| 12Q7GT | 5/- |
| 12SA7 | 8/6 |
| 12SC7 | 8/6 |
| 12SG7 | 8/6 |
| 12SH7 | 8/6 |
| 12SJ7 | 8/6 |
| 12SK7 | 6/- |
| 12SQ7 | 11/6 |
| 12SR7 | 8/6 |
| 12U5G | 7/6 |
| 12Y4 | 10/6 |
| 14S7 | 27/3 |
| 18 | 23/10 |
| 19 | 10/6 |
| 19AQ5 | 10/6 |
| 19BG6G | 22/8 |
| 19H1 | 10/- |
| 20D1 | 14/11 |
| 20F2 | 25/11 |
| 20L1 | 25/11 |
| 20P1 | 25/11 |
| 20P3 | 22/8 |
| 20P4 | 25/11 |
| 20P5 | 22/8 |
| 25A6 | 10/6 |
| 25L6GT | 11/6 |
| 25U4GT | 16/2 |

| | |
|---|---|
| 25Y5 | 10/6 |
| 25Y5G | 19/5 |
| 25Z4G | 11/6 |
| 25Z5 | 10/6 |
| 25Z6GT | 19/5 |
| 27SU | 19/5 |
| 28D7 | 7/- |
| 30C1 | 8/- |
| 30C15 | 16/2 |
| 30F5 | 6/- |
| 30FL1 | 10/- |
| 30FL12 | 18/2 |
| 30L1 | 8/- |
| 30L15 | 9/- |
| 30P4 | 15/- |
| 30P12 | 7/6 |
| 30P18 | 7/6 |
| 30P19 | 19/5 |
| 30PL1 | 10/6 |
| 30PL13 | 12/6 |
| 35A5 | 20/9 |
| 35L6GT | 9/6 |
| 35W4 | 7/6 |
| 35Z3 | 18/2 |
| 35Z4GT | 6/- |
| 35Z5GT | 9/- |
| 40SUA | 18/2 |
| 41STH | 25/11 |
| 42 | 22/3 |
| 43 | 10/- |
| 50A5 | 21/10 |
| 50C5 | 10/- |
| 50CD6G | 35/7 |
| 50L6GT | 10/- |
| 52KU | 14/4 |
| 53KU | 19/5 |
| 72 | 4/6 |
| 77 | 8/- |
| 78 | 6/6 |
| 80 | 9/- |
| 83 | 15/- |
| 83V | 19/5 |
| 85A1 | 42/- |
| 85A2 | 16/- |
| 90AG | 67/6 |
| 90AV | 67/6 |
| 90CG | 37/6 |
| 90CV | 37/6 |
| 90C1 | 16/- |
| 150B2 | 18/- |
| 150C2 | 17/6 |
| 161 | 10/6 |
| 185BT | 32/4 |
| 185BTA | 32/4 |
| 301 | 10/6 |
| 302 | 10/6 |
| 303 | 10/6 |
| 304 | 10/6 |
| 305 | 10/6 |
| 306 | 10/6 |
| 807 | 7/6 |
| 4033 | 12/6 |
| 4378 | 2/- |
| 5763 | 7/6 |
| 7193 | 5/- |
| 7475 | 7/6 |
| AC042 | 25/11 |
| AC044 | 10/6 |
| AC2PEN | 22/8 |
| AC2PEN/DD | 12/6 |
| AC4PEN | 27/2 |
| AC5PEN | 22/8 |
| AC5PEN/DD | 25/11 |
| AC6PEN | 7/6 |
| AC/PEN(5) | 22/8 |
| AC/PEN(7) | 15/- |

| | |
|---|---|
| AC/SG | 22/8 |
| ACSGVM | 15/- |
| AC/TH1 | 32/4 |
| AC/TP | 32/4 |
| AC/VP2 | 22/8 |
| ATP4 | 5/- |
| AZ1 | 18/2 |
| AZ31 | 10/- |
| AZ41 | 13/7 |
| B36 | 15/- |
| BL63 | 7/6 |
| C1 | 12/6 |
| C1C | 12/6 |
| CBL1 | 27/2 |
| CBL31 | 22/8 |
| CCH35 | 22/8 |
| CK506 | 6/6 |
| CL4 | 23/10 |
| CL33 | 18/9 |
| CV6 | 2/6 |
| CV63 | 10/6 |
| CV271 | 10/6 |
| CY1 | 18/2 |
| CY1C | 18/2 |
| CY31 | 11/- |
| D1 | 3/- |
| D15 | 10/6 |
| D63 | 5/- |
| D77 | 4/- |
| DAC32 | 10/6 |
| DAF91 | 6/- |
| DAF96 | 8/6 |
| DCC90 | 10/6 |
| DD4 | 12/6 |
| DD41 | 13/7 |
| DDT4 | 13/6 |
| DET25 | 7/6 |
| DF33 | 10/6 |
| DF66 | 15/- |
| DF72 | 30/- |
| DF91 | 3/6 |
| DF96 | 8/6 |
| DF97 | 9/- |
| DH30 | 15/6 |
| DH63 | 6/6 |
| DH76 | 5/- |
| DH77 | 7/- |
| DH101 | 27/11 |
| DH107 | 13/7 |
| DK32 | 12/- |
| DK40 | 21/10 |
| DK91 | 6/6 |
| DK92 | 9/- |
| DK96 | 8/6 |
| DL33 | 9/6 |
| DL35 | 12/6 |
| DL63 | 10/- |
| DL66 | 17/6 |
| DL68 | 15/- |
| DL72 | 15/- |
| DL75 | 30/- |
| DL92 | 7/- |
| DL94 | 7/6 |
| DL95 | 7/6 |
| DL96 | 8/6 |
| DL810 | 10/6 |
| DM70 | 7/6 |
| DW4/350 | 8/6 |
| DW4/500 | 8/6 |
| E80F | 30/- |
| E83F | 30/- |
| E1148 | 2/6 |
| EA50 | 2/- |
| EA76 | 9/6 |
| EABC80 | 9/- |
| EAC91 | 4/6 |
| EAF42 | 9/- |
| EB34 | 2/6 |
| EB41 | 8/6 |
| EB91 | 4/- |
| EBC3 | 23/10 |
| EBC33 | 5/- |

| | |
|---|---|
| EBC41 | 8/6 |
| EBC81 | 8/- |
| EBC90 | 7/- |
| EBC91 | 12/4 |
| EBF80 | 9/- |
| EBF83 | 13/7 |
| EBF89 | 9/3 |
| EBL1 | 30/6 |
| EBL21 | 22/8 |
| EBL31 | 22/8 |
| EC31 | 13/7 |
| EC52 | 5/6 |
| EC53 | 12/6 |
| EC54 | 6/- |
| EC70 | 12/6 |
| EC81 | 27/6 |
| EC90 | 7/- |
| EC91 | 10/6 |
| EC92 | 13/- |
| ECC31 | 15/- |
| ECC32 | 5/6 |
| ECC33 | 8/6 |
| ECC34 | 23/11 |
| ECC35 | 8/6 |
| ECC40 | 17/6 |
| ECC81 | 6/- |
| ECC82 | 6/6 |
| ECC83 | 7/6 |
| ECC84 | 9/- |
| ECC85 | 8/6 |
| ECC88 | 18/- |
| ECC91 | 5/6 |
| ECF80 | 10/6 |
| ECF82 | 10/6 |
| ECF86 | 19/5 |
| ECF804 | 25/11 |
| ECH3 | 25/11 |
| ECH21 | 22/8 |
| ECH33 | 22/8 |
| ECH35 | 6/6 |
| ECH42 | 9/6 |
| ECH81 | 9/- |
| ECH83 | 13/7 |
| ECL80 | 9/- |
| ECL82 | 10/6 |
| ECL83 | 18/9 |
| ECL86 | 16/2 |
| EF6 | 22/8 |
| EF9 | 22/8 |
| EF22 | 14/- |
| EF36 | 4/- |
| EF37A | 8/- |
| EF39 | 5/6 |
| EF40 | 15/- |
| EF41 | 9/- |
| EF42 | 10/6 |
| EF50 | |
| Brit. | 5/- |
| Amer. | 7/- |
| EF54 | 5/- |
| EF73 | 10/6 |
| EF80 | 6/- |
| EF83 | 13/6 |
| EF85 | 6/- |
| EF86 | 10/6 |
| EF89 | 9/- |
| EF91 | 4/6 |
| EF92 | 4/6 |
| EF95 | 8/- |
| EF97 | 13/- |
| EF98 | 13/- |
| EF183 | 18/2 |
| EF184 | 12/6 |
| EF804 | 22/8 |
| EK2 | 25/11 |
| EK32 | 8/6 |
| EL3 | 19/6 |
| EL32 | 5/- |
| EL33 | 12/6 |
| EL34 | 15/- |
| EL35 | 10/6 |
| EL37 | 23/11 |

| | |
|---|---|
| EL38 | 25/11 |
| EL41 | 9/- |
| EL42 | 10/6 |
| EL81 | 16/2 |
| EL83 | 19/5 |
| EL84 | 7/6 |
| EL85 | 13/7 |
| EL86 | 16/10 |
| EL91 | 5/- |
| EL95 | 10/6 |
| EL360 | 27/- |
| EL820 | 18/2 |
| EL821 | 25/11 |
| EL822 | 19/6 |
| EM4 | 17/9 |
| EM34 | 9/6 |
| EM35 | 12/- |
| EM71 | 23/10 |
| EM80 | 9/- |
| EM81 | 9/6 |
| EM84 | 10/6 |
| EM85 | 16/10 |
| EN31 | 53/- |
| EN91 | 15/- |
| EY51 | 9/- |
| EY81 | 13/- |
| EY83 | 16/2 |
| EY84 | 14/- |
| EY86 | 9/- |
| EY91 | 7/6 |
| EZ35 | 6/- |
| EZ40 | 7/- |
| EZ41 | 7/- |
| EZ80 | 7/- |
| EZ81 | 7/- |
| EZ90 | 5/- |
| FC4 | 25/11 |
| FC13 | 25/11 |
| FC13C | 25/11 |
| FW4/500 | 8/6 |
| FW4/800 | 8/6 |
| GT1C | 25/- |
| GU50 | 41/6 |
| GZ30 | 9/- |
| GZ32 | 10/- |
| GZ33 | 19/5 |
| GZ34 | 14/- |
| GZ37 | 19/5 |
| H30 | 5/- |
| H63 | 12/6 |
| HABC80 | 13/6 |
| HL2 | 7/6 |
| HL13C | 7/6 |
| HL23 | 14/11 |
| HL23DD | 7/6 |
| HL41 | 12/6 |
| HL133DD | 12/6 |
| HN309 | 23/11 |
| HVR2A | 6/- |
| HVR2 | 20/- |
| IW3 | 10/- |
| IW4/350 | 8/- |
| IW4/500 | 16/2 |
| KBC32 | 20/5 |
| KF35 | 8/6 |
| KL35 | 8/6 |
| KLL32 | 23/11 |
| KT2 | 5/- |
| KT8 | 15/- |
| KT33C | 10/- |
| KT36 | 29/1 |
| KT41 | 22/8 |
| KT44 | 12/6 |
| KT61 | 12/6 |
| KT63 | 7/- |
| KT66 | 15/- |
| KT88 | 43/6 |
| KT101 | 32/4 |
| KTW61 | 6/6 |
| KTW62 | 7/6 |

| | |
|---|---|
| KTW63 | 6/6 |
| L63 | 6/- |
| LP2 | 9/6 |
| ME41 | 16/10 |
| ME91 | 12/6 |
| MH4 | 7/- |
| MHD4 | 12/6 |
| MHL4 | 7/6 |
| MHLD6 | 12/6 |
| ML4 | 8/6 |
| ML6 | 6/6 |
| MS4B | 22/8 |
| MU12/14 | 8/- |
| MX40 | 25/11 |
| N37 | 22/8 |
| N78 | 22/8 |
| N108 | 22/8 |
| N118 | 22/8 |
| N151 | 13/7 |
| N308 | 20/1 |
| N339 | 15/- |
| N369 | 16/10 |
| P61 | 3/6 |
| PABC80 | 13/7 |
| PC95 | 13/- |
| PCC84 | 8/- |
| PCC85 | 9/6 |
| PCC88 | 18/- |
| PCC89 | 9/- |
| PCF80 | 8/- |
| PCF82 | 10/6 |
| PCF84 | 16/2 |
| PCF86 | 9/6 |
| PCL82 | 10/- |
| PCL83 | 10/6 |
| PCL84 | 9/6 |
| PCL85 | 12/6 |
| PCL86 | 16/2 |
| PEN4DD | 25/11 |
| PEN25 | 4/6 |
| PEN40DD | 34/- |
| PEN45 | 19/6 |
| PEN45DD | 25/11 |
| PEN46 | 7/6 |
| PEN383 | 22/8 |
| PEN453DD | 32/4 |
| PENA4 | 22/8 |
| PENB4 | 23/11 |
| PENDD 4020 | 34/- |
| PL33 | 18/9 |
| PL36 | 15/- |
| PL38 | 25/11 |
| PL81 | 10/6 |
| PL82 | 7/6 |
| PL83 | 9/- |
| PL84 | 12/4 |
| PL820 | 18/2 |
| PM84 | 16/10 |
| PT15 | 10/6 |
| PX4 | 10/6 |
| PX25 | 61/2 |
| PY31 | 16/2 |
| PY32 | 13/6 |
| PY80 | 7/6 |
| PY81 | 7/6 |
| PY82 | 7/- |
| PY83 | 8/6 |
| PY88 | 13/- |
| PY800 | 13/- |
| PZ30 | 19/5 |
| QP21 | 7/- |
| QP22B | 12/6 |
| QP25 | 14/6 |
| Q8150/15 | 10/6 |
| R10 | 15/- |

| | |
|---|---|
| R12 | 9/- |
| R16 | 25/11 |
| R17 | 17/6 |
| R18 | 14/- |
| R19 | 19/5 |
| R52 | 12/6 |
| RG1/240A | 54/- |
| RK34 | 7/6 |
| S130 | 22/6 |
| SP4B | 23/10 |
| SP13C | 12/6 |
| SP41 | 3/6 |
| SP42 | 12/6 |
| SP61 | 3/6 |
| SU25 | 27/2 |
| SU61 | 9/- |
| SU2150A | 7/- |
| T41 | 9/- |
| TDD2 | 12/6 |
| TDD4 | 12/6 |
| TH21C | 20/- |
| TH41 | 25/11 |
| TH233 | 34/- |
| TP22 | 15/- |
| TP25 | 15/- |
| TP2620 | 32/4 |
| TY86F | 13/- |
| UABC80 | 9/- |
| UAF42 | 9/6 |
| UB41 | 12/- |
| UBC41 | 8/6 |
| UBC81 | 11/- |
| UBF80 | 9/- |
| UBF89 | 9/6 |
| UBL21 | 22/8 |
| UCC84 | 14/3 |
| UCC85 | 9/- |
| UCF80 | 16/2 |
| UCH21 | 22/8 |
| UCH42 | 9/6 |
| UCH81 | 9/6 |
| UCL82 | 11/6 |
| UCL83 | 18/9 |
| UF41 | 9/- |
| UF42 | 12/6 |
| UF80 | 10/6 |
| UF85 | 9/- |
| UF86 | 13/6 |
| UF89 | 9/- |
| UL41 | 10/6 |
| UL44 | 25/11 |
| UL46 | 14/6 |
| UL84 | 8/6 |
| UM4 | 17/9 |
| UM34 | 16/10 |
| UM80 | 14/11 |
| UR1C | 18/2 |
| UU5 | 8/- |
| UU6 | 19/5 |
| UU7 | 16/2 |
| UU8 | 25/11 |
| UU9 | 7/6 |
| UU10 | 22/8 |
| UU12 | 9/- |
| UY1N | 18/2 |
| UY21 | 16/2 |
| UY41 | 7/6 |
| UY85 | 7/- |
| U12/14 | 8/6 |
| U16 | 10/- |
| U17 | 12/6 |
| U18/20 | 8/6 |
| U19 | 48/6 |
| U21 | 15/- |
| U22 | 8/- |
| U24 | 29/1 |
| U25 | 17/6 |
| U26 | 10/- |
| U31 | 11/6 |
| U33 | 25/11 |
| U35 | 25/11 |

| | |
|---|---|
| U37 | 25/11 |
| U41 | 19/6 |
| U43 | 9/- |
| U45 | 13/6 |
| U47 | 17/6 |
| U50 | 6/6 |
| U52 | 6/6 |
| U54 | 19/5 |
| U76 | 6/- |
| U78 | 5/- |
| U107 | 16/2 |
| U191 | 16/2 |
| U201 | 16/2 |
| U251 | 14/- |
| U281 | 19/5 |
| U282 | 22/- |
| U291 | 11/6 |
| U301 | 22/8 |
| U329 | 14/- |
| U339 | 16/2 |
| U403 | 16/2 |
| U404 | 8/6 |
| U801 | 29/1 |
| U4020 | 18/2 |
| VMP4G | 15/- |
| VMS4B | 15/- |
| VP2 | 12/6 |
| VP2B | 14/6 |
| VP4 | 15/- |
| VP4A | 17/6 |
| VP4B | 22/8 |
| VP13C | 7/- |
| VP23 | 6/6 |
| VP41 | 6/- |
| VP133 | 22/8 |
| VR75 | 17/6 |
| VR105 | 8/- |
| VR150 | 7/6 |
| VT61A | 5/- |
| VT501 | 5/- |
| VU39 | 8/- |
| VU111 | 20/- |
| VU133 | 7/6 |
| W21 | 12/6 |
| W42 | 22/8 |
| W61M | 25/11 |
| W63 | 10/6 |
| W76 | 5/6 |
| W77 | 4/6 |
| W81M | 6/- |
| W101 | 29/1 |
| W107 | 18/2 |
| W729 | 19/5 |
| X14 | 12/- |
| X18 | 9/- |
| X41 | 25/11 |
| X61 | 12/6 |
| X63 | 9/- |
| X64 | 7/6 |
| X65 | 12/6 |
| X66 | 12/6 |
| X76M | 14/- |
| X78 | 22/8 |
| X79 | 22/8 |
| X109 | 16/10 |
| Y63 | 7/6 |
| Y65 | 10/6 |
| Z63 | 7/6 |
| Z66 | 17/6 |
| Z77 | 4/6 |
| Z329 | 18/2 |
| Z719 | 6/- |
| Z729 | 10/6 |
| Z759 | 36/- |

| *Transistors and diodes* | |
|---|---|
| CG64H | 2/6 |
| CG7E | 7/6 |
| GD3 | 4/- |
| GD4 | 4/- |
| GD5 | 4/- |
| GD6 | 4/- |
| GD8 | 4/- |
| GD9 | 4/- |
| GD10 | 4/- |
| GD12 | 4/- |
| GD15 | 10/- |
| GD16 | 4/- |
| GET106 | 14/5 |
| GET111 | 18/- |
| GET114 | 4/8 |
| GET873 | 6/10 |
| GET874 | 6/11 |
| GEX13 | 4/- |
| GEX35 | 4/- |
| GEX36 | 10/- |
| GEX45/1 | 6/6 |
| GEX55/1 | 15/- |
| GEX64 | 11/6 |
| GEX66 | 13/- |
| AF102 | 27/6 |
| AF114 | 11/- |
| AF115 | 10/6 |
| AF116 | 10/- |
| AF117 | 9/6 |
| OA5 | 6/- |
| OA10 | 8/- |
| OA70 | 3/- |
| OA73 | 3/- |
| OA79 | 3/- |
| OA81 | 3/- |
| OA85 | 3/- |
| OA86 | 4/- |
| OA91 | 3/- |
| OA95 | 3/6 |
| OA210 | 9/6 |
| OA211 | 13/6 |
| OC16W | 35/- |
| OC19 | 25/- |
| OC22 | 23/- |
| OC26 | 25/- |
| OC35 | 18/- |
| OC36 | 21/6 |
| OC41 | 9/- |
| OC44 | 9/3 |
| OC44PM | 9/3 |
| OC45 | 9/- |
| OC45PM | 9/- |
| OC65 | 22/6 |
| OC66 | 25/- |
| OC70 | 6/6 |
| OC71 | 6/6 |
| OC72 | 8/- |
| OC73 | 16/- |
| OC75 | 8/- |
| OC76 | 7/- |
| OC78 | 8/- |
| OC81 | 8/- |
| OC81M | 8/- |
| OC82 | 10/- |
| OC83 | 6/- |
| OC84 | 8/6 |
| OC140 | 29/- |
| OC170 | 9/6 |
| OC171 | 10/6 |
| OCP71 | 29/6 |
| PXC101 | 6/6 |
| PXC101A | 6/6 |
| XA103 | 15/- |
| XA104 | 18/- |
| V10/15A | 12/- |
| V30/10P | 28/6 |
| V6/R2 | 9/3 |

**METAL RECTIFIERS.** DRM1B 13/-. DRM2B and DRM3B 15/6. LW7 21/-. LW15 26/-. RMO 7/11. RM1 5/3. RM2 7/6. RM3 7/9. RM4 14/-. RM5 19/6. 14A86 17/6. 14A97 25/-. 14A100 27/-. 14A124 28/-. 14A163 38/-. 14B130 35/-. 14B261 11/6. FC101 17/6. 16RC.1.1.16.1 8/6. FC31 21/-. 16RD.2.2.8.1 12/-. 16RE.2.1.8.1 8/6. 18RA.1.1.8.1 4/6. 18RA.1.2.8.1 11/-. FC116 6/6. FC124 15/-.

**ELECTROLYTICS.** Can types: 32 x 32/450v 5/9. 50 x 50/350v. 7/-. 64 x 120/350v. 8/3. 60 x 250/275v. 9/6. 100 x 400/275v. 12/6. 100/275v. 3/-. 200/275v. 4/-. 100 x 200/275v. 9/6. Tubular types: 8/450v. 1/9. 16/450v. 2/9. 32/450v. 3/9. 8 x 8/450v. 3/-. 16 x 16/450v. 4/-. 32 x 32/350v. 4/-. 8 x 16/450v. 3/9.

**P.M. SPEAKERS.** 3 ohm types: 2½in. 17/-. 5in. 15/6. 6½in. 17/-. 7 x 4in. 15/-. 10in. 27/-. 12in. 29/6. 2½in., 80 ohms, 17/6. 12in. "Auditorium" with latest foam plastic suspension. Handles 15 watts. Aluminium re-entrant dome. 15 ohms. £3.3.?. 12in. "Quality" model, handles 15 watts. 15 ohms. £5.5.0. Post 2/- each.

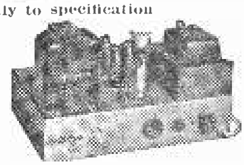
All goods brand new and actually in stock. We do not sell second-hand goods, manufacturers' rejects, or items from dismantled equipment.

Terms of business:—Cash with order or C.O.D. only. Post 6d. per item except where stated. Orders over £3 post free. C.O.D. 2/6 extra. All orders cleared same day. C.O.D. orders by telephone for immediate despatch accepted until 3.30 p.m. We are open for personal shoppers 8.30—5.30 p.m. Sats. 8—1 p.m. Complete list of valves, resistors, condensers, transformers etc. 6d. Please enquire for any item not listed with S.A.E.

# STERN'S MULLARD DESIGNS

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

## MULLARD "5-10" MAIN AMPLIFIER

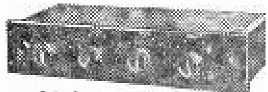


For use with the MULLARD 2-valve pre-amplifier with which undistorted power output of up to 10 watts is obtained. We supply **SPECIFIED COMPONENTS AND NEW MULLARD VALVES**, including **PARMEKO MAINS TRANSFORMER** and choice of the latest Ultra-Linear **PARMEKO** or the **PARTRIDGE** Output Transformer.

COMPLETE KIT OF PARTS (PARMEKO Output Trans.). **£10.0.0**

Alternatively we supply ASSEMBLED and TESTED. **£11.10.0** INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, £1.6.0 EXTRA.

## MULLARD'S PREAMPLIFIER TONE CONTROL UNIT



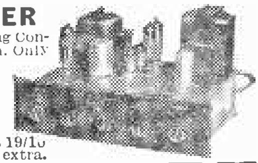
Employing two EF86 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE COMPLETE KIT OF PARTS **£6.6.0** ASSEMBLED AND TESTED **£8.0.0**

Supplied strictly to **MULLARD'S SPECIFICATION** and incorporating:

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

## THE MULLARD "510/RC" AMPLIFIER

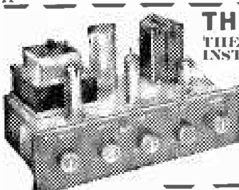


The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Only Specified Components and new **MULLARD VALVES** are supplied including **PARMEKO MAINS TRANSFORMERS** and choice of the latest **PARMEKO** or **PARTRIDGE** ULTRA-Linear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

KIT OF PARTS **£11.10.0** OR ASSEMBLED and TESTED **£13.10.0**

H.P. Dep. £2.6.0, 12 months at 17/0. Dep. £2.14.0 12 months at 19/10
ABOVE incorporating PARTRIDGE OUTPUT TRANS. £1.6.0 extra.

## THE MULLARD "33/RC"

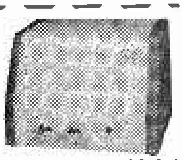


THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT

COMPLETE KIT OF PARTS **£7.10.0** OR ASSEMBLED and TESTED **£8.19.6**

(plus 6/6 carriage and insurance) H.P. Terms: Deposit £2.0.0 and 8 months at £1.0.0. Complete to MULLARD'S SPECIFICATION including Mullard valves and a **PARMEKO OUTPUT TRANSFORMER.**

## STERN'S INTER-COMM BABY ALARM



A small versatile Unit employing the new MULLARD ECL86 valve and designed to provide two (or three) way conversation up to extreme distances. Operates from A.C. mains 200 to 250 Volts.

PRICES . . . MASTER UNIT and ONE EXTENSION

KIT OF PARTS **£6.17.6** ASSEMBLED AND TESTED **£8.8.0**

Consists of a MASTER UNIT, size only 8½ x 5½ x 6in. and ONE EXTENSION (a second extension may be added to any time). The Master Unit incorporates switching and power supply and with the chassis completely isolated from the mains is operated in absolute safety. Cases covered in quality leatherette.

## THE "MONO GRAM" AMPLIFIER

A small Amplifier capable of genuine high quality performance. It incorporates the new Mullard ECL86 Valve, separate BASS and TREBLE CONTROLS and when driven by the standard Crystal Pick Up a power output of 3 watts is achieved without distortion.

PRICE . . READY FOR USE **£4.19.6** carr. & ins. 5/- extra.

The "MONO-GRAM" is ideally suited to incorporate in Portable Record Player and an attractive Portable Case is now under design, this will accommodate the AMPLIFIER with a ROLA 8" x 5", price £1.0.0. and has room for one of the modern PLAYER UNITS. **Constructors Can Build a Really First-Class Record Player, Complete in all respects,** for approx. £14. This will compare with known Record Players currently offered at much higher prices.

## A SPECIAL PURCHASE ENABLES US TO OFFER THE "TUDOR" STEREO AMPLIFIER FOR ONLY £18.18.0

Deposit £4.0.0. 12 months £1.9.4.

A self contained Amplifier designed to provide high quality stereophonic and monophonic reproduction. Each channel provides a rated output of 6 watts and for monophonic operation approx. 12 watts is produced. Separate BASS and TREBLE CONTROLS. DESCRIPTIVE LEAFLET IS AVAILABLE.

## PRICE REDUCTIONS

(a) The KIT OF PARTS to build both the "5-10" Main Amplifier and the 2-valve PRE-AMP CONTROL UNIT H.P. Dep. £3.7.0 and 12 months at £1.2.0 .......... **£15.15.0**

(b) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. £3.16.0 and 12 months of £1.7.8 .......... **£18.18.0**

With Partridge O/put Transformer £1.6.0 extra.

## RECORD PLAYERS

*Each Unit is available with Stereo Cartridge fitted.*

THE NEW GARRARD "AUTO-SLIM" 4-speed Autochanger with Crystal Pick-up .... **£8.10.0**

PHILIPS MODEL AG1016 . . . A 4-speed Player which can be operated both manually and automatically. Suitable for Mono or Stereo operation ........................ **£13.13.0**

GARRARD "AUTO-SLIM DE-LUXE" 4-speed Auto changer incorporates transcription Pick Up Arm .................. **£12.14.6**

COLLARO "JUNIOR" 4 SPEED SINGLE RECORD PLAYER with separate Crystal Pick-up. **£3.15.0** Carriage and Insurance 5/-. Above Pick-up separately for £1.6.6.

The NEW COLLARO C60 4-speed Autochanger unit with Studio "O" Pick-up...... **£7.19.6**

B.S.R. MODEL UA14. A 4-speed mixer Autochanger with Crystal Pick-up .......... **£7.10.0**

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

Carriage and Insurance on each above 5/- extra.

## SPECIAL CASH OFFER

This very attractive **PORTABLE AMPLIFIER CASE** together with a good quality **GRAM AMPLIFIER** and a matched **P.M. SPEAKER** ALL for ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS.

The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Rexine.

WE ALSO SUPPLY SEPARATELY—

(a) The 2-stage (plus Rectifier) **AMPLIFIER** **£4.2.6**
(b) The **PORTABLE CARRYING CASE** **£3.17.6**
(c) 6in. **P.M. SPEAKER** 17/9. Carriage and Insurance 4/- extra.

## MULLARD FOUR CHANNEL MIXER UNIT

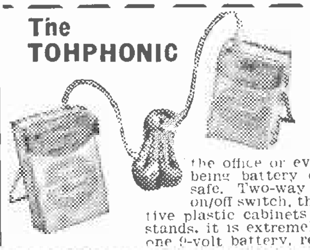
Self powered with Cathode follower output. Incorporates Two inputs for MICROPHONES One for CRYSTAL PICK UP and a fourth for RADIO or TAPE.

Complete Kit of Parts **£8.8.0**
Assembled and Tested **£10.0.0**

TERMS: Deposit £2 and 12 months at 15/-.

Alternatively **MODEL LL.** provides one microphone Input matched for moving coil or Ribbon Mike. £1.17.0 extra.

## The TOHPHONIC



### TRANSISTOR BATTERY OPERATED INTERCOM

**89/6** P. & P. 4/-.

Including PP3 battery and 25 yards lead with plugs. A completely Portable Intercom with 101 uses being ideally suitable for the office or even as a Baby Alarm, since being battery operated, it is completely safe. Two-way calling system and volume on/off switch, the units are housed in attractive plastic cabinets (black/white) with chrome stands, it is extremely economical operating on one 9-volt battery, replacement price being 2/6.

**STERN RADIO** 109, FLEET ST., LONDON, E.C.4. TELEPHONE FLEET ST. 5812-3 **PREMIER RADIO** 23, TOTTENHAM COURT RD., LONDON W.1. TELEPHONE MUSEUM 3451

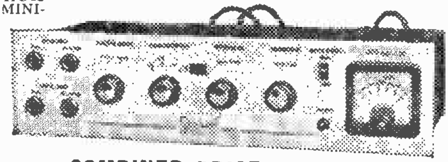
MAIL ORDERS and all POSTAL ENQUIRIES to 7-9 TUDOR PLACE, TOTTENHAM COURT RD., LONDON, W.1. MUSEUM 4128/9

# Stereophonic Sound by Stern's

## THE "STP-1" STEREO TAPE PRE-AMPLIFIER

## DESIGNED TO OPERATE WITH

- BRENELL Mk. V TAPE DECK incorporating similar ½-TRACK MINI-FLUX TAPE HEADS.
- PUSH PULL OSCILLATOR CIRCUIT
- 4-SPEED EQUALISATION
- FERROXCUBE OSCILLATOR TRANSFORMER
- SENSITIVE METER FOR SIGNAL LEVEL
- SEPARATE GAIN CONTROLS IN EACH CHANNEL
- MULLARD VALVES INCORPORATED



COLLARO "STUDIO" TAPE DECK incorporating the latest ½-TRACK REUTER TAPE HEADS.

OVERALL SIZE CASE 13½ x 3in.

FRONT PANEL (choice of Black or White) 14 x 3½in.

PRICES . . . INCLUDES SEPARATE POWER SUPPLY UNITS

Kit of Parts **£22.0.0** Deposit £4.8.0. 12 months of £1.12.3

Assembled and Tested **£28.0.0** Deposit £5.1[illegible].0. 12 Months of £2.1.1.

### COMBINED PRICE SCHEDULE

(a) The BRENELL Mk. V ½-TRACK DECK with the complete KIT to build the STP-1............ **£61.0.0**
Deposit £12.4.0. 12 months of £4.9.6.

(b) The COLLARO "STUDIO" ½-TRACK DECK with the complete KIT to build the STP-1............ **£39.0.0**
Deposit £7.16.0. 12 months of £2.17.3.

(a) The BRENELL Mk. V ½-TRACK DECK with the Assembled STP-1 and matched to the Deck.... **£67.0.0**
Deposit £13.8.0. 12 months of £4.18.3.

(b) The COLLARO "STUDIO" ½-TRACK DECK with the STP-1 Assembled and matched to the Deck.. **£45.0.0**
Deposit £9.0.0. 12 months of £3.6.0.

**STEREOPHONIC RECORD PLAYER UNITS ARE AVAILABLE FROM STOCK**

THE MULLARD "10 + 10" AMPLIFIER (described below) with the "STP-1" PRE-AMPLIFIER and one of the TAPE DECKS provide a complete STEREOPHONIC INSTALLATION. *Details are readily available.*

## MULLARDS "10 PLUS 10" STEREO AMPLIFIER

**A high fidelity design based on the famous Mullard "5-10". Provides up to 10 watts (per channel) Superb reproduction. Frequency response flat to within 3 db from c/s. to 60 Kc/s at 50 Mw. Total Harmonic Distortion at 10 watts 0.1%.**

(a) ASSEMBLED COMPLETE AMPLIFIER, including CONTROL UNIT (as Illustrated)...... **£21.0.0**
Deposit £4.4.0. 12 months at £1.10.10.

(b) A complete KIT of PARTS............... **£18.10.0**
Deposit £3.14.0. 12 months at £1.7.2.

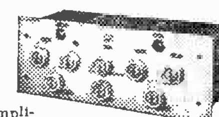
We also supply the assembled MAIN AMPLIFIER only (excludes control unit) for operation with our DUAL CHANNEL PRE-AMPLIFIER, this provides for a more versatile or elaborate installation and would be essential if a low output Magnetic Pick-Up, such as the Decca, is to be used.

(a) THE ASSEMBLED MAIN AMPLIFIER with the ASSEMBLED DUAL CHANNEL PRE-AMPLIFIER ........................................ **£30.0.0**
Deposit £6.0.0. 12 months at £2.4.0.

(b) A complete KIT of PARTS for both Unit...... **£26.0.0**
Deposit £5.4.0. 12 months at £1.18.2.

**Illustrated and Descriptive Brochure available. Please enclose S.A.E.**

## DUAL CHANNEL PRE-AMPLIFIER

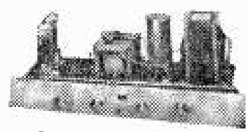


Incorporates two Mullard 2-valve Pre-amplifiers combined into a Single unit enabling it to be used for both **STEREOPHONIC** or **MONAURAL** operation. It is designed primarily to operate with our range of **MULLARD MAIN AMPLIFIERS** but will also operate equally well with any make of Amplifiers requiring an input of 250 m/volts.

COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0**

H.P. £2.10.0 & 12 mths. at 13/4. H.P. £3.0.0 & 12 mths. at £1.[illegible].0

## STEREO "TWIN THREE" AMPLIFIER



**OFFERED ASSEMBLED and TESTED for £7.15.0** (Carr. & Ins., 7/6 extra).

Based on a recent design by MULLARD LTD., the "TWIN THREE" is ideally suited for use in PORTABLE RECORD PLAYERS for which purpose we offer a specially designed Portable Case. It incorporates MULLARD ECL86 valves, separate BASS and TREBLE CONTROLS, and produces excellent reproduction of up to 3 watts per channel. Frequency response is 40 c/s to 30 Kc/s. Size is only 11½ x 3 x 5in.

**To construct a STEREO PORTABLE RECORD PLAYER** *WE OFFER:* The assembled AMPLIFIER with two ROLA 8 x 5in. LOUDSPEAKERS and the PORTABLE CASE for (Carr. & Ins., 10/- extra). Deposit £2.16.0. 12 months of £1.0.6. **£14.0.0**

SUITABLE RECORD PLAYERS are AVAILABLE FROM **£8.14.0**

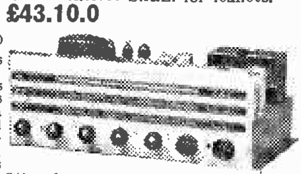
An alternative **"TWIN THREE"** can be supplied for DUAL CHANNEL MONOPHONIC operation producing output of 6 watts. PRICE AS ABOVE.

## ARMSTRONG RADIOGRAM CHASSIS

FULL RANGE IN STOCK. please enclose S.A.E. for leaflets.

### STEREO 12 Mk. 2 £43.10.0

(ILLUSTRATED)



Deposit £8.14.0. 12 months at £3.3.10.

The most complete chassis ever produced, combines AM and FM Tuners, a Stereo Control Unit and two High Fidelity Amplifiers in one compact unit, provide a total of 16 watts for both mono and stereo. Other features include: inputs for tape recording, play back, pick-ups and stereo radio (should this come about); separate wide range bass and treble controls and balance control.

### STEREO 55 £32.15.0

Deposit £6.15.0 12 months at £2.7.8

A junior version of the Stereo 12 Mk. 2 providing ten watts output, five watts from each amplifier and covering the VHF and Medium wavebands.

### JUBILEE Mk.2 £30.12.0

Deposit £6.4.0 12 months at £2.4.9

A Hi-Fi mono chassis giving eight watts push-pull output and covering VHF, medium and long bands. Tape recording and play back inputs.

### AF208 £22.18.0

Deposit £4.18.0 12 months at £1.13.0

An AM/FM chassis providing 5 watts output and covering the full VHF and medium wavebands. Tape recording and playback inputs.

### TVB VHF TUNER £21.18.0

Deposit £4.14.0 12 months at £1.11.7

A self-powered high-fidelity tuner of outstanding design, incorporating features which are normally found only in the most expensive tuners. The full VHF band (87-108 M/cs) is covered and a matching output control enables the output to be varied between 0 and 500 mV.

**"HI-FI" LOUDSPEAKERS** WE HAVE IN STOCK A COMPLETE RANGE BY GOODMANS—WHARFEDALE—W.B. ILLUSTRATED AND PRICE LEAFLETS ON REQUEST.

## "The TUDOR" AM/FM TUNING UNIT

A SELF POWERED HIGH FIDELITY TUNER OF OUTSTANDING DESIGN.

PRICE ONLY **£19.19.0** Deposit £4.0.0 and 12 months at £1.9.4.

Provides full coverage of the VHF/FM band (87-108 Mc/s) and also the LONG and MEDIUM wavebands. Incorporates Multiplex outlet socket for stereophonic purposes (when adopted) and separate controls for tuning the FM and AM bands. Operates perfectly with the STERN-MULLARD AMPLIFIERS and contains matching FRONT PANEL in Black/Gold or White/Black. Also operates equally well with any Amplifier requiring input of 100 to 350 m/Volts.

**STERN RADIO**
**PREMIER RADIO**
**MAIL ORDERS and all POSTAL ENQUIRIES to**

# BUILD A HIGH QUALITY TAPE RECORDER LIKE THIS FOR £35.0.0

CARR. and INS. 10/- extra

**FOR THIS WE SUPPLY......** Deposit £7.0.0 and 12 months at £2.11.4

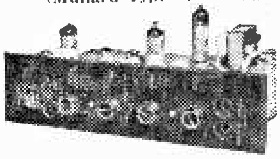
★ Complete Kit of Parts to Build the HF/TR3 Tape Amplifier. ★ The Latest Collaro "Studio" Tape Deck. ★ Portable Carrying Case (as illustrated). ★ Rola/Celestion 10 x 6in. p.m. Loudspeaker. ★ ACOS Crystal Microphone and 1,200ft. Spool E.M.I. Tape.

**ALTERNATIVELY WE SUPPLY THE COMPLETELY ASSEMBLED and GUARANTEED TAPE RECORDER FOR .. .. .. .. .. £39.10.0**

H.P. Terms: Deposit £7.18.0 and 12 months of £2.17.11.

## HF/TR3MKII TAPE AMPLIFIER

(Mullard Type "A" Design)



A very high quality Amplifier incorporating 3-speed treble equalisation, by the latest FEROXCUBE POT CORE INDUCTOR. FOR COLLARO-TRUVOX-BRENELL WEARITE Tape Decks, has GILSEN Output Transformer. Includes separate Power Supply Unit.

KIT OF PARTS **£13.13.0** Deposit £2.15.0 12 months at £1.0.0.

ASSEMBLED and TESTED **£17.0.0** Deposit £3.8.0. 12 months at £1.4.11.

## SPECIAL "COMBINED ORDER" PRICES

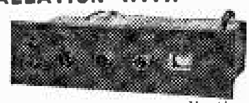
For Constructors with their own cabinet—WE OFFER—

| | | |
|---|---|---|
| (a) | COMPLETE KIT to build the HF/TR3 Amplifier together with the COLLARO "STUDIO" DECK Deposit £5.4.0. 12 monthly payments of £1.18.2 | £26.0.0 |
| (b) | As above but with the HF/TR3 supplied ASSEMBLED and TESTED .................... Deposit £5.18.0. 12 monthly payments of £2.3.4 | £29.10.0 |
| (c) | COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK.... Deposit £8.8.0. 12 monthly payments of £3.1.7. | £42.0.0 |
| (d) | As above but with HF/TR3 supplied ASSEMBLED and TESTED .............................. Deposit £9.2.0. 12 monthly payments of £3.6.9 | £45.10.0 |
| (e) | THE ASSEMBLED AND TESTED HF/TR3 AMPLIFIER with the WEARITE MODEL 4A DECK, incorporates Wearite Head Lift Transformer etc. Deposit £12.12.0. 12 monthly payments of £4.8.9. | £60.10.0 |

*(Carriage and Insurance on each above is 10/- extra.)*

## ADD "HI-FI" TAPE RECORDING TO YOUR EXISTING AUDIO INSTALLATION WITH

**MULLARD TYPE "C" TAPE PRE-AMPLIFIER—ERASE UNIT**



The "Hi-Fi" link to add full tape recording facilities to High Fidelity home installations. Incorporates FEROXCUBE POT CORE PUSH PULL OSCILLATOR and 3-speed treble equalisation by FEROXCUBE POT CORE INDUCTOR FOR WEARITE-COLLARO-TRUVOX OR BRENELL TAPE DECKS. Includes separate power Supply Unit.

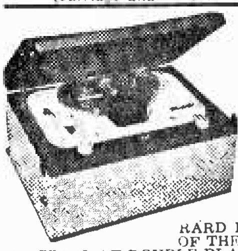
KIT OF PARTS **£14.0.0** Deposit £2.16.0, 12 mths. at £1.0.6

OR ASSEMBLED **£17.0.0** Deposit £3.8.0 12 months at £1.4.11

(Excluding power unit £11.15.0 and £14.10.0 respectively.)

| | | |
|---|---|---|
| (a) | The COLLARO "Studio" Deck with the Model "C" Preamplifier and POWER SUPPLY UNIT ASSEMBLED AND TESTED.................. Deposit £5.18.0. 12 monthly payments of £2.3.3 | £29.10.0 |
| (b) | As above but the TYPE "C" Unit and POWER UNIT supplied as COMPLETE KIT OF PARTS Deposit £5.6.0. 12 monthly payments of £1.18.10 | £26.10.0 |
| (c) | The BRENELL Mk. V Deck with the Model "C" PREAMPLIFIER and POWER UNIT. ASSEMBLED and TESTED ...................... Deposit £9.4.0 and 12 months at £3.7.6 | £46.0.0 |
| (d) | As above but the Model "C" PREAMPLIFIER and POWER UNIT supplied as a COMPLETE KIT OF PARTS .................................. Deposit £8.12.0. 12 monthly payments of £3.3.1 | £43.0.0 |
| (e) | The WEARITE MODEL "4" DECK with ASSEMBLED and TESTED Model "C" PREAMPLIFIER and POWER UNIT incorporating WEARITE HEAD LIFT TRANSFORMER, Etc. Deposit £12.2.0 and 12 months at £4.8.9 | £60.10.0 |

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



## The MODEL HFG/2R PORTABLE TAPE RECORDER

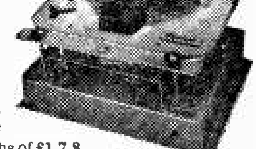
(Original Price £33.0.0)

**FOR ONLY 22 gns.**

Deposit £4.14.0. 12months £1.13.9 Crystal Microphone £1.0.0 extra. *(Carr. and Ins. 10/- extra)*. Incorporates THE LATEST GARRARD "MAGAZINE" TAPE DECK and a HIGH QUALITY AMPLIFIER which is entirely based on the very successful MULLARD TYPE "A" DESIGN and specifically developed to operate the GARRARD DECK. Price INCLUDES SUPPLY OF THE GARRARD TAPE MAGAZINE and 4in. SPOOL OF DOUBLE PLAY TAPE. Comprises a Twin Track Recorder operating at 3¾in/sec. speed and providing up to 1 hour 10 mins. playing time. Truly "Portable", weighs only 22 lbs. Outstanding features are excellent performance and simplicity of operation

## THE 'ADD-A-DECK'

Incorporating **GARRARD TAPE DECK and MODEL HF/G2P PRE-AMPLIFIER**



Supplied on ONE CHASSIS (as illustrated) READY FOR USE **18 Gns.**

(Carr. & Ins. 10/- extra.)

*Price includes Garrard Magazine and a 4 in. Spool Double Play Tape*

H.P. Deposit £3.16.0, and 12 months of £1.7.8. Provides complete tape recording facilities and designed to operate through the pick-up sockets of the standard type of RADIO RECEIVER, or an AMPLIFIER, from which really first class reproduction is obtained. It consists of a Twin Track Deck connected to the Pre-amplifier and operates at 3¾in/sec. speed providing up to 1 hr. 10 mins. playing time.

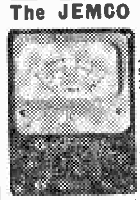
## THE TRUVOX "SERIES 80" TAPE EQUIPMENT

| | | |
|---|---|---|
| **MODEL D82** TAPE DECK | Incorporating **Twin Track Heads.** Deposit £5.5, 12 months of £1.18.6 | £26.5.0 |
| **MODEL D84** TAPE DECK | With **Four Track Heads** and Track Switch for **Mono/Stereo** operation. Deposit £6, 12 months of £2.2.11. | £29.8.0 |
| **MODEL PD82** | Complete Twin Track Mono Recorder-Preamplifier Unit. Deposit £8.8, 12 months of £3.1.7. | £42.0.0 |
| **MODEL PD84** | Complete Four Track Mono Recorder-Preamplifier Unit incorporating outlets for **Stereo** reproduction. Deposit £9.4. 12 months of £3.7.6. | £46.0.0 |

The PD82 and 84 comprise two self-contained units to add full tape facilities to existing sound reproducing installations (Hi-Fi) equipment, radiograms, record reproducers, or good radio receivers

DESCRIPTIVE LEAFLETS READILY AVAILABLE

## The JEMCO MODEL MT-955 MULTIMETER



50,000 ohms per volt — D.C.
5,000 ohms .. .. A.C.

A truly efficient Meter for the amateur or professional man, having features found normally in more expensive Meters. Ranges:

D.C. volts 2.5–10–50–250–1.K
A.C. ,, 2.5–10–50–250–1.K
D.C. Current 100μA–10mA–100mA–500mA 10 amps
Resistance 4 Ranges up to 20 meg.
Add D.B. 0–46 Size 7 x 5¼ x 3in.

PRICE, including Full Test Lead Kit .................... **£12.19.6** 4/- p. & p.

**109, FLEET ST., LONDON, E.C.4.** TELEPHONE FLEET ST., 5812-3
**23, TOTTENHAM COURT RD., LONDON W.1.** TELEPHONE MUSEUM 3451
**7-9 TUDOR PLACE, TOTTENHAM COURT RD., LONDON, W.1.** TELEPHONE MUSEUM 1128/9

## STEREO-MONO CRYSTAL CARTRIDGES AT GREATLY REDUCED PRICES

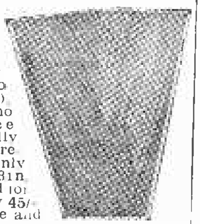
| | |
|---|---|
| RONETTE Model "OV" Output 110m/Volts .............. | 29/6 |
| RONETTE Model "105" Output 250m/Volts .............. | 35/- |
| RONETTE Model "105" with DIAMOND STYLUS........ | 39/6 |
| RONETTE Model "106" Output 500m/Volts .............. | 32/- |
| COLLARO "CERAMIC" Output 50m/Volts ................ | 25/6 |

All above are "TURNOVER" type Cartridges.

## Hi Fi SPEAKERS

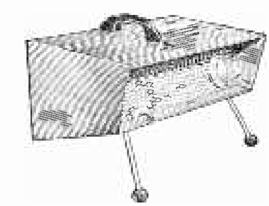
E.M.I. Ceramic magnet 12,000 lines, size 13 x 8in. (roughly equivalent to 12in. round speaker). Handles up to 10 watts. Price 33/6, plus 5/- carriage and insurance. State whether 15 ohm or 3 ohm. Similar model but specially designed and hand made for very low frequencies (40 to 55 cycles), Price £7.10.0.

## Hi-Fi Snip Infinite Wall Baffle



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

## The J.B. Tangential Air Conditioner

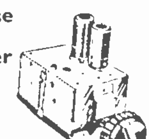


The displacement caused by the new Tangential fan is quite amazing, but what is more amazing is the almost complete absence of noise.

In addition to a fan for moving the air, the unit also contains a heater and control switch, wired such that 500, 1,000 or 2,000 watts of heating may be used.

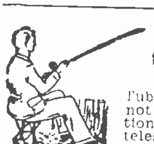
The total building cost of this air-conditioner is £7.10.0, plus 5/- carriage and insurance. The case is very nicely finished in hammered enamel, and when assembled, the unit is indistinguishable from those selling at £12 and more.

## Last of these Brayhead Turret Tuner



Complete with Band 1 and Band 3 coils. New but removed from unused equipment. Less valves 15/- each or with valves 25/- each. Post 2/6 (Knobs 3/6 extra).

## Fishing Rod from Dinghy Mast

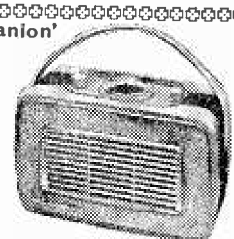


Tubular aluminium not separate sections, extends like telescope from 15ins. to 9ft., 6/6 each.

## Transfilters

These ceramic devices save alignment problems and improve performance. Use instead of I.F. transformer. Complete with circuit, 8/6 each.

## The 'Good Companion' Mk.II using Transfilters



In the 'de-luxe' cabinet as illustrated it costs £10.15.6 to build—but what a set!

Scan these pages; you will find nothing to compare with its specification. It uses transfilters instead of I.F. transformers, has variable feedback as well as all the usual features. A.V.C., push-pull output, Ferrite Aerial, Slow Motion Tuning, etc. etc., and is a very powerful Medium & Long Wave set, conservatively rated at 750mW. Every component used is by a famous maker, such as American Philco MADT R.F. transistors—Mullard A.F. transistors—Jackson Brother's tuning condensers—Rola-Celestion loudspeaker—Dubilier—T.C.C.—Morganite resistors and controls. Also full after sales service available.

**You will definitely be doing the right thing if you buy a Good Companion.**

### *"A jolly fine set but deserving a better case"*

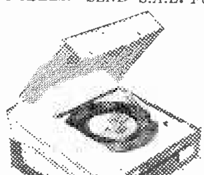
This is a comment which many constructors have voiced and therefore we now offer a De Luxe version of the Pocket Companion. This uses a solid hide case of very pleasant red with gold lettering and our Pocket Companion now has the 15 guinea look.

The most up-to-date Superhet portable of its type, it uses a transfilter in conjunction with Philco R.F. transistors and Mullard output transistors. Complete building costs with plastic case £6.15s. or with solid hide case, £7.15s.

If you have already built and want to change your case, then return the plastic case with a postal order for £1 or if you wish to retain the plastic case then send 26/-, plus 1/6 Post and Ins. for the hide case only.

*AGENTS WANTED TO BUILD OUR COMPANION PORTABLES. SEND S.A.E. FOR FULL DETAILS.*

## Cabinet & Pick-up



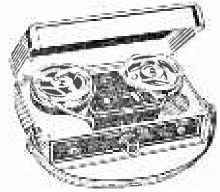
Cabinet for battery record player. Size approx. 9 x 11 x 5in. allows for 7 x 4in. speaker and amplifier. Nicely covered two tone. Must have cost at least £2 to make. New and perfect. Offered whilst stocks last 19/6, plus 4/6 post and insurance.

## ROMANTICA 7


Cheaper than you can possible make it, we offer a completely made up transistor Pocket Superhet. Uses all first made miniature parts and is complete with leather case, earphone and battery. 535-1605 kc/s., sensitivity 300 micro volts/M, output 150 mW, ferrite slab aerial. Size approximately 4½ x 2½ x 1½in. Price £6.19.6. Post and Ins. 3/-.

## Be The Best Dad in the World

What a thrill for your boy to receive a present like this.



Completely transistorised tape recorder with full range of accessories. Suitable for work or play—study or relaxation—office or home—outdoors or indoors. Weight 2½lb. and only 9 x 6 x 3in. (approx.). Supplied as completely wired sub-assemblies; just link these together—only 10 connections to make. Three transistor amplifier with centre switch-forward stop-rewind with microphone input record play-volume control, etc. Complete in most modern carrying case in two-tone and with microphone, reel of tape and spare reel. Nothing else to buy. Order this bargain now as it won't be available for Xmas. **Only £6.19.6.** plus Post and Ins. 5/-. or secure with a small deposit.

## Miniature Circuit Breaker

(Or repairable fuse)

You will have experienced the annoyance of having to repair a fuse especially in the middle of an experiment or repair job. Save yourself this bother by installing a simple circuit breaker. All you have to do then (if you touch the wrong wires together) is to re-set (push in) the circuit breaker. Offered with instructions at 15/- each. (Will save its cost in time and temper in no time).

## Triple Purpose Auto Transformer

Ministry reference 10K/143. This will convert 230 v. to 110 v. or 230 v. to 460 v. Use it also as a filament transformer 230 v. to 6.3 v. 5 amps or 230 v. to 12.6 v. 3 amps. Price 12/6. Post and Packing 2/6.

## Ice-Stat

This is a small thermostat which cuts on and off at around freezing point. Has many uses, one of which could be an ice warning device to be fitted under your motor car. Price 7/6. Post 1/-.

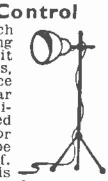
## Gramophone Motor

E.M.I. 4 speed with turntable and pick-up on control board £4.5.0, plus 5/- post & ins. Plinth for mounting same in cupboard or drawer 12/6. Post free if ordered with motor.

## Mains Motor

Intended for vertical mounting so suitable for gramophone or tape recorder. Can also be mounted horizontally when it can be used as a fan for ventilating, the fan blades being fitted directly on to the shaft. Snip price only 15/-, plus 2/6 post and insurance.

## Flood Lamp Control



Our dim and full switch is ideal for controlling photo flood lamps: it gives two lamps in series, two lamps full brilliance and lamps off. Similar control of other appliances can be arranged where used in pair or where circuit can be split exactly in half. Technically the switch is known as a double-pole change over with off. Our price 3/6, plus post and insurance 1/-.

## Limited Quantity Only!

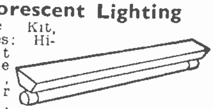
**Waterproof heater wire. 16 yds. length. 70 watts. Self regulating temperature control. 10/-. Post Free.**

## 15 amp. Thermostat

(Sunvic)

Adjustable over a fairly wide range of temperatures but set for 70°F. suitable for wall mounting to control room heaters. Exceptional bargain at 9/6, plus 1/- post and insurance. Crackle finished and calibrated case, suitable for mounting this (only minor adjustment) 5/- extra.

## Fluorescent Lighting



Complete Kit, Comprises: Hi-Craft choke unit, starter lamps, 2 lamp holders, white enamel metal work and 40 watt tube. Special summer price 30/- complete, plus carriage and insurance 6/-. Lots of 12 or more carriage free.

## Zener Diodes

Latest invention for voltage control and stabilisation. Complete with circuit diagram 7/6.

## Yaxley Switches

*All new and unused and in first class condition.*

| | | | |
|---|---|---|---|
| 1 pole, 2 way | 1/6; | 1 pole, 3 way | 1/6 |
| 1 pole, 4 way | 1/9; | 1 pole, 5 way | 2/6 |
| 1 pole, 7 way | 3/-; | 1 pole, 9 way | 3/- |
| 1 pole, 11 way | 3/-; | 1 pole, 12 way | 3/3 |
| 2 pole, 2 way | 2/-; | 2 pole, 4 way | 2/6 |
| 2 pole, 5 way | 3/6; | 2 pole, 6 way | 3/6 |
| 2 pole, 12 way | 5/6; | 3 pole, 3 way | 2/- |
| 3 pole, 6 way | 3/6; | 3 pole, 12 way | 8/6 |
| 4 pole, 2 way | 2/-; | 4 pole, 3 way | 3/- |
| 4 pole, 4 way | 3/6; | 4 pole, 5 way | 4/6 |
| 4 pole, 6 way | 5/6; | 4 pole, 11 way | 10/6 |
| 4 pole, 12 way | 11/6; | 5 pole, 3 way | 3/6 |
| 5 pole, 6 way | 7/-; | 5 pole, 12 way | 14/6 |
| 6 pole, 2 way | 2/6; | 6 pole, 3 way | 3/6 |
| 6 pole, 6 way | 8/6; | 6 pole, 11 way | 16/6 |
| 6 pole, 12 way | 17/6; | 8 pole, 2 way | 3/6 |
| 6 pole, 4 way | 4/6; | 8 pole, 6 way | 11/6 |
| 8 pole, 12 way | 23/6; | 12 pole, 2 way | 3/6 |
| 12 pole, 5 way | 16/6; | 12 way fader | 3/6 |

6 pole, 8 way, shorting 3/6

*Big stocks of most types*
*Special prices for quantities.*

## Battery Charger Bargain

**Components Would Cost More**

Car Battery Charger—ready-made high output battery charger in stove enamelled sheet steel louvred case. New, complete and ready to work. Rated at 12 v. 5 amps. and variable rate selector for trickle charging, also a meter to show charging rate. Suitable for 230/250. A.C. mains. Special snip price of **65/-**, plus 3/6 post and ins.

## Infra-red Heaters

Make up one of these latest type heaters ideal for bathroom, kitchen, bedroom, etc. They are simple to make from our easy to follow instructions—uses silica enclosed elements designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and instructions **15/6**, plus 2/6 post and insurance.

## Convector Heater

Just screw it together. Uses 1250 watt copper clad element which gives off black heat. Will last a life time. Ideal for bedroom, it's so safe. Complete in crackle finished case. **£3.19.6**, easily worth double. Carriage and insurance, 6/6.

## "Starlux 208"

Solderless '3' **TRANSISTOR**. Ideal for home and holidays as no Aerial or Earth required. Enjoy assembling and performance. Our solderless Terminals ensure perfect connections Using first grade Transistors and all parts incl. Earpiece for private listening. Will receive Luxemburg (the station of the stars) and other stations on both Medium and Long waves. Penlight Battery operated. **37/6**. Post and insurance, 2/6.

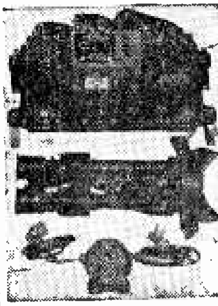
## Suppressor Condenser

Stop your drill or other appliances interfering with your, or your neighbour's, radio or television. Simple instructions given. 1/6 each, 12/- dozen.

## Bargain For Service Engineers

You often come up against the old set that wont be parted with. For these we can offer bargain parcel of rectifiers MU12 replacement and 1D5 replacement. Ex-government of course, six of each for **£1**, post paid.

## THIS MONTH'S SNIP!

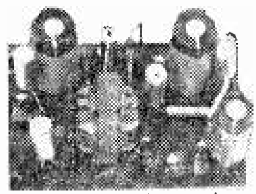


### Tabby Equipment

**With details to make Closed Circuit TV lens system !**

"See in the dark" equipment comprising 5,000 volt power pack which contains ignition coil, vibrator, etc., control unit, interconnecting cables and Infra-red binoculars. Offered for one month only at the give away price of **£3.19.6**, plus 10/- carriage, these are unused, just as received from the Ministry, believed in good working order but sold without guarantee.

## 750mW TRANSISTOR AMPLIFIER



4 transistors including two in push pull—input for crystal or magnetic microphone for pick-up—feed back loops—sensitivity 5 m/v—output 1 watt peak into 35 ohm speaker. Speakers available. Price **52/6**. Postage and insurance 2/6.

## Simmerstat Heater Regulator

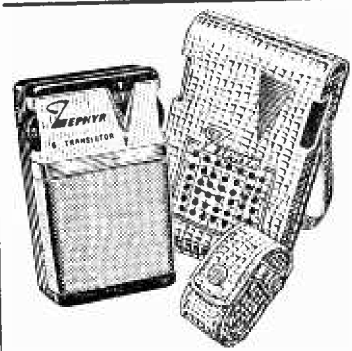
A device for controlling the quantity of heat delivered from an element, boiling ring, heater, soldering iron (anything up to 2,500 watts) Completely adjustable from zero to max. Normally these are 55/- each. Special snip price **15/-** each. Plus 1/6. post and insurance.

## Parcel of Mica Condensers

50 all very useful values. Total list price over **£5**. Yours for **5/-**, plus 1/6.

## Miniature Microphone

American made. Dynamic type, real bargain at **2/6**, plus 6d. postage.




# £1 COMMISSION FOR YOU!

## on every ZEPHYR you Sell!

***Turn spare time into Cash Time—Become a prosperous ZEPHYR selling agent***

The fabulous new contemporary styled ZEPHYR transistor pocket radio is a new concept in precision manufacture.

What a Set! It's packed with latest advancements, gets more stations with more power and what superb tone!

Show your friends . . . let them hold and try it and they will fall over themselves to order, earning you £1 profit again and again . . . that's real easy money.

Selling at **£6.19.6**, the ZEPHYR is a winner—large sales enable us to cut out shop discount and reduce our own profit—FOR YOUR BENEFIT—ACT NOW!

LEATHER CASE—EARPHONE & CASE—BATTERY—PRESENTATION BOX ALL INCLUDED! SECURELY PACKAGED AND SENT BY INSURED POST WITH SIGNED GUARANTEE.

No complicated forms to fill. Just send **£5.19.6.** Plus 3/6 Post & Ins. AND START EARNING **NOW.**

**CUT OUT AND POST TODAY**

I enclose £6.3.0. Please despatch a Zephyr demonstration model, also send me details of tape recorders and other bargains which will earn me £££s, before Xmas.

NAME ______________________________

ADDRESS ______________________________

______________________________

# ELECTRONIC PRECISION EQUIPMENT LTD.

**post orders are dealt with from Eastbourne, so for prompt attention please post your orders to 66 Grove Road, Eastbourne, marked Department 7. Callers may use any one of the Companies below.**

| | | | | |
|---|---|---|---|---|
| **266 London Road, Croydon.** Phone: CRO 6558 Half day Wednesday | **29 Stroud Green Rd., Finsbury Park, N.4.** Phone: ARChway 1049 Half day Thursday | **520 High Street North Manor Park, E.12.** Phone: ILFord 1011 Half day Thursday | **42-46 Windmill Hill, Ruislip, Middx.** Phone: RUIslip 5780 Half day Wednesday | **246 High Street, Harlesden, N.W.10.** Phone: ELGar 4444 Half day Thursday |

**Brand new, individually checked and guaranteed**

# VALVES

AL60 6/-
AR8 5/-
ARDD5 2/-
ARP3 3/-
ARP4 3/6
ARP12 3/-
ARP21 5/6
ARP24 3/6
ARP34 4/-
ARTH2 7/-
ATP4 2/9
ATP7 5/6
AU1 5/-
AU4 5/-
AW3 4/-
AZ31 8/-
BS4A 5/6
BT45 15/-
BT9B 20/-
BT83 22/6
CV54 5/-
CV264 20/-
CV4014 8/-
CV4015 7/-
CV4025 10/-
CV4046 40/-
CY31 7/6
D41 3/3
D77 4/3
DA30 12/6
DAF70 35/-
DAF91 6/-
DAF96 7/6
DD41 4/-
DET5 15/-
DET19 3/6
DET20 2/-
DF39 4/-
DF72 7/6
DF91 4/-
DF96 8/-
DK96 7/3
DL92 6/-
DL94 6/-
DL96 8/-
EA50 1/6
EABC80 7/3
EAC91 3/6
EAC91W 7/6

EB34 1/6
EB91 3/9
EBC33 7/-
EBC41 7/9
EBC90 5/-
EC52 8/-
EC70 10/-
EC90 20/-
EC91 3/-
ECC81 5/6
ECC82 6/6
ECC83 7/-
ECC84 7/-
ECC85 8/-
ECC91 4/-
ECF82 8/6
ECH81 7/9
ECL80 8/-
ECL82 9/-
EF22 7/-
EF36 3/6
EF39 4/-
EF50 2/6
EF54 3/3
EF55 5/-
EF70 4/-
EF73 6/-
EF80 5/6
EF85 6/6
EF86 7/-
EF89 7/9
EF91 3/6
EF92 3/-
EF95 5/-
EL32 3/9
EL33 8/-
EL35 6/-
EL41 8/-
EL42 8/-
EL84 7/-
EL91 4/6
EM80 8/-
EM84 9/-
EN31 15/-
EP37A 7/-
EP71 6/6
EP72 5/-
ESU208 6/-
EY51 8/-

EY86 8/-
EY91 3/6
EZ40 7/-
EZ41 6/9
EZ80 6/-
EZ81 6/9
FW4/500 6/6
G120/1B 9/-
GL450 10/-
GL464A 10/-
GU20/21 40/-
GZ32 9/-
H63 7/-
HL23 6/-
HL23DD 8/-
HVR2 12/6
KRN2A 19/-
KT8 22/6
KT32 8/-
KT33C 4/-
KT44 6/3
KT63 5/-
KT76 10/-
KTW62 7/6
KTW63 6/6
KTZ41 6/-
MH4 3/6
MH41 5/-
ML4 4/-
ML6 6/-
MS/PEN 6/-
NT2 9/-
OB3 7/-
OC3 5/6
OD3 6/-
OZ4 5/-
PCC84 7/-
PCC85 8/-
PCF80 7/-
PCF82 8/-
PCL82 8/6
PCL83 11/-
PCL84 9/-
PEN45 4/6
PEN46 5/-
PEN65 6/6
PEN220A 3/-

PL36 10/6
PL81 9/-
PL82 8/-
PL83 10/-
PT15 10/-
PT25H 7/6
PX4 19/-
PX25 9/-
PY32 12/-
PY80 6/9
PY81 7/-
PY82 8/-
PY83 7/3
PZ1-35 9/-
QP21 6/-
QP25 5/3
QS75/20 6/9
QS95/10 6/9
QV04/7 7/6
R3 8/-
R3/10 4/-
R10 7/6
REL21 25/-
RK34 2/6
RX235 10/-
SP2 4/-
SP13C 4/6
SP41 2/6
SP61 2/-
SU2150A 4/9
T41 7/-
TP25 15/-
TT11 3/-
TT15 25/-
TZ20 16/-
U12/14 8/-
U17 5/-
U18 6/6
U27 8/-
U52 5/-
UCH42 7/6
UBF80 8/6
UL11 5/-
UL12 5/-
UL41 7/-
UL84 7/6
UU9 5/6
UY41 6/-
UY85 6/6
VP23 3/-
VP41 5/6
VR99 8/-
VR105/30 5/6

VR150/30 6/-
VT4C 25/-
VU39 6/-
W31 7/-
X66 8/-
Y63 5/-
Y65 4/-
Y66 8/-
Z31 6/-
1A3 3/-
1A5GT 5/-
1C5GT 7/6
1D8GT 6/-
1E7G 7/6
1G6GT 6/-
1L4 3/6
1LD5 5/-
1R5 6/-
1S4 5/-
1S5 5/9
1T4 4/-
1W4 6/-
2A3 5/-
2A5 6/-
2A6 7/-
2C34 2/6
2C42 25/-
2C46 30/-
2X2 4/-
3A4 5/-
3B7 5/-
3B24 5/-
3E29 (829B) 60/-
3Q4 6/-
3S4 5/-
3V4 6/-
4E27 60/-
5B/254M 30/-
5R4GY 9/-
5T4 9/-
5U4G 5/-
5V4G 8/-
5Y3GT 6/-
5Z4 8/6
5Z4G 8/-
6AB7 4/-
6AC7 3/-
6AG5 3/-
6AG7 6/-
6AJ7 3/-
6AK5 5/-

6AK7 6/-
6AM5 5/-
6AM6 4/-
6AQ5 7/-
6AT6 5/-
6B7 5/6
6B8G 2/6
6BA6 5/6
6C4 2/6
6C5 6/-
6C6G 3/-
6C8G 5/-
6D6 4/-
6F5 5/3
6F6G 4/-
6F7 5/-
6F5GT 5/9
6F8G 5/-
6F12 4/6
6F13 5/-
6F17 5/-
6G6G 2/6
6H6M 1/6
6J5 3/6
6J5G 3/-
6J6 3/6
6J7G 5/-
6K6GT 6/-
6K7G 2/3
6K7GT 4/9
6K8G 5/9
6K8GT 8/3
6K8M 8/6
6L5G 6/-
6L6 9/-
6L6G 6/6
6L7G 4/6
6L34 4/6
6N7G 5/9
6N7GT 6/-
6Q7G 6/-
6R7 6/-
6SC7G 4/6
6SC7GT 5/-
6SG7 5/-
6SH7 3/-
6SJ7GT 5/9
6SJ7Y 6/6
6SK7 5/3
6SL7GT 6/6
6SN7GT 4/6
6SQ7 6/-
6SS7 6/-
6V6G 4/6

6V6GT 5/-
6X4 5/-
6X5GT 5/-
6Y6G 6/-
6Z4 5/6
7B7 7/6
7C6 7/-
7C7 6/6
7H7 7/3
7Q7 7/-
7V7 5/-
7Y4 6/-
7Z4 4/6
8D2 2/6
9D2 3/-
12A6 2/6
12AH7 5/-
12AT7 5/6
12AU6 6/6
12AU7 6/-
12AX7 7/-
12C8 3/-
12E1 22/6
12H6 2/-
12K7GT 4/6
12K8M 7/6
12J5GT 3/6
12Q7GT 4/4
12SA7 7/6
12SC7 4/-
12SG7 4/-
12SH7 3/-
12SJ7 5/-
12SK7 3/6
12SL7 5/9
12SN7 5/9
12SR7 6/-
14L7 7/-
15D2 6/-
20A2 17/6
21B6 9/-
25L6GT 7/9
30 5/-
35L6GT 8/-
35T 17/6
35Z4GT 7/-
37 4/-
38 4/-
58 6/-
59 6/-
75 5/6
76 5/-
77 6/-
78 7/-

80 5/6
81 9/-
82 8/-
83V 9/-
84 8/-
85A1 9/-
85A3 15/-
89 6/-
210VPT 7-pin 2/6
250TH £9
350B 8/-
393A 15/-
705A 15/-
715B 60/-
717A 8/6
801 6/-
803 22/6
804 55/-
805 30/-
807 AMER 6/-
807BR 6/-
808 8/-
810 80/-
813 60/-
815 40/-
816 30/-
829A 30/-
832 15/-
832A 35/-
843 7/4
866 10/-
872 20/-
930 8/-
954 4/-
955 2/6
956 2/-
957 5/-
958A 5/-
1616 3/-
1619 5/-
1625 6/-
1626 4/6
1629 4/6
4043C 13/6
4063 8/-
6064 10/-
6065 8/-
6120 4/-
6516 8/-
7193 1/9
7475 3/-
8013A 25/-

8020 10/-
9001 3/-
9002 5/6
9003 6/-
9004 2/6
9006 2/6

**Cathode Ray Tubes**

ACR1 15/-
ACR11 15/-
CV995 15/-
CV1596 (09J) 55/-
E4103/B4 25/-
3FP7 25/-
5BP1 35/-
5CP1 42/6
5FP7 45/-
5FP7A 25/-
7BP7 40/-
12DP7 60/-
VCRX258 (with scanning coil) 45/-
VCR138 30/-
VCR139A 35/-

**Photo Tubes**

CMG8 9/-
CS16 12/6

**Special Valves**

2J31 45/-
3A/1481 45/-
3J170/E £35
3J192/E £37.10
4J31 £35
4J50 £35
5D21 £3
723A/B 50/-
725A 30/-
726A 27/6
ACT6 160/-
CV193 30/-
CV980 3/-
ESU77 200/-
KR6/3 £4
LS7B 30/-
WL417A 15/-

**AND MANY OTHERS IN STOCK, INCLUDING CATHODE RAY TUBES AND SPECIAL VALVES.** All U.K. Orders below 10/-. 1/- P. & P. 2/6 over 10/-. Orders over £3, P. & P. free. C.O.D. 2/6 extra. Overseas Postage extra at costs.

**BRAND NEW ORIGINAL SPARE PARTS FOR AR88 RECEIVERS.** Please write your requirements.

**MARCONI RECEIVER TYPE CR 100/2** tested and aligned **£32.10.0** Carr. £1.

**TELEPHONE HANDSET.** Standard G.P.O. type. New **12/-**. P. & P. 2/-.

**CONNECTORS FOR TCS RECEIVER, TRANSMITTER AND REMOTE CONTROL,** with original plugs on both ends. New **£1.17.6.** P. & P. 2/6.

**SPECIALLY BUILT POWER PACK** for TCS receivers, 230 volts A.C. mains, including 6XSGT valve. **£3.10.0.** Carr. 5/-.

**R.109 RECEIVER.** Covering 2-8 Mc/s. 6 v. D.C. with set of spare valves and carrier. Brand new in original packing case. **£6.18.0** including delivery in U.K.

**R.109A RECEIVER.** Covering 2-12 Mc/s, **£7.18.0.**

**"CONNECT AND FORGET— CANNOT OVERCHARGE" "ESSTRON" AUTOMATIC BATTERY CHARGER.** Charging rate 4 amps. The charging rate automatically adjusts itself to the charge in the battery. Automatic current and voltage control. Patented application of magnetic amplification to battery charging. Indicator lights show battery fully charged, receiving charge, incorrectly connected or faulty cells. Mains voltage 200/250 v. Built for 6 or 12 v. batteries. Measurements 7 x 5 x 5½in. Weight 8½ lbs. Price **£6.19.6.** P. & P. 3/6.

**TANNOY LOUDSPEAKERS,** 7.5Ω imp., in wooden case. New **19/-**. Carr. 5/-.

**HIGH RESISTANCE HEADPHONES (CHR), 12/6.** P. & P. 2/-.

**LOW RESISTANCE HEADPHONES** (D.L.R.) 8/-. P. & P. 2/-.

**TELESCOPIC MAST.** 34ft. Consisting of 6 sections of steel tubing of such internal and external dia. that the smaller sections may be collapsed with the largest section. Immediate erection. Absolutely complete with brackets, guys, pegs, spikes etc., **£12.10.0.** Carr. **18/-**. As above but 20ft., **£7.10.0.** Carr. 18/-.

**MULTI-TESTER.** 0-6-30-120-600-1,200v. AC/DC. 0-120 μA, 0-300 mA, AC/DC. 0-30,000 Ω, 0-3 MΩ. 10,000 Ω/v. 3½ x 4½ x 1in. Very clear, large scale. Price **£4.10.0.** P. & P. 3/-.

**COMPLETE SET OF STRONG AERIALS RODS** (American). Screw-in type MP49, 50, 51, 52, 53, total length 15ft. 10in. Top dia. 0.185in. Bottom dia. 0.615in., together with matched aerial base. MP37 with ceramic insulator. Ideal for car or roof insulation **£2.10.0.** Post free.

**53 TRANSMITTER SPARES.** Full range. Price list on application.

**DYNAMOTORS DM 21 FOR BC 312 RECEIVER.** Brand New, **£2.10.0.** P. & P. 4/-.

**AERIALS 11ft. long.** 2ft. long when folded, **15/-**. P. & P. 2/-.

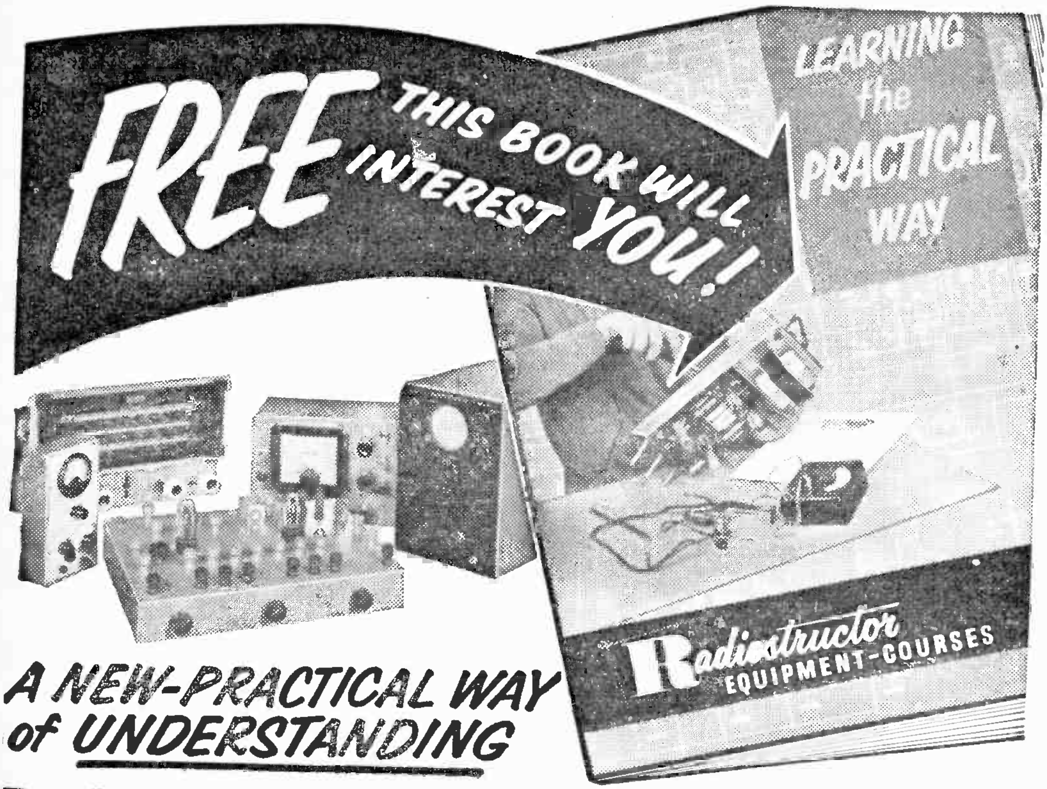
**CRYSTAL CALIBRATORS No. 10.** Frequency range 1.5 to 10 Mc/s. Together with working instructions, lead and spare valves. **£4.10.0.** P. & P. 3/-.

**AMERICAN WIRE RECORDER/REPRODUCER UNIT.** Facilities for recording from Dynamic or Carbon microphone and radio. 1 knob operation for recording, rewinding and erasing. Neon recording lever indicator. Internal speaker. Mains 110 v. Supplied with outer transformer, carbon mike and wire magazine for 1 hour's operation and headphones. Price **£18.0.0.** P. & P. £1. **Spare Wire Magazine 50/-. Dynamic mike and stand £4.**

**R.209 RECEPTION SET.** A 10-valve high-grade Superhet Receiver with facilities for receiving R/T (A.M. or F.M.) and C.W. frequency 1 Mc/s-20 Mc/s. Hermetically sealed. Built on miniature valves and incorporating its own vibrator power supply unit driven by a 6 v. battery (2 point connector included). The set provides for reception from rod, open-wire or dipole aerial with built-in loudspeaker or phone output. Dimensions: Length 12in., width 8in., depth 9in. Weight 23lb. In as new, tested and guaranteed condition, **£23.10.0,** including special headphone and supply leads. Carr. £1.

**CARBON INSET MICROPHONE,** G.P.O. type, **2/6.** P. & P. 1/6.

**P.C. RADIO LTD.**
**170, GOLDHAWK RD., W.12**
**Shepherds Bush 4946**




# Radio · Television · Electronics

*Including: Transistors; VHF/FM; Hi-Fi equipment; Computers; Servo-mechs; Test Instruments; Photo-electrics; Nucleonics, etc.*

## FOR ... Your Career ... Your Own Business ... An Absorbing Hobby

**Radiostructor—an organisation specialising in electronic training systems offers a new self-instructional method using specially designed equipment on a "do-it-yourself" basis.**

**You learn by building actual equipment with the big kits of components which we send you. You advance by simple steps, performing a whole series of interesting and instructive experiments—with no complicated mathematics! Instructional manuals employ the latest techniques for showing the full story of electronics in a practical and interesting way—in fact—you really have fun whilst learning! Post the coupon below, now, for full details.—**

# RADIOSTRUCTOR

## *LEADS THE WORLD*

## IN ELECTRONICS TRAINING

## *POST NOW*

To RADIOSTRUCTOR (Dept. G82)
READING, BERKS.

*Please send brochure, without obligation, to:*

★ *Name* ________________

*Address* ________________

10/62

★ **BLOCK CAPITALS PLEASE**

*(We do not employ representatives)*

# Practical Wireless

Vol. XXXVIII No. 668 OCTOBER, 1962

Editorial and Advertisement Offices:
PRACTICAL WIRELESS
George Newnes, Ltd., Tower House, Southampton Street, W.C.2.



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 - - - - £1.9.0 per annum
Abroad - - - - £1.7.6 per annum
Canada - - - - £1.5.0 per annum

## Contents





# THE RADIO SHOW

THE Radio Show is over for another year, and although for some of us nothing could have equalled the excitement caused by last year's exhibition, when, for the first time, many manufacturers and the broadcasting companies made colour and 625-line television their prime attractions on their stands, at this year's show it was interesting to note the reactions of these same manufacturers and broadcasting companies to the report of the Pilkington Committee and to the subsequent action taken by the Government on certain points in the report.

The G.P.O.'s exhibit—always one of the most interesting in our opinion—featured a communications satellite like "Telstar" and a model of the Goonhilly Downs tracking station.

As usual, the armed services provided very interesting displays of radio and electronic equipment now in use, and the Metropolitan Police disclosed some of its methods of fighting crime with radio aids.

We were pleased once again to meet many of our readers at the PRACTICAL WIRELESS stand and we will try to keep in mind the useful suggestions and constructive criticisms which these meetings brought to light.

## THIS MONTH'S BLUEPRINTS

Included in this issue of P.W. is the first of our new series of free Blueprints, beginning this month with designs for a signal generator and a power amplifier. The "Strand" amplifier—as the latter is called—consists of an amplifier and a power pack built on separate chassis to facilitate their installation in a suitable cabinet.

The Strand gives a virtually distortion-free output of 20W, making it an ideal addition to a hi-fi enthusiast's range of equipment.

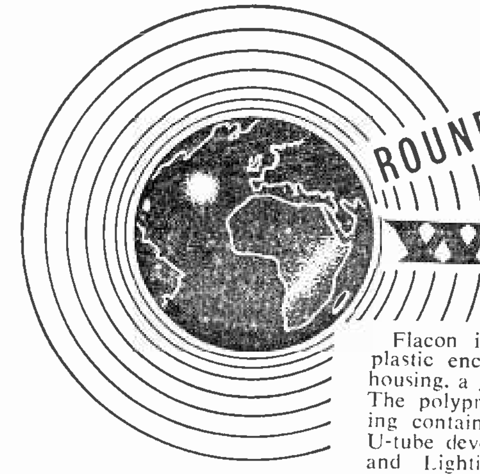
The P.W. Signal Generator is a mains-operated, portable, R.F./A.F. instrument which could be used to advantage by a beginner to radio, to form a basis of a set of home-constructed test equipment.

The November and December issues of PRACTICAL WIRELESS will also contain free double-sided Blueprints, making a total of six new designs for the amateur constructor. Four of the six pieces of equipment are capable of being combined into a single hi-fi system, consisting of a radio tuner, a pre-amplifier, a power amplifier and a loudspeaker enclosure. Of course, each piece of equipment may be built and used separately as the constructor wishes.

## PRACTICAL TELEVISION DATA CHART

In the October issue of our companion journal *Practical Television*, we are giving away free, a Data Chart to be used in connection with a new series of articles starting that month and dealing with the principles and practice of television. The Data Chart contains information of interest to all radio and TV enthusiasts, such as; a complete list of television stations throughout the U.K., tables of decibels and power ratios, and comparisons of television standards, colour codes, designs for attenuators, aerial information, etc., etc.

**Our next issue dated November, will be published on October 5th.**



# ROUND THE WORLD of WIRELESS

## NEWS AT HOME AND ABROAD

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of June, 1962, 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 | 641,456 |
| Home Counties | 593,815 |
| Midland | 429,453 |
| North Eastern | 455,439 |
| North Western | 387,617 |
| South Western | 350,165 |
| Wales and Border Counties | 200,981 |
| Total England and Wales | 3,058,926 |
| Scotland | 328,255 |
| Northern Ireland | 108,653 |
| Grand Total | 3,495,834 |

### *New Miniature Rescue Beacon*

A VALUABLE addition to marine, desert and mountain survival equipment, a miniature distress beacon weighing only 3½lb. and named Flacon, has been introduced by Associated Electrical Industries Ltd. It generates flashes of light so intense that they will attract attention over distances as great as ten miles at night.

Flacon has the advantage over radio survival devices in that it does not demand specialised search equipment. It has been developed primarily as an integral part of equipment for aircraft dinghies and ships' liferafts of the inflatable type.

Flacon is made up of three plastic encased units—the lamp housing, a generator and battery. The polypropathene lamp housing contains a Xenon gas-filled U-tube developed by AEI Lamp and Lighting Company. The generator comprises transistorised multivibrator circuits plus a transformer and charging circuit to provide the high voltage pulse which drives the Xenon tube. The standard battery is a 6V mercury cell type.

### *Radar at Farnborough*

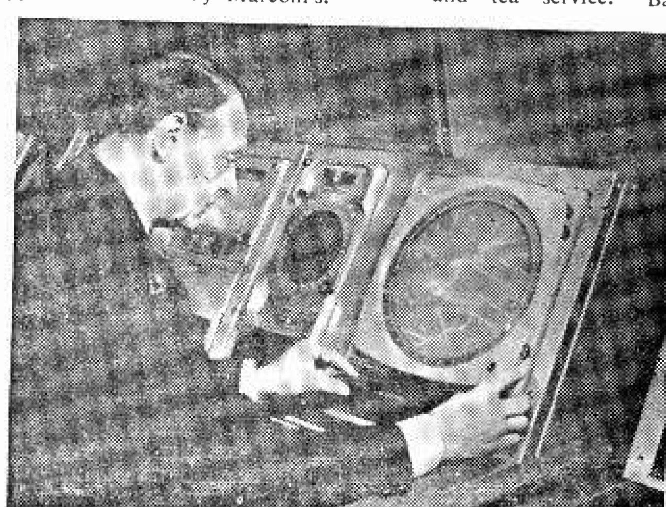
AT this year's SBAC exhibition (the Farnborough air show) Marconi's Wireless Telegraph Co. Ltd. has on show a wide range of airborne radio equipments and navigational aids, the latter including ground station radar displays.

Of particular interest is the new transistorised PPI display type S3001 made by Marconi's. This is on view to the public for the first time at Farnborough. The S3001 displays not only raw radar information but also synthetic echoes, a video map, range marks, IFF and azimuth marks, and direction finding information all on one PPI tube.

### *International Radio Communications Exhibition*

THE Radio Society of Great Britain's Exhibition in future will be called the International Radio Communications Exhibition and will be transferred to the Seymour Hall, Seymour Place, Marble Arch, London, W.1. It will be held earlier this year and for a period of four days from Wednesday, 31st October, to Saturday, 3rd November.

Catering accommodation will be larger with increased seating and tables and improved luncheon and tea service. Bar



*This illustration shows the new Marconi transistorised PPI display type S3001, on view for the first time at the Farnborough air show.*

services will be in separate room and with more accommodation.

A special display of home-built equipment will be shown and, as in other years, silver plaques will be presented for the most outstanding home constructed radio equipment and for a manufacturer's outstanding equipment contribution to the radio world.

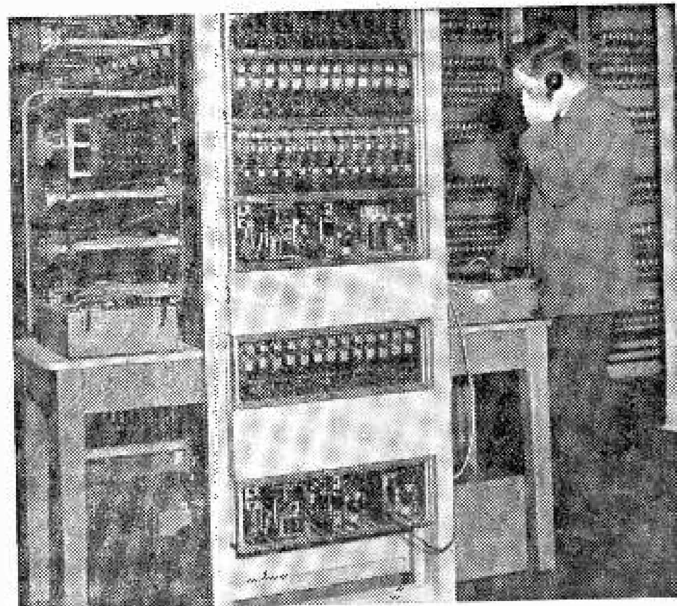
The Armed Services and, it is expected, Government Services, will again show latest developments and offer educational and recruiting services to all visitors.

### *CENTO Delegation Visits Britain*

RECENTLY a party of over 30 senior Naval, Army and Air Force officers from three Central Treaty Organisation countries—Iran, Pakistan and Turkey—visited the Chelmsford works of the Marconi Company as part of a programme arranged for them by the British Government.

In the morning, after a reception by Mr. R. Telford (general manager) and other senior company officials, the party was taken on a tour of the works. In addition to seeing familiar equipments in process of manufacture, three small exhibitions were mounted for inspection by the delegates. These included examples of airborne radio, closed circuit television, and high-power radar transmitter/receivers. A demonstration of naval communication transmission systems was also given.

The party also visited the Marconi Development Laboratories at Writtle, where they saw a mobile high-frequency radio station and a super-high-frequency radio link.



*The terminal equipment in Crayford Telephone Exchange for the "local area carrier" telephony trials conducted by Standard Telephones and Cables Limited, by arrangement with the GPO.*

### *Experimental Telephone System in London*

A SUBSTANTIAL increase in the number of telephone circuits carried by existing and new cables between telephone exchanges should be possible using a new system of "carrier" telephony which has been on test in London and North Kent.

Equipment has been installed at Faraday Building, London; at Crayford telephone exchange in Kent; and at nine points along this cable route to test the performance of the system designed and built by Standard Telephones and Cables Limited.

Subject to the success of these trials the new system could help to provide those extra lines between exchanges needed to cope with the growing use of the telephone. The system is called "local area carrier" and is experimental at present. It uses techniques similar to those used for the past 30 years on long-distance cables.

STC are testing two systems over lines in the Faraday-Crayford cable, which passes through the telephone exchanges at Bermondsey, Tideway, Woolwich and Erith. There are nine repeaters (amplifiers) spaced approximately 4,000yd apart, five repeaters being fed with power over the cable from Crayford and four from Faraday Building.

Whereas each pair of wires in this voice-frequency junction cable is normally capable of carrying only one telephone circuit, in these tests two pairs are being made to carry 12 circuits. A 13th circuit passes the signalling (dialling) signals for the others.

The system, known as SC-12, transmits the carrier and both sidebands of each channel, thus reducing the complication and cost of the multiplexing equipment. In this respect it differs from long-distance coaxial cable systems which transmit one sideband only, suppressing the other sideband and the carrier frequency.

### *Equipment for a New Liner*

THE new 22,000-ton liner, the s.s. Northern Star, of the Shaw Savill Line, has been supplied with telephones, telegraph equipment, salinometers, X-ray apparatus and some of its wiring cables by Associated Electrical Industries Ltd.

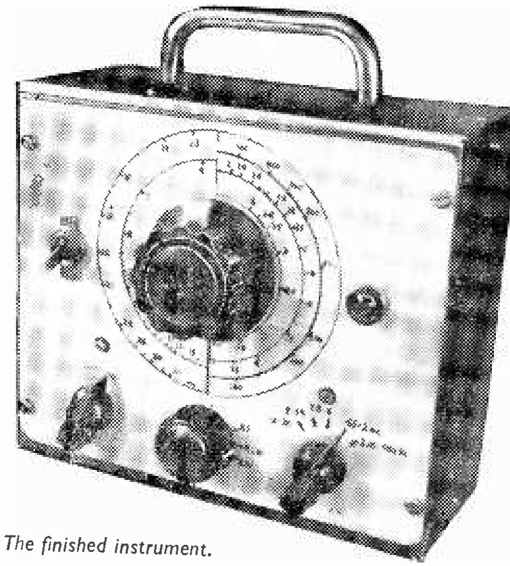
The marine department of AEI Telecommunications Division have fitted the Northern Star with one single-point and two ten-point salinometers to monitor the saline content of the boiler feedwater system, a transistorised telephone system to link the bridge to lifeboat and docking stations, and a complete telegraph installation to transmit docking and steering orders.

Two AEI electric torsionmeters have also been fitted by the British Shipbuilding Research Association and will be used to determine the shaft horsepower transmitted by the ship's propeller shaft.

THE SUBJECT OF ONE SIDE OF THIS MONTH'S FREE BLUEPRINT, AN R.F./A.F. TEST INSTRUMENT.

# The P.W. SIGNAL GENERATOR

By F. G. Rayer.



*The finished instrument.*

THIS signal generator has been designed to fit into a cabinet 6in. x 7in. x 3in., and to use a single double-triode valve, making the circuit quite simple. It covers from 150kc/s to 3Mc/s (2,000 to 10m) in five bands, and can provide a continuous wave or modulated output, as required, over these frequencies. An audio frequency output is also included, for A.F. circuit tests. These features make the signal generator a very useful piece of equipment for aligning, calibrating, testing and trimming all kinds of receiver.

The generator uses A.C. mains for power, and is directly calibrated in frequency. This can be carried out to a standard sufficiently accurate for all practical purposes.

### The Circuit

Fig. 1 on the blueprint shows the circuit, the valve being a 6SL7GT. One triode section acts as an R.F. oscillator, the output being taken from C4 to the potentiometer VR1. For C.W. (continuous wave) output, only this triode operates. Only one coil is included in Fig. 1, the remaining four coils being wired in the same way.

The second triode section acts as an audio oscillator, and an audio signal may be taken from C5. This A.F. output can be used to test all kinds of audio circuits.

The 3-way function switch permits each kind of working, and when this is in the centre "Mod. C.W." position, the continuous wave is modulated by the A.F. oscillator. The purpose of each kind of output is dealt with later.

A small power pack provides current for the generator, this being included so that the equipment is completely self contained.

### Panel and Cabinet

The panel (6in. x 7in. aluminium), with drilling dimensions, is shown in Fig. 3. Clearance holes are drilled for all the control bushes, or may be stamped out with a punch. Four small holes take self-tapping screws to hold the panel to the cabinet, and two more holes take 6B.A. bolts, to secure the small chassis inside.

A piece of thin, smooth white card is cut slightly smaller than the panel, with holes to match. A similar piece of celluloid, thin Perspex, or other transparent material is also prepared, with holes to agree with those in the panel. Tuning calibrations and other markings are made on the card, when the generator has been finished. The transparent material is placed over the card to protect it from unwanted marks.

The box or cabinet consists of universal chassis sides (available from Home Radio Ltd., 187 London Road, Mitcham, Surrey), held together with 4B.A. bolts. Two members 7in. x 3in. form the top and bottom of the cabinet, and two 6in. x 3in. pieces are used as sides. A further member 6in. x 3in. acts as a chassis, for the valve-holder, coils and A.F. transformer. A second 6in. x 7in. plate, held with self-tapping screws, forms the back.

The back, top, bottom and one of the sides are left off until construction is otherwise finished.

### Power Pack Section

This is built completely on one 6in. x 3in. side, as in Fig. 3. A converter or tuner mains transformer, with an output of 220V at 20mA is adequate, as the actual H.T. consumption is less than 5mA. The valve heater and indicator lamp require 6·3V at 0·6A, and so a 1A secondary serves well. The circuit will work satisfactorily with an H.T. line voltage of 150V or even less, so a 220V H.T. secondary is by no means essential. If the voltage should be higher, it can easily be reduced by increasing the value of R3 or R5, so almost any transformer to hand may be used.

The rectifier is rated at 250V 540mA and is contact-cooled. Rectifiers of other rating may, of course, be used to suit the actual current and transformer voltage. R6 merely keeps the peak current to a safe limit.

The actual values used for C8 and C9 are of little importance, and may be from 2$\mu$F to 32$\mu$F. A small 8$\mu$F+8$\mu$F condenser is convenient. Mains leads pass through a grommet in this side of the case, and the switch is fitted to the panel. The fuse holder, with 250mA or other low-rating fuse, is bolted to the chassis.

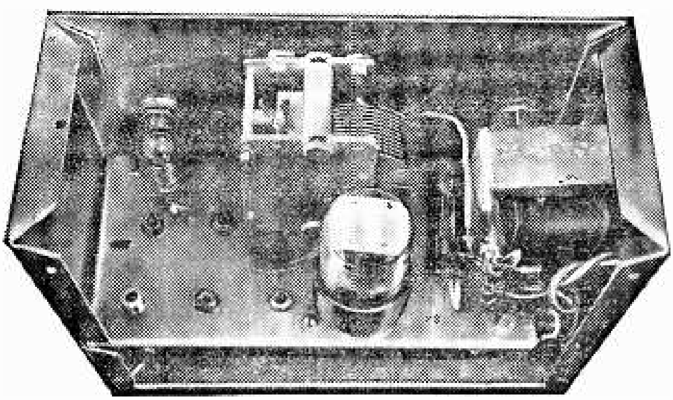
### *R.F. and A.F. Section*

Coils, valveholders and the A.F. transformer are fitted to the 6in. x 3in. chassis, as in Fig. 2. This chassis, and the power pack, are secured to the panel, and all wiring may then be completed, and the generator can be tested, before adding the other side, or top, bottom and back.

Almost any small A.F. transformer will be satisfactory for the audio oscillator. The primary is wired from C6 to chassis, and the secondary from triode grid (pin 1) to chassis. A check for audio oscillation is made by connecting headphones, or a loudspeaker with output transformer, to the output socket and chassis. If no oscillation is heard with the function switch in the A.F. position, the leads to the primary of the A.F. transformer should be reversed.

A transformer with a centre-tapped winding may be used, the tap being taken to chassis. A small valve receiver output transformer can thus be used, or even a transistor type of output transformer. The unrequired winding (secondary) is then left disconnected. The note will probably be satisfactory, but, if it is too high in pitch, it can be lowered by wiring a capacitor across either the primary or the secondary. The pitch may be raised by wiring a resistor across the secondary.

The audio oscillator section can be tested by itself, R3 and the coils, etc., being omitted. A modulated R.F. signal will not be produced if the A.F. circuit is not oscillating.



*An above-chassis view.*

C4 is a low-value capacitor, made by twisting insulated wires together for about ½in. The capacity required is very small, but not in any way critical.

### *Band-switch and Coils*

The switch is a 2-pole 6-way component, with one position not used. A lead is taken from the fixed plates of the tuning condenser, to the switch and C2 and R1, as in Fig. 2. This point is switched to A, B, C, D, or E, thereby bringing in the grid, or tuned windings, of the coils. A short lead from L1 (13-30Mc/s) coil, passes to the chassis.

Condenser C3 is switched to F, G, H, I or J, bringing in the coupling windings of the coils. Switching here is very straight forward, but if any difficulty is experienced, the simplest solution is to wire up one coil only, and test the generator. The other coils may then be added one by one.

For the three H.F. ranges, standard superhet oscillator coils are used. A medium-wave coil is used for L4, and a long-wave coil for L5; M.W. and L.W. oscillator coils cannot be used for L4 and L5, because the actual frequency coverage of an oscillator coil is higher than that of the signal frequency coil with which it is employed. However, M.W. and L.W. coils with reaction windings, or H.F. and R.F. coils, with coupling windings of suitable dimensions, will be suitable. If no oscillation is obtained with any particular coil, connections to the feedback winding on it should be reversed.

The actual ranges obtained were as follows:

L1: 10-23m or 30-13Mc/s.
L2: 21-75m or 14-4Mc/s.
L3: 75-170m or 4-1·8Mc/s.
L4: 150-550m or 2-0·55Mc/s (2,000-550kc/s)
L5: 600-2,000m or 500-150kc/s.

L1 and L2 are nearest the switch, as in Fig. 2, and wiring to these coils should be short. The range coverage can be adjusted, to obtain suitable overlap, by means of the coil cores, but these must be sealed, or left untouched, after calibration.

The 1,000pF 1,000V condenser in series with the output socket isolates the equipment from any high voltage circuit to which the prod may be applied.

A check can be made to see that band coverage is suitable, and that the whole unit works correctly, before adding the sides and the back. A transparent cursor about 4in. long, scribed with a line, is cemented to the tuning control knob.

### *A.F. Output*

This is obtained with the function switch at A.F. and the signal strength is controlled by the attenuator VR1. To test an amplifier, or the audio section of a receiver, the test prod is applied to various A.F. circuit points in turn. Commence at the loudspeaker or loudspeaker transformer, moving from there to the output valve anode, then to the output valve grid, then to the grid coupling condenser, and so on, introducing one lead or component at a time. If a fault is present, reproduction will cease, or almost disappear, when the fault is passed. As extra stages of amplification are brought in, the attenuator must be turned back, to keep volume down.

Mains, battery and transistor sets can be rapidly checked in this way, and a faulty stage can often be located in a few moments. A few such tests with a receiver or amplifier in good condition will soon show what to expect.

### *Mod. C.W. Output*

With the function switch in the "Mod. C.W." position, a radio frequency signal is produced, the frequency of the signal depending on the band selected, and position of the tuning control. The

PRESENTED FREE
WITH
"PRACTICAL WIRELESS"
OCTOBER 1962

# The P.W. SIGNAL GENERATOR

PUBLISHED BY GEO. NEWNES LTD., TOWER HOUSE, SOUTHAMPTON STREET, LONDON W.C.2.

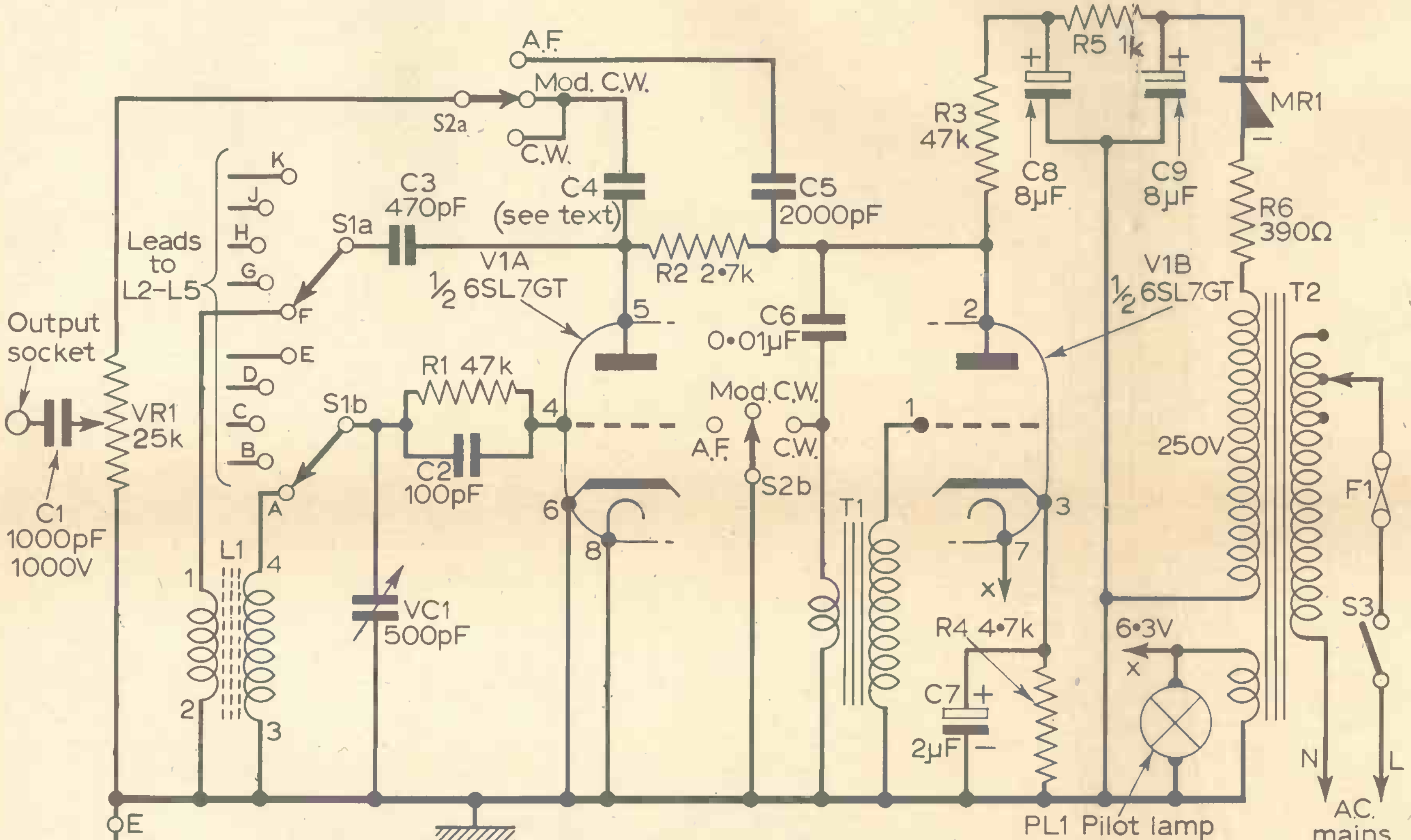


Fig. 1 – The circuit diagram.

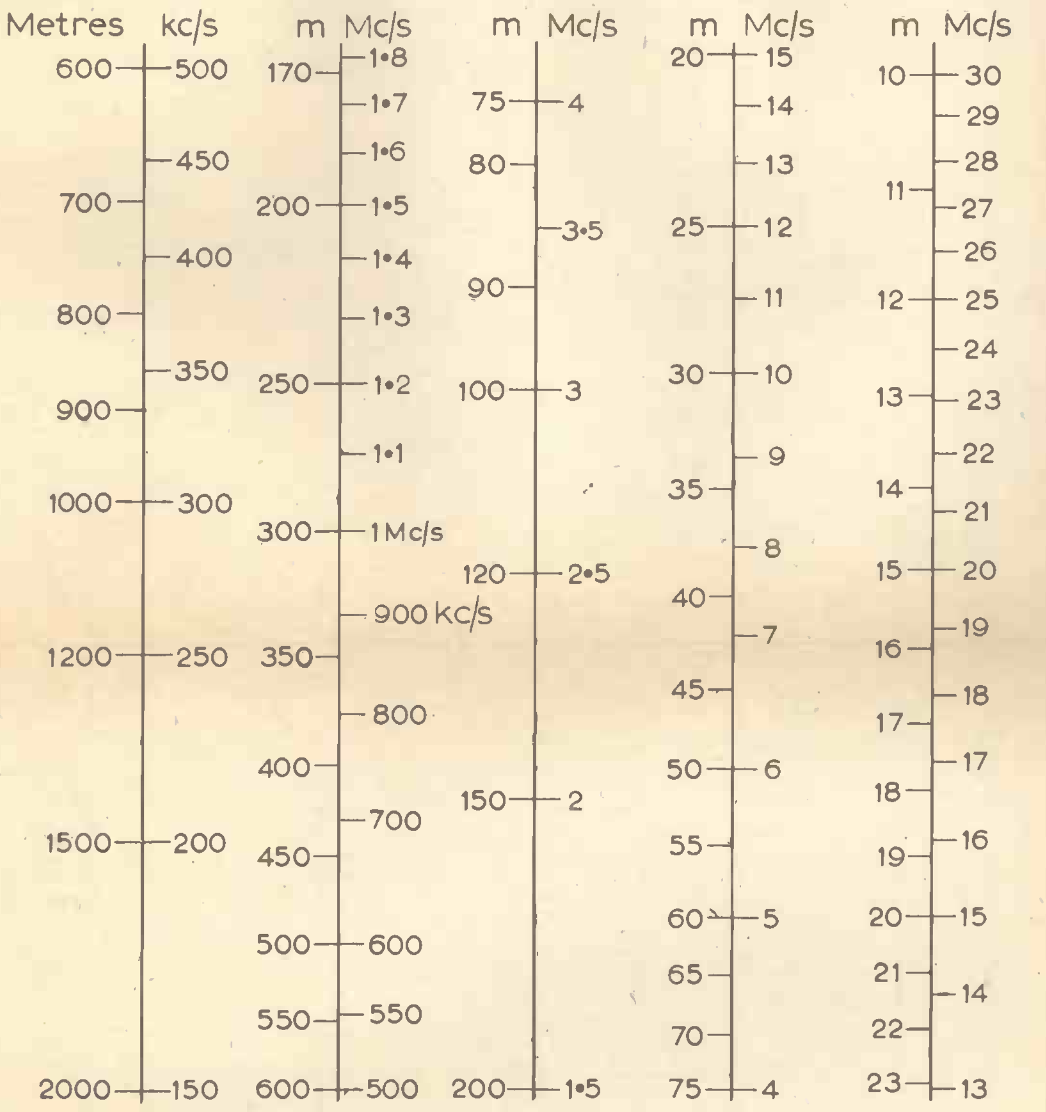
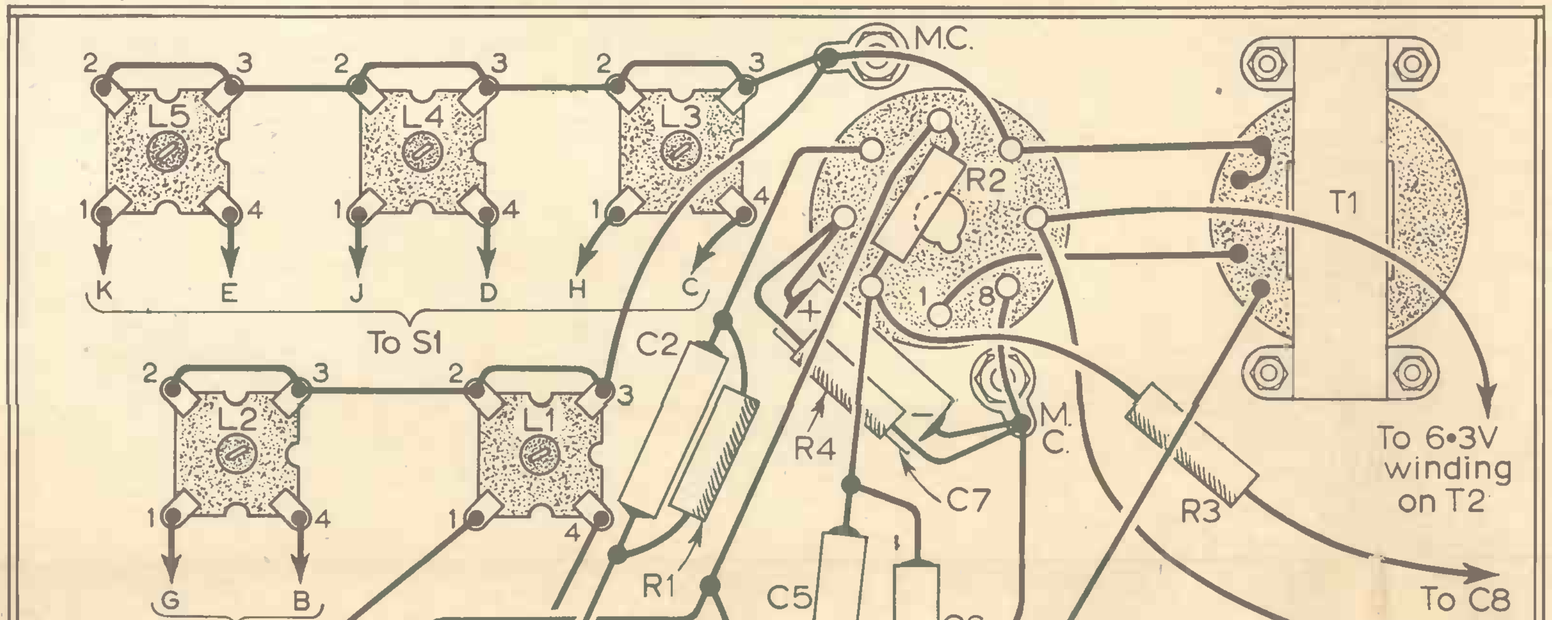
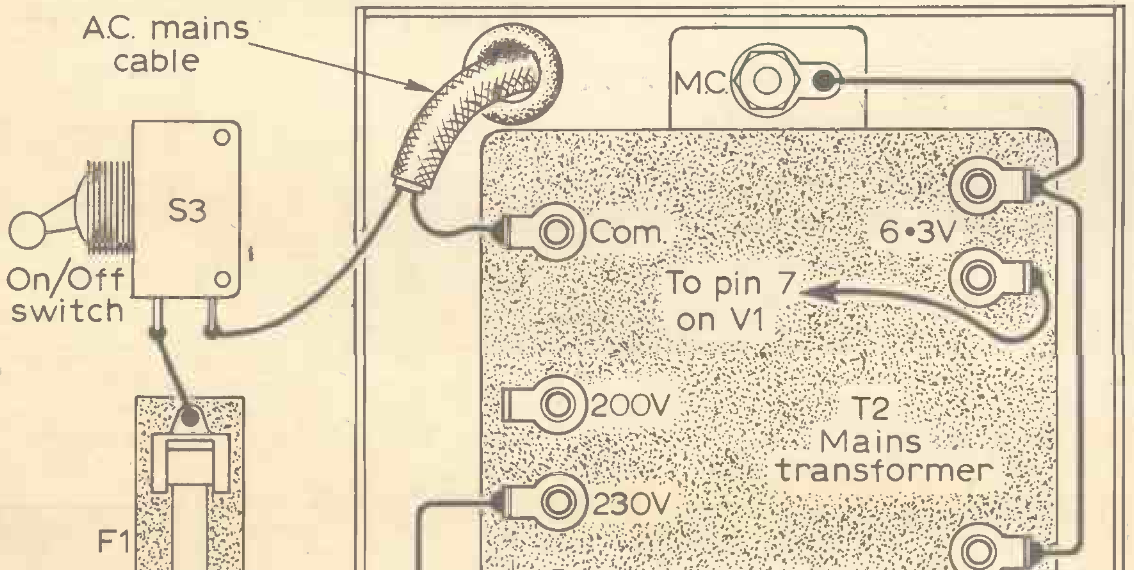


Fig. 4 – Wavelength – Frequency conversion scales.



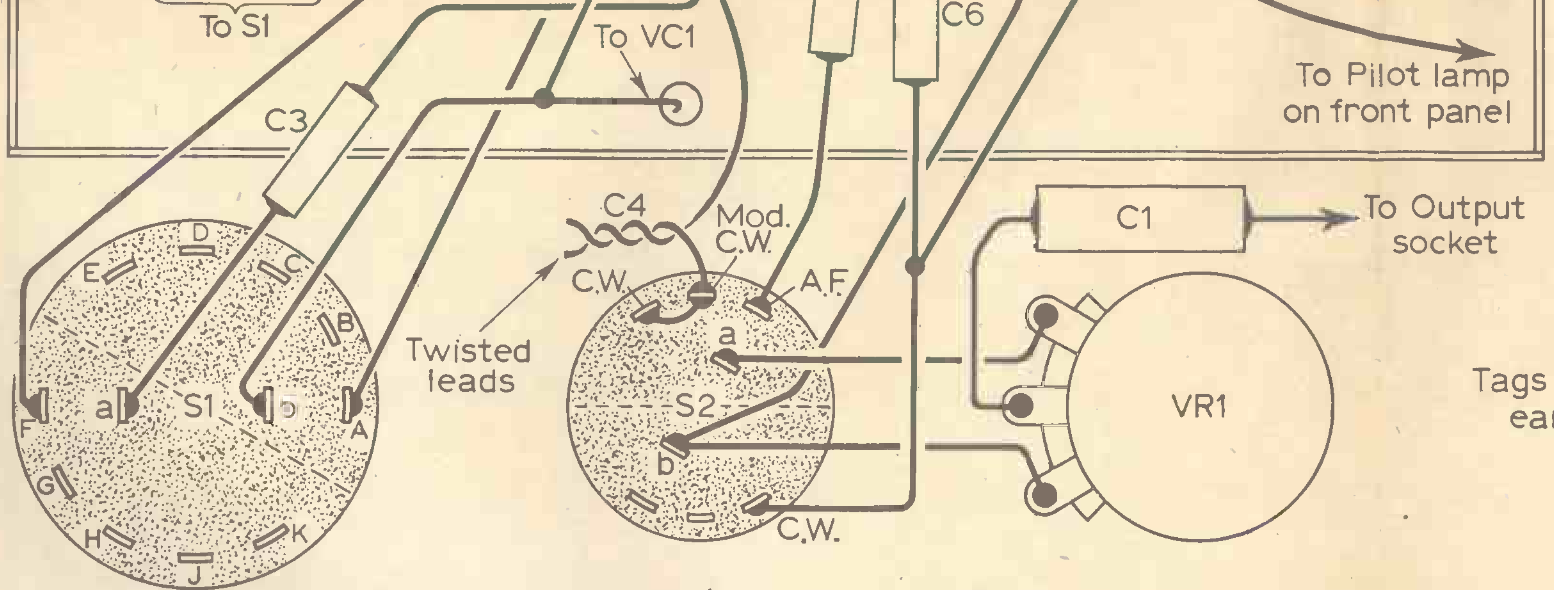



Fig. 2 – The R.F./A.F. chassis wiring.

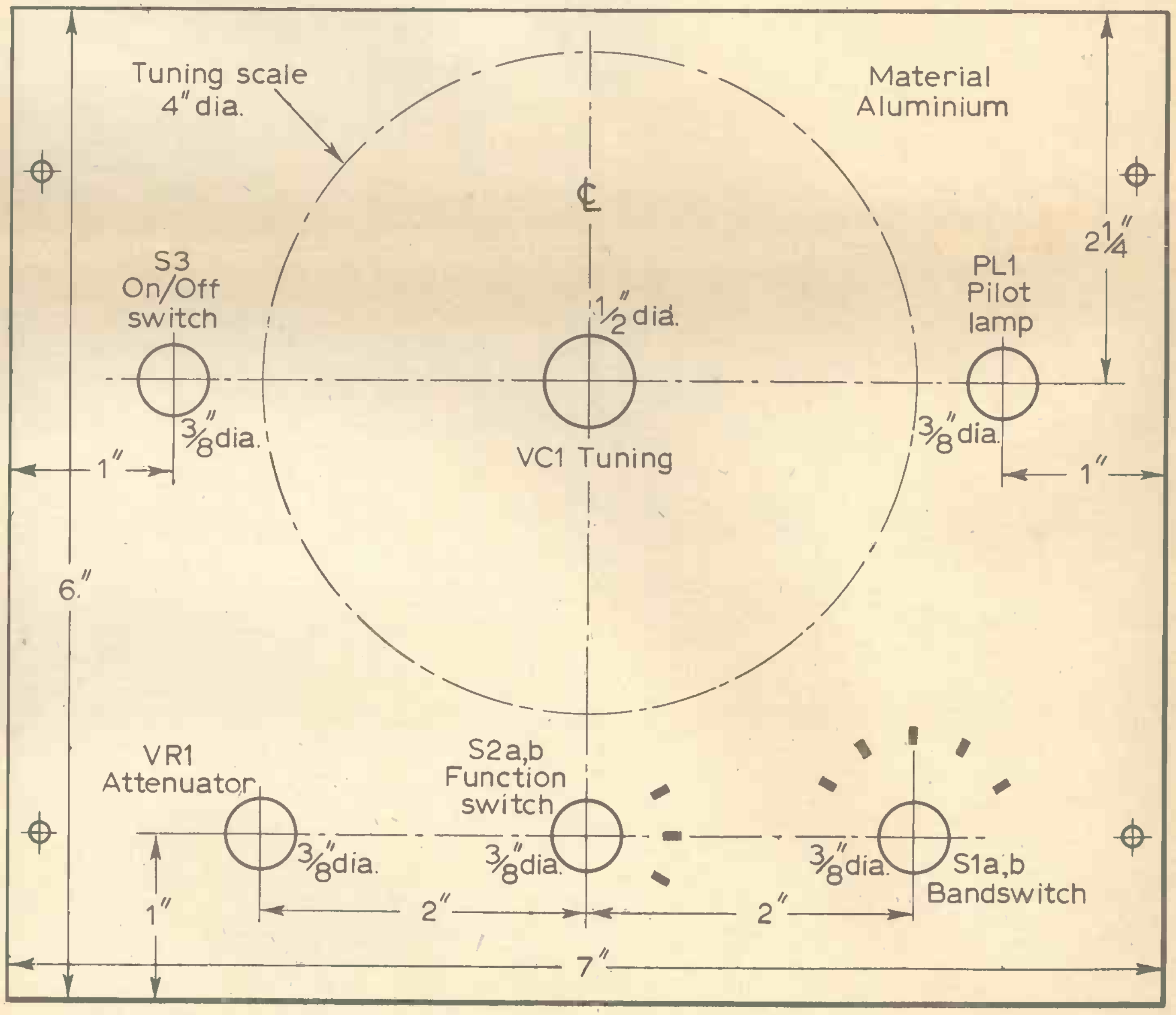



Fig. 3 – Front panel details.

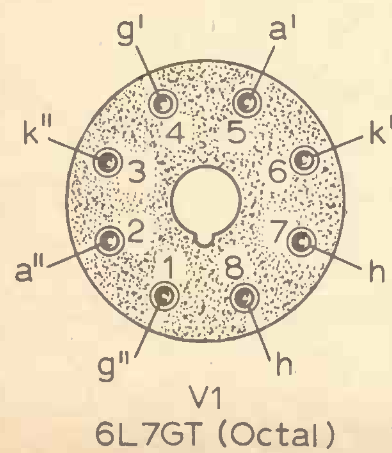



Fig. 5 – Valvebase details.

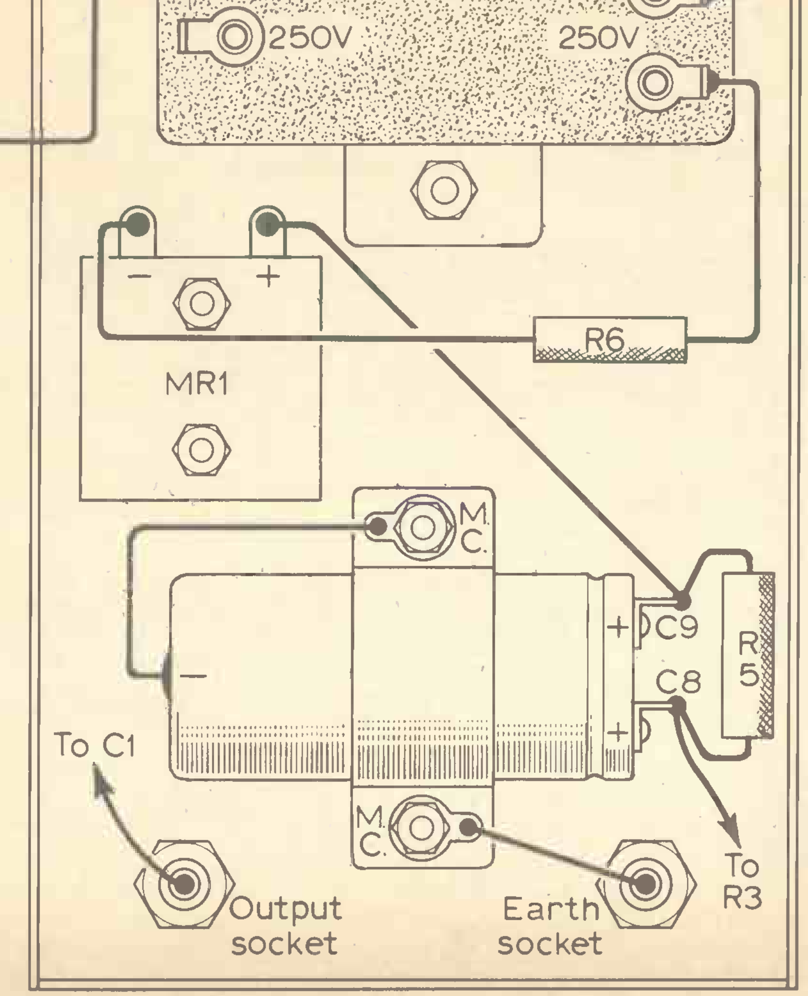



Fig. 6 – The power pack wiring.

## COMPONENTS LIST

Resistors:
(All ½W, 10% unless otherwise stated.)
- R1 47k
- R2 2·7k
- R3 47k
- R4 4·7k
- R5 1k 1W
- R6 390Ω
- VR1 25k potentiometer

Capacitors:
- C1 1000pF 1kV mica
- C2 100pF
- C3 470pF
- C4 See text
- C5 2000pF
- C6 0·01μF
- C7 2μF 25V
- C8, C9 8μF+8μF elec 250V
- VC1 500pF tuning (Jackson El)

Valve:
- V1 6SL7GT

Coils (Osmor):
- L1 QO1
- L2 QO2
- L3 QO4
- L4 QHFO8
- L5 QHFO6

Transformers:
- T1 A.F. output transformer (see text)
- T2 Mains transformer (Elstone MT11 0-250V 25mA, 6·3V 1A)

Rectifier:
- MR1 E250 C50

Chassis:
Front panel 7in. x 6in. aluminium
A.F./R.F. chassis 6in. x 3in. with ½in. flanges all round.

Switches:
- S1a, b 2-pole, 5-way band switch
- S2a, b 2-pole, 3-way function switch
- S3 Single-pole on/off switch

Miscellaneous:
Output and earth sockets, 6·3V 0·3A pilot lamp, 1A fuse, B9A valveholder, card and Perspex for front panel, control knobs, handle, connecting wire, nuts and bolts, etc.

R.F. is modulated by the audio oscillator, so the signal can be heard on any receiver. To check I.F. stages in a receiver, tune the generator to the intermediate frequency of the receiver, and apply the modulated C.W. signal to each circuit point in turn, working backwards from the second detector. Reproduction ceases when the fault is passed, so it is thereby localised to one stage.

To check other circuits, such as R.F. stages, tune the receiver and signal generator to the same frequency, on any required band. To trim circuits, tune the generator to a high frequency on the receiver band. To adjust receiver coil cores, tune the generator to a low frequency on the receiver band.

Sufficient coupling will often be obtained merely by placing the generator prod or lead near the aerial or other R.F. circuit connection. Coupling between generator and receiver should always be very loose, for final trimming and alignment.

To calibrate a receiver, the generator will have to be calibrated itself. (This can be done as described later.) It is then only necessary to tune the generator to various frequencies, and tune in the signal on the receiver, and mark its dial. The same method can be used to secure best agreement with a ready marked receiver tuning scale or dial.

### C.W. Output

This is a radio frequency signal, tuned as already described, but not modulated. It will operate a receiver AVC system, or tuning meter or tuning eye, but cannot be heard by ear, with an ordinary receiver.

If a superhet has a beat frequency oscillator, the C.W. signal will be heard as a whistle. This will also be so with a TRF receiver having reaction, if reaction is sufficiently advanced to produce oscillation.

The C.W. output may be used for trimming, etc., when a magic eye or other tuning indicator is present. It may also be coupled into the second detector of an ordinary superhet, to make C.W. morse audible. The generator is then adjusted to within 1kc/s or so of the intermediate frequency of the receiver.

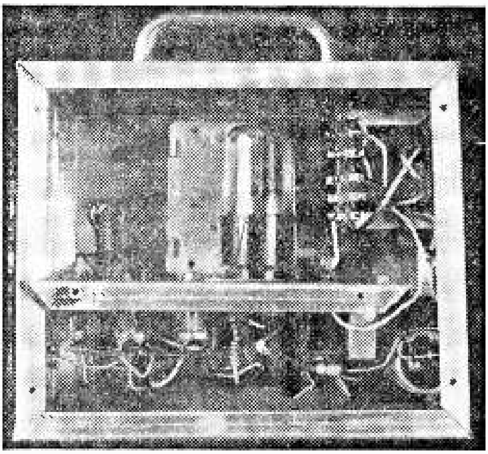
If a superhet is not operating, and early tests have made the oscillator suspect, the generator signal may be injected at the frequency changer oscillator or mixed grid. The receiver is tuned to agree with an expected station, and the signal generator is tuned slowly over a band around 470kc/s higher. If results are then obtained, the receiver oscillator is probably faulty (for this test, the generator frequency should be equal to the receiver frequency plus the intermediate frequency of the receiver).

### Calibration

For maximum utility, the generator tuning should be calibrated. Five semicircles are drawn for this, and actual calibration may be achieved in a number of ways. If a communications receiver, or other accurately calibrated receiver is available, the generator may be coupled to this by placing its output lead near a short wire attached to the aerial terminal. The receiver is then tuned to various frequencies, and the generator is adjusted until its signal falls on the receiver frequency, which may then be marked on the scale. A receiver with a tuning meter is most suitable.

Should a 100kc/s, 500kc/s, 1Mc/s or other crystal marker be available, a receiver can be tuned to the marker signal, and each multiple (harmonic) and the generator can then be calibrated in 100kc/s or other intervals, with good accuracy.

If a calibrated signal generator can be utilised, its signal can be tuned in on a receiver, and the uncalibrated generator can then be tuned to the same frequency. In this way, calibration marks can be made on the scales.



*The signal generator with the back cover removed*

In all cases, it is best to proceed systematically, finishing one range at a time. Fig. 4 shows the relationship between wavelength and frequency, and may be useful. The generator may be marked with frequencies in black, and wavelengths in red. Or wavelengths may be omitted.

### Harmonic Calibration

If no ready calibrated receiver or generator is available, it is still possible to calibrate the scales. This will take a little longer, but only need be done once, and can be of good accuracy.

When the generator is tuned to any frequency, its note will be heard on this frequency, and also multiples of the frequency. That is, upon harmonics. For example, harmonics of 200kc/s will be audible to over 4Mc/s, with a sensitive receiver. Similarly, harmonics of 1Mc/s can be heard to nearly 30Mc/s, and harmonics of 2·5Mc/s can be heard to 30Mc/s.

To use this method, tune in the long-wave Light Programme, which is transmitted on a frequency 200kc/s. Set the generator for C.W. and tune it to zero beat with the received signal, and mark the scale for 200kc/s. The generator is then left at 200kc/s, but is switched to "Mod. C.W." and the receiver is tuned upwards in frequency, until the generator is heard. This will be the second harmonic, or 400kc/s. The receiver is left untouched, and the generator tuned to the receiver frequency, and its scale marked for 400kc/s. The whole process is repeated for 600kc/s, 800kc/s and

*(Continued on page 502)*

# Radio Components and their Functions

THE COMPONENTS OF A TRF RECEIVER

By K. Royal

A REASONABLE understanding of the purpose of the many and varied components used in radio and amplifier circuits can go far in helping the experimenter and service technician to reach a speedy and accurate diagnosis of a fault condition. With that in mind, this series of articles sets out to investigate the functions of the components used in three basis pieces of equipment—the TRF receiver, the superhet receiver and the A.F. amplifier.

In addition, the symptoms to be expected owing to a fault in any particular component will be considered, as also will the voltages and currents in the various stages, both under normal and fault conditions.

### *The TRF Receiver*

Although this type of receiver is now extinct so far as radio dealers are concerned, it is still, nevertheless, a popular set with beginners and home constructors. Kits of parts are still available for producing this kind of set, and quite a few are in operation as a second home-made "domestic" receiver. Just before and after the war many American versions were available on the British market, and there is every likelihood that some of these are serving well to this day.

The term "TRF", means "tuned radio-frequency", which indicates that the set is not of the almost universal superhet type, but that it uses an R.F. amplifier to step up the strength of the aerial signals, and that detection occurs direct from the modulated R.F. carrier. With a superhet, of course, the signal frequency is converted to an intermediate-frequency before detection.

In Fig. 1 is given a block diagram of a typical TRF receiver. Some sets are more complicated than others and may employ more than just a single R.F. amplifier stage, but the majority have but a single stage, as shown in the block diagram. The detector invariably uses either a leaky-grid or anode bend circuit, a pentode or tetrode valve being employed for this purpose. This arrangement provides sufficient audio signal at the anode fully to drive a tetrode or pentode output valve. On mains operated versions, the power supply usually consists simply of a valve half-wave rectifier fed direct from the mains supply, with a heater dropper or line-cord resistance to allow the required current to pass through the heaters of the series-connected valves.

### *Typical Circuit*

A circuit typical of a TRF battery receiver is given in Fig. 2. Here V1 is the R.F. amplifier screened grid valve (tetrode). V2 is the leaky-grid detector and A.F. amplifier valve (pentode) and V3 the output valve (pentode).

The aerial coupling coil is L1, and signals from the aerial are coupled to this through C1, that having a value between 100 and 3,000pF, depending upon the circuit. In some early models, the coupling capacitor was sometimes variable and worked as a form of variable selectivity control—the smaller the capacitance the greater the selectivity. This, of course, resulted from the lighter loading on the aerial tuner-circuits by the smaller capacitance. In the set under discussion, however, C1 is 3,000pF and has no bearing on the selectivity, it being more of an isolating component.

The tuned windings are L2 and L3, with the inductance of the two in series tuning over the L.W. band and the inductance of L2 only tuning over the M.W. band. Switch S1 is a part of the wavechange switch which when closed short-circuits L3 and gives M.W. operation. The aerial circuits are tuned by VC1, this being one section of a two-gang capacitor and the trimming capacitor (TC1) being a part of it.

Thus, VC1 tunes either L2 and L3 in series or just L2 by itself depending upon the position of S1. In this way, tuning over the L.W. and M.W. bands is accomplished, and the selected signal is fed to the control grid of V1, the arrow across the valve symbol indicating that the valve has a variable-mu characteristic. This means that the signal amplification through the stage can be altered fairly evenly by changing the grid bias—the smaller the bias the greater the amplification.

### *Control of Volume*

This, then, leads to the arrangement used for control of volume on some TRF receivers. In Fig. 2, VR1 is, in effect, an R.F. gain control. It works in that way because the negative voltage (relative to earth) across R8 and R9 is applied across VR1 and R2 in series and is then tapped off at the slider of VR1 and used as bias for the R.F. valve V1.

It will be seen that continuity exists between the slider of the control and the control grid of V1 through R10, L3 and L2. Thus, by altering the control so the grid bias is altered, and in that way a control of R.F. gain is secured. In addition, however, VR1 serves as a variable loading to the signal across L1. For example, when the slider of VR1 is at the R2 end of the control, L1 is damped by the whole of VR1, via C3. But since VR1 is of fairly high value (50k), the loading is very small and there is virtually no attenuation of the signal. In that position there is also minimum negative bias on the control grid of V1, so both the signal input and the R.F. gain are at a maximum.

When the slider of the control is moved away from R2, however, the damping across L1 is progressively increased and, further, the bias on V1 is also increased. In these two ways, therefore, a control of volume is effected. C3 is called a signal filter capacitor and has a value of 0·01μF, R10 serves a like purpose and has a value of around 33k, while C4 is the "bottom end" coupling capacitor for the R.F. tuner circuits and has a value of 0·0005μF. R1 and C2 are rather specialised components of the receiver under discussion, and serve essentially to prevent the tuned circuits from going out of step in the region of 500m.

The tuned signal is redeveloped in amplified form across L4 and L5 in series (L.W.) or across L4 only (M.W.) in the anode circuit of the R.F. amplifier. S2 is ganged to, and serves a similar purpose to S1, being open on L.W. and shorting out L5 on M.W. Current for the anode for the R.F. valve is fed through L4 and L5, and the signal across these inductors is coupled to the detector tuned circuit, L6 and L7 through the coupling capacitor C6, which has a value of 11pF. The combinations L4/L5 and L6/L7 provide band-pass coupling and considerable increase in selectivity. S3, again, is a part of the wavechange switch and shorts out L7 on M.W.

### *Detector Circuit*

The L.W. and M.W. signals across L6 and L7 are tuned by the section VC2 of the two-gang capacitor, and the selected signal is coupled to the control grid of V2 through the 50pF capacitor C11. This capacitor together with the grid leak R4 produces a time-constant which gives the leaky-grid detector action, R4 having a value of 4M. A little grid bias is given to V2 by the potential-divider R5 and R6 across the filament circuit, the values being 220k and 77k respectively.

The A.F. of the signal carrier thus occurs at the control grid of V2 and this is developed in amplified form across the anode load resistor R7, a typical value being 33k. There is also a little signal voltage at this anode, and this is fed back to the control grid of V2 via C12 (0·1μF), the differential reaction capacitor C11 and the reaction winding L8.

The phase of the signal so fed back is such that it adds to the signal already present at the grid and thus gives rise to positive feedback. This is often called "reaction" or "Q-multiplication". The former because when the feedback is sufficiently high oscillation occurs, and the latter because the effective Q or "goodness value" of the detector tuned circuits is enhanced as the feedback is increased. This makes the selectivity of the tuning progressively improve as the feedback is increased, but when a certain point is reached uncontrolled oscillations develop and the detector turns into an oscillator which, of course, is no good for reception. The idea, then, is to adjust the feedback just prior to the point of feedback and this is accomplished by the coupling of the reaction capacitor C11.

This kind of circuit may have several "gimmicks", and those in the circuit under discussion are the differential reaction capacitor, the pre-set capacitor C10 and the switch S4 which brings in resistor R3 (990Ω) on L.W. When the reaction capacitor is at minimum, the residual R.F. or signal at the anode of V2 is by-passed to earth or chassis and no feedback occurs. However, as the control is rotated towards maximum, the by-pass effect is decreased and coupling takes place progressively via the other plate. The pre-set capacitor C10 which is shunted across the moving plates and one set of fixed plates ensures, however, that a small amount of "reaction" is applied to the grid of V2 with the manual control at minimum. The fixed capacitor C9 (100pF) balances the other section of the control in a similar manner.

Capacitor C7 (0·005μF) is the L.W. and M.W. padder and is also common to the feedback path. Thus, when R3 is switched into circuit by S4, the feedback path is slightly modified, thereby ensuring smooth reaction during reception on the L.W. band.

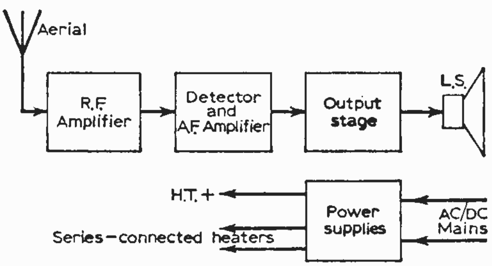



*Fig. 1—A block diagram of a typical TRF receiver. Here the R.F. amplifier steps up the weak aerial signals to a level suitable for detection.*

To operate a gramophone pick-up on this kind of set it is necessary simply to introduce the pick-up across the detector grid-leak, to turn down the reaction and to detune the set from a station. A separate volume control is necessary, though, for the pick-up, and this usually mounted on the motor board. Care must be taken when connecting a pick-up to a mains TRF set, however, for in this type of circuit the mains is often connected to one side of the receiver chassis and there is always the possibility of severe electric shock and mains hum. The pick-up circuit must be isolated from the mains supply.

### *The A.F. Stages*

C12, apart from coupling residual signal back to the grid for reaction, also serves as the A.F. coupling capacitor, its value (0·1μF) being high enough to permit this without unduly attenuating the lower audio frequencies. The A.F. signal at the anode of V2 is fed to an auto-transformer (or tapped choke) L9, which steps up the signal and increases the impedance to values suitable for the control grid of the output valve V3. In mains receivers and in modern all-dry battery sets, resistor-capacitor coupling is nearly always used instead of a transformer, but with old-style battery models, the extra gain produced by the coupling transformer is often desirable.

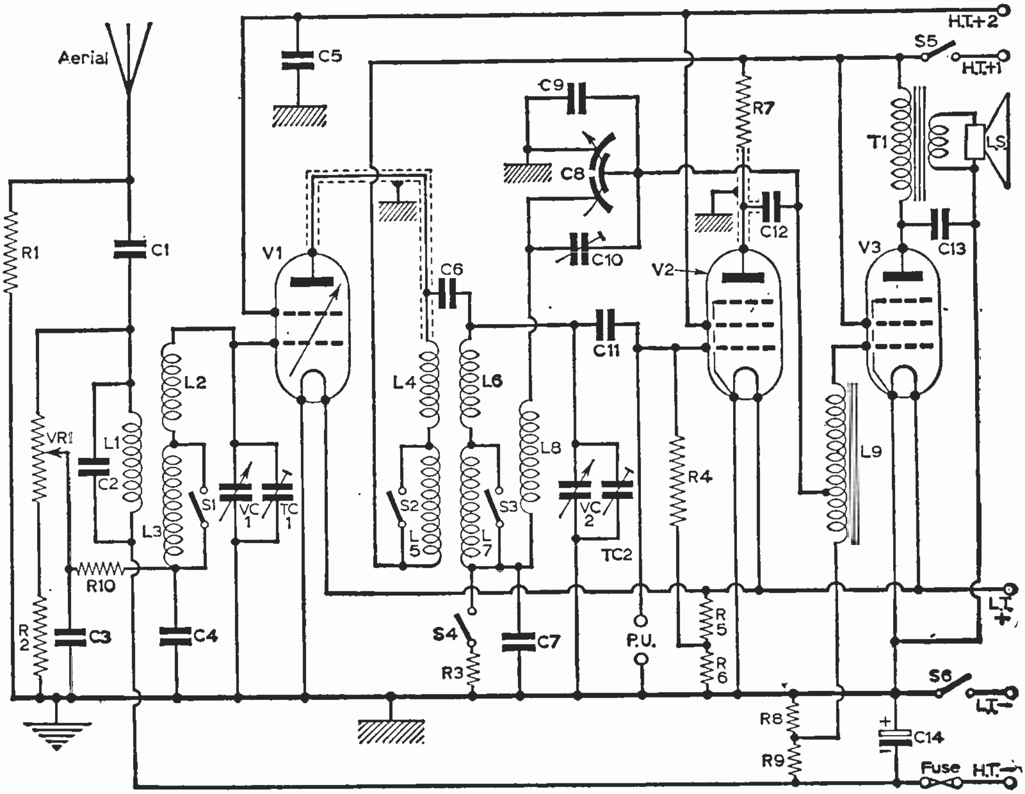



*Fig. 2—The circuit diagram of a typical TRF battery receiver with stages conforming to the block diagram of Fig. 1.*

### Speaker Coupling

The anode of the output valve V3 is loaded by the primary of the loudspeaker transformer T1, while the secondary of the transformer is connected across the speech coil of the loudspeaker. The transformer is to match the loudspeaker impedance (about 3Ω) to the optimum load value of the output valve (several thousands of ohms, depending upon the type of valve). The matching is based on the transformer turns ratio and is equal to $\sqrt{Z1/Z2}$:1 where Z1 is the optimum anode load of the value and Z2 the impedance of the loudspeaker.

The screen grid of V3 is connected direct to H.T.+1 (120V), while the screen grids of V1 and V2 are fed separately from a 90V tapping on the H.T. battery, H.T.+2.

### Auto-biasing

Very early battery sets required a 9V grid bias battery, but the set under examination uses an auto-bias system. It works in this way: H.T.— is taken to the chassis or earth line not directly, but through R8 and R9 in series (350Ω and 500Ω respectively). This means, then, that the full H.T. current of the set flows through these resistors, and thus produces a voltage drop across them. Relative to chassis, therefore, H.T.— is negative and, as well have already seen, this is applied to the R.F. gain control system (R2 etc. in V1 circuit). Owing to the potential-divider action of R8 and R9, a lesser negative voltage (still relative to chassis) appears at their junctions, and this is applied as grid bias to the control grid V3, via L9. The circuit is completed by a fuse bulb in the H.T.— lead and by the main on/off switch, S5/S6. Decoupling for the auto-bias is provided by C14, which is a 32$\mu$F electrolytic capacitor, and for the screen grids by C5, valued at 0·25$\mu$F. C13 is a fixed "tone control" capacitor which, in effect, suppresses certain distortions produced by the output valve.

To conclude this month's article, the voltages and currents to be expected in the three stages are given below.

### Voltages and Currents

**V1 anode 120V 2mA; screen grid 90V 1mA. V2 anode 100V 2mA; screen grid 90V 1mA. V3 anode 108V 4 to 5mA; screen grid 120V 1mA. Bias across R8 and R9 in series 4 to 5V.**

Much, of course, will depend on the condition of the batteries and on the tapping selected for H.T.+2 and so far as the anode of V2 is concerned, on the sensitivity of the voltmeter used for the measurements.

*(To be continued)*

# SERVICING TAPE RECORDERS

(Continued from page 418 of the September issue)

## RECORDING FROM A.M./F.M. AND A.C./D.C. RECEIVERS

By T. S. Smith

ALTHOUGH the method of obtaining a radio signal for recording purposes from across the secondary of the receiver's output transformer probably introduces a smaller distortion content than by placing the microphone in front of the loudspeaker, the overall distortion is still, nevertheless, higher than it need be. This is because the receiver's output stage is designed to supply power at a low impedance, and it is far more difficult to secure a distortion-free signal that way, than a low-level signal at high impedance, which is far more suitable for the input of a tape recorder, as was revealed last month.

### Detector Signal

All receivers, valve and transistor types, produce a source of audio-frequency signal which is as free as it can possibly be of distortion. This signal is developed across the load resistor of the detector stage (A.M. or F.M.). This signal is of a relatively low level (in terms of millivolts), and in the receiver itself is fed first to an A.F. amplifier and then to the output stage. It is obvious, of course, that the A.F. and output stages will introduce some distortion to the signal, even if only small, so connecting to a tape recorder before those stages goes a long way to enhance the recorded quality.

A receiver typical of the type used by home recordists is given in Fig 28. This shows the final I.F. amplifier, the A.M. and F.M. detector circuits, the magic-eye tuning indicator, the first A.F. stage, the output stage and the power supply circuits. One rather important point to notice is that the mains transformer has a totally isolated mains primary winding. This means that the chassis of the set may be connected direct to an efficient earth point, and that a tape recorder may be connected direct to the receiver without any danger of electric shock or fear of damaging the equipment.

V3 is the final I.F. amplifier valve, while V5 serves as both A.M. and F.M. detector and also as the A.F. amplifier. One diode in the valve (the one connected to pin 6) is used as A.M. detector, and the other two diodes are used in a ratio detector circuit for F.M. The triode section of the multiple valve is the common A.F. amplifier. The amplified A.F. signals from the anode of the triode feed the output valve V6, and the bridge rectifier W1 supplies H.T. voltage for the whole of the set. V4, of course, is the magic-eye tuning indicator.

It is not proposed to delve into the detailed operation of these stages as such information is available in past issues of this magazine. However, the A.M. detector load resistor is R15 (330k) in series with the "earthy" side of the secondary (L19) of the A.M. I.F. transformer. The A.F. signal from across this load is fed to the A.M./F.M. change-over switch S1a.

Now, in the "F.M." position, C44 (680pF) acts as the load and this, as will be seen, is connected to the other side of the A.M./F.M. change-over switch, via C45. Thus, on the slider contact of the switch (point 5) we have an audio signal which is either A.M.-or F.M.-derived, depending upon the setting of the receiver. These factors are common to all A.M./F.M. receivers and, as with the circuit under discussion, the A.F. is always fed to the top-end of the volume control (R29), in this case, via C51.

For normal operation of the set, the required level of A.F. is taken from the slider of the volume control and fed to the grid of the A.F. triode amplifier. However, for normal driving of the average tape recorder, the A.F. signal across the volume control is of adequate level, and there is absolutely no need to amplify it further in the receiver. Thus, by extracting the signal from across the volume control, the inherent distortion in the receiver's audio stages is eliminated. Furthermore, this component is common to both the A.M. and F.M. audio, so extra switching is not required.

### Avoid Shorting the Negative Feedback

In some receivers the bottom end of the volume control is returned direct to chassis, as shown in Fig. 29, but in other sets, as in Fig. 28, the bottom-end of the control is loaded with a fixed resistor to facilitate the application of negative feedback.

In the former case, there is no difficulty whatever in obtaining the A.F., for it simply resolves to the connection of a screened cable, with the inner conductor to the top of the control and the braiding to chassis, as revealed in Fig. 29. In the latter case, however, similar connection would almost certainly effect the negative feedback system and result in somewhat confusing symptoms.

Where possible it is always best to retain a direct connection between the braid of the tape recorder signal output cable and the chassis of the receiver. But if that is done in Fig. 28, the input resistance of the recorder would appear across R29 and R30 in series. In certain cases this may not matter much, but in other cases instability and hum may result, depending upon the exact nature of the receiver's negative feedback loop and the input impedance of the recorder. To be on the safe side, therefore, the braid should be connected to chassis, but the inner conductor of the feed-out cable should be connected to the top of the volume control via an isolating capacitor of 0·1$\mu$F (see Fig. 30).

The A.F. signal across the volume control is upwards to a maximum of about 1V peak, and is adequate for almost all tape recorders. The frequency response at this point is also very good, being limited essentially by the passband of the I.F. circuits and the design of the detector. With A.M./F.M. receivers, de-emphasis usually takes place to some degree between the ratio detector or phase discriminator and the volume control, so that the A.F. across the volume control should be in reasonable frequency balance. However, when a coupling capacitor is used, as in Fig. 30, the value of that can be reduced if necessary to provide a certain amount of bass cut (i.e., top lift) to suit the recording characteristics of the tape recorder.

***Isolate D.C.***

In some A.M.-only receivers, including transistor sets, the volume control acts as the whole or part of the detector load. This means that in addition to the A.F. across the resistor, there occurs a direct-voltage which is the rectified I.F. carrier. This voltage is negative with respect to chassis (positive in transistor sets) and increases with increase in signal amplitude. It is thus employed as an AGC bias.

Care must, therefore, be taken to avoid shorting the voltage out or applying it to the input of the tape recorder. This would not harm anything particularly, but it might either introduce distortion due to bias disturbance in the first stage of the tape recorder or, if the radio signal is passed through a volume control in the recorder, noise as the volume control is adjusted.

In all cases where the detector diode is in direct connection with the volume control, as in the transistor circuit in Fig. 31, an isolating capacitor should be connected between the top-end of the control and the inner conductor signal lead-out (Fig. 30).

Even in a transistor set, it is desirable to maintain connection between the braid and the chassis or common battery circuit. This will prevent random earth effects which could produce hum or instability. In transistor sets, the volume control is of a lower value than that in valve receivers, (e.g., 5k in Fig. 31 as compared with 500k in Fig.

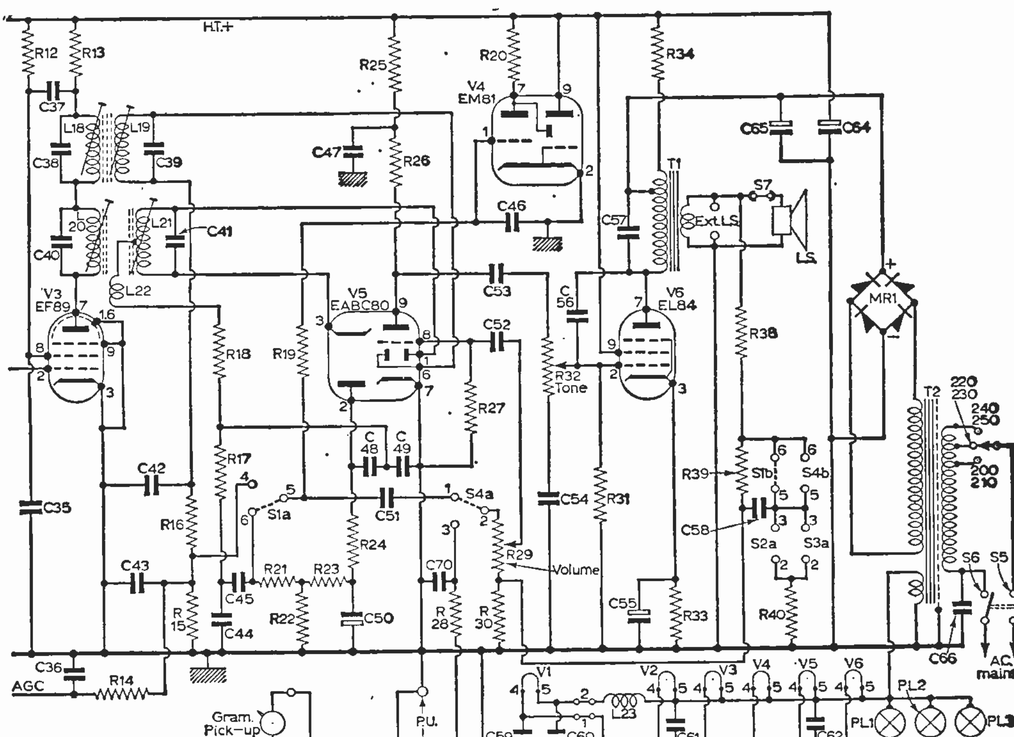
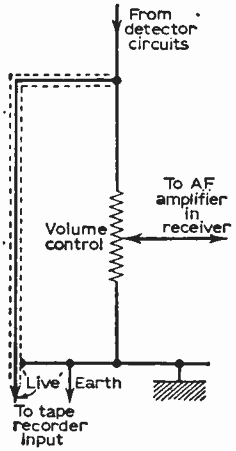



*Fig. 28—A typical circuit of an A.M./F.M. receiver from which a "recording" signal can easily be obtained. The audio from both A.M. and F.M. transmissions is developed across the volume control R29, and from here it may be directed to the "radio input" of a tape recorder, as shown in Fig. 30. This set also features a fully isolated mains transformer, which is a requirement for recording purposes.*



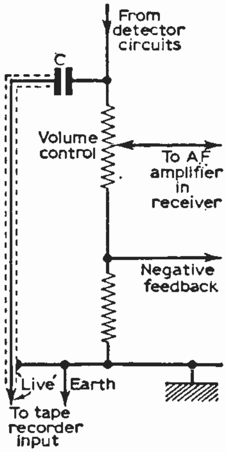




*Fig. 29 (left)—When one side of the volume control is connected direct to chassis, and provided there is no direct-voltage due to carrier rectification, across the control, then the audio may be fed direct to the tape recorder as shown.*

*Fig. 30 (right)—If there is a direct-voltage across the volume control or if a fixed resistor is connected at the "earthy" end to facilitate negative feedback, then the tape recorder signal must be directed through an isolating capacitor C.*

28). This does not matter unduly provided the coupling capacitor C (Fig. 30) is no less than 0·1$\mu$F. It may even pay from the bass response point of view to increase the value to 0·25$\mu$F.

At this stage, it should also be remembered that large transients are likely to destroy transistors, and that transients of destroying magnitude can occur due to the connection of mains equipment to a transistor circuit. This can mainly be avoided, however, by ensuring that all the connections are highly efficient and that they are made *before* switching on the tape recorder and transistor set. A poor connection causes crackles in the loudspeaker or on the tape, and these crackles are really transient surges of current. Further, on no account should a transistor set be coupled direct to A.C./D.C. equipment, but this does not often apply, since almost all tape recorders are for A.C. mains only and feature a fully isolated mains transformer.

### *Mains Isolation*

Tape recordists often require to record from an A.C./D.C. type of receiver. These sets have no mains transformer, and due to that there must exist a connection direct from the mains to the H.T. negative line or chassis. This presents no trouble under normal operating conditions, but if internal connections are made to this kind of receiver, one side of the mains supply is, in effect, brought out to the connecting leads and applied direct to the tape recorder.

Since, for the sake of hum and stability, it is necessary to connect the braid to the chassis of the receiver (Figs. 29 and 30) and to connect the braid at the other end to the "earth" side of the radio input on the tape recorder, the mains supply is connected straight to all the metal work of the recorder. If that happens to be connected to the

*(Continued on page 525)*

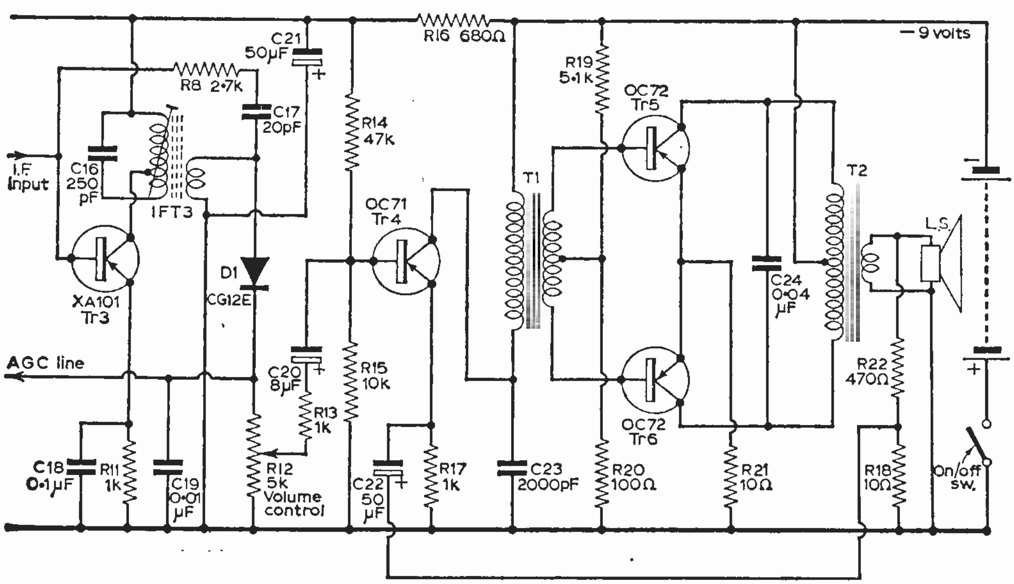



*Fig. 31—Although a transistor circuit uses a lower value volume control (R12) than valve circuits, the recorder signal can still be picked up from that point, but a higher value capacitor may be required for isolation. The capacitor is necessary to isolate the D.C from the recorder input circuits (see Fig. 30).*

# *Technical Training in Radio, Television and Electronics Engineering with*

# ICS

The decision is YOURS. To be a success in your chosen career; to qualify for the highest paid job . . . to control a profitable business of your own. ICS home-study courses put your plans on a practical basis; teach you theory and practice; give you the knowledge and experience to take you. at your own pace, to the top.

*Choose the RIGHT course:*

RADIO & TELEVISION ENGINEERING
INDUSTRIAL TELEVISION

RADIO & TELEVISION SERVICING
RADIO SERVICE AND SALES

VHF/FM ENGINEERING : ELECTRONIC COMPUTERS & PROGRAMMING

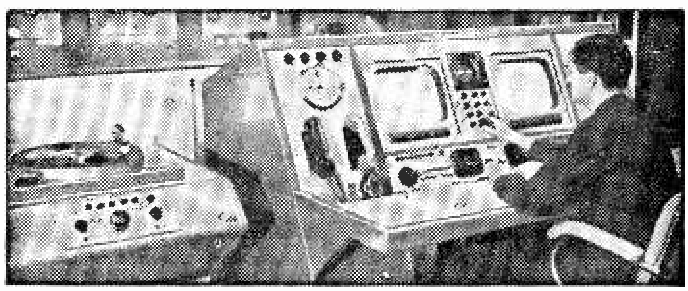
ICS provides thorough coaching for professional examinations:

Brit. I.R.E., City and Guilds Telecommunication Technicians, C. & G. Radio & TV Servicing (R.T.E.B.); C. & G. Radio Amateurs.
P.M.G. Certificates in Radiotelegraphy.

## LEARN AS YOU BUILD

*Practical Radio Courses*

Gain a sound up-to-professional-standards knowledge of Radio and Television as you build **YOUR OWN** 4-valve T.R.F. and 5-valve superhet radio receiver, Signal Generator and High-quality Multimeter. At the end of the course you have three pieces of permanent and practical equipment and a fund of personal knowledge and skill. ICS Practical Radio courses open a new world to the keen Radio amateur.



**THERE ARE ICS COURSES TO MEET YOUR NEEDS AT EVERY STAGE OF YOUR CAREER. FILL IN AND POST THIS COUPON TODAY.**

You will receive the FREE 60 page ICS Prospectus listing examinations and ICS technical courses in radio, television and electronics PLUS details of over 150 specialised subjects.

Other I C S courses include:
MECHANICAL, MOTOR
FIRE, ELECTRICAL &
CHEMICAL ENGINEERING.
FARMING, GARDENING.
ARCHITECTURE &
WOODWORKING.
SELLING & MANAGEMENT.
ART. PHOTOGRAPHY,
etc., etc.

*PLEASE STATE ON COUPON SUBJECT YOU ARE INTERESTED IN . .*

**INTERNATIONAL CORRESPONDENCE SCHOOLS**
**(DEPT. 170) INTERTEXT HOUSE, PARKGATE RD., LONDON, SW11**

*PLEASE SEND FREE BOOK ON*..............................

*NAME*..............................

*ADDRESS*..............................

..............................

*OCCUPATION*.............................. *AGE*..............
10.62

THE FOLLOWING TWO ARTICLES HAVE BEEN INCLUDED WITH THE INTERESTS OF THE HI-FI ENTHUSIAST KEPT IN MIND

# A Small Enclosure for GOOD BASS Reproduction

By W. Groome

THE demand for small loudspeaker enclosures, intensified by the advance of stereo, has been met to some extent by the development of special loudspeakers, but many enthusiasts would like to use their existing units of conventional design. It was this need that prompted the author to make some interesting experiments described below.

Failure of the usual loudspeaker in a small box is mainly caused by the stiffness of the enclosed air; a springiness which, added to that of the cone suspension, raises the bass resonant frequency by as much as one-third. An open-baffle resonance of 45c/s could become 60c/s in a cabinet having a volume of 2cu. ft. As there is little worthwhile output below this frequency there is serious loss of bass. It is unfortunate because at frequencies above resonance, small enclosures (properly lined) behave very well.

To reduce the stiffness or, to express it properly, to increase the compliance of the box (Cb), would require increased volume, so other factors must be considered. These are, compliance of the cone and suspension (Cs), the mass of cone and suspension (Ms) and the mass of the air load (Ma).

The functions of compliance and mass in acoustic resonance are similar to those of capacitance and inductance in tuned circuits, and an increase in either will lower the resonant frequency. Adjustments of Cs or Ms require drastic alterations to the loudspeaker that can be tackled more light-heartedly with a cheap unit than with the quality instrument we are concerned with. Therefore we can experiment only with the mass of the air load.

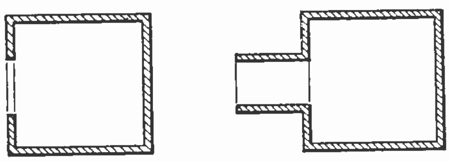



*Fig. 1—(a) A simple resonant cavity, (b) with added duct.*

### Horn Loading

The best-known method of air loading is the horn, which compels the cone to activate the large mass of air it encloses and couples it to the outer air over its large mouth area. In contrast the direct radiator cone has nothing to confine the air against it firmly enough to load it and transfer all of its energy.

Any mass of air that is, by some means, confined to the front of the cone becomes part of the resonant system. We can liken the air in a small box cavity, Fig. 1(a), to a stiff spring with a high rate of vibration and the mass of air in the added duct (b) to a weight that will slow the movement of the spring. That is to say, it will lower its resonant frequency. Variation of the length of the duct and the area of its opening provide considerable control over the resonant frequency; it has been claimed that the system can be tuned lower than the bass resonant frequency of the loudspeaker, so increasing the range downwards.

The duct also adds acoustic resistance which can be adjusted to damp the resonance, flattening the peak (it seems) to make the system behave like a non-resonant one. Compact practical arrangements of the duct are indicated in Fig. 2, where the drawings show them as they would appear with one side removed. The author has made several enclosures to test the duct idea and has been surprised at the liberties that can be taken with cavity volume with a loudspeaker of good bass response. Fig. 3 shows one that houses a large 12in. unit and its dimensions, 15in. x 14in. x 10in. plus duct, could hardly be smaller.

### *Experiments*

Experiments, however, cost very little. A reflex cabinet requires about 20sq ft of expensive plywood or blockwood at least 1in. thick and can be a costly failure if panel resonance or loudspeaker

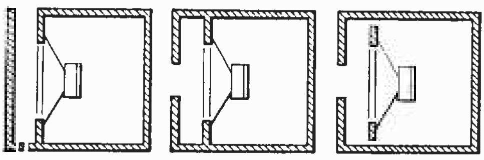



*Fig. 2—(a) A practical duct loading with either one or two openings, (b) with front slot, (c) with gap loudspeaker mounting.*

mis-match do their worst. Bracing the reflex is almost a feat of engineering but a small box of ½in. plywood is remarkably rigid. For preliminary tests boxes in any rigid timber can be quickly assembled and then followed, when satisfactory results are obtained, with a first-class job.

Fig. 3 gives constructional details of one of the enclosures. If any adjustments to the dimensions are considered necessary, it is preferable to widen the enclosure to increase the effective length of the duct. Contrary to some long-held opinions, the allowance for the volume of the loudspeaker should be quite small—about 60cu. in. for the magnet and frame only. The cone does not affect the volume because it is transparent to sound, therefore the box is effective

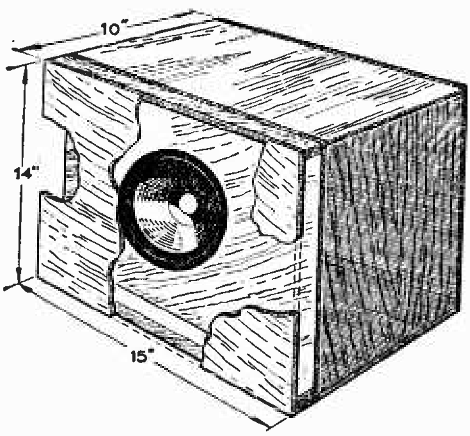



*Fig. 3—The construction of an enclosure with vertical slide slots.*

as a resonator right up to the loudspeaker opening. Although the box hardly needs any bracing you can add fillets to aid screw assembly. The loudspeaker mounting board and front duct panel should be screwed, without glue, to allow for removal when necessary.

### *Dust Opening*

Modification of the duct spacing and area of the two vertical openings can be achieved by changing the depth of the top and bottom battens to which the front panel is secured, starting with 2in. gaps and reducing in ¼in. steps until the most satisfactory results are obtained. The area of duct opening can be halved simply by standing the box on floor or table with one opening downwards. This has been done in Fig. 3 to off-set the effect of another experiment that will be described later.

Line the box with double layers of ¼in. carpet underfelt, not drawn too tightly. A limp "curtain" of the same material should be arranged across the cavity behind the loudspeaker.

Distribution of low frequencies is not noticeably affected by the directions in which the slots face, but choice of position can improve the air loading. If the enclosure is placed on the floor in a corner, slots facing the rear and vertical, the air mass partially enclosed by the wall, floor and cabinet side, form a step in the coupling from duct to room. Although the total slot opening area is smaller than that of the cone there is no loss of output (unless it is made ridiculously small) because of the improved transfer of energy by air loading. By experiment it was found that there is a point beyond which further reduction brings no audible improvement; the damping by acoustic resistance can, like electrical damping, be overdone.

The enclosure, shown in Fig. 4, has the slot facing the loudspeaker cone, and has proportions more acceptable than those of Fig. 3. The loudspeaker mounting board is screwed to battens fixed inside and can be brought forward to narrow the gap by interposing spacing strips. Slot area adjustments should be verified by the use of temporary front panels before cutting and fitting permanen. ones. The effect of limited coupling between front and back of the cone can be tried by leaving small gaps at the top and bottom of the loudspeaker mounting board. (They permit some flow of air while resisting sound energy, possibly increasing box compliance and adding some damping.) A simple way of arranging a small air gap is to stand the loudspeaker off the board by means of spacers or washers; another is to drill an array of small holes as is done with larger cabinets using resistance loading.

### *Appearance*

This enclosure can be used in any position, but again the "slot/vertical" corner arrangement is worth trying. Mounted on legs and smartly contemporary, it can be arranged slot-downwards and will gather less dust than in other positions. Beyond this suggestion the author offers no advice on the question of final appearance, for the compactness of these boxes will probably prompt the reader's own adaptations, aided by the helpful fact that in several positions there is no need for a grille.

So long as fidelity is the aim, it may be best not to reduce the volume for a smaller loudspeaker unit. The smaller loudspeaker opening leaves a longer effective duct for a board of the same size, which will help to off-set the poorer air coupling of a small cone. As 8in. and 10in. loudspeakers require less cabinet depth than 12in. ones, the frontal area can be increased for the same volume to provide another increase in duct length. A cabinet 21in. x 12in. x 8in. should give good results.

The following remarks are for the experimenter who is interested in scaling the size down even more than described. The enclosure shown in Fig. 3 is less than 2,000cu. in., but it gives very fine bass, free of boom or "honking", with the character of the instruments clearly defined with none of the "tuned thud" effect so often heard. Probably because of the resistive loading the system seems tolerant, if not independent, of cavity volume. Removal of the front panel converts the enclosure into a simple box and quickly demonstrates the superiority of the duct loading.

### Tests

A test with a cheap radio-set type of 8in. loudspeaker in a ducted enclosure somewhat less than 2,000cu. in. gave surprisingly good bass despite the flabbiness of its thin, soft cone, although it did not, of course, measure up to the massive 12in. unit. In the extreme a small elliptical loudspeaker intended for a portable radio was tried in a roughly-made box measuring 14in. x 10in. x 6in.,

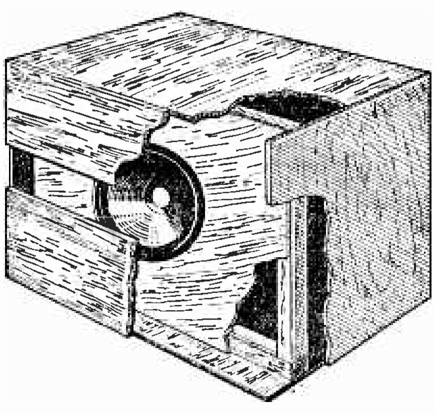


*Fig. 4—An enclosure with a front slot.*

and the reproduction proved better than the loudspeaker had given in an open-back cabinet. All this tends to show that there is scope for some interesting experiments.

The purpose of the author's tests was to verify claims that the system can maintain and even extend the loudspeaker bass response in a small enclosure without distortion or frequency-doubling, and with good transient response. One of the tests was to try it to the very moderate high frequency range of the 12in. unit without the cross-over network that normally excludes H.F. The enclosure shown in Fig. 3 was modified by cutting an elliptical opening in the front panel to expose the central area of the cone. The loudspeaker was not a full range model and its response droops above 8,000c/s in any enclosure, and the small enclosure with one slot closed to off-set the area of front opening did not seem to impair its performance.

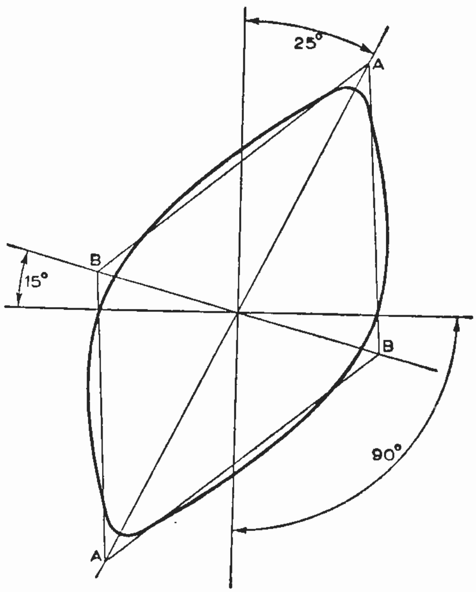



*Fig. 5—The duct opening for a full frequency-range loudspeaker.*

This may not hold good for a wide-range unit, for American designers have stressed that high-frequency response is dependent on the shape of the opening and described a particular shape claimed to achieve the best results. The author has not tested the idea, but for those who are interested this "lemon" shape is shown in Fig. 5. Draw the axis (AA) 25° from vertical, and the axis (BB) 15° from horizontal and half the length of (AA). Join (ABAB) to form the diamond shown in light line, then round it off to the "lemon" shape shown in heavy line. This opening is intended to replace a single vertical front slot and to have the same area.

As only the front radiation is used there is some loss of volume compared with systems in which the back emission is reversed in phase and used to boost the bass, but it is far less than would be expected from a comparison of size. Against this, however, there seems little, if any, of the bass loss sometimes found with other systems when fed by amplifiers of low output resistance and less boost is needed to capture the lowest notes. ■

# A *Stereo* EXPERIMENT

## SOME NOTES OF INTEREST TO THE OWNERS OF TAPE RECORDERS WITH 4 TRACK OR STEREO HEADS

By H. Peters

THE author recently fitted a stereo head to a tape recorder, and despite a warning note in the instructions about home-recorded stereophonic tapes, he decided to attempt to produce some form of stereophonic recording using as little extra equipment as possible.

### *Limitations*

True stereo has to be ruled out when recording stereo as only one recording channel (the one in the instrument) is available, and this means that each channel has to be recorded separately and alternately in such a way that the two when played back together will provide some directional effects. The block diagram (Fig. 1) shows the form that the finished arrangement took. For convenience the original recording track which is used for monaural recordings is referred to as track A (head A), and the second track needed for stereo, track B (head B). Track A is used as the right hand channel, track B as the left hand channel.

It is necessary to build a switching unit (Fig. 3) so that the output of the existing recorder can be fed to the A or B track (or both) whilst the output of the other track is taken away outside the recorder to a separate amplifier, which in the author's case was the one in his radio receiver.

This involves building a suitable pre-amplifier to lift the signal level from the B head to a voltage sufficient to feed into the pick-up sockets of a domestic radio. Such an amplifier is shown in Fig. 2.

### *Switching Unit*

This is a standard 2-pole 3-way Yaxley type wafer switch totally enclosed in a metal case. Each wiping contact is connected to the inner of the screened lead to each head, and in the first position these heads are connected to their respective amplifiers, the A head to the record/playback amplifier, so that in this position the instrument can be used in its original form.

In the second position no head is taken to the second channel pre-amplifier; both heads are taken to the record/playback amplifier. Thus a stereo tape may be reproduced as monaural, and it is also possible to record on to both tracks at the same time. This is a useful facility since it represents "central" noises on the stereo tape, but it must be emphasised that unless special arrangements are made to compensate for the reduction in bias caused by the two head inductances being in parallel, distortion will occur at the higher volume levels.

In the third position the heads are reversed, the second channel amplifier being connected to the A head and the record/playback amplifier to the B head. This enables recording to be carried out in a forward direction on the B track. Any recording made on the B track by turning the tape over and making the recording via the A head will, of course, be heard backwards.

### *Earthing*

The outer braids of all the screened wires are joined together and taken to chassis at the main earth point. There is usually one earth connection only between the tape deck and the amplifier chassis, and this point should be used to avoid an inductive loop creating hum. If the two chassis are joined by random chassis connections at different places, hum may be increased. The metal case around the switch should be taken to chassis, either by bolting it down, or if it is clear of all the metal work, by a wire taken to the aforesaid main earth point.

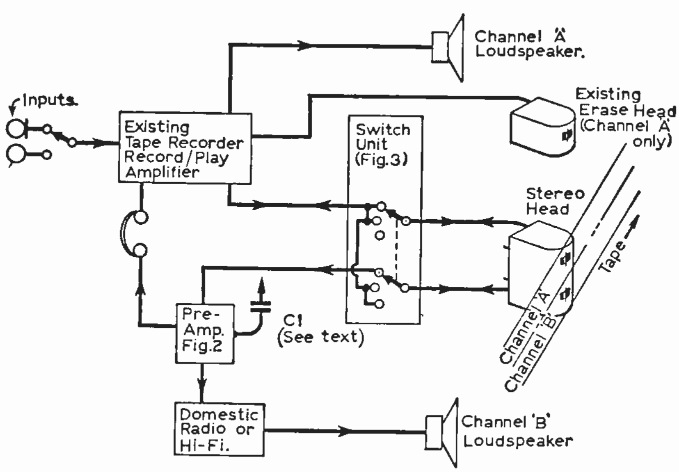



*Fig. 1—The arrangement used for the stereo recording.*

### *Pre-amplifier (Fig. 2)*

This is a simple two-stage resistance capacity coupled double-triode amplifier. An ECC83 (12AT7) valve is used and this valve takes barely 3mA H.T. and 0·3A L.T., and so can safely be added to the load of the tape recorder power unit. The valve heaters (pins 9 and 4/5) should be left free from the chassis as the heater wiring is probably taken to chassis elsewhere.. The layout is not critical.

The purpose of C1 (0·1$\mu$F) will be dealt with later. R7 (1M) may be a potentiometer to control the volume of the channel if no other volume control is available, and any tone correction (bass lift) necessary, may be made by suitable resistance-capacity networks between the junction C3/R7 and, chassis. No correction or control was fitted into the original pre-amplifier since adequate control was available already in the radio to which it was fitted. A screened lead connects the pre-amplifier output to the radio and this can be ordinary television (downlead) coaxial cable. The author's radio was not earthed and so no special precautions were necessary, but if both the tape recorder and the radio or amplifier happen to be earthed separately, an inductive loop can be formed giving rise to hum. There are two ways of overcoming this: one is to take the screened lead to chassis at one end only (experiment will decide which end), and the other is to insert a small 1:1 ratio transformer in the screened lead so as to isolate one chassis from the other. An isolating transformer of this type is essential if either equipment has a live chassis.

### *Accessories*

As the basis of the method used for recording directional effects upon the tape relies upon being able to listen to one track whilst recording on the other, three accessories are very useful. One is a pair of headphones adapted for stereo. The high resistance type with 2000Ω impedance per headpiece is the best type to use, and each pair of leads should be separated and extended separately from the junction. The A channel phone is plugged into the "monitor" socket of the tape recorder, and the B channel phone is connected to the output of the pre-amplifier in place of the lead to the radio It is advisable to identify with labels the A and B phones and their associated leads, remembering that it is possible to reverse the channels by means of the switching unit, and at the same time to put the phones on the wrong way round.

The third accessory is C1, a 0·1$\mu$F capacitor This is merely a piece of stiff thin card cut to a shape which will fit around the erase head to prevent the tape from coming into contact with it. It is fitted for two reasons: to avoid erasing the A track whilst recording the B track, and for superimposition so that speech, for example, can be laid on the top of music already recorded. (If the recorder is a 4-track model and has superimposing facilities which cut out the erase head, there is no need for an erase head guard.)

The third accessory is C1, a 0·1$\mu$F capacitor which is fitted close to the input to the pre-amplifier and which can be plugged into a small socket fitted as near as possible to the grid pin of the first triode: in the author's case this enables one track to be heard whilst recording on the other. It may well be that in other tape recorders, C1 is not necessary, but theory tends to support that it is. Its purpose is to by-pass the bias current induced into the adjacent (listening) head from the recording head, which is of sufficiently high an order to overload the first stage of the ECC83 pre-amplifier. The inserting of C1 into the grid circuit naturally muffles the tone of the second channel but there is adequate volume and clarity to enable the output to be understood and for cues to be picked up from it. Without the capacitor absolutely nothing can be heard. (The author has tried various forms of tuned rejector circuit but without any success, due mainly to self oscillation of the circuits when the rejectors were added.)

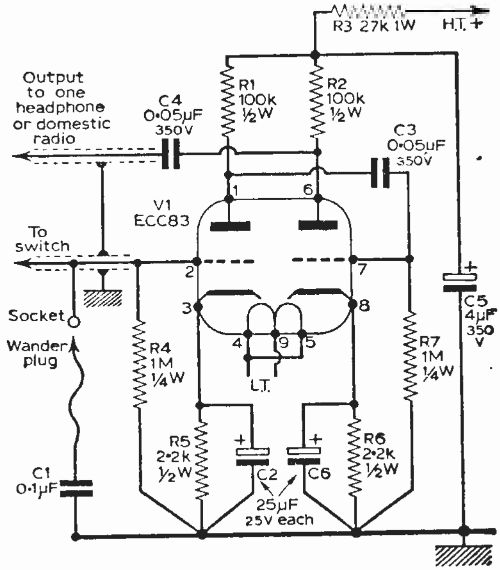



*Fig. 2—The circuit of a channel B pre-amplifier.*

### *Making a Simple Recording*

To make a simple stereo recording the tap must first be erased on both tracks and then th erase guard should be fitted over the erase head as this is no longer required. Many readers wil realise that these preliminaries are not absolutel essential provided that track not covered by th single erase head has been wiped clean, but it ha been found that starting with a clean tape an shielding the erase head reduces the number o mistakes that can be made.

With the erase guard still in position make test recording to check levels, etc. The quicke and most effective way is to record a spell c television advertisements from the ITA channe switching the head selector switch betwee separate advertisements. If this is satisfactory proceed to make the desired recording, workin from a script as in this simple example:

| *L.H. Channel (B)* | *R.H. Channel (A)* |
|---|---|
| | Yesterday upon the stai |
| I met a man | |
| | Who wasn't there. |
| He wasn't there | |
| | Again today. |
| I wish that he would go away. | I wish that he would g away. |

With the erase guard in position and the selector switch connecting the main record/replay amplifier to track A (as for monaural recording) set the recorder to record from microphone and say "Yesterday upon the stair," then pause, saying to yourself, "I met a man," then say aloud "Who wasn't there"; pause for "He wasn't there," say aloud "Again today, I wish that he would go away."

Stop the recording, wind back to the beginning, connect the headphones so that the tape may be monitored on both channels, reverse the head

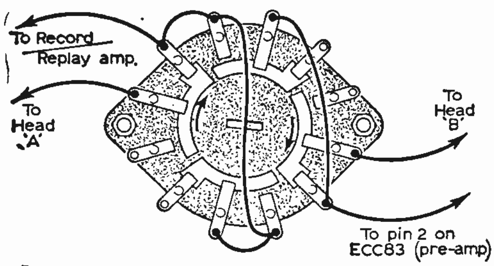



*Fig. 3—The wiring details of the switch unit shown in the same position as in Fig. 1.*

selector switch (move two positions in one direction) so that the main record/replay amplifier is now connected to track B, plug in capacitor C1 and, with the erase guard still in position, record the left-hand channel speech whilst listening to the right-hand channel thus: Listen for, "Yesterday upon the stair", and then say "I met a man", wait for "Who wasn't there", say "He wasn't there", listen for "Again today", and then in unison, "I wish that he would go away".

Stop recording, rewind, remove erase guard and C1, switch the head selector switch back to its original position and replay. You should now have a stereo type recording sufficiently useful to enable balance and phasing tests to be made.

### tereo Sound Cine Films

More ambitious recordings can be attempted nd provided they are scripted beforehand, realistic onversations may be taped in this way. An effective use of this form of stereo is the production f accompanying sound to cine films. Here, with he usual mixture of music, effects, and commentry, effective results can be produced, and in view f the increasing popularity of this home entertainment combination a brief description of the echnique used by the author may be of interest o readers. Similar methods may be employed to nake demonstration or entertainment tapes in ound only, and these are somewhat easier to produce since the timing is not so critical. Two things nould be emphasised here; one is that smooth esults can only be obtained by careful planning nd adequate rehearsal, and the other is that mistakes can so easily be made due to the complicated "set up" and so all switching operations hould be double checked at each stage of recording.

### lethod of Recording

To make accompanying film sound, the tape hould first be wiped clean on both channels by recording with the gain control at zero. Then fit the erase head guard and record a "timing scale" on channel B by speaking the time every five or ten seconds into the microphone. Rewind the tape and switch to channel A. Set up the film in the projector so that the beginning of the film and the start of the tape timing scale coincide, and run through the film talking the scenes down on to track A.

This might sound something like: "Opening title, cut to pan shot of bay, M. and J. walking in the background, medium close-up of M. and J. coming towards camera, car passes NOW . . ." and so on.

From these combined monitor tracks the sound script is drawn up. It is essential that the whole tape is scripted in full details on both channels before recording is started, so that the exact sequence of laying on the final sound can be planned. In the "end product" the commentary or dialogue should predominate over the effects and music, and where both effects and music are to be heard together the effects should be the louder. It follows from this that the music should be laid on first, the effects over the music, and the dialogue on top of the two. Too much sound will tend to be confusing, and it is better to use either effects or music as a background rather than a mixture of the two. Dialogue should be marked on the tape at this stage with marking

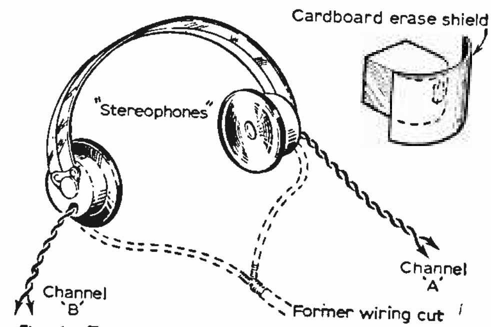


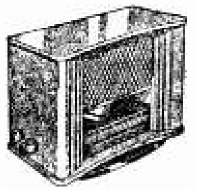

*Fig. 4—Two accessories used in the recording process.*

tabs or small strips of jointing tape, as the recording of the music and effects will wipe out the monitor tracks with their cue points. Before recordings can be made on track B the tape will have to be turned over and wiped clean of the timing track, and it is better to erase only one portion at a time just prior to recording so that accurate monitoring facilities are retained as long as possible. Except for the erasing of the monitor tracks the erase head shield should be fitted at all times.

### Effects

The recording of stereophonic effects is quite entertaining and some realistic noises can be produced. One method is to set the recording head switch to mid-position and record the whole sound effect on both tracks, subsequently working over it and erasing certain noises from one track and other noises from the other.

*(Continued on page 508)*

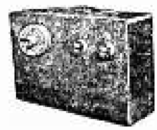


## COMPLETE V.H.F./A.M. RADIO FOR £12.10.0

(carr. paid)

Brand new set, in superb walnut cabinet (size 19 x 8½ x 14½in. high). Covering 80-100 Mc/s. 16-49 M. and 200-500 M. Mains trans. 200-250 v. with 2 tappings. Ferrite rod aerial for A.M. Controls: volume on/off, tone, tuning, w/change. Gram and ext. speaker position provided. Valves 12AT7, 12AH8, 6BJ6 EABC80, 6BW6 and metal rectifier. Fully guaranteed. Today's Value, £20.

## THE "CANTATA" 6-TRANSISTOR AND DIODE PORTABLE



COMPLETE KIT FOR ONLY

**£7.19.6** (post 3/6)

500mW push-pull output. Ferrite rod aerial. Car aerial socket and coil. M.W. and L.W. full coverage. Operates on two 4.5v. cells. Printed circuit board 8½ x 2⅞in. All holes drilled and component positions marked. Instructions 2/6 for 16p. (refunded on purchase of kit). Size 9 x 3, x 7in. 8 x 2½in. P.M. high quality speaker. Attractive Vynair covered cabinet, two-tone. Two batteries 5/6 the pair (Ever Ready 126). Mullard transistor OC44, 2 x OC45, OC81D, and 2 x OC81. Top grade We mouth Radio coils and transformers. Alignment service if required 17/6 (inc. post). Write for list of prices. All parts supplied separately. Built in two hours.

## BUILD YOUR OWN RECORD PLAYER

**Price £12 carr. paid**

*Fully built 2-valve amplifier*

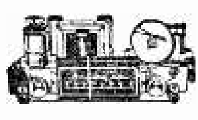
B.S.R. 4-sp. autochanger, case 17 x 15 x 8½in. Assembled in 15 mins. Similar cabinet for tape recorder with plain board only £3, carr. paid. Attractive colours.

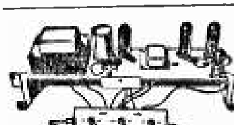
*or with 3-valve amplifier 15/- extra*

AUTOMATIC RECORD CHANGERS—LATEST MODELS. 4 SPEED CRYSTAL CARTRIDGE. All 5/-. extra carr. B.S.R. UA14, £7.10.0. Garrard Slimline, Mono £8, Stereo, £8.5.0. Motor Board for UA8, UA20, UA14, Slimline. 5/-. (post 1/6) or 3/6 post paid when purchased with Autochanger. Motor Board for Collaro C60, 4/-. post paid.

TELEFUNKEN STEREO AMPLIFIERS. 2 ECL82—2 x 2½ watts, 12 x 9 x 2in. piano keys, £7, post paid.

SELF-POWERED VHF TUNER CHASSIS. Covering 88-95 Mc/s. Mullard permeability Tuner, Dims. 10¼ x 4½ x 5in. high ECC85, EF91, EF91 and 2 diodes. Metal Rectifier. Mains transformer. Fully wired and tested. Only £7.10.2 (carr. paid). Attractive Vynair Cabinet 20/-. Room dipole 12/6, Feeder, 6d. yd.





## PUSH-PULL AMPLIFIER £5.5.0

(5/- Carr.)

Brand new 200-240 A.C. mains. Bass, treble and vol. controls. With valves EZ80, ECC83 and 2-EL84 giving full 8 w. Chassis 12 x 3½ x 3½in. With o.p. trans. for 2-3 ohm speaker. Front panel (normally screwed to chassis) may be removed and used as "flying panel." Stereo version 2 x 4 w. same price.

## TAPE RECORDER AMPLIFIER

Type TR3. Fully built, high gain, low noise, printed circuit. Attractive grey and gold front panel 13 x 1½in. Height 5½in. overall. Front to back 5½in. Vol. and on/off tone. Mike, radio, monitor and ext. speaker jacks. Valves ECC83, ECL82, EZ80. Mains trans. Ready to bolt to B.S.R. Deck. Complete with switch wafer wired. Our Price ONLY £6.2.6. (6/- Packing and Carr.) Similar model without magic eye, Type T.R.1. 3" instead of 1½", £5.15.0. (6/- Carr.).

Transistor set Battery Eliminator. Converts your 6-transistor receiver to mains operation. Size 1½ x 1 x ⅜in. With flex lead and battery charging attachment, 13/6.

Staar "Galaxy" or Garrard 9v. battery operated single 45 r.p.m. record player deck, with pick-up arm, and stylus etc. Only 50/-. P. & P. 4/-.

## NEW LOUDSPEAKER BARGAINS. Good Makes.

2-3 ohms. 13 x 8½in. 35/- (4/-); 7 x 4in. 14/6 (2/-); 6½ x 4½in. 12/6 (2/-); 10 x 6in 25/- (3/-); 5in. 12/- (2/-); 4in tweeter 7/6 (2/-); 7 x 5in. 17/6 (2/-); 9 x 6in. 22/- (2/6); 8in. circ. 18/6 (2/6); 10in. circ. 25/- (3/-). Postal charges bracketed.

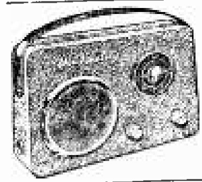
## BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £14.0.0 (Carriage Paid)

A.C. ONLY. Chassis size 15 x 6½ x 5½in. high. New manufacture. Dial 14½ x 4in. in 2 colours predominantly gold. Pick-up. Ext. Speaker. Ae., E., and Dipole Sockets. Five push buttons—OFF L.W., M.W., F.M. and Gram. Aligned and tested. O.P. Transformer. Tone Control. 1,000-100 M.; 200-500 M.; 88-98 Mc/s. Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85.

Speaker and Cabinet to fit chassis (table model). 47/6 (post 4/-). 9 x 6in. ELLIPTICAL SPEAKER, 20/-, to purchasers of this chassis.

TERMS: (Chassis) £5 down and 5 monthly payments of £2.

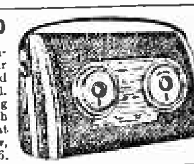
Cheap Room Dipole for V.H.F., 12/6. Feeder 6d. yd. Circuit diagram 2/6.



## 6-TRANSISTOR PORTABLE—Fully Built

The "SCALA" for only £9.17.6, carr. paid. 8½ x 2 x 5½in. high. Choice of colours. Rexine. M.W. and L.W. Ferrite aerial. Battery included. Printed circuit. Nicely styled. A professional job. 3½in. speaker. Fully Tunable M.W. and L.W.

## THIS SUPERB SET for £10



6-transistor radio with 3 push button controls, covered in sponge clean Duracour fabric, in latest two tone shades, M.W. and L.W. ferrite rod, provision for car aerial. 2-colour scale. With PP9 battery giving 300 hours use. Weighs under 4 lbs. With carrying handle. 12 x 7½in. high x 4½in. at base tapering to 2in. at top. Brand new, fully guar'teed. £10. Carr. paid. Worth £16.

## SUPERIOR GRAMOPHONE AMPLIFIER

Valves UY85, UF80 and UL84. Mains trans. 200-240 A.C. Covered baffle 13½ x 7½in. (6½in. speaker) or 11 x 7½in. (8 x 5in. speaker). 3 front controls bass, treble, on-off/vol. 74/- (post 4/-) either type. Rexine cabinet to fit, with carrying handle, and lid (detachable) 14in. or 12 x 8½ x 5in., 16/- extra.

GRAMOPHONE AMPLIFIER. With 5in. SPEAKER Baffle 12½ x 6in. ECL82 and Rectifier, Tone and Volume. On/off switch. Two knobs. Useful for Stereo, 57/- (post 4/-).

TAPE—TOP QUALITY—BOXED. 5¾in.—850ft., 15/-; 1,200ft., 17/6; 7in.—1,200ft., 17/6; 1,800ft., 26/6 (all plus 1/6 post, 2/- for 2).

## SPECIAL OFFER

Brand new tape recorder, two-tone beige case, "gold" trimmings. Magic eye, monitor, ext. speaker sockets. With 5¾in. tape and mike. Fully guaranteed. Price usually 19½ gns. Very high gain with low noise. Price £18 carr. paid.

COLLARO STUDIO TAPE TRANSCRIPTOR. 3 MOTORS, 3 SPEED. 1⅞, 3¾ and 7½ I.P.S. Push buttons. £10.17.6 (10/- carr.) incl. spool.

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

2½ watts. ECC83, ECL82 and EZ80. Controls, volume, bass and treble. On/off switch. Mains and O.P. trans. Size as for Push-Pull Amp. Suitable for microphone input and for Guitar. **95/-** P. & P. **5/-**

Also acts as telephone amplifier using pick-up coil price 14/-. Chassis 12 x 3½ x 3½in. Fixed front panel. Price includes handsome walnut finish polished cabinet, 13 x 7½in. facia containing high quality 3 ohm P.M. speaker 5½ x 4½in. (20/- less without cab and speaker).

## BATTERY ELIMINATOR

For 4 Low Consumption Valves (96 range). 90v. 15mA and 1.4v. 125mA, 45/- (2/6 post). 200-250v. A.C. Also for 250mA, 1.4v. and 90v. 15mA at same price.

## CHASSIS BATTERY RADIO

Valves DK96, DF96, DAF96, DL96. Two Short Wavebands 16 to 49 M. and 25 to 75 M. Size 10½ x 4½ x 5in. £4.16.0, carr. paid. MW and SW, £5, carr. paid. Or as Kit 75/-.

ALL ITEMS ARE NEW AND FULLY BUILT UNLESS OTHERWISE STATED. TESTED BEFORE DESPATCH.

Terms Available on Items over £5. Send 6d. (stamps will do) for 20 page illustrated catalogue. All New Goods. Delivered by return. C.O.D. 2/- extra.

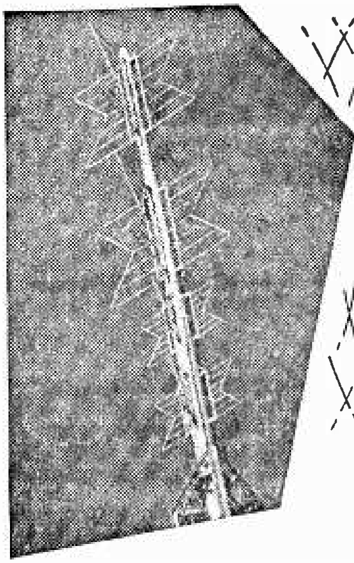
ALL ITEMS GUARANTEED 12 MONTHS VALVES 3 MONTHS

## GLADSTONE RADIO

**"SCALA", CAMP RD., FARNBOROUGH, Hants.**

(Farnborough 3371) and at 247 New Road, Copnor, Portsmouth.

FARNBOROUGH CLOSED SATS.—PORTSMOUTH WEDS.



# On Your Wavelength

By THERMION

### *Those Electronic Games Again*

THE response to my recent remark on the above subject has been amazing, and I am afraid that I cannot answer individually all those who have been kind enough to send me letters, articles, and drawings covering almost every aspect of this subject. I have passed many of them on to the editorial section of this paper to see if any of them are suitable for publication and no doubt use will be made of some of the very wide range of material which has been supplied. The only point which surprises me is that this response was not forthcoming when I first wrote about it and it was only after I had pointed out this fact that so much interest appears to have been aroused.

### *Unusual Faults*

When I have mentioned particular faults in past issues I have been surprised at the interest which has been taken and the novel way in which some of my readers have offered solutions to the problems mentioned. I recently heard of another of these peculiar faults which leaves both the amateur concerned, and my humble self, deeply mystified. The apparatus in question is part of a home-built radio-gram which has been in use for many years. The amplifier section has now developed a fault which is baffling and does not appear to answer to all normal tests. It is of the 20W class, with two KT66's in the output stage, and all condensers are of the paper type (no electrolytics) rated at 1,000V, although the H.T. line is only 350V. The fault takes the following form: when the amplifier is switched on there is the usual short period of silence whilst the valves are warming up and then a most terrific hum builds up. This reaches a peak and then slowly fades away to complete silence. This is, of course, with the volume control turned to minimum and in this condition the amplifier is inaudible, both acoustically and electrically. If the volume is then turned up there is "perfect" reproduction without the slightest trace of hum and no distortion of any kind which can be heard. If the volume control is turned up before switching on (a separate on/off switch is employed) the noise is claimed to be deafening at its peak. Of course, I suggested all the usual things, basing the trouble on valves, the hum appearing to come with increasing current, but, what I fail to see, is why it should disappear when the valves are at maximum emission, especially as in this condition everything seems to be working correctly. I understand that a current meter inserted in the H.T. lead, and in either of the output valve anodes, shows the normal rise as the valves heat, and there is no indication of a sudden rise or fall accompanying the cessation of the hum.

### *Progress?*

I had an opportunity of inspecting some of the new season's models which were shown at this year's Radio Show before it opened, and must confess I was not a little surprised at what I consider is a lack of progress in general design. The same old printed circuit seemed to be generally adopted, and there did not appear to be any of the modern component design incorporated in the majority of them. One particular component which has now been on the market for some years, appeared to be conspicuous by its absence, and I have tried to locate its use in many of the receivers which have been produced during the last two or three years, but must confess that I cannot find even one. I suppose the reason is that the printed circuit has taken over, although I feel that there is more scope in the particular item I refer to. This is, of course, the turret valveholder. This enables all the main components associated with a particular valve to be mounted round the actual valve base. The particular component I have in mind also has, at the lower end, a set of valve pins corresponding to the particular socket and this enables the valves to be inserted in the holder and the entire assembly may then be removed or replaced, which greatly facilitates experimental work.

# A HOME-MADE HI-FI OUTPUT TRANSFORMER

BY W. GROOME

THE USE OF A TERTIARY FEEDBACK WINDING ARRANGEMENT SIMPLIFIES THE CONSTRUCTION OF THIS TRANSFORMER AND REDUCES THE COST.

*(Continued from page 400 of the September issue)*

IN last month's article the author began an explanation of his home-made transformer which included descriptions of some interesting circuits for its use. In Fig. 4, for example, a triode "see-saw" phase-splitter amplifier stage feeds the output pentodes. The tertiary winding, earthed one end, supplies feedback to V1 via R2 and provides a path for the cathode current.

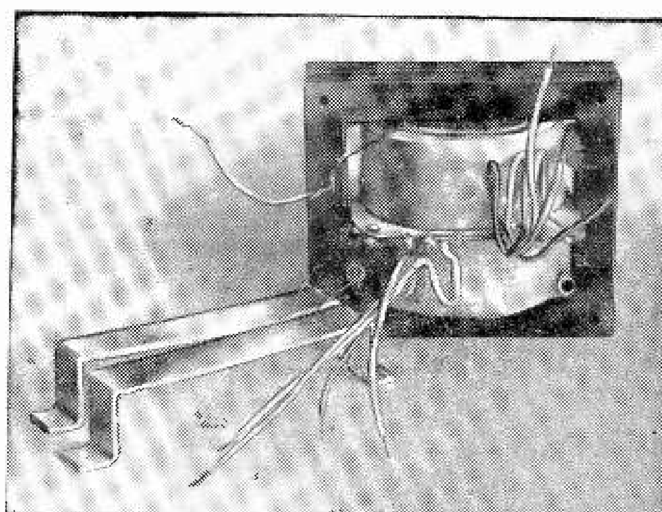
If pentodes were used for the phase-splitter stage the sensitivity, held by the feedback ratio, would remain the same. The feedback ratio, and with it the amplifier sensitivity, can be made variable by shunting the tertiary winding with a 100Ω potentiometer and taking the feedback voltage from the tap, as shown in Fig. 5 (last month). This refinement may be of interest to some experimenters, but the triode circuit will be found suitable for most domestic purposes. The ECL82 valve, comprising an amplifier triode and an output pentode enables a two-stage push-pull amplifier to be built around only two valves—and stereo using only four valves becomes a practical proposition.

### Cathode Follower Output

The improvement achieved by the use of feed-back over the output stage (apart from easing the application of overall feedback) is a 'natural sound' that is not likely to show up on instrument tests. It is real enough, however, and the once-popular cathode-follower circuit with its virtually complete cancellation of its own distortion and immunity from the errors that can arise in a complex loop, gives a realism that is still hard to better. Its limitation to triode efficiency and the large grid voltage swing needed for full loading have caused it to decline in popularity and designs more suitable for pentodes have become more popular.

These are the "distributed load" circuits, of which the quaintly named ultra-linear version is best known. As the author's transformer has both secondary sections split into two well-insulated sections with free leads, it can be connected in the ultra-linear mode as shown in Fig. 7. It is true that the tap at 50% is higher than is customary but this closer approach to triode conditions has not been found to be the slightest drawback.

Ultra-linear connections are not the only, or even the first, form of distributed load circuit, for a more elegant circuit was developed in this country several years before the 'ultra-linear' circuit appeared. However, the version shown in (Fig. 7) embodies cathode loading which, as stated in an earlier paragraph, is a highly desirable method of obtaining output stage feedback. Despite the strangeness, on paper, of a load distributed between anode and cathode, the relationship to the ultra-linear arrangement can be appreciated when the screen is considered, this being tapped into the transformer load in both cases. This is obvious in the ultra-linear circuit; in Fig. 7, it is still loaded by the transformer because its current and signal are compelled to flow in the cathode winding.



*One of the author's prototype experimental output transformers.*

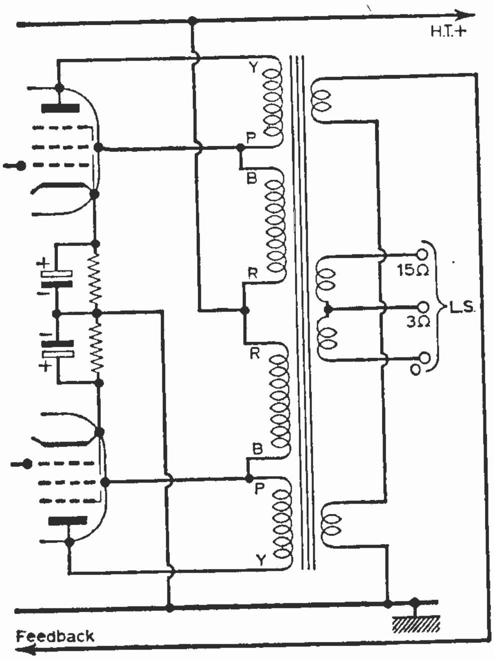
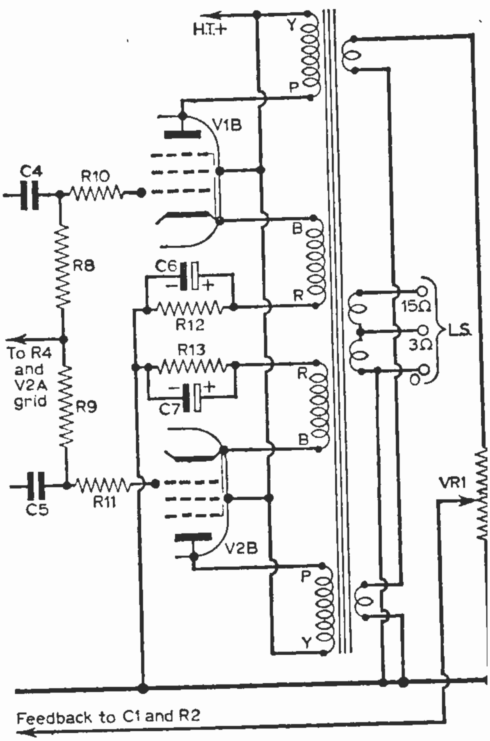



*Fig. 6 (left)—Connections for ultra-linear loading.*

*Fig. 8 (below)—Rearrangement of a two-stage amplifier for anode/cathode loading.*




### 50 : 50 Distribution

This form of loading can be tried by connecting the transformer as indicated in Fig. 8. Bear in mind, however, that the output circuit is patented. The transformer and its associated circuits must not be compared with a well-known make of amplifiers to which this form of loading is exclusive. As 50:50 load distribution must be used, the output stage feedback is already nearly enough to give the required reduction in distortion and output impedance and the amount needed in the overall loop is therefore small. For this reason, a potentiometer is shown across the feedback winding in Fig. 8, which shows the ECL82 circuit modified for this form of loading.

As the grid resistors are returned to earth (via the grid resistor of V2A) the D.C. resistance of the cathode loads contributes towards the bias voltage of the output

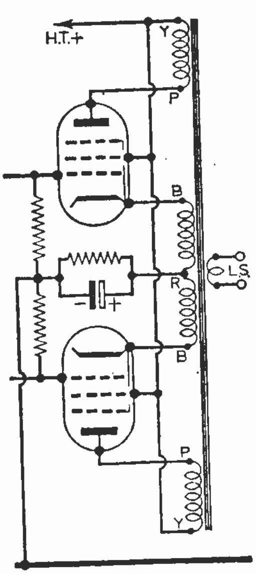



*Fig. 7 (right)—Here the load is distributed between the anodes and cathodes.*

valves. The resistance of these portions ‹ the windings should therefore be checked ar the value of the bias resistors reduc‹ correspondingly. A variation of this for of distributed loading has the grid resistors co nected to the cathode ends of the load and ı adjustment of the bias resistors is needed. It not really suitable for use with a see-saw phas splitter, but can be driven by a "concertina circuit either in the straight form or in the hig gain versions, one of which employs the inp resistance of the phase-splitter to load an amplifi pentode, and another using the pentode in starv tion anode conditions. This phase-splitter c also be used in a positive feedback circuit f high gain but it is preferred to keep the sigr "clean" at every stage rather than have to cle up an accumulation of distortions with the ma feedback loop.

### Input Signal

Now that crystal pick-ups have reached hi fidelity standard, with outputs so much grea than the magnetic types that were once essent for the discriminating listener, and radio tun also deliver large signals, there is no longer urgent need for great sensitivity in the domes amplifier. Indeed, amplifiers requiring as mı as 4V input can be fully loaded, for the sig

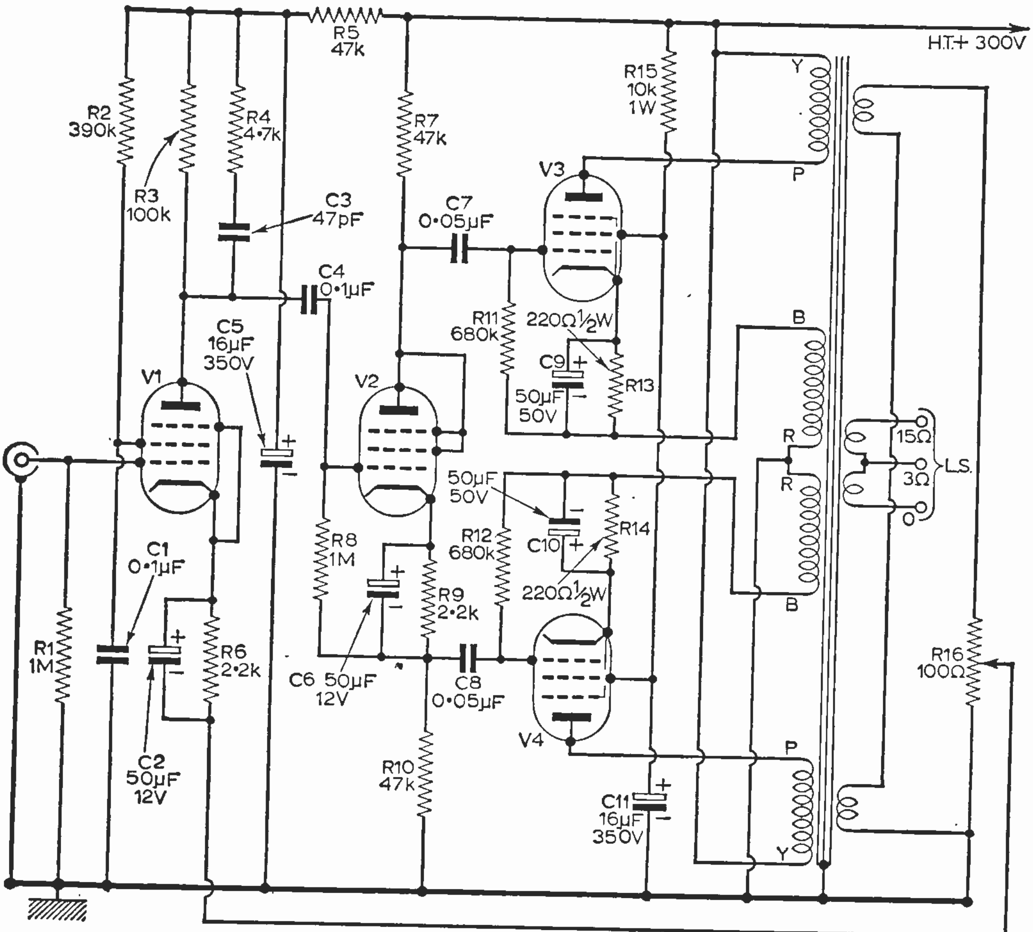



*Fig. 9—A three-stage amplifier with another version of anode/cathode loading.*

almost always passed through a pre-amplifier ›ntrol unit first, and a highly sensitive amplifier ›uld be hopelessly overloaded.

The straight pentode and concertina circuit ıown in Fig. 9 will give all the gain likely to be ꞉eded. The grid resistors of the output valves ·e connected to the cathode ends of the cathode ads. The front end can be altered if it is wished try one of the high-gain versions, without astic alteration of the remainder. The use of ·o A.C. couplings is not likely to cause instability th tertiary feedback, but direct coupling between l and V2 can be used by the constructor terested in the experiment. V1 and V2 could triodes, i.e., a double triode.

The transformer, of which constructional details ll be given in the next issue, has been used in variety of circuits, not all of which were con- ered desirable when matters of cost and ease adjustment were taken into account. All, how- eı, tended ·o prove the inherent stability of the ·tiary feedback system.

*(To be continued)*

# P.W. SIGNAL GENERATOR

*(Continued from page 482)*

so on, at 200kc/s intervals, until the generator harmonics are too weak to hear.

The fifth harmonic of 200kc/s will be 1,000kc/s, or 1Mc/s, and the generator may be tuned to this. Harmonics of the generator will then be heard at 2Mc/s, 3Mc/s, 4Mc/s and so on, at 1Mc/s intervals, until too weak to be found. It is, of course, necessary to have a receiver with short-wave ranges, for this purpose. By proceeding as described, calibration marks can be obtained at 1Mc/s intervals.

In many parts of the country the National Physical Labaratory signal on 2·5Mc/s can be received. This will furnish a 2·5Mc/s calibration of great accuracy. By proceeding as above, harmonics of this will furnish calibration marks at 5Mc/s, 7·5Mc/s, 10Mc/s and so on, at 2·5Mc/s intervals. ■

# INCREASING AMMETER RANGES

By G. A. W. Partridge

MOST radio dens have milliammeters or multimeters but not always ammeters. However, a good milliammeter will make a useful ammeter provided a reliable shunt is used. There are times when it is desired to measure the currents of heaters, small motors or such other apparatus which may draw up to one ampere. In some cases it may not be necessary to increase the range to 1A but only to, say, 500mA, which will mean using a shunt of different resistance.

The resistance of a shunt can be calculated from:—

$$R = \frac{Rm}{n - 1}$$

Where R is the resistance of the shunt, Rm is the internal resistance of the meter and $n$ is the multiplication factor.

For example, a 0—1mA meter is to be used in a 1A circuit. Its internal resistance is 50Ω. What then will be the resistance of the shunt?

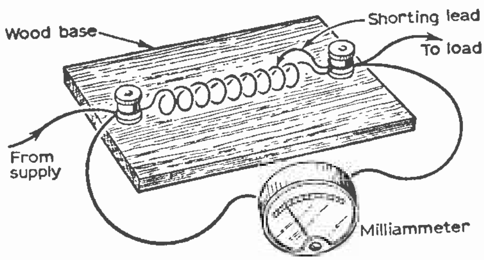



*Fig. 1—Connecting a shunt across a milliammeter.*

The range of the instrument will be increased 1,000 times, so $n$ will be 1,000.

$$R = \frac{Rm}{n - 1} = \frac{50}{1000 - 1} = \frac{50}{999} = 0{\cdot}05\Omega$$

It will be appreciated that great accuracy is required here. If the shunt had an error of 0·01 it would make the meter inaccurate by 20%. A shunt of this type would also have to be robust as it has to remain accurate over a long period of time. There are special types of shunt on the market which are very reliable. However, for reasonable accuracy a shunt can be made up and used for ordinary purposes. Fig. 1 shows a shunt connected to a meter. It is mounted on a hard, dry wooden base between two terminals. Note the copper shorting lead which is for calibration purposes. If resistance wire at one ohm per yard

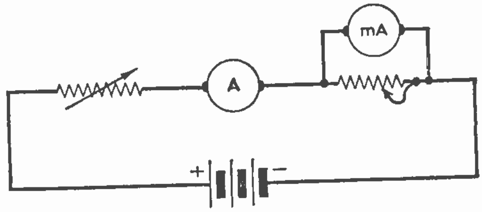
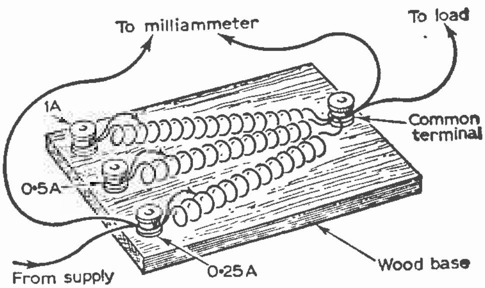



*Fig. 2 (above)—The calibration circuit.*
*Fig. 3 (below)—Multi-range shunts.*




is chosen an 0·05Ω would require 1·8in. About 2in. should be used and calibrated as shown in Fig. 2. A reliable ammeter is the standard. The rheostat is adjusted until 1A is flowing through the circuit. The shorting lead is soldered on to various points along the shunt until the milliammeter reads full-scale deflection. The leads to the milliammeter that were used when calibrating the shunt must always be used as their resistance is part of the milliammeter circuit.

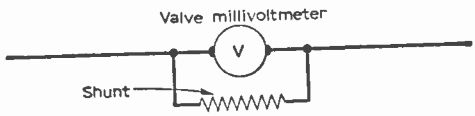



*Fig. 4—A valve millivoltmeter as an ammeter.*

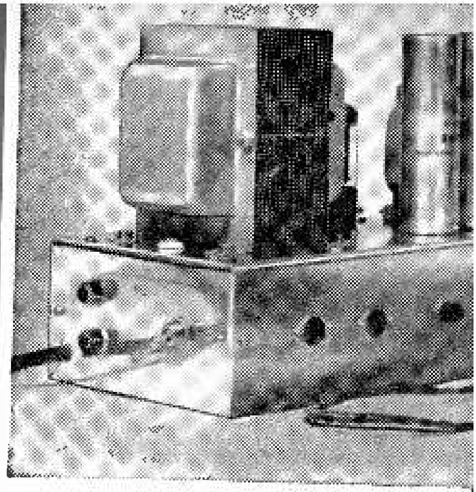
If various ranges are desired, several shunts can be made up and mounted as shown in Fig. 3.

A.C. milliammeters are not very common but readers who happen to have such instruments will have to calibrate their shunts on the frequency that they intend to use. A.C./D.C. instruments will have to have separate shunts for D.C. and A.C. because it is only the internal resistance that affects the D.C. calibration, but the internal impedance determines the calibration in A.C. work.

Valve millivoltmeters can also be used as ammeters or milliammeters for A.C. or D.C. work

*(Continued on page 522)*

# The STRAND Amplifier



FOR a close approach to realism in sound reproduction an amplifying system must be capable of handling peak power levels greatly exceeding the average sound level, in order to accommodate transients.

Faithful reproduction of these transients is essential if the character and vitality of the original performance is to be retained. It is generally considered that a power reserve of 15-20W is desirable for a good quality reproduction system, and the full range of audible frequencies should, of course, be amplified with negligible distortion or frequency discrimination.

The Strand amplifier has been designed to meet such requirements. The circuit contains several well known features including a distributed loading push-pull output stage. This arrangement enables an output of 20W to be obtained for an input of 0·225V, with 30dB negative feedback applied overall. An output of nearly 30W is obtained before overloading occurs. The frequency response characteristic at the rated output of 20W is flat within ±0·5dB from 30c/s to 2kc/s.

A two-unit form of construction has been adopted as this avoids the use of what might be an inconveniently large single chassis, and also has the advantage of providing more flexibility when planning the installation of the equipment. Furthermore, good separation of the power supply components and the amplifier proper is always desirable as this reduces the chance of hum being induced into the input stage.

### *Input Stage*

A high degree of voltage amplification is obtained in the first stage, with a good signal-to-noise ratio due to the use of a low-noise pentode type EF86. Negative feedback is applied to the cathode of this valve from the secondary of the output transformer, via a high frequency attenuation network, C10, R14 (see Fig. 1a on Blueprint).

It should be noted that high stability cracked carbon type resistors are specified for the anode, screen and cathode circuits of V1.

The anode of this voltage amplifier is directly coupled to the grid of V2A. The absence of a coupling capacitor reduces phase shift and ensures good stability at low frequencies.

### *Phase Splitter and Driver*

The double triode V2 (ECC83) functions as a phase splitter and a driver stage for the output valves. The two cathodes are connected to chassis via a common resistor R8, and the valve operates as a cathode-coupled phase splitter. This type of phase splitter has a particularly good performance at higher frequencies. The grid of the second triode section, V2B, is earthed by C6, and the operating conditions are determined by the D.C. potential applied via R6.

### *Output Stage*

A pair of EL34 pentodes, V3 and V4, form the push-pull output stage. These valves are operated under distributed load conditions. In this method of operation, also known as "ultra linear", the screen grids of the two output valves are not connected directly to the H.T. supply but are taken to tappings on the primary of the output transformer. These tapping points are arranged so that approximately 20% of the primary winding is between the anode and screen grid circuits in each case.

### *Output Transformer*

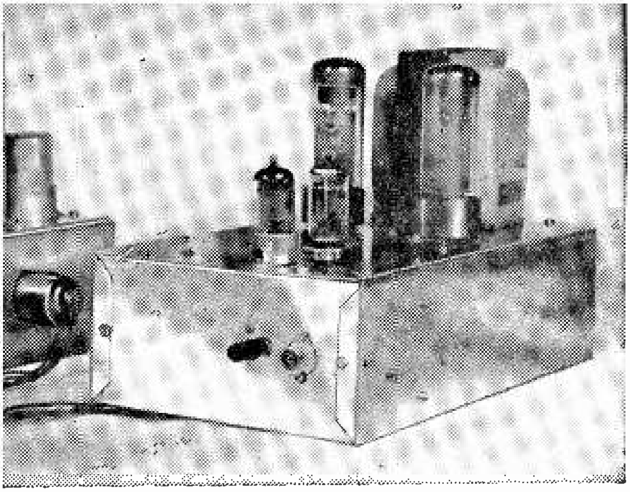
The performance of any amplifier is very largely determined by the characteristics of the output transformer. The output transformer used in this amplifier has a 7,000Ω primary, with a centre tap and screen grid taps at 20%. A high primary inductance of 225H ensures good low frequency performance, while excellent response at the high frequencies is attained through the use of sectionalised primary and secondary windings, which reduce the leakage inductance to about 14mH.

The transformer is capable of delivering the full rated output of 20W over the frequency range 30 to 20kc/s and upwards. The low frequency cut-off point is 5c/s. Resonance occurs at 90kc/s and is thus well beyond the audible range.

### *Power Supply*

H.T. and L.T. supplies are fed into the power amplifier by a four-core cable which is terminated in an 8-way octal plug PL1.

All power supplies are obtained from the mains transformer T2. H.T. rectification is performed by V5 (GZ34) and filtering by L1, C13 and C14. The



**THE CIRCUITS AND WIRING DIAGRAMS FOR THIS AMPLIFIER AND ITS POWER PACK ARE GIVEN ON ONE SIDE OF THIS MONTH'S BLUEPRINT.**

**By F. E. BENNETT**

smoothed D.C. output is approximately 465V. Protection is afforded against overload or short-circuit of the H.T. line by the 250mA fuse, FS1. The H.T. positive line and the common earth return are connected to SK3, pins 4 and 6 respectively; the 6·3V 5A winding on T2 is connected to pins 1, 2 and 7, 8 on this socket.

The H.T. consumption of the main amplifier is about 140mA, and since the 410-0-410V winding is rated at 180mA, a further 40mA may be drawn via the two 5-way sockets SK4 and SK5. Pin 3 of each of these sockets is connected to the main H.T. line via a separate dropping resistor, and a 16$\mu$F smoothing capacitor is connected across each auxiliary H.T. output.

The values of R25 and R26 may of course be varied to meet the requirements of a particular pre-amplifier, radio tuner or other auxiliary equipment, but the total H.T. current drawn from these outlets must not exceed 40mA.

The second 6·3V winding on T2 is connected to pins 1 and 5 of SK4 and SK5, while the centre tap of this winding is taken to chassis, as is pin 4 on both of these sockets. The maximum current available from this 6·3 V supply is 2A.

Note: a supplementary L.T. supply of up to 1·5A may be drawn from the 6·3V 5A winding since the main amplifier valves consume a total of 3·5A. The modification required would be to disconnect the wiring between pins 1 and 5 of SK4

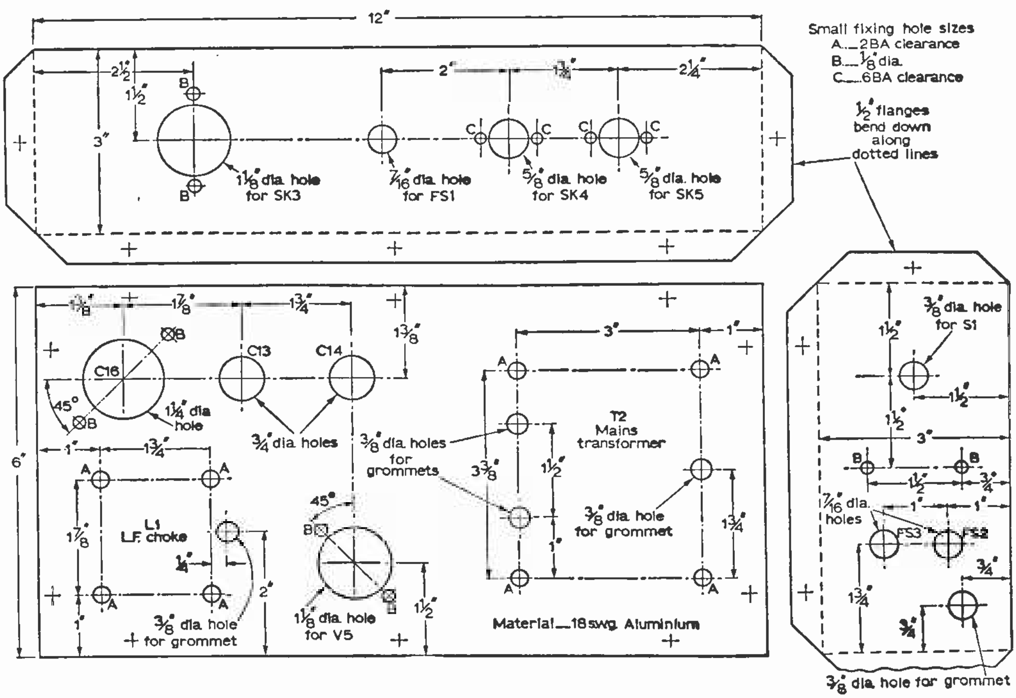



*Fig. 4—The drilling details of the power pack.*

PRESENTED FREE
WITH
"PRACTICAL WIRELESS"
OCTOBER 1962

# Practical Wireless STRAND AMPLIFIER

PUBLISHED BY GEO. NEWNES LTD., TOWER HOUSE, SOUTHAMPTON STREET, LONDON W.C.2.

PRICE 5/-

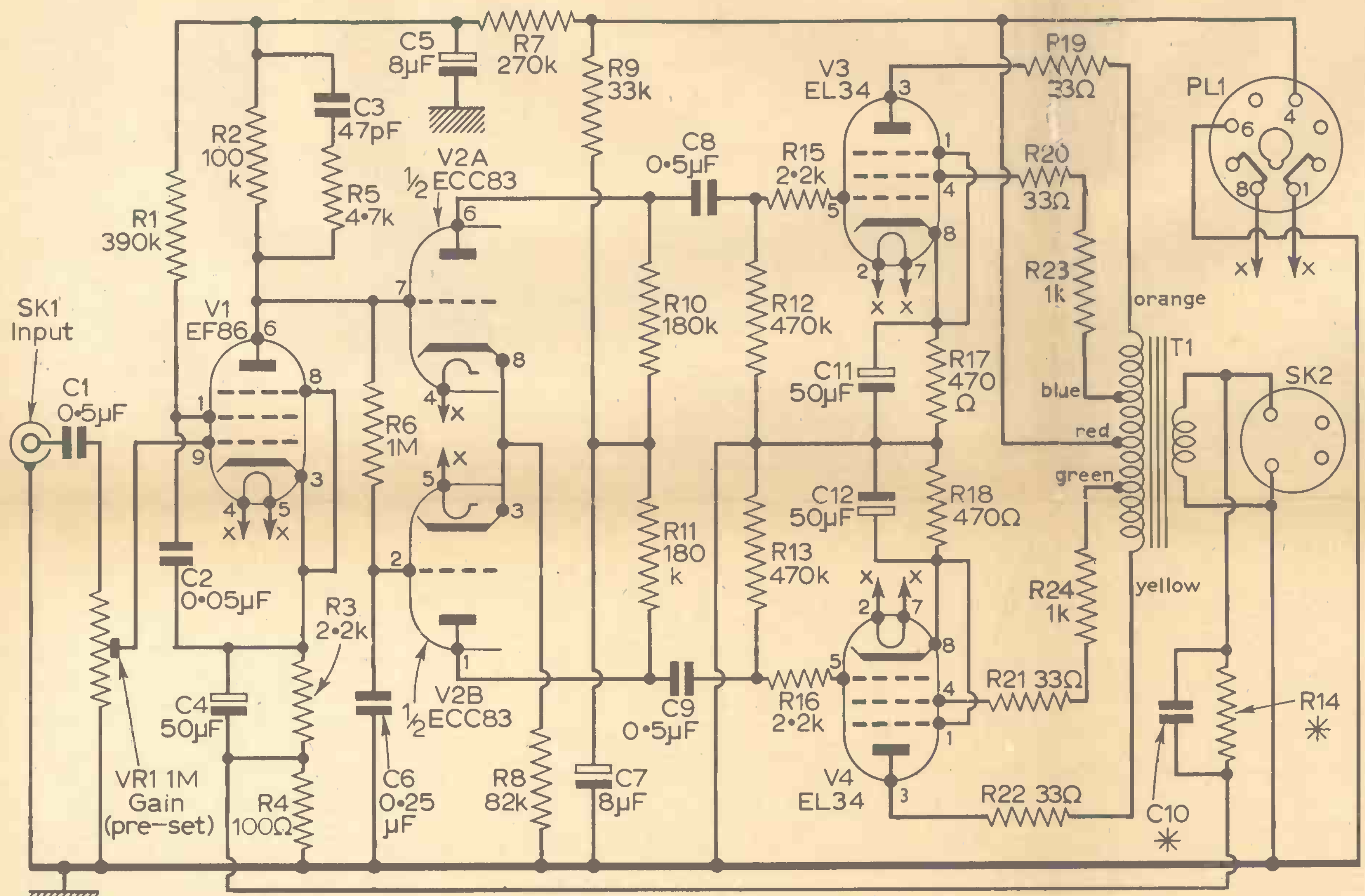
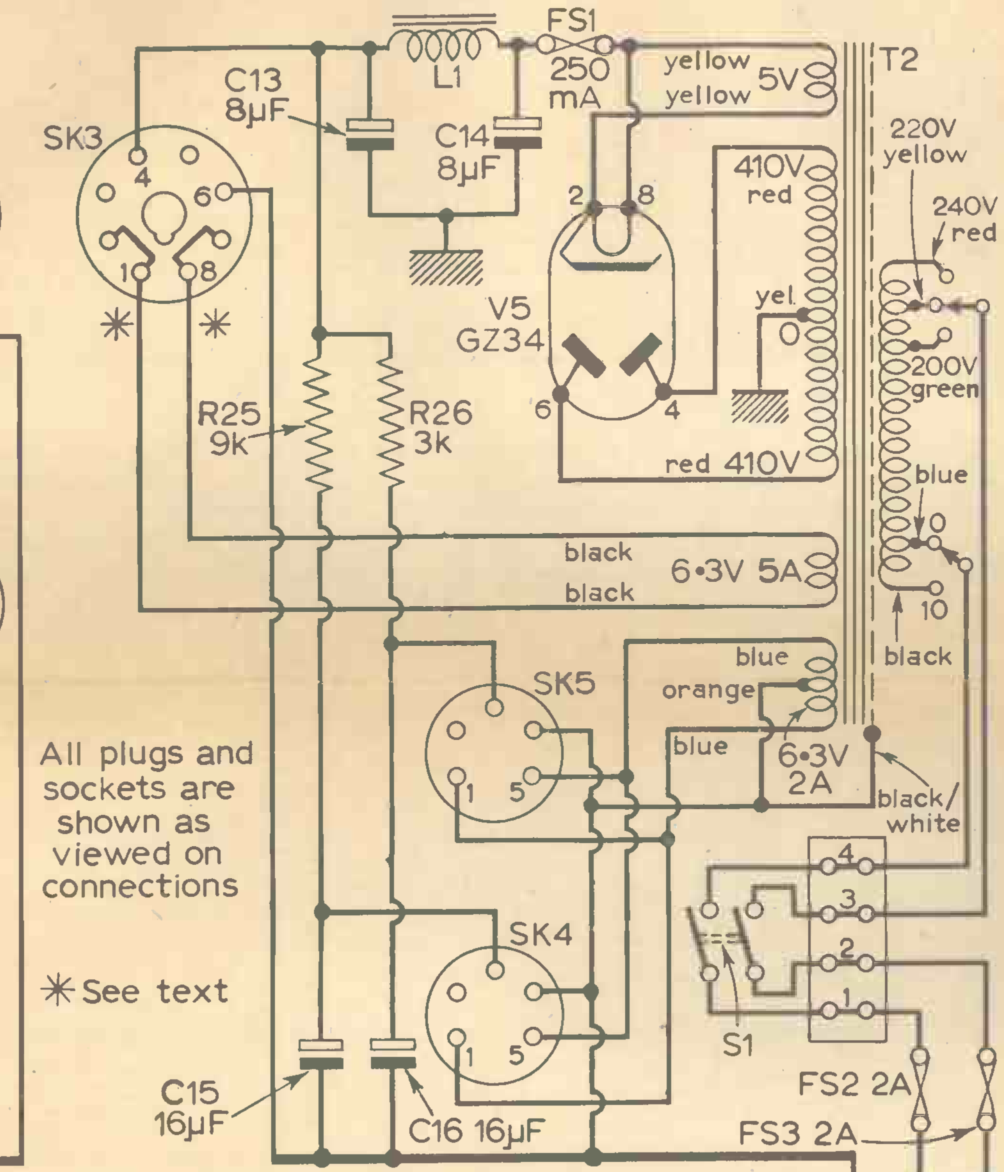


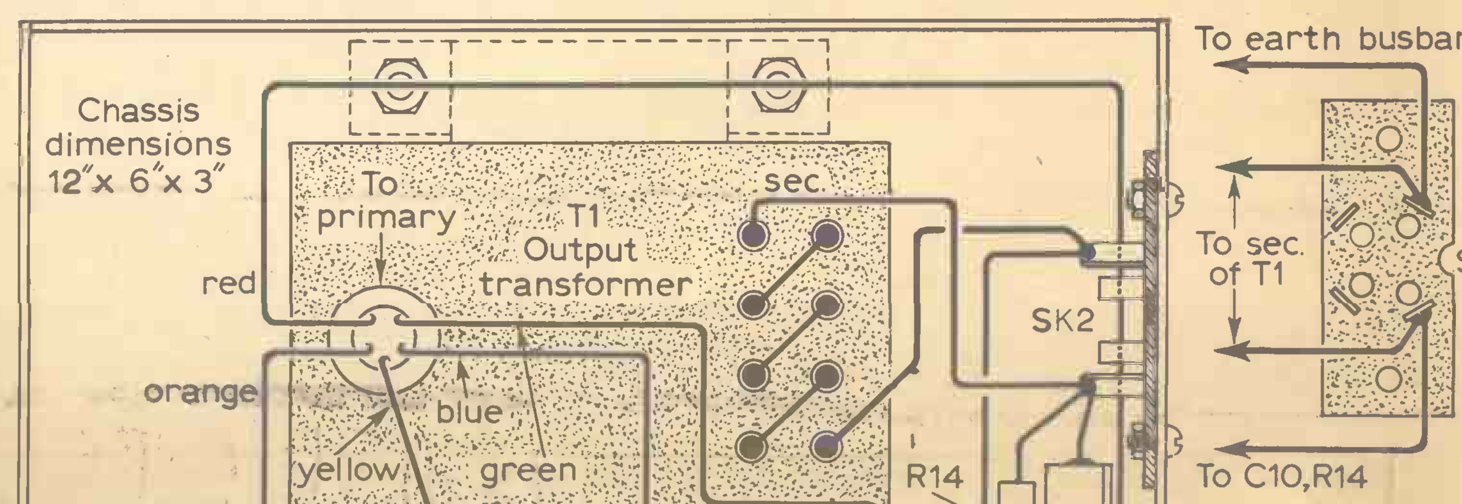

Fig. 1a – The circuit of the Main Amplifier

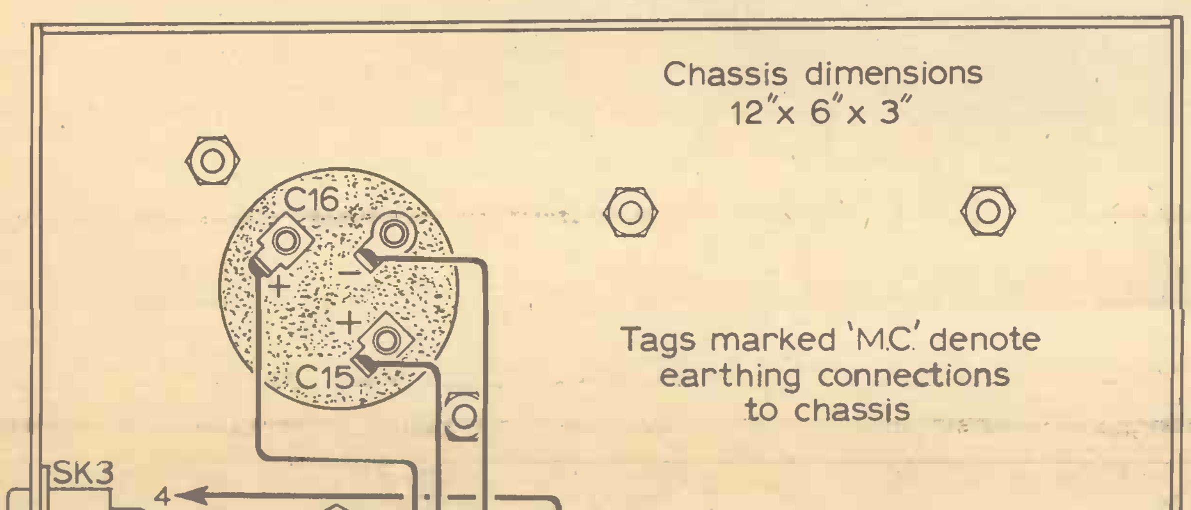


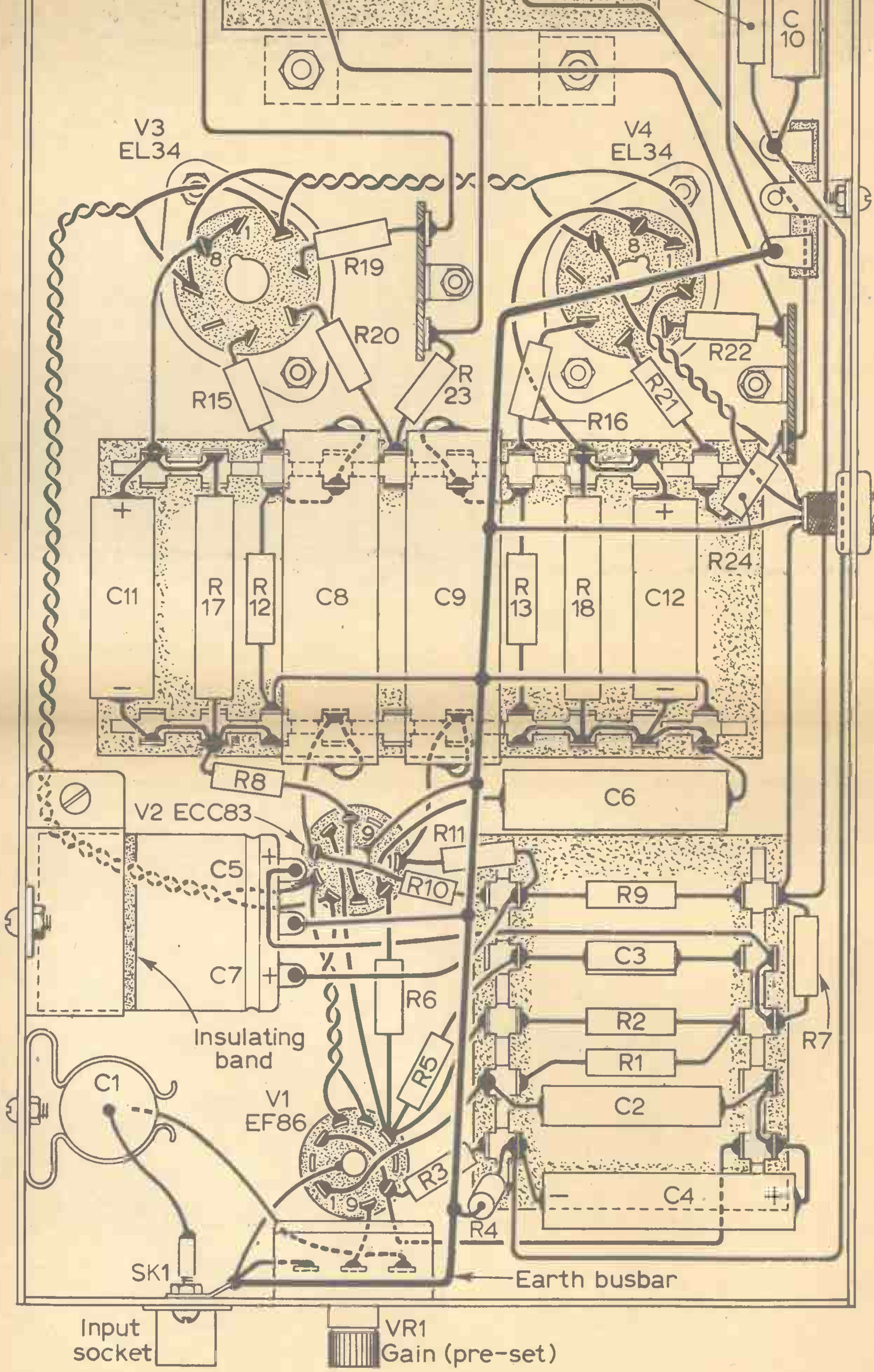

All plugs and sockets are shown as viewed on connections

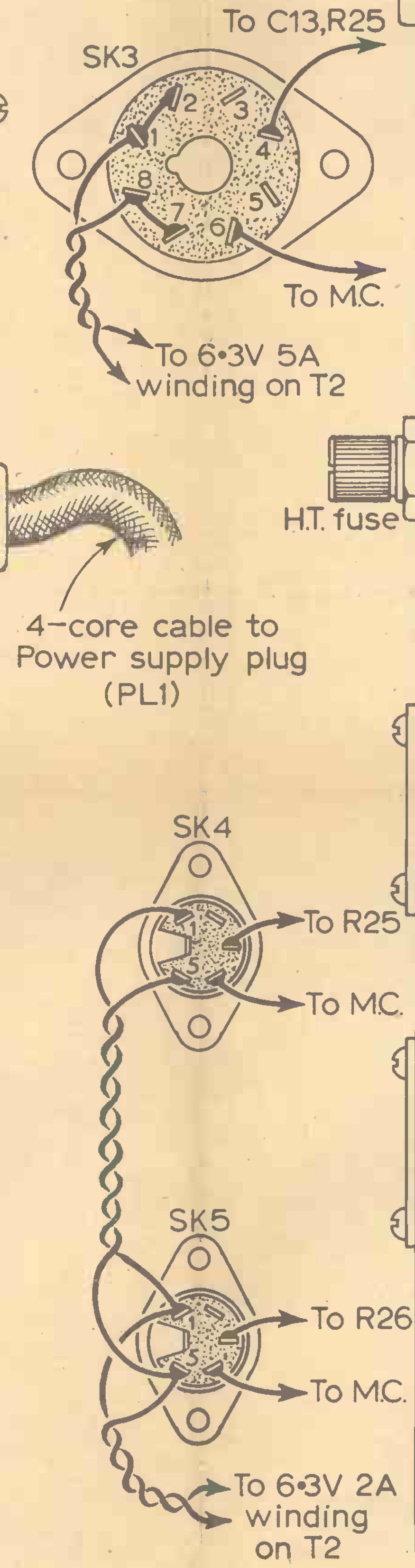
✳ See text

Fig. 1b – The circuit of the Power Unit






**Note:** *For detailed list of components and full constructional details, see associated text.*

Fig. 2 – The under-chassis wiring of the Main Amplifier.

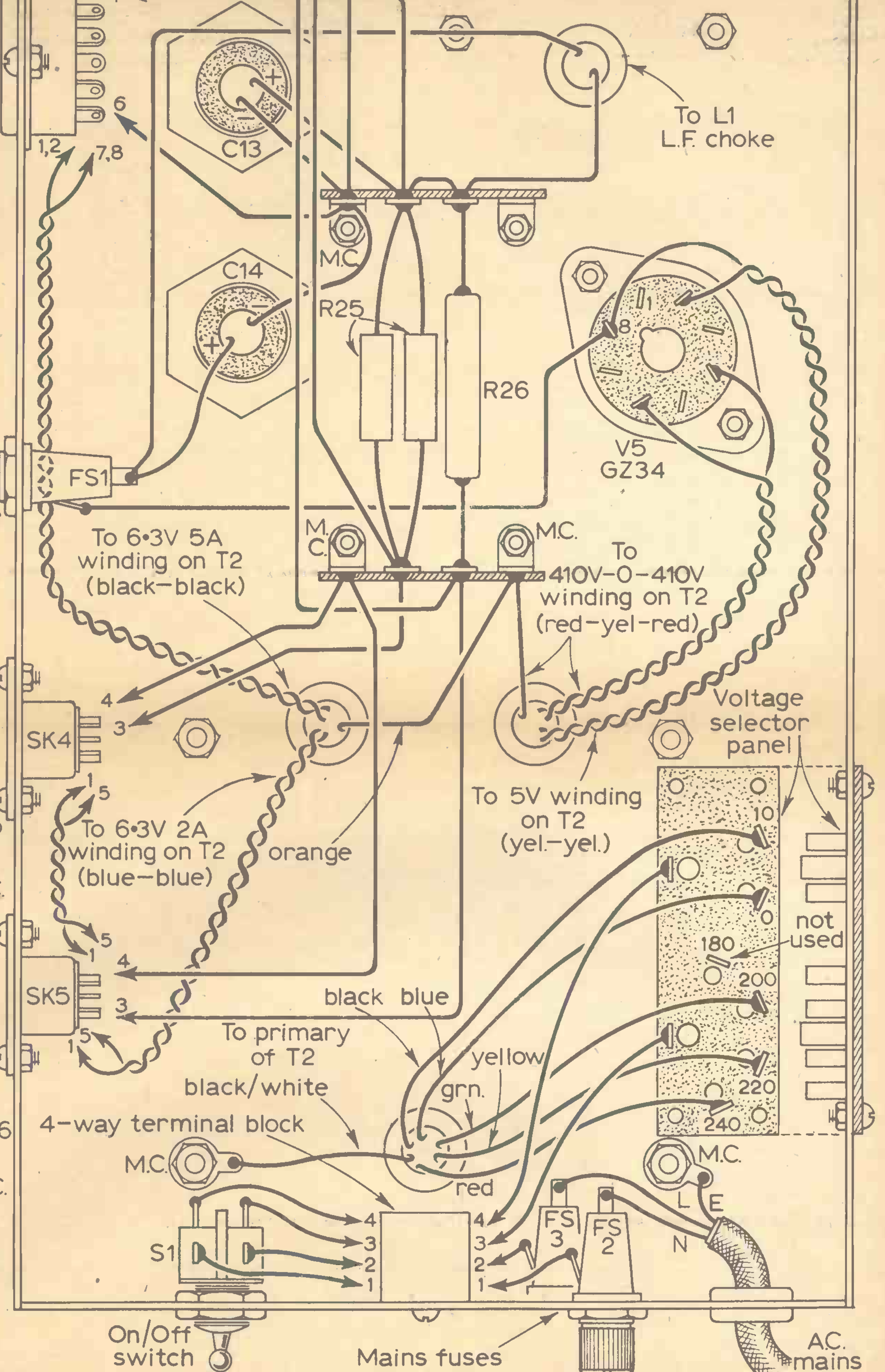



Fig. 3 – The under-chassis wiring of the Power Unit.

and SK5 and then to connect pins 1 and 5 of SK4 to pins 1 and 8 of SK3.

The 4-way terminal block is included in the mains input circuit in order to facilitate the transfer of the mains switch S1 to an associated pre-amplifier if remote control is required.

### Construction

The main amplifier and the power supply are built on separate chassis. Both chassis measure 12in. x 6in. x 3in. and can be constructed from 16 or 18s.w.g. sheet aluminium, or may be purchased in prefabricated sections requiring only bolting together.

The arrangement of components and wiring shown in Figs. 2 and 3 (see Blueprint) has proved very satisfactory and should be adhered to as closely as possible.

The orientation of the mains transformer, smoothing choke and output transformer should be particularly noted. It will be seen that when the two chassis are side by side—thus providing the most compact installation—the core of the output transformer is at right angles to the core of the mains transformer and choke, and hum pick up is reduced to the minimum.

Where the installation demands some other arrangement, one chassis may be turned through 90° with respect to the other, provided that the two units are spaced apart.

### Assembling the Power Unit

Complete all drilling according to Fig. 4 and remove any burrs. Mount the components, commencing with the smaller items and dealing with the sides before the top of the chassis. The mains transformer and the choke must be securely bolted in position, with washers beneath the bolt heads and nuts. Fit rubber grommets to the three holes adjacent to the mains transformer; also to the hole at the side of the choke, and to the hole for the mains cable in the front side panel.

Feed each of the three groups of leads from the mains transformer through the appropriate grommet hole, then proceed to wire up, checking the colour coding of these leads with the circuit diagram (Fig. 1b) and the wiring diagram (Fig. 3). Pay particular attention to the heater leads. Each pair should be tightly twisted and then be run close to the chassis, in the angle of the sides and top wherever possible.

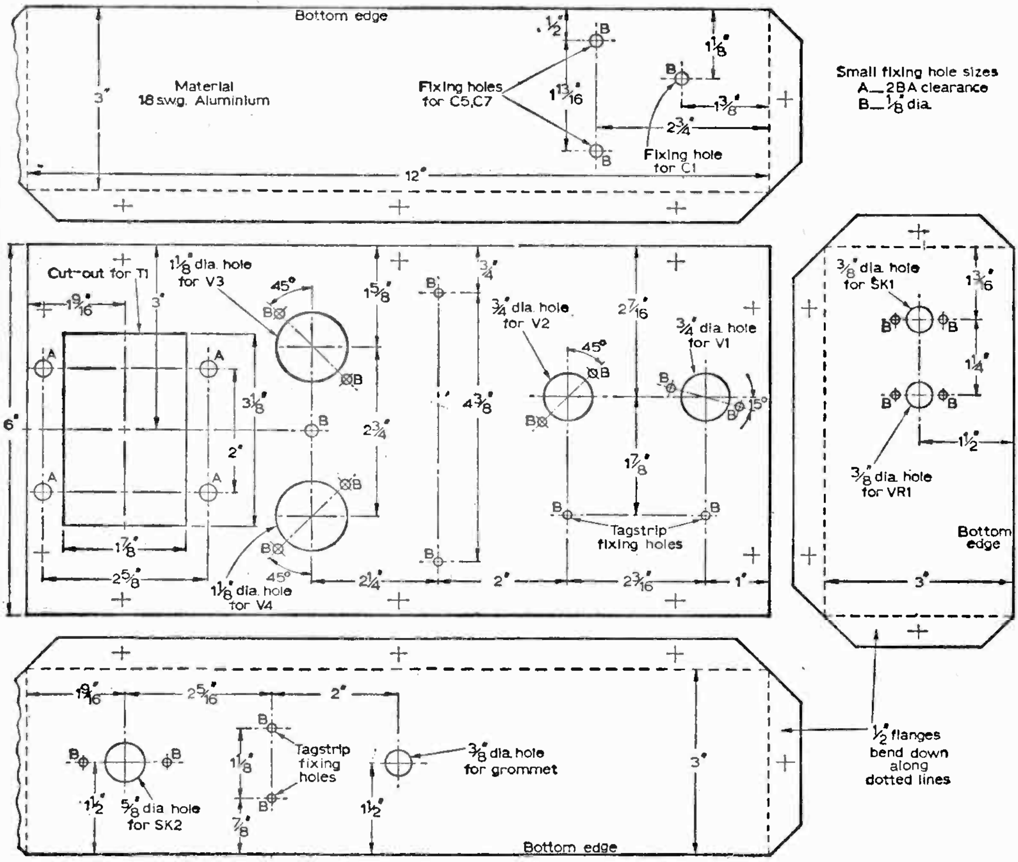



*Fig. 5—Drilling dimensions for the amplifier chassis.*

### Assembling the Power Amplifier

Refer to Fig. 5 for details of the chassis drilling. Proceeding around the sides of the chassis, fix in position the following items: clips for capacitors C5/C7 and C1; input socket SK1 and gain control VR1; and 3-way tag strip and output socket SK2. Mount the valveholders, ensuring that a skirted, low-loss B9A holder is fitted in V1 position. Fix the 10-way and 5-way group boards, and the two 3-way tag strips to the underside.

Wire the heater circuit to the valveholders using tightly twisted leads. Run these leads close to the chassis.

Mount the output transformer and securely bolt in position. The group of eight terminal posts on the underside of T1 must be adjacent to the output socket SK2. Indentify the primary leads and connect these as shown in Fig. 2.

Now proceed to complete the amplifier wiring stage by stage, starting at SK1. Pins 2 and 7 on the valveholder of V1 must be connected to the centre spigot. Avoid overheating the high stability resistors when soldering these components in position. To facilitate the wiring operation, the dual electrolytic capacitor C5/C7 should not be placed in position or connected up until all the other components associated with V1 and V2 have been wired in position. Furthermore, note that the metal can of this capacitor must be isolated from chassis by means of an insulating band fitted around the lower part of the can. Ensure that the bottom of the can is clear of the chassis before tightening up the clamping screw. The earth busbar should be ignored until all the foregoing work has been completed.

The method of ascertaining the appropriate values for R14 and C10 is dealt with later.

### Earth Busbar

It will be noted that an earth busbar is used for all earthing connections in the amplifier chassis. The busbar is earthed to the chassis at one point only—this being close to the input socket SK1. This arrangement minimises hum picked up from currents circulating in the chassis. The busbar should be made from a length of 14 or 16s.w.g. tinned copper wire. This wire should be stretched out so that it is straight and rigid. Solder a tag to one end of the wire and secure this to one of the screws holding the input socket SK1 in position. Make a sharp bend about 1½in. from this anchored end of the wire, and make another about 7in. further along but in the opposite direction so that the free end may be anchored on

## COMPONENTS LIST

**Resistors (All 10% ½W unless otherwise stated)**

- R1 390k high stability, cracked carbon
- R2 100k high stability, cracked carbon
- R3 2·2k high stability, cracked carbon
- R4 100Ω 5% high stability, cracked carbon
- R5 4·7k R7 270k R9 33k
- R6 1M R8 82k
- R10 180k, R11 180k } Matched to within 5%
- R12 470k, R13 470k } Matched to within 5%
- R14 see text R15 2·2k R16 2·2k
- R17 470Ω 5% 3W w.w.
- R18 470Ω 5% 3W w.w.
- R19 33Ω R21 33Ω R23 1k
- R20 33Ω R22 33Ω R24 1k
- R25 9k 2W (2 x 18k 1W in parallel, see text)
- R26 3k 3W w.w. (see text)
- VR1 1M carbon potentiometer (pre-set)

**Capacitors**

- C1 0·5μF paper 350V
- C2 0·05μF paper 350V
- C3 47pF silvered mica ±10%
- C4 50μF elec 12V
- C5 8μF elec 500V (dual section with C7)
- C6 0·25μF paper 350V
- C7 8μF elec 500V (see C5)
- C8 0·5μF paper 350V C12 50μF elec 50V
- C9 0·5μF paper 350V C13 8μF elec 600V
- C10 see text C14 8μF elec 600V
- C11 50μF elec 50V
- C15 16μF, C16 16μF } dual elec 500V

**Valves**

- V1 EF86 V3 EL34 V5 GZ34
- V2 ECC83 V4 EL34

**Choke**

- L1 L.F. choke 10H 180mA 200Ω (Gilson W01341 WES)

**Transformers**

- T1 Output transformer. Primary 7000Ω, centre tap, 20% screen grid taps. Secondary 1·7, 3, 7, and 15Ω (Gilson W01932)
- T2 Mains transformer, with tapped primary, 200-250V. Secondaries 410-0-410V, 180mA; 5V 3A; 6·3V 5A; 6·3V CT 2A (Gilson W01566WES)

**Fuses (⅝in. miniature fuse cartridges)**

- FS1 250mA FS2 2A FS3 2A

**Switch**

- S1 D.P.S.T. Toggle.

**Sockets**

- SK1 coaxial (Belling Lee L604/S); free plug (L734/P/AC)
- SK2 4-way, with plug and cover (Cinch)
- SK3 8-way (octal valveholder)
- SK4 5-way (T.S.L. B5B); free plug (T.S.L. A5B)
- SK5 5-way (T.S.L. B5B); free plug (T.S.L. A5B)

**Plug**

- PL1 Octal plug

**Miscellaneous**

Three fuseholders (Belling Lee L575). Valveholders: three octal; one ordinary B9A and one B9A nylon loaded with screening skirt (for V1). One 10-way and one 5-way group boards (Bulgin C114 and C109). Three 3-way and two 4-way tag strips. One 4-way terminal block (Grelco). Two chassis 6in. x 12in. x 3in. (Home Radio Ltd.). One voltage selector panel (Cinch 75/881). Capacitor clips, grommets, etc.

the 3-way tag strip which is mounted on the side of the chassis.

The various earth connections can now be made to the busbar. This is best performed by proceeding systematically from the input end of the chassis, and checking with the under-chassis wiring diagram. Tinned copper wire of 18 to 22s.w.g. is suitable for the branch leads.

### *Output Impedance*

The eight terminals on the secondary of the output transformer T1 may be connected in various ways in order to provide output impedances of 1·7Ω, 3Ω, 7Ω or 15Ω. Details of these connections and impedances are given in Fig. 6.

The component values for the H.F. attenuation network, R14, C10, in the negative feedback loop are dependent upon the loudspeaker impedance, and should be selected accordingly from the table below.

| Ouput Impedance | R14 | C10 |
|---|---|---|
| 3Ω | 3·9k | 470pF |
| 7Ω | 5·6k | 330pF |
| 15Ω | 8·2k | 220pF |

R14 must be a 5% high stability resistor.

C10 must be a 5% silvered mica capacitor.

### *Hum*

Negligible hum has been experienced with the heater supply to the amplifier valves unearthed, as shown in the diagrams. It cannot, of course, be assumed that this will prove to be so in all cases, since minor variations in the layout of components or wiring can upset the hum balancing properties

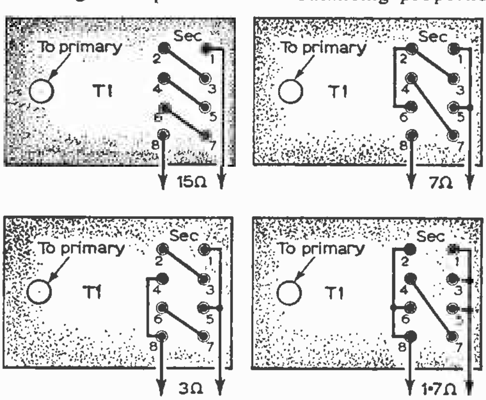
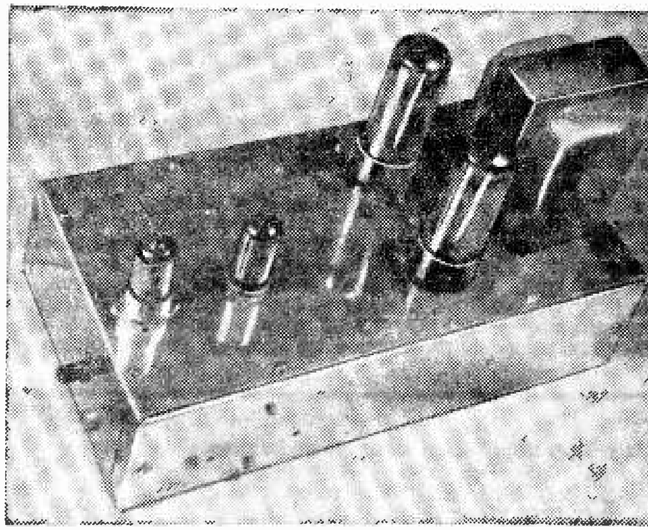



*Fig. 6—The transformer connections.*

of the circuit. If hum does become troublesome, experiments should be made in earthing (to the busbar) one side of the heater circuit, firstly at V1 valveholder and then at other valveholders in turn. If this does not effect a cure a potentiometer connected across the 6·3V supply in the power unit (wired to pins 1 and 8 of SK3) with its slider connected to chassis may eliminate the hum. A 100Ω wire-wound potentiometer should be suitable for this purpose.

The amplifier must not be put into operation without a loudspeaker, or a suitable dummy load, connected to the output socket. In the event of a "howl" from the loudspeaker, turn the gain control to minimum and switch off immediately. This "howl" will indicate that the feedback loop is connected in reverse sense—and positive feedback



*An above-chassis view of the amplifier.*

is in fact being applied. The remedy is to change over the two leads that connect the outer secondary terminals on the ouput transformer to the socket SK2. ■

## A *Stereo* EXPERIMENT

*(Continued from page 496)*

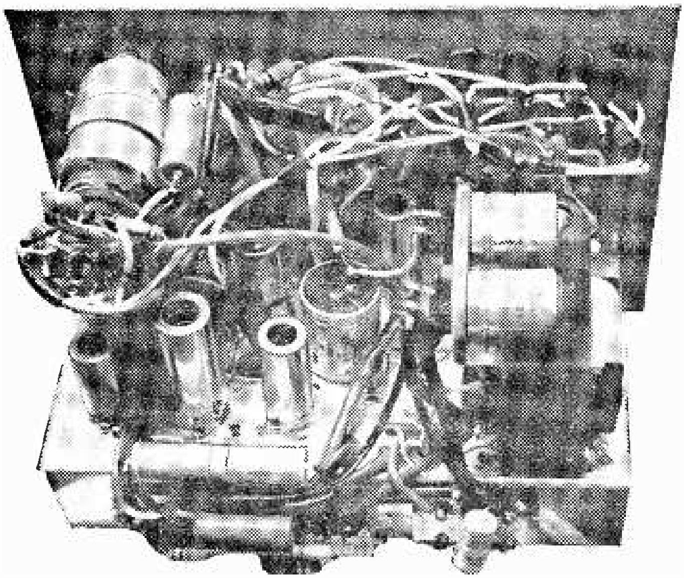
Alternatively a fairly lengthy effects sequence (such as "sea with seagulls") can be laid on one track starting from the beginning, and then on the other track staggered by playing the effect through about 10 or 15 seconds before commencing to record it. The commentary, which goes on last of all will normally need to be inserted "blind", relying on the cue marks affixed with sticky labels whilst the monitor track still exists. These labels should subsequently be peeled off to reduce the chance of the tape catching in the head as they pass through.

### *Mistakes*

Finally, the correcting of mistakes. This can often mean starting all over again, and much patience is needed if it does. Single words or very short sentences can be recorded in place of existing matter without the absence of the few notes of background music or effects being noticed. If the sound on one channel drowns the commentary on the other it may be softened by running through the recording lead, with erase guard fitted with the instrument switched to record and the level at zero.

# THE MINISCOPE

By M. L. Michaelis



*(Continued from page 412 of the September issue)*

IN his description of the circuit, begun last month, the author referred to the advantage of the cathode-follower input stage of the signal amplifier, which is that considerable shunt capacity is tolerable here without high-frequency loss. This has the further advantage that the gain-control does not affect the anode current of the cathode-follower stage, as it appears subsequent to it, and thus the anode current can be passed through a moving-coil meter for simultaneous use of the cathode-follower input stage as valve-voltmeter for D.C. For this purpose the signal input is D.C.-connected, which is fully permissible on account of the large acceptable input level.

The input cathode-follower will accept a drive of 60V peak to peak without distortion under the operating conditions adopted here. All calibrations are made to apply for and include the characteristics of a special probe head with a dividing ratio of about 15 : 1 (the construction of this probe and discussion of the reasons for its necessity will appear in a later article). The Miniscope should not normally be used without this probe. The actual acceptable input maximum is thus about 900V peak-to-peak A.C., D.C. or mixed, which is ample for all normal purposes.

With the linear design range of 60V p.p. for the input cathode-follower, and a cathode resistor of roughly 30k (R53), the anode current swing will be 2mA. The resting anode current should be just a little more than half of this, so that the valve just does not cut off on negative peaks, and consequently a value of about 1·3mA has been chosen. This would require a positive bias of about 30V on the grid, or a corresponding negative bias to which the cathode resistor must be returned, in order to set this desired operating point. The former alternative is intolerable, as the positive grid bias would react back through the signal input into the test circuits and would even be nullified if the signal source had a low impedance. Thus, the cathode resistor R53 has been returned to a stabilised bias supply of about 35V, using two Zener diodes, D10 and D11. Stabilisation is here used to avoid undue slow or fast fluctuations of meter-zero and to avoid injection of timebase signals into the Y-amplifier as part of the same bias supply is used in the timebase circuits.

The meter movement used is a cheap surplus thermocouple R.F. meter, modified for normal moving-coil function (see "Experimenter's Power Pack", in the January 1962 issue). It is shunted to give 4mA f.s.d. and has zero-deflection as normal at the left. R51 and the potentiometer VR12 (meter balance) augment the no-signal standing anode current of the input cathode-follower to exactly 2mA, so that the pointer then stands at mid-scale, where "O" on the new scale is placed. To the left of this centre-zero the new scale is labelled "negative" and to the right "positive" and calibrated such that quarter deflection corresponds to minus 400V and three-quarters deflection to plus 400V. The scale is continued linearly to plus and minus 600V on each side respectively and a dot labelled "off" made at the actual mechanical zero on the left. The resistors in the probe are subsequently trimmed to make this scale hold true. The final input impedance with probe will be about 2M in parallel with a few pF capacity.

R53 itself is not used as gain control, a separate potentiometer VR13 being fed via a coupling condenser C33 instead. There are two reasons for this. Firstly, if R53 were the gain-control it would be carrying D.C. and any movement of its slider would thus pass spurious transients on to the following high-gain amplifier chain. This would cause intense fluttering of the trace on the CRT, causing it to jump temporarily right off the screen with everything but the slowest movements of the knob of this gain control. Secondly, were R53 itself the gain control, consider the conditions which would then prevail at "minimum volume", when the slider would be down at D11. It would then pick up the full ripple voltage from the bias

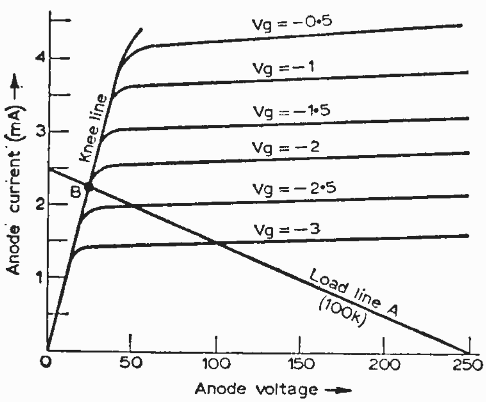



*Fig. 2a—The anode-characteristic curves of a typical pentode valve, to explain the phenomenon of "bottoming." Under the conditions shown, the anode current cannot rise above 2·3mA, reached at —2V at the grid, however much the grid voltage rises further in a positive direction. The anode voltage thus "bottoms" at about 20V, represented by point B on the curves, as soon as the grid voltage reaches —2.*

line and cause this to be amplified through the amplifier chain. Experiment showed that this ripple is just sufficient to give full-screen deflection on the CRT under these conditions. But, with the actual arrangement used for the gain control, VR13, C33 blocks the D.C., so that there is no flutter upon movement of the knob, and R53 and the low-internal impedance of the cathode follower form a ripple-voltage divider of about 300 : 1 reduction, which is thus the maximum (negligible) ripple-remnant passed on to the amplifier from the bias line, and it is further reduced, down to zero, as the slider of VR13 is slid down to chassis to reduce gain.

V1 triode (pins 1, 2 and 3) and V2 form a conventional R.C.-coupled three-stage amplifier. The average gain per stage is somewhat under 10 on account of the very small anode loads and the negative feedback given by un-by-passed cathode resistors throughout. Both these measures are necessary to obtain the required extension of level high-frequency response up to over 100kc/s. The small anode loads tolerate correspondingly high unavoidable stray capacities before the time-constant rises to the order of a period of a cycle of the highest frequency to be passed (the rough criterion for high-frequency amplification limit), and the cathode-negative feedback gives the usual additional linearisation, stabilisation and greater freedom from ageing and manufacturing tolerances of valves. The first stage of this amplifier chain has the lowest anode load (R50); subsequent stages cannot have such a low load on account of the need for the greater voltage swing at those stages and the final requirements for full deflection of the CRT (about 100V p.p. in the tube used in the prototype).

Note the generous grid-stoppers used at all stages, including the input cathode-follower.

### *Parasitic Prevention*

A chain of high-slope triodes as used here in the signal amplifier is very unlikely to be stable if any arbitrary wiring arrangement is used. In fact, it is virtually impossible to make more than two stages of the ECC81/EC92 type of valve run stable if grid-stoppers are not wired *very close* to *all* grids and wiring otherwise kept very short and direct.

It must be remembered that cathode followers count as normal amplifiers for the purpose of parasitic oscillation considerations because the tiny distributed capacitive and inductive strays responsible for these VHF oscillations will make the stage appear as a normal amplifier or oscillator *at VHF* if all the stray virtual components were drawn in on the circuit and the cathode-follower arrangement at lower frequencies were disregarded.

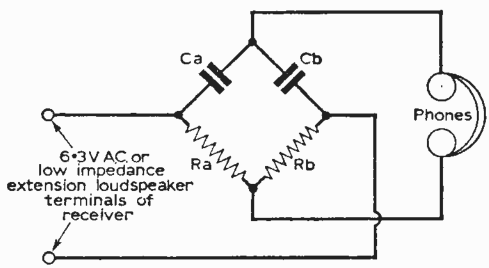
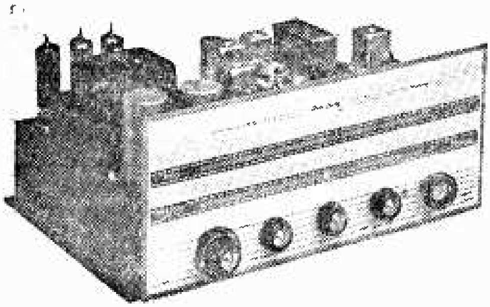



*Fig. 2b—A simple method for trimming two condensers, Ca and Cb, to have exactly the same capacity ratio as the resistance ratio of two standard resistors Ra and Rb. Various small condensers are tried in parallel with Ca or Cb, until minimum sound is heard in the headphones.*

The common manifestations of *severe* parasitics in high-slope triode chains can be of a form outwardly so puzzling that some further discussion is not out of place. The common symptom is—namely, in a poorly-designed amplifier of this type, strong *low-frequency motor-boating.* The uninitiated experimenter will not attribute this to VHF parasitics and will start looking for the "normal" causes of motor-boating—namely, inadequate H.T. decoupling. He will then find, however, that the inclusion of large decoupling condensers or even feeding the stages from

*(Continued on page 513)*

# *an Armstrong chassis is more than just a radiogram chassis*



It is a carefully designed combination of tuner, control unit and amplifier in one compact unit which can be used as the basis of a complete high fidelity system. A system which can include tape recording and playback as well as radio and record reproduction.

## STEREO 12 MK.2 £43.10.0

8 watts push-pull output from each channel, 16 watts total. VHF. with automatic frequency control, medium and long bands. A hi-fi system on one compact chassis.

## STEREO 55 *(Illustrated)* £32.15.0

A junior version of the Stereo 12 Mk. 2. 5 watts per channel. 10 watts total. VHF and medium bands. Inputs for tape. pick-ups and possible future stereo radio.

## JUBILEE MK.2 £30.12.0

A mono chassis of 8 watts push-pull output and covering VHF, medium and long bands. Separate tone controls. A.F.C. Pick-up and tape inputs.

## AF208 £22.18.0

An AM/FM mono chassis of 5 watts output covering VHF and medium bands. An inexpensive version of the Jubilee Mk.2

*Post this coupon or write for catalogue or call at our showroom for full demonstration and professional advice on your installation. Open 9-5 including Saturdays.*

NAME________________________ POC

ADDRESS ________________________

**ARMSTRONG** WARLTERS ROAD, HOLLOWAY LONDON N.7. NORTH 3213

---

## TESTED and GUARANTEED VALVES

**Please send S.A.E. for latest price list**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OA2 | 6/- | | | | | | | | | PY81 | 7/6 |
| OB2 | 6/- | | | | | | | | | PY82 | 7/- |
| OC3 | 5/6 | | | | | | | | | PY83 | 8/- |
| OD3 | 5/- | | | | | | | | | PY88 | 9/- |
| OZ4 | 5/- | | | | | | | | | PX25 | 10/- |
| IG6GT/G | 7/- | 6BR7 | 12/6 | 1487 | 14/6 | DAF96 | 7/6 | EL42 | 8/- | QP25 | 7/6 |
| IH5GT | 9/- | 6BR8 | 5/- | 25L6GT/G | | DF96 | 7/6 | EL81 | 9/- | QQV03-10 | |
| IN5GT | 9/- | 6BW6 | 9/- | | 8/- | DK92 | 9/- | EL84 | 7/- | | 30/- |
| IR5 | 6/- | 6BW7 | 9/- | 25Z4G | 9/6 | DK96 | 7/6 | EL95 | 6/6 | QS105/45 | |
| IS4 | 5/- | 6C4 | 2/6 | 25Z6GT | 6/- | DL96 | 7/6 | EL821 | 6/- | | 15/- |
| IS5 | 5/6 | 6CD6G | 17/- | 28D7 | 7/- | DM70 | 4/6 | EM84 | 9/6 | QS150/15 | |
| IT4 | 4/- | 6CH6 | 6/- | 30F5 | 6/9 | E180F | 15/- | EN31 | 10/- | | 10/- |
| IU4 | 7/- | 6CL6 | 10/- | 30FL1 | 9/6 | EA76 | 7/6 | EN32 | 10/- | QV04-7 | 7/- |
| IU5 | 7/- | 6CW4 | 14/- | 30L15 | 12/- | EABC80 | 8/- | EY51 | 8/- | R10 | 15/- |
| 2C26 | 8/- | 6E5 | 7/- | 30PL1 | 10/3 | EAC91 | 4/- | EY81 | 9/- | RL18 | 12/6 |
| 2CW4 | 14/- | 6F5 | 6/- | 30PL13 | 10/6 | EAF42 | 8/6 | EY84 | 7/6 | PT15 | 35/- |
| 2D21 | 6/- | 6F32 | 5/- | 35L6GT | 8/- | EBC41 | 7/9 | EY86 | 8/- | TZ40 | 30/- |
| 2E22 | 25/- | 6F33 | 4/- | 35W4 | 6/- | EBF80 | 9/6 | EZ41 | 8/6 | U19 | 25/- |
| 2E26 | 20/- | 6J4 | 9/- | 35Z4GT | 7/- | EBF83 | 12/- | EZ80 | 6/- | U24 | 10/- |
| 3A4 | 4/- | 6J5G | 3/- | 35Z5GT | 7/- | EBF89 | 8/- | EZ81 | 7/- | U25 | 11/- |
| 3A5 | 5/- | 6J6 | 3/6 | 42 | 5/- | EC91 | 3/- | GZ32 | 12/- | U26 | 11/- |
| 3E29 | 50/- | 6J7G | 5/- | 50L6GT | 7/- | ECC40 | 9/- | GZ37 | 9/- | U801 | 20/- |
| 3Q4 | 7/- | 6K7G | 2/- | 75 | 5/6 | ECC70 | 15/- | HL23DD | 8/- | UABC80 | 8/6 |
| 3V4 | 6/6 | 6K8G | 5/6 | 76 | 5/- | ECC84 | 8/- | KT8C | 25/- | UAF42 | 8/- |
| 4-65A | 60/- | 6L6G | 6/- | 80 | 6/- | ECC85 | 8/- | KT41 | 12/6 | UBC41 | 7/- |
| 5R4GY | 9/- | 6L18 | 8/- | 83 | 8/- | ECC88 | 15/- | KT61 | 7/- | UBC81 | 8/- |
| 5U4G | 5/- | 6N7 | 6/- | 85A2 | 7/6 | ECF80 | 10/6 | KT66 | 15/- | UBF80 | 8/6 |
| 5V4G | 8/- | 6Q7G | 6/- | 715A | 30/- | ECF82 | 9/- | ML6 | 6/- | UBF89 | 8/6 |
| 5Y3G | 4/- | 6SG7 | 5/- | 803 | 30/- | ECH35 | 10/- | N78 | 12/- | UBL21 | 13/- |
| 5Y3GT | 6/- | 6SK7 | 5/- | 807 | 6/6 | ECH42 | 9/6 | PC97 | 10/- | UCC85 | 8/- |
| 5Z3 | 6/- | 6SL7GT | 6/6 | 813 | 65/- | ECH81 | 7/6 | PCC84 | 8/- | UCH21 | 9/6 |
| 5Z4 | 9/- | 6SN7GT | 4/6 | 832 | 15/- | ECH83 | 8/6 | PCC85 | 8/- | UCH42 | 8/- |
| 5Z4G | 7/- | 6V6G | 4/- | 866A | 12/- | ECL80 | 7/6 | PCC88 | 15/- | UCH81 | 9/- |
| 6A3 | 8/- | 6X4 | 5/- | 931A | 60/- | ECL82 | 8/6 | PCC89 | 11/- | UCL82 | 11/- |
| 6A8GM | 7/- | 6X5G | 4/6 | 955 | 8/- | ECL86 | 11/- | PCF80 | 9/6 | UCL83 | 12/6 |
| 6AB7 | 4/- | 6Y6G | 6/- | 2051 | 6/- | EF37A | 8/- | PCF82 | 9/6 | UF41 | [illegible] |
| 6AG5 | 3/- | 6Z4 | 6/- | 5670 | 10/- | EF40 | 10/- | PCF86 | 14/- | UF42 | 9/- |
| 6AG7 | 7/- | 10F1 | 7/- | 5751 | 11/- | EF41 | 8/- | PCL81 | 9/- | UF80 | 7/6 |
| 6AK5 | 5/- | 11E2 | 20/- | 5763 | 10/- | EF42 | 7/6 | PCL82 | 10/- | UF85 | 8/- |
| 6AL5 | 4/- | 11E3 | 20/- | 6080 | 30/- | EF80 | 6/- | PCL83 | 10/- | UF86 | 12/- |
| 6AM5 | 4/- | 12AT7 | 5/- | 6146 | 27/6 | EF85 | 6/6 | PCL84 | 10/- | UF89 | 8/6 |
| 6AM6 | 4/- | 12AU7 | 5/- | 7586 | 22/6 | EF86 | 7/6 | PCL85 | 13/- | UL41 | 9/6 |
| 6AQ5 | 6/- | 12AX7 | 6/- | 7895 | 22/6 | EF89 | 7/- | PCL86 | 11/- | UY21 | 6/6 |
| 6AS6 | 5/- | 12AY7 | 10/- | 9002 | 5/- | EF92 | 3/6 | PL36 | 11/- | UY41 | 8/- |
| 6AT6 | 5/- | 12BA6 | 8/- | 9003 | 7/- | EF98 | 10/- | PL81 | 10/- | UY85 | 7/- |
| 6AU6 | 7/- | 12BE6 | 5/- | ARP12 | 3/6 | EF183 | 10/- | PL82 | 8/- | VGT128 | 10/- |
| 6B8 | 5/- | 12E1 | 20/- | AZ1 | 9/- | EF184 | 10/- | PL83 | 8/- | W81M | 6/- |
| 6B8G | 2/6 | 12K7GT | 7/- | AZ31 | 7/6 | EL33 | 7/- | PL84 | 8/- | X63 | 6/- |
| 6BA6 | 6/- | 12Q7GT | 5/- | AZ41 | 9/- | EL34 | 12/- | PT15 | 10/- | X65 | 5/6 |
| 6BE6 | 6/- | 12SK7 | 5/- | CIC | 10/- | EL35 | 5/- | PY32 | 12/- | X66 | 8/- |
| 6BH6 | 8/- | 12SL7GT | 7/6 | CL33 | 9/- | EL41 | 8/- | PY80 | 7/6 | X81M | 7/- |
| 6BJ6 | 10/- | 12SN7GT | | CY31 | 6/- | | | | | | |
| 6BQ7A | 8/- | | 7/6 | DA30 | 20/- | | | | | | |

# Z & I AERO SERVICES LTD

*Retail Shop:* **85 TOTTENHAM COURT ROAD**
**Tel: LANgham 8403**

***Head Office and Warehouse:*** 14 SOUTH WHARF RD., W.2. Tel. AMB 0151/2, 0677.
Please send all correspondence and Mail Orders to the Head Office.

**TRANSISTORS**—Mullard Top Quality: OC44 7/6; OC45 6/6; OC78 7/-; OC78D 7/-; OC81 7/-; OC81D 7/-, OC72 8/-; Pair of Matched OC78 or OC81 13/-; Set of two OC78 and one OC78D or Set of two OC81 and one OC81D 18/-. **Substandard Transistors,** perfect to use on reduced voltage, OC44 3/-; OC45 3/-. **Brand New R.C.A. Transistors:** 2N410 (OC45) 5/-; 2N412 (OC44) 5/-; White Spot 2/8; Red Spot 2/8; Yellow Spot 1/10; Green Spot 1/6.

**SEMICONDUCTOR DIODES**—Silicon: SX641, 60 p.i.v., 290 mA D.C. 3/-; SX642, 120 p.i.v., 270 mA D.C. 3/6; SX643, 180 p.i.v., 260 mA D.C. 3/6; SX645. 400 p.i.v., 190 mA D.C. 5/6; SX781, 60 p.i.v., 50 mA D.C. max. switching speeds 100 mc/s 7/6. Germanium: CG12E, 25 p.i.v., 30 mA max 1/6; CV442, 25 p.i.v., 30 mA max. 1/6.

**CATHODE RAY TUBES**

2AP1 25/-; VCR97 40/-; 09D 80/-; VCR138 60/-. Bases for the above 3/6 each.

**SPECIAL OFFER** (Strictly limited to Personal Shoppers only)
Cossor type 339 Double Beam Oscilloscopes in full working order for £13/0/0 only. Demonstrations on request.

**UNIVERSAL RELAYS**

300 Ω Coil; 4 change-over contacts which can be independently adjusted to operate at any voltage from 3.5 to 24V D.C. The relay can therefore be used for sequence switching, energising each contact in turn as the voltage is increased to max. 15/-. P. & P. 3/-.

**POST OFFICE RELAYS TYPE 3000**

2 C.O., 500mA, 10k Ω Coil, sec. hand .. .. .. .. 8/6
4M + 4B, 500mA, 250 Ω Coil, sec. hand .. .. .. 8/6
1M, 1 Amp, 6500 Ω Coil, brand new .. .. .. .. 10/6
3M + 1B, 1 Amp, 8800 Ω, brand new .. .. .. .. 12/6

**UNITORS**

4-way plugs and sockets 4/6 per pair
6-way plugs and sockets 5/6 per pair
12-way plugs and sockets 7/6 per pair
18-way plugs and sockets 8/6 per pair
25-way plugs and sockets 12/- per pair

**CHARGER TRANSFORMERS**

MT3AT, input 200/250V, output tapped at 12-15-20-24-30V, 2A.. 25/6
MT16AT, input 200/250V, output 24V at 5 Amps .. .. 38/6
MT21AT, input 200/250V, output tapped at 12-15-20-24-30V, 4 Amps .. .. .. .. 38/-
Packing and Postage 5/-

**A.C. MAINS MOTORS**

Aircraft Dynamotor converted to efficient A.C. Commutator Motors developing approx. 50 watts. at 6-8000 r.p.m. Low speed take off shaft, giving reduction ratio of 500 : 1 can be engaged by hand or by electro-magnetic clutch. Suitable for fan drives, polishers, etc. 20/- P. & P. 5/-.

**MINIATURE PANEL MOUNTED METERS**

1½in. Round Flush General Electric Meters, available in the following ranges: 1mA 25/-; 25mA 20/-; 75mA 20/-; 100mA 20/-; 150mA 20/-.

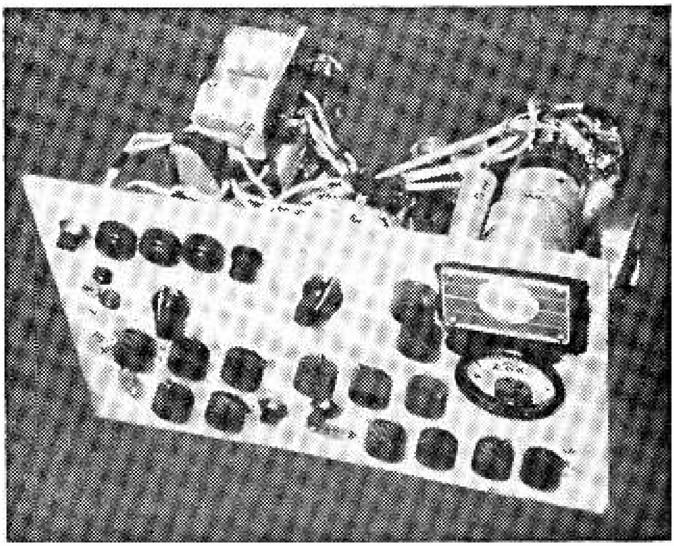
Unless stated otherwise, please add 2/6 in the £ to cover postage and packing, subject to a minimum of 1/6.

*(Continued from page 510)*
entirely separate rectifiers and smoothing will make virtually no difference.

This form of motor-boating, which may be called "parasitic motor-boating", is a new form of instability which has arrived with the advent of modern high-slope valves. Older valves of the old PM2HL or HL2 class had far too small a mutual conductance to give parasitics of the necessary intensity if at all. Thus motor-boating with such low-slope valves was almost invariably due to insufficient decoupling, increase of which then effected a cure. But, when using modern high-slope miniature valves in multi-stage high-gain audio amplifiers, *both* possible sources of motor-boating must be watched and distinguished, which should not be difficult from the above discussion of the symptoms.

Parasitic motor-boating is positively cured by wiring adequate grid-stoppers very close to all grid pins. Normal values of 1k are not necessarily sufficient; 10k is more advisable in a multi-stage amplifier and sometimes 47k or more may be needed. Emphasis is on "really close" to the grid pins, which means cutting off the wire end of the resistor to within a fraction of an inch, bending a hook which is passed through the tag on the valve-holder and pinched with pliers and then soldered. The resistor thus stands as a "tree" projecting immediately from the valveholder. Nothing else whatsoever must be wired direct to the grid-pin concerned. It is often not permissible to run a neat wire from the grid-pin to a nearby tag on a tagstrip and wire the grid-stopper there, not even if the connection is as short as less than an inch. With high-slope frame-grid valves the inductance of this short lead can be sufficient to bring the parasitic resonant frequency to within the range at which the valve can oscillate. "Neatness" *must* here, in a sense, be sacrificed for stability! It is necessary to remember that no object, wire, etc., has zero capacity or zero inductance; thus *every circuit* whatever its appearance on the theoretical circuit, will in practice also have a VHF resonance given by the stray inductance and capacity. Oscillation is then likely if the circuit is associated with a valve or transistor capable of amplification at the stray resonance involved. This oscillation is prevented by means of heavy resistive damping of the tuned circuit involved, by means of interposing a large resistance in series with its virtual "coil", which is our familiar grid-stopper.

As far as the Miniscope Signal Amplifier is concerned, 10k grid-stoppers throughout proved adequate. The arrangement to be adopted has been indicated as well as possible under the conditions of geometric perspective involved. Grid-stoppers and cathode resistors are wired close to the respective pins as indicated above and all made to stand up vertically from the valve-holders. The grid leaks are cut short at their connecting wires and soldered securely between the free ends of the grid-stoppers and cathode resistors. The cathode resistor end is then wired with a direct lead to chassis and actual grid circuit connections made to the grid-stopper end. Other components should be wired in as compact a bundle as possible to these assemblies. The resulting "floating" junction points of components—i.e., free in the air and not on tagstrips everywhere, are necessary. Those constructors thinking that a layout using the slightly longer leads where everything goes to tagstrips has the neater appearance and is thus to be preferred are warned that they undertake such experiments at their own risk; there is a serious risk of instability in such cases under the conditions of the compact chassis here used. The layout here given has been proved stable.



*The Miniscope as it appears in an advanced stage of construction.*

### *Earthing*

There are basically two methods of earthing (chassis connections) in electronic equipment chassis. The first is the single-anchorage busbar and the second is the multiple-anchorage busbar.

The single-anchorage busbar uses a stout bare tinned copper wire, insulated from chassis except at *one* point, normally at the power supply, where it is securely connected to chassis. All component ends connected to chassis on the theoretical circuit are connected not direct to chassis but to this busbar as it passes the part of the circuit concerned. The main feature of this type of earthing is that it prevents random circulating currents in the chassis proper. The chassis carries no currents whatsoever, A.C. or D.C., in this arrangement, serving as a pure screen. This arrangement is thus ideal for ultra-high gain amplifiers, preventing hum introduction into the sensitive input stages which could result from earthing loops embracing chassis currents in random earthing, yet it aggravates unwanted couplings between amplifier stages and gives the poorest earthing resistance. This form of earthing is particularly undesirable at high frequencies, as the one-anchorage busbar, which must carry all return currents, here represents appreciable inductive impedance.

Thus, for everything except extremely high gain low-frequency amplifiers, one is well advised to use some form of multiple-anchorage busbar earthing with its possibilities of better earth contact and lower inductive impedance. The familiar VHF practice of using the chassis itself as busbar and taking all earth leads of each respective stage by as direct a route as possible to a chassis-connection tag on or near the respective valve-holders comes under this class. It offers the minimum possible inductive coupling but not necessarily the minimum contact resistance to chassis. When any particular earth lead relies on a single bolt and tag for chassis connection, having no alternative route, one is rather relying on just that bolt not working *slightly* loose after a long period of use and vibration. Thus, when one is not dealing with too high frequencies and can thus tolerate less strict reduction of inductive coupling, as is the case with the Miniscope, a form of earthing very popular with the author is very useful. This gives an excellent compromise between low coupling, low contact resistance and the added availability of very handy earthing points almost anywhere as required on the chassis. This involves including a tinned soldering-tag washer under every (or almost every) valve-holder fixing bolt and tagstrip fixing bolt and other suitable component fixing bolts. Bare tinned copper wire is strung between all these tags so that all tags have electrical connection not only through the chassis but also by at least one path along the bare wire, which is securely soldered at each tag. This gives a chassis connection grid of excellent contact security and reliability. Components to be earthed can have a hook bent on the end of their leads pinched on to the earth wiring at any convenient point and soldered secure. This gives excellent rigidity if the anchorage tags are not too far apart and the inductive coupling is merely that of the short lengths of bus wire to the next tag. Earth points belonging to critical components of different stages should be located on different sections of bus wire. This arrangement is ideal for equipment dealing with frequencies not exceeding 5 to 10Mc/s and as low as one pleases at the other end, which includes the great majority of non-VHF equipment.

The Miniscope uses this earthing arrangement in duplicate. In other words, independent earthing frames are used for the signal amplifier and the timebase sections. The signal amplifier occupies one half of the underchassis space and the timebase circuit the other half. A brass foil is interposed and connected at two ends to the signal amplifier earthing frame to stop direct radiation of timebase transients into the Y-amplifier. These measures combine to give extremely low injection of unwanted timebase signals into the Y-amplifier, which could cause serious disturbance otherwise when listening to weak signals on the headphones in the "tracer and scope" function. A further measure adopted to reduce such injection is the inclusion of a synchronisation amplifier between the point of extraction of the sync-signal from the signal amplifier and its point of injection into the timebase oscillator.

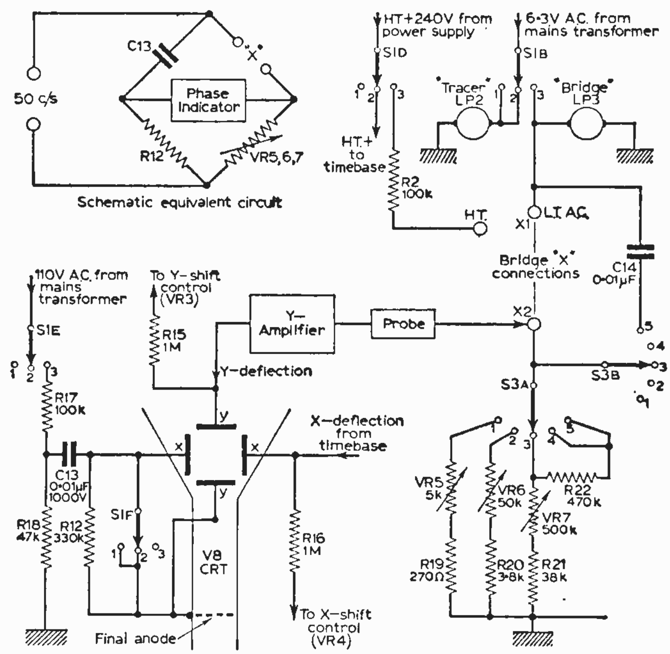



*Fig. 3—A phase-shifted sample of the mains frequency is here used as X-deflection, and an unknown capacity of inductance is used in conjunction with calibrated potentiometers to shift phase of the mains frequency applied to the Y-amplifier. The potentiometers are adjusted for balance, indicated by the general ellipse closing to a diagonal line in the case of a capacity measurement, and by a true circle in the case of an inductance measurement.*

*(To be continued)*

## CORRECTION

In the components list of the Miniscope given on page 411 of the September issue, the name of the manufacturers of diodes D4 to D11 was shown incorrectly as the Bush Crystal Co. Ltd.; it should, of course, be the BRUSH CRYSTAL CO. LTD.

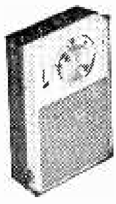
# RADIO CLEARANCE LIMITED

27 TOTTENHAM COURT ROAD, LONDON, W.I.

*THE OLDEST COMPONENT SPECIALISTS IN THE TRADE*

TRADE ENQUIRIES INVITED — *Telephone:* MUSEUM 9188 — EST. 30 YRS.

**YOU CAN HOLD EUROPE IN THE PALM OF YOUR HAND WITH THE**



## *"CAPRI"*

A **miniature** pocket transistor Radio that **REALLY** works, retaining the most attractive features of the famous "Contessa." Six first-grade Mullard transistors plus diode are employed in a highly sensitive superhet MW and pre-set LW circuit embodying the most modern design practices. A special $2\frac{1}{4}$in. high gauss loudspeaker provides surprising volume and a personal earpiece socket is also available. An attractive two-tone plastic case is supplied in two colours—ivory/red or ivory/blue, the full constructional details being furnished with each set of parts. The **total measurements** of the "Capri" are $4\frac{1}{2} \times 2\frac{3}{4} \times 1\frac{1}{4}$ in.

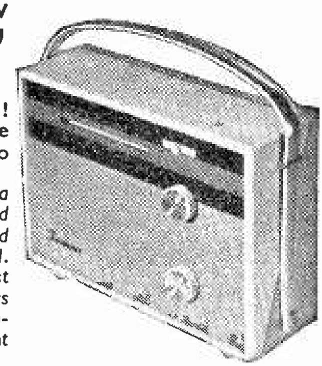
SEE AND HEAR A WORKING MODEL TODAY

Inclusive price for all associated components, case and constructional data, complete in every detail, or our BUY AS YOU BUILD Scheme, any parts sold separately. (9 volt battery 2/6 extra.) **£6.19.6** (Plus 2/- P. & Pkg.)

INTRODUCING THE NEW

## "CONTESSA"

Mk III



**The Best is Now Even Better!** A brilliant conception of the finest 2-band 6-transistor radio available.

★ *Ultra-modern styling with a magnificent twin-tone cabinet fitted with fully expanded metal front and a slide-rule type waveband dial. GREATER OUTPUT using the latest high-efficiency Mullard Transistors and Diodes, incorporating an improved design, featuring different circuit constants.*

*MORE punch—MORE gain—MORE stations—SUPERB appearance—the NEW "Contessa" scores again ! !*

*SEE it—HEAR it—you will BUY it !*

- Waveband coverage of 530 kc/s to 1,620 kc/s and 160 kc/s to 270 kc/s.
- Assured reception of at least a dozen stations in daylight!
- Large clearly-calibrated station-named dial.
- Internal high-gain Ferrite aerial.
- 5 : 1 ratio slow motion tuning.
- Fitted with the latest 12,000-line high-flux loudspeaker.
- Power of 600 milliwatts from the single-ended push-pull final stage.
- Specially designed aerial matching coil for use in a CAR.
- Only first-grade Mullard fully-guaranteed matched transistors and diodes are used.
- Tape recorder socket provided.
- Double-tuned IF transformers for maximum gain and knife-edged selectivity.
- Fully drilled printed circuit panel marked with component numbers.
- The two-tone case outer measurements are $10\frac{1}{2} \times 7\frac{1}{2} \times 3\frac{1}{2}$in. and weighs approx. 4 lbs. when assembled.
- Battery lasts 4 months with normal usage.
- Book supplied with detailed assembly instructions, diagrams and circuitry.
- Anyone can build this set—everything supplied, just a soldering iron required.
- Cabinets available in two tone beige and two tone blue.
- Adjustable carrying handle.

Inclusive price for all associated components, cabinet and battery, complete in every detail: Or our BUY AS YOU BUILD SCHEME, any part sold separately. Send for comprehensive descriptive Manual and Parts List, 2/10 post free. **£10.19.6** (Plus 3/6 P. & Pkg.)

## STILL AVAILABLE to callers only

**SUPERB MAGNAVOX PRINTED CIRCUIT 4-WATT TAPE RECORDER AMPLIFIER**

Record, playback and erase facilities. Bass and Treble Tone Controls—40 cys to 12,000 cys. With valves, plugs, leads and full circuit details.

DIRECT FROM THE MANUFACTURERS @ **£3.10.0**

OR LESS VALVES @ **£2.0.0**

**ALL** the Components for the matching **POWER SUPPLY** including Transformer, Rectifier, Sub-chassis, smoothing, plugs and sockets. **£1.3.6**

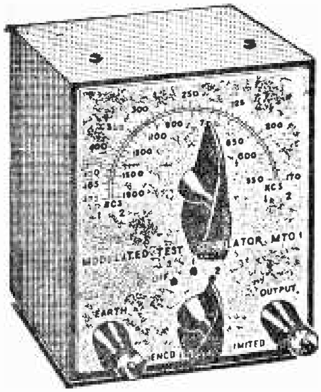
**Regret Transcriptors SOLD OUT.**

STAMPED and ADDRESSED ENVELOPE with any enquiry please. But regret no lists or catalogues—our stocks move too quickly! PLEASE ALLOW FULL POSTAGE AND PACKING CHARGES

**Terms of Business: CASH WITH ORDER OR C.O.D. ON ORDERS OVER 10/-.**

THE WORD MAXI~Q REGD. IS THE REGISTERED TRADE MARK OF DENCO (CLACTON) LIMITED IT IS ALSO A GUARANTEE OF WORKMANSHIP & TECHNICAL PERFORMANCE

OUR RANGE OF PRODUCTS IS SO GREAT THAT WE NOW HAVE TO REQUEST THE AMOUNT OF 1/6d FOR OUR GENERAL CATALOGUE AND TO SAVE YOU POSTAL ORDER POUNDAGE CHARGE WE REQUEST SEND 1/6d. IN STAMPS.



## MODULATED TEST OSCILLATOR MTO. I

★ Provides a modulated signal suitable for I.F. alignment, also trimming and tracking R.F. circuits.

★ Frequency is continuously variable from 170-475 kc/s and 550-1,600 kc/s.

★ Suitable for the alignment of transistor receivers.

★ Operates from a single 9-volt grid-bias battery (not supplied) which is housed within the unit.

★ The case is manufactured from steel and is finished in silver hammer. The front panel is gloss black bearing white lettering. Dimensions are 5 1/16in. x 4 1/16in. x 3in.

★ Supplied with full operating instructions.

**PRICE £3/17/6**

PLEASE SEND S.A.E. WITH ALL ENQUIRIES

**DENCO (CLACTON) LTD.**

(DEPT. P.W.)

357/9 OLD ROAD, CLACTON-ON-SEA, ESSEX

**STOP PRESS:**

TDO.3 Tape Oscillator Coil for Mullard, 3 watt Tape Amplifier, 7/6 each.

# "CODAR CLIPPER" ALL BAND RECEIVERS 10-2000 METERS

LISTEN TO AMATEURS, AIRCRAFT, SHIPPING, SHORT, MEDIUM, LONG WAVE BROADCAST STATIONS THROUGHOUT THE WORLD.

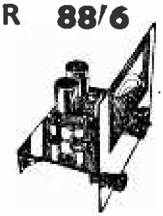
## THE MINI-CLIPPER

NEW LOW PRICE **36/6**

The ORIGINAL and finest one valve all band receiver. Outstanding performance. New first grade components ensure top efficiency. Low loss air spaced tuners, high gain polystyrene plug in coils. Satin Silver metal panel with engraved dials, grey pointer knobs. Provision for adding 2 transistor amplifier stage. Chassis ready punched. Total building cost, all parts, one coil 20-60 meters, wire solder full plans, 36/6. P. & P. 2/6.

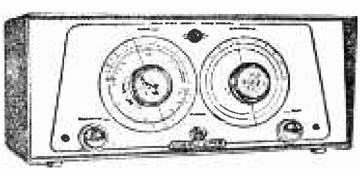
Other coils 10-2000 meters and electrical bandspread available. Parts sold separately. Plans and parts list, 2/-.

## THE SUPER CLIPPER 88/6



This world-famous hybrid receiver has achieved remarkable success. Tremendous performance with Hi-gain valve detector PLUS two Ediswan transistor amplifiers which are supplied assembled, only 3 wires to connect. Large precision dial, 7 x 4in., with 2 pointers, bandset and bandspread, dual slow-motion drives air spaced variables. Punched chassis 8 x 5½in. Batteries last months. Covers 10-2000 metres (5 coils). Total building cost including chassis, valve, 2 transistor stages, 2 coils 20-60 and 55-190 metres. Step-by-step pictorial plans, nuts, bolts, wire 88/6. P. & P. 2/6. Plans only, 2/6. **THE CLIPPER.** As above but one transistor stage, 79/6. P. & P. 2/6. Optional Front Panel, Silver Hammer finish, all holes, 6/9.

## THE NEW CR45 ★ *NEW STYLING TOP PERFORMANCE*



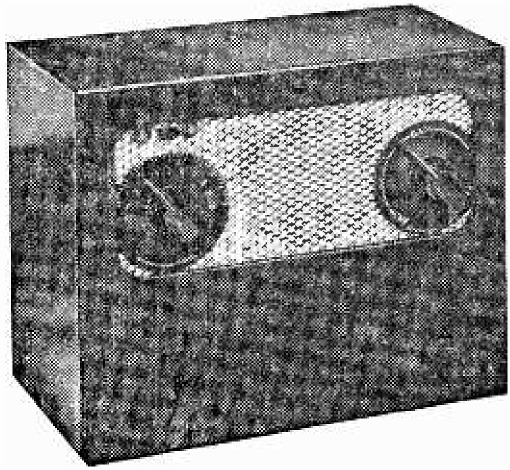
Previously produced exclusively for Export, the de-luxe version of this famous ALL BAND receiver is now also available for the home market. Superb new styling, satin silver front panel, frequency calibrated scales, grey and silver trim knobs, perspex disc cursors. High gain circuit with ECC81 duotriode, EL84 output, EZ80 full wave rectifier. Power output 3½ watts for 2/3 ohm speaker. 3 Planetary vernier slow motion drives, separate electrical bandspread. Covers 10-2000 meters (5 Coils). World wide reception. For A.C. supply 200-250 volts (Export version 105-120 volts). Total building cost all parts, valves, front panel, ready punched chassis, 2 coils, 20-60 and 55-190 meters, wire, solder, instruction manual.

**£6.19.6** P. & P. 3/6. Optional extra. CR45 Cabinet 12 x 5 x 7in., slide flap for easy coil changing, Silver grey finish, 27/6.

No technical knowledge required to build these fine receivers. Send 3d. stamp for illustrated leaflets, testimonials, etc. Now available the NEW 1962 CR 66 A.C. SUPERHET COMMUNICATION RECEIVER.

**CODAR RADIO COMPANY, 24 CHAPEL ROAD, FISHERSGATE, PORTSLADE, SUSSEX**

G3IRE *Canadian Distributors:* JAYCO ELECTRONICS, TWEED, ONTARIO. G3IPA



# the Tudor

## A FOUR-VALVE BATTERY SUPERHET FOR MEDIUM AND LONG WAVES

By S. Collins

*(Continued from page 438 of the September issue)*

WHEN carrying out the aerial modifications described in last month's article, the reader should refer to Fig. 10.

Great care should be taken in wiring the battery plug as a careless mistake can prove an expensive one since all the valves could be destroyed in a moment if incorrect voltages were applied to them. To be absolutely safe it is a good idea not to insert the valves at first but to test the filament wiring by plugging in the battery and checking between pins 1 and 7 on the valveholders of V1, V2, and V3, and between pins 1 and chassis on the valveholder of V4 using a voltmeter or a 2·5V bulb. The reading should be 1·5V in each case or if using a bulb it should just light up dully. If the bulb flashes and blows then there is a mistake in the L.T. wiring which must be located and put right before the valves go in.

### *Alignment*

Having carried out this test satisfactorily the valves can be inserted into their correct position and the set switched on. With the volume control turned full on a quick test of the L.F. portion of the set can be made by lightly touching pin 6 of V3 when distinct clicks and possibly a faint hum will be heard. Now turn the tuning control slowly until some signal is heard however faint and then the upper and lower tuning cores in the two I.F. transformers should be carefully adjusted in turn to bring the signal to its loudest, if necessary reducing the setting of the volume control progressively as it is easier to detect the peak of adjustment at lower volume levels. It is worth while to go over these adjustments several times to ensure that the best setting has been obtained. This alignment is more easily carried out if access to a signal generator is possible but in any case it is not difficult using the normal broadcast stations.

In view of the fact that the tuning dial is marked nominally from 0 to 10 it was considered that exact calibration was not very important and therefore no oscillator trimmers were provided, the

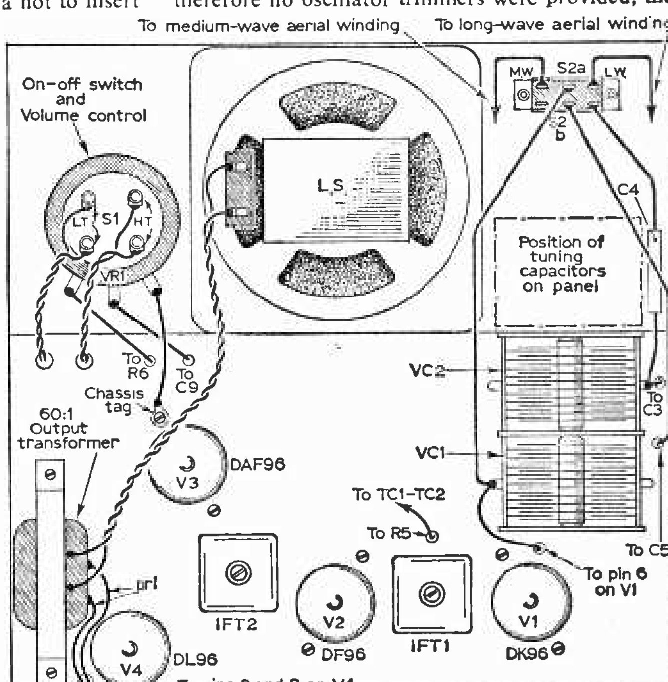



*Fig. 8—The above-chassis layout of components.*

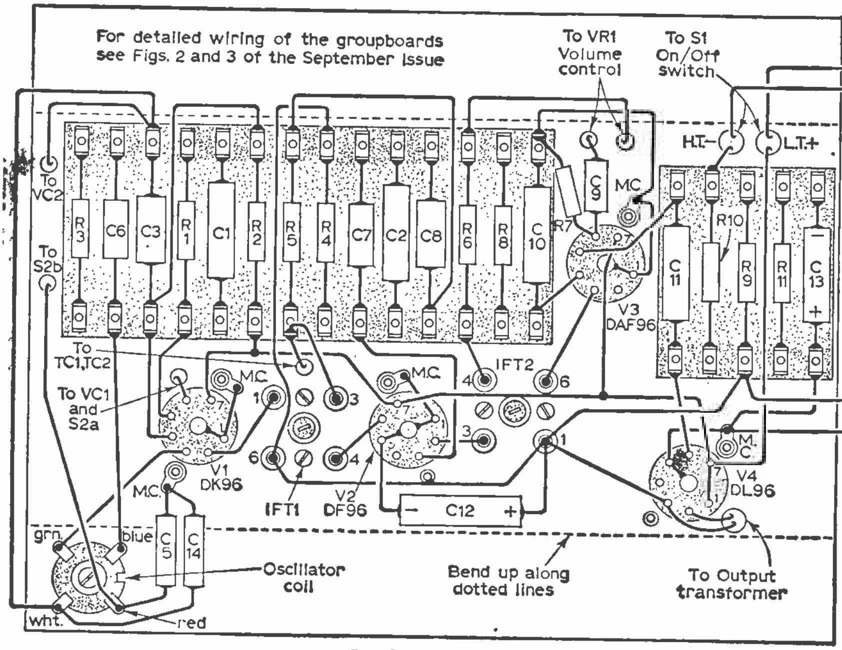



*Fig. 9—The underchassis wiring diagram.*

only oscillator adjustment is the core of the coil and this was set to give the medium wave Light programme on 2·5 on the dial. The Home service then came in at 4 and Luxembourg was received at excellent strength on 1.

Having completed the I.F. and oscillator adjustments the aerial circuits should be trimmed for optimum performance, and it should be noted that for all the alignment adjustments it is preferable to use a non-metallic trimming tool. Switch to long wave and tune in the Light Programme which should be about 6 on the dial and then adjust for the maximum result by sliding the long wave aerial coil each way along the ferrite rod aerial and at the same time adjusting the long wave aerial trimmer.

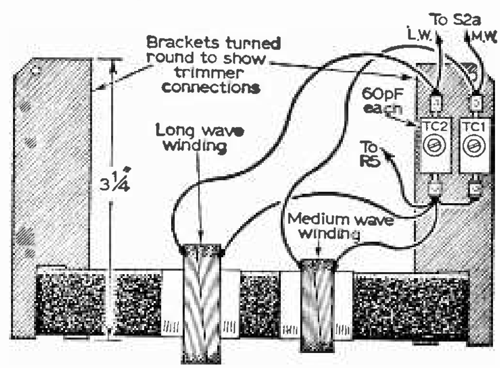
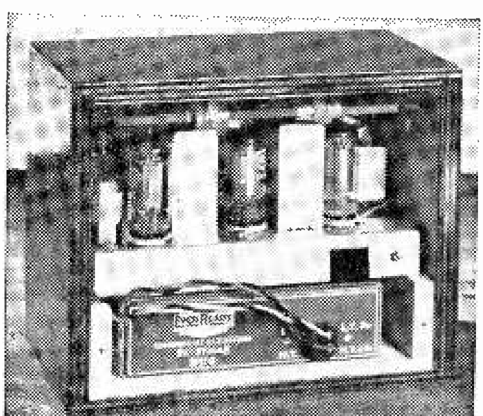



*Fig. 10—The ferrite rod aerial and trimmers.*



*The completed receiver assembled in its case.*

Now switch to medium wave and select a station round about 6 (probably Hilversum) and adjust the medium wave aerial coil by sliding each way on the ferrite rod aerial for optimum signals. Next tune to Luxembourg or another station at about 1 on the dial and adjust the medium wave trimmer condenser for maximum volume. As it will be found that all these adjustments are slightly inter-independent and altering one will affect the others, it is worth while going over them all two or three times until satisfied that the best results are being obtained.

Owing to this set's neat and compact shape the cabinet is quite simply constructed from ⅜in. plywood with a suitable cut-out in the front for the controls and loudspeaker. Two runners, also of ⅜in. plywood, are fitted to the inside of the cabinet support the set which is then held firmly in position by a small block glued inside the back. ■

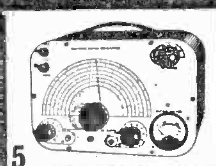
# Just a few of our BARGAINS

1

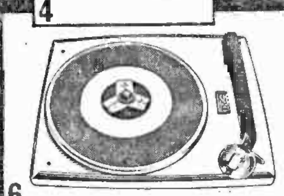
2

3

4

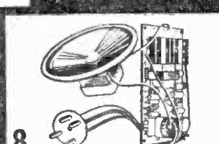


5

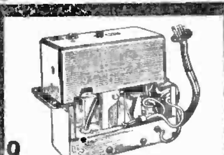


6

7

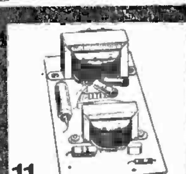


8

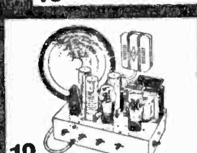


9

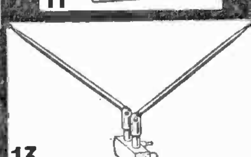
10



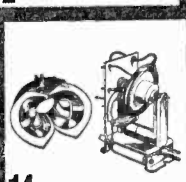
11



12



13



14

1. **SUPER 5 TRANSISTOR POCKET RADIO INCORPORATING PRINTED CIRCUIT & MINI-EARPIECE.** No Aerial or Earth required. 4¾ x 3¼ x 1¼in. Output 200 M.W. 5 first quality transistors. High flux moving coil speaker. M/L Internal high gain ferrox aerial. £2.19.6. P. & P. 3/6. Circuit diagram 1/6, free with parts. All parts available separately.

2. **TRANSISTORISED POCKET RADIO** with printed circuit, mini-earpiece, high gain ferrox slab aerial. No aerial or earth required. To build yourself for completely personal listening. 4¾ x 3¼ x 1¼in. Luxembourg in favourable areas. Only 21/-. P. & P. 2/6. All parts available separately.

3. **A.C./D.C. POCKET MULTI-METER KIT.** 2in. moving coil meter, scale, calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0-50, 0-100, 0·250, 0·500. Milliamps 0-10, 0-100. Ohms ranges 0-10,000, 0-100,000, 24/6. P. & P. 2/-. Wiring diagrams 1/-, free with parts.

4. **SIGNAL GENERATORS.** Cash £7.5.0, or 30/- deposit and 6 monthly payments of 21/6. P. & P. 5/6. Coverage 100 kc/s to 100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Case 10 x 6¼ x 5½in. Three miniature valves and Metal Rectifier. A.C. mains 200/250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy ± 2 per cent.

5. **SIGNAL GENERATORS.** Cash £5.5.0. P. & P. 5/6. Coverage 120 kc/s to 84 Mc/s. Case 10 x 6¾ x 4¼in. Size of scale 6¼ x 3¼in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Accuracy ± 2 per cent.

6. **STAAR 45. 9 v. BATTERY RECORD PLAYER** complete with pick-up and deck. A completely portable player. Head protected by plastic dome with a brush which cleans the stylus as it rises into playing position. 45 r.p.m. Auto on/off switch governed motor, attractive two tone grey finish, £2.14.6. P. & P. 2/-.

7. **CARRYING CASE for STAAR 45 or COMPLETE KIT** beautifully styled in two tone with record compartment. Specially designed to take player and amplifier. Just screw in and connect up. All parts available separately. Case only 22/6. P. & P. 4/-. Complete kit £5.10.0. P. & P. 5/-.

8. **TRANSISTORISED AMPLIFIER, suitable STAAR 45.** Output 1 watt. Size 4¼ x 2¾in. Printed circuit, tone/volume controls plus 4 transistors Push-pull output complete with 3in. moving coil speaker. Built and tested, 49/6. P. & P. 2/-.

9. **CHANNEL TUNER I.F.** 16-19 Mc/s. Continuously tunable from 174-216 Mc/s. Valves required—PCF80 and PCC84 (in series). Cover BBC and ITA ranges. Also Police, Fire and Taxis, etc. Brand new by famous maker, 10/-. P. & P. 3/-.

10. **B.S.R. MONARCH UA8 WITH FUL-FI HEAD.** 4-speed, plays 10 records, 12in., 10in. or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position: colour brown. Dimensions: 12¼ x 10¾in. Space required above baseboard 4¾in. below baseboard 2¾in. Fitted with Ful-Fi turnover crystal head, £6.19.6. P. & P. 5/6.

11. **PUSH PULL OUTPUT STAGE** inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the POCKET RADIO. Kit of parts, including transistors, 19/6. P. & P. 2/-. Wiring diagram 1/6, free with parts.

12. **8-watt PUSH PULL 4 VALVE AMPLIFIER plus METAL RECTIFIER.** A.C. mains 200-250 v. Size 10¼ x 6¼ x 2¼in. 5 valves. For use with all makes and types of pick-up and mike. Negative feed back. Two input, mike and gram, and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s. 2 db down to 20 kc/s. Output 8 watts at 5 per cent total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohms speech coils. For use with Std. or L.P. records, musical instruments such as guitars, etc. Suitable for small halls, £8.19.6. P. & P. 6/-. Crystal mike to suit, 15/-. P. & P. 2/-. 8in. P.M. Speaker to suit, 12/6. P. & P. 2/-.

13. **INDOOR AERIAL for ITV/BBC/FM.** Complete with standard co-axial plug. Heavy chrome extending dipoles—7ft. fully extended. Plugs straight into T.V. or VHF Tuner. Fully directional, 10/6. P. & P. 1/6.

14. **LINE E.H.T. TRANSFORMERS.** Built-in line width control. 14 kv. Scan coil 90in. deflection on ferrite yokes. Frame O.P. transformer pl. 18 kv smoothing condenser, suitable for 14in., 17in. or 21in. tubes. With circuit diagram, 29/6. P. & P. 4/6. Suitable Focus Magnet (state tube), 10/-. P. & P. 3/-.

**RADIO & T.V. COMPONENTS [ACTON] LIMITED**

**21b HIGH STREET ACTON, LONDON, W.3.**

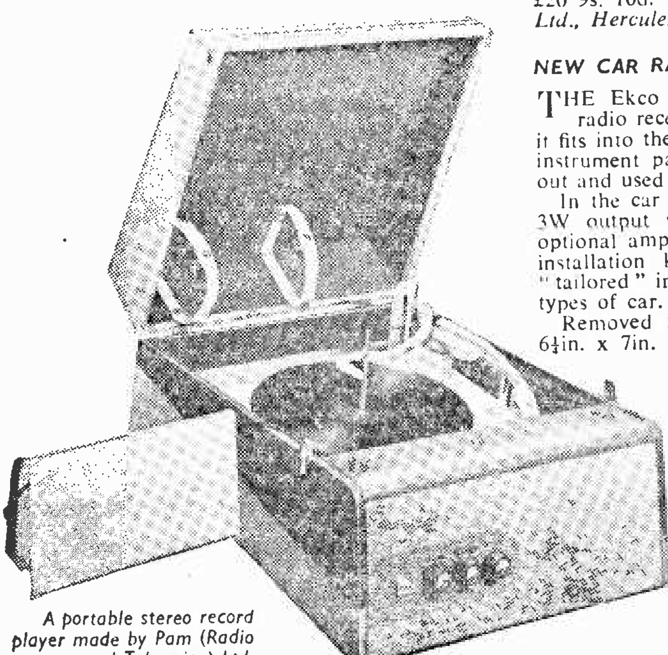
ALL ENQUIRIES S.A.E.
GOODS NOT DESPATCHED OUTSIDE U.K.

# Trade News

## PORTABLE STEREO RECORD PLAYER

AT this year's Radio Show, Pam (Radio and Television) Ltd. displayed a large selection of their radios, television receivers and record players. Among the last section was the model SP63 portable stereo record player.

This compact instrument measures 14$\frac{1}{4}$in. x 20in. x 8$\frac{5}{8}$in. and weighs only 31lb. A twin-channel amplifier feeds two sensitive loudspeakers. The four-speed record deck is housed in a two-tone cabinet.

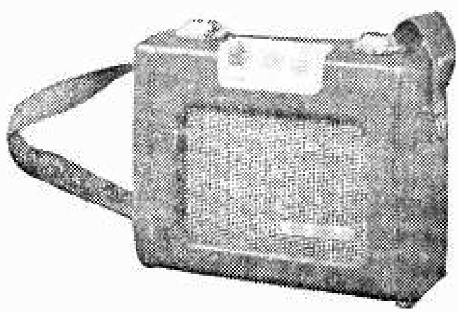


*A portable stereo record player made by Pam (Radio and Television) Ltd.*

The model SP63 costs 28 guineas and is made by *Pam (Radio and Television) Ltd., 295 Regent Street, London, W.1.*

## LIGHTWEIGHT PORTABLE RADIO

AMONG other Ever Ready receivers exhibited at this year's Radio Show was the "Sky Leader". This six-transistor receiver weighs less than 5lb. and measures 9$\frac{5}{8}$in. x 3$\frac{1}{2}$in. x 7$\frac{1}{4}$in. It normally uses a built-in aerial but a socket is provided for connection to a standard car aerial. The loudspeaker is a 4in. moving-coil type and the whole receiver is housed in a wooden cabinet.



*The "Sky Leader" receiver from The Ever Ready Company Limited.*

A printed circuit is used in the construction of this receiver which covers fully the medium and long wavebands. The price of the "Sky Leader", including the battery and purchase tax, is £20 9s. 10d. It is made by *The Ever Ready Co. Ltd., Hercules Place, Holloway, London, N.7.*

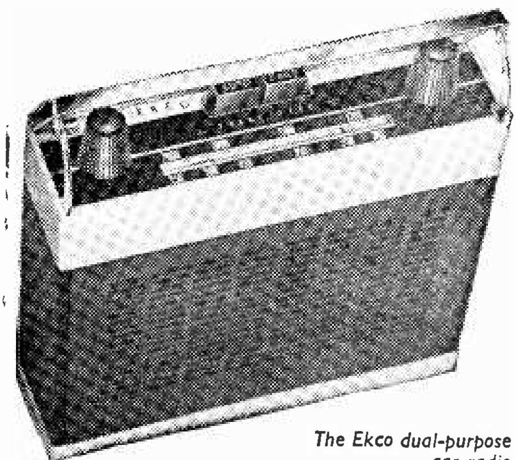
## NEW CAR RADIO

THE Ekco "Twin-Set" is a dual-purpose car radio receiver, its important feature being that it fits into the opening provided for a radio in the instrument panel of most cars or may be taken out and used as an ordinary portable.

In the car the receiver is a true car radio with 3W output when used in conjunction with an optional amplifier. There is available a range of installation kits and loudspeakers to permit a "tailored" installation in more than 100 different types of car.

Removed from the car the receiver measures 6$\frac{1}{4}$in. x 7in. x 1$\frac{3}{4}$in. and is finished in black and chromium plate. The tuning covers both the medium and long wavebands. In the car a very low current is drawn from the car battery and, out of the car, power is supplied by a 9V dry battery.

The price of the "Twin-Set" (model CP920) is 18$\frac{1}{2}$ guineas and the optional 3W amplifier costs 4 guineas, while the receiver housing costs a further 3 guineas. This new set is manufactured by *Ekco Radio and Television Ltd. Southend-on-Sea, Essex.*

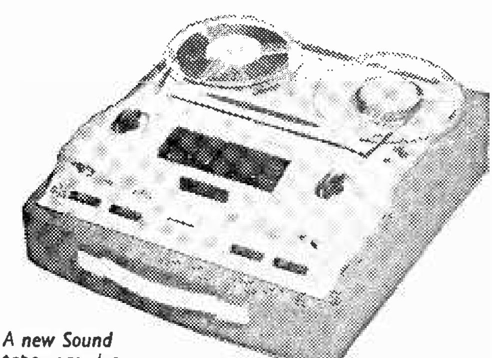


*The Ekco dual-purpose car radio*

### TAPE RECORDERS

THE makers of Sound Tape Recorders have released eight new models to add to their Slimline and Riviera ranges, all of which were on show at the Radio Show.

One of the new recorders in the Slimline range is the Three-Two, which is a three-speed, twin-track model giving up to nine hours recording and playback time. Each recorder is supplied with a crystal microphone and a spool of tape. The built-in loudspeaker delivers over 3½W output. The price of the Three-Two tape recorder is 40 guineas and the makers are *Tape Recorders (Electronics) Ltd., 784-788 High Road, London, N.17.*



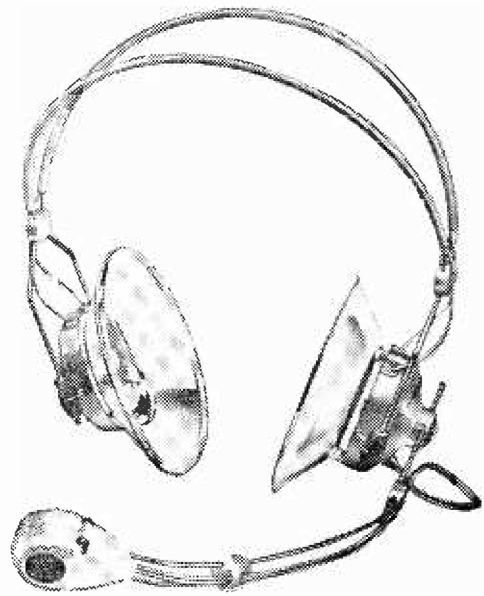
*A new Sound tape recorder*

### HEADPHONES AND HEADSETS

A NEW lightweight headphone set (available with or without a boom microphone) has recently been introduced by Amplivox Ltd. under the name of Jetlite. They are available with magnetic, tropicalised or moving-coil earphones. The headphone set alone weighs only 4oz. It is designed for use with tape recorders, dictating machines, television and broadcasting, film monitoring, etc.

The boom microphone headset version weighs 5oz. and may be fitted with magnetic or carbon microphones, high or low impedance headphones and a miniature lapel switch.

The manufacturers of the new Jetlite headsets are *Amplivox Ltd., Beresford Avenue, Wembley, Middlesex.*



*A Jetlite boom microphone headset made by Amplivox Limited.*

## Increasing Ammeter Ranges

*(Continued from page 503)*

depending upon their design. The resistance of the instrument can be taken as infinite so that the value of the shunt is arrived at by dividing the voltage by the current. Fig. 4 shows a simple arrangement for measuring up to 1A. The shunt resistance will have to be as low as possible in order to reduce its effect upon the circuit. Its resistance is, say, 0·1Ω.

Therefore if the instrument reads 100 millivolts the current in the circuit will be:—

$$I = \frac{E}{R} = \frac{100/1000}{0{\cdot}1} = 1A$$

Bigger shunts must be used for smaller currents —0·2Ω is suitable for 500mA circuits, while a 1Ω shunt will give the same reading on 100mA.

The resistance of the shunt can be taken into consideration by measuring the supply voltage. From this the total resistance or impedance can be found (R = E/I).

The current taken by the circuit *without* the shunt will be:—

$$I = \frac{E}{Rt - Rs}$$

Rt is the total resistance of circuit and Rs is the resistant of the shunt. ■

# CLYNE RADIO LTD.

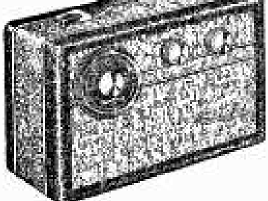
**THE COMPONENT SPECIALISTS**

18 TOTTENHAM COURT ROAD, W.1 MUSeum 5929/0095
162 HOLLOWAY ROAD, LONDON N.7 NORth 6295/6/7
19 CAMBERWELL CHURCH STREET, S.E.5 RODney 2875

**All post orders etc. to 162 HOLLOWAY ROAD, LONDON, N.7**

## NEW! NEW! The "AIR KING"

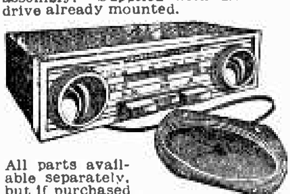
A New Six transistor luxury portable with the new "SLIM LINE" look. To build yourself, with printed circuit chassis for reliability and simplicity in construction. May be used as Car Radio, with full MEDIUM wave and LONG wave coverage.
**Look at these features!**



★ 500 milliwatt output to high flux 7 x 3½in. high fidelity loudspeaker. ★ Six selected **Mullard Transistors** in latest super sensitive circuit, plus germanium diode. ★ Compact size—only 9¼ x 3¼ x 6½in. (high). ★ Attractive three tone cabinet, Black, Dark Grey, and Silver Grey, with gilt control knobs and all gilt fittings. ★ Coax socket for car aerial. ★ Brand New guaranteed components. ★ Push pull output. ★ Automatic volume control. ★ Long life battery. ★ Super sensitive internal ferrite rod aerial. ★ Nothing more to buy. Cabinet included.
Special inclusive price for all required components. **£7.19.6** Plus P. & P. 4/-.
Alignment service available. Full assembly details and individually priced parts list, all of which are available separately, price 1/6, post free.

## The "HIGHWAYMAN"

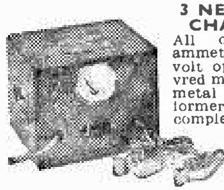
**At last a quality Car Radio to build yourself, at an economical price.** Look at these features:—
★ Attractive styling. ★ Push-pull output. ★ 3 latest Mullard transistors plus valves type EBF 83 and ECH 83. ★ No Buzz. High Output and sensitivity. ★ Printed circuit (newest type). 7" x 4" High flux p.m. speaker. ★ Medium and Long Waves. ★ Push Buttons for fingertip control. ★ Extremely low Battery consumption (less than ½ amp). ★ Easy to fit any make car (Positive earth only). ★ 12 volt operation. ★ Compact size measures only 7" x 7" x 2" deep. ★ Easy assembly. Supplied with dial and drive already mounted.



All parts available separately, but if purchased at one time, the whole will be supplied at a special inclusive price of only
**£10.19.6** Plus 4/- P. & P.
Parts list and comprehensive instruction booklet 2/6, post free. (Deducted from cost if complete parcel purchased later.)

**The SMALLEST TRANSISTOR AMPLIFIER**
Size only 2" x 1" x ⅜" high. Three transistor, printed circuit, 125 milliwatts output. From 100-25,000 cycles, ± 1.5 dB. Will operate from 4.5 v. to 9.0 v. Output to any speaker 35 ohm to 80 ohm. Complete with free leaflet showing variety of uses. Radiogram amplifier, baby alarm intercomm, door answering device, etc. Price Only **45/-**, post free.

## 3 NEW BATTERY CHARGER KITS

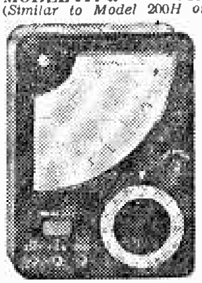


All complete with ammeter! For 6 and 12 volt operation. Louvred metal case, fuses, metal rectifier, transformer, absolutely complete including heavy duty crocodileclips. Full instructions provided. 1½ amp., 35/-. 2½ amp., 42/6. 4 amp., 50/- each plus 2/6 P.&P. Also available 2 amp charger kit complete, no ammeter, fully shrouded mains transformer. **Full instructions 30/-, plus 2/6 P. & P.**

## MODEL 500

**30,000 ohms per volt Multimeter!** 9 ranges D.C. voltage to 1 kV. 7 ranges A.C. voltage to 1 kV. 5 ranges D.C. current to 12 amp. 3 ranges resistance to 60 meg. Incorporates internal buzzer for audible warning of direct shorts and blocking condenser for A.F. Output capacity —20 +56. Size 3.5/16 x 6.5/16 x 2⅛in. Outstanding Value at **£8.19.6.** H.P. available.

**NEW IMPORT! Large quantity shipments enable us to offer keenest meter value yet!**
**20,000 ohms per volt**
**MODEL ITI-2. Volt-ohm-Milliameter**
*(Similar to Model 200H originally advertised)*



Ranges: A.C. Voltage: 10, 50, 100, 500, and 1000 volts (10,000 ohms per volt). D.C. Voltage: 5-25, 50, 250, 500, and 2.5k. (20,000 ohms per volt). D.C. Current: 0-50 microamps. 0-2.5 mA, 0-250 mA. Resistance: 0-6k, 0-6 meg. (300 ohm and 30k at centre scale). Capacitance: 10 pF to .001 mfd, .001 mfd. to 1 mfd. Decibels: —20 to +22 dB.
A fully guaranteed pocket size meter (actual size: 4½" x 3¼" x 1") knife edge pointer, top quality supplied complete with test prods and full operating instructions. ONLY **£5.5.0** POST FREE

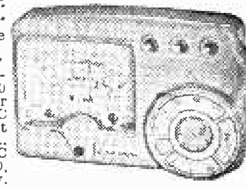
**ALSO AVAILABLE! MODEL TE10.** Identical in appearance and size with rotary type switch but 10,000 Ω/v. **Ranges:** D.C. Voltage: 0-6-30-120-600-1200 volts (10,000 ohms per volt). A.C. voltage: 0-6-30-120-600-1200 volts (10,000 ohms per volt). D.C. Current: 0-120 microamp, 0-3-300 mA. Resistance: 0-30k, 0-3 Meg. (150 ohm and 15k at centre scale). Capacitance: 50 pF to 0.01 mfd., .001 mfd., to 0.15 mfd. Decibels: —20 to +63 dB in 5 ranges.
ONLY **89/6** POST FREE

**Optional Extra.** Attractive carrying case suitable for either meter, 13/6 only. (Bonafide trade enquiries invited.) Leaflet available.

## INEXPENSIVE TEST GEAR

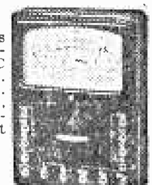
**Three Ideal Pocket Instruments for Amateur or Student**

**MODEL T11**



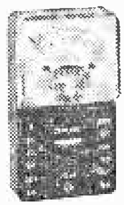
Size only 3½" x 2¼" x 1½" Meter Size 1¼" x 1⅛" Sensitivity 285 micro-amps —1000 ohms per volt AC/DC DC Current 1.25, 250 mA. DC and AC volts 10, 50, 250, 1,000 v. Resistance 50 ohms—100 K Battery 1.5 v-U12. Complete with test prods, battery and full instructions
Outstanding Value at **57/6** Plus 2/6 P. & P.

**MODEL TK.50**



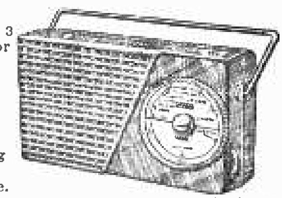
Size 5" x 3½" x 1½" 1000 ohms per volt AC/DC. DC Current 1-250 mA DC and AC volts. 10, 250-500 and 1000 v. Resistance 0-10K, 0-100K. Complete with test prods, battery and full instructions. Outstanding buy at
**63/-** Plus 2/6 P. & P.

**MODEL TK.20A**



Size 3½" x 2¼" x 1½". Meter size 2¼" x 1½". Sensitivity 1000 o.p.v. on both A.C. and D.C. volts. 0/15, 0/150, 0/1000 volts. D.C. Current, 0/150 mA. Resistance. 0/100K. Complete with test prods, battery and full instructions. OUTSTANDING VALUE at
**42/-** Plus 1/6 P. & P.

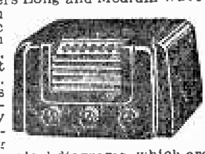
## The "COURTESAN"



Our New 3 transistor plus 2 diode pocket receiver with *full Medium and Long Wave* Coverage.
★ No external aerial and earth required.
★ Latest 2½"—75 ohm speaker.
★ First grade Mullard transistors.
★ Condenser tuning.
★ Volume control with on/off switch.
★ Easy assembly on pre-tagged circuit board.
★ Attractive red polystyrene cabinet measures 5¼ x 3¼ x 1½", chrome handle, attractive gold and black dial.
★ Luxembourg, Hilversum, etc., guaranteed in reception areas.

ONLY **63/-** Plus 2/6 P. & P.
All parts available separately, itemised parts list and full assembly instructions 1/6, post free.

## "FAMILY FOUR"



Our supersensitive T.R.F. Receiver for home construction. Covers Long and Medium Wavebands, is housed in very smart plastic table cabinet in Brown or Black. 3 valve plus contact cooled rectifier. For A.C. mains 200/250 v. Comprehensive assembly instructions provided, including practical and theoretical diagrams, which are easy to follow and will enable you to complete this receiver which will be the envy of your friends. ALL NECESSARY COMPONENTS ARE BEING OFFERED FOR LIMITED PERIOD ONLY at the REMARKABLE PRICE of ONLY 79/6, plus 2/6 P. & P. Instruction book available separately if you wish to study before purchase at 1/6 post free.

# LASKY'S RADIO

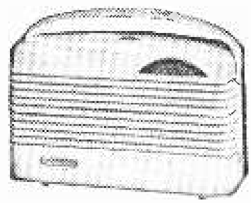
# "BUILD-YOURSELF" TRANSISTOR RADIOS

The finest receiver at present available for home construction. Fully tunable long and medium wavebands. Uses 7 Mullard Transistors: OC44, 2 OC45's, OC71, OC81D and 2 OC81's, plus Crystal Diode OA70.

## The "REALISTIC" Seven

STAR FEATURES ★★★★

- ★ 7-Transistor Superhet. 350 Milliwatt output into 4-inch high flux speaker.
- ★ All components mounted on a single printed circuit board, size 5¼ x 5¼in. in one complete assembly.
- ★ Plastic cabinet, with carrying handle, size 7 x 10 x 3¼in. in choice of colours:
- ★ Red/Grey, Blue/Grey, all Grey.
- ★ Easy to read Dial.
- ★ External Socket for car aerial.
- ★ I.F. frequency 470 K/cs.
- ★ Ferrite Rod internal aerial.
- ★ Operates from PP9 or similar battery.
- ★ Full comprehensive data supplied with each Receiver.
- ★ All coils and IF's, etc., fully wound ready for immediate assembly.



An Outstanding Receiver. Lasky's Price for the complete parcel including Transistors, Cabinet, Speaker, etc., and Full Construction Data.

**£6.19.6** Postage and Packing 4/6

Battery 3/9 (included free with complete parcel). Data and instructions separately 2/6, refunded if you purchase the parcel.

## The New "ALBERTA 5" Mk. II

Now using printed circuit and supplied with miniature earphones for personal listening at no extra cost. Push-pull, 200 milliwatts output. Five transistors and one diode, 2½in. moving coil speaker, ferrite rod aerial. Med. and long wave. Smart plastic Case, 4¾ x 3¼ x 1½in. overall.

CAN BE BUILT FOR **59/6** Post 3/6

All components available separately. Full details, circuit diagram, 1/6 post free.

## THE BETA TWO

A 2-transistor plus 2-diode personal receiver for home construction. Uses printed circuit and ferrite rod aerial. Personal earphone gives clear reception for private listening. Tunes over full medium waveband. Uses same cabinet as our Alberta 5 receiver, illustrated above, size 5¼ x 3¼ x 1½ ins. overall. All components available separately. CAN BE BUILT FOR **21/-** Postage 2s. 6d. extra. Including personal earphone, cabinet, etc. Circuit diagram and step by step instructions 1s. 6d. (Free with parcel).

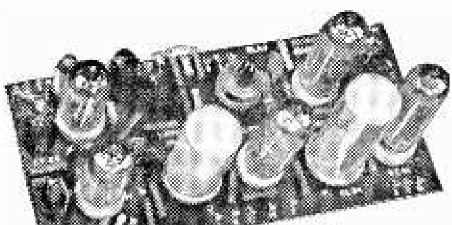
★ *REBUILDING CLEARANCE*
**SALE**
*at 42 Tottenham Court Rd., W.1.*
*LAST SIX WEEKS!*
HUNDREDS OF BARGAINS!!

**207 EDGWARE ROAD, LONDON, W.2.** Near Praed St. PADDINGTON 3271/2

**33 TOTTENHAM COURT ROAD, W.1.** Nearest Stn. Goodge St. MUSEUM 2605

*BOTH OPEN ALL DAY SAT. Early Closing Thurs. Mail Orders to Dept. P.W. Edgware Road.*

# KITS THAT 'BUILD THEMSELVES'



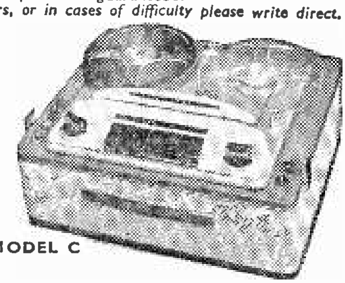
- **HI-FI quality printed-circuit amplifiers, supplied checked and assembled.**
- **Complete with valves, transformers and everything down to wire cut to length.**

Produced by the makers of amplifiers for some of today's best known recorders and backed by years of experience in audio design. The specially designed kits offered here set entirely new standards of performance and finish for the home constructor. Amplifier available separately or with case and speaker and deck. EASY TO FOLLOW INSTRUCTIONS. All equipment complete and guaranteed.
*From radio dealers, or in cases of difficulty please write direct.*

## *FOR HIGH QUALITY TWO & FOUR TRACK TAPE RECORDERS*

| | |
|---|---|
| **AMPLIFIER 'C'** for Collaro Studio Deck (*illustrated above*). | 11 gns. |
| Case and Speaker for above. | 5 gns. |
| **AMPLIFIER 'A' (4-TRACK)** for BSR Monardeck. | 9 gns. |
| **AMPLIFIER 'B' (TWO TRACK)** for BSR Monardeck. | 8 gns. |
| Two-tone covered wooden case with speaker for above. | 4 gns. |
| **KIT 'A'** with Deck, Case and Speaker. | 24 gns. |
| **KIT 'B'** with Deck, Case and Speaker. | 21 gns. |
| **KIT 'C'** with Case, Speaker and Deck (*as illustrated*). | 28½ gns. |

*All amplifiers supplied assembled on printed circuit boards with valves.*



MODEL C

# MARTIN RECORDAKITS

*Leaflet free on request.*
Set of full instructions for any one model 2/6d. post free. (Allowable on purchasing kit.)

COUPON BRINGS DETAILS

MARTIN ELECTRONICS LIMITED,
155 HIGH ST., BRENTFORD, MIDDX.
Leaflet on Martin Recordakits please
NAME ____________
ADDRESS ____________
(In Block Letters.) P.W.10

# Letters to the Editor

*The Editor does not necessarily agree with the opinions expressed by his correspondents*

**Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of the cover.**

### STRIPED SOUND

SIR.—I have been an avid reader of your magazine for the last 15 months and, although many of the articles are still above my head, the home construction bug has bitten hard. I have imported a number of the kits advertised in *Practical Wireless* and my most recent attempt—a stereo amplifier—is now working well, albeit a little distortion in the left-hand channel.

I now wish to attempt some experimental work with 8mm. striped sound, using the above amplifier and the necessary pre-amplification.

Therefore, I am appealing for information from any readers who may already have attempted this sort of thing. I wish to keep the record/playback unit as compact as possible, using the existing film drive sprockets of my projector. If any readers could let me have any such information I would be very grateful and would endeavour to reply to all correspondence.

I am currently busy constructing a stereo pre-amplifier and am hoping that this will also be of use with these experiments.—A. P. RAATS (6 Elizabeth Road, Bedfordview, Tvl., South Africa).

### COPIES OF P.W. WANTED

SIR.—I require urgently certain copies of *Practical Wireless* dating from 1948 onwards. I will pay the full price for copies in good condition.—B. E. WASHER (15 Bower Road, Harrogate, Yorkshire).

### ELECTROMAGNETIC RADIATION

SIR,—With reference to Mr. Craske's letter in the August issue, I fear that he has misconstrued the Quantum theory of electromagnetic radiation (EMR) entirely.

Mr. Craske proposes to emit EMR as a particle, then convert it into a wave at a later stage.

While it is true that the Quantum theory treats EMR as particles, reference to the theory will show equations involving the frequency of the EMR and only waves have frequency. In fact, the "wave" and "particle" conceptions are only analogies used to explain certain observable phenomena of EMR. Actually EMR is neither wave nor particle and should not be considered as such.

It follows, therefore, that a photon cannot be emitted and converted into a wave or vice-versa. It simultaneously exhibits the properties of both wave and particle!

Also, if a photon were, as Mr. Craske put it, to "explode", its energy would be dissipated among several secondary photons and the frequency would be lowered *in a random manner!*—K. ROBBINS (Coventry).

### CORRESPONDENT WANTED

SIR.—I am 15 years of age and I have been interested in S.W. radio for some time. I would like to correspond with amateurs of my own age or anyone interested in 38 and 18 sets.—S. AMOS 53 Meldon Terrace, Newbiggin-by-Sea, Northumberland.

# SERVICING TAPE RECORDERS

*(Continued from page 488)*

"live" pole of the mains, the whole equipment becomes highly dangerous. There is not only the possibility of fatal electric shock, but a random earth connection made on the recorder could cause severe damage to the equipment.

Some operators feel that adequate isolation is possible by interposing two capacitors, one in each conductor, at the set-end of the signal lead-out cable. Such isolation is pretty futile for several reasons. One is that an isolating capacitor must not exceed 0·005$\mu$F, since a higher value would pass too much alternating current due to its lower reactance at 50c/s and would thus be almost as unsafe as a direct connection. Another is that such a relatively low value capacitor would attenuate the lower-frequency audio signals too much for good quality recording. A third reason is that the impedance across the isolating capacitors gives rise to a 50c/s voltage, which is extremely difficult to remove from the low-level signal circuits.

There is only one real answer to this problem and that is to connect a 1-to-1 ratio isolating transformer between the mains supply and the A.C./D.C. set. In that way the chassis is at zero potential and can be retained that way by connecting it to a good earth point. The external tape recorder circuit may then be connected as shown in Figs. 29 and 30 without damage. On no account, however, must an earth be connected to an A.C./D.C. receiver without an isolating transformer. It should also be noted that some sets, although for A.C. mains only, may have a mains transformer to supply only the valve heaters, with the H.T. mains circuit still in connection with chassis. Such models should be handled in the same way as A.C./D.C. receivers.

*(To be continued)*

# Club News

## REPORTS OF CURRENT ACTIVITIES

**BURSLEM AMATEUR RADIO CLUB**
**Hon. Sec.: W. Luscott, 36 Rothsay Avenue, Sneyd Green, Hanley, Stoke-on-Trent, Staffordshire.**

At the August meeting, held on 15th at the Queens Hall, Burslem, G3MUX gave a lecture covering all aspects of two metre operation.

Future Event:
September 19th—"A home constructed two metre rig" by G3EHM.

**CRAY VALLEY RADIO SOCIETY**
**Hon. Sec.: S. Coursey, G3JJC, 49 Dulverton Road, London, S.E.9.**

At the request of the First Swanley Scout Group, a station was put on the air at their recent fete, and a number of contacts were made on 160m by the members who operated it.

**DERBY AND DISTRICT AMATEUR RADIO SOCIETY**
**Hon. Sec.: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.**

The now well known Derby Mobile Rally was held on 19th August at Rykneld School. On Wednesday, 22nd August, members attended a stereophonic demonstration, and on 5th September a sale of surplus equipment was held.

Future Event:
September 12th—Transistors.

**HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY**
**Hon. Sec.: G. Sunter, 24 Booth Fold, Luddenden Foot, Halifax, Yorkshire.**

On August 7th, members listened to a lecture given by G3EKE on the subject of "amateur television". The other meeting for that month was devoted entirely to a ragchew.

The subject of G2VO's talk, which he gave on September 4th, was "amateur radio through the years".

Future Event:
October 2nd—The annual general meeting.

**NORTHERN HEIGHTS AMATEUR RADIO SOCIETY**
**Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorkshire.**

On August 29th all interested members attended a discussion on the R.A.E. course to be held during the 1962/63 season.

Future Event:
September 12th—"Simple fault finding" by G30GV.

**WIRRAL AMATEUR RADIO SOCIETY**
**Hon. Sec.: A. Seed, 31 Withert Avenue, Bebington, Wirral, Cheshire.**

Owing to the decorating and repairs carried out on the club's new premises, no meetings were held during August. The address of the new H.Q. is, The Scout Headquarters, Park Road West, Claughton, Birkenhead.

On September 6th members attended a lecture on single sideband which was given by G2FOS.

### COURSES OF INSTRUCTION

The following classes, organised by the East London R.S.G.B. group, in conjunction with the Essex County Council, are available for all those interested in amateur radio, irrespective of whether they are members of any society or of the general public. There are two R.A.E. courses to be held on Wednesday and Thursday evenings. Also a Morse and codes of practice course held on Monday evenings.

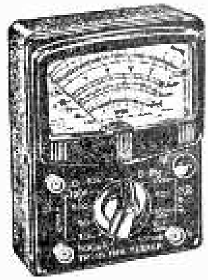
The venue for the classes is, The Ilford Literary Institute, High School for Girls, Cranbrook Road, Ilford, but those interested should first write to Mr. C. H. L. Edwards, 28 Morgan Crescent, Theydon Bois, Epping, Essex.

## SUPERB COMMUNICATION RECEIVERS

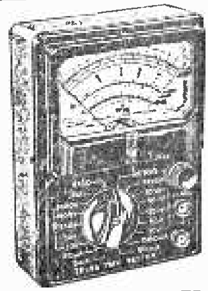
**AMERICAN AR88D RECEIVERS.** Fresh release of these renowned sets. 14 valves, 6 wavebands, covering 500 Kc/s-32 Mc/s. Incorporate every possible refinement and have internal A.C. mains pack for nominal 5/230 v. Thoroughly reconditioned, immaculate in appearance, and in perfect working order. ONLY £35 (add carriage 30/- and 50/- deposit on returnable transit case). S.A.E. brings illustrated leaflet.

**MARCONI CR. 100/8 COMMUNICATIONS RECEIVER.** Covers 60 Kc/s to 30 Mc/s. Complete with all valves, makers instruction manual, and internal A.C. Power unit for 200/250 volts. BRAND NEW IN ORIGINAL TRANSIT CASES. Aerial tested before despatch. ONLY £35 (carr. etc. 40/-). S.A.E. for full details.

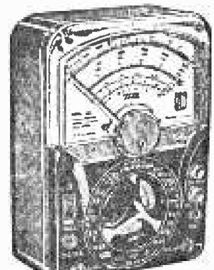
# TEST METERS FOR EVERY PURPOSE & POCKET



**2,000 O.P.V. MODEL TP-10.** Reads A.C. & D.C. Volts up to 1,000; D.C. Current to 500mA; Resistance to 1 Meg; Capacitance to 1μF; Decibels from —20 to +36; Output jack for Audio Measurements. Size 3¼in. x 5in. x 1¼in. £3.19.6



**20,000 O.P.V. MODEL TP-5S.** Reads voltage up to 1,000; D.C. at 20,000 ohms per volt and A.C. at 10,000 o.p.v.; D.C. Current to 500mA; Resistance to 10 Megs.; Capacitance to 0.1μF; Decibels from —20 to +36. Size 3¼in. x 5¼in. x 1¼in. £5.19.6



**30,000 O.P.V. MODEL 500.** Volts to 1,000; D.C. at 30,000 O.P.V., A.C. at 20,000; 12 Amps D.C. Current; 60 Megs Resistance; —20 to +56 Dbs; Internal buzzer short circuit warning. Size 3⁵/₁₆in. x 6⁵/₁₆in. x 2¼in. £8.19.6

All New Stock, with leads, prods, and internal batteries. 6 months' guarantee backed by full service facilities. Details S.A.E.

**AMPLIFIER TYPE A1413.** Ex R.A.F. For normal A.C. Mains use. 5Z4 Rectifications with 6V6 output. Input and output jack sockets, gain control, fully fused. 600 ohms output transformer easily changed for 3 ohms type. Standard rack mounting size 19" x 7" x 6". Used, good condition. ONLY 59/6 (carriage etc. 10/6).

**POWER UNITS TYPE 234.** Primary 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 19" x 7". Fitted Input and Output Voltmeter. 79/6, or model less meter 59/6. (Carriage either type 10/6.)

**AVOMETER MODEL 7 LEATHER CASES,** fitted with carrying handle and long strap. BRAND NEW. ONLY 32/6 (Post 2/6).

**20/- CONSTRUCTORS PARCEL.** Assorted colours wiring wire, solder, resistors condensers, volume controls, tag panel. ALL NEW. (Post 2/6).

**RESISTORS.** 100 assorted values our choice. NEW 10/-.

**CONDENSERS.** 100 assorted mica & silvermica. NEW 12/6.

**PCR COMMUNICATION RECEIVERS**

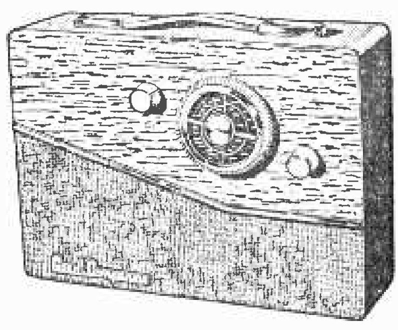
Manufactured by **Pye & Philips.** One of the Army's most versatile and sensitive sets. RF stage and 2 of I.F., using 6 British I.O. type valves. Large 180 degrees Illuminating and Calibrated Dial. Flywheel Tuning with locking device. Aerial Trimmer. Tone and Vol. Controls. Band Switch from panel jacks for speaker or phones. In black metal case, size 17in. L x 8in. H x 10in. D. Model PCR covers 6-18 Mc/s. 200-550 metres and 850-2,000 metres and has internal 5-in. speaker. **£6.19.6. Model PCR2** has similar L & M waveband coverage. Short wave 6-22 Mc/s. but no speaker. Used but excellent condition **£5.19.6.** Every receiver aerial tested before des. Add 10/6 carr. all models. Designed to operate from bulky EXTERNAL power supply, but any set can be fitted with BRAND NEW COMPONENTS INTERNAL PACK for 200/250 v. A.C. at extra cost of **£2.**

*S.A.E. FOR ILLUSTRATED LEAFLET*

## THE "GOOD COMPANION" Mk. II

USING TRANSFILTERS, THE LATEST MANUFACTURING TECHNIQUE TO SAVE ALIGNMENT DIFFICULTY

THE FINEST COMBINED PORTABLE and CAR RADIO YET DESIGNED FOR THE HOME CONSTRUCTOR



★ 750 mW output.

★ 6 transistors and 2 diodes.

★ Full Medium and Long Wave coverage.

★ Quality speaker.

★ Brilliantly styled 2-tone cabinet, size 11 x 8 x 3in.

★ Very fine tuning with calibrated dial.

★ Latest printed circuit. ★ Internal high gain aerial with car aerial socket. ★ Easy to follow construction data (available separately 3/6). All parts sold separately and full illustrated details will be sent on request.

Total Cost **£9.19.6.**

With alternative luxury cabinet using 7 x 4in. speaker. £10.19.6. Either type, pluse 5/- post and ins. (Battery 3/6 extra).

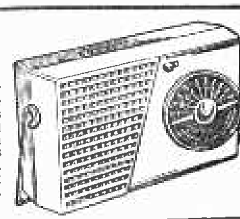
## "P.W." 6 TRANSISTOR PERSONAL RECEIVER

Designed by the technical staff of *Practical Wireless:* easy to build, using printed circuit and 1st Grade Matched Transistors and Diode. Full Medium and Long Wave coverage to internal speakers. All parts sold separately (new components only) enabling you to buy as required and full detailed price list will be sent on request. Constructional details 1/6.

Newly designed OSMOR Cabinet and reduced price. TOTAL COST INCLUDING BATTERY and CABINET NOW £7.19.6.

"P.W. TROUBADOUR 7" Parts List, S.A.E.

## "POCKET 4" TRANSISTOR RECEIVER



Uses miniature speaker, proper tuning condenser, and volume control. Built-in aerial makes unit efficient and portable. Ideal for the beginner. Full medium wave coverage. All components and case for only 42/6 (p. & p. 2/6). Ten-page constructional book free with parts or separately 1/6. S.A.E. for parts price list.

# 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.*

another NEW instrument from Salford, the

# minitest


## POCKET-SIZED MULTIRANGE TEST SET

A new compact instrument suitable for the measurement of D.C. voltages and currents, A.C. voltages and ohms. Its high sensitivity renders it suitable for testing and fault location in all types of electrical and electronic circuits. It is well built to ensure long and satisfactory service. The instrument is economically priced and supplied with test leads with plug connections at one end. (Leather carrying case available as an extra).

| | | |
|---|---|---|
| **RANGES:** | A.C. Volts | 2.5, 10, 25, 100, 250, 1000. |
| | D.C. Volts | 2.5, 10, 25, 100, 250, 1000. |
| | D.C. Amps. | 50µA, 1mA, 10mA, 100mA, 1A. |
| | Ohms | 2000 200,000 20 MΩ |
| **ACCURACY:** | D.C.Volts & Amps | ± 3% of full scale deflection |
| | A.C. Volts | ± 4% of full scale deflection |
| | Ohms | ± 5% at centre scale. |

*Send for leaflet MIN/6009/PW*

neat and compact . . . with large instrument performance

**SALFORD ELECTRICAL INSTRUMENTS LIMITED**
Peel Works · Silk Street · Salford 3 · Lancs · Tel: Blackfriars 6688
London Sales Office: Brook Green Hammersmith, W.6. Tel: Riverside 5246.
*A Subsidiary of* THE GENERAL ELECTRIC CO. LTD. OF ENGLAND

SEI

# THE LINEAR L1/10

## A 10-WATT HIGH FIDELITY ULTRA LINEAR AMPLIFIER WITH INTEGRAL PRE-AMP

**Full advantage has been taken of latest component miniaturisation developments to produce a 10-watt Hi-Fi push-pull amplifier incorporating tone control pre-amplifier stages within the measurements of 9 x 7 x 5ins.**

**In addition two high impedance input sockets are provided for microphone and gram., etc. With selector switch and vol. control, five** B.V.A. valves are employed ECC83, ECC83, EL84, EL84, EZ81, H.T. and L.T. power supply point is included for a radio tuner.

**FREQUENCY RESPONSE**
± 1 d.b., 30-20,000 c.p.s.

**MAXIMUM POWER OUTPUT**
in excess of 14 watts.

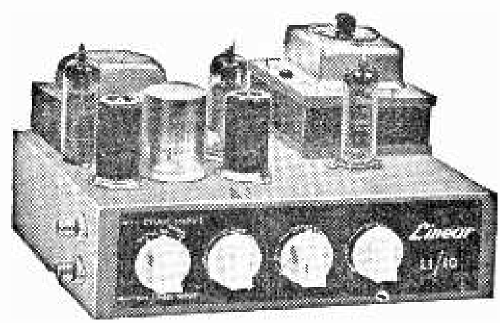
**SENSITIVITY**
L.P. 220 m.v. for 10 watts. 78 r.p.m. 220 m.v. for 10 watts. Radio/Microphone 40 m.v. for 10 watts.

**TREBLE LIFT CONTROL**
+ 10 d.b. to —22 d.b. at 12,000 c.p.s.

**BASS CONTROL**
+ 14 d.b. to —10 d.b. at 50 c.p.s.

**HUM LEVEL**
Referred to maximum output and including integral pre-amp.—70 d.b.

**NEGATIVE FEEDBACK**
21 d.b. in main loop.




**HARMONIC DISTORTION** Less than 0.1% measured at 8 watts at 1000 c.p.s. Weight 10 lbs. Power consumption 90 watts. For 200-230-250 v. 50 c.p.s. A.C. mains. Outputs for 3 and 15-ohm speakers. Chassis finish stoved Gold hammer.

**HIGHEST QUALITY**
**MAXIMUM RELIABILITY AT A PRICE YOU CAN AFFORD**

Retail Price **13** GNS.

Send S.A.E. for descriptive literature

**Also Available—THE L.45.A compact High Quality 4-5 watt amplifier.** Size approx. 7-5-5½in. high. Sensitivity is 28 millivolts so that the input socket can be used for either microphone or gram., tape, radio tuner etc. B.V.A. valves used are ECC83 EL84, EZ80. Controls are: Vol. Treble and Bass with mains switch. The Tone controls provide full compensation for long playing records. Output matching for 3 ohm loudspeaker. Retail price **£5.19.6.**

**THE LT45 TAPE DECK AMPLIFIER.** A complete unit (power pack and oscillator incorporated) ready for connection to A.C. mains. 3 ohm loudspeaker and practically any make of deck. Negative feedback equalisation adjustment by multi-position switch for 1⅞, 3¾ and 7½in. per second. Retail price **12 gns.**

**DIATONIC 10-14 WATT.** High Fidelity amplifier with integral pre-amplifier. Retail 12 gns.

**CONCHORD 30 WATT.** Hi-Fi amplifier with two separately controlled inputs. Retail **16 gns.**

**L50 50 WATT AMPLIFIER.** Size approximately 14 x 10 x 8in. Sensitivity 25 mV. Output for 3 and 15 Ω speakers. Retail price **22 gns.**

**L5/5 STEREO AMPLIFIER** 5 + 5 watt **12 gns.**

**TRADE ENQUIRES to**

**LINEAR PRODUCTS LTD.** ELECTRON WORKS, ARMLEY LEEDS

# TRANSMITTING TOPICS

## MODULATION MONITORING

By G3OGR

THE need for checking the depth of modulation with a telephony transmitter makes some method of modulation monitoring very useful. Over-modulation can cause interference, and must always be avoided, while insufficient modulation makes a signal difficult to copy when conditions are bad.

### *Methods*

There are several methods of checking the depth of modulation, and they are very helpful indeed, both for regular working, and when testing or setting up a new transmitter. It is also useful to be able to listen to the speech quality of the actual radiated signal.

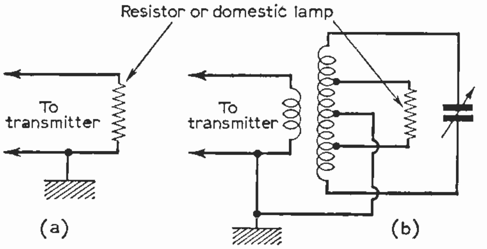



*Fig. 1—An artificial aerial consisting of a lamp load or resistor.*

When adjusting or testing the equipment, some over-modulation will probably arise. It is thus essential to use an artificial aerial with the transmitter to avoid unnecessary interference with other transmissions. Two methods of providing an artificial aerial load are shown in Fig. 1. For a small transmitter (such as a top-band rig) it is feasible to use ordinary carbon resistors (Fig. 1a). Two 5W 24Ω resistors in series will provide a 10W 48Ω load or five 2W resistors, or some similar combination, may be to hand. The exact load is generally unimportant, because the transmitter matching can be adjusted to suit.

Large non-inductive resistors for such purposes are obtainable, but are expensive, so for transmitters in the 25W to 150W range, an ordinary domestic lamp (200/250V) is generally adopted. A 15W lamp is also suitable for a low power transmitter. The lamp is chosen to suit the transmitter power and the wattage is not critical.

If the transmitter can be loaded into the relatively high impedance of the lamp (as many transmitters can) then it is only necessary to connect the lamp in place of the aerial or aerial tuner, as in Fig. 1, but if the transmitter will only match a low impedance load, some form of impedance matching circuit is needed. A convenient method is to use a tuner, as in Fig. 1b. This could be the usual aerial tuner, or a tuner wired up for the purpose. The coil is tuned to the operating frequency. The transmitter is coupled with a loop of about two or three turns round the coil, and the lamp is tapped across a portion of the coil, to give suitable loading.

Most transmitters use a $\pi$-output circuit; loading into this follows normal practice. That is, the $\pi$-output capacitor is set at high capacity, and the power amplifier (P.A.) capacitor is tuned to resonance, as shown by a dip in anode current. The output capacitor is opened a little at a time, the P.A. being kept tuned to resonance, until the anode current reaches the required figure. This process will cause the lamp to light more and more brightly, as R.F. output increases.

### *Monitoring with an Oscilloscope*

An oscilloscope can be used to monitor modulation depth, by taking a small R.F. voltage to the Y (vertical) input. Sufficient R.F. input may be obtained by twisting an insulated lead round one lead to the lamp load, this lead forming capacitor C1 in Fig. 2. The oscilloscope attenuator is adjusted to give a display of suitable height. If the oscilloscope is a simple one with no attenuator, adjust the coupling provided by C1.

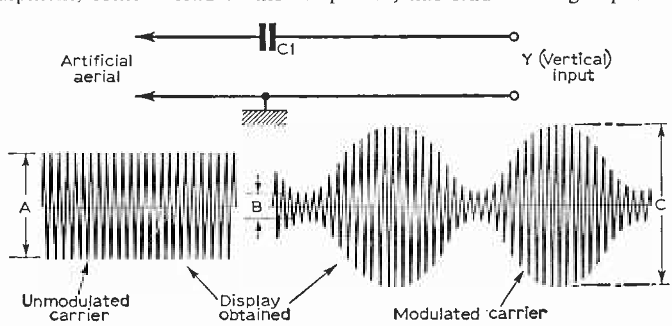



*Fig. 2—Monitoring with an oscilloscope, with timebase.*

A steady tone is preferable for monitoring, as the irregular display obtained from speech is less easily examined. This tone can be obtained from an oscillator or other convenient source. By locking the timebase to the oscillator by means of the sync control of the oscilloscope, a stable display will be achieved.

The unmodulated R.F. has the amplitude "A" in Fig. 2. As modulation is increased, the waveform of the modulated carrier will grow more pronounced. Downwards modulation produces the

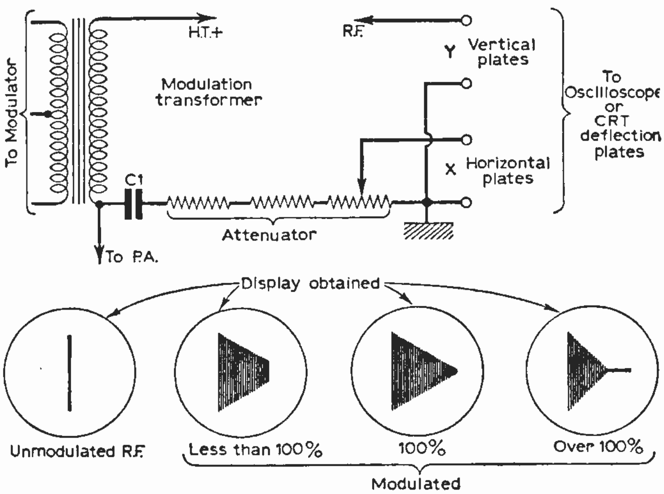



*Fig. 3—Using an oscilloscope without timebase.*

dips, the amplitude being measured as at "B". The downwards modulation, as a percentage, is:

$$100\left\{\frac{A-B}{A}\right\}$$

The distances can be measured in millimetres or any other units. Upwards modulation produces the "humps" and the upwards modulation percentage is:

$$100\left\{\frac{C-A}{A}\right\}$$

If modulation is symmetrical the upwards and downwards modulation percentages will be the same. Downwards modulation must not exceed 100% or interference will be caused.

The same display can be obtained with a received transmission. A station with an oscilloscope can thus monitor the transmission of another station. This can be useful when setting up a modulation meter of the type described later. To obtain the display modulated R.F. can be taken from the last I.F. amplifier in the receiver.

### *Using a Simple Oscilloscope*

Modulation can be monitored with a simple oscilloscope having no timebase. To do this, R.F. is applied to the Y-input, as already described, coupling being adjusted to obtain sufficient deflection to draw a vertical trace, as in Fig. 3.

The X-input (horizontal) is taken from the audio amplifier, via the isolating capacitor C1, which can be of any convenient fairly large value. Two or more resistors are used as an attenuator, as shown. Two 1M fixed resistors, with a 500k potentiometer, will suffice for many transmitters.

When the signal is modulated, a display of the kind shown will be obtained. The attenuator setting merely controls the extent to which the audio shifts the trace horizontally, and is adjusted to obtain a reasonably large display, but one not exceeding the screen size. As with the previous method, a steady tone is most suitable, as merely speaking into the modulator microphone will give a rapidly fluctuating pattern less easily examined.

### *Monitor Oscilloscope Circuit*

With a small tube, sufficient trace can easily be obtained without amplifiers, so the X- and Y-inputs can be taken directly to the tube plates (via isolating capacitors). A simple circuit of this kind is shown in Fig. 4, and is intended for the DH3-91 tube. This has a 6·3V 550mA heater, which should receive current from a 6·3V transformer winding. For H.T. 500V will easily suffice, and this can most probably be obtained from the transmitter power pack, or from a simple half-wave pack using the full winding of a 250-0-250V transformer. The 560k resistor (R3) may be adjusted to modify the trace brilliance; a variable control may be fitted, if preferred. If so, a 470k fixed resistor in series with a 500k potentiometer can be used.

As no timebase is available, the display obtained will resemble that in Fig. 3. No X-amplifier is present, so the attenuator will need adjusting to

*(Continued on page 533)*

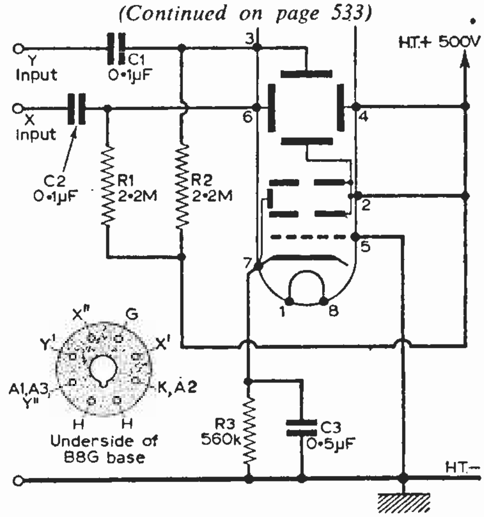



*Fig. 4—A circuit for a 1in. oscilloscope.*

# MAILPLAN OFFERS

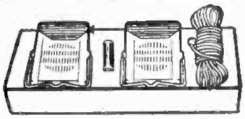
Dept. PW 138 Lewisham Way, New Cross, London, S.E.14. TIDeway 6667

**Immediate Despatch Service! Best Value for Money!**

All items advertised have been approved by our technical team of qualified engineers.

## TWO SENSATIONAL TRANSISTORISED INTERCOMS

### *HANDY INTERPHONE*

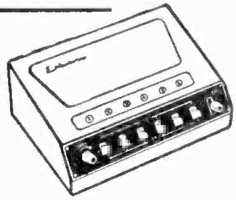


For Home, Workshop, Office, two-way calling. Consumes current only when talking or calling. Housed in attractive plastic cabinets with chrome stands. Completely portable. Master and sub-station. Replacement battery only 2/6

MAILPLAN PRICE **89/6** incl. P.P.3 battery and 25 yds. lead with plugs. P. & P. 3/-.

(Today's value 8 gns.)

### 7 Station De Luxe Transistorised Intercom



The very latest in Office and Factory communication. Calling is audio and visual. Battery operated but consumes current only when calling or talking. Neat compact attractive units, up to 6 extensions supplied separately. Battery life 300 hours.

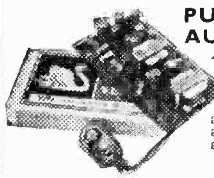
Master **14 GNS.** Post free.

Extensions 2 gns. Post free.

*HALF THE PRICE OF OTHER MAKES*

Construct your own Record Player, Intercom, Tape Recorder, etc., with the

## PK.543 SUBMINIATURE 4-TRANSISTOR PUSH-PULL AUDIO AMPLIFIER 52/6



An assembled and wired miniature amplifier incorporating output transformer, and 4 transistors, class B. 200 m. watts. All connections for battery, speaker and volume control. The quality is amazing. Complete with instructions and circuit P217A. Size 3 x 1 9/16 x 11/16in.

8 ohm speaker to suit above. 2½ flux density, 7,800 gauss. Power, 200 mW. **16/6** P. & P. 1/-.

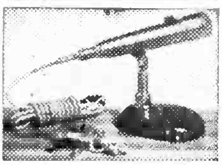
## M178 CRYSTAL LAPEL MIKE 17/6

100-9,000 cps. 1¼in. diam.. 5ft. lead P. & P. 1/-

## SLIM CRYSTAL MICROPHONE

**— 3 WAY —**

**Hand held, Stand mounted or suspended by lavalier cord.**



**MODEL 100C 39/6** Post Free

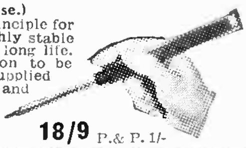
Check the spec. and judge for yourself. Response 60-10,000 cps. Built-in ON-OFF Switch, Output Level —52 dB. Omni-directional. Termination above 500 K ohms. Satin Chrome Finish. Accessory Table Top Stand, 8/6.

### *PORTABLE SOLDERING IRON Model SPI*

**30 Watt 230 Volts**

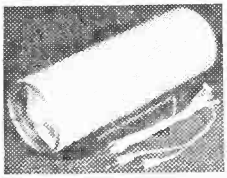
(Size 10½in. 6½in. when not in use.)

Designed on an entirely new principle for light-weight applications. Highly stable heat characteristics ensures long life. Removable handle permits iron to be carried safely even while hot. Supplied complete with Vynil bag, lead and plug. Spares available. Element 4/6. P. & P. 6d.



**18/9** P. & P. 1/-

## TUBULAR BAFFLE EXTENSION SPEAKER



Most adaptable of all speakers. Mounts vertically, horizontally, or sits on desk.

**ANOTHER MAILPLAN Top Value offer . . . 54/6** P. & P. 2/6.

The T.S. 30. Frequency Response: 65-7,000 cps. Impedance 8 ohms. Rated at 1.5 watts. Cabinet, beige leather finish with contemporary gold baffles. Size 9¼ x3in. diam.

## *SERVICE ENGINEERS!*

***Here's the most useful tool money can buy . . .***

### the D900 TRANSISTOR TESTER/ POWER SUPPLY

*LABOUR SAVING—SPEEDY—SIMPLE*

ONLY **£10** *Ask for full technical specification.*

**Checks** Alpha gain (Current gain—AC)
**Checks** Beta gain (Current gain under DC conditions)
**Measures** Leakage currents between Collector/Base and Collector/Emitter, at any voltage between zero and 25 V.
**With transistors in place**
*Size 5¼ x 3 x 2¼in.*

**NOW** you can carry out, fast testing of transistors and miniature transistor receivers without removing transistors from circuit. Self-contained signal tracing oscillator, self-contained variable power supply.

## Miniature Clear Plastic Panel Meters

### FOR YOUR HOME BUILT TEST EQUIPMENT

| | | | |
|---|---|---|---|
| DC MICROAMMETERS | Model MR.25 | 0 to 50 µA .. | 39/6 |
| | Model MR.250 | 0 to 500 µA .. | 32/6 |
| DC MILLIAMMETER | Model MR.21 | 0 to 1 mA .. | 27/6 |

All models Individually Boxed and Fully Guaranteed. P. & P. 2/6 each.

**"S" METER MODEL SR. 2P.** Standard "Ham" Signal strength indicator. Calibrated in "S" units from 0-9 with scale terminating in +10 to +30 dB calibrations. Additional full scale calibrations of 0-5+0-10 in linear scale divisions. 35/-

**VU METER MODEL VR. 1P.** Calibrated and damped in accordance with standard VU Meter Practice. Upper scale reads —20 to +3VU. Lower scale 0-100% modulation. Uses precision carbon film multiplier resistor and full wave rectifier. 42/6.

## SKANTEST—THE L.O.P.T. TESTER

Tests TV Windings for shorting turns by unique pulse method. This compact instrument can save you pounds. It detects a single shorting turn in a line output transformer, deflector coil or other Windings. The pulses provided by the instrument detect intermittent faults. In position one, the continuity of the Windings is checked; in position two, high impedance coils, and in position three, low impedance coils. Once you have used the Skantest you will regard it as a must in TV Servicing.

**Exclusive Mailplan Offer 99/6** P. & P. 2/9

## High resistance Standard type TWIN HEADPHONES 13/6

2,000 ohm Model SF20. Complete with headband. P. & P. 1/-

**WATCH FOR MAILPLAN EACH MONTH!**

**When placing your first order** ask for your name to be entered on the **MAILPLAN Special Small Quantity Bargain Mailing List**

*(Continued from page 530)*

obtain sufficient deflection. In the same way, there is no Y-amplifier or adjustable attenuator, so coupling must be so adjustable to the lamp load or aerial, to give a suitable vertical trace.

Such a monitor is easily made as a small, separate unit. A magnifier, preferably with hood, can be fitted over the screen, to enlarge the display, as the tube mentioned is only 1in. in diameter. Larger tubes may be employed in a similar manner, but a much higher voltage will generally be needed for them.

### Neon Indicator

A 240V or similar neon lamp can be used as a modulation indicator, as shown in Fig. 5. C1 is merely an isolating capacitor, of 0·05$\mu$F or similar value. R1 and VR1 form a voltage dropping network, and VR1 is so adjusted that the neon just strikes when modulation reaches nearly 100%. While transmitting, repeated flashing of the neon is a warning to move farther from the microphone, or reduce the modulator gain control setting.

The values of R1 and VR1 will depend on the P.A. voltage, but VR1 can be a 500k potentiometer. R1 will then probably be from about 250k to 1M, depending on the transmitter H.T. voltage. If the neon does not light with VR1 set for maximum voltage across it, then R1 must be reduced in value.

If there is no objection to having the neon at H.T. potential, the network and neon may be in parallel with the modulation transformer winding. The neon can be mounted behind the panel, preferably screened from too much extraneous light.

If an oscilloscope is available, the neon indicator can be set up with the oscilloscope monitoring the modulation level. If it is not possible to obtain an oscilloscope for this purpose, the receiver can be employed to listen for the sideband splatter caused by over-modulation. To do this, it will probably be necessary to use a lamp load, and to remove the receiver aerial, to avoid overloading the receiver. This depends on the screening, and transmitter power. Alternatively, a valve, such as an R.F. amplifier, may be removed from its socket, if the signal strength is still too great with the R.F. gain control on the receiver at minimum.

When the transmitter is being modulated, sideband splatter as a result of over-modulation will be heard when the receiver is tuned slowly away from the correct frequency. The sound is heard only at the instants of over-modulation, and will not be audible with a properly modulated signal (such as from a BBC station). Modulation is then adjusted until splatter has just ceased, and VR1 is adjusted so that it is then just igniting, on speech or modulation peaks.

### Modulation Level Meter

Modulation reaches 100% when the P.A. anode voltage is swung from zero to twice its unmodulated voltage. For example, if the power amplifier operates with 500V on its anode, the modulator swings this from zero to 1,000V for 100% modulation.

An A.C. voltmeter will thus act as a modulation meter, and a multi-range meter with A.C. ranges can be used, though a separate meter is preferable. A suitable circuit is shown in Fig. 6. C1 is merely an isolating capacitor, of suitable working voltage. A 0·05$\mu$F 1,000V component would be suitable for many transmitters. The meter can be a 1mA, 5mA, or similar instrument, with 1mA or 5mA rectifier. R1 is the voltage-dropping resistor.

The meter will give no reading when the transmitter is not being modulated (unless there is hum on the carrier) but will kick upwards when speech is present. If a signal is obtained from an audio oscillator or similar source, the meter will take on a steady reading. It is necessary to adjust R1 to obtain a convenient deflection of the meter pointer,

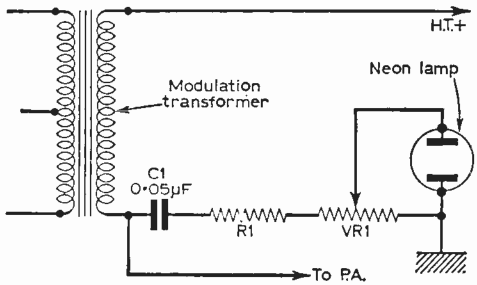



*Fig. 5—A neon modulation indicator.*

and the meter can then be calibrated for 100% modulation, by one of the methods previously described. This calibration is most accurate if carried out with the usual microphone and by speaking in the usual manner. After calibration, it is only necessary to observe the meter, when checking modulation, to see that its reading is well up, but not over the 100% mark.

### Modulator H.T. Current

Class B modulators are used with all but the smallest transmitters, and with these the H.T. current drawn by the output stage depends on the audio power handled. A meter in the H.T. supply to this stage can thus be used as a check on modulation. The reading to which the meter will rise, for nearly 100% modulation, can be found


*Fig. 6—A speech level meter for monitoring.*

by the methods previously described, as well as by obtaining reports from stations contacted.

A disadvantage of this method lies in the fact that the audio input required for full modulation depends on the loading of the P.A. The P.A. should thus always be loaded to the same extent, or nearly so, by means of the usual aerial coupling adjust-

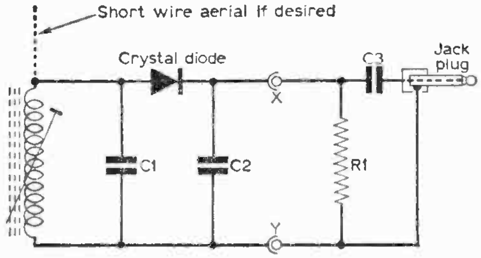



*Fig. 7—A diode pick-up for audible monitoring.*

ments. It is then only necessary to speak or adjust the modulator gain control, until the meter peaks are around the accustomed figure.

### Speech Polarity

If a trace like that in Fig. 2 is observed, while speaking into the modulator microphone, the modulation peaks in both directions will probably not be equal. That is, upwards modulation may exceed downwards modulation, or the reverse. If downwards modulation exceeds 100% (broken carrier) interference is caused. But upwards modulation exceeding 100% need not cause interference. It is therefore preferable that the lack of equality in the modulation should be so arranged that the highest peaks are in the upwards direction, as a greater level of average modulation is then possible, without exceeding 100% modulation in the downwards direction.

The human voice functions in such a way that many sounds are not of symmetrical waveform. If the strongest peaks give an upwards modulation trace, these peaks may exceed 100%, while downwards modulation does not exceed 100%. If the peaks result in downwards modulation, the average audio signal has to be reduced, to keep these peaks within the 100% limit. This can be overcome by reversing the connections to any audio transformer winding, in the modulator. Probably the driver secondary or modulator transformer primary connections can most easily be reversed. The best polarity for one microphone is not necessarily most suitable for another microphone. If no oscilloscope is available, the best polarity or phase is that giving most freedom from splatter.

### Modulation Quality

A simple pick-up for audible monitoring is shown in Fig. 7. C1 can be any convenient capacitor, fixed or variable, from about 25pF to 500pF, to allow the coil to be tuned to the required amateur band. C2 is 500pF to 5,000pF or so. Phones are connected at the points X and Y for audible monitoring.

If a tape recorder is available, R1 and C3 may be added. About 100k and 0·01μF will be satisfactory, and a short screened lead is equipped with a plug to suit the recorder input socket. The pick-up tuner is then placed at a suitable distance from the transmitter, aerial, aerial tuner, or lamp load. In this way, a recording of any test or other transmission can be made, and it will be of the same quality as radiated over the air. The recording can be played back afterwards, as a check on speech quality, modulator operation, and so on. If the recorder volume control setting is noted, the test can be repeated without difficulty, when necessary, and no helper is required. ■

## SOUND RECORDINGS

**TAPE BARGAINS** in all sizes. Example: Top brand 5¾in. 1,200ft 19/6 p. and p. 1/3. S.A.E. for list. Large choice of New and Used Recorders. E. C. KINGSLEY AND CO., 132 Tottenham Court Road, London W1. EUS 6500.

## RECEIVERS & COMPONENTS

**NEW AND SURPLUS** Valves, guaranteed, from **3/6.** Also reclaimed Valves, perfect, from **1/6.** Many bargains. S.A.E. for complete list. LEWIS, 46 Woodford Avenue, Ilford, Essex.

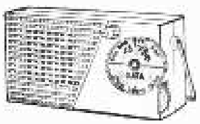
**SPEAKER REPAIRS.** Cones/Fields fitted. Clock coils wound. L. S. REPAIRS, Pluckley, Ashford, Kent.

**A.1 POST FREE BARGAINS.** EB91, EF50, EF80, EF91, 10F1, 6F1, **9d** each, 5 for 2/6 (mixed). PY82, PL38, 4/6, PZ30, 4/-. Speakers 6" 7/6, 8" 6/6, 10" x 6" 15/-. "Primax" 60 watt twin light solder guns 92/6. Morse Keys 3/-. All Mullard B.V.A. Transistors and valves stocked. All previous bargains available. A.1 Radio Components 14 The Borough, Canterbury, Kent.

## DATA TRANSISTOR POCKET KITS

**NO SOLDERING OR DRILLING. COMPLETELY SELF CONTAINED**

NO AERIAL REQUIRED - MEDIUM & LONG WAVE - ASSEMBLY TOOL PROVIDED - CAN BE BUILT BY ANYONE

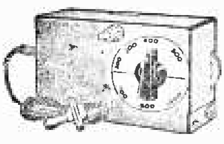


**DATA 427**
5¼ x 3 x 1¼in.

**75/-**

P.P. 2/9 ex. Battery 2/3 ex.

4 TRANSISTORS - 2 DIODES
7 STAGES - MOVING COIL SPEAKER



**DATA 326**
4¼ x 2¾ x 1¼in.

**49/6**

P.P. 2/-ex. Battery 1/- ex.

3 TRANSISTORS - 2 DIODES - 6 STAGES - PERSONAL EAR PIECE

**ALL PARTS CAN BE BOUGHT SEPARATELY**

**DATA ELECTRONICS LTD.**
6 HILLSIDE GDNS., EDGWARE, Middlesex

**RATES:** 7/3 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., London W.C.2.

## RECEIVERS & COMPONENTS

*(continued)*

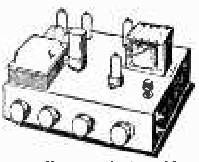
## ★ SPECIAL OFFER ★

**MINIATURE 6-TRANSISTOR SUPERHET** chassis 3¾in. x 2¼in. x 1in. All components mounted on printed circuit board. Long and Medium waves: 200 mW Push pull output; 2in. moving coil speaker. Earpiece socket fitted. Each set complete with battery and guaranteed working perfectly. Supplied without case. £5.12.6, P. & P. 3/-. extra.

**SAVOY ELECTRONICS (Sales) LTD.**
15 Maiden Lane, London, WC2.
TEMple Bar 5484

"**HEATHKITS**" can now be seen in London and purchased in easy terms. Free brochure. DIRECT TV REPLACEMENTS LTD., Dept. P.W. 7/9. 138 Lewisham Way, SE14. Tideway 6666.

## ULTRA LINEAR AMPLIFIERS



High Fidelity. 15 watts. Valves ECC83, ECC83, EL84, EL84, EZ81. Two inputs. Sensitivity 10 millivolts. Bass & Treble controls. 3 & 15 ohms. outputs. kit, £6.10.0. plus 5/- carr. Factory built, £9, plus 5/- carr. Similar 30 watt £12. plus 7/6 carr. Leaflet free. Same day despatch.

**STROUD AUDIO**
Bath Road, Stroud, Glos.
Tel. Stroud 783.

**TRANSISTOR COMPONENTS.** 7 x 4in. 35 ohm speakers, **25/-**, 7 x 4in. 3 ohm, **19/6. EARPIECES.** 7 ohm, 150 ohm, **6/6.** Xtal with Jack, **7/6,** all complete with plugs. 4 pole 2 way switches 1 inch spindle, **2/6** each. Min. Caps, 15 v. wkg.—1, 2, 4, 5, 8, 10, 16, 32, 50 mfd., 64 mfd., 10 v., 100 mfd., 6 v., 100 mfd., 12 v., all at **1/10** each. Resistors mostly 10% small, 10 ohms to 10 meg., **3d.** each. Ceramicons, most values in stock, 1 pfd. to 5,000 pfd. Slide switches, DP/DT, 3/- each.

**TRANSISTORS.** OC44, OC45, **7/6** each, A.F. Pack OC81D, 2 OC81, **18/6,** set. G.E.C. 874, **4/6,** S6, S7, good output transistors, **2/6** each. Red spots, **2/3,** White spots, **2/6,** OC76, **3/6,** OCP71, **12/6,** OA81 Diodes, **2/6,** GEX00, **9d.** Terms C.W.O. or C.O.D.

**BROADWAY ELECTRONICS**
92 Mitcham Road, Tooting, S.W. 17.

## DON'T READ THIS

unless you repair Radio and TV sets. Halve the cost of repairs by using our surplus or reclaimed Valves and Tubes. Most comprehensive selection at keenest prices. All valves re-tested before despatch and guaranteed to be in good working order.

| | | | | | |
|---|---|---|---|---|---|
| 5U4 | 4/6 | 20L1 | 4/- | KT36 | 4/- |
| 6A7 | 7/6 | 20P1 | 4/- | KT33C | 2/6 |
| 6A8 | 6/- | 20P3 | 6/- | KT81 | 6/- |
| 6AQ5 | 6/- | 25L6 | 6/- | KTW61 | 4/- |
| 6AT8 | 4/- | 25Z4 | 4/- | LN152 | 4/- |
| 6AU6 | 4/- | 27SU | 10/- | MU12 | 5/- |
| 6BQ7A | 7/6 | 30C1 | 4/- | N37 | 6/- |
| 6BG6 | 12/6 | 30F5 | 4/- | PCC84 | 4/- |
| 6C5 | 4/6 | 30L1 | 4/- | PCF80 | 4/- |
| 6CH3 | 6/- | 30P4 | 10/- | PCL82 | 4/- |
| 6F1 | 2/- | 30P12 | 4/- | PCL83 | 4/- |
| 6F14 | 4/- | 30P13 | 6/- | PEN45 | 4/- |
| 6F15 | 4/- | 30PL1 | 4/- | PL33 | 2/6 |
| 6F33 | 4/6 | 35L6 | 6/- | PL38 | 10/- |
| 6J5 | 4/6 | 50C5 | 4/6 | PL81 | 4/- |
| 6J6 | 4/- | 80 | 5/- | PL82 | 4/- |
| 6J7 | 4/- | 185BT | 10/- | PL83 | 4/- |
| 6K8 | 6/- | B36 | 4/- | PY31 | 4/- |
| 6K25 | 6/- | DDT4 | 5/- | PY80 | 4/- |
| 6L1 | 4/- | DH63 | 4/6 | PY81 | 4/- |
| 6L6 | 6/- | E88CC | 5/- | PY82 | 4/- |
| 6L18 | 4/- | EAC91 | 2/6 | PZ30 | 4/- |
| 6L19 | 7/6 | EBC33 | 4/- | TDD4 | 5/- |
| 6P25 | 4/- | EBC91 | 4/- | U12 | 5/- |
| 6SJ7 | 4/- | EBF80 | 4/- | U24 | 7/6 |
| 6SK7 | 4/- | ECC81 | 2/6 | U25 | 10/- |
| 6SL7 | 4/- | ECC82 | 4/- | U31 | 4/- |
| 6SN7 | 2/6 | ECC83 | 4/- | U35 | 4/- |
| 6T8 | 6/- | ECC85 | 5/- | U191 | 7/6 |
| 6U4 | 6/- | ECC88 | 5/- | U281 | 4/- |
| 6V6 | 4/6 | ECC91 | 4/- | U282 | 10/- |
| 7AN7 | 4/- | ECF80 | 5/- | U301 | 10/- |
| 7B7 | 5/- | ECF82 | 5/- | U403 | 6/- |
| 7C5 | 5/- | ECH35 | 6/- | UAF42 | 4/- |
| 7S7 | 7/6 | ECH42 | 6/- | UBC41 | 6/- |
| 10C2 | 6/- | ECL80 | 4/- | UBL21 | 12/6 |
| 10F1 | 2/6 | EF9 | 7/6 | UCH21 | 12/6 |
| 10P13 | 4/- | EF39 | 2/6 | UCH42 | 6/- |
| 10P14 | 4/- | EF80 | 2/- | UF42 | 3/- |
| 12AT7 | 2/6 | EF91 | 2/- | UL41 | 4/- |
| 12AU7 | 4/- | EF92 | 4/- | UL44 | 4/- |
| 12AX7 | 4/- | EK32 | 7/6 | UL46 | 6/- |
| 12BH7 | 4/- | EL33 | 4/- | UR1C | 7/6 |
| 12BY7 | 4/- | EL33 | 4/- | UU7 | 7/6 |
| 12E1 | 6/- | EL41 | 6/- | UU8 | 10/- |
| 12K8 | 6/- | EL42 | 7/6 | Z66 | 4/- |
| 12SK7 | 4/6 | EL81 | 6/- | Z77 | 2/- |
| 12SN7 | 4/- | EL90 | 6/- | ZD152 | 6/- |
| 20D1 | | FC4 | 5/- | | |

Most pre-war 4, 5, 7, 8 and 9 pin valves. British, American, Continental, 5/- each. Postage and packing (all valves) 6d. each. Orders over £1.0.0 post free.
**NEW TRANSISTORS.** Red spot 2/6. OC45, OC72, OC76 7/6. OC201 (silicon) 17/6.
**SPEAKERS:** 6in. 5/-, 7 x 4in. 7/6, p. & p. 2/-.
**LINE OUTPUT TRS,** from 20/-. Many types.
**CONSTRUCTOR'S PARCEL.** 2 lbs. assorted parts from TV sets. Resistors, condensers, potentiometers, electrolytics, valve holders, etc., etc., 7/6. P. & P. 2/6.
**VALVE PARCEL.** 12 valves all different as taken out of TVs, Ideal for spares, testing, etc. 8/3. Postage 1/6.
Before you decide to purchase anything send a S.A.E. for our complete FREE list of 1,000 valves, and terms of business. You will be amazed at our prices. All letters S.A.E. for reply please.
**"St. John's Radio,"** Mail Order Dept., 3 Jews Row, London S.W.18 *Phone:* VAN 8822

## "LITON" PHOTOELECTRIC CONSTRUCTIONAL MANUAL

10 Interesting **PHOTOELECTRIC PROJECTS,** fully described with building plans and circuit diagrams which can be easily made by amateurs from standard components. Hints on the use of photocells and phototransistors. A mine of practical information for the experimenter. All units available, ready built or in kit form.

1. Battery burglar alarm. Kit 65/-.
2. Mains burglar alarm.
3. Light saver.
4. Customer announcer.
5. Simple garage door opener.
6. Photoelectric counter.
   Price (2-6) Kit £4.12.6. Built £5.10.0.
7. Long range infra-red mains alarm.
8. "MIRA" Miniature infra-red battery alarm. Total consumption 0.2 watt.
9. Motorised garage door opener.
10. Door opener with electronic lock.

If you are interested in electronics or electro-mechanical gadgets send 1/- stamp for this 24-page, profoundly illustrated publication to:
**"ST. JOHN'S RADIO,"** 3 Jews Row, London SW18. *Phone:* VAN8822

## BRIAN E. HAMPSHEIR (R & T) LTD.

**Dept PWA, 23 NORTHCROSS ROAD, S.E.22.**

| | | | | | | |
|---|---|---|---|---|---|---|
| 6F13 | EF80 | EF91 | 6P25 | 10F1 | Z77 | 25L6GT |
| EB91 | 6P28 | 6F1 | EF50 | L63 | 6F12 | |

SALVAGED. GUARANTEED 100% ALL AT ONE PRICE
**£1 for 10, p. & p. FREE**

RECEIVERS & COMPONENTS *(continued)*

**NEW TRANSISTORS** MONEY BACK GUARANTEE.

MARKED AND TESTED SUCH AS XA101. XA102. XB103. XC101. ETC. 20/- PER PACKET OF 10.

UNMARKED BUT TESTED MOST RADIO TYPES 20/- PER PACKET OF 16.

UNMARKED UNTESTED 20/- PKT OF 40.

DUDS MAY BE SUITABLE AS DIODES 20/- PKT OF 80.

POST FREE

ANY 2 PACKETS 37/6 CASH WITH ORDER

QUANTITY DISCOUNT

K.R. WHISTON (DEPT PWT). NEW MILLS, STOCKPORT.

## FOR SALE

**ASK** your dealer for American Ferrodynamics "Brand Five" Recording Tapes—the best tape value!

**AMATEUR LICENCE** Morse Course. The new Rhythm Method of teaching takes the drudgery out of learning Morse and is the quickest known! For full explanatory booklet: S.A.E. G3CHS, 45 Green Lane, Purley, Surrey.

# E. R. NICHOLLS

**47 MIDDLE HILLGATE, STOCKPORT**

RETAIL SHOP

**BUMPER PARCEL**

100 Resistors, 100 Condensers, 100 Cartridge Fuses, 3 Mains Droppers, 2 Rotary Toggle Switches, 6 Paxolin Panels, 2 B.C. Lampholders, 1 Transmitter, Chassis less Valves, 6 Potentiometers. **20/- Post Free.**

**No. 2 PARCEL.** 1 ex Unit Mains Transformer 250-0-250 x 4 x 5 x 6.3 volts, 1 Sound Output Transformer, 1 Isolation Transformer, 1 5in. Speaker P.M., 3 Jack Sockets, 4 Terminal Blocks, 2 Inert Cells, 1 Telephone Fuse Box, 1 12-volt 4-pin Vibrator, 100 Cartridge Fuses, 1 Helmet Spot Lamp, 1 Nylon Parachute for the youngster, 24 asstd. sizes Polythene Bags for the wife, 12 sheets Carbon Paper for the lodger, 1 Thermistor and if you send a local view (post card) I will send 12 High Stab Resistors. All this for **40/-, Post Free. Don't Miss It.**

High Stab Resistors 6d. each. S.A.E. List

20 ft. Telescopic Masts 50/-, via BRS Post free

*Mail Order to—*

**33/35 Carrington Field St., Stockport.**

**BRAND NEW** Adjustable Steel Shelving, 73in. high by 34in. wide by 12in. deep. Stove Enamelled dark green. Sent unassembled. Six-shelf bay £3/15/-. Sample delivered free. Quantity discounts. N. C. BROWN LTD., Eagle Steelworks, Heywood, Lancs. Tel.: 69018.

**PORTER'S RADIO.** Component Specialist. We have now doubled the size of our premises in order to supply a larger range of Components, Amplifiers and Hi Fi Equipment. Pay us a visit or send your enquiries to—15-19 Chapel Street, Guildford, Surrey. Telephone 4766, Ext. 3.

## FOR SALE
*(continued)*

**RED SPOT** Transistors **1/9d.**, six for 8/-; 1mfd to 100mfd Trans. Cons. 2/- each, six for **10/-**; Midget I.F.T. 465kc 6/- pair. 10.7mc **4/-** pair; 9V Trans. Eliminators **17/6**; EP10K meter **£5**; Silicon Recs. 250V, 500mA **10/-**; 1962 Catalogue 2/-. All post free. B. W. CURSONS, 78 Broad Street, Canterbury.

**OFFERS ARE INVITED** for two Peto Scott Pre-tuners and 60W Amplifier Rack for communal Radio. Inspection by appt. only. Apply: Deputy House Governor, R.N.T.N. and Ear Hospital, 330 Gray's Inn Road, W.C.1. (TER 8855.)

## WANTED

**WANTED: NEW** Valves and Transistors, any quantity. S. N. WILLETS. 43 Spon Lane, West Bromwich, Staffs. Tel.: WES 2392.

**NEW VALVES WANTED**

**Any type, any quantity**

**CASH PAID**

**R.S.T. 211 Streatham Road, Mitcham, Surrey**

**Telephone: MITCHAM 6202**

**WANTED: TEST GEAR.** Meters, Valves, Components, Communication Sets, Amplifiers HUGGETS LTD., 2-4 Pawson's Road, West Croydon, Surrey.

**WANTED:** New Valves and Transistors, any quantity. Phone Cherrywood 3955. D. AND B. TELEVISION 131-131a Kingston Road, South Wimbledon, SW19.

**WANTED VALVES**

All types for prompt cash. Must be new. State quantity.

**WILLIAM CARVIS LTD.**

**103 North Street, Leeds 7**

## WANTED
*(continued)*

**NEW VALVES** bought, state price. A.D.A. MANUFACTURING CO., 172 Alfreton Road, Nottingham.

**A PROMPT CASH OFFER** for your surplus Brand New Valves and Transistors, R.H.S., Beverley House, Manville Terrace, Bradford 7.

# VALVES WANTED

IMMEDIATE CASH SETTLEMENT

Must be new

Phone, write or call

**Radio Facilities Ltd.**

**38 Chalcot Road, London N.W.1**

PRImrose 9090

*The valve specialists*

## MISCELLANEOUS

**YOUR OWN** Kits built up or assistance given, Bradford/Leeds area S.A.E.: TVS, 19 Aberdeen Terrace, Bradford 7, Yorkshire.

**WANTED** to contact, London area, good amateur radio man for exchange of ideas. MONEY, 48 Friends Road, Croydon, Surrey.

**ELECTRONIC MUSIC?**

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 21 stops—uses 41 valves. With its variable attack you can play Classics and Swing.

**Write NOW** for free leaflet and further details to **C. & S., 20 Maude Street, Darlington, Durham.** Send 2½d. stamp.

**PRINTED BILLHEADS**, 8 x 5, blue ruled, 100 **12/6**, 250 **20/-**, cash with order. Print copy clearly. BROOKVALE PRESS, 147 George Road, Birmingham 23.

## SERVICE SHEETS

**SERVICE SHEETS** for all makes of Radio and TV, 1930-1962. Prices from 1/- with free fault-finding guide. Catalogue of 6,000 models 1/6. 125 Radio/TV sheets covering many popular models 20/-. S.A.E. inquiries: HAMILTON RADIO, Western Road, St. Leonards, Sussex.

**WHY TOLERATE DELAY** when we can supply your Radio or TV Service Sheet by return of post at 4/- each, plus postage. List 1/-. Also Manuals for sale and hire. List 1/-. S.A.E. with inquiries please. Mail orders only to S.P. DISTRIBUTORS, 44 Old Bond Street, London W1.

**FAULTFINDER FILES**, showing common faults that each receiver is prone to and other useful servicing information, 2/- each. List 9d., plus postage. Mail orders only. S.P. DISTRIBUTORS, 44 Old Bond Street, London W1.

**SERVICE SHEETS**, Radio and TV, 4/- each. List 1/-. All orders dispatched on day received. Also manuals for sale and hire. List 1/-. S.A.E. please: SULTAN RADIO, Pantiles Chambers, Tunbridge Wells, Kent.

**SERVICE SHEETS**; also Current and Obsolete Valves for sale. JOHN GILBERT TELEVISION, 1b Shepherd's Bush Road, London W12. Phone SHE 8441.

**SERVICE SHEETS**: Radio, TV, 5,000 models. List 1/-. S.A.E. enquiries: TELRAY, 11 Maudland Bk., Preston.

## CIRCUIT INFORMATION

**18 SET TRANSMITTER RECEIVER**
Description. Operation. Values. Diagrams. Tests, etc. P.O. 5/-

**38 SET WALKIE TALKIE**
Alignment procedure. Faults. Components. Description. Diagrams, etc., P.O. 5/-.

**CAMPBELL**
Everland Road, Hungerford, Berks.

## EDUCATIONAL

**"HOW AND WHY"** of Radio and Electronics made easy by a new, non-maths practical way. Postal instruction based on hosts of experiments and equipment building carried out at home. New courses bring enjoyment as well as knowledge of this fascinating subject. Free brochure from: Dept. P.W. 12, RADIOSTRUCTOR, Reading.

***Radio Television & Electronics***

Learn at home with the world's largest home study organisation, Brit.I.R.E.; City & Guilds; P.M.G.'s certs., etc. Also Practical Courses with equipment. No books to buy.

**Write for FREE prospectus stating subjects to**

**I.C.S.**

**(Dept. 541), Intertext House, Parkgate Road, London, S.W.11**

## EDUCATIONAL *(continued)*

$$X = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

**DON'T FUMBLE** with Formulae. Master Mathematics quickly and easily the Understandable Way.

***1st lesson and details FREE***

The Dryden School of UNDERSTANDABLE MATHEMATICS

**11F10 Dryden Chambers, Oxford St. London, W.1.**

Name.................................

Address.................................

.................................

**LEARN RADIO AND ELECTRONICS** the new and practical way! Hosts of absorbing experiments carried out at home under expert guidance to teach you Radio in a new, enjoyable and interesting way. Construction, servicing and fault-finding on equipment made easy for the first time! No previous experience needed. No mathematics used. Free brochure from: Dept. 11, P.W. RADIOSTRUCTOR, Reading.

**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.

**THE** Incorporated Practitioners in Radio and Electronics (I.P.R.E.) Ltd. Membership Conditions booklet 1/-. Sample copy of I.P.R.E. Official Journal 2/- post free. Secretary, 20 Fairfield Road, London N8.

**£'S MADE**

By repairing Radio and TV Sets as a job or as a spare time business. Our practical course will show you the way. No previous experience is required.

**SEND FOR FREE BOOK TODAY!**

**RADIOSTRUCTOR**

**Dept. G77 READING, BERKS**

## SITUATIONS VACANT

A well known Company manufacturing ELECTRONIC INSTRUMENTS for SCIENCE and INDUSTRY, require

**SKILLED ELECTRONIC WIREMEN**

as GROUP LEADERS in its Wiring and Assembly Section. The selected applicants will be engaged on work which is both varied and interesting requiring the use of individual initiative.

IN ADDITION WE CAN OFFER:

1. Good Rates of Pay.
2. A Staff Canteen.
3. Modern Working Conditions.
4. Sickness and Pension Schemes.
5. Free Overalls.
6. Free Tea.
7. Medical Services.
8. Free Travel Facilities from the Brentford and Southall areas.

Write or telephone: The Personnel Officer,

**DAWE INSTRUMENTS LIMITED,**
**Western Avenue, Acton W.3.**

# Fly as an Air Electronics Officer in the R.A.F.

The domain of the Air Electronics Officer is the whole range of electrical and electronics equipments in an operational aircraft. This covers high frequency long range communication equipment (both voice and wireless telegraphy), VHF communications (short range radio telephone), ASV (air to surface vessel) radar, and the 'black boxes' for the electronic defence of the aircraft.

Having completed your highly-specialised training courses—during which you do about 123 hours flying, including two flights abroad—you fly in the V-bombers of Bomber Command or on Coastal Command reconnaissance.

You are a key man doing a key job—where success depends entirely on your own skill, training and flexibility. There is nothing run-of-the-mill about it. You have a career you can be proud of—and there lies satisfaction.

You are well paid from the very beginning—you earn £976 as a Flying Officer of 21. At 25 as a Flight Lieutenant, drawing full allowances, you could earn over £1,800. You travel the world, meeting old friends on almost every airfield, making new friends wherever you go. You live well in the Officers Mess, and have the opportunity of taking part in almost any sport you can name.

If you are under 26, fit, and hold or expect to gain G.C.E. at 'O' level (or equivalent) in 5 acceptable subjects including mathematics and English language, you are eligible for a Direct Entry commission. Write for further details, giving date of birth and educational qualifications to Group Captain J. A. Crockett, R.A.F., Air Ministry (PW906) Adastral House, London, W.C.1.

**THE FUTURE IS WITH THE R.A.F.**

**The Royal Air Force**

## SITUATIONS VACANT

*(continued)*

**A.M.I.Mech.E., A.M.Brit.I.RE., City** and Guilds, G.C.E., etc., brings high pay and security. "No pass—no pay" 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 W8.

**TV AND RADIO**, A.M.Brit.IR.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, TV and Electronics. write for 148-page handbook. free. B.I.E.T. (Dept. 242G), 29 Wright's Lane, London W8.

**UNITED KINGDOM ATOMIC ENERGY AUTHORITY, ATOMIC ENERGY ESTABLISHMENT, WINFRITH**

**Electronic Instrument Mechanics**

A.E.E. Winfrith require experienced men with knowledge of electronic equipment and/or industrial instrumentation for fault diagnosis, repair and calibration of a wide range of instruments used in nuclear reactors and asssociated experiments.

Men with Services, Industrial or Commercial backgrounds of radar, radio, television, industrial or aircraft instruments are invited to write for further information. Training in Specialised Techniques is provided for successful applicants having suitable background.

Married men living beyond daily travelling distance may be eligible for housing and this will be determined at time of interview. A lodging allowance is payable whilst waiting for housing. Working conditions are good and include sick pay and pension schemes.

Application forms may be obtained by sending a post card quoting your name address and the reference EL/INST/NAT to the Labour Department, A.E.E. Winfrith, Dorchester, Dorset.

**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 W8.

## METAL WORK

**METALWORK.** All types cabinets, chassis. racks. etc.. to your specifications. PHILPOTT'S METALWORKS LTD.. Chapman St., Loughborough.

## BOOKS & PUBLICATIONS

**FIND TV SET TROUBLES IN MINUTES** from the great book "The Principles of TV Receiver Servicing". **10/6** all bookhouses and radio wholesalers. If not in stock, from Secretary. I.P.R.E., 20 Fairfield Rd., London N8.

**Please mention "Practical Wireless" when answering Advertisements**

# RETURN-OF-POST SERVICE

**We offer a really efficient Mail Order Service on all items stocked. All cash orders are dealt with on the day of receipt.**

**★ Hire purchase orders are subject to slight delay but this is kept to the absolute minimum.**

## ● "P.W. BLUEPRINTS"

Full stocks of all items for the Mercury, Troubadour, Regency, Citizen, Mini-amp and Tutor. Printed circuit for Mercury now in stock. Instruction manuals: Mercury (printed circuit version), 2/3; Mini-amp, 1/6; Citizen, 2/3. Fully detailed price list for any circuit available free.

## ● NEW ILLUSTRATED LISTS

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, GRAMOPHONE EQUIPMENT, AMPLIFIERS. Any will be sent free upon request.

## ● STEREO COMPONENTS

Morganite ganged potentiometers as specified for the Mullard circuits. ● Log/Anti-Log, 500k, 1 meg., 2 meg. ● Log/Log, 50k, 250k, 1 meg., 2 meg. ● Lin/Lin 250k, 500k, 1 meg. All 10/6 each.

## ● TRANSISTORS

**MULLARD.** Reduced prices. Current production types, not rejects. All in makers' boxes. Postage 3d. on each transistor.

OC44, 9/3; OC45, 9/-; OC70 and OC71, 6/6; OC72, 8/-; OC72 Matched Pairs 16/-; OC78, 8/-; OC81, 8/-; OC170, 9/6; OC171, 10/6.

## ● OUTPUT TRANSFORMERS

**GILSON:** W0696A, W0696B, 50/6, post 2/6. W0710, 55/6, post 2/6. W0892, 62/3, post free; W0767, 27/-, post 1/6. W01796A, 57/6, post 2/6.
**PARTRIDGE:** P3667, 75/-; P4131, 65/-; P5202, P5203, £5.18.6. All post free.
**PARMEKO:** P2629, 45/6; P2642, 43/3; P2643, 45/6. All plus post 2/9. P2641, 28/3, post 2/-; P2928, 15/3, post 2/-; P2932, 39/3, post 2/6.
**ELSTONE:** OT/ML, 45/-, post 2/9; OT/3, 25/-, post 2/6.

## ● MAINS TRANSFORMERS

**GILSON:** W0741AB, 63/-, post free; W0839, 40/9, post 2/9; W01328, 58/6, post 3/6; W01288, 58/-, post 3/6.
**PARMEKO:** P2631, 33/9, post 2/9; P2630, 52/6, post 3/3; P2644, 73/6, post free; P2930, 39/3, post 3/-; P2931, 54/6, post 3/3.
**ELSTONE:** MT/MU, 45/-, post 3/3; MT3/M, 35/-, post 3/-; MT/510, 42/-, post 3/3.

## ● LOUDSPEAKERS

**GOODMANS:** Axiette 8in., £5.5.1; Axiom 10in., £5.16.8; 12in., Axiom 201, £9.15.0; 12in., Axiom 301, £14.0.0; 12in., Audiom 51 Bass, £8.4.0; 12in., Audiom 61 Bass, £13.2.0; Trebax Tweeter, £6.4.0; X05000 Crossover unit, £1.19.0.
**WHITELEY:** HF1016 10in., £7.16.0; HF1012 10in., £4.17.6; HF816 8in., £6.13.9; T816 8in., £6.6.9; T10 Tweeter, £4.8.3; T359 Tweeter, £1.14.0; CX3000 Crossover unit, £1.11.6; CX1500 Crossover unit, £2.0.0. H.P. Terms available on all speakers.

## ● AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 3-3, Mullard 2 and 3 Valve Pre-amp. Mullard Stereo. Mullard Mixer, GEC 912 Plus. Fully detailed list on any of these sent upon request.
Instructional Manuals: All Mullard Audio Circuits in "Circuits for Audio Amplifiers", 9/5, GEC912, 4/6. All post free.

## ● LATEST TEST METERS

| | Cash Price | Hire Purchase Deposit | Mthly/Pmts. | |
|---|---|---|---|---|
| AVO Model 8 Mark II | £24. 0.0 | £4.16.0 | 12 of | £1.15. 2 |
| AVO Model 8 with leather carrying case | £27.18.0 | £5.12.0 | 12 of | £2. 0.11 |
| AVO Model 7 Mark II | £21. 0.0 | £4. 4.0 | 12 of | £2.10.10 |
| AVO Multiminor | £9.10.0 | £1.19.0 | 12 of | 14/4 |
| AVO Multiminor with leather carrying case | £11. 9.0 | £2. 5.0 | 12 of | 17/- |
| TAYLOR MODEL 127A | £10.10.0 | £2. 2.0 | 12 of | 15/8 |
| CABY A-10 | £4.17.6 | £1. 7.6 | 3 of | £1. 6.8 |
| CABY B-20 | £6.10.0 | £2. 0.0 | 3 of | £1.13.4 |
| CABY M-1 | £2.14.0 | — | — | — |

Full details of any of the above supplied free on request.
*The AVO Models 7 and 8 are both latest models from current production—not to be confused with Government Surplus.*

## ● TRANSISTORISE YOUR CRYSTAL SET

We have two new designs for Transistor amplifiers which can be used to greatly improve the signal from any crystal set. Leaflet available.
RLD4 Kit. One stage 12/- post free.
RLD5 Kit. Two stage 21/- post free.
The kits are easy to build and very detailed instructions are supplied.

## ● MULLARD CATHODE RAY TUBES

**ALL AT THE NEW REDUCED PRICES**

We supply both Mullard Radiant Screen (brand new factory fresh) and Mullard Lumenar (re-builds by Mullard with reclaimed bulbs—all other parts brand new). List of types available with prices and hire purchase terms.

## ● GRAMOPHONE EQUIPMENT

| ALL LATEST MODELS ALL POST FREE | Cash Price | Hire Purchase Deposit | Mthly/Pmts. | |
|---|---|---|---|---|
| **RECORD CHANGERS** | | | | |
| GARRARD AUTOSLIM (GC8 PU) | £7.19.6 | £1.12.6 | 12 of | 12/3 |
| GARRARD AUTOSLIM De-luxe (GC8 PU) | £12.14.8 | £2.11.8 | 12 of | 18/8 |
| GARRARD AUTOSLIM De-luxe (EV26A PU) | £13.12.9 | £2.14.9 | 12 of | 20/- |
| B.S.R. UA14 (TC8 PU) | £7.17.6 | £1.12.6 | 12 of | 12/1 |
| B.S.R. UA14 Monarch (TC8S Stereo/LP/78) | £8.17.6 | £1.16.6 | 12 of | 13/5 |
| **SINGLE RECORD PLAYERS** | | | | |
| GARRARD TA (GC8 PU) | £8.2.6 | £1.12.6 | 12 of | 12/6 |
| B.S.R. TU12 (TC8 PU) | £4.5.0 | £1.5.0 | 3 of | £1.3.4 |
| **TRANSCRIPTION UNITS** | | | | |
| GARRARD 4HF (GC8 PU) | £17.19.6 | £3.11.6 | 12 of | £1.6.5 |
| PHILIPS AG1016 | £13.13.0 | £2.15.0 | 12 of | £1.0.0 |

Many of the above can be supplied for stereo working. See our Gramophone Equipment List for details.

## ● TAPE RECORDING EQUIPMENT

| TAPE DECKS ALL CARRIAGE FREE | Cash Price | Hire Purchase Deposit | Mthly/Pmts. | |
|---|---|---|---|---|
| B.S.R. TD2 | £8.19.6 | £1.16.6 | 12 of | 13/7 |
| Latest COLLARO Studio | £12.19.6 | £2.12.6 | 12 of | 19/- |

**TAPE AMPLIFIERS**

We now stock the **Martin Recorder Kits.** These are partly assembled kits for complete tape recorders. The Amplifier Printed Circuit panels are completely wired, but the assembly of this and external components is left to the constructor. Very complete instructions are supplied. Send for leaflet.
**MODEL C** for Collaro Studio Deck £11.11.0.
**MODEL B** for BSR TD2 Deck, £8.8.0.
**CARRYING CASES.** Smart carrying cases are available to take the above amplifiers and decks. Fitted with speaker. For Model C Amplifier and Collaro Deck, £5.5.0.
For Model B Amplifier and BSR Deck, £4.4.0.
H.P. Terms available for amplifiers, cases and decks.

**TAPE PRE-AMPLIFIERS**

**ARMSTRONG PABO-3.** This is a ready made version of the Mullard Tape C Pre-amplifier. Price £16.16.0. Hire Purchase Deposit £3.8.0, and 12 monthly payments of £1.4.7.
**MULLARD TAPE C PRE-AMPLIFIER.** We stock complete kits and all components. Send for list.
**MARTIN.** Pre-amp kit for Collaro Studio Deck £8.8.0.

## ● "BRAND FIVE" RECORDING TAPE

**Long Play:** 900ft. (5"), 18/6; 1200ft. (5¾"), 23/6; 1800ft. (7"), 35/-. Post free.

## ● JASON F.M. TUNER KITS

Kits supplied complete with every item needed including instruction manuals. Fully detailed list available. Separate items supplied, ask for price list.
**FMT1, £6.12.C; FMT2 (less power), £7.15.0; FMT2 (with power), £9.12.6; FMT3 (less power), £9.9.6; FMT3 (with power), £11.7.6; Mercury 2, £10.14.6. JTV/2, £14.12.6.**
H.P. Terms available on any kit.

**● TERMS OF BUSINESS**

Cash with order or C.O.D. We charge C.O.D. orders as follows: Up to £3, minimum of 3/2. Over £3 and under £5, 1/6. Over £5 and under £10, 1/8. Over £10, no charge. **Postage extra on CASH orders under £3 except where stated. Postage extra on overseas orders irrespective of price.**

# WATTS RADIO

(MAIL ORDER) LTD.

**54 CHURCH ST., WEYBRIDGE, SURREY**

**Telephone: Weybridge 4556**

**Please note: Postal business only from this address**

**● HIRE PURCHASE TERMS**

are available on any item. Re-payments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5 per cent but minimum charge of 10/-. Six and Twelve months: Deposit 4/- in the £. Service charge 10 per cent, but minimum charge 20/-.

# CABINETS & HI-FI EQUIPMENT

**We can supply any cabinet to your own specification**

**The Lowboy**
**Price 24 gns.**

This is only one example of—
THE LARGEST RANGE OF CABINETS IN THE COUNTRY
Equipment is also our speciality.

**SEND TODAY FOR THE TWO NEW LEWIS CATALOGUES**

Designed to assist your choice of cabinet and equipment.
THE New Lewis Radio Cabinet Catalogue—the most comprehensive ever prepared. THE unique 64 page equipment catalogue.
*Please send your two new catalogues enclosed is P.O. for 3/6 which will be credited against any purchase I make.*

**LEWIS radio**
**100 (P102) Chase Side, Southgate, London, N.14. Pal 3733/9666**

# FIRST-CLASS RADIO AND T/V COURSES... GET A CERTIFICATE!

After brief, intensely interesting study—undertaken at home in your spare time—**YOU** can secure your professional qualification or learn Servicing and Theory. 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 Telecomms Exams. Radio Amateurs' Exams., Gen. Cert. of Educ. London B.Sc. (Eng.), A.M.I.Prod.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 1885—OVER 150,000 SUCCESSES**

**NATIONAL INSTITUTE OF ENGINEERING**
**(Dept. 461), 148 HOLBORN LONDON, E.C.1**
S. Africa: P.O. Box 8417, Jo'burg.
Australia: P.O. Box 4570, Melbourne.

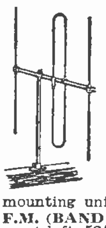
# RADIO BOOKS

**A BRILLIANT NEW**
Pictorial approach to understanding
**BASIC ELECTRICITY**
**BASIC ELECTRONICS**
in Simple straight-forward words and Clear Explanatory Pictures. The Reader is taken Step by Step from Picture to Picture.
**LEARN WHILE YOU PAY FOR ONLY 2/6 PER WEEK**
*Write for FREE Illustrated Prospectus giving details of instalment plan.*

**MODERN TRANSISTOR CIRCUITS FOR BEGINNERS.** 8/-.
**ELECTRONIC NOVELTIES.** Bradley 5/6.
**ELECTRONIC GADGETS.** Bradley 4/-.
**SERVICING TRANSISTOR RECEIVERS** New and enlarged edition. Pettit. 8/-.
**All above titles include postage.**
SEND STAMP FOR LISTS

**SELRAY BOOK CO.**
**60 HAYES HILL, HAYES, BROMLEY KENT.** Tel. HURstway 1818

## BBC - ITV - F.M. AERIALS



**B.B.C. (BAND 1).** Telescopic loft, 19/6. External. S/D. 26/3.
**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. 48/9. Wall mounting. 1+3 Element, 56/3. 1+5 Element, 63/9. Chimney and mast mounting units also available.
**F.M. (BAND 2).** Loft "H", 28/-. 3 Element loft. 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. yd. Coaxial plugs, 1/3. Send 6d. stamps for illustrated lists.

**K.V.A. ELECTRONICS (Dept.P.W.)**
**3B, Godstone Road, Kenley, Surrey.**

**SOUTHERN RADIO SUPPLY LTD.**
11 LITTLE NEWPORT STREET
LONDON, W.C.2. GER 6653
*All goods still available as previously advertised*

**Please mention "Practical Wireless", when replying to advertisements**

# 18,000 O.P.V. MULTIMETER KIT

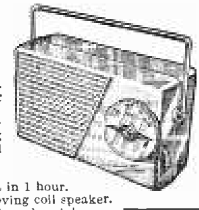
Ranges 0-0.25 and 2.5 V DC; 10, 25, 100, 250 500, 1000 V AC, DC, and output volts; Ohms 100 ohms to 10 Meg. (two ranges); 0.25, 2.5, 25, 250 mA DC (2.5A range 4/- extra). Kit comprises new 3 x 2¾in. Weston 0-50 microamps m.c. meter, all 1% multipliers, 1% ready adjusted shunts, padding resistor adjusted for each meter, 3 other resistors, 1 condenser, meter rec., knobs, switches, sockets, pots, circuit, instructions, wiring diag. scale (ohms, dB, uF, mA & V, 10V AC scales) i.e. everything except case and battery. Details of 200 pF—0.5uF range. Price 69/-, post free. Circuit, scale, etc. 9d. free with kit. 0-50uA meter as above, with circuit etc. 22/6, post 1/6. Multimeter scale fitted to meter 2/6 extra.
1% High Stability Resistors. S.A.E. list.

**PLANET INSTRUMENT CO.**
**25 DOMINION AV., LEEDS, 7**

# FREE LAYOUT PLANS & PRICE LISTS

sent on receipt of S.A.E.

**AMAZING RESULTS from the "OLIVER"**



**M.W. and L.W. 5-Stage Transistor Receiver**
A highly sensitive receiver using transistors and components. Fully tunable.
- Can be built in 1 hour.
- High flux moving coil speaker.
- Built in ferrite rod aerial.
- Specially designed coils for maximum signal strength.
- Volume on/off control.
- Eyeletted circuit board.
- Easy to follow building plans.

**65/-** P. & P. 2/6

**"PERSONAL TWO" For Private Listening** (As illustrated in Sept. issue.)
35/-. P. & P. 1/6. (Earpiece 7/6 if reqd.)

All parts available separately. Trade enquiries welcomed. Mail order only.

**R.C.S. PRODUCTS (RADIO) LTD**
**11 OLIVER ROAD, LONDON, E.17**

# THE AMATEUR RADIO HANDBOOK 1962

by R.S.G.B., new edition, 34/-, postage 2/6.
**The Cabinet Handbook** by Briggs, 7/6. postage 1/-.
**Servicing Transistor Receivers,** new edition by Pettit, 7/6, postage 6d.
**Using an Oscilloscope** by Easterling, 6/6, postage 6d.
**Modern Transistor Circuits for the beginner** by Sinclair. 7/6, postage 6d.
**A.R.R.L. Radio Amateurs Handbook.** 36/-, postage 2/6.
**Surplus Radio Conversion Manuals.** Vols. 1, 2 and 3, 24/- each, postage 1/- each.
**The Hi-Fi Year Book 1962,** 10/6, postage 1/-.
**The Microphone Guide** by Borwick, 7/6, postage 9d.

**UNIVERSAL BOOK CO.**
**12 Little Newport Street, London, W.C.2** (adjoining Lisle Street)

**Portable Transistor Kit, £5.17.6,** (post 3/6). M. & L. Waves, no aerial required, no difficult aligning, simple to follow instructions. If you have been disappointed with other Kits, try ours. We were amongst the first to advertise Transistor circuits in P.W. and we can recommend this set with confidence. **Pocket Kit** with personal earphone, **65/-**, (post 2/-).

Red Spot Transistors **2/3**, White Spots **2/3**, Yell/Green **3/-**, Mullard OC71, **6/-**; OC72, **7/6**; OC44, **7/6**; OC45, **7/6**. Sets of 6 for superhets Mullard **40/-**; our selection **30/-**. Newmarket V15/10P, **15/-**. Silicon Rectifiers 70 piv. ½ amp., **3/3**; 400 piv. ½ amp., **3/9**. Sub-min Electrolytics 2, 4, 8, 10, 16, 32, 50µF **2/-**; 100µF, **2/9**; 250, 500, 1,000µF, **3/3**. Transistor Holders **1/-**; Super Coax. 75 ohms., **6d.** yd. Tannoy Mike, **3/6** (post 2/-); Crystal Inserts new **7/6**. Gorler Units—the amazing 1 watt amplifier **92/6**; I.F. Amplifier (460 Kc/s pre-aligned), **92/6**; 3 waveband converter **90/3**; Manual No. 167 describing and circuits, **2/9** post free.
TERMS: C.W.O. Post extra, excess refunded. Send 10d. stamps for Transistor Notes.

**MOORE'S EXPERIMENTAL SUPPLIES**
(Dept. P)
**8 & 10 Granville Street, Sheffield 2**

## TRANSISTORS AND DIODES

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Transistors* | | OC75 | 8/- | OCP71 | 25/- | OA73 | 3/- | GEC S1 | |
| OC35 | 18/- | OC77 | 12/- | | | OA79 | 3/9 | Audio | 3/6 |
| OC36 | 21/6 | OC78 | 8/- | *Matched Prs.* | | OA81 | 2/6 | Red | |
| OC44 | 6/- | OC81 | 8/- | 2xOC72 | 16/- | OA85 | 3/- | Spot | 3/6 |
| OC45 | 6/- | OC84 | 8/6 | 2xOC78 | 16/- | OA91 | 3/- | White | |
| OC70 | 6/6 | OC170 | 9/6 | *Diodes* | | OA95 | 3/6 | Spot | 5/- |
| OC71 | 5/- | OC171 | 10/6 | OA5 | 6/- | | | GEX34 | 3/- |
| OC72 | 8/- | OC201 | 31/- | OA10 | 8/- | *Sundry Types* | | GEX35 | 3/- |
| OC73 | 16/- | OC202 | 26/- | OA70 | 3/- | PXA102 | 4/- | XD201 | 1/- |

**A set of Transistors comprising 1 OC44, 2 OC45, 1 OC81D, 2 OC81, 37/6 set.**

## LOUDSPEAKERS

**All 3 ohm IMPEDANCE**

Round Types—1¾in. 17/6; 2½in. 17/6; 5in. 15/-; 6½in. 16/6; 8in. 17/6; 12in. 29/6.

Square Types—2½in. 18/6; 3in. 19/6; 4in. Tweeter 12/6.

Elliptical Types—6in. x 4in. 15/6; 7in. x 4in. 15/6; 8in. x 6in. 17/6; 10in. x 6in. 21/-.

We also have in stock TSL Lorenz LPH65 37/8; WB HF812 £4.1.3; WB HF912 £4.6.0; WB HF1012 £4.17.6; 12in. RTC 15 ohms unit 105/-.

## CLEAR PLASTIC METERS

Miniature panel meters—all having D'Arsonval movements, clear plastic cases, jewelled bearings and an accuracy of 2% full scale, silvered dials and black numerals and pointers.

## MICROAMMETERS MILLIAMMETERS

1.21/32in. square front, 1¼in. overall front to back with 1¼in. behind panel including ¼in. terminals. Require 1½in. diameter round hole in panel, four corner holes with 1¼in. centre. Terminal polarity clearly marked. Zero adjustment screw on front of panel, screw terminals. 1⅝in. dial size, supplied complete with mounting screws individually boxed and guaranteed.

Model MR.25 Range 0-50 μA 39/6
Model MR.250 Range 0-500μA 32/6
Model MR.21 Range 0-1ma 27/6

## BUILD YOUR OWN PORTABLE RADIO

You'll be proud of its "big set" performance. Advanced G.E.C. drift-field transistors, high impedance 2½in. speaker, powerful reflex circuit and a host of other features rank it as the finest value for the do-it-yourself enthusiast. Built in Ferrite rod. Uses the popular Ever-Ready PP4 battery. Attractive high impact ivory case. Two controls. Ready drilled circuit board. Model KT603, price 52/6. Complete set of parts and step-by-step pictorial instructions.

## PERSONAL EARPHONE

A really sensitive dynamic earphone of exceptionally fine quality. Provides clear reproduction of music as well as speech. Fully guaranteed and complete with ear insert, 3 feet cord, sub-miniature plug and socket. Model C.R.5 Crystal Earpiece, high imp. Model M.R.—4 Magnetic Earpiece, low imp. 8/- each. Post 1/-.

**A new Intercom and Electronic "Baby Sitter".** Model TT.206 for desk use or wall mounting. Transistorised operation, two-way buzzer call system, moulded-plastic case, white and gold. Each unit 2¼ x 4½ x 1½in. Complete with battery and connecting cord. **6 gns.**

**Lightweight high resistance headphones,** widely used for crystal sets. **13/6 pair.**

**OUR 1962/3 CATALOGUE IS NOW AVAILABLE. PLEASE SEND 1/- IN STAMPS FOR YOUR COPY. TRADE CATALOGUE ALSO AVAILABLE FOR WHICH PLEASE ATTACH YOUR BUSINESS LETTER HEADING.**

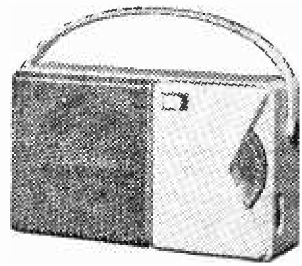
## AUTOMATIC RECORD CHANGERS

BSR Monarch UA14 ............ £6.19.6
Collaro C60 Studio ............... £7.19.6
Garrard Autoslim ............... £8.19.6

## SINGLE RECORD PLAYERS

E.M.I. 4-speed with pick-up ...... £3.15.0
BSR Monarch GU6 ............... £4.19.6
Garrard TA Mk. II............... £8.10.6

## "PRACTICAL WIRELESS" POCKET TRANSISTOR SUPERHET



The new version in a redesigned cabinet with carrying strap.

COMPONENTS PRICE LIST

| | |
|---|---|
| Coil Set, (Osc. and 3 I.F.s) ......... | 22/- |
| Driver Transformer, Type PW/DT ................................ | 8/3 |
| Output Transformer, Type PW/OT.................................. | 8/- |
| Ferrite Rod Aerial, Type PW/FR ................................ | 8/6 |
| Printed Circuit Board ............ | 7/6 |
| 2 Gang Capacitor, Type "OO"... | 12/6 |
| Volume Control, Type V.C.1545 | 8/- |
| Switch ................................ | 3/6 |
| Hardware (Screws, nuts, washers, spacers, battery clips, cable cradles, cable studs, cable strapping)............................. | 4/- |
| Transistors, Type YC (Set of 6) Xtal Diode, Type GD9............ | 43/- |
| Speaker .............................. | 17/10 |
| Case .................................. | 12/6 |
| Capacitors ........................... | 15/- |
| Resistors ............................. | 5/- |
| Trimmers, Type MT31/4A (3 required) ............................ | 3/9 |

CONSTRUCTION LEAFLET AND "BLOW-UP" CIRCUIT DIAGRAM. PRICE FOR THE COMPLETE KIT £7.19.6.

**An entirely new range of Miniature Transistor Transformers, size ¾ x ¾ x ⅝in., high permeability nickel iron core. Suitable for printed circuits.**

**TT45. DRIVER TRANSFORMER**
For double ended push-pull output stage. Ratio 4.5 to 1+1. Secondaries bifular wound ... ... ... ... ... ... ... ... ... ... 5/-

**TT46. PUSH-PULL OUTPUT TRANSFORMER**
For double ended output matching to a 3 ohm speaker. Ratio 4+4 to 1 ... 5/-

**TT47. DRIVER TRANSFORMER**
For single ended output stage matching to a 35 ohm speaker. Secondaries bifular wound. Ratio 4.5 to 1+1 ... ... ... ... ... ... ... 5/-

**TT49. L.F. TRANSISTOR COUPLING TRANSFORMER**
Suitable for interstage coupling in simple L.F. amplifiers. Ratio 4.5 to 1 ... 5/-

**MINIATURE DOUBLE TUNED I.F. TRANSFORMERS**
455 to 475 kc/s. Can size ½in. square x 11/16in. Ferrite pot and core construction. Suitable for 1st and 2nd I.F.T. giving better selectivity than single tuned I.F.T.'s. Can be used with normal R.F. transistors. Extra sensitivity when used with diffused alloy 4 element transistors. (Boxed with circuit). Coil ratios: Total primary to collector tap—2.5 to 1. Collector tap to secondary tap—7.3 to 1. 6/9.

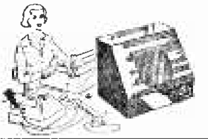
**ALPHA RADIO SUPPLY CO.**

**103 LEEDS TERRACE WINTOUN STREET LEEDS 7**

**TERMS:** Cash with Order or C.O.D. Postage and Packing Charges extra. Single valves 9d., Minimum Parcel Post charges 2/-. Please include sufficient postage with your order. Minimum C.O.D. fees and postage 3/6. These Postal Rates apply to U.K. only. For full terms of business see inside cover of catalogue. Personal shoppers 9 a.m. to 5 p.m. Mon. to Friday. Saturday 10 a.m. to 1 p.m.

## ALL-TRANSISTOR
## ● TIME SAVER ●
### OFFICE OR HOME TELEPHONE PICK-UP AMPLIFIER

★ No more "holding on" wasting time waiting for your call to come through. When it does the amplifier can be switched off if required. No connections, just press the pick-up coil to back of phone as below. Fully Guaranteed. Housed in attractive Gold Finish Cabinet.

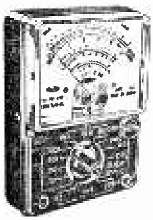


BUILT, TESTED, READY TO USE

**£5.10.0**

P.P. 2/6

**4 TRANSISTOR BABY-ALARM**
**Very sensitive, £5.10.0** P.P. 2/6.



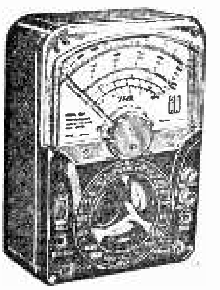
### MODEL TH-L33

2,000 ohms per volt AC/DC. Size 5 x 3½ x 1¼in.

**79/6** Fully Guaranteed

with test leads, battery and instructions.

0/10/50/250/500/1000 volts D.C., 0/10/50/250/500/1000 volts A.C., 0/500μA/10/250mA., D.C.
3 ranges resistance 0/10K/100K/1 Meg. Capacity and dB ranges.



### MODEL 500

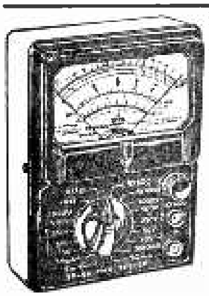
**30,000 ohms per volt multi-meter**

**£8.19.6**

Fully Guaranteed

8 Ranges D.C. volts to 1 kV.
7 Ranges A.C. volts to 1 kV.
5 Ranges D.C. current to 12 amps.
3 Range resistance to 60 meg.
Short circuit, Buzz test. Output meter dB, etc., etc. Size 6½ x 4½ x 2¼in. With Leads, Batteries and Instructions.

### MODEL TP55



A.C./D.C. voltage up to 1,000 in 5 ranges. D.C. current 4 ranges up to 500mA. 4 range resistance to 10 megs. Capacity dB scales, etc. **20,000 ohms/volt** Fully Guaranteed

**£5.5.0**

With Test Leads, Battery and Instructions. Size 5¼ x 3½ x 1¾in.

## LATEST ILLUSTRATED CATALOGUES NOW AVAILABLE 1/-

**1.** 4-Transistor 2-way Intercomm. 2-way buzzing, 2-speakers, ready to use, **8 gns.** P.P. 2/6.
**2.** New Model Control Book with 60 pages of transistor circuits, **7/6,** P.P. 6d.
**3.** Complete Set of Meter Leads with Prods. Clips etc. with pouch, **8/6,** P.P. 1/-.
**4.** Telephone Recording Coil to record conversations. For all amplifiers and recorders, **14/-,** P.P. 9d.
**5.** Printed Circuit Kit, to etch your own circuits. Complete with boards and details, **19/6,** P.P. 1/-.
**6.** Miniature 850 ohm Record/Playback Head, with mounting block, **12/6,** P.P. 9d.
**7.** 2,000 ohm lightweight Headphones with leads. Very sensitive, **12/6,** P.P. 1/-.
**8.** Transistor Pocket RF, IF Generator for Radio, TV etc. Fault finding, **52/6,** P.P. 1/-.
**9.** 8-Range All Transistor Signal Generator, 200 kc/s to 220 mc/s: RF, AF, IF, HF, etc., **£7.10.0,** P.P. 3/6.
**10.** GS12C (Dekatron) Bi-directional 12 way indicator tube. Brand new, **25/-.**
**11.** 4½-9 volt Tape Recorder Motor, governed. **12/6,** P.P. 1/-.
**12.** 30 watt Pocket Solder Iron, with pocket pouch and mains plug, **18/6,** P.P. 1/-.
**13.** 931A Photo Multiplier. Brand new, **60/-.**
**14.** 1 Kc/s Transistor Audio Test osc., variable output, **39/6,** P.P. 1/6.
**15.** Crystal Contact Microphone. Very sensitive. Ideal for Guitar, **12/6,** P.P. 9d.
**16.** Practical Transistor Circuits. 40 circuits to build, **3/6.**
**17.** Personal Earphones with leads, Jack plug and socket, 600 ohm, **10/6;** 1000 ohm **12/6;** Crystal **9/6;** 8/10 ohm **9/6.**
**18.** W/W Erase Head, FE7, **7/6,** P.P. 6d.
**19.** Dynamic Microphone, **49/6,** P.P. 1/6.
**20.** Extension Speaker Unit. Plugs into phone socket of most portables. Gives big set volume. Ideal for car use, **52/6,** P.P. 1/6.

| Miniature Panel Meters | Miniature 4-Transistor 250 mW Amplifier. |
|---|---|
| 0/50μA (DC) 39/6<br>0/500μA (DC) 32/6<br>0/1mA (DC) 27/6<br>0/5mA (DC) 27/6<br>0/300 volts (DC) 27/6<br>Brand New Boxed | Size 3 x 1¾ x ⅞in.<br>Push-Pull output.<br>Built and tested with circuit.<br>**52/6.** P.P. 1/6 |

**21.** 7-Section Telescopic Aerial, **10/6.**
**22.** LA1 Ferrite Pot Core, **12/6,** P.P. 6d.
**23.** Stereo Stethescope Type Miniature Phones, **27/6,** P.P. 1/6.
**24.** Miniature Jack and Socket, **3/6,** P.P. 6d.
**25.** No. 19 Set Crystal Calibrator with Handbook, **79/6,** P.P. 2/-.
**26.** New 2-way Intercom with 2-way calling. Supplied with cable, battery, etc. Housed in moulded cabinets. **89/6,** P.P. 2/-.
**27.** Battery Eliminator and Charger for PP3 volt Batts. Ready to use. **29/6,** P.P. 1/6 with details.
**28.** 9 volt 80 mA battery eliminator kit for larger portables, **35/-,** P.P. 1/6.

# Henry's Radio Ltd

*PADdington 1008/9*

**5 HARROW ROAD, LONDON W2**

*Open Monday to Sat. 9-6, Thurs. 1 o'clock*

**TRADE SUPPLIED**

**PLEASE TURN TO BACK PAGE**

## TRANSISTOR PORTABLE TAPE RECORDER

**FOR OFFICE, HOME OR TRAVEL**

● Play/record up to 30 mins. ● Built-in speaker, volume control, batteries and play/record/rewind. ● Quality reproduction. ● Sturdy case 6 x 8¼ x 2¾in.

**£10.10.0**
P.P. 3/6.

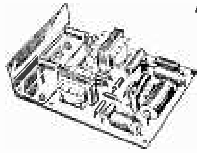
**Fully guaranteed**

Supplied complete with microphone, tape, batteries and personal phone (for monitoring), and full instructions. Built and tested.

### CRYSTAL MICROPHONES

**ACOS 39-1.** Stick Microphone with screened cable and stand (list 5 gns.), **32/6.** P.P. 1/6.
**ACOS 40.** Desk Microphone with screened cable and built-in stand (list 50/-), **15/-.** P.P. 1/6.
**ACOS 45.** Hand Microphone with screened lead, very sensitive, **25/-.** P.P. **1/6.**
**100 C.** Stick Microphone with muting switch and screened cable, detachable desk stand, cord and neck, **39/6.** P.P. **1/6.**
**MC 24.** Stick Microphone with muting switch and cable, **25/-.** P.P. 1/6.
**LAPEL.** Miniature Mic. With clip. Ideal for recording, **12/6.** P.P. 1/-.

## 3/4 WATT 4 TRANSISTOR AMPLIFIER



● 1 watt peak output.

± 3db 70c/s to 12 kc/s.

Output to 3 ohm speaker

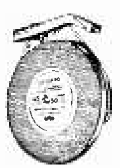
9 volt operated.

**Details on request.**

| Built and Tested | Kit of Parts |
|---|---|
| **59/6** OR | **52/6** |
| P.P. 1/6 | P.P. 1/6 |

A printed circuit high gain amplifier size 4 x 2¾ x ⅞in. using Mullard OC71/OC81D and 2-OC81 Transistors. Ideal for Intercomm., Record Player, Tuner Amplifier or any application requiring a quality and reliable amplifier.

## BATTERY RECORD PLAYER



● 6-7½ volt Garrard turntable with crystal pick-up. Plays 45 r.p.m. Ideal for above amplifier.

**55/-** P.P. 1/6.

● Suitable cabinet for amplifier and player **12/6,** P.P. 2/-.

### TRANSISTORS PRICES DOWN AGAIN

**Send for New List. Over 400 Types now in Stock. Also Silicon and Zener Diodes.**

**COMPLETE NEW RANGE AT SPECIAL LOW PRICES**

# Practical Wireless

## BLUEPRINT SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, constructional details are available free with each blueprint except for the PW Monophonic Electronic Organ and the PW Roadfarer.

The Index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London W.C.2.

### SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. *The majority of the components for these receivers are no longer stocked by retailers.*

| *Title* | *Number* | *Price* |
|---|---|---|
| **CRYSTAL SETS** | | |
| Junior Crystal Set | PW94 | 2/- |
| Dual-wave Crystal Diode | PW95 | 2/6 |
| **STRAIGHT SETS** | | |
| **Battery Operated** | | |
| Modern One-valver | PW96 | 2/6 |
| All-dry Three | PW97 | 3/6 |
| Modern Two-valver | PW98 | 3/6 |
| **SUPERHETS** | | |
| A.C. Band-pass Three | PW99 | 4/- |
| A.C. Coronet-4 | PW100 | 4/- |
| A.C. D.C. Coronet | PW101 | 4/- |
| The PW Pocket Superhet | — | 5/- |
| **MISCELLANEOUS** | | |
| The PW 3-speed Autogram | — | 8/- |
| The PW Monophonic Electronic Organ (*No constructional details are available with this blueprint*) | — | 8/- |
| The PW Roadfarer (*No constructional details are available with this blueprint*) | — | 5/- |
| **TELEVISION** | | |
| The PT Band III converter | — | 1/6 |

| *Title* | *Number* | *Price* |
|---|---|---|
| A.C. Fury Four | PW20 | 2/6 |
| Experimenter's Short Wave | PW30a | 2/6 |
| Midget Short Wave Two | PW38a | 2/6 |
| Band-Spread Three (Battery) | PW68 | 2/6 |
| Crystal Receiver | PW71 | 2/- |
| Signet Two (Battery) | PW76 | 2/6 |
| Simple S.W. One-valver | PW88 | 2/6 |
| Pyramid One-valver | PW93 | 2/6 |
| BBC Special One-valver | AW387 | 2/6 |
| A One-Valver for America | AW429 | 2/6 |
| Short-Wave World Beater | AW436 | 3/6 |
| Standard Four Valve S.W. | WM383 | 3/6 |
| Enthusiast's Power Amplifier | WM387 | 3/6 |
| Standard Four Valve | WM391 | 3/6 |
| Listener's 5-Watt Amplifier | WM392 | 3/6 |

**QUERY COUPON**

This coupon is available until 5th October, 1962, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.

PRACTICAL WIRELESS, OCTOBER, 1962

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand; GORDON & GOTCH (A/sia), Ltd., South Africa and Rhodesia; CENTRAL NEWS AGENCY, LTD. East Africa; EAST AFRICAN STANDARD LTD. Subscription rate including postage for one year: Inland £1.9.0. Abroad £1.7.6 (Canada £1.5.0.). Registered at the General Post Office for the Canadian Magazine Post

# *Redesigned* 'Contessa' Mk. III

## ★ *combined portable and car radio* ★

- **NOW** WITH 600mW **MELLOWTONE** OUTPUT ON MEDIUM AND LONG WAVES.
- **NOW** FITTED HORIZONTAL TUNING SCALE WITH ALL STATIONS CLEARLY MARKED.
- **NOW** SUPPLIED WITH SIX MULLARD TRANSISTORS AND TWO DIODES.
- **NOW** FITTED RECORDING SOCKET AND CAR AERIAL SOCKET.
- **NOW** SUPPLIED WITH TWO-TONE BEIGE OR TWO-TONE BLUE CABINET WITH GOLD FITTINGS.

**GUARANTEED THE VERY BEST OBTAINABLE**

**TOTAL COST £10.19.6** P.P. 3/6

**OVERALL SIZE 10¾ x 7¾ x 3⅝in.**

● **All parts sold separately** ● ● **Detailed Leaflet on Request** ●

The New "CONTESSA" 6-Transistor Portable Superhet Radio features simple printed circuit construction and fully illustrated building instructions, with all parts clearly marked and identified. Fitted with 8 inch Ferrite Aerial, double IFT's and the latest in components and design. Full tuning of both Medium and Long Wave Bands with unbeatable Selectivity and Sensitivity. Clearly marked station dial and room filling "MELLOWTONE" push-pull output are standard features. Performance is guaranteed to be better than any other design available to the home constructor whether used at home, out and about, or in a car.

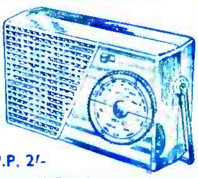
FULL AFTER SALES SERVICE AND GUARANTEE

★ **ALL THESE EXTRA FEATURES AT NO EXTRA COST** ★

## "QUINTET" MEDIUM AND LONG WAVE POCKET RADIO

PUSH-PULL SPEAKER OUTPUT

Size 5½ x 3 x 1¾in.



Red or Blue with Gold trim.

**Total Cost £4.19.6** P.P. 2/-

A Five-Transistor and Diode medium and long wave printed circuit loudspeaker radio. Features Mullard transistors and plainly marked printed circuit with carded components. Excellent results with full station separation guaranteed. Including Radio Luxembourg. Push-pull output up to 200 mW. Fitted 'Phone/Record socket and Car aerial socket. **Full after sales service and guarantee.**

## "CAPRI" POCKET SIX. 6-TRANSISTOR MEDIUM AND LONG WAVE POCKET SUPERHET RADIO

● SIZE 4½ x 2¾ x 1¼in. REALLY POCKET SIZE ●

The most compact 6-transistor and diode radio with speaker available to the home constructor. Features the latest in miniature components and circuitry. Supplied with Mullard transistors and two-tone moulded cabinets in red/white or Blue/White with gold fittings. All components are supplied in packets and clearly identified. A printed circuit is used with fully illustrated building instructions. Push-pull output coupled with a sensitive and selective circuit make the "CAPRI" hard to beat. Fitted Earphone/Record socket.

● FULL AFTER SALES SERVICE AND GUARANTEE.

● ALL PARTS SOLD SEPARATELY—DETAILED LEAFLET ON REQUEST

★ **DESIGNED BY EXPERTS FOR THE HOME CONSTRUCTOR** ★

**TOTAL COST £6.19.6** P.P. 2/-

## "TRANSFIVE" PORTABLE RADIO

**Medium and Long Wave Portable**

8½ x 6½ x 3½in.

**£5.19.6** P.P. 2/6

A simple to build 5-Transistor and Diode. Printed Circuit. Medium and Long Wave Portable. Features 5in. speaker. Car aerial socket. Mullard transistors and carded components. Building plans free on request. THE IDEAL PORTABLE. **Full after sales service and guarantee.**

## "RANGER 3"

Size 4¾ x 3 x 1¼in.

A Three-Transistor Two-Diode Personal Radio for Medium Waves and Amateur top band and shipping. Quality output on personal phone. Fitted air spaced tuner, vol. control. No aerial or earth. **Luxembourg guaranteed.**

**59/6** P.P. 1/6

## "CARVERTER"

**MOBILE TRANSISTOR SHORT WAVE CONVERTER**

As featured in the May Edition of Radio Constructor. Just plugs into the aerial socket of your car radio. Crystal controlled—covers amateur and short wave broadcast bands from 5 to 16 Mc/s.

**Total cost with sprayed cabinet, etc. 69/6** P.P. 2/-

Supplied complete with long life battery and 39/40 metre band crystal. Send 1/- stamp for full Booklet. **No modifications to car radio at all.**

## 'PW' TROUBADOUR

**7-Transistor Superhet**

**Medium and Long Wave Radio**

Size 5¾ x 3⅜ x 2in.

**£8.10.0** P.P. 2/-

('PW' SIX **£7.19.6** P.P. 2/-)

Modified version of previously advertised "PW" Superhet. Now with new style Two-Tone Cabinet. 1st grade components and transistors. Printed circuit. Features matched set of 7 Transistors, New 2½ inch quality speaker and new illustrated building instructions.

**PW Troubadour**
**PW Mercury**
**PW Regency**
**PW Alpha 3**
**PW Mini-amp**
**PW Citizen**
**PW Superhet**
**PW Shortwave 2**
**PW Feeder Unit**

All parts in stock for ALL PW Designs. Parts Lists on Request.

**And the latest PW Designs.**

# Henry's Radio Ltd

*PADdington 1008/9*

**5 HARROW ROAD, LONDON W2**

*Open Monday to Sat. 9-6 Thurs. 1 o'clock*

**Send 1/- Stamp for Latest Illustrated Price Lists.**

◀ PLEASE TURN PAGE