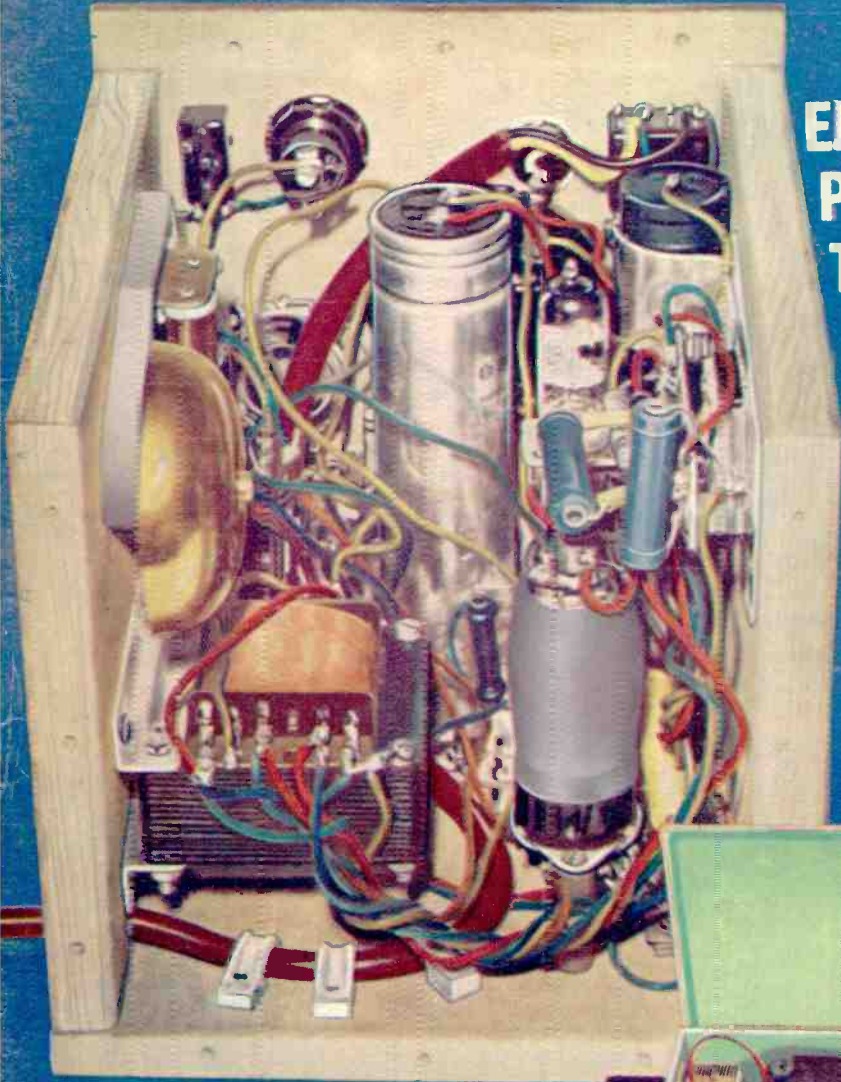


JULY  
1962

# *Practical* 2/- **WIRELESS**

**ELECTRONIC  
PROCESS  
TIMER**



**The ALPHA-THREE  
personal transistor  
superhet**

**BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £14 (Carriage Paid)**

A.C. ONLY. Chassis size 15 x 61 x 51 in. high. New manufacture. Dial 14 1/2 x 4 in. in 2 colours predominantly gold. Pick-up. Ext. Speaker. Ae., E. and Dipole Sockets. Five push buttons—O.P.F., L.W., M.W., F.M. and Gram. Aligned and tested. O.P. Transformer. Tone Control. 1,000-1,900 M.; 200-500 M.; 88-93 Mc/s. Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85. Speaker and Cabinet to fit chassis (table model). 47/6 (post 2/6). 9 x 6 in. **ELLIPTICAL SPEAKER**. 20/- to purchasers of this chassis. **TERMS**—(Chassis) £5 down and 5 Monthly Payments of £2. or with Cabinet and Speaker £5.10.0 down and 6 Monthly Payments of £2. Cheap Room Dipole for V.H.F.. 12/6. Feeder 6d. yard. Circuit diagram 2s. 6d.



**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 8 1/2 x 2 1/2 in. All holes drilled and component positions marked. Instructions 2/6 for 16p. (refunded on purchase of kit). Size 9 x 3 1/2 x 7 1/2 in. 3 x 2 1/2 in. P.M. high quality speaker. Attractive Vynair covered cabinet, two tone. Two batteries 5/6 the pair (Ever Ready 12s). Mullard transistors OC44, 2 x OC45, OC81D, and 2 x OC81. Top grade Weymouth 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 FOR £12.10.0.**

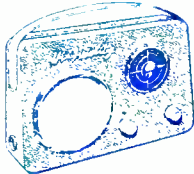
Fully built 2 valve amplifier

B.S.R. 4-sp. autochanger, case 17 x 15 x 8 1/2 in. 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. £8.5c. Motor Board for UA6, UA20, UA14, Slimline, 5/-, (post 1/6) or 3/6 plus 1/6 when purchased with Autochanger. Motor Board for Collaro C60, 4/-, post paid.

**TELEFUNKEN STEREO AMPLIFIERS.** 2 ECL#2—2 x 2/4 watts, 12 x 9 x 2 1/2 in. piano keys, £7, post paid.



**6 TRANSISTOR PORTABLE—FULLY BUILT.** The "SCALA" for only £7.19.6, carr. paid. 8 1/2 x 2 1/2 x 5 1/2 in. high. Choice of colours. Rexine. M.W. and L.W. Ferrite aerial. P.P4 battery 2.3 extra. Printed circuit. Nicely styled. A professional job. 3 1/2 in. speaker.

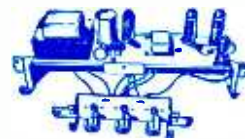
**SELF-POWERED VHF TUNER CHASSIS.** Covering 88-95 Mc/s. M. Hard permeability Tuner. Dims. 10 1/2 x 4 1/2 x 5 1/2 in. high. ECC83, EF81, EF91 and 2 diodes. Metal Rectifier Mains transformer. Fully wired and tested. Only £7.14.0 (carr. pd.). Attractive Vynair Cabinet 20/-. Room dipole 12/6. 300 ohm twin feeder. 6d. vd.



**PUSH-PULL AMPLIFIER £5.50**

(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 3 1/2 x 3 1/2 in. With o.p. trans. for 2.3 ohm speaker. Room dipole 12/6. 300 ohm twin feeder. 6d. vd.



Front panel (normally screwed to chassis) may be removed and used as "flying panel". Stereo version 2 x 4 w. same price.

**THIS SUPERB SET FOR £10**

6-transistor radio 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 PP4 battery giving 300 hours use. Weighs under 4 lbs. With carrying handle, 12 x 7 1/2 in. high x 4 1/2 in. at base tapering to 2 in. at top. Brand new, fully guaranteed. £10. Carr. paid. Worth £16.



**COMPLETE V.H.F. A.M. RADIO FOR £12.10.0** (carr. paid)



Brand new set, in superb walnut cabinet (size 19 x 8 1/2 x 14 1/2 in. high). Covering 88-100 Mc/s. 16-49M., and 200-500 M. Mains trans. 200-250 v. 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.

**TEST LEAD KIT.** Leads, Prods. Terminals. Clips. in case, 10/-, post paid. **TAPE, TOP QUALITY BOXED.** 5 1/2 in.—850 ft., 15/-; 1,200 ft., 17/6; 7 in.—1,200 ft., 17/6; 1,800 ft., 26/6. (all plus 1/6 post. 2/- for 2).

**COLLARO STUDIO TAPE TRANSCRIBTOR, 3 MOTORS, 3 SPEED.** 11, 3 1/2 and 7 1/2 I.P.S. Push buttons. £10.17.6 (10/- carr.) incl. spool.

**SUPERIOR GRAMPHONE AMPLIFIER 3 valves, 4 watt**

13 x 7 1/2 in. (2 1/2 in. front to back). 3 front controls, bass, treble, vol. on-off, 6 1/2 in. round speaker; UY85, UF80 and UL84. Mains trans. 200-240ac; fabric covered front. 74/-, (p.p. 4/-).

**GRAMPHONE AMPLIFIER** With 5in. SPEAKER Baffle 12 1/2 x 6 in. ECL#2 and Rectifier, Tone and Volume On/off switch. Two Knobs. Ready to play. Useful for Stereo ONLY 57/-, post 4/-.

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

2 1/2 watts. ECC83, ECL#2 and EZ80. Controls, volume, bass and treble. On/off switch. Mains and O.P. trans. Size as for Push-Pull Amp. Suitable for microphone. **95/-** 5/- input and for Guitar. P & P. Also acts as telephone amplifier using pick-up coil, price 14/-. Chassis 12 x 3 1/2 x 3 1/2 in. Fixed front panel. Price includes hand-some walnut finish polished cabinet, 13 x 7 1/2 in. fascia containing high quality 3 ohm P.M. speaker 5 1/2 x 4 1/2 in.

**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. In two sections H.T. and L.T. to replace existing batteries.

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



4 watts Valves ECC83, EL84 and EZ80 Controls, volume, bass and treble. On/off switch. (Chassis size 6 1/2 x 3 x 2 1/2 in.) 6 1/2 in. round or 7 x 4 1/2 in. elliptical speaker. Not suitable for microphone input. A.C. only. 67/- P & P 3/-.

**CHASSIS, BATTERY RADIO.** Valves DK96, DF96, DAF96, DL96. Two Short Wavebands 16 to 49 M. and 25 to 75 M. Size 10 1/2 x 4 1/2 x 5 in. £4.16.0, carr. paid. Or as Kit 75/-.

\*\*\*\*\*

**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—CLOSED SATURDAY.

**GLADSTONE RADIO**  
"SCALA," CAMP RD., FARNBOROUGH, Hants.  
Farnborough 3371  
and 247 New Road, Copnor, Portsmouth.

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	ECC88 17/6	EY86 8/6	PCC89 9/6	U10 9/-	UY41 7/6	5Z4 9/6	6L18 10/-	12C8 8/6
AC2PEN	ECC91 4/-	EZ35 6/-	PCF80 9/6	U12 9/-	UY85 7/-	5Z4GT 12/6	6L19 17/6	12J5GT 4/-
DD	EFC80 8/6	EZ40 7/-	PCF82 7/-	U14 9/-	VMS4B 12/6	6A7 9/-	6LD20 14/6	12J7GT 8/6
ACTP	ECH21 22/-	EZ41 7/-	PCF84 16/-	U22 8/-	VP4 15/-	6ABG 8/6	6P25 10/6	12K7GT 5/-
ACVP1	ECH3 21/-	EZ80 7/-	PCF86 15/-	U24 21/-	VP4A 17/6	6ABGT 13/6	6P28 17/6	12K8GT 10/-
AZ1	ECH42 9/6	EZ81 7/-	PCL82 9/6	U25 12/6	VP4B 17/6	6AB8 9/-	6Q7 6/6	12Q7GT 6/6
AZ31	ECH35 10/-	EZ90 7/-	PCL83 12/6	U26 10/-	VR10530 7/-	6A18 9/6	6Q7GT 8/6	12SA7 8/6
B36	ECH81 8/-	EL148 2/-	PCL84 10/6	U27 8/-	VR15030 7/-	6AK5 5/-	6SA7 7/6	12SK7 6/-
C1C	ECH83 8/6	FC2 21/-	PCL85 16/-	U31 9/-	VU39 9/-	6AK8 7/6	6SG7 7/-	12SL7 8/6
CBL31	ECH85 8/-	FC2A 21/-	PENA4 17/6	U35 17/6	VU111 2/6	6AL5 6/-	6SH7 6/-	12TS7 8/-
CCH35	ECL80 9/-	FC4 15/-	PENB4 17/6	U37 17/6	VU120 2/6	6AM5 5/-	6SJ7 6/6	12SN7 10/-
CL33	ECL81 10/-	FC13 21/-	PEN4DD	U43 8/6	W61 11/-	6AM6 4/-	6SK7 5/6	13D3 12/6
CY1	ECL82 9/6	FC13C 21/-		U45 10/-	W76 5/-	6AN5 7/6	6SL7GT 6/-	14H7 10/-
CY31	ECL83 12/6	FW4/500 9/-	PEN4VA	U47 12/6	W77 4/-	6AQS 6/6	6SN7GT 5/6	14R7 10/-
D77	EF6 21/-	FW4/800 9/-		U50 7/6	W81 6/-	6AQ8 9/3	6SQ7 8/6	14S7 15/-
DAC32	EF9 4/-	GZ30 10/6	PEN45	U52 4/-	W81M 6/-	6AT6 6/-	6U4GT 10/-	19AQ5 8/-
DAF91	EF22 14/-	GZ32 10/6	PEN45DD	U76 7/6	X17 8/6	6AUB 9/-	6USG 7/6	19BG6 21/-
DAF96	EF36 4/-	GZ33 19/3		U78 4/6	X18 9/-	6BBG 3/-	6V6 4/6	20D1 12/6
DCC90	EF37 8/-	GZ34 13/6	PEN46	U191 15/-	X41 15/-	6BA6 6/-	6V6GT 8/-	20F2 17/6
DF33	EF37A 8/-	GZ37 19/3	PEN453DD	U251 12/6	X61 12/6	6BE6 6/-	6X4 4/6	20L1 17/6
DF91	EF39 4/-	HABC8010/6		U281 18/-	X61M 22/6	6BG6G 17/6	6X5 7/6	20P1 25/-
DF92	EF40 15/-	HL41DD 8/6	PENDDD4020	U282 19/6	X65 12/6	6BH6 8/-	6XSGT 8/6	20P3 25/-
DF96	EF41 8/-	HL9Z 8/6		U301 22/6	X76 12/6	6BJ6 6/-	6X6 6/6	20P4 22/6
DF97	EF42 10/-	HL13DD		U329 15/6	X76M 12/6	6BQ7A 12/6	6Y5 12/6	20P5 25/-
DH63	EF50A 4/-	HN309 20/-	PL33 25/-	U339 15/-	X78 21/-	6BR7 12/6	6Y8 12/6	21B6 12/6
DH77	EF80 5/-	IW4/35010/6	PL36 15/-	U403 10/-	Y61 10/-	6BW6 7/6	7B6 10/6	25A6 8/-
DK32	EF85 5/-	IW4/50010/6	PL81 12/-	U404 10/-	Y61 10/-	6BW7 5/6	7B7 8/6	25L6 8/-
DK91	EF86 10/-	KT33C 8/-	PL82 8/-	U801 29/-	Y66 9/6	6BX6 5/6	7B8 8/6	25Y5 8/-
DK92	EF89 9/6	KT36 17/6	PL83 10/6	UABC80 7/-	Z63 7/6	6C4 3/6	7C5 8/6	25Z4 7/6
DK96	EF91 4/-	KT55 17/6	PL84 9/-	UBA42 8/6	Z66 10/-	6C5GT 8/-	7C7 8/6	25Z5 8/-
DL33	EF92 4/-	KT61 9/6	PL89 10/-	UBC41 8/6	Z77 4/-	6C6 6/6	7D3 15/6	25Z6 8/-
DL35	EF95 7/6	KT66 15/6	PM24M 13/6	UBC81 10/-	Z152 5/-	6C9 12/6	7D5 15/6	27SU 17/6
DL92	EF97 12/6	KT76 10/6	PX4 15/-	UBF80 8/6	ZD17 8/6	6C9D 7/6	7D6 15/6	30C1 9/6
DL93	EF98 10/-	KT81 15/-	PX25 25/-	UBF89 7/6	OZ4 5/-	6C9DG 12/6	7D8 15/6	30F5 10/-
DL94	EF183 18/-	KT88 21/-	PY31 15/-	UCC21 21/-	IA7 11/6	6C6H 10/-	7H7 7/6	30FL1 10/6
DL96	EF184 14/-	L63 5/6	Y32 12/6	UCH84 10/6	IC1 8/6	6D2 4/6	7K7 8/6	30L1 9/6
EA50	EK32 8/6	LN152 9/-	PY80 7/6	UCC85 7/6	IC2 9/6	6D6 5/6	7Q7 10/-	30L5 11/6
EABC80	EL2 21/-	LN309 12/6	PY81 7/6	UCF80 13/6	IC3 9/6	6E5 10/6	7Y4 7/6	30P4 21/-
EAC91	EL3 21/-	LZ319 12/6	PY82 7/6	UCH21 21/-	IC5 10/6	6F1 10/6	8D3 4/6	30P12 10/-
EAF42	EL6 21/-	MKT4 17/6	PY83 8/6	UCH42 9/6	ID5 8/6	6F6 6/9	9B1 12/6	30P16 9/-
EB34	EL32 4/6	MS4B 17/6	PZ30 18/6	UCH81 8/-	ID6 10/-	6F11 10/-	10C2 17/6	30PL13 12/6
EB41	EL33 10/6	MVSPEN	QS9510 10/-	UCL82 10/-	IHS 9/6	6F12 4/-	10F1 15/6	35L6GT 8/6
EB91	EL34 15/-	MVSPENB	QS15015 10/-	UCL83 13/6	IL4 5/-	6F13 10/-	10F3 15/6	35W4 7/6
EB33	EL35 10/6		R2 10/-	UF41 7/6	ILNS 4/6	6F14 10/-	10F9 12/6	35Z3 16/-
EB34	EL37 17/6		R3 10/-	UF42 7/6	INS 9/6	6F15 12/6	10LD11 15/6	35Z4 7/6
EB41	EL38 21/-	MU14 9/6	R12 8/6	UF80 7/-	IR5 7/6	6F19 12/6	10LD12 10/6	35Z5 8/6
EB81	EL41 10/-	MX40 15/-	R16 17/6	UF85 7/6	IS4 8/-	6F23 10/6	10P13 15/6	40SUA 15/-
EBF80	EL42 10/6	N18 8/-	R19 19/6	UF86 12/6	IS5 7/6	6H6 2/-	10P14 19/6	41STH 21/-
EBF83	EL81 12/6	N37 14/-	R20 19/6	UF89 6/6	IT4 4/-	6H6 2/-	10P18 15/6	42 12/6
EBF89	EL84 6/9	N78 17/6	S130 7/6	UL41 8/6	IUS 5/9	6I5 4/6	11D3 23/6	50C5 10/6
EBL1	EL85 10/-	N108 18/-	SP41 3/6	UL44 21/-	2P 24/9	6J5GT 4/6	11D5 23/6	50L6 8/6
EBL21	EL90 8/6	N308 20/-	SP61 3/6	UL46 14/6	3A4 5/-	6I6 3/6	12A6 6/6	50CD6G 36/6
EBL31	EL91 4/-	N339 30/-	SU2150 25/-	UL84 7/-	3A5 10/6	6I7 5/6	12A88 9/-	
ECC34	EL95 10/6	N369 10/6	SU2150A	UL85 7/6	3Q4 8/-	6J7GT 7/6	12AT6 7/6	53KU 12/6
ECC35	EM80 8/6	OD3 5/6		UM80 10/6	3Q5 9/-	6K7 2/-	12AT7 5/6	57 8/-
ECC40	EM81 8/6	OZ4 5/6	T41 15/-	UR1C 15/-	3S4 7/-	6K7GT 8/6	12AU7 8/6	78 7/6
ECC51	EM84 9/6	P2 10/6	TDD4 12/6	U06 19/-	3V4 8/-	6KB 5/-	12AX7 7/6	80 9/-
ECC82	EM85 10/-	PABC80 13/-	TDD13C	U08 21/-	5U4 4/-	6KGT 9/6	12BA6 17/6	85A2 12/6
ECC83	EY51 8/6	PCC84 17/6		U09 7/6	5V4 7/9	6K25 18/-	12BA6 7/6	185BT 30/-
ECC84	EY81 8/6	PCC85 9/6	TH41 24/-	UY1N 12/6	5Y3 8/6	6L1 13/-	12BE6 7/6	305 9/6
ECC85	EY83 15/-	PCC88 15/-	TY86F 12/6	UY21 15/6	5Y3GT 8/6	6L6 7/6	12BH7 10/-	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 8/6, 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/-, 12A88 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

**Closed Circuit TV**

If you feel like taking a day out we invite you to our studio here at Eastbourne and will demonstrate 405 and 625 systems, as well as under water and other types of installations. We have equipment for sale or loan, and will be glad to discuss any proposals which you may have. You will be interested to note that a transistorised camera for working direct into a domestic TV receiver can now be purchased for little more than the cost of a good photo camera.

**Adjustable Thermostat**



Suitable for Industrial or domestic purposes, such as controlling furnaces, oven, immersion heater etc. Can also be used as a fanestat or fire alarm. Made by Sunvic these are approximately 17" long and adjustable over a range 0 to 550 F. The contacts are rated at 15 amps, 230 volts, and the adjustment spindle, which comes to the top, can be fitted with a flexible drive for remote control or just a pointer knob for local control. Listed at £3 or £4 each, these are offered at only 12/6 plus 2/6 postage and insurance.

**Don't Go Unshaven!**



To operate your razor from car battery or suitable for many other uses, we offer Motor and Generator 12v input, 200 v output, which must have cost at least £10 to make, for only 17/6, plus 4/6 post and insurance.

**Acos Cartridge**



For turnover pick-up 10/- Ditto but Stereo 27/6.

**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.

Stand the J.B. Air-Conditioner on a window ledge near an open window, and you can have either extract of bad air, or input of clean, new air, depending upon which way you turn it.

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, but is offered at a specially low price during the summer months, this price namely £6-10-0, 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.

**Don't miss this special summer offer.**

**MOST POPULAR PORTABLES or CAR RADIOS**

*"Works better than my 25 gn. '—'!"*

*We hear this remark so many times and feel this is why our Companion portables are growing more and more popular*

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



In the "de-luxe" cabinet as illustrated it costs £10.19.6 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 750 mw. Every component used is by a famous maker, such as American Philco MADD 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.

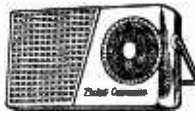
**You will definitely be doing the right thing if you buy a Good Companion.**

**The "Tremendo Companion"**

If you don't mind the battery consumption being a little higher and you want really big output then order The "Tremendo". This has an undistorted output of almost 14 watts and is probably the most powerful home constructor set available today. Complete building cost of this is £11.5.0, which includes the transfilter (Mk.II circuit) batteries, cost 3/6 (two required).

**The "Pocket Companion"**

This is without doubt the most modern and best pocket set available. It uses the very latest I.F. transfilters, Philco R.F. transistors, airspaced tuning condensers in Supertone circuit covering M.W. and L.W. Complete building cost £6.15-0. Battery 2/-. Post & Ins. 2/6. Data free with parts or separately 2/6.



**T.R.F. POCKET PORTABLES**

*Still available as previously advertised, all are complete and with cabinet similar to "Pocket Companion".*

**THE "PIMPERNEL"**

Five transistors, 3in. Moving Coil Speaker. 79/6, plus 2/6 postage and insurance.

**THE POCKET "4"**

Undoubtedly the easiest to build set available, three transistors and one diode. 42/6, plus 2/6 postage and insurance.

**THE SOLDERLESS "3"**

Two transistors, miniature earphone. Assembled like a Meano set, ideal for juveniles and beginners. 37/6, plus 2/6 postage and insurance.

**CABINET AND 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 27/6, plus 4/6 post and insurance.

**Cosmocord Pick-up**

As illustrated with cartridge and headset. Ready, new and perfect. Suitable for 45 or 33 records. Price

12/6, plus 2/6 post and insurance.

**Extra Special Offer**

The above two items if ordered together will be supplied for 37/6, plus 4/6 postage and insurance.

**The Pocket "7"**



**Cheaper than you can make! Stage, Transistor Superhet Pocket Radio!**

Made up and ready—for less than the price of a kit. Never before and possibly never again will such a bargain come your way! This uses 7 semi-conductors, the ideal number for a well designed circuit, gives maximum quality and volume for minimum operating cost. Carefully designed elegantly styled, the set is a thrill to hold! Luxembourg and station after station all roll in and its amazing how they boom out as you manipulate the finger tip controls! You will be astonished that such a tiny set can have such a punch but its the push-pull output that does it. You will have Elvis, Cliff, Lonnie, all the stars always at hand. Admire the elegant lines of this precision instrument which comes complete with real hide case and miniature earphone, and all for £7.18.6. (Uses a PP3 battery). Or less case and earphone, £6.19.6. Specification: 7 semi-conductors, ferrite aerial-dust cored Hi-Q coils, printed circuit—band tuning condenser—moving coil speaker—push-pull output. 8 ohm miniature earphone.

**Save While You Listen!**

Do you use a transistor set? If so, do you throw your money away? You can save two ways, batteries can be re-charged and the set can be worked off the mains at next to no cost. Our 9 volt battery eliminator (only a few inches long) has leads all ready to match up with the radio or battery and to fit into the light socket, no alterations to set. Expensive batteries can be charged eight or nine times—will give a life-time of entertainment for nothing as the meter can hardly read the current used. Price, complete and ready, only 29/6.

**Supertone Hi-Fi Tubular Amplifier**



As you pocket set owners know—the tiny speaker in your set cannot do justice to its components and circuitry—with our Supertone but without any extra drain on battery, you can have real Hi-Fi with music and speech really booming out—you will be amazed at the difference! Can be mounted on wall or ceiling or will sit anywhere. No alteration to set—just plug into phone socket. Price £2.5.6.

**Transistorised TV Pre-amplifier**

As described in Practical Television April and May issues. Complete set of parts including U.H.F. Transistors. Price 70/-.

**Introducing the J.B. Range of Transistors**

- Try these you will be very pleased—
- JB1. All wave mixer (replaces OC45 etc.) .. 6/6
  - JB3. I.F. Amplifier (replaces OC45 etc.) .. 4/6
  - JB4. A.F. Driver (replaces OC81D etc.) .. 5/-
  - JB6. Output matched pair (replaces OC81 etc.) .. 13/-
  - Special offer set of six matched for superhet. .. 25/-
  - Special offer set of four matched for Amplifier (1 watt) .. 17/-

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

Ranges: D.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 D.C. milliamps 0-5, 0-100, 0-500, Ohms 0-50,000 with internal batteries 0-500,000 with external batteries Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions. Price 24/6, plus 2/6 post and insurance.



**Blueprint Receiver**

The Regency (April). All parts available for this receiver 75/-. A suitable cabinet, 25/- extra.

**The Taylor Meter Model 127A**



A pocket size meter but with a big scale and a sensitivity of 20,000 ohms per volt D.C., for an ideal unit for television servicing—robustly made and complete with leads and prods—20 ranges as follows: D.C. current 50 microamps. to 1 amp. D.C. voltages—0-1,000 volt in seven ranges (25 kV) with external probe, optional extra. Volts A.C.—0.2,500 in six ranges. Ohms—0.20 meg. ohm in three ranges (self-controlled). Self-contained, 3in. movement. Price £10 or 10/- deposit and 23 fortnightly payments of 10/-. Non-callers add 5/- carriage and insurance.

**Transistor Set Cabinets**



Very modern cream cabinet, size 5 1/2 x 3 x 1 1/2 in. with chrome handle, tuning knob and scale. Price 7/6, plus 1/6 postage and packing. Special quotations for quantities.

**P.W. BLUEPRINT SERVICE**

We try to hold stocks of parts for all the P.W. Blueprint sets, and we will be glad to help you. When ordering please mention the month of issue and the number of the Blueprint set in question. Mark your order P.W. Blueprint Service.

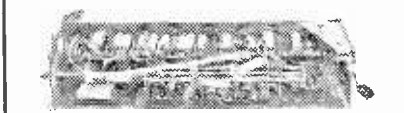
**"DIPYT" Automatic Headlamp Dimmer**



A transistorised device for automatically dipping headlamps so leaving driver's hands and feet free for emergency, could easily avoid an accident. We now offer such a device ready made and tested.

The unit measures 5 x 2 x 5 in. and fits under the dash. It is very easy to wire into the circuit and can also be used to control side lamps for parking. Price of unit is £10.19.6, carr. paid, diagram and instructions free with unit or separate 2/6. (Agents Wanted).

**THIS MONTH'S SNIP**



**BREAKDOWN UNIT.** Contains a mass of components, and must have cost the Government at least £20.

Contents: Over 50 paper tubular and mica condensers values up to .05 mFd. Over 50 carbon resistors, various wattages and values—6 Yaxley switches—6 I.F. transformers, dust covered suitable for TV or rewinding—7 octal valve holders. Many useful sundries—chokes, valve top clips, tag boards, plugs, switch, springs, etc., weighs 6 lbs. Secure one of these whilst stocks last, price only 9/6, plus 3/6, postage and packing.

**TRANSFORMERS**

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

**PHILCO RECORD PLAYER CABINET**



Two tone, covered with high grade rexine, fitted with rubber feet. The front is particularly nice being made of tygan with a horizontal fold bar. Size approximately 14 1/2 in. wide, 8 1/2 in. deep, 16 1/2 in. long. Will take BSR or similar record player or tape deck and amplifier. Must have cost at least £3 each, our special snip price 35/- each, carriage and insurance 6/6.

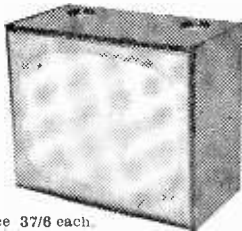
**TV CABINET**

**FOR 17" MODEL**

Really well made and finished with polyester lacquer. Originally intended for Philco sets. Price

**35/-** plus 10/- carriage and insurance.

**SHELLS** available for 21in. models, beautifully polished and finished, but would need a moulded front and back to complete. Price 37/6 each, plus 10/- carriage and insurance.



**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 3/6  |
| 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   |
| 8 pole, 4 way 4/6;          | 8 pole, 5 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, 6 way, shorting 3/6 |                     |

Big stocks of most types  
Special prices for quantities.

**Blueprint Receiver**

**The International SW2**

All components to make up this receiver as described in the April issue are available. Price 39/6, plus 2/6 postage and insurance. Note this price does not include cabinet, baking tin or headphone.

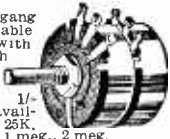
**Motor with blower attached**

24 volts D.C., but will work on 12 volts. For cooling equipment or can be adapted as car heater. 15/-, plus 1/6.

**Rotary Converter**

24 volts D.C. to 230 volts, 50 cycle A.C. with automatic regulator, this is complete in a grey steel case for silent running and it is rated 100 watts though this is a Navy rating, which usually can be considerably exceeded. Ideal to operate TV set or boat, etc. These are big units and can only be viewed by prior arrangement. Price £27.10.0 each, carriage at cost.

**Morganite Potentiometers**



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

**Infra Red Monocular Equipment**

This is portable equipment, made originally for military use. It is a complete viewing device, having an infra red cell with optical lens system and Zambini pile to provide the EHT. Complete with leather case for easy carrying, these devices are so in their sealed packages as collected from the Ministry, and they must not be opened during the daylight. Sold as received, believed to be in good working order, but without guarantee. Price £4.10.0, plus 3/- carriage and insurance.

**Transistor Components**

Send S.A.E. for our new price list, just printed.

**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.

286 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: IL Ford 1011 Half day Thursday

42-46 Windmill Hill, Rushin, Wiltshire. Phone: RU1slp 5730 Half day Wednesday

**John Bull**  
248 High Street, Harlesden, N.W.10. Phone: ELGar 4444 Half day Thursday



# 6 SIX GOOD REASONS WHY YOU NEED THE NEW EDITION OF THE Mullard MAINTENANCE MANUAL

1. This is a completely new and up-to-date edition including data on all current replacement valves, semiconductors and cathode ray tubes. It contains valuable new material essential as reference for every Service Engineer.
2. Supplementary data sheets will be issued from time to time to provide data on new types. This service is included in the initial price of 16/-.
3. The binding of this edition is specially designed to allow the supplementary data sheets to be inserted simply and without gluing.
4. The manual contains full data on 178 separate types and the equivalents list of current types provides cross-references to 480 types.
5. All devices are listed in alphabetical order for easy reference.
6. The data on each type has been carefully compiled to supply the information which the Service Engineer is most likely to require, including very clear base diagrams for each type.



**NOTE:** A few copies of the previous edition are still available at 10/6d. each (postage and packing 1/- extra).

Published by Mullard Ltd. U.K. Price 16/- . Get your copy from your radio dealer or order direct from MULLARD LTD., MULLARD HOUSE, TORRINGTON PLACE, LONDON, W.C.1. (Postage and packing 1s. 0d. extra.)

MVM4002

## FREE TO AMBITIOUS ENGINEERS - THE LATEST EDITION OF ENGINEERING OPPORTUNITIES

### Have you sent for your copy?

**ENGINEERING OPPORTUNITIES** is a highly informative 156-page guide to the best paid engineering posts. It tells you how you can quickly prepare at home for a recognised engineering qualification and outlines a wonderful range of modern Home Study Courses in all branches of Engineering. This unique book also gives full details of the Practical Radio & Electronics Courses, administered by our Specialist Electronics Training Division—the *B.I.E.T. School of Electronics*, explains the benefits of our Employment Dept. and shows you how to qualify for five years promotion in one year.

### We definitely Guarantee "NO PASS — NO FEE"

Whatever your age or experience, you cannot afford to miss reading this famous book. If you are earning less than £25 a week, send for your copy of "ENGINEERING OPPORTUNITIES" today—FREE.

**BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY** (Incorporating E.M.I. Institutes)  
(Dept. SE/21), 29 Wright's Lane, London, W.8

### WHICH IS YOUR PET SUBJECT ?

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

### GET SOME LETTERS AFTER YOUR NAME!

A.M.I. Mech. E.  
A.M.I.C.E.  
A.M.I. Prod. E.  
A.M.I.M.I.  
A.I.D.B.  
A.F.R. Ae.S.  
B.Sc.  
A.M. Brit. I.R.E.  
City & Guilds  
Gen. Cert. of Education  
Etc. etc.

### PRACTICAL EQUIPMENT

Basic Practical and Theoretical Courses for beginners in Radio, T.V. Electronics, Etc.,  
A.M. Brit. I.R.E. City & Guilds Radio Amateurs' Exam.  
R.T.E.B. Certificate  
P.M.G. Certificate  
Practical Radio  
Radio & Television Servicing  
Practical Electronics  
Electronics Engineering  
Automation

### INCLUDING TOOLS!

The specialist Electronics Division of *B.I.E.T. (Incorporating E.M.I. Institutes)* NOW offers you a real laboratory training at home with practical equipment. Ask for details.

### B.I.E.T. SCHOOL OF ELECTRONICS



### POST COUPON NOW!

Please send me your FREE 156-page "ENGINEERING OPPORTUNITIES"  
(Write if you prefer not to cut page)

NAME .....

ADDRESS .....

SUBJECT OR EXAM THAT INTERESTS ME ..... (SE/21)

**THE B.I.E.T. IS THE LEADING ORGANISATION OF ITS KIND IN THE WORLD**

# ★ VALVES ★

by return of post  
THE MOST COMPREHENSIVE COMPETITIVE  
VALVE LIST IN THE COUNTRY

**10% DISCOUNT**  
SPECIAL OFFER TO  
PURCHASERS of any  
SIX VALVES marked in  
black type (15% in  
dozen). Post: 1 valve,  
6d., 2-11, 1/4.

**NEW LOW  
PRICES  
GUARAN-  
TEED 3  
MONTHS**

**FREE TRANSIT IN-  
SURANCE.** All valves  
are new or of fully  
guaranteed or ex-Government  
origin. Satisfaction or  
Money back Guarantee  
on Goods if returned un-  
used within 14 days.

024	5/-	6J5GT	4/-	12E1	17/6	DAE96	7/8	ESM1	8/6	SU2150	4/6
1ASGT	5/-	6J6	4/-	12J7GT	9/-	DET19	2/8	EM84	9/-	T41	7/6
1A7GT	11/-	6J7	8/6	12K8GT	4/9	DF35	9/9	EM85	1/0	TDD4	7/6
1CSGT	9/-	6J7G	4/9	12K7	11/-	DF91	3/6	EN81	16/4	U14	8/-
1D5	8/-	6J7GT	7/8	12K8GT	9/8	DF96	7/3	EY51	U18	8/-	
1D6	9/9	6J7G	8/6	12J7GT	5/-	DH63	6/-	JHD42	7/9	U22	6/6
1EGT	9/9	6K6GT	6/6	12N47	7/-	DH78	5/-	EZ86	7/8	U24	16/-
1L4	3/3	6K7	5/9	12S87	5/-	DK32	11/-	EY86	5/6	U25	11/6
1LL5	3/6	6K7G	2/2	12S18	8/6	DK91	5/-	EZ35	6/6	U26	9/9
1LL6	4/9	6K7GT	4/6	12S37	5/8	DK92	7/-	EZ41	7/-	U31	7/-
1NGT	9/9	6K8GT	5/9	12S37	5/9	DK96	7/3	EZ60	6/3	U33	14/-
1R5	5/6	6K25	7/6	12B7GT	7/9	D133	8/-	EZ82	6/6	U35	12/6
184	8/-	6L1	12/6	13J3	9/-	D135	8/-	FW4500	8/-	U37	26/-
185	4/6	6L6G	6/6	14S7	14/9	D165	6/-	FW4800	8/-	U50	5/9
1T4	3/6	6L18	9/-	19A05	7/6	D175	6/-	GT1G	7/-	U52	4/9
2A3	6/6	6L19	11/-	19B96	19/-	DL92	8/-	EZ32	8/9	U7	4/-
2A7	4/4	6L21	8/6	20P1	15/-	EAF42	4/9	V42	12/6	U39	6/9
2A7	5/9	6L21	9/9	20F2	9/6	D192	6/-	HABC80	9/6	U191	12/6
3A5	9/-	6LD20	7/9	20L1	16/-	D194	6/9	HLL4DD	U281	9/6	
3D6	4/6	6N7	2/6	20P1	8/9	D196	7/8	HN309	8/9	U282	15/-
3Q4	7/-	6P1	7/6	20P3	12/6	EABCS0	8/9	HN309	15/-	U301	15/-
3QG4	8/-	6P25	8/6	20P4	15/-	EAB91	4/8	HW4350	7/6	U329	6/9
3SGT	6/-	6P23	12/6	20P5	15/-	EAF42	4/9	1W4500	7/8	U339	6/9
3A7	5/9	6G7G	8/-	25A5G	8/-	EB41	3/-	KLL32	8/6	U801	18/-
6R4G12	6/0GT	8/6	25L6G	7/9	EB31	3/-	KT32	8/6	UABC80	8/6	
6T4	8/-	6K7G	8/6	25L6GT	7/9	EB33	4/9	KT32	8/6	UABC80	8/6
6U4G	4/9	6S47	6/6	25Z5G	8/-	EB41	3/-	KT32	8/6	UABC80	8/6
6V4G	5/9	6S7	4/8	25Z5GT	8/-	EB31	3/-	KT32	8/6	UABC80	8/6
6Y3G	5/9	6S7	4/8	25Z5G	8/-	EB31	3/-	KT32	8/6	UABC80	8/6
6Y3GT	5/9	6S7GT	5/9	25Z6G	8/-	EBF88	9/6	KT45	8/6	UBC81	9/6
6Y4G	11/-	6S8TGT	5/9	30C1	7/-	EBF89	8/6	KT61	8/6	UBF80	8/-
6Z4	11/-	6S8TGT	4/6	30P3	6/6	EBL21	12/6	KT63	5/9	UBF89	7/6
6Z4G	7/6	6S27	5/6	30L1	9/6	ECC34	9/6	KT66	8/6	UBL21	14/6
6Z4GT	11/-	6S8T	3/6	30L1	6/9	ECC34	9/6	KT66	8/6	UBL21	14/6
6J30L2	8/-	6U4GT	10/6	30P4	9/6	ECC31	7/8	KTW62	5/9	UC85	7/-
6A6	4/9	6V6G	5/-	30P12	7/6	ECC32	4/8	KTW63	5/9	UC80	15/-
6A7	10/-	6V6GT	8/-	30P16	8/6	ECC33	4/8	KTW63	5/9	UC81	12/-
6A8G	6/6	6V6	7/6	30P1	9/6	ECC34	9/6	KTW63	5/9	UC82	7/6
6A8GT	12/6	6V6	8/6	30L16GT	8/6	ECC33	6/8	LN152	7/6	UCH81	8/-
6A8B	7/-	6X5G	5/-	35T	25/-	ECC40	14/-	MU14	7/6	UCH82	9/6
6A8C	3/3	6X5GT	5/6	35W4	6/9	ECC51	8/6	NT3	11/-	UCH83	13/6
6A8D	3/-	6V6G	7/6	35Z4GT	5/8	ECC82	6/8	NT8	13/-	UF41	7/8
6A8E	7/8	7/4	8/6	35Z5GT	5/8	ECC83	6/8	NT8	13/-	UF42	7/8
6A8F	5/-	7B8	9/-	41	7/6	ECC84	8/-	N162	8/6	UF80	7/8
6A8G	3/-	7B7	7/9	42	7/6	ECC85	7/9	P41	4/6	UF85	7/8
6A8H	3/-	705	7/8	50C5	9/-	ECC88	16/-	P61	2/9	UF86	14/6
6A8I	6/-	706	7/6	50C16	19/-	ECC91	4/-	PABC80	UP89	7/-	
6A8J	5/9	7H7	7/3	50L6GT	8/6	ECCF90	8/6	PL4	11/6	UL41	7/-
6A8K	7/8	7K7	9/6	52R U	10/6	ECCF92	8/6	PC84	8/6	UL44	11/-
6B7	8/6	7Q7	8/6	53K U	10/6	ECH21	12/6	PC85	8/3	UL46	9/9
6B8G	3/-	7R7	10/6	61BPT	11/-	ECHF35	7/6	PC88	8/4	UL84	7/-
6B8A	5/9	787	9/-	62B1T	13/6	ECHH42	8/6	PC89	9/-	UM80	9/6
6B8B	5/9	7V7	7/9	75	6/8	ECH81	7/8	PC89	9/-	UR1C	8/-
6B8C	15/-	7Y4	6/9	78	6/8	ECH83	8/3	PC82	7/8	U86	12/6
6B8D	6/-	7Z4	7/-	80	5/9	ECL80	6/-	PC84	16/-	U17	9/6
6B8E	6/-	8D3	3/-	80	5/9	ECL82	8/6	PC85	7/8	U8	17/-
6B8F	9/9	10C1	11/6	185BT	19/6	ECL83	11/7	PC85	10/6	UY1N	11/-
6B8G	7/8	10C2	14/8	80	19/-	EP22	7/-	PL84	7/6	UY21	11/-
6B8H	5/6	10C14	8/-	80T(A)	5/6	EPC6	5/6	PEN48	8/6	UY41	6/-
6B8I	6/6	10P1	6/9	808	7/6	EP39	4/6	PEN46	5/-	UY85	6/6
6C4	3/6	10F9	10/6	813	55/-	EP40	12/-	PL33	8/3	VP41	5/8
6C5	5/6	10L14	7/-	832A	14/-	EP41	8/-	PL36	9/6	VR105	6/9
6C6	3/6	10L13	7/8	866A	11/6	EP42	7/8	PL38	18/6	VR150	6/9
6C8	11/-	10LD11/14	6/6	91	9/-	EP-BR 27	8/6	PL41	8/6	W44	11/-
6CD6G	19/6	10L19	8/6	928	2/8	USA	4/6	PL82	6/6	W78	4/9
6C8H	3/6	10P13	11/-	950	4/-	EP54	3/3	PL83	6/6	W81	7/3
6D2	3/-	10P14	9/-	9002	4/9	EP80	4/9	PL84	8/-	X61M	11/-
6L13	9/6	10P18	7/-	ATP4	2/9	EP85	6/6	PL820	8/6	X63	8/6
6D9	4/8	12A6	4/9	A31	8/-	EP86	9/-	PLX	12/6	X65	11/-
6E1	9/9	12A9	5/8	A24	11/-	EP89	5/9	PLX25	9/6	X66	11/-
6F4G	5/9	12AD6	17/6	B36	7/9	EP91	3/4	PY31	9/-	X76M	11/-
6F12	3/-	12AE6	13/9	C	9/6	EL92	4/6	PY32	10/-	X78	21/-
6F13	6/9	12AHS	9/-	CB11	26/6	EP96	3/4	PY60	8/6	X79	16/8
6F14	9/6	12AT6	7/8	CHL31	21/-	EL32	4/6	PE81	6/6	X81M	6/-
6F15	9/6	12AT7	8/6	CH35	15/6	EL33	4/6	PY32	6/6	X83	6/3
6F16	8/-	12AUG	9/6	CL3	9/6	EL35	7/-	PY83	7/-	Z63	4/9
6F19	6/8	12AU7	6/-	CY31	9/-	EL41	8/-	PZ30	9/6	Z66	9/8
6F23	6/8	12AX6	6/6	D77	3/8	EL42	8/9	N18	11/-	Z52	4/9
6F32	6/8	12BA6	7/8	B192	8/9	EL33	11/-	PL11	11/-	Z719	4/9
6F33	6/8	12B6	7/8	A30	12/6	EL34	11/-	PL11	9/6	Z1912	7/9
6F5	4/8	12BH7	9/8	DAC32	9/9	EL41	4/-	SP61	2/8		
6F5G	3/-	12C8	6/6	DAC31	4/9	EM80	7/8	SU25	16/-		

Post: 2 lbs. 2/-, 4 lbs. 2/6, 7 lbs. 3/6, 15 lbs. 4/- etc. No C.O.D. ALL ITEMS

# Tubes

HIGHEST QUALITY -  
COMPARE OUR PRICES

Carr. & Ins. 12/6.

GUARANTEED		NEW TYPES	
6 Months	12 Months	MW 31/74	£4-0-0
12in.	£2. 0. 0	£3. 5. 0	MW 36/24
14in.	£2.10.0	£3.15.0	£5-0-0
15/17in.	£3. 5. 0	£4.10.0	CRM 172
21in.	£3.15.0	£5.15.0	MW 43/64
			£6-0-0

## 13 CHANNEL T.V.s

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

**£2.19.0** 14in. **£4.19.0**

**F.M. TUNER KITS.** Well known make comprising F.M. Tuning Head, guaranteed none drift. Frequency coverage 85-100 mc/s. CASI balanced diode output, Magic Eye Tuning, Two I.F. Stages and discriminator, **26.9.8.** P.P.

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

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

**PICK-UP CARTRIDGES.** "Acos" 65.3, 62/6, "Sonotone", 17/-, "Steig and Reuter", 17/6. Power Point, 17/-

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

**HEADPHONES.** Ex-Govt. quality with Jack-plugs, 7/6 pair. P.P. 1/6.

**ACETATE TAPE.** The highest quality, guaranteed. 5in. 600ft., 15/-, 5ftm. 1200ft., 21/6. 7in. 1200ft., 23/6. 7in. 1,800ft., 32/6. Also new empty spools, 3in., 1 1/8, 5in., 3/-, 5 1/2in., 3/6, 7in., 4/6.

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

**TRAV-ER TAPE RECORDER** Superior, Transistorized, Portable Fast Rewind, Built-in High Output speaker. Unrepeatable. Listed 29 gns. OUR PRICE 15 gns.

**U20 Autochangers.** Latest B.S.R. 10 mixed records. Brand New. Unrepeatable. **£8.19.0.** Also V.A14. 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 45.

**A.M./M. RADIOS.** Latest Super German press built, long, medium, short and P.M., normally approx. £30. OUR SPECIAL DISCOUNT PRICE 19gns.

**LINE TRANSFORMERS.** Most types available from stock from 19/-. Also frame and blocking oscillator transformers. S.A.E. enquiries.

**SCREEN HOLDERS** 376, 6d. ea., with Valve 8d. ea. 39A, 6d. ea., with Screen 8d. ea.

**IVORY/GOLD KNOBS** 1" Diameter, half price 1/2, 5 for 4/6, 1 1/2" 1/8, 5 for 5/-

**SPECIAL TEMPORARY OFFER.** 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.

**RECORDERS.** "Veriluk" 4 Track Collaro 3 Speed Transcription Deck. Superior reproduction. Streamlined Portable Case. Complete with Mike. Market value approx. **£45.** OUR SPECIAL PRICE 29gns.

**PERFEX** fronts for 17in. T.V. Sets. Brand new, 7/6. P.P. 1/5.

**RESISTORS** your selection, 4/8 doz. Condensers, Silver Mica and Ceramic, 6/- doz. Most values in stock.

**CO-AX.** Standard and low loss, 25 yds., 12/6; 50 yds., 22/6; 100 yds., 42/6. Co-ax Plug 1/3. Wall outlet boxes 8/6.

**EXTERNAL L.T.V. Converters,** with Power Pack. Very compact, 39/-, P.P. 2/-

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

**PORTABLE RECORD PLAYERS.** Takes all sizes Records, all speeds, amplifier auto-changer, Garrard new "Slimline" Gram. In two-tone Case. All absolutely new. 14 gns.

**MIRROR GALVANOMETERS.** Ever-shed and Vignoles, 45 cent swing, high sensitivity, heavy gunmetal cases, with spares, in transit case, unused. **£5.10.0.**

**P.M. SPEAKERS.** 3 ohm, top makes, Performance guaranteed. 6gin., 8in., 8in., 5in., 7 x 4in., 11/-

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

**AVO MODEL 40.** Universal standard test meter, limited quantity, **£3.10.0.** 12 Volt Meters, ex-Govt., 19/6.

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

Famous makes complete with PCF80, PC934 valves-38 M/c L.F. Fantastic value **19/-**

**CONDENSERS.** 5x Mixed, Electrolytic. Many popular sizes. List Value **£8** Our Price 10/-

**SOLDERING IRONS.** "Pico" with built-in Searchlight, 22/-, "Coka" with angled bit, 18/9.

**GET 15.** G.E.C. High Power, Contact cooled, manufacture matched per Transistor with Push-Bull Input & Output Transformers. Knock out price **20/-**, P.P. 1/6.

## AUDIOTRON HI-FI TAPE RECORDER KIT

**REALISM AT INCREDIBLY LOW COST, CAN BE ASSEMBLED IN AN HOUR**  
 The Recorder incorporates the latest Collaro Studio Tape Transcriber. The Audiotron 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 14 1/2 x 15 x 8 1/2 in. high, and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.A.E. for leaflet.



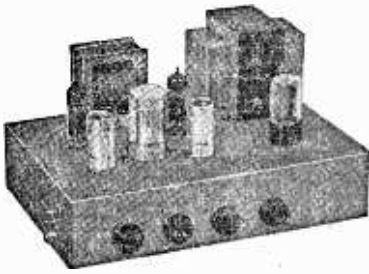
**25 1/2**  
 GNS.  
 Carr.  
 17/6

**I.P. TERMS.** Deposit £5.7.6 and 12 monthly payments of 39/9 Cash price if settled in 3 months.

## HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

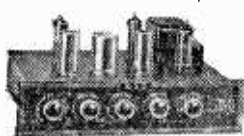
### PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES

Two input sockets with associated controls allow mixing of "mike" and gram, as in A.D. High sensitivity. Includes 6 valves. ECC83, ECC83, EL84, EL84, 5Y3. 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  $\pm$  3 D.B. 30-30,000 c/s. Six negative feedback loops. Hum level 50 D.B. down. ONLY 23 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best design.



**MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS**, etc. For **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. 12-9-7 in. 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/-  
 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. Speakers. Microphones, etc., with cash and credit terms.

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



A complete set of parts for the construction of a stereophonic amplifier giving 5 watt 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 and "cut". 10 watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, E281. Outputs for 2-5 ohm speakers Point-to-Point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. **8 Gns.** Carr. 10/-  
 Full constructional details and price list 2/6. Carr. 10/-  
 Use. 59/6 extra.

Kit can be assembled, ready for use. 59/6 extra.

### DRAMATIC RECORDING HEADS.

High Impedance Record/Playback 22/-.

**COLLARO JUNIOR** 1-speed Single Player Unit and Crystal Pick-up with hi-fi Turnover head. Only £3.19.6.

**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. Label type 35/6.

**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 Pick-up head. For 200-250 v. A.C. £7.19.6. Carr. 4/6.

**B.S.R. UA 8 4-speed AUTO-CHANGERS** with hi-fi turnover head. £6.19.9. 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 1 1/2 x 2 1/2 x 2 1/2 in. Controls: Vol. and Tone with switch. Only 59/6.

## R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250v., 50ccs 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. Plug, Fuses, Fuseholder and circuit. 59/6. Carr. 4/6.



### 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 Carr. 5/- mains and output leads. 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 Only Fused. Carr. 3/9 **49/9**

### BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses. Fuse-holders, Grommets, panels and cir.uit. Carr. 3/8 extra.  
 6v. or 12v. 1 amp. .... 24/9  
 As above, with Ammeter 25/9  
 6 v. 2 amps. .... 28/9  
 6v. or 12 v. 2 amps. .... 31/6  
 6 v. or 12 v. 2 amps. inclusive of Ammeter. .... 42/9  
 6 v. or 12 v. 4 amps. .... 49/9  
 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector ..... 59/9  
**CHARGER AMMETERS.** 0-5 a., 0-3 a., 0-4 a., 0-7 a., 0-25 a., 0-60 a. 8/9.

### PARMEKO POTTED CHOKES

200 mA, 12 H 100 ohms .. .. 16/9  
 120 mA, 30 H 200 ohms .. .. 18/9  
 120 mA, 8 H 10 ohms .. .. 13/9

### SOLDERING IRONS.

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

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

Interleaved and impregnated. Primaries 200-230-250 v. 50 c/s. Screened **TOP SHROUDED DROP THROUGH**  
 250-0-250v. 70mA. 6.3v. 2a. 0-5-6.3v. 2a 17/9  
 350-0-350v. 80mA. 6.3v. 2a. 5v. 2a .. 19/9  
 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. 5v. 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. 5v. 3a .. 26/9  
 350-0-350v. 100mA. 6.3v. 4a. 5v. 3a .. 26/9  
 350-0-350v. 150mA. 6.3v. 4a. 0-5-6.7v. 3a 26/9  
**FULLY SHROUDED UPRIGHT**  
 250-250v. 60mA. 6.3v. 2a. 0-5-6.7v. 2a. Midget type 21-3-3in. .... 17/11  
 250-0-250v. 100mA. 6.3v. 4a. 5v. 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  
**OUT PUT TRANSFORMERS**  
 Midget Battery Pentode 66:1 for 354. etc. .... 4/8  
 Small Pentode, 5,000  $\Omega$  to 3  $\Omega$  .. 4/8  
 Small Pentode 7/8,000  $\Omega$  to 3  $\Omega$  .. 4/8  
 Standard Pentode 5,000  $\Omega$  to 3  $\Omega$  .. 5/8  
 Standard P entode 7,800  $\Omega$  to 3  $\Omega$  .. 5/8  
 10,000  $\Omega$  to 3  $\Omega$  .. 5/8  
 Push-Pull 8 watts, EL84, or 6V6 to 3  $\Omega$  or matched to 1  $\Omega$  .. 9/9  
 Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5  $\Omega$  or 15  $\Omega$  .. 19/9  
 Following types for 3 and 15  $\Omega$  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. 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 .. 12/9  
 Both above size 2 1/2 x 2 1/2 in.

**FILAMENT TRANSFORMERS**  
 All with 200-250 v. 50 c/s. primaries 6/3 v. 1.5 a. 5/9; 6.3 v. 2 a. 7/9; 0-4-6.3 v. 2 a. 7/9; 12 v. 1 a. 7/9; 6.3 v. 3 a. 9/11; 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 .. .. 8/9  
 60 mA. 10 H 400 ohms .. .. 4/11

**CHARGER TRANSFORMERS**  
 All with 200-250 v. 50 c/s Primaries: 0-4-15 v. 1 1/2 a. 12/9; 0-9-15 v. 2 a. 14/6; 0-8-15 v. 3 a. 16/9; 0-9-15 v. 5 a. 19/9; 0-8-15 v. 6 a. 23/9; 0-7-15 v. 8 a. 28/9.

**AUTO (Step up/Step down) TRANS.**  
 0-110-120-230/250 v. 50-90 watts. 13/9; 250 watts. 39/9; 150 watts. 27/9.

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



**R.S.C. (Manchester)** MAIL ORDERS to 29 Moorfield Rd., Leeds 12. Terms: C.W.O. or C.O.D. No C.O.D. under £1.  
 Ltd. Postage 2/9 extra under £2. 3/9 extra under £5. Trade Supplied. S.A.E. with all enquiries please.

<b>BIRMINGHAM:</b> 6 Great Western Arcade, Birmingham	<b>SHEFFIELD:</b> 13 Exchange St. Castle Market Bldgs., Sheffield	<b>HULL:</b> 51 Savile St. Hull (Half day Thurs.)	<b>LIVERPOOL:</b> 73 Dale St. Liverpool 2	<b>BRADFORD:</b> 56 Morley Street (Above Alhambra Theatre), Bradford	<b>MANCHESTER:</b> 8-10 Brown St. (Market St.) Manchester 2	<b>LEEDS:</b> 5-7 County (Mecca) Arcade, Briggate Leeds 1
--	--	--	---	---	--	--

**SENSATIONAL STEREO OFFER**

**Only 4 Gns. carr. 5/-**

A complete set of parts to construct a good quality Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. Including pair matched 6in. speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset, balance control. Full instructions and point-to-point wiring diagrams supplied. Stereo Pick-up Head 19/9 extra with above only.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response ±3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF86, ECC83, 807, 807, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram, and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete Kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. It required perforated cover with carrying handles can be supplied for 19/9. The amplifier can be supplied, factory built with EL34 output valves and 12 months guarantee, for 14 Gns.

**11 Gns.**

Carr. 10/-  
 TERMS: DEPOSIT 33/9 and 9 monthly payments of 33/9.  
 Suitable microphones and speakers available at competitive prices.

**WE STOCK ARMSTRONG RADIOGRAM CHASSIS, GOODMANS and WHARFEDALE SPEAKERS. H.P. or Credit Terms available. No carriage charges on Mail Orders for above.**

**LINEAR TAPE PRE-AMPLIFIER**  
 Type LP/L. Switched Negative feedback equalisation. Positions for Record 11in. 8in., 7in. and Play-back, FM4 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriber and a high fidelity amplifier, but suitable for almost any Tape Deck. Only 9 gns. S.A.E. for leaflet.

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

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



Complete kit with diagrams, 39/9, or ready to use, 46/6.

Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. 90 v. and 60 v., 40 mA. and 2 v. 0.4 a. to 1 amp. Fully smoothed. Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s. **SUITABLE FOR ALL BATTERY RECEIVERS** normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions, 49/9, or ready for use, 59/6.

Jason FMT1 V.H.F.F.M Radio Tuner design. Total costs of parts including valves. Tuning dial, Escutcheon, etc. £6.19.9.

**LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER.** Suitable for use with any record playing unit, and most microphones. Negative feedback 12db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 7-5 5/8 in. high. Guaranteed for 12 months. Only £5.19.6. Send S.A.E. for illustrated leaflet. Terms: Deposit 22/6 and 5 monthly payments of 22/6.

**R.S.C. 4.5 WATT A5 HIGH-GAIN AMPLIFIER**

A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'tapes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 db. down 15 db. of Negative feedback is used. H.T. or 300 v. 25 mA. and L.T. or 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use 25/- extra. Plus 3/6 carr.; or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

230-250 v. 50 c/s. Output for 2-3 ohm speaker.

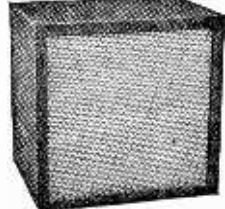
Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions.

**R.S.C. PORTABLE GUITAR AMPLIFIERS.** (For 200-250 v. A.C. Mains) Junior 5 watts High Quality output. Separate Bass and Treble "Cut" and "Boost" controls. Sensitivity 15 m.v. Twin inputs. High Flux 8in. Loudspeaker "built-in". Handsome, strongly made Cabinet (size approx. 14 x 14 x 7 1/2 in.) finished in attractive and durable polycrome, and fitted carrying handle. Terms: Deposit £1 and 9 monthly payments of £1. Carr. 10/-

**£8.19.6**

Senior 10 watts High Fidelity output Separate Bass and Treble "Cut" and "Boost" controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12in. for Bass notes and a 7 x 4 in. elliptical for Treble. Cabinet is well made and finished as Junior model. Size approx. 18 x 18 x 9 in. **15 Gns.** H.P. Terms: Deposit 34/9. Carr. 10/- 9 monthly payments of 34/9. Carr. 10/-  
 Super Hi-Fi 15 Watt. All facilities as 10 watt. Cabinet size 20 x 15 x 13ins. Terms: Deposit £2.11.6, and nine monthly payments of 51/6. Cash 22 gns. Carr. 12/6

**12in. 10 WATT HIGH QUALITY LOUD-SPEAKER IN POLISHED WALNUT FINISHED CABINET**



**LOUD-SPEAKER IN POLISHED WALNUT FINISHED CABINET**

Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only 4.19.6 Carr. 5/-  
 TERMS: Deposit 11/3 and 8 monthly payments of 11/3.

**12in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 10in. Finish as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 8/6.**

12in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 10in. Finish as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 8/6.

**R.S.C. BASS REFLEX CABINETS, JUNIOR MODEL.** Specially designed for W.B. HF102 Speaker, but suitable for any Good quality 10in. speaker. Acoustically lined and ported. Polished walnut veneer finish. Size 18 x 12 x 10in. Handsome appearance. Ensure superb reproduction for only £3.19.6.

**AUDITION MODEL.** As above but for 12in. speakers. Size 20 x 15 x 13in. Especially recommended for Audioton Loud-speaker systems. £5.19.6. Suitable less with brass ferrules, 25/- per set of 4. **AUDITION CORNER CONSOLE CABINETS.** Polished walnut veneer finish. Pleasing design. Size 27x18x18ins. for 8 or 10in. speaker. 4 Gns.  
**AUDITION HI-FI SPEAKER SYSTEMS.** Consisting of matched 12in. 12,000 line, 15 ohm high quality speaker; cross-over unit (consisting of specially wound choke, condenser, etc.) and Tweeter. The smooth response and extended frequency range ensure strikingly realistic reproduction. Standard 10 watt rating £5.19.6 or Senior 15 watt, £7.19.6.

**P.M. SPEAKERS.** 10in. W.B. "Stentorian" 3 or 15 ohm type HF102 10 watts, hi-fidelity type. Recommended for use with our All Amplifier, £4.12.9. 12in. R.A. 3 ohms 10 watts (12,000 lines). 59/6.  
**TWEETERS.** Plessey 3G 19/9, 15 25/9.  
**HI-FI (H.S.T.A.) RECORDERS.** (Cartridges) Acos. Standard replacement for Garrard, B.S.R. and Collaro, 19/9. Acos Stereo/Monaural 49/9. Ronette Stereo/Monaural 59/6.

**R.S.C. EQUIPMENT CABINET.** Dimensions and outer appearance identical with Standard Bass Reflex Cabinet. Top hinged Bass board adjustable. Will take Tape Deck or Player Unit, and Amplifier plus F.M. or A.M./F.M. Unit. Only 6 gns.  
**SUPERBITE FEEDER UNIT.** Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). Delayed A.V.C. Controls are Tuning, W/Ch. and Vol. Only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9x6x7 1/2 in. High. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with Illustration, 2/6. Total building cost £4.15.0. For leaflet send S.A.E.

# Make Your Ability PAY

**UNLIMITED OPPORTUNITIES** exist today for "getting on" . . . but only for the fully trained man. Let I.C.S. tuition develop your talents and help you to succeed.

**STUDY IS EASY** with I.C.S. guidance. The courses are thorough. Printed manuals, fully illustrated, make study simple and progress sure.

**YOUR ROAD TO SUCCESS** can start from here—today. Complete this coupon and post it to us, for full particulars of the course which interests you. **MODERATE FEES INCLUDE ALL BOOKS.**

## Take the right course now . . .

- |  |  |
|--|--|
| <p><b>ADVERTISING</b><br/>Gen. Advertising, Retail &amp; Dept. Store Copywriting</p> <p><b>ART</b><br/>Oil &amp; Water Colour<br/>Commercial Illustrating</p> <p><b>BUILDING</b><br/>Architecture, Clerk of Wks., Buildg. Constr. &amp; Allied Trades, Quantity Surveying.</p> <p><b>CIVIL ENGINEERING</b><br/>Highway Eng., Struct. Engrg., Concrete Engineering</p> <p><b>COMMERCE</b><br/>Bookkeeping, Accountancy, Office Training, Costing, Secretaryship, Storekeeping<br/>Shorthand &amp; Typewriting</p> <p><b>DRAUGHTSMANSHIP</b><br/>Architectural, Mechanical, Maths. &amp; Machine Drawing<br/>Drawing Office Practice<br/>Structural Drawing</p> <p><b>ELECTRONICS</b><br/>Industrial Electronics<br/>Computers &amp; Maintenance</p> <p><b>FARMING</b><br/>Arable &amp; Livestock<br/>Farm Machinery Maint.<br/>Pig &amp; Poultry Keeping<br/>Market Gardening</p> <p><b>FIRE ENGINEERING</b><br/>I.F.E. Examinations<br/>Fire Service Promotion</p> <p><b>GENERAL EDUCATION</b><br/>Good Eng., Foreign Langs.<br/>G.O.E. subjects at ordinary or advanced level</p> | <p><b>HORTICULTURE</b><br/>Complete Gardening<br/>Flower &amp; Veg. Growing</p> <p><b>MANAGEMENT</b><br/>Business Management<br/>Hotel Management<br/>Office Management<br/>Industrial Management<br/>Personnel Management<br/>Work Study, Foremanship</p> <p><b>MECHANICAL &amp; MOTOR ENGINEERING</b><br/>Engineering Maths., Weldg. Diesel Engines and Locom. Inspection, Workshop Pract. Refrigeration, Motor Mech. Running and Maintenance (many other subjects)</p> <p><b>PHOTOGRAPHY</b><br/>Practical Photography<br/>F.D.A. Examination</p> <p><b>POLICE</b><br/>Police Entrance Exam.</p> <p><b>RADIO, T.V. &amp; ELECTL.</b><br/>Radio Servicing &amp; Engrg. T.V. Servicing &amp; Engrg. Radio Constrn. (with kits)</p> <p><b>SELLING</b><br/>Commercial Travellers<br/>Sales Mngmt, Ret. Selling</p> <p><b>WRITING FOR PROFIT</b><br/>Short Story Writing<br/>Free-Lance Journalism<br/>And many other subjects</p> |
|--|--|

**INTENSIVE COACHING** for all principal examinations including C.I.S., A.C.C.A., I.C.W.A., B.I.M., A.M.I.Mech.E. Brit.I.R.E., I.Q.S., City & Guilds of London Institute, R.H.S., P.M.G. Certificates in Radiotelegraphy, etc.

*Start today the I.C.S. way!*

(Dept. 172)  
Intertext House, Parkgate Rd., London, S.W.11

Send FREE book on \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

Occupation \_\_\_\_\_

7.62

**INTERNATIONAL CORRESPONDENCE SCHOOLS**

## RETURN-OF-POST SERVICE

### GRAMOPHONE EQUIPMENT

ALL LATEST MODELS ALL POST FREE

	Cash Price	Deposit	Hire Mthly	Purchase Pmnts.
--	------------	---------	------------	-----------------

<b>RECORD CHANGERS</b>				
<b>GARRARD AUTOSLIM</b>				
(GC8 PU)	£17.98	£12.6	12 of	12/9
B.S.R. UA11 (TC8 PU)	£17.8	£12.6	12 of	12/1
B.S.R. UA14 Monarch (TC8 Stereo/LE/7)	£17.8	£12.6	12 of	12/1
	£17.8	£12.6	12 of	13/5

<b>SINGLE RECORD PLAYERS</b>				
<b>GREENCOAT 45 UNIT</b>				
(Battery v.)	£19.6	£19.6	3 of	£1.68
GARRARD TA (GC8 PU)	£8.26	£12.6	12 of	12/6
B.S.R. TU12 (TC8 PU)	£4.50	£15.0	3 of	£13.4

<b>TRANSCRIPTION UNITS</b>				
GARRARD 4HF (GC8PU)	£17.98	£11.6	12 of	£1.65
PHILIPS AG106	£13.13	£2.15	12 of	£1.0

Many of the above can be supplied for stereo working. See our Gramophone Equipment List for details.

### "BRAND FIVE" RECORDING TAPE

Standard Play: 600ft. (5") 18/-; 1,200ft. (7") 25/-  
Long Play: 900ft. (5") 18/6; 1,800ft. (5") 27/-; 1,800ft. (7") 35/-  
Double Play: 1,200ft. (5") 37/8; 2,400ft. (7") 60/- (All Post Free.)

<b>LATEST TEST METERS</b>				
	Cash Price	Deposit	Hire Mthly	Purchase Pmnts.
AVO Model 8 Mark II	£21.00	£4.0	12 of	£1.15
AVO Model 7 Mark II	£21.00	£4.0	12 of	£1.10
AVO Multimeter	£9.10	£1.80	12 of	14/0
TAYLOR MODEL 127A	£10.00	£2.0	12 of	15/8
CABY A-10	£4.78	£1.76	3 of	£1.88
CABY B-29	£3.00	£2.00	3 of	£1.13.0
CABY M-1	£2.10	—	—	—

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.

### TAPE RECORDING EQUIPMENT

<b>TAPE DECKS</b>				
ALL CARRIAGE FREE	Cash Price	Deposit	Hire Mthly	Purchase Pmnts.
B.S.R. TD2	£21.96	£1.68	12 of	13/7
Latest COLLARO Studio	£12.96	£2.18	12 of	19/6

**T.A.P.E. AMPLIFIERS**  
**MARTIN RECORDER KITS**, 8311V for Collaro Studio Deck. 11 gns. 8312M for B.S.R. De k. 8 gns. Carrying cases available. H.P. Terms on Decks, Amplifiers and Cases, send for quote.  
**ARMSTRONG PABO-8**, Price £16.16.0. Hire Purchase Deposit £28.8.0. and 12 monthly payments of £1.47.

### JASON F.M. TUNER KITS

We stock complete kits for FM1, FMT2, FMT3, Mercury 2, and JTV2 at competitive prices. Send for list.

### P.W. BLUEPRINTS

Kits and components for Regency, VHF/FM Receiver, Short Wave Two, Mains Receiver, Transistor Portable, Tutor, Citizen and Mini-Amp. Full lists available.

### LOUDSPEAKERS

**GOODMANS**: New Axlette £25.5.0; New Axiom 10 £25.18.0; Axiom 112 10in. £25.14.0; Axiom 806 12in. £11.5.8.  
**WHITELEY**: F 1016 10in. £7.16.0; HF 1012 10in. £4.17.8. All Goodmans and Whiteley units supplied. H.P. available.

### STEREO COMPONENTS

Morganite ganged potentiometers as specified for the Mullard circuits. ● Log/Anti-Log, 500k, 1 meg., 2 meg. ● Log/Log, 50k, 20k, 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/-; OC110, 9/6; OC171, 10/6.

### 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. GEC 912 Plus. 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.

● **ILLUSTRATED LISTS** are available on **LOUDSPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT AMPLIFIERS**. Any will be sent free upon request.

**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 STREET, WEYBRIDGE, SURREY  
Telephone: Weybridge 4556

Please note: Postal business only from this address.

**CLOSED FOR ANNUAL HOLIDAYS**  
AUGUST 11th to 25th

Brand new, individually checked and guaranteed  
**VALVES**

AL60 6/-	EBCC90 5/-	EZ41 6/9	PL83 10/-	YR150/30	6AK5 5/-	6V6GT 5/-	78 7/-	9001 3/-
AR8 5/-	EC52 8/-	EZ80 6/-	PT15 10/-	VT4C 25/-	6AK7 6/-	6X4 5/-	80 5/6	9002 5/6
ARDD5 2/-	EC70 10/-	EZ81 6/9	PT25H 7/6	VU39 6/-	6AM5 5/-	6X5GT 5/-	81 9/-	9003 6/-
ARP3 3/-	EC90 20/-	FW4/500	PX4 19/-	W31 7/-	6AM6 4/-	6Y6G 6/-	82 8/-	9004 2/6
ARP4 3/6	EC881 5/6		PX25 9/-	X66 8/-	6AQ5 7/-	6Z4 5/6	83V 9/-	9006 2/6
ARPI2 3/-	ECC82 6/6	G120/1B 9/-	PY32 12/-	Y66 5/-	6AT6 5/-	7B7 7/6	84 8/-	Cathode
ARP21 5/6	ECC83 7/-	GL450 10/-	PY80 6/9	X63 8/-	6B7 5/6	7H7 7/3	85A1 9/-	Ray Tubes
ARP24 3/6	ECC84 7/6	GL464A 10/-	PY81 7/-	Y65 4/-	6B8G 2/6	7C6 7/-	85A3 15/-	ACR1 15/-
ARP34 4/-	ECC85 8/-	GU20/21	PY82 8/-	Y66 8/-	6C4 2/6	7E7 6/6	89 6/-	ACR11 15/-
ARTH2 7/-	ECC91 4/-		PY83 7/3	Z31 3/-	6C5 6/-	7Q7 7/-	210VPT	CV195 15/-
ATP4 2/9	ECH82 8/6	GZ32 9/-	PZ1-35 9/-	IA3 3/-	6C6G 3/-	7V7 5/-	7-pin 2/6	CV1596
ATP7 5/6	ECH42 7/6	H63 7/-	QP21 6/-	IA5GT 5/-	6C8G 5/-	7Y4 6/-	250TH £9	(09J) 55/-
AUI 5/-	ECH81 7/9	HL23 6/-	QP25 5/3	IC5GT 7/6	6D6 4/-	7Z4 4/6	350B 8/-	E4103/B4
AU4 5/-	ECL80 8/-	HL23DD 8/-	QS75/20 6/9	ID8GT 6/-	6F5 5/3	8D2 2/6	393A 15/-	
AZ3 4/-	ECL82 9/-	HVR2 12/6	QS95/10 6/9	IE7G 7/6	6F6G 4/-	9D2 3/-	705A 15/-	3FP7 25/-
AW31 3/6	EF22 7/-	KRN2A 19/-	QSI08/45	IG6GT 6/-	6F7 5/-	12A6 2/6	715B 60/-	5BP1 25/-
BS4A 5/6	EF36 3/6	KT32 8/-		IL4 3/6	6F5GT 5/9	12AH7 5/-	717A 8/6	5CP1 42/6
BT45 15/-	EF39 4/-	KT33C 4/-	R3/10 4/-	ILD5 5/-	6F8G 5/-	12AT7 5/6	801 6/-	5FP4 25/-
BT9B 20/-	EF50 2/6	KT44 6/3	R10 12/6	IR5 5/-	6F12 4/6	12AU6 9/-	803 22/6	5FP7A 45/-
BT83 22/6	EF54 3/3	KT63 5/1	R13 10 4/-	IS4 5/-	6F17 5/-	12AU7 6/-	804 55/-	7BP7 40/-
CV54 5/-	EF55 5/-	KT76 10/-	R22 25/-	IT4 4/-	6H6M 1/6	12AX7 7/-	805 30/-	12DP7 60/-
CV264 20/-	EF70 4/-	KTW62 7/6	RK24 2/6	IW4 6/-	6J5 3/6	12C8 3/-	807 AMER	VCRX258
CY31 7/6	EF73 6/-	KTW63 6/6	RL21 2/5	IT4 4/-	6J5 3/6	12E1 22/6		(with scanning coil) 45/-
D41 3/3	EF80 5/6	KTZ41 6/-	RK34 2/6	1W4 6/-	6J5 3/6	12G1 2/6		VCR138 30/-
D77 4/3	EF85 6/6	MH4 3/6	RS235 10/-	2A3 5/-	6J5G 3/6	12H6 2/-		VCR139A
DA30 12/6	EF86 7/-	MH41 5/-	SP2 4/-	2A5 6/-	6J6 4/-	12K7G 4/6		Photo Tubes
DAF70 35/-	EF89 7/9	ML4 4/-	SP1C 4/6	2A6 7/-	6J7G 5/-	12K8M 7/6		CM8 9/-
DAF91 6/-	EF91 3/6	ML6 6/-	SP41 2/6	2C34 2/6	6K6GT 6/-	12J5GT 3/6		CS16 12/6
DAF96 7/6	EF92 3/-	MS/PEN 6/-	SP61 2/-	2C42 25/-	6K7G 2/3	12K9M 7/6		Special Valves
DD41 4/-	EF95 5/-	NT2 9/-	SU2150A	2C46 30/-	6K7GT 4/9	12SA7 4/6		843 7/4
DETS 15/-	EL32 3/9	OB3 7/-	T41 7/-	2X2 4/-	6K8G 5/9	12SC7 4/-		829A 30/-
DET19 3/6	EL33 8/-	OC3 5/6	T11 3/-	3A4 5/-	6K8GT 8/3	12SG7 4/-		832 15/-
DET20 2/-	EL35 6/-	OD3 3/-	TP25 15/-	3B7 5/-	6K8M 8/6	12SH7 5/-		832A 35/-
DF22 7/-	EL41 8/-	OZ4 5/-	TT11 3/-	3BZ4 5/-	6L5G 6/-	12SJ7 5/-		843 7/4
DF39 4/-	EL42 8/-	PCC84 7/-	TZ20 16/-	3E29	6L6 9/-	12SK7 3/6		866 10/-
DF72 7/6	EL84 8/-	PCC85 8/-	U12/14 8/-	(829B) 60/-	6L6G 6/6	12SL7 8/9		872 20/-
DF91 3/3	EL85 10/-	PCF80 7/-	U17 5/-	3Q4 6/-	6L7G 4/6	12SN7 8/-		930 8/-
DF96 8/-	EL91 4/6	PCF82 8/-	U18 6/6	3S4 5/-	6L8A 4/6	12SR7 6/-		954 4/6
DK96 7/3	EM80 8/-	PCL82 8/6	U27 8/-	3V4 6/-	6N7G 5/9	14L7 7/-		955 2/6
DL92 6/-	EM84 9/-	PCL83 11/-	UCH42 7/6	5B/254M 60/-	6N7GT 6/-	15D2 6/-		956 2/6
DL94 6/-	EN31 15/-	PCL84 9/-	UBF80 8/6		6Q7G 6/-	20A2 17/6		957 5/-
DL96 8/-	EP71 6/6	PEN45 4/6	UL11 5/-	5R4G 9/-	6R7 6/-	21B6 9/-		958A 5/-
EA50 1/6	EP72 5/-	PEN46 5/-	UL12 5/-	5T4 9/-	6SC7 5/1	25L6GT 9/-		967 5/-
EABC80 7/3	ESU208 8/-	PEN65 6/6	UL41 7/-	5U4G 9/-	6SC7G 5/1	30G 5/-		1619 5/-
EAC91 4/6	EY51 8/-	PEN220A 3/6	UL42 7/-	5U4G 9/-	6S7 5/-	35L6GT 8/-		1625 6/-
EB34 1/6	EY86 8/-	PL36 10/6	UL84 7/6	5V4G 8/-	6SH7 3/-	35T 17/6		1626 4/6
EB91 3/9	EY91 3/6	PL81 9/-	UL85 7/-	5Y3GT 6/-	6S17GT 5/9	35Z4GT 7/-		1629 4/6
EBC41 7/9	EZ40 7/-	PL82 8/-	UY9 5/6	5Z4 8/6	6S17Y 6/6	37 4/-		4043C 13/6
			UY41 6/-	5Z4G 8/6	6SK7 5/3	38 4/-		6064 10/-
			UY85 6/6	6AB7 4/-	6SL7GT 6/6	58 6/-		6120 4/-
			VP23 3/-	6AC7 3/-	6SN7GT 4/6	59 6/-		7193 1/9
			VP41 5/6	6AGS 3/-	6SQ7 6/-	75 5/6		7475 3/-
			VR99 8/-	6AG7 6/-	6S57 6/-	76 5/-		8013A 25/-
			VR105/30 5/6	6AJ7 3/-	6V6G 4/6	77 6/-		8020 10/-

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.  
**TANNOY LOUSPEAKERS, 7.5Ω** imp., in wooden case. New 19/-. Carr. 5/-.  
**HIGH RESISTANCE HEAD-PHONES (CHR), 12/6.** P. & P. 2/-.  
**LOW RESISTANCE HEAD-PHONES (D.L.R.) 8/-.** P. & P. 2/-.  
**TELEPHONE HANDSET.** Standard G.P.O. type. New 12/-. P. & P. 2/-.  
**CONNECTORS FOR TCS RECEIVER,** with original plugs on both ends. New £1.17.6. P. & P. 2/6.  
**SPECIALLY BUILT POWER PACK** for TCS receiver, 230 volts A.C. mains, including 6X5GT valve, £3.10.0. Carr. 5/-.  
**R109 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.  
**R109A RECEIVER.** Covering 2-12 Mc/s. £7.18.0.  
**POWER SUPPLY UNIT.** Input 200/250 v. A.C., 50 cycles. Output: 1, HT 280/350 v. 300 mA smoothed; 2 MT 150/200 v. 40 mA (positive earthed); 3, LT 18/25 v. 4 amp. D.C. smoothed (negative earthed). 2 relay switching, H.T. and M.T., safety switch fuses on A.C. and all D.C. Two 5Z3 for H.T., one 6X5 for M.T. Selenium rectifier for L.T. Ideal for Ham transmitters. Weight 45 lb. Dimensions 14 x 8 1/2 x 18in. Price £12.10.0 including valves. P. & P. 25/-.  
**AR 88's.** Completely rebuilt with new PVC wiring. Type "D" £75; "LF" £70.

**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. 3 1/2 x 4 1/2" x 1 1/2". Very clear, large scale. Price £4.10.0. P. & P. 3/-.

**COMPLETE SET OF STRONG AERIAL 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.

**RECEIVER TYPE R206.** Frequency 0.55 Mc/s. to 30 Mc/s. in 6 bands. 100-250 v. A.C. or 12v. D.C. Loudspeaker in power supply unit. High performance superhet, eleven valves including a separate local oscillator valve, beat oscillator valve and two valves (amplifier and detector) in the A.V.-B.C. system. In very good condition, £15.10.0 incl. power pack. Carr. 15/-.

**No. 62 TRANSMITTER-RECEIVER.** 1.6 12 Mc/s in two ranges. Ideal for mobile use. Total 11 valves. Rx—A super with separate mixer and local oscillator. Tx uses QV04-7 as power amplifier VFO or switched selected crystals. C.W., phone (grid modulation) metered for operation and valve testing. Pi output to match rod aeriels or long wire "Press to send" operation from mike. Size 8 1/2 x 17 1/2 x 13 1/2in. weighs only 29 lbs. Completely self contained with internal power unit for 12 v. operation. Power consumption 4.4 amps. on send, 3.4 amps. on receive. In tested condition, complete with operation instructions. Price £17.10.0. Delivery included.

**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 headpiece and supply leads. Carr. £1.

**VARIOMETERS** for W/S No. 19. Fully tested and working, 12/6. P. & P. 2/6.  
**CARBON INSET MICROPHONE,** G.P.O. type, 2/6. P. & P. 1/6.

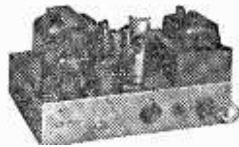
**P. G. RADIO LTD.**  
170, GOLDHAWK RD., W.12  
Shepherds Bush 4946

# STERN'S MULLARD DESIGNS

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

## COMPLETE KIT OF PARTS MULLARD "5-10" MAIN AMPLIFIER

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



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 **£6.6.0** ASSEMBLED AND TESTED **£8.0.0**



Equalisation for the latest R.L.A.A. characteristics.  
● Input for Crystal Pick-ups, and variable reactance magnetic types.  
● Input (a) Direct from 11 1/2 Imp. Tape Head. (b) From a Tape Amplifier or Pre-Amplifier.  
● Sensitive Microphone Channel. ● Wide range BASS and TREBLE Controls.

## COMPLETE MULLARD "5-10" 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 PARMKO MAIN TRANSFORMERS and choice of the latest PARMKO 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.

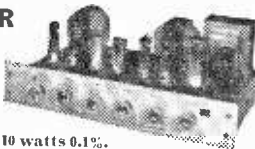


## COMPLETE MULLARD "3-3"

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 6 months at £1.0.0. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMKO OUTPUT TRANSFORMER.

## MULLARD'S "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 to 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 £11.10.0
  - (b) A complete KIT OF PARTS..... **£18.10.0**  
Deposit £3.14.0, 12 months at £11.7.0
- We also supply the assembled MAIN AMPLIFIER only (excludes control unit) for operation with our DUAL CHANNEL PREAMPLIFIER, 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 PREAMPLIFIER..... **£30.0.0**  
Deposit £8.0.0, 12 months at £24.0.0
  - (b) A complete KIT OF PARTS for both Units..... **£26.0.0**  
Deposit £5.4.0, 12 months at £118.2.

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

## STERN'S INTER-COMM BABY ALARM

A small versatile Unit employing the new MULLARD ECL86 valve and designed to provide two (or three) way conversion up to extreme distances. Operates from A.C. mains 200 to 250 Volts. PRICES... MASTER UNIT and ONE EXTENSION **£8.0.0**



Consists of a MASTER UNIT, size only 8 1/2 x 5 1/2 x 6 in. 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.

## PRICE REDUCTIONS

- (a) The KIT OF PARTS to build both the "3-10" Main Amplifier and the 2-valve PRE-AMP CONTROL UNIT H.P. Dep. £3.7.0 and 12 months at £12.9.0 **£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 at £17.8.0 **£18.18.0**
- With Partridge Output Transformer £1.6.0 extra.

## RECORD PLAYERS

- The Latest Models are in stock many at reduced prices. Send S.A.E. For Illustrated Leaflet.
- THE NEW GARRARD "AUTO-SLIM" 4-speed Autochanger with Crystal Pick-up .... **£8.10.0**
  - COLLARO "JUNIOR" 4 SPEED SINGLE RECORD PLAY- **£3.15.0** ER with separate Crystal Pick-up Carriage and Insurance 5/- Above Pick-up separately for £1.6.0.
  - THE NEW COLLARO C60 4-speed Autochanger unit with Studio "O" Pick-up..... **£7.19.6**
  - THE E.M.I. 4-speed Single Record Player with Crystal Pick-up ..... **£6.9.6**
  - B.S.R. MODEL UA14. A 4-speed mixer Autochanger with Crystal Pick-up ..... **£7.10.0**
- Available incorporating the B.S.R. STEREO Pick-up, plays 7" L.P. and 78 Records. **£8.13.10**
- GARRARD MODEL TAMK.11 4-speed Player fitted high output Crystal Pick-up... **£8.10.0**
  - GARRARD MODEL RC210. Autochanger 4-speeds. High output. Crystal Pick-up... **£9.19.6**
- Carriage and Insurance on each above 5/- extra.

## SPECIAL CASH OFFER

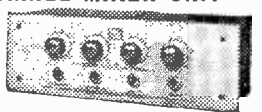
This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER ALL for ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)



- 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 18/0. 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/-  
MODEL I.L. one microphone Input matched for moving coil or Ribbon Mike. £1.17.0 extra.

## DUAL CHANNEL PREAMPLIFIER

Incorporates two Mullard 2-valve Preamplifiers 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 mV/ohms. COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED and TESTED **£15.0.0** H.P. £2.10.0 & 12 mths. at 18/4. H.P. £3.0.0 & 12 mths. at £1.2.0



# STERN RADIO LTD.

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

FOR THIS WE SUPPLY

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

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

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

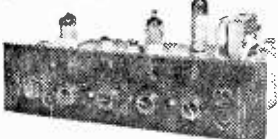


HF/TR3 MKII TAPE AMPLIFIER (Mullard Type "A" design)

A very high quality Amplifier incorporating 3-speed treble equalisation, by the latest FEROCUBE 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 £3.9.0  
12 months at £1.4.11.



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

MULLARD TYPE "C" TAPE PRE-AMPLIFIER—ERASE UNIT  
The "Hi-Fi" Unit to add full tape recording facilities to High Fidelity home installations. Incorporates FEROCUBE POT CORE PUSH PULL OSCILLATOR and 3-speed treble equalisation by FEROCUBE 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 £1.0.9

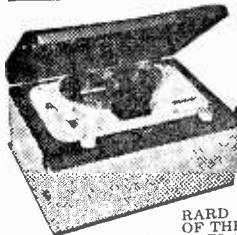
OR ASSEMBLED £17.0.0  
Deposit £3.8.0  
12 months at £1.4.11  
(Excluding power unit £11.15.0 and £14.10.0 respectively.)



### 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 **£26.0.0**
  - (b) As above but with the HF/TR3 supplied ASSEMBLED and TESTED **£29.10.0**  
Deposit £5.4.0. 12 monthly payments of £1.18.2
  - (c) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK... **£42.0.0**  
Deposit £8.3.0. 12 monthly payments of £3.1.7
  - (d) As above but with HF/TR3 supplied ASSEMBLED and TESTED **£45.10.0**  
Deposit £9.2.0. 12 monthly payments of £3.6.9
  - (e) THE ASSEMBLED and TESTED HF/TR3 AMPLIFIER with the WEARITE MODEL 4A DECK, incorporates Wearite Head Lit Transformer etc. **£60.10.0**  
Deposit £12.12.0. 12 monthly payments of £4.3.9.
- (Carriage and Insurance on each above is 10/- extra.)

- (a) The COLLARO "Studio" Deck with the Model "C" Preamplifier and POWER SUPPLY UNIT ASSEMBLED and TESTED **£29.10.0**  
Deposit £5.18.0. 12 monthly payments of £2.3.3
- (b) As above but the TYPE "C" Unit and POWER UNIT supplied as COMPLETE KIT OF PARTS **£26.10.0**  
Deposit £5.6.0. 12 monthly payments of £1.18.10
- (c) The BRENELL Mk. V Deck with the Model "C" PREAMPLIFIER and POWER UNIT. ASSEMBLED and TESTED **£46.0.0**  
Deposit £9.4.0 and 12 months at £3.7.6
- (d) As above but the Model "C" PREAMPLIFIER and POWER UNIT supplied as a COMPLETE KIT OF PARTS **£43.0.0**  
Deposit £8.12.0. 12 monthly payments of £3.3.1
- (e) THE WEARITE MODEL "4" DECK with ASSEMBLED and TESTED Model "C" PREAMPLIFIER and POWER UNIT incorporating WEARITE HEAD LIT TRANSFORMER, Etc. **£60.10.0**  
Deposit £12.2.0 and 12 months at £4.8.9  
(Carriage and Insurance on above is 10/- extra.)



### The MODEL HFG/2R PORTABLE TAPE RECORDER (Original Price £33.0.0) FOR ONLY 22 gns.

H.P. Dep. £4.14.0. 12 months £1.13.9 (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 3 1/2 in/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.

### STEREO "TWIN THREE" AMPLIFIER with specially designed PORTABLE CASE

A most compact portable design consisting of TWIN CHANNEL AMPLIFIER based on the latest design by MULLARD LTD., incorporating top grade Output Transformers, and the new audio Triode-Pentode Valves Mullard E.C.L.86 Separate Bass and Treble controls. Suitable for use with Crystal Pick Ups, and capable of genuine high quality reproduction up to 3 Watts per channel. A versatile stereo arrangement tested and guaranteed which can be assembled in the minimum of time.



PRICE for the ASSEMBLED AMPLIFIER. Two 8 x 3 in. ROLA SPEAKERS and PORTABLE CASE **£14.0.0**  
Deposit £2.16.9. 12 months at £1.0.6

ASSEMBLED AMPLIFIER supplied for... **£7.15.0**

### THE 'ADD-A-DECK'

Incorporating GARRARD TAPE DECK and MODEL HF/2R 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 £1.7.9. 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 3 1/2 in/sec. speed providing up to 1 hr. 10 mins. playing time.

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

DESIGNED TO OPERATE WITH  
BRENELL Mk. V TAPE DECK. COLLARO "STUDIO" TAPE DECK, incorporating similar 1-TRACK incorporating the latest 1-TRACK MINIFLUX TAPE HEADS. COLLARO TAPE HEADS.

- PUSH PULL OSCILLATOR CIRCUIT.
- 4-SPEED EQUALISATION.
- FEROCUBE OSCILLATOR TRANSFORMER.
- SENSITIVE METER FOR SIGNAL LEVEL.
- SEPARATE GAIN CONTROLS in each Channel.
- MULLARD VALVES INCORPORATED.

PRICE **£28.0.0**  
Including separate Power Supply Unit. Dep. £5.12.0  
12 months £2.1.1.

#### COMBINED PRICE SCHEDULE

The "STP-1" PRE-AMPLIFIER IS OFFERED WITH TAPE DECKS as follows:

- BRENELL Mk. V 4-TRACK MODEL... **£67.0.0**  
DEPOSIT £13.3.0, 12 months £4.18.3
- COLLARO "STUDIO" 4-TRACK MODEL... **£45.0.0**  
DEPOSIT £9.12.0, 12 months £3.6.9

THE MULLARD "STP-1" STEREO AMPLIFIER (described opposite) with the "STP-1" PRE-AMPLIFIER and one of the TAPE DECKS provides a COMPLETE stereophonic installation. WE OFFER "10+10" AMPLIFIER, "STP-1" PRE-AMPLIFIER and the TRUVOX... **£87.0.0**

- As above with BRENELL Mk. V DECK... **£87.0.0**  
Deposit £17.9.0. 12 months £8.7.8
- As above with COLLARO "STUDIO" DECK... **£65.0.0**  
Deposit £12.12.0. 12 months £4.16.0.

DESCRIPTIVE LEAFLET AVAILABLE, PLEASE SEND S.A.R.

Dept. P.W. 109 FLEET ST., LONDON, E.C.4  
Telephone: FLEET STREET 5812/3/4

# BENTLEY ACOUSTIC CORP. LTD.

38 CHALCOT ROAD, CHALK FARM, LONDON, N.W.1  
Telephone P14mrose 9999.

Express postal service. All orders despatched same day as received. Immediate despatch of C.O.D. orders if telephoned before 3.30 p.m.

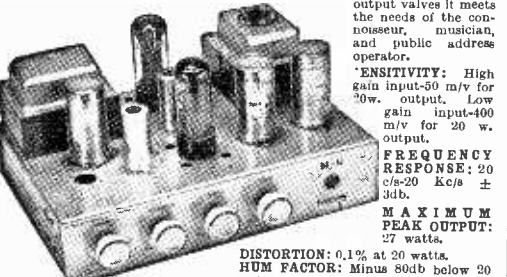
0Z4GT 5/-	20L1 27/2	EUC35 8/6	EY51 9/-	U15/20 8/6
1L4 3/8	20P1 27/2	EUC40 23/10	EY83 17/-	U19 48/6
1L5 6/8	23/10	EUC81 6/-	EY86 9/-	U22 30/-
1S1 9/-	20P4 27/2	EUC82 8/6	EZ40 7/-	U24 30/7
1S3 6/-	20P3 23/10	EUC83 7/6	EZ41 7/6	U26 10/-
1T4 3/8	25L6GT11/8	EUC84 9/-	EZ80 7/-	U28 10/-
2D21 15/-	25Z4G 9/8	EUC85 8/6	EZ81 7/-	U31 9/6
2A3 10/8	27S0 20/5	EUC88 18/-	GU50 41/8	U33 27/2
3A4 7/8	30K15 17/-	EUCF80 10/8	GZ33 20/5	U35 27/2
3S4 7/-	30P3 6/-	EUCF82 10/8	GZ34 14/-	U37 27/2
3V4 7/8	30P11 10/-	EUCF86 20/5	HN309 25/3	U43 13/8
5R4GY 17/8	30L15 11/8	EUCF84 27/2	HVR2 20/-	U76 6/-
5U4G 6/8	30P4 15/-	ECH43 9/6	HVR2A 6/-	U107 17/-
5V4G 10/-	30P22 7/8	ECH81 9/6	KT33C 10/-	U191 17/-
6Z3 20/5	39P11 10/8	ECH83 14/8	KT36 30/7	U201 17/-
6Z4 9/-	30P13 12/8	ECL80 9/-	KT86 15/-	U281 20/5
6AT6 7/-	35Z3 19/1	ECL83 10/8	KT88 43/-	U282 23/2
6BA6 7/8	35Z4GT 6/-	ECL83 19/8	KT101 34/-	U301 23/10
6BB6 6/-	35Z5GT 9/-	ECL86 17/-	MU14 8/-	U329 14/10
6BH6 8/-	35Z6GT 9/-	EP36 4/-	N37 23/10	U389 17/-
6BJ6 8/-	35Z7 17/8	EP39 4/-	N73 23/10	U403 17/-
6BK7A 15/-	30AV 67/8	EP40 10/8	N108 23/10	U404 3/8
6BR7 12/8	90C1 16/-	EP40 15/-	N308 21/2	U801 30/7
6BR8 19/1	90CG 37/8	EP41 9/-	N339 15/-	UAB80 9/6
6LW5 8/8	150B2 18/-	EP42 10/8	PC93 13/7	UAP42 9/6
6CH6 9/-	130P2 17/8	EP43A 7/-	PC84 9/-	UB41 12/-
6CW4 24/-	183BT 34/-	EP40(E) 5/-	PC85 9/6	UB41 8/6
6F1 27/2	807 7/6	EP44 5/-	PC88 18/-	UB81 11/8
6FG 7/8	7763 12/8	EP73 10/8	PC89 11/8	UB80 9/-
6FG2 7/8	AC8PEN7/8	EP80 6/-	PC90 8/-	UB89 9/8
6F24 11/8	AZ31 10/8	EP85 6/-	PC92 10/8	UC84 15/-
6K25 20/5	B36 15/-	EP89 10/8	PC94 17/-	UC85 9/-
6L1 23/10	CL33 19/8	EP89 9/-	PC96 15/-	UCP80 17/8
6LG 8/-	CY31 11/-	EP92 4/6	PC83 10/8	UCH1 9/6
6L18 13/-	DAF96 8/6	EP97 13/7	PCL84 9/6	UCL82 11/8
6P28 27/2	AZ31 10/8	EP98 13/7	PCL85 12/6	UCP83 19/8
6Q7G 6/8	DF96 8/6	EP183 13/1	PC88 17/1	UP41 9/6
6SL7GT 6/8	DF97 9/-	EP184 12/6	PEN46 7/6	UP42 12/6
6SN7GT 5/8	DK92 9/-	EP804 23/10	P333 19/8	UP80 10/6
6UG 7/8	DK96 8/8	EL33 12/8	P336 15/-	UP85 9/-
6V6G 7/-	DL96 17/8	EL34 15/-	P337 27/2	UP86 18/5
6V8GT 8/8	DL98 15/-	EL37 23/8	PL1 10/8	UP89 8/6
6X4 5/-	DL96 8/6	EL38 27/2	PL2 7/6	UL41 10/8
6X3GT 6/-	DM70 7/6	EL41 9/-	PL3 9/-	UL44 27/2
6Y30L2 10/-	EB0F 30/8	EL43 10/8	PL84 13/-	UL46 14/8
10C1 13/-	EB3F 30/8	EL81 17/-	PL80 19/1	UL84 8/6
10C2 27/2	E180F 34/8	EL82 20/5	PM84 17/8	UM4 17/8
10F1 27/2	EABC80 9/-	EL84 7/6	PK4 10/8	UM34 17/8
10P13 15/-	EAF42 9/-	EL85 14/4	PY31 17/-	UM80 15/8
10P14 19/8	EB91 4/-	EL86 17/8	PY32 13/8	URIC 19/1
12A3 15/8	EB33 5/-	EL95 10/8	PY80 7/6	U6 20/5
12AD6 17/8	EB41 5/6	EL90 23/-	PY81 8/6	U6 27/2
12AE6 14/4	EB81 8/-	EL80 19/8	PY82 7/-	U9 7/8
12AH8 12/6	EBP80 9/-	EL821 27/2	PY88 3/8	UY1N 19/1
12AT6 7/6	EBP83 14/4	EL822 19/8	PY83 17/1	UY21 17/-
12BA6 8/-	EBP89 9/6	EM4 17/8	PZ20 20/5	UY41 7/8
12BB6 9/-	E13123/10	EM34 9/6	SP41 3/8	UY86 7/-
12BH7E/10	EC70 12/6	EM71 23/10	SP81 1/6	VL13 100/275v. 9/-
12K5 18/5	EC81 27/6	EM80 9/-	SU25 27/2	VL150 7/6
19A5 10/8	EC92 13/7	EM81 9/-	T41 9/-	X61 12/6
19H1 10/-	EUC32 5/6	EM84 10/8	TY86F 13/7	X66 12/8
20D1 15/8	EUC33 3/6	EM85 17/8	UL14 8/8	X78 23/10
20F2 27/2	E180F 34/8	EN31 55/-	U16 10/-	X79 23/10

Our full list, with terms of business, includes all types of components, transistors, microphones, condensers, resistors, etc. We do not sell second-hand goods nor manufacturer's rejects. Please note that all goods advertised are brand new and actually in stock.

**ELECTROLYTIC CONDENSERS.** Can types: 32 x 32/450v. 5/8, 50 x 50/350v. 7/-, 64 x 120/350v. 8/3, 80 x 250/275v. 9/6, 100 x 400/275v. 12/6, 100/275v. 4/-, 100 x 200/275v. 9/6. Tubular types: 8/450v. 1/8, 16/450v. 3/8, 32/450v. 3/8, 8 x 8/450v. 3/-, 16 x 16/450v. 4/-, 32 x 32/350v. 4/-, 8 x 16/450v. 3/8. P.M. SPEAKERS. 3 ohm types. 2 1/2" 17/-, 5" 15/6, 6 1/2" 17/-, 7 x 4" 15/-, 10" 27/-, 12" 29/6, 2 1/2" 80 ohms 17/8, 12" Auditorium with latest foam plastic suspension, Aluminium resonant dome 15 ohms 23.8.0. 12" Quality type. Hand assembled, very sensitive. Handles 15 watts, 15 ohms, 25.5.0. Post 2/- each.

## The Superb HI-FI TWENTY AMPLIFIER

Designed to the highest standards this new R.T.T. Amplifier provides true high fidelity. Employing only best quality components including the latest EL34 output valves it meets the needs of the connoisseur, musician, and public address operator.



**SENSITIVITY:** High gain input—50 mV for 20w. output. Low gain input—400 mV for 20 w. output.  
**FREQUENCY RESPONSE:** 20 c/s—20 Kc/s ± 3db.  
**MAXIMUM PEAK OUTPUT:** 27 watts.  
**DISTORTION:** 0.1% at 20 watts.  
**HUM FACTOR:** Minus 80db below 20 watts.  
Independent volume controls for both inputs. Wide range bass and treble controls. Power take-off for tuner or pre-amp, 16 gms., post free. Delivery from stock.  
Post/packing charges 6d. per item except where stated. Orders over £3 post free. C.O.D. 2/6 extra. Shop hours 8.30—5.30. Sat. 1 p.m. Any parcel insured against damage in transit for only 6d. extra.

ILFord 6001/2/3

## RECORDER MONTH

### TAPE RECORDER AMPLIFIER

# £9.15.6

By famous manufacturer. Superb 4-valve amplifier. Two controls and superimpose switch. Sockets for Mike and Gram. Size 11 x 4 x 6in. Ins., Carr. 4/6. Drawings FREE with Order.



**De-Luxe Recorder Cabinets**

**59/6**

Beautifully styled rexine covered cabinet in Red or Beige. Size 14 1/2 x 13 x 9 1/2 in. Storage comp. in lid for tapes and mike. Easily adapted to Record Player Cabinet. Ins., Carr. 5/-.



**Look 29/9**

Beautifully made Tape Recorder Cabinet. Size: 13 1/2 x 10 1/2 x 8 in. Covered in two-tone coloured rexine cloth. Stylish design. Easily adapted to Record Player Cabinet. P. & P. 5/-.

Send for our FREE LIST

**DUKE & CO. (London) LTD.** 621/3 ROMFORD RD. MANOR PARK, E12

## SOUTHERN RADIO'S WIRELESS BARGAINS

PORTABLE TEST METERS. (As featured in March 1961, issue, pages 1005 to 1010) 0-5000 ohms; 0-60mA; 0-15 v., 0-3 v., 12/6 each. TRANSMITTER RECEIVERS. "Type 38" with 5 valves. New but untested. No guarantee, 25/- each. Post paid. ATTACHMENTS FOR "38" TRANSMITTER-RECEIVER; Headphones 15/6; Throat Microphones, 4/6; Junction Boxes, 2/6; Aerials, No. 1, 2/9, No. 2 5/3; Webbing, 4/-; Haversacks, 5/6; Valves—AR12 4/6, ATP4, 3/6. Set of five valves, 19/- Postage on each item 1/6 extra (except valves). Type "18" RECEIVING PORTION only with 4 valves. S.W. 6-9Mc/s, 35/- each. ATTACHMENTS FOR "18" TRANSRECEIVER. Headphones, 15/6; Microphone 4s, 12/6; Aerials, 5/-; Morse Key, 6/6; Valves—AR12, 4/6, ATP4, 3/6, AR8, 7/6; Set of six valves, 25/- Official booklet "19" T.R. Circuits, etc., 6/6 post paid. Postage extra (except valves) 1/6 each item. QUARTZ CRYSTALS. Types F.T. 241/243 2-pin 1/2 in. space. FREQUENCIES: (F.T.243) 5706 kc/s to 8625 kc/s. FUNDAMENTAL (F.T.241) 20 Mc/s to 38.9 Mc/s. (54th and 72nd Harmonics) 4/6 each. Lists available if frequencies stocked. CRYSTAL BASES. F.T.241, F.T.243, 1/6 each. CRYSTAL CASES. F.T.241/243. 10/6 per dozen. DYNAMOTORS for attaching to B.C. SERIES COMMAND RECEIVERS. 28v. D.C. to 250v. D.C. 17/6. VARIOMETERS for "19" Sets. New. 21/- each. RECORDING BLANKS. New 13in., 6/- each or 15 complete in Tin 4/-.

**BOMBIGHT COMPUTERS.** Ex-R.A.F. Wealth of gears, motors, blowers, etc. Ideal for experimenters, £3.12.6, carr. paid.  
**RESISTANCES.** 100 Ass'd. Useful values, new, 12/6 per 100.  
**CONDENSERS.** 100 Ass. Mica Elec. Tub., etc. New 15/- per 100.  
**LUBRICA HOLE CUTTERS.** Adjustable, 1/2 in. to 3 1/2 in., 7/9.  
**VISUAL INDICATORS (10Q4).** Type 3 with 2 meter movements, 2 neons. New 12/-.  
**MAGNETS.** Strong Bar, 2in. x 1/2 in., 1/6 each.

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

## SOUTHERN RADIO SUPPLY LTD.

11 LITTLE NEWPORT ST., LONDON W.C.2. GER. 6653

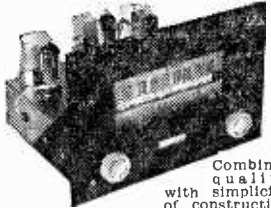
# GLYNE RADIO LTD



18 TOTTENHAM COURT ROAD, W.1 MUSEUM 5929/0095  
 162 HOLLOWAY ROAD, LONDON N.7 NORth 6295/617  
 9 CAMBERWELL CHURCH STREET, S.E.5 RODney 2875  
 All post orders etc. to 162 HOLLOWAY ROAD, LONDON N.7

## THE COMPONENT SPECIALISTS

### A QUALITY F.M. TUNER UNIT TO BUILD YOURSELF!



Combines quality with simplicity of construction (only specially selected top-grade components are used). The refinements provided, and the performance achieved are equal to many commercial models at twice the price. ★ Guaranteed non-drift. ★ Permeability tuning. ★ Freq. coverage 88-100 Mc/s. ★ Self powered using a good quality mains transformer and valve rectifier. ★ Fully drilled chassis. ★ F.M. Tuning Head by famous maker. ★ OA81 Balanced Diode output. ★ Magic-eye tuning indicator. ★ Two I.F. Stages and Discriminator. ★ Attractive maroon and gold glass dial. ★ Valves used: ECC85, two EF80s, EZ80 (rectifier) and magic-eye. ★ Attractive metal front panel as illus. finished in a choice of black crackle, glossy hammer green or grey enamel. ★ Everything supplied down to the last nut and bolt. All parts sold separately. Special inclusive price for all components, full assembly instructions, circuit diagram, etc. £6.12.6 Plus 5/- P. & P. Full assembly instructions, etc. available separately if required at 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 intelligent control. ★ Extremely low Battery consumption (less than 1 amp). ★ Easy to fit any make car (Positive earth only). ★ 12 volt operation. ★ Compact size measures only 7" x 4" 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.)

### NEW! NEW! The "CRUSADER"

Our new four transistor plus diode portable with big set quality?



- ★ Full Medium Wave coverage.
- ★ Completely self-contained.
- ★ Five inch P.M. Speaker.
- ★ Genuine high grade Mullard or Ediswan Transistors.
- ★ New components throughout.
- ★ Attractive two-tone blue/grey Vyndie-covered cabinet size 8 x 5 1/2 x 3 1/2 in. with adjustable carrying handle.
- ★ Eyeleted chassis simplifies construction.
- ★ Longer life with larger size PP7 battery.

★ SPECIAL FEATURES! ★ SUPPLIED WITH JACK SOCKET FOR DIRECT CONNECTION TO CRYSTAL MICROPHONE FOR USE AS BABY ALARM WITHOUT ANY MODIFICATION! ALSO FOR DIRECT CONNECTION TO CRYSTAL PICK-UP FOR USE AS A GRAMOPHONE AMPLIFIER! SUPPLIED COMPLETE WITH RECESSED SOCKET FOR DIRECT CONNECTION TO CAR AERIAL!

All required components including full instructions, solder, battery, etc. at special inclusive price of ONLY 95/- P. & P. All parts available separately. Itemised parts list and full assembly instructions 1/6 post free.

### THE "BABYCALL"

At last! A Baby Alarm without untidy connecting wires. Can be used anywhere and transferred from room to room at will.

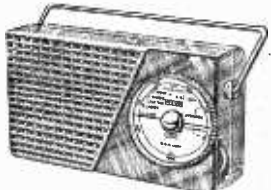


Consisting of two completely separate units—No extra wires or wiring between units—Just plug the "receiver unit" into any mains socket in the house (or next door) and you will immediately receive "loud and clear" sounds that the remote microphone unit is picking up (from wherever it is plugged into). Operates by using the "house mains wiring" as the connecting link. Completely safe. Each unit is contained in an attractive modern "Slim line" type moulded cabinet. Handsome appearance, with Vynair front panel. TCC Printed circuit board, TCC Capacitors. No "live" chassis. High flux loudspeaker. Easy to assemble. Dimensions 10" x 4" x 4" (deep) Each Unit. Complete Kit of Parts, including instruction booklet at special inclusive price of £5.19.6, plus 3/6 postage and p.a.-kink. Itemised parts list and full assembly details 1/6, post free.

N.B. This is a non-repeatable offer. Limited quantity only. Purchased complete from manufacturer. Worth Double !!

### NEW! NEW! The "COURTESAN"

Our New 3 transistor plus 2 diode pocket receiver with full Medium and Long Wave Coverage.



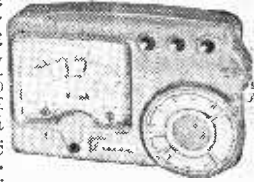
- ★ No external aerial and earth required.
- ★ Latest 2 1/2"-75 ohm speaker.
- ★ First grade Mullard transistors.
- ★ Condenser tuning.
- ★ Volume control with on/off switch.
- ★ Easy assembly on pre-tagged circuit board.
- ★ Attractive red polystyrene cabinet measures 5 1/2 x 3 1/2 x 1 1/2". chrome handle, attractive gold and black dial.
- ★ Luxembourg, Hilversum, etc., guaranteed in reception areas.

ONLY 63/- Plus 2/6 P. & P.

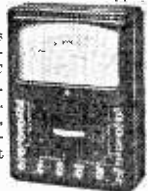
All parts available separately, itemised parts list and full assembly instructions 1/6, post free.

### INEXPENSIVE TEST GEAR Two Ideal Pocket Instruments for Amateur or Student

MODEL T11 Size only 3 1/2" x 2 1/2" x 1 1/2" Meter Size 1 1/2" x 1 1/2" Sensitivity 285 microamps —1000 ohms per volt AC/DC DC Current 1.25, 250 ma. DC and AC volts 10, 50, 250, 1,000 v. Resistance 50 ohm—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 3 1/2" x 1 1/2" 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.



### The "CLYMAX"

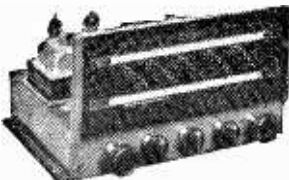


At last a 6-transistor pocket size superhet for Medium and Long Wave at a price you can afford. All required components

ONLY £6.16.6

Nothing more to buy! Plus 3/6 P. & P.  
 ★ Completely self contained. No external aerial or earth required. ★ Full medium wave coverage. plus switched Light programme on Long Wave. ★ Push-pull output—250 milliwatts. ★ Matched set of latest type Mullard transistors. ★ Genuine 3in. P.M. Speaker. ★ High-Q Coils. ★ Ferrite rod aerial with high selectivity. ★ Size: 5 1/2 x 3 1/2 x 1 1/2 in. Two-tone cabinet. ★ Precision etched printed circuit with components references clearly marked. Alignment service available. All parts available separately. Full assembly instructions and individually priced parts list. 2/- post free.

**ARMSTRONG AF208 AM/FM RADIOGRAM CHASSIS**



★ Full VHF Band (67-108 Mc/s and Medium Band, 187-570M) ★ 7 Valves ★ 5 Watts Output ★ 15db Negative Feedback ★ Separate wide range Bass and Treble Controls ★ 2 Compensated Pick-up Inputs ★ Frequency Response 30-22,000 c.p.s. ±2db ★ Tape Record and Playback Facilities ★ Continental Reception of Good Programme Value ★ For 3, 7, and 15 ohm speakers. Send S.A.E. for leaflet.

PRICE £22.18.0 Carr. Free

**LATEST "EMI" 4 SPEED SINGLE RECORD PLAYER**

Acos Hi-Fi Pick-up for L.P. and/or 78, 7, 10 and 12in. records. Silent motor, heavy turntable, auto stop. Complete on Base-plate.

Special offer £6.5.0. Post free.

**SINGLE-PLAYER BARGAIN**

Ready-built, complete with BSR TU9 4-speed gram pick-up unit. Handsome portable case. 3-watt amplifier with 2 valves and speaker. List price £12.12.0. OUR PRICE £8.19.6. Fully guaranteed in manufacturer's sealed cartons.

**New Boxed VALVES 90-day Guarantee**

1L5	7/8	6K8G	7/8	EA50	1/8	EZ20	7/8
1B5	7/8	6L6G	10/8	EBAC80	8/8	E148	1/8
1T4	6/-	6N7M	6/8	EB91	6/-	HA8C80	
6Z2	3/8	6Q7G	8/8	EBC33	5/8		12/8
384	7/8	6SA7	8/-	EBCA41	8/8	HYR2A	8/8
3V4	7/8	6E8J7M	6/8	ERF80	10/-	MU14	9/-
5U4	7/8	68N7	6/8	ECC84	9/8	PCC84	9/8
5Y3	7/8	6V6G	6/8	ECCF80	9/8	PCF80	9/8
5Z4	9/8	6X4	7/8	BCH42	10/8	PCL82	11/8
8A4M	5/-	6X5	6/8	ECL80	10/8	PLN25	6/8
6B8	5/-	12A6	7/8	ECL82	10/8	PL81	12/8
6BE6	7/8	12A7	8/-	EF39	5/8	PL82	10/8
6BH6	9/8	12A7	8/-	EF41	9/8	PY80	7/8
6BW6	9/8	12A7	8/-	EF50	5/8	PY81	9/8
6DS	6/-	12BE6	8/8	EF80	8/-	PY82	7/8
6F5	7/8	12K7	8/8	EF86	12/8	SP81	3/8
6H6	3/8	12Q7	6/8	EF92	5/8	URC41	3/8
6J5	5/8	35L6	9/8	EL32	5/8	URC42	9/8
6J6	5/8	35Z4	7/8	EL41	9/8	UF41	9/8
6J7G	6/8	8Q7	9/8	EL44	8/8	UL41	9/8
6K6GT	6/8	804	5/8	EY31	9/8	UY41	8/-
6K7G	5/-	9A4	1/8	EZ10	7/8	U22	8/-

**SETS OF VALVES**

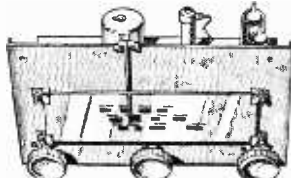
DK96, DF96, DAF96, DL96, 8/6 each or 27/8 set	
1R5, 1T4, 1B5, 384 or 3V4	19/8
6B8, 6K7, 6Q7, 6V6, 5Z4 or 6X5	27/8
EOCH42, EF41, EBC41, EL41, EZ40	37/8
ECH81, EF89, EBC81, EL84, EZ20	39/8
12K8, 12K7, 12Q7, 35L6, 35Z4	35/-

NEW ELECTROLYTICS		FAMOUS MAKES	
TUBULAR	TUDULAR	CAN TYPES	
1/350V	2/- 50/350V	5/8	16/450V 5/-
2/350V	2/3 100/25V	3/-	29/350V 4/-
4/450V	2/3 200/25V	3/-	100/270V 5/8
8/450V	2/3 500/12V	3/-	2,000/6V 4/-
16/450V	3/- 500/12V	3/-	5,000/6V 5/-
32/450V	3/8 8+8/450V	3/8	32+8+350V 5/-
63/70	6/8 8Q7, 6V6, 5Z4 or 6X5	6/8	32+32/450V 27/8
25/25V	1/8 8+16/450V	3/8	32+32+32/350V 5/-
50/25V	2/- 16+16/450V	4/8	50+50/350V 7/-
60/50V	2/- 32+32/350V	4/8	84+120/350V 11/8
			100+200/275V 12/8

**COMPLETE RADIO £4.19.6 post free**



4 Mullard valves, 5in. speaker, frame aerial. 4 pre-set stations, 1 long, 3 med. wave. Superhet Circuit, BRAND NEW. Size 9 x 6 x 5 1/2in. high. Tested by us ready for use. 200/250 v. A.C.-D.C. Mains.



DE LUXE MODEL as above but with illuminated dial. Fully tunable over Medium and Long Wave, 5 inch speaker. Bargain £5.19.6, post free. Tested by us before despatch.

**MAINS TRANSFORMERS 200/250 v. A.C. Postage 2/- each transformer.**

STANDARD, 250-0-250, 80 mA, 6.3 v, 3.5 a, tapped 4 v, 4 a. Rectifier 6.3 v, 1 a, 3 v, 2 a, or 4 v, 2 a, 22/6, ditto, 350-0-350	28/8
MINIATURE 200 v, 20 mA, 6.3 v, 2 a, 1/8	10/8
MIDGET, 220 v, 45 mA, 6.3 v, 2 a, 1/8	15/8
SMALL, 220-0-220, 50 mA, 6.3 v, 2 a, 1/8	17/8
STD., 250-0-250, 65 mA, 6.3 v, 3.5 a, 1/8	7/8
HEATER TRANS, 6.3 v, 1 1/2 amp, 10/8	10/8
Ditto, tapped sec. 2, 4, 6.3 v, 1 1/2 amp, 8/8	10/8
Ditto, sec. 6.3 v, 3 amp, 10/8	10/8
GENERAL PURPOSE LOW VOLTAGE, 2 amp, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24, 30 v, 1/8	22/8
AUTO TRANSFORMERS, 150 v, 1/8	22/8
6, 120, 200, 230, 250 v, 500 w, 22/8	22/8
MULLARD "4510" Mains transformer, 30/-	30/-

O.P. TRANSFORMERS, Heavy Duty 50 mA, 4/8. Multitap, push-pull, 7/8, Ditto, 10 w, 15/8. Miniature, 384 etc, 5/8. L.F. CHOKES 15/10H, 60/65 mA, 5/8; 10 H, 85 mA, 10/8; 10 H, 150 mA, 14/-.

**TELEVISION REPLACEMENT Line Output Transformers from 45/- each, New Stock**

and other timebase components. Most makes available. S.A.E. with all enquiries.

FULL WAVE BRIDGE SELENIUM RECTIFIER: 2, 5 or 12 v, 1 1/2 amp, 8/9; 2 a, 11/3; 4 a, 17/8.

CHARGER TRANSFORMERS. Tapped input 200/250 v, for charging at 2, 6 or 12 v, 1 1/2 amps, 15/8. 2 amps, 17/8. 4 amp, 22/8. Circuit included.

4 AMP CAR BATTERY CHARGER with amp meter Leads, Fuse Case, etc., for 6 v, or 12 v, 69/8.

**BOOKS list S.A.E.**

40 Circuits for Germanium Diodes 3/- +V.V. Radio Valve Data, 6/- High Fidelity Speaker Enclosure, 5/- Valve and TV Tube Equivalents, 9/6 TV Fault Finding, 5/- Quality Amplifiers, 4/6 Radio Valve Guide. Books 1, 2, 3 or 4, 5/- each. Transistor Superhet Receivers, 7/6. Practical Radio Inside Out, 3/6. Master Colour Code Chart, 1/6. Transistor Controlled Models, 7/6.

**C.R.T. BOOSTER TRANSFORMERS**

For Cathode Ray Tubes having heater cathode short circuit and for C.R. Tubes with falling emission. Full instructions supplied. Type A, Optional 25% and 50% Boost. 2V or 4V or 6.3V or 10.8V or 13.3V. Mains input. 12/6

LOUDSPEAKER P.M. 3 OHM. 2 1/2, 3, 4 in, 19/6 5 in, 17/8; 5 in, 25/-; 7 in, 4 in, 17/8, 18/-; 6 in, 17/8; 10 x 8 in, 27/6; 10 in, 30/6; 4 in, 2 in, 25/-; 12 in, R.A. 30/-; 1 1/2 x 5 in, 45/-.

STANTONIAN HP1012, 10 in, 3-15 ohms, 10 w., 95/-

**BAKER SELHURST LOUDSPEAKERS**

Details S.A.E.

12 in. Baker 15w. Stalwart 3 or 15 ohms, 43-13,000 c.p.s. ... 90/-

12 in. Baker Stalwart, Foam Suspension, 15 ohms, 40-13,500 c.p.s. ... 86

12 in. Stereo, Foam Suspension, 12w., 35-16,000 c.p.s. ... 82.17.8

12 in. Baker Ultra Twelve, 20 c.p.s. to 25 kc/s, 127.10

15 in. Auditorium, 35 w., Bass, 20 c.p.s. to 12 kc/s, 125



TWIN GANG TUNING CONDENSERS. 355 pF, miniature lin. x 1 1/2 in, 10/-, 500P/F Standard with trimmers, 9/-; midget, 7/6; with trimmers, 9/-; SMALL 3 gang 600 pF, 17/-; SINGLE 25 pF, 50 pF, 75 pF, 100 pF, 160 pF, 5/6. Solid dielectric, 100, 300, 600 pF, 3/8.

CONDENSERS. New stock, 0.001 mfd, 7/6; T.C.C., 5/8; Ditto, 20 kv, 9/6; 0.1 mfd., 7 kv, 9/6; Tubular 500 v, 0.001 to 0.03 mfd., 9d., 0.1, 1 v/-; 0.25, 1/6 0.5/500 v., 1/8, 0.1/350 v., 9d. 0.1/2,000 v., 0.1/1,000 v., 1/8; 0.1 mid., 2,000 volts, 3/8.

CERAMIC CONDS. 500 v, 0.3 pF to 0.01 mfd., 9d. SILVER MICA CONDENSERS. 10% 3 pF to 500 pF, 1/-; 500 pF to 3,000 pF, 1/3. Close tolerance (± 1 pF) 1.5 pF to 47 pF, 1/6. Ditto 1% 50 pF to 815 pF, 1/8; 1,000 pF to 5,000 pF, 2/-.

**465 kc/s SIGNAL GENERATOR**

Total cost 15/- Uses B.F.O. Unit, ZA 30038 ready made. POCKET SIZE 2 1/2 x 4 1/2 in. Slight modifications required. Full instructions supplied. Battery 8/6 extra 63V 1 1/2V. Details S.A.E.

Wavechange Switches. 2 p. 2-way long spindle, 3/8; 3 p. 4-way 2 water, long spindle, 6/8; 2 p. 6-way, 4 p. 2-way, 4 p. 3-way, long spindle, 3/6; 3 p. 4-way, 1 p. 12-way, long spindle, 3/6.

Wavechange "MAKITS" Wafers available: 1 p. 12 wafer, 2 p. 6 wafer, 3 p. 4 wafer, 4 p. 3 wafer, 6 p. 2 wafer, 1 wafer, 8/8; 2 wafer, 12/6; 3 wafer, 16/-; additional wafers up to 14, 3/8 each extra.

Toggle Switches, s.p., 2/-; d.p., 3/6; d.p.t.d., 4/-. Ex. Govt. s.p.d., 1/-.

**CRYSTAL MIKE INSERT**

8/6 Precision engineered. Size only 1 1/2 in. dia. x 1 in.

**ACOS 39-1 DE LUXE STICK MIKE 35/-**

Valveholders, Pax. int. oct., 4d. EA50-6d. B12A, CRT 1/3. Engl. and Amer. 4, 0, 6 and 7 pin, 1/-, MOULDED Mazda and int. oct., 6d.; B7C, B8A, B9C, B9A, 9d. B7G with can, 1/6; B9A with can, 1/9. Ceramic EF50, B7C, B9A, int. oct., 1/-; B7G, B9A cans. 1/- each.

**THE ORIGINAL**

**RADIO COMPONENT**

Our written guarantee with every purchase.

Bus 133 or 68 pass door S.R. Stanton Selhurst



Volume Controls 80 ohm COAX CABLE

Long spindles, Midget 2 Mex. 40 yds. 17/8 6d.yd.
5 K ohms to D.P.S. 60 yds. 25/-
3/- 4/6 Fringe Quality 1/- yd.
Near or Log Tracks. Air spaced.

TELESCOPIC CHROME AERIALS. 13in. extending to 43in. 8/6 ea. Coax Adaptor Plug, 1/8 extra.
TRIPLEXERS Bands I, II, III LEAD SOCKET... 12/6
COAX PLUG... 1/-
BALANCED TWIN FEEDER yd. 6d. 80 or 300 ohms. 4/6
DITTO SCREENED per yd. 1/6. 80 ohms only.
WIRE-WOUND POTS, 3 WATT. Pre-set Min. TV Types. All values 10 ohms to 25 K 3/- ea.
30 K, 50 K, 4/-, (Carbon 30 K, to 2 meg., 2/-)
WIRE-WOUND 4 WATT Pots. Long spindle. Values, 50 ohms to 50 K, 6/6; 100 K, 7/6.
PHILIPS TRIMMERS, 0-10 pF, 3-30 pF, 1/-
TRIMMERS, Ceramic, 30, 50, 70 pF, 9d.; 100 pF, 150 pF, 1/8; 250 pF, 1/8; 500 pF, 7d.; 750 pF, 1/8.
TRIMMER, 1000 pF, with knob, 2/-
RESISTORS. Preferred values, 10 ohms to 10 meg., 1 w., 4d.; 1 w., 4d.; 1 w., 6d.; 1 1/2 w., 8d.; 2 w., 1/-
HIGH STABILITY. 1/2 w., 1/-, 2/-. Preferred values, 10 Oh to 10 meg. Ditto 5%, 100 Oh to 5 meg., 9d.
5 watt WIRE-WOUND RESISTORS 1/3
10 watt 25 ohms-10,000 ohms 1/8
12.5k to 50k 10 w 3/-

AMERICAN "BRAND FIVE" PLASTIC RECORDING TAPE

Table with columns for Double Play, Long Play, Standard, and Instant Bulk Tape. Includes details like 7in. reel, 2,400ft., 80/- Spare Elastic, etc.

CRYSTAL SET 200ALEX. 1/-
CRYSTAL DIODE 2/6, 3EX34, 4/-, OA31, 3/-
HIGH RESISTANCE PHONO, 4,000 ohms, 15/- pr.
SWITCH CLEANER, Fluid squirt sprout, 4/6 tin.

HIGH GAIN TV PRE-AMPLIFIERS BAND I B.B.C.

Tunable channels 1 to 5. Gain 18db. ECC84 valve. Kit price 29/6 or 49/6 with power pack. Details 6d. (ECC84 valves if preferred.)
BAND III I.T.A.—Same prices. Tunable channels 8 to 13. Gain 17db.

Paxolin Panels, 10 x 8 in., 2/-
Miniature Contact Cooled Rectifiers, 250V 50mA, 7/6; 250V 60mA, 8/6; 250V 85mA, 9/8; 200mA, 21/-; 300mA, 27/8.
TV etc., Silicon Sub-Min. Rectifier, 125V, 300mA, 6/8; 250V, 300mA, 14/6.
Selenium Rect. 300V 85mA, 5/-.
Coils Weatite "P" type, 3/- each.
Osmer Midget "Q" type, adj. dust core, from 4/- each. All ranges.
Teletron D.W.R. L. and Med. T.R.F. with reactions, 4/- Med wave D.R. 3/6.
Ferrite Aerins, M., 8/8; M, and L, 12/6.
Osmer Ferrite Rod Aerials, L. and M. for transistor circuits, 10/- each.
Ferrite Rods, 8 x 1in., 3/-; 8 x 5/16in., 3/-; D.R.F. Chokes, 2/8. Osmer PQ1, 6/8.
T.R.F. Coils, 4/8, 7/- pair; HAX, 3/-.
Repaired H.R. 4/-, DEX1, 2/6.
Radio Screwdriver, 5in., 6d.
Neon Mains Tester Screwdriver, 5/-
Solder Radiograde, 4d. yd., 1lb. 5/-
Black Crackie Paint. Air drying, 3/- tin.

Aluminium Chassis, 18 s.w.g. Plain undrilled, 4 sides, riveted corners, lattice fixing holes, 2 1/2 in. sides, 7 x 4 in. 4/6; 9 x 7 in., 5/6; 1 1/2 x 7 in., 6/8; 13 x 9 in., 9/6; 14 x 1 1/2 in., 10/6; 15 x 14 in., 12/6; 18 x 16 x 3 in., 16/6.
Aluminium Panels, 18 s.w.g., 12 x 12 in. 4/6; 14 x 9 in., 4/-; 12 x 8 in., 3/-; 10 x 7 in., 2/8; 8 x 6 in., 2/-.

6 TRANSISTOR RADIO MED. & LONG WAVE KIT

First class components to make a 6 transistor 2 wave band superhet chassis. Ideal for portable or table radio. All parts including BVA transistors ferrite aerial, printed circuit, 8 1/2 in. x 2 1/2 in., but EXCLUDING speaker and cabinet. P & P, 2/6. Simple instructions 1/6 (Free with kit).
Speakers, 35 ohm, 7 x 4 1/2 in. 25/- extra or 3 1/2 in. round 19/6 extra. £4.5.0

TV Plug-in "V" Aerial 16/6

JACKS. English open circuit, 2/6. Closed circuit, 4/8. Grundig type, 3 pin, 1/3.
JACK PLUGS. English, 3/-; Screened, 4/-. Grundig, 3 pin, 3/6.
Wirewound Ext Speaker Control, 10 Oh 3/-.
ALADDIN FORMERS and cores, 1in., 8d.; 1 1/2 in., 10d. 0.3in. FORMERS 9937 or 8 and cans TV1 or 2, 1in. sq. x 2 1/2 in. or 1in. sq. x 1 1/2 in., 2/- with cores.
SLOW MOTION DRIVES. 4 1/2, 2/3.
SOLON IRON, 23W, 200V or 230V, 24/-.

JASON FM TUNER COIL SET. 29/-

H.F. coil, aerial coil, oscillator coil, two I.F. transformers, 10.7 Mc/s, detector transformer and heater choke. Circuit and component book using four 6AM6, 2/6. Complete Jason FMT.1 Kit. Jason chassis with calibrated dial, components and 4 valves, £6.5.0.

MAINS DROPPER, 3 x 1 1/2 in. With adjustable sliders, 0.3A, 1,000 ohms, 4/8; 0.2A, 1,000 ohms, 4/8.

LINE COIL, 0.3A 60 ohms per foot, 0.2A 100 ohms per foot, 2-way, 1/- per foot; 1/- per foot.
MIKE TRANS. 50-1, 3/9; 50-1, potted, 10/6.
P.V.C. Conn. Wire, A colours, single or stranded, 2d. yd. sleeving, 1.2mm, 2d.; 4mm, 3d.; 6mm, 6d. yd.
SPEAKER FRET. Gold cloth, 17 x 2 1/2 in., 5/-; 25 x 3 1/2 in., 10/-; Tytan, various colours, 5 1/2 in. wide, from 10/- to 26 in. wide, from 6/- ft. Samples, S.A.E. Expanded Metal, Gold, 12 x 1 1/2 in., 8/-.

I.F. TRANSFORMERS 7/8 pair

465 kc/s slug tuning miniature can 1 1/2 x 1 x 1 in. High Q and good band width. Data sheet supplied.

"REGENT" 4 VALVE "96"



PRINTED CIRCUIT BATTERY PORTABLE KIT

Medium and long wave. Powerful 7 x 4 in. high Flux Speaker. T.C.A. Printed Circuit and high Flux Speaker. Components of most quality clearly identified, with assembly instructions. Osmer Ferrite Aerial (Cais. Resins covered) atache case cabinet, Size 12in. x 8in. x 3in. Batteries used H126 (L5512) and AD35 (L5040), 10/8 extra. Instructions 9d. (free with kit).

MONARCH RECORD PLAYER



BUILD IT YOURSELF using 4-SPEED BSR MONARCH AUTOCHANGER READY BUILT 3W. AMPLIFIER, HANDSOME PORTABLE CASE. HIGH FLUX LOUD-SPEAKER. FULL INSTRUCTIONS SUPPLIED. Total Price £12.10.0
Carr. and ins. 5/-.

RECORD PLAYER BARGAINS

Table listing record player bargains with prices: 4 Speed Autochangers Post 2/- each, Collaro C60 £7.19.6, BSR, U.A.14 £7.10.0, BSR, U.A.12, Stereo/Mono £8.5.0, Garrard 'Autoslim' £7.19.6, 4 Speed Single Players £8.0.0, Garrard Mk. II £8.17.8, Model ASP Garrard 4 HF Transcription £17.19.6, Garrard Stereo Heads £2 extra, All Sapphire Stylis available from 6/-.

ARDENTE TRANSISTOR TRANSFORMERS

Type D3035, 7.3 CT: Push Pull to 3 ohms for OC72, etc., 1 x 1 x 1 in., 9/8.
Type D3041, 1.75 : 1CT: Push Pull Driver for OC72, etc., 1 x 1 x 1 in., 9/8.
Type D3058, 11.5 : 1 Output to 3 ohms for OC72, etc., 1 x 1 x 1 in., 9/8.
Type D167, 18-2 : 1 Output to 3 ohms for OC72, etc., 1 x 1 x 1 in., 12/-.
Type D230, 4.5 : 1 Driver Transformer, 1 x 1 x 1 in., 10/-.
Type D240 8.5 : 1 Driver Transformer, 1 x 1 x 1 in., 10/-.

ARDENTE TRANSISTOR VOLUME CONTROLS

Type VC155, 5K with switch, dia. 0.9in., 8/-.
Type VC1760, 5K with switch, dia. 0.7in., 10/6
Deaf aid ear piece xtal or magnetic, 7/8.

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

Long and Medium Wave Aerial—RA2W. On 6in. rod, 7/16in. diameter, 208pF tuning, 12/6.
Oscillator Coil P50/1AC, Medium wave. For 175pF tuning, 5/4.
1st and 2nd I.F. Transformers—P50/2CC, 470 kc/s, 11/16in. dia. by 1in. high, 5/7.
3rd I.F. Transformers—P50/3CC, to feed diode detector 6/- Spare Cores—6d. each. Driver Transformer—LFD72, 1 5/16 x 1 1/2 x 4 in., 8/8.
Printed Circuit—PCAI. Size 2 1/2 x 8 1/2 in. Ready drilled and printed with component positions, 9/6.
7 x 4 in., 35 ohm Speaker, 25/-, 3 1/2 in. round 35 ohm speaker, 19/6.
These components are approved by transistor makers and performance is guaranteed.
Constructor's Booklet 2/-.

NEW MULLARD TRANSISTORS

Audio OC71 6/- R.F. OC44 8/9 OC45 8/6
Sub-miniature Electrolytic (15V), 1uF, 2uF, 4uF, 5uF, 8uF, 15mfd, 25uF, 50uF, 100uF, 2/8. Diodes OA70, OA81, 3/-, GEX34, 4/-.

B.B.C. Pocket 2 Transistor, M.W. and L.W. Radio Kit, 29/8. Phones 7/6 or deaf aid earpiece, 7/6, Batt. 2/3.

"P.A.V." POCKET 6 TRANSISTOR KIT WITH LATEST OSMOR MODIFICATIONS. ALL PARTS, PRINTED CIRCUIT AND NEW CABINET. OSMOR DESIGNED KIT, £8.15.0.

COMPONENT SHOP SPECIALISTS

337 WHITEHORSE ROAD WEST CROYDON

Telephone: THO 1665 (Esport welcome. Send remittance and extra postage).

P. and P. charge 1/-, over £3 post free. C.O.D. 2/-.

Easy-to-build kit-sets of



highest quality at lowest cost



SB-10U

**SINGLE SIDEBAND ADAPTOR, Model SB-10U.** May be used with most AM transmitters. Less than 3 w. R.F. input power required for 10 w. output. Operation on 80, 40, 20, 15 and 10 m bands on USB, LSB or DSB ... .. £37.60

**THE "MOHICAN" GENERAL COVERAGE RECEIVER, Model GC-1U.**

Fully transistorised, including 4 piezo-electric transfilters. The very latest and an excellent portable or general purpose receiver for the Amateur and short-wave listener



GC-1U

**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. ... .. £32.10.0

**VAR. FREQ. OSCILLATOR, Model VF-1U.** Calibrated 160-10 m. fundamentals 160-40 m. Ideal DX-40U and similar transmitters ... .. £11.2.0

**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 ... .. £11.18.0

**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 ... .. £19.19.6

**VALVE VOLTMETER, Model V-7A.** Measures volts to 1,500 (C.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. £13.0.0

**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 7½ x 4½ x 12½ in. long. Wt. only 10½ lb. ... .. £19.10.0

**5in. OSCILLOSCOPE, Model O-12U.** Wide-band 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 ... .. £36.10.0

**RES.-CAP. BRIDGE, Model C-3U.** Measures capacity 10 pF-1,000 μF, resistance 100Ω-5MΩ and power factor. 5-450 v. test voltages. Safety switch. £8.6.6

**SINGLE CHANNEL AMPLIFIER, Model MA-12.** 10-12 watt Hi-Fi amplifier. Extremely low distortion and wide frequency range ... .. £10.19.6

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

**GRID DIP METER, Model GD-1U.** Coverage from 1.8 Mc/s to 250 Mc/s. Complete set of plug-in coils provided ... .. £10.9.6



MALVERN

**TAPE RECORDING/PLAYBACK AMPLIFIER, Model TA-1.** Monaural (TA-1M) £18.2.6

Conversion unit to Stereo ... £6.10.0  
Stereo (TA-1S) £23.6.0

"PACKAGED DEALS" of Hi-Fi equipment including TAPE DECKS, RECORD PLAYERS and DECCA ffs PICK-UPS.



F.M. TUNER



S.33



S.88



DX-40U



UXR-1



OS-1



SSU-1

**AMATEUR TRANSMITTER, Model DX-100U.** Covers all amateur bands. 160-10 m. 150 w. D.C. input. Self contained including power supply, Modulator, V.F.O. (illustration bottom right). £71.10.0

**SHORTWAVE TRANSISTOR PORTABLE, Model RSW-1.** Two short bands, trawler and medium ... .. £21.6.0

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

**HI-FI F.M. TUNER.** Tuning range 88-108 Mc/s. Tuning Unit (FMT-4U) with 10.7 Mc/s I.F. output (£32.0 inc. P.T.) I.F. Amplifier (FMA-4U) complete with cabinet and valves (£11.11.0). Total £44.13.0

**6-W STEREO AMPLIFIER, Model S-33.** 3w/chl. inputs for radio/tape and gram. Stereo or Mono, ganged controls. Sensitivity 200 mV. ... .. £12.8.6

**HI-FI 16W STEREO AMPLIFIER, Model S-88.** 20 mV basic sensitivity (4 mV model available, 7/6 extra). Ganged controls. Stereo/Mono gram., radio and tape recorder inputs. Push-button selection. Two-tone grey metal cabinet ... .. £26.12.6

**TRANSCRIPTION RECORD PLAYER, Model GL-58.** Goldring—Lenco four speed unit. G.60 pick-up arm and infinitely variable speed adjustment between 33 and 80 r.p.m. with fixed speed at 16 r.p.m. Balanced turntable (3½ lb.). Stereo ... .. £19.12.6

**HI-FI SPEAKER SYSTEM, Model SSU-1.** Ducted-port bass reflex cabinet "in white". Twin speakers. Pedestal model £11.15.0. Bookcase model ... .. £10.14.0

**"COTSWOLD" HI-FI SPEAKER SYSTEM.** Acoustically designed enclosure "in the white". 26 x 23 x 15½ in. 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. ... .. £21.19.0

**COMPLETE MATCHED STEREO OUTFIT.** Includes RP-1U record player, S-33 amplifier and twin SSU-1 speaker systems. (Pedestal speaker legs optional £2.2.0) ... .. £44.9.0

**STEREO CONTROL UNIT USC-1.** Luxury model with press-button inputs to suit any pick-up or tuner and most tape-heads. Output 1.3 v. R.M.S. per channel. Printed circuit construction ... .. £18.18.6



DX-100U

**STEREO HEAD PREAMPLIFIER USP-1.** Ideal for boosting tape-head output and low output pick-ups (e.g. Decca ffs) £6.17.6

Deferred Terms available on orders over £10

Prices include free delivery UK

Please send me FREE CATALOGUE (Yes/No) \_\_\_\_\_

Full details of model(s) \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PW7

**DAYSTROM LTD.**

Dept. P.W.7, GLOUCESTER, ENGLAND

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

# Practical Wireless

Vol. XXXVIII No. 665 JULY, 1962

Editorial and Advertisement  
Offices:

**PRACTICAL WIRELESS**

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

© George Newnes Ltd., 1962

Phone: Temple Bar 4363.

Telegrams: Newnes, Rand, London.  
Registered at the G.P.O. for trans-  
mission 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

	Page
Editorial ... ..	201
Round the World of Wireless	202
The Alpha Three Personal Transistor Superhet	204
Servicing Tape Recorders	207
The Everest Tuner ... ..	210
A 4-Valve Signal Tracer	215
How Transistors Work	218
On Your Wavelength ... ..	223
The P.W. Troubadour ... ..	224
Short Wave Listener's Log	227
Electronic Process Timer	228
Neons in the Experimenters' Power Pack ... ..	231
Versatile Low Current H.T. Supply ... ..	237
Books Reviewed ... ..	242
Power Rectifier Circuits	245
Trade News ... ..	253
Letters to the Editor ... ..	257
Club News ... ..	258

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

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

## TRANSISTOR SETS

THE word "transistor" has acquired a particular meaning in the lay mind—to the radio enthusiast and the technically knowledgeable, it means a semiconductor device, but to the man in the street it stands for any form of miniature radio receiver. Over the past few years, the use of these small receivers has grown enormously and has certainly revived interest in sound radio; nowadays, it appears to be the "done thing" to have at least one transistor set (or "transistor"). Naturally, as time goes on these receivers are being continually improved in running costs, sensitivity, and more particularly in the volume of sound which they will produce. In fact, some sets give so much output that they are considered objectionable; it was last summer when objections to the invasions of privacy by sounds from portable radios reached their height and several towns passed bye-laws prohibiting the playing of portable radio receivers in public places. In London, buses carried notices pointing out that the operation of portable receivers could not be permitted.

The bye-laws and the notices in public places gradually seemed to take effect last year, and, late in the summer, it was rare to hear portable sets playing in the open air. However, no doubt many more receivers have been bought this year, and to their owners they will still be novelties. This seems to us to be the main reason for the annoyance caused by these sets; their owners play them in many instances not because they are interested in or really require to hear the programmes, but because they are using a new gadget. For the radio enthusiast who builds his own portable receiver, the same sort of problem does not arise since he is accustomed to such circuits and they have no novelty value for him.

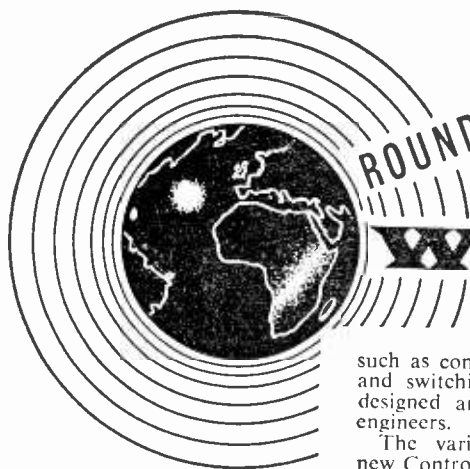
It is to be hoped that as transistor radios become even more commonplace, their indiscriminate use will be reduced. Unless this happens, more definite steps must certainly be taken to discourage the playing of portable receivers in public places.

## THE PILKINGTON COMMITTEE

At the annual conference in Bournemouth of the Radio and Television Retailers' Association, an attack was made on the Pilkington Committee by several speakers. In the words of one, "the delay of its report was enough to put any industry on the rocks", and another speaker said that the Postmaster-General must act swiftly when the Committee reported—"any further delay in forming a clear policy would be disastrous to the industry".

Whether or not commercial broadcasting will be introduced is not known at the time of writing, nor has any hint been given of the future of sound broadcasting in this country. With all committees, reports take a long time to produce since often it is difficult for members of the committee to meet sufficiently regularly; however, in view of the very urgent nature of the problems which the Pilkington Committee was set up to investigate, the opinion is widely held that the final report should have been made sooner or that an interim report should have been issued.

Our next issue dated August, will be published on July 6th.



ROUND THE WORLD

of

WIRELESS

## NEWS AT HOME AND ABROAD

### Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of March, 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 .. .. .	644,942
Home Counties .. .. .	599,079
Midland .. .. .	432,793
North Eastern .. .. .	463,909
North Western .. .. .	398,851
South Western .. .. .	353,924
Wales and Border Counties .. .. .	204,695
<b>Total England and Wales .. .. .</b>	<b>3,098,493</b>
Scotland .. .. .	332,583
Northern Ireland .. .. .	107,431
<b>Grand Total .. .. .</b>	<b>3,538,507</b>

### New Technical and Programme Facilities for Broadcasting House

THE BBC's new eight-floor Broadcasting House extension, occupying some 14 acres in Portland Place, London, contains a number of new and improved technical and programme facilities in addition to extensive and much needed office accommodation.

A large modern Control Room has been built which is now the BBC's main London Control Room for sound broadcasting where the Home, Light and Third Programmes and Network Three are assembled. For this, a range of specialised equipment

such as control desks, amplifiers, and switching systems has been designed and installed by BBC engineers.

The various sections of the new Control Room were brought into operation progressively. The most careful planning and execution of the transfer of the connections of some 900 lines was necessary to ensure the smooth changeover of facilities from the old Control Room without interruption to any of the services. In this, BBC engineers, with the close co-operation of Post Office engineers, were able to provide the circuits to the new Control Room as and when required.

The extension building also contains a new television switching centre which is the focal point for the vision circuits of the BBC television distribution

network feeding regional studio centres and transmitting stations throughout the country.

As a final stage in these developments, work has started on the construction of new sound studios on the basement floor of the extension building and it is proposed also to provide a television news interview studio in this area. The sound studios will include two drama suites as well as general purpose talks and discussion studios.

### Cabling for Railway Colourlight Signalling System

A CONTRACT to supply and install cable as part of the colourlight signalling system now being installed by AEI-GRS Ltd, for the London Midland Region of British Railways has been awarded to the Con-



The sound control room of the new Broadcasting House extension in London. This room houses the Technical Operations Supervisor's desk (on the right) and the Main Control desk.

struction (Cables and Lines) Division of Associated Electrical Industries Ltd.

The contract will involve the supply, installation and termination of more than 100 miles of twin 660V cable and multi-core 250V cable. The cable will be laid alongside the railway track between Colwich and Rugby and will provide the power for the signalling and route interlocking system.

The cable is to be produced by AEI Cable Division and will be manufactured at its Lydbrook, Gloucestershire, factory.

#### "Call Nurse" Equipment for Harlow New Town Hospital

A CONTRACT for patients' communication system in Harlow New Town Hospital has been placed with Hadley Telephone and Sound Systems Ltd.

The contract forms part of the hospital's construction programme, which provides for 169 beds in a maternity wing and general ward block.

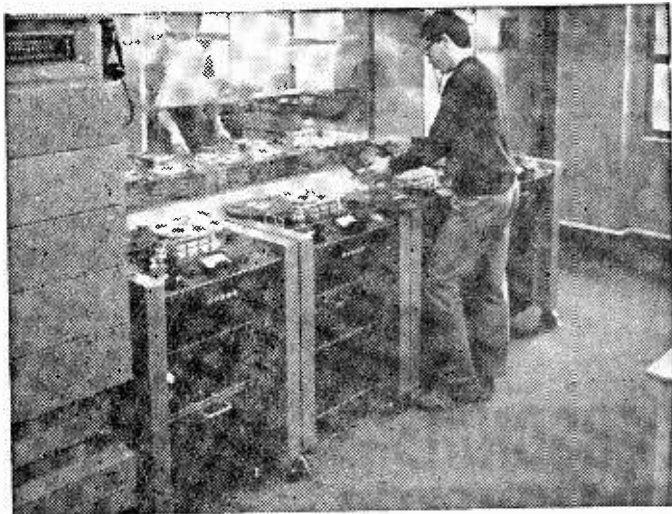
The Hadley equipment to be installed will include the "call nurse" patient-to-nurse visual and sound signalling system, and this will be the first major installation to use the new multi-service unit, which can be held easily in the patient's hand and which provides at a touch a micro-speaker and nurse-calling push button, a radio programme selector switch, volume control and an over-bed light switch. In the Harlow hospital the units will give five-channel radio—BBC Home and Light programmes, sound for BBC and Independent Television and a channel for hospital internal broadcasting.

#### Mullard maser for GPO Satellite Communication Ground Station

A TRAVELLING wave maser amplifier designed and built by scientists at Mullard Research Laboratories was installed recently at the GPO Satellite Communication Ground Station at Goonhilly Downs, Cornwall.

Operating at 4170Mc/s, the maser will be used in the first stage of the receiver to amplify signals relayed across the Atlantic via the communications satellite Telstar, expected to be launched in June from Cape Canaveral.

Because of its ability to



Four of the fifteen remotely-controlled machines for recording news despatches in the new Broadcasting House extension.

amplify without introducing appreciable noise the maser enables the power of the satellite transmitter — and consequently the payload requirements of the launching rocket—to be reduced so that this form of communication becomes practicable.

The signal applied to the maser input is expected to be of the order of 10<sup>-12</sup>W or even less. Conventional, thermionic devices if used to amplify a signal of this small magnitude would produce an unacceptably high noise level. However, the maser behaves as a virtually noiseless amplifier since it operates at a very low temperature (in the present case about 2°K—i.e., -271°C) and, moreover, does not depend for its operation on an electron beam. To maintain it at the required temperature the device is immersed in liquid helium.

#### Radar Display Units

THIRTY radar displays, type 3A, manufactured in RCA Great Britain Ltd.'s Sunbury-on-Thames factory to Ministry of Aviation specifications, are being supplied as a part of the 10 fully transistorised Solatron radar simulator systems for the Royal Swedish Air Force.

The type 3A radar display is a general compatibility radar display utilising a 12in. tube and housed in a rectangular "table top" cabinet. It has a maximum/

minimum range display ratio of 6:1 with a minimum range of 10 nautical miles. It can be used as a display for radar equipment operating in any band and for radar simulators.

#### Private Automatic Telephone Exchange

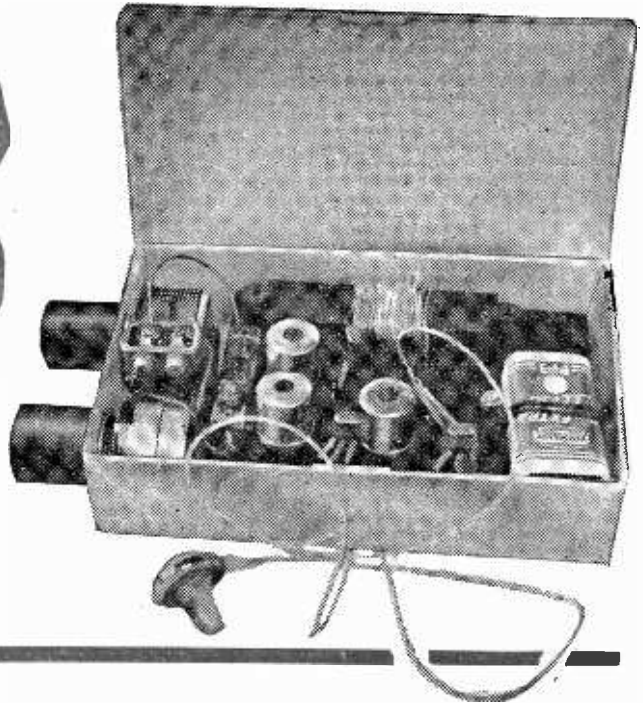
A PRIVATE automatic branch telephone exchange for export only and of particular value to small business concerns overseas where an inexpensive and reliable communication system is required, has been introduced by telecommunications division of Associated Electrical Industries Ltd. The equipment will provide nine internal extensions and three lines to the local exchange.

The essential feature of the system is that the manual operator normally required to receive incoming exchange calls is no longer necessary since all incoming calls are routed to one or more selected extensions.

Automatic transfer facilities enable the exchange caller to be transferred from one extension to another in the same system if required. Outgoing calls via the public exchange can be dialed directly from any extension, and all internal calls are automatically connected by dialling. In the event of a power failure each exchange line is automatically connected to a selected extension.

# The P.W. Alpha 3

## PERSONAL TRANSISTOR SUPERHET



INDIVIDUAL listening with earphones, a single earpiece, or a miniature "personal" phone makes quite sure that others are not disturbed, and this type of reception is often very convenient. The set described here is for this purpose and has the control knobs at one end of the case so that the completed receiver will easily slip into a pocket.

The case holds a "personal" type of earphone, so that the whole set is self-contained. If a pair

of headphones with two earpieces is preferred this is quite in order. A lightweight pair of earphones can give very good results indeed with very good quality reproduction. A single headphone, attached to a length of thin twin flex, could also be used.

### Circuit

The receiver is a superhet and the circuit is shown in Fig. 1. A home-wound ferrite slab

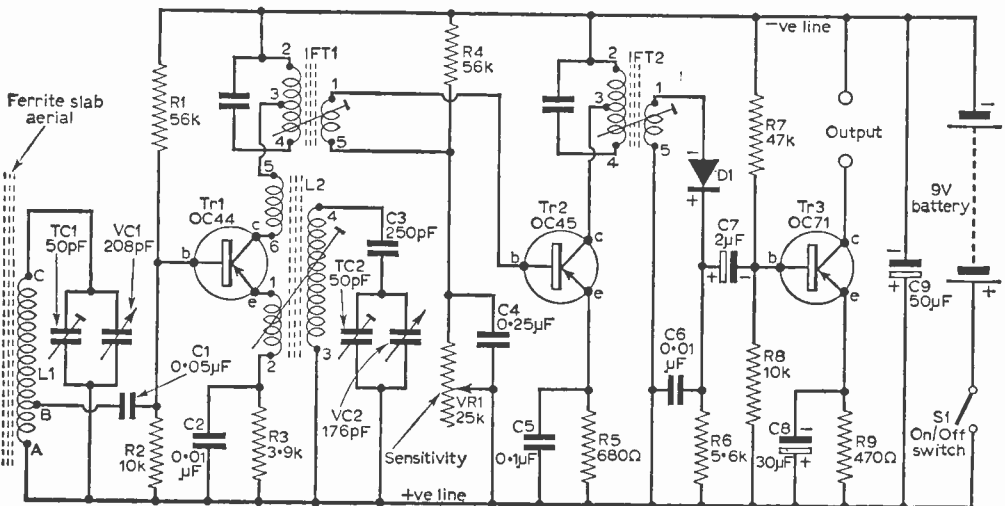


Fig. 1—The circuit of the receiver.

aerial tunes medium waves, but a ready-made rod or slab aerial would be equally satisfactory. The circuit is simplified and has one I.F. stage, followed by the diode detector and an audio amplifier. A 25k potentiometer, with switch, acts as sensitivity control. The circuit is for use with a 6V to 9V battery and a small 9V battery such as the PP3 will have a long life. Selectivity is very much better with this type of circuit than with the simple type of TRF receiver which is often employed for headphone reception.

The receiver fits in a plastic box approximately 3½ in. x 6 in. x 1½ in. (outside dimensions). This allows sufficient free space to make construction easy. Holes are drilled at the end of the box to take the tuning condenser and potentiometer. The condenser is fixed with short 4B.A. bolts, a washer or two being placed between box and condenser if necessary. About two washers will also be needed between the potentiometer and box. The spindle is sawn off to match the length of the condenser spindle. This can most readily be done while holding the *unwanted* end of the spindle in a vice.

**Aerial**

The ferrite slab is 3 in. x ½ in. x ½ in. and fits in slots filed in two pillars of insulating material, as in Fig. 2. These pillars can be of wood, solid ebonite or similar material, or they may be cut from insulated tubing. Solid pillars will need drilling to take the securing screws. These screws should be short. Metal pillars or any form of metal brackets are not recommended.

For the winding, 26s.w.g. DCC copper wire can be used and is easy to handle. Beginning at point "A", twelve turns are wound on in a compact pile. The wire is then bared for a short distance and twisted to form a connecting point for the



The receiver in its closed case.

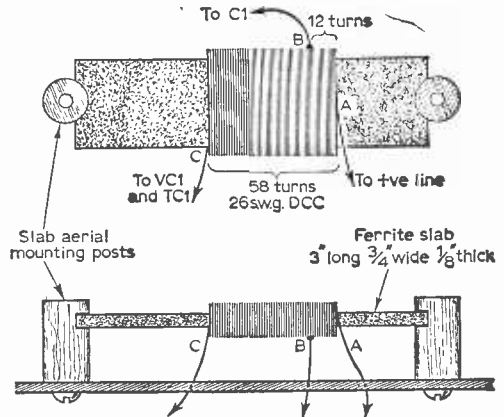


Fig. 2—The aerial winding and mounting details.

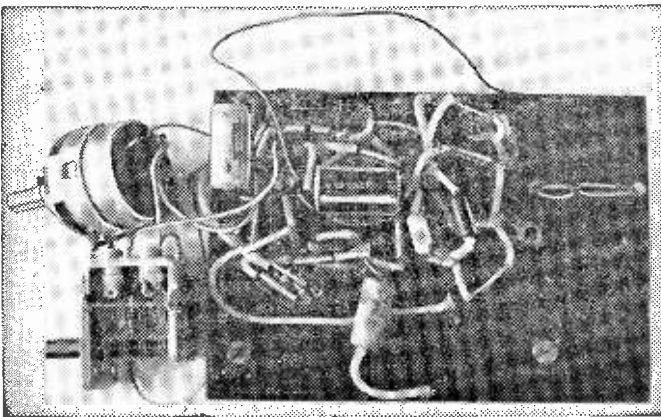
lead "B"; then 46 more turns are wound on, forming them into a pile as winding progresses. The whole winding of 58 turns is 1 in. long and near the centre of the slab.

Satisfactory alignment is achieved by adjusting the oscillator coil core to suit the inductance of the aerial winding, which is fixed. If the winding is held together with Sellotape it can be moved along the slab, if needed, when first testing the receiver.

If a ready-made aerial is used it may have a separate base coupling winding. If so, connect this winding from the 0.05µF condenser (C1) to the "earth" line. The larger winding is wired to the tuning condenser in the usual way.

**Receiver Panel**

This is approximately 3½ in. x 4½ in., so that it fits in the case with a little clearance, and it is cut from ¼ in. paxolin. It is placed in the case and a 4B.A. clearance hole is drilled through both panel and case in the position shown for the



The receiver panel when the wiring is nearing completion.

## COMPONENTS LIST

## Resistors:

R1 56k	R6 5.6k
R2 10k	R7 47k
R3 3.9k	R8 10k
R4 56k	R9 470 $\Omega$
R5 680 $\Omega$	
VR1 25k with s.p. switch	

## Capacitors:

C1 0.05 $\mu$ F	C4 0.25 $\mu$ F
C2 0.01 $\mu$ F	C5 0.1 $\mu$ F
C3 250pF	C6 0.01 $\mu$ F

C7 2 $\mu$ F 6V	C9 50 $\mu$ F 9V
C8 30 $\mu$ F 6V	

VC1, VC2 208, 176pF tuning capacitor with two 50pF trimmers (TC1, TC2) and internal screen.

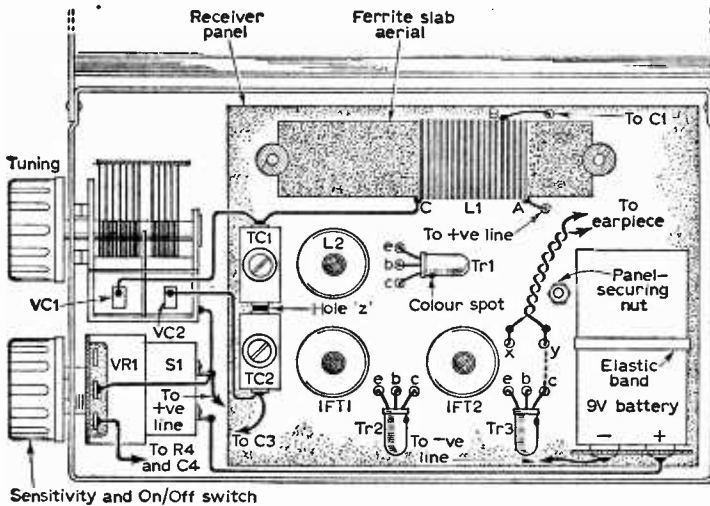
Tr1 OC44	Tr2 OC45	Tr3 OC71
----------	----------	----------

Aerial, see text; oscillator coil, white and blue coded IFT's (Osmor); two knobs; medium or high impedance earpiece or phones; plastic box; 9V battery; etc.

panel-securing nut in Fig. 3 A  $\frac{1}{4}$ in. 4B.A. bolt with three nuts will then allow the finished receiver to be held in position.

Fig. 3 shows the layout of parts on the panel.

An elastic band passes through two holes and holds the battery. Clearance holes are drilled for the oscillator coil and I.F. transformer pins, and rough edges are cleaned up as necessary with a small file or a larger drill so that the cans fit flush with the panel. The aerial mounting is shown in Fig. 2. The two 50pF trimmers have their tags soldered together and passed through a hole, this point being wired to the receiver "earth" line.



Sensitivity and On/Off switch

Fig. 3—The controls and panel layout inside the case.

Take care to position the oscillator coil correctly or all connections here will be wrong. Note that the first I.F. transformer is coded with a white spot and the second transformer with a blue spot. These items are held in place by bending out the long tags attached to the screening cans. These tags are wired together and to the earth line. It may be found helpful to scratch numbers by the pins on the underside of the panel.

(To be continued)

## BRITISH STANDARD MEMORANDUM on Light-current semiconductor devices (B.S.3494 : Part 1 : 1962)

THE British Standards Institution has been preparing a memorandum on light-current semiconductor devices, and the first part was published during May (B.S.3494: Part 1).

This first part lists the ratings, characteristics and other parameters of light-current semiconductor devices which are regarded as the minimum data that should be quoted by the manufacturer when describing his product for general sale. Part 2, will deal primarily with methods of measuring the characteristics listed in Part 1.

To facilitate the comparison of semiconductor devices offered by different manufacturers it is necessary that the data sheets describing the per-

formance of those devices should contain, as a minimum, information on the essential ratings and characteristics. The information should be quoted in the same terms by all manufacturers; adoption of the recommendations given in Part 1 will assist in achieving this.

Part 1 does not specify the numerical values of ratings and characteristics.

Devices primarily intended for use in industrial power equipment are not included in the memorandum. Similar information relating to power diodes, which are not covered by the memorandum, will be published separately.

Copies of this standard may be obtained from the British Standards Institution Sales Branch, 2 Park Street, London W.1., price 6s. each.



# SERVICING TAPE RECORDERS

THE RECORDING,  
PLAYBACK AND ERASE HEADS.

(Continued from page 124 of the June issue)

By T. S. Smith

**L**AST month we investigated the basic requirements of magnetic recording tape and the need for correct head alignment; we will start this month's article by looking in greater detail at the heads themselves and the circuits that feed them.

We have already discovered that three head functions are required: one for recording—converting the signal voltages to magnetic flux changes and transferring these permanently on to the magnetic tape—the second for replay—converting the magnetic programme pattern on the tape back into signal voltages—and the third for erasing programme material that is no longer required so as to leave the tape "clean" for the next recording.

The three heads have much in common and, as has been told in past articles, the recording and playback functions are nearly always carried out by the same head on most domestic machines. The average tape recorder thus has two heads, one for recording and playback and the other for erase. The basic construction of a recording playback head was shown in Fig. 1 of the first article of this series (page 1037, March, 1962), and this illustration also reveals how the changes in magnetic flux across the working gap transfer magnetic signals on to the tape.

## Gap Spacing

In some cases, however, there may be only one winding (as opposed to the two windings shown on the diagram mentioned) and there may not be a rear gap, depending upon the precise design of the head. The most important feature is the front gap. This must be highly engineered so that it is straight and uniform, and to facilitate these requirements a non-magnetic "spacer" is inserted between the two halves of the pole pieces.

Although the spacing of the rear gap is nowhere near as critical as that of the front gap,

fairly close spacing is nevertheless required as a means of keeping the reluctance of the magnetic circuit within the pole pieces as small as possible. The pole pieces themselves are composed of a material possessing a high permeability and Mu-metal is often used. The sensitivity of the heads is also related to the magnetic permeability of the pole pieces as well as to the number of turns on the winding and the current in the

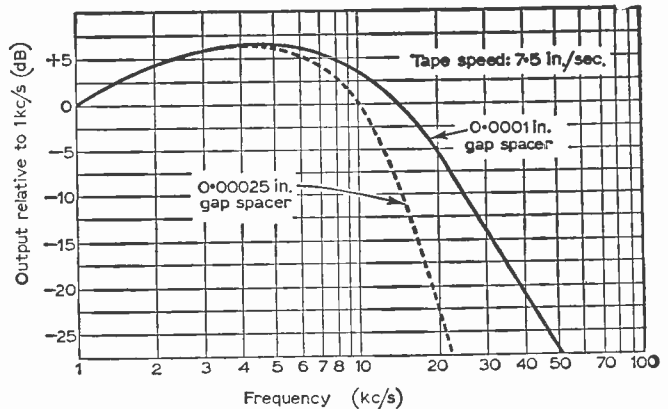


Fig. 13—How the high-frequency response of a replay head is improved by reducing the width of the working gap.

winding. The number of turns also governs the impedance of the head—a high impedance head has considerably more turns than a low impedance head but, as the latter is fed to or from a transformer, the correct signal voltage step-up is achieved. In other words, the voltage across a low impedance head is smaller than that across a high impedance head, but in the former case the signal current is greater.

## Frequency Response

The high-frequency response at a given tape speed is very closely related to the width of the working gap in the playback head in particular. The dimension of the gap of the recording head is also important, of course, but not so much as that of the playback head. However, since composite

recording/playback heads are invariably used, the recording gap width requirement is adequately catered for within the gap requirements of the playback function.

From the high-frequency aspect, therefore, we can consider primarily the playback action. Past articles have explained that the signal EMF generated across the winding is proportional to the rate of change of magnetic flux. Thus, with a tape of constant recording over the audio spectrum, the signal EMF across the playback winding will rise with frequency at the rate of 6dB per octave up to a certain frequency which is governed by the gap width and other factors, as will be discussed.

#### 6dB Per Octave

An increase of one octave is a two-to-one rise in frequency which, since the output is proportional to the rate of change of flux, gives a two-to-one rise in signal EMF (voltage) across the replay winding and, because a two-to-one voltage ratio is exactly the same thing as a rise of 6dB, it becomes perfectly clear why the replay signal voltage rises at the rate of 6dB per octave. This happens at all speeds, but the advantage of higher speeds is that the point at which the 6dB per octave rise ceases extends further into the higher audio-frequency spectrum. This is because the peak occurs when the wavelength of the tape signal is about twice the gap width. Thus, if the gap has an effective width of, say, 0.0005in., the wavelength would be 0.001in., which at a tape speed of 7½in./sec would represent a frequency of 7.5kc/s. At 3½in./sec the peak would occur at approximately 3.75kc/s and at approximately 15kc/s at 15in./sec.

#### Other Factors

Unfortunately, the effective gap width is somewhat greater than the thickness of the spacer, and because of this and other things like imperfect contact between the head and the tape and losses in the head due to eddy currents and hysteresis, the peak output usually occurs at a lower frequency than that calculated in relation to the gap width.

This is illustrated by the curves in Fig. 13 which show the relative replay responses for a head of 0.0001in. gap and for a head of 0.00025in. gap under equal recording conditions. It will be seen that the peak occurs in both cases at about 5kc/s, but that the curve of the head with the 0.0001in. spacer does not fall off so rapidly as the other and extends further into the high-frequency spectrum. These curves are taken from the Gresham range of heads which employs Mu-metal pole pieces.

The main reason why the effective gap width is not equal to the thickness of the gap spacer is because of imperfect contact between the spacer and the faces of the pole pieces. However, new manufacturing techniques now make it possible to achieve an effective gap width which is considerably closer to the spacer thickness than was possible on early heads. These have also made possible the recent "low speed" recorder, the production of which several years ago would have been considered almost impossible. Machines

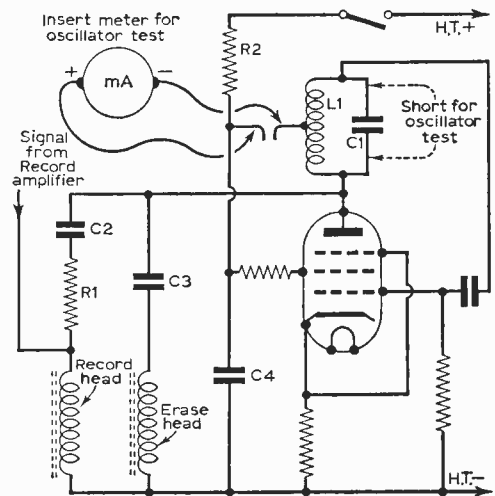


Fig. 14—The basic circuit of a Hartley oscillator.

claimed to have a top response approaching 15kc/s at 3½in./sec are now readily available, and quite good quality sound can be produced at a tape speed as low as 1½in./sec—using transistors.

#### TV Recorders

Many of these improvements have resulted from developments in the field of video tape recorders and, while we are still on the subject of frequency response, a quick look at such recording systems would not be amiss. The Ampex machine uses a replay head gap somewhat less than one-quarter thousandth of an inch, and at a head-to-tape velocity of 1,500in./sec a response up to 4Mc/s is maintained. The tape itself is moving longitudinally at a speed of 15in./sec, but the effective high tape speed is achieved by the head rotating and scanning the tape over its width.

The British system, on the other hand, operates in the more conventional manner and at a tape speed of 200in./sec gives a response which at 2.5Mc/s is only 3dB down. As would be expected, considerable wear occurs on the head at such high tape speeds, and on both machines the heads need replacing after about 100 hours of use!

The gap width of the British system is 0.00002in. and at such a small dimension the ordinary type of spacer is rarely used. Instead quartz or some other non-magnetic material is "sputtered" or vacuum deposited between the interfaces of the pole pieces. This technique is now being examined for use on sound replay heads and it should not be very long now before further improvements are found in the domestic and professional recorder, leading to enhanced high-frequency response at low speeds.

#### Poor Top Response

The tape is held in close contact with the head either by pressure pads or by the tape being run

through special guides either side of the head, so that the tape is under slight pressure against the pole pieces. The former arrangement is the most popular, but the latter arrangement has much to commend it and will possibly be found more in machines of the future.

Apart from incorrect azimuth adjustment, as dealt with last month, another common cause of poor top response is inadequate contact between the tape and the head. The working surface of the head sometimes picks up oxide deposits from the tape after considerable use which hold the tape away from the gap. As the deposits are likely to become very hard with time a magnifying glass is often necessary to detect them, and extreme caution should be exercised when removing them.

should not normally be visible to the naked eye, and if it is—except for the erase head gap—the head may need replacement.

Excessive head wear coupled with impaired H.F. response may also be caused by incorrect adjustment of the pressure pads or tape guides. With the pinch roller disengaged from the capstan, the tape should pass the centre of the head (with the pressure pads released) without kink or curl. If this does not happen then the guides should be adjusted in height to give the desired effect. The guides often wear badly themselves, but this can usually be overcome without cost by rotating them so that a fresh surface is presented to the tape.

### Optimum Pressure

Too much tension on the pressure pad will not hold the tape any straighter nor will it enhance the high-frequency response; it will simply wear out the heads long before the end of their life is really due. If excessive pressure appears to give a better top response, then the trouble is caused either by a worn head or oxide deposits adjacent to the gap (or incorrect azimuth adjustment). On the other hand, too low a pressure will impair the H.F. response, but the pressure should be as low as possible consistent with optimum H.F. response.

It is surprising just how the H.F. response falls when contact of the tape with the head is reduced. The loss in dB can be computed approximately by multiplying the gap distance between the tape and the head by 55 and then dividing the answer by the wavelength of the signal being reproduced. Thus, with a one tenth of one thousandth of an inch loss of contact on a tape running at  $7\frac{1}{2}$  in./sec recording a signal at 7.5kc/s, the cut would be 5.5dB. Varying pressure of the tape against the head is also a cause of noise modulation, and this could result from a twisting tape or wear of the head.

### Erasing

The erase head, although of similar design to the recording/playback head, has a considerably wider gap of some five thousandths of an inch or so. The pole pieces may be either of laminated Mu-metal or ferrite and the supersonic erase signal is applied at fairly high power to a comparatively low impedance winding. To supply sufficient erase power the oscillator often incorporates a pentode valve (or power tetrode) to feed between 200 and 500mA of erase current into the winding of the erase head, and as we have already seen (Fig. 5, page 1123, April, 1962, issue), the output valve in the playback amplifier may take over as bias and erase signal oscillator on record.

In Fig. 14 is given the circuit of a Hartley oscillator, which is very popular in tape recorders. The frequency is governed by the tuned circuit comprised of L1 and C1, and a good test for oscillation is to insert a milliammeter in series with the H.T. feed to the anode circuit, as shown. The reading should be noted and, if there is an appreciable rise in anode current when C1 is short-circuited, this is proof enough that the circuit is oscillating with the short removed.

(Continued on page 227)

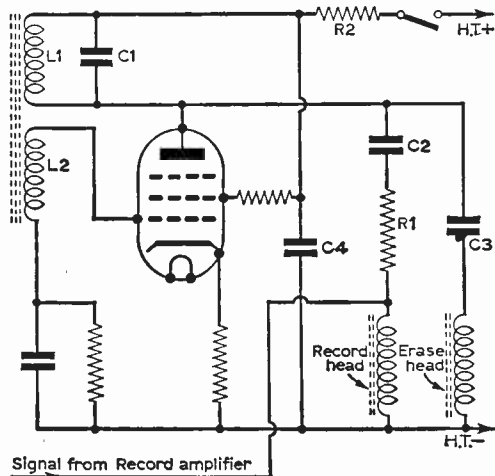
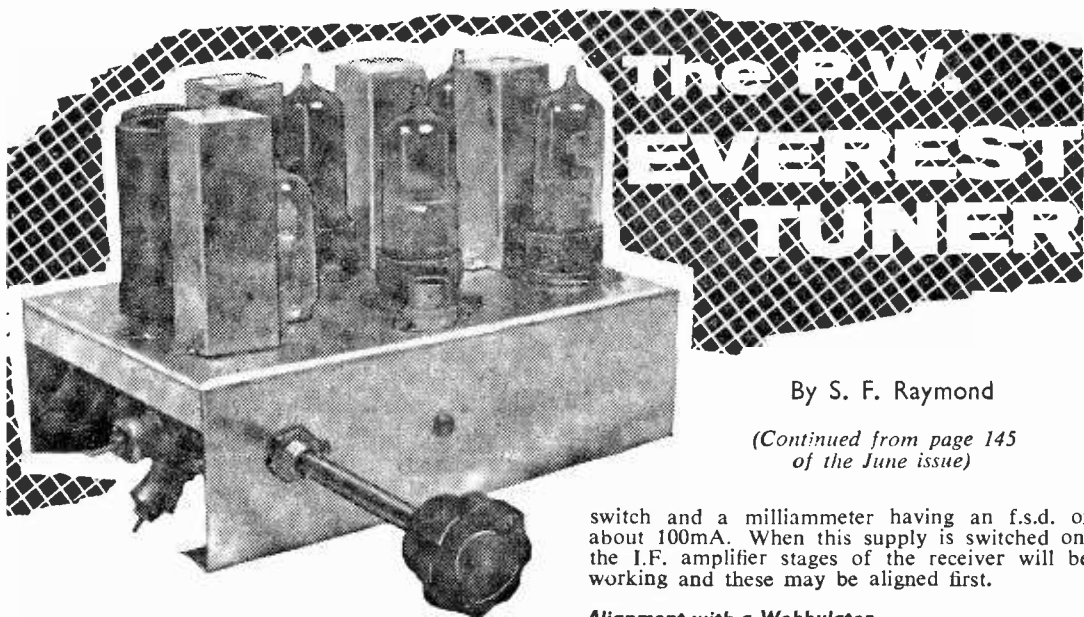


Fig. 15—The basic circuit of a Meissner oscillator.

### Removal of Oxide Deposits

On no account should a pointed instrument be employed to pick away the deposits from the pole laminations or gap. The best thing is to endeavour to dissolve the deposits with a good quality lighter fuel or carbon tetrachloride. A piece of lint-free cloth should be soaked in the solvent and applied with reasonable pressure to the working area of the head. Care should be taken to avoid either solvent coming into contact with the tape, and lighter fuel (petrol) should be kept well clear of rubber drive wheels. Carbon tetrachloride does no harm to rubber, however, and is useful for roughening and cleaning such drives.

During the course of servicing the head in the foregoing manner it may be discovered that the pole surface is badly stepped, indicating wear. While consistent wear over the area in contact with the tape is of little consequence (provided it is not too severe, of course, and has not widened the gap), unbalanced wear, resulting in a sloped face, nearly always calls for head replacement. Again, a magnifying glass or small microscope is useful for investigating head wear. The gap



# The P.W. EVEREST TUNER

By S. F. Raymond

(Continued from page 145  
of the June issue)

## A SWITCH-TUNED, VHF/F.M. TUNER.

**I**N last month's article, the circuit of the tuner was described and the functions of the various stages explained. However, one of two constructional points remain to be described. Firstly, the receiver is small in size and therefore the heat generated by the valves must be dissipated as efficiently as possible so that the chassis does not become unduly hot during operation. To this end, V2 and V6 are fitted with screening cans and these cans are blackened inside and out so that heat is lost from them as quickly as possible. (Blackened surfaces both radiate and absorb heat more quickly than polished surfaces.) The cans may be blackened with photographer's matt black paint which is quick drying and gives a good surface. The skirts of the other valveholders can also be painted inside and out with the black paint taking care that no paint reaches the insulation of the valveholders or the contacts.

### Testing and Alignment

When the tuner has been completed, it is wise to carry out a few tests before alignment is begun. Firstly, with all the valves removed, a meter should be used to check that a reading of infinite resistance is obtained across the 6.3V power supply leads—with the valves removed, there should be nothing to complete the circuit. The meter should also be used to check that there are no short circuits in the H.T. line. Having established that all is well in the above respects, V3, V4, V5 and V6 should be inserted and the heater supply switched on when the valves should be observed to light. An H.T. supply of about 150V is required for the unit and this should be connected via a

switch and a milliammeter having an f.s.d. of about 100mA. When this supply is switched on, the I.F. amplifier stages of the receiver will be working and these may be aligned first.

### Alignment with a Wobbulator

The easiest method of aligning an F.M. receiver is with a wobbulator and this method will be outlined first, but not in great detail since it is assumed that those readers having access to a wobbulator will also know how to use it.

To align the I.F. stages, a signal should be injected from the wobbulator into the grid circuit of V3. This signal should have a centre frequency of 10.7Mc/s and this frequency should be marked on the display of the response on the oscilloscope either by using the internal marker of the wobbulator or by the use of an additional signal generator. The output voltage for the I.F. amplifier characteristic is derived from the limiter grid resistor—from Test Point 2 (T.P.2) on the circuit diagram (Fig. 1 on the Blueprint). R17 is included at this point to prevent any instability from arising when the lead is connected. Using the marker generator, the response of the I.F. amplifier should be adjusted so that it is centred on 10.7Mc/s and sensibly flat from about 10.625Mc/s to about 10.775Mc/s, say 3dB down at the extremes of the pass-band.

The next step is to align the discriminator and for this display, the voltage is derived from T.P.3 (see the circuit diagram). If a double-beam oscilloscope is used, one beam can be used for the I.F. amplifier and the other for the discriminator—this procedure will facilitate optimum adjustment of the circuits.

It should be noted that on the circuit diagram, the "hammer heads" which represent the dust cores in the coil cans have been turned upside down in some cases. This has been done to facilitate adjustment of the cores and inversion of the "hammer heads" denotes that the core concerned is at the bottom of the can and reached from the underside of the chassis.

The cores in the discriminator section (IFT3) should be adjusted for maximum symmetry of the

response curve. (Note that a brass core is required for the secondary.) The primary core affects the tuning point of the discriminator and the secondary core the linearity of the response. The response should be centred at about 10.7Mc/s and be linear for  $\pm 75$ kc/s at least. No more details will be given of the alignment procedure using a wobulator since there are many books available which cover the subject in great detail.

#### Alignment Using a Signal Generator

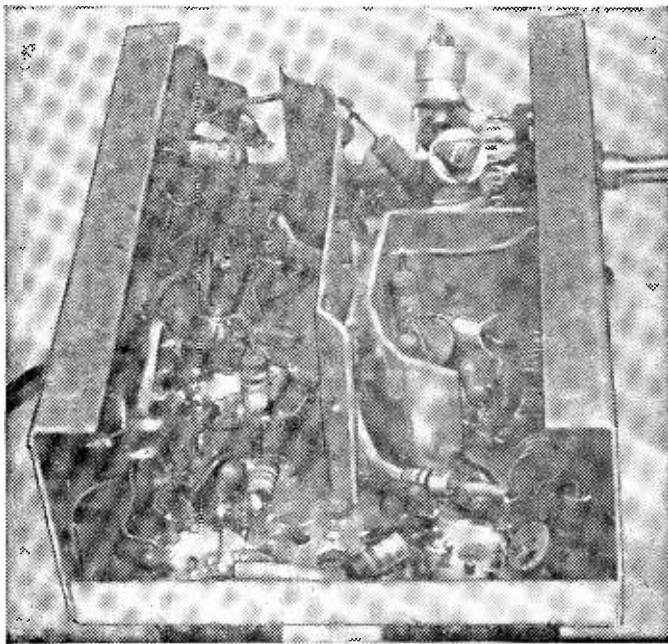
To align the I.F. amplifier and discriminator using a signal generator, an unmodulated signal of 10.7Mc/s frequency should be injected into the grid circuit of V3. A sensitive voltmeter should be connected between T.P.2 and chassis (positive lead to chassis) and the cores of the I.F. transformers adjusted for maximum response, reducing the

negative with respect to chassis and the meter should initially be switched to a high range. The leads may then be reversed if necessary so that the needle of the meter moves in the usual direction.

With the signal generator set to give an unmodulated signal of 10.7Mc/s, the core of the primary winding of IFT3 should be set to give maximum reading of the meter. The secondary core should now be adjusted so that the meter reading drops to zero—it is probable that in order to obtain this zero reading, a brass core will have to be inserted into the top of IFT3 instead of a dust core.

As the core is screwed in and the meter reading drops to zero, the meter leads should be reversed. When the core is screwed in further, the meter reading should again rise; if it does not, a position should be found for the core where this does occur. The secondary core should now be adjusted so that a small reading is obtained on the meter and then the primary core should be rotated until this reading is maximum. The secondary may now be adjusted until the reading is zero once again, reducing the range of the meter as zero is approached.

Finally, the signal generator should be altered from about 10.6Mc/s to about 10.8Mc/s. It will be found that the meter reading varies (as the frequency is altered) both in magnitude and polarity and it will be necessary to reverse the leads of the meter as the frequency passes through 10.7Mc/s. It should be found that the voltage at about 10.625Mc/s has the same value but opposite polarity as that at about 10.775Mc/s. If this condition cannot be obtained, then the core of the primary should be altered by about half a turn, the secondary re-adjusted and the test tried again. Eventually, by trial and error, it should be possible to achieve the desired result.



The underchassis wiring of the Everest

input from the generator as the circuits come into line—the coupling between the generator and V3 may be reduced gradually also.

The frequency of the injected signal should now be varied from about 10.6Mc/s to 10.8Mc/s and the cores of the transformers altered to give a flat response from about 10.625Mc/s to about 10.775Mc/s—in other words, the meter reading should remain sensibly constant as the frequency of the input signal is varied from about 10.625 to about 10.775Mc/s. It should be noted that considerable trial and error may be necessary before this condition is obtained.

When this part of the alignment has been completed, the meter may be transferred to T.P.3. The voltage at this point may be positive or

#### Oscillator Adjustment

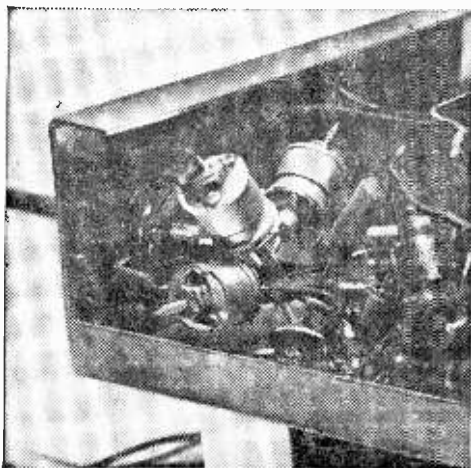
The meter and signal generator may now be disconnected and the power supply switched off. Valve V2 may then be inserted into its holder. The crystal unit may also be inserted into the B7G valveholder provided. A microammeter of f.s.d. about 100 $\mu$ A is connected between T.P.1 (positive to chassis). It is best to solder the meter connections in position in case the leads should become detached and contact the H.T. line. The programme switch should be turned to the Light Programme position and the trimmer TC1 screwed up almost completely. A dust core should be inserted into the top of the former of L2. This dust

# The P.W. EVEREST TUNER

## CONTINUED

core should be screwed gradually into the former until the reading on the meter is observed to increase suddenly. If this does not happen, then remove the dust core and alter the setting of TC1 until the meter reading is seen to increase. If TC1 has to be almost completely unscrewed to obtain this condition, remove the can of L2 and increase the spacing between the turns. Then, return TC1 to its initial setting and insert the dust core. When the correct position has been found for the dust core, TC1 may be adjusted for maximum deflection of the meter.

The programme switch is then rotated to the Home Service position and TC2 adjusted for maximum reading of the meter. This will occur with the trimmer almost completely unscrewed. The switch may then be set for the Third Programme and TC3 adjusted for maximum meter reading—this will occur with the trimmer at about its mid-way position.

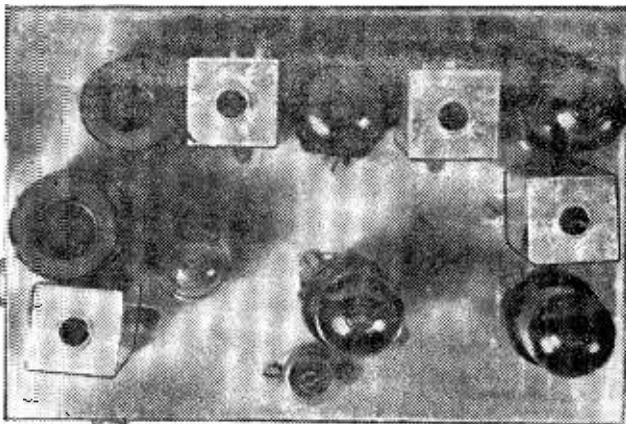


*The arrangement of the concentric trimmers around the programme switch.*

### The R.F. Stage

The power supply may be switched off and V1 inserted. With this valve in position, the current consumption should be about 40mA and this should be checked on the meter.

If an aerial is connected, the local Light Programme transmission should be heard when an amplifier is connected to the output of the tuner. The R.F. stage and the input tuned circuit of the mixer are broad in tuning and therefore no variable tuning has been incorporated in the circuits. The aim is to adjust the tuning of the R.F. and mixer stages so that the F.M. band is adequately covered. To do this, it is necessary once again to



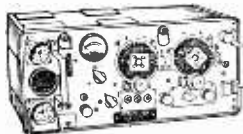
*This view of the complete tuner shows clearly the layout of the valves and transformers on the top of the chassis*

connect the meter to T.P. 2. With the programme switch set to the Light Programme, the spacing of the turns of L1 is adjusted for maximum reading of the meter. The switch is then set to the Home Service and the spacing of the turns of L3 adjusted for maximum reading of the meter. The switch is then set to the Third Programme (make sure beforehand that there are transmissions in progress) and the meter reading should be the same as obtained on the other two programmes. By repeated adjustments on all three programmes, the turns spacing of the coils should be altered until equal readings are obtained on all three.

To achieve optimum results, the I.F. transformers and the discriminator may be adjusted finally with the tuner switched to one of the three positions. The same type of adjustments are required as detailed above in the alignment instructions.

In conclusion, it must be pointed out that this receiver is not intended for the inexperienced radio constructor who would be wise not to attempt it—the advanced constructor will find little trouble in building the tuner but nevertheless it is useful to visit the local reference library and read about the operation and adjustment of F.M. receivers before completing the set so that the abbreviated alignment instructions given above may clearly be understood. ■

### WIRELESS SET NO. 19



This most famous Army Trans/Receiver covers 2-8 Mc/s. (150-37 metres in two bands and 230-240 Mc/s V.H.F.). Has an intercom. amplifier. Designed for 12 and 24 volt operation. Uses a 6 valve superhet receiver. I.F. being 465 Kc/s, and a 6 valve transmitter designed for voice and C.W. operation. Incorporates test and tuning meter for voltages, aerial loading and current tests. Panel Controls: Frequency tuning, P.A. tuning, Gain control, MCW, CW, R/T switch, Het-tone netting, off-on, Quench, aerial—AVC, LT-HT—Drive tests. Supplied complete with 15 valves and instruction book.

SET ONLY

65/-

Carriage 10/-

**LIMITED NUMBER ONLY**  
*Don't be disappointed—*  
**Order Now**

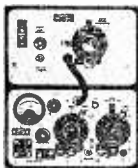
### COMPLETE STATION



Complete 19 set station (as illus.) comprising 19 set. Supply Unit, Control Box, Headphones, Microphone, Morse Key, Variometer, Short Wave and V.H.F. Aerials and bases and full set of leads.

ALL FOR ONLY £9 carriage 25/-

### PORTABLE TRANS/RECEIVER NO. 18



A self-contained Trans/receiver for Telephone and C.W. Range approx. 10 miles, Frequency 6-9 Mc/s (50-33.3 meters). Valve line-up: three ARP-12, one AR-8, one ATP4. Complete with aerial, H.T. and L.T. meter and all accessories. Weight 20 lb. Size 8 x 10 x 17 in.

ONLY £5 carriage 10/-

### PORTABLE RADIO—PHONES



Consisting of trans-receiver covering 7.4-9 Mc/s. Range up to 6 miles, depending upon obstructions and elevation. On test the receiver astounded us for we heard 65 short wave stations—one as far away as Russia. Complete with 5 valves, headphones, microphone, junction box and 6ft. telescopic aerial. Operates from standard 120 v. and 3 v. dry batteries.

ONLY 60/- EACH

P. & P. 4/-

TWO FOR £6 post free  
(Batteries 20/- per set extra).

**Our goods must be seen to be appreciated—  
 a visit to 87 Tottenham Court Road will be  
 most rewarding.**

MAIL ORDERS TO  
 (DEPT. P.), 32a COPTIC STREET,  
 LONDON, W.C1

## RELDA METER SENSATION!!



10,000 o.p.v. MULTI  
 TESTER IN SEMI-  
 ASSEMBLED KIT FORM

only 69/6

Ranges: D.C. Voltage: 0-6-30-120  
 600-1,200 v. (10,000 ohm v.).  
 A.C. Voltage: 0-6-30-120-600-1,200 v.  
 (10,000 o.p.v.).  
 D.C. Current: 0-120µA, 0-12-300 mA.  
 Resistance: 0-20K, 0-2 Meg. (150 ohm,  
 15K at centre scale.)  
 Capacitance: 0.005 to 15µF (at A.C.  
 6 v.).  
 Decibels:—20 to ±63db (600 ohms  
 1 mW, odbm—0.775 v.).  
 Accuracy: D.C. voltage and current  
 ±2%, I.S. A.C. Voltage ±4% I.S.  
 Resistance ±3% of total scale  
 length.  
 Size: 4 1/2 in. x 3 1/2 in. x 1 1/2 in. Complete  
 with test leads, battery and in-  
 structions.

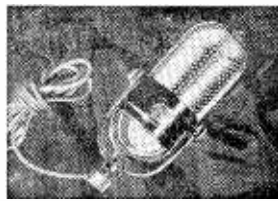
Few only available—  
 rush your order now  
 whilst stocks last!

### ALL DIRECTIONAL STUDIO CRYSTAL MICROPHONE

MODEL AC-70

A professional microphone with 360° pickup, using a new variable "D" shock mounted crystal cartridge for added power and sensitivity. Smooth response (50-12,000 cps) and natural reproduction. Size 7 in. high x 3 in. wide. Complete with shielded cable, lavalier cord and in-stand holder.

69/6 complete



### A MINIATURE TAPE RECORDER IN KIT FORM

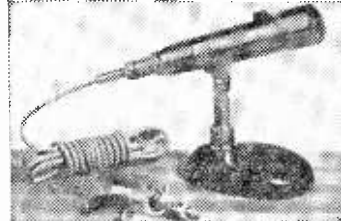
Consisting of three transistors for amplifiers, record/play volume control, miniature speaker, forward-stop-rewind-switch, reel of tape and spare reel, motor, att. reactive coloured case, Mic and earphone sockets, pick-up coil, mike, earphone and carrying handle supplied. Standard battery operated. Simple to put together in less than one hour. Brand new and guaranteed.

ONLY \$6.19.6

A guaranteed saving of at least £4! Results comparable with similar built-up recorders selling at around 12 gns. S.A.E. for further details. Order early.

### 3-WAY SLIM CRYSTAL MICROPHONE

MODEL 100C



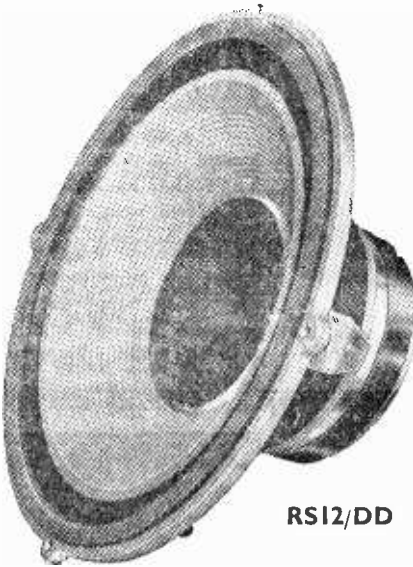
May be hand-held, stand mounted (either floor stand or desk stand) or suspended by lavalier cord. Response 60-10,000 Cps. Built-in on/off switch. Output level—52db. Omni-directional head. Clips on or off standard stand adaptor permitting tilting for multi-angle use. Satin chrome finish.

ONLY 48/-

Supplied complete with 7ft. of shielded cable, lavalier cord and desk stand. Brand new Floor Stand and Base, suitable for above, 65/-, Carriage Paid.

CALLERS WELCOME AT  
 87 TOTTENHAM COURT ROAD,  
 LONDON, W.1 MUS 9608





RS12/DD

**A 12" SPEAKER  
for the HOME CONSTRUCTOR**

A fine 12" Speaker employing a new type of double diaphragm and magnet assembly, the RS12/DD has been designed with the home constructor in mind—it is one of the few 12" models suitable for use in compact enclosures enabling a really high quality system to be assembled at a modest price.

*Some important features of the RS12/DD—*

- Very low resonance
- Synthetic Centring Device
- Ceramic Magnet
- Die-cast Chassis
- Foam edge Damping
- One-piece HF Flare Dome
- Airtight impregnated Roll Surround

**£11.10.0 TAX FREE**

Complete the coupon for technical specification of the RS12/DD including Constructional details of suitable cabinets.

Post to Wharfedale Wireless Works Ltd.,  
Idle, Bradford, Yorkshire



NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
\_\_\_\_\_ PW

**P.W. BEST SETS**



**OSMOR  
VERSIONS**

**P.W. POCKET S'HET:** 6 Transistors. Printed Circuit. Contemporary Case.

**P.W. MERCURY SIX:** 6 Transistor S'het. 7in. Speaker. Printed Circuit. Attractive two-col. Case.

**P.W. BRITANNIC TWO:** Simple Design. Mains powered. Good Performance. Economy.

**P.W. TROUBADOUR:** The fabulous 7-transistor set (June-July issues.)

We make up nearly all P.W. designs and arrange some for printed board construction.

COMPONENT PRICE LISTS ON REQUEST

**OSMOR Ltd.** 418 BRIGHTON RD.  
S. CROYDON Cro. 5148

**EXPRESS ELECTRONICS  
ROSEDENE LABORATORIES  
KINGSWOOD WAY, SELSDON, SURREY**

**VALVES NEW TESTED AND GUARANTEED FOR THREE MONTHS**

1C1	7/6	6H48	8/-	12AT7	8/-	DH177	8/-	EF86	9/-	FL81	12/6
1C3	8/-	6BE6	7/-	12AU7	3/6	DH142	8/6	EF91	4/-	FL84	7/-
1F1	8/-	6BH6	5/9	12AX7	6/0	DH150	10/-	EF92	5/6	PL83	7/6
1F3	7/6	6BJ6	5/9	12BH6	8/0	DK91	7/6	EL41	9/6	PY81	6/9
1FD1	8/-	6BR7	8/0	12BH7	10/6	DK92	7/6	EL84	7/-	PY82	7/6
1FD9	7/6	6BW6	7/6	12K5GT11/-	DK96	8/-	EM84	10/-	PY83	7/6	
1I4	8/0	6BW7	7/-	12Q7GT	7/6	DL82	7/6	EM85	10/-	SO41	8/6
1P1	8/-	6D2	4/-	16A5	9/-	DL94	8/6	EY51	7/6	U28	9/6
1P10	7/6	6F12	4/-	25A6G	8/6	DL96	8/-	EY81	10/-	U87	11/6
1P11	7/6	6H6GT	2/-	25L6GT	7/6	EH91	4/-	EZ40	7/6	U82	7/6
1U5	8/-	6J7GT	7/6	25Z4G	9/-	EHC41	10/-	EZ60	8/-	U78	7/6
1S3	8/-	6K7G	5/6	30C1	7/6	EBF80	8/6	EZ81	8/0	U78	5/-
1T4	7/6	6K8G	6/-	30L1	7/6	ECC81	6/-	HVR2	9/6	UBC41	8/6
1U5	6/6	6Q7G	5/6	35L8GT	9/-	ECC82	6/9	KT33C	6/-	UCH42	9/6
8Q4	8/-	6L7GT	8/-	35W4	8/6	ECC83	6/9	KT66	11/6	UF41	8/6
384	7/6	6N7GT	8/-	35Z4GT	8/-	ECC84	7/6	N17	7/6	UL41	8/6
3V4	6/6	6V6G	7/6	53KU	10/6	ECP80	8/6	N19	8/-	UY41	7/6
5U4G	7/6	6X4	5/-	6763	7/6	ECP82	8/-	N19	7/6	W76	4/6
5Y3GT	5/-	8X5G	5/-	80	8/-	ECH42	9/-	N709	7/-	W142	5/6
5Z4G	9/6	8X5GT	8/-	DAP91	7/6	ECH81	10/-	PC084	7/6	X17	7/6
6A5	6/6	787	9/6	DAP96	8/-	ECL50	8/6	PCF80	7/6	X142	8/-
6AL5	4/-	8D8	4/-	DF91	7/6	ECL82	9/-	PCP82	7/6	X150	9/-
6AM6	4/-	12AD6	11/6	DF96	8/-	EF41	9/-	PCL82	8/-	Z77	4/-
6AT6	6/-	12A8	10/-	DH76	7/6	EF80	8/-	PCL84	7/6	ZD17	7/6

High Stability Resistors 1/2W 5% 50 Ω to 1M, 9d. Midret Ceramics 500 v. 9d. Coax. Super quality 1/2in., 6d. yd. Plugs 9d. Sockets 9d. Silicon H.T. Rects. 250v. 300 MA 1in. x 1in. 17/6. Contact Cooled 250v. 50 MA 6/6. 85 MA 8/6.

**NEW TRANSISTORS BY MULLARD.** OC19, OC26, OC68, 25/-; OC44, OC45, 9/-; OC70, OC71, 8/-; OC72, 7/6; OC72 matched in prs. 18/-; OC74, OC75, OC78, OC81, 7/8; OC82, OC170, 9/6.

**VALVES MATCHED IN PAIRS**

EL84 17/-, N709 17/-, 6V6G 17/-, 6BW6 18/- per pair. Push Pull O.P. Transformers for above 3-15 D 14/8, P & F 1/8, 12in. P.M. Speakers 3 D 24/8. Baker's "selhurst" 12in, 15 Q 13W, 90/-, 12in. Stereo Model, 27.0.

**SETS OF VALVES**

DK91, DF91, DAP91, DL92 or DL94, 18/6	ECH42, EF41, EBC41
DK96, DF96, DAP96, DL96, 27/6	EL41, EZ40, 37/6
1C3, 1F1, 1FD1, 1P1, 27/2	UCH42, UF41, UBC41
1R8, 1T4, 1S8, 384, or 3V4, 18/6	UL41, UY41, 35/6

Postage and packing 6d. Over 21 post free. C.O.D. 2/6.



# A 4-valve Signal Tracer

THIS INSTRUMENT WILL ALSO PROVIDE A SIGNAL FOR TESTING AUDIO AMPLIFIERS

By V. E. Holley

*(Continued from page 137 of the June issue)*

THE circuit was described in detail in the last issue and in this month's article, the constructional details will be given.

An additional facility, which was not required in the prototype can be provided by bringing the grid of V3 out to a fifth jack socket as in Fig. 2(b), so that the valve becomes available for use as an indicator for alignment of receivers, etc. (see page 136, last month).

### Construction

The form of construction is not critical. The layout of the original was somewhat influenced by the fact that the chassis had previously been used for another purpose. However, the resulting arrangement, which is shown in Fig. 4, proved quite convenient. The valve V2 must be screened, as also must the choke, Ch1; the latter, if not already screened, can be dealt with quite simply

by wrapping it in corrugated cardboard and enclosing it in a can of suitable size, the lid of which can be bolted to the chassis.

The bracket shown in Fig. 5 is a simple and effective method of mounting the aerial. Rubber grommets are fitted into the two  $\frac{1}{8}$ in. holes, the ferrite rod is passed through them and the metal is then closed up to produce a good tight fit. Suitable material is aluminium sheet of 18s.w.g., and this is also suitable for the chassis. The tuning indicator, V3, is fitted at the end of about 9in. of four-core flexible cable and can be mounted in any desired position. It is not necessary to use the EM84 as in the prototype; almost any other type will serve equally well.

### Components and Wiring

The only critical components are C1 and C8. Both should be mica and C1 should be  $\pm 5\%$ .

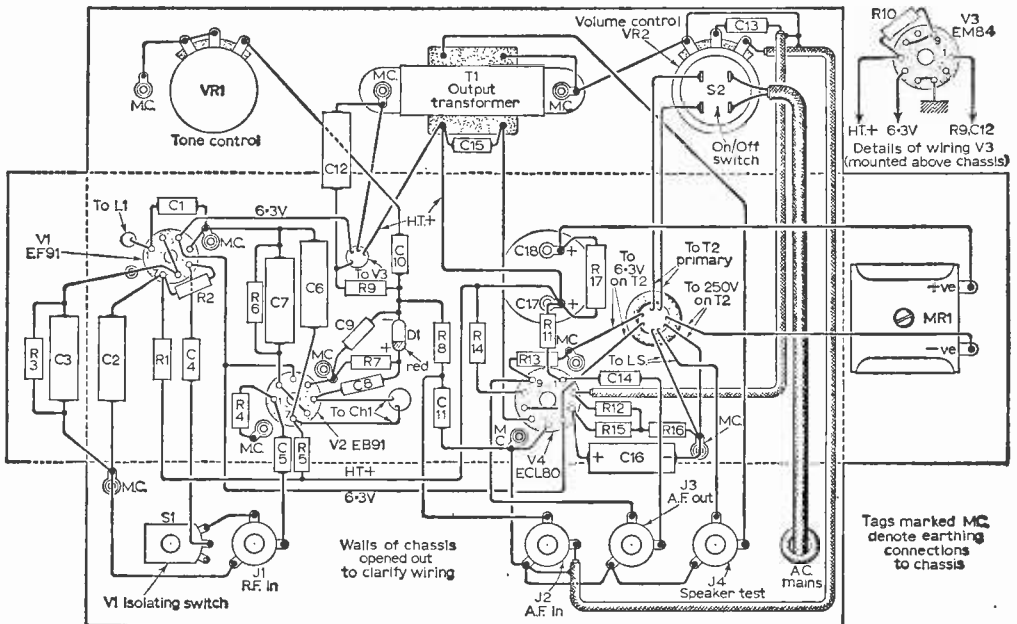


Fig. 4—The underchassis wiring diagram.

The value of C8 is not important, but its insulation must be above suspicion. The usual tolerances are satisfactory for the remaining components and the constructor may use anything he has to hand which can be fitted in. Capacitors in the H.T. circuits must be of 350V rating as they will receive the full peak voltage from the rectifier while the valve cathodes are warming up. The wattage rating for resistors was shown in the components list last month.

Valves other than EF91 can be used for V1 and V2, but they must be capable of operation with 200V on the screens or it will be necessary to provide additional voltage dropping and decoupling circuits for them.

A complete wiring diagram is given in Fig. 4 and shows the approximate position of each component in the chassis. The wiring has been opened out to show the connections clearly so that some of them appear much longer than in fact they are. Tinned copper wire of 22s.w.g. is suitable for all the wiring except the four flexible connections to V3.

**Testing**

When the wiring is complete and has been checked against the circuit diagram, test with a meter between C18 and chassis to see that there are no shorts in the H.T. circuits. If all is well, switch on and check that voltage is present at the screens and anodes of all the valves. Measure the H.T. circuits. If all is well, than 210, R17 must be increased in value to bring it down to this figure.

Alignment is limited to adjusting the position of the aerial coil upon the rod for maximum voltage at the diode load as

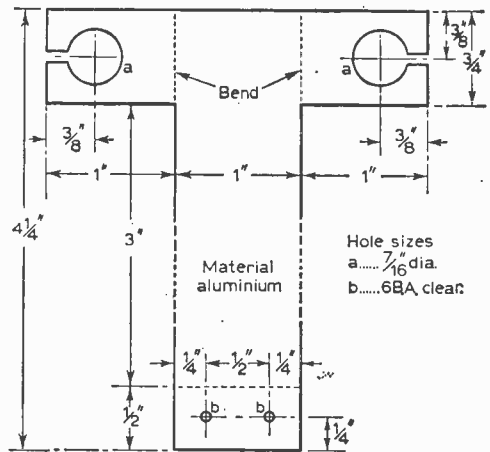
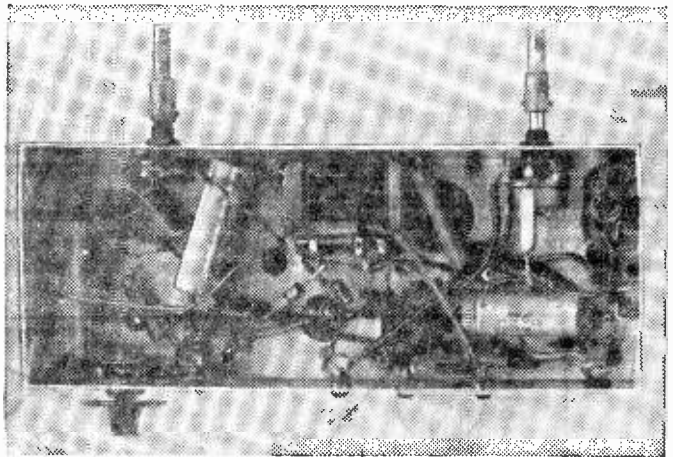
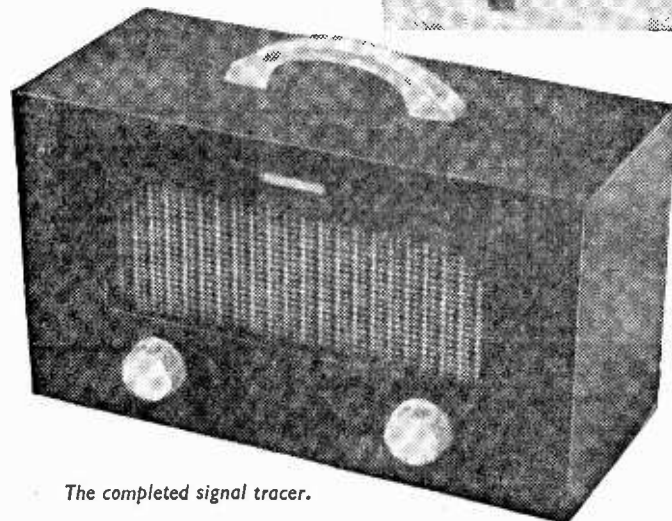


Fig. 5—Details of the ferrite rod aerial mounting bracket.



Above—An underchassis view of the instrument.



The completed signal tracer.

shown by the tuning indicator. It may be necessary, in order to achieve resonance, to make a small alteration in the value of C1 and of course, the value given in Fig. 1 holds good only for the Light programme on 200kc/s. The coil should be secured on the rod with a little hot bees-wax when the optimum position has been found.

**Test Leads**

Test leads should be no longer than conveniently necessary, and for A.F. work should be of screened cable. For R.F. tracing, the effect of the tracer upon the circuit to which it is connected must not be forgotten and the test

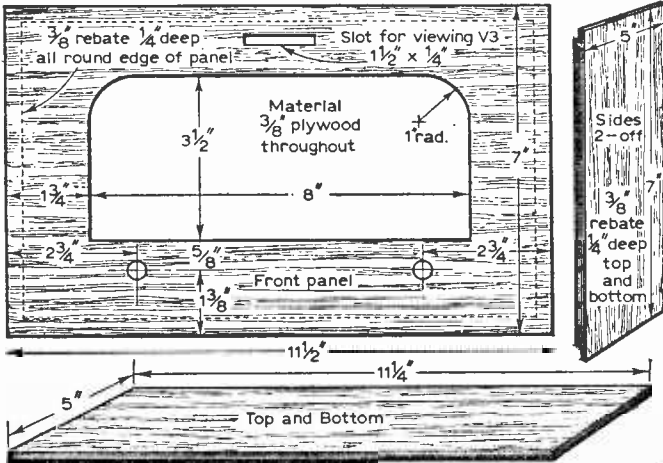


Fig. 6—The constructional details of the cabinet.

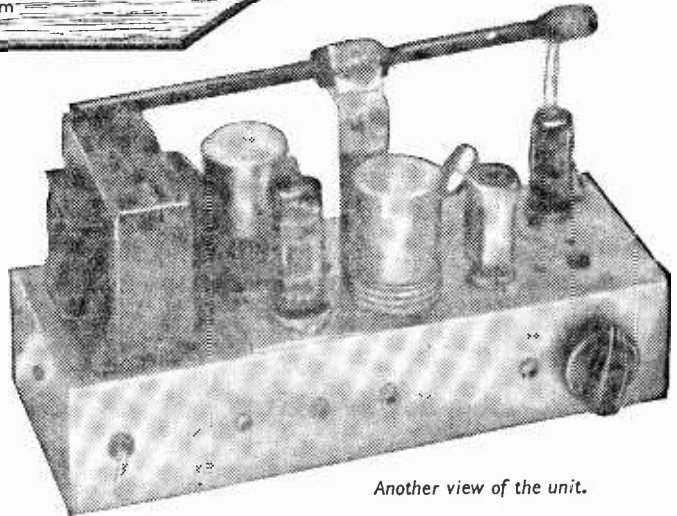
leads should be two single conductors so as to avoid introducing too much additional capacity. To check the tracing performance, clip the "hot" test lead to the grid of the first valve of the receiver and the other to its chassis; any signal present should be heard quite easily and can be followed through the I.F. stages to the signal diode. The A.F. test lead will then trace it through to the output transformer.

**Receiver Performance**

Though not originally intended for reception, apart from the provision of a test signal, the performance as a receiver was surprisingly good. In a not very favourable reception area, the single-tuned circuit proved adequate for interference-free reception

both in daylight and after dark at quite unexceptionable quality. The tracer, in fact, was viewed with unqualified approval as a handy portable receiver, and as a result had to be provided with a tone control (VR1) and the polished plywood cabinet shown in the illustration on the opposite page.

Since a cabinet of some kind will be needed anyway, the measurements and form of construction are given in Fig. 6. A 7in. x 4in. elliptical speaker was mounted behind the large front aperture and V3, the tuning indicator behind the smaller one above it where, having no other



Another view of the unit.

function in receiver service, it does duty as a pilot light. A cream plastic carrying handle and two control knobs to match add to the appearance. ■

**New Electronics Company for Nigeria**

It was announced recently, by the L.M. Ericsson Company of Sweden and Marconi's Wireless Telegraph Company Limited of England, that they have together formed a new company in Nigeria, to be known as the Nigerian Telecommunications Corporation.

An official inauguration ceremony took place at the Federal Palace Hotel, Lagos.

The purpose of the new Corporation is three-fold: to provide an "on-the-spot" organisation which can deal rapidly and efficiently with all aspects of telecommunication requirements; to promote the expansion of technical education in Nigeria, and to introduce local assembly of some types of telecommunication units rather than import them already assembled.

The L.M. Ericsson Company is known for its telephone equipment. Since 1960 L.M. Ericsson has been represented in Nigeria by the Industrial Products Company (West Africa) Ltd.

The Marconi Company is at present responsible for the maintenance of much of the Nigerian Federation telecommunications network. In 1956, under contract from the Department of Posts and Telegraphs, the Company set up a Telecommunication School at Oshodi, Lagos, in which 217 students are currently under training on four-year courses. The initial (1956) intake of trainees have now completed their course and have taken over as maintenance engineers in the Nigerian P and T. Other Nigerian engineers are undergoing training at the Marconi Works in England.

# How Transistors Work

By B. N. Rolfe

(Continued from page 165 of the June issue)

## A BASIC NON-MATHEMATICAL EXPLANATION

As a conclusion to this series we shall now deal essentially with fault finding in transistor equipment, but before useful work can be carried out it is necessary to have available a testmeter giving a range of fairly low voltage full-scale deflections. An ideal instrument would be a multimeter with low voltage ranges of 0-1, 0-5, 0-10 and 0-20 and with a sensitivity of 20,000Ω/V. This would require a meter movement which itself had a full-scale sensitivity of at least 50μA.

### Sensitivity

A multimeter based on such a movement would also probably give full-scale deflection on the lowest current range at 50 or 100μA. This would be extremely useful for oscillator checking and for other tests in which the circuit current is small. Further full-scale current ranges of 250μA, 1mA, 10mA, 100mA and 1A would be very useful, as also would a range of "ohms" measurements from about 1Ω to 10M.

Such an instrument would allow almost the whole of any item of transistorised equipment to be analysed from the static (or D.C.) point of view. To secure a reasonable indication of what is wrong—or not wrong—in a transistor stage it is essential to be able to measure small differences

in relatively low voltages (and currents). We must also always keep in mind that transistors are current-operated devices—that is, the current is the prominent factor with the relatively low impedances encountered in transistorised circuits compared with the lower currents and higher impedances in valve equipment.

### Loading

This impedance difference is also somewhat important when injecting signals from a signal generator and when measuring output on an output meter or A.C. voltmeter. Valve circuits put a negligible load across the termination of a signal generator (owing to their high impedances compared with the low output impedance of most signal generators) and therefore the voltage indicated by the R.F. attenuator on the signal generator may be taken as applied to the circuits.

This may not be so with transistor circuits. Two things could happen here: one is that the low impedance output of the generator could load the transistor input circuits heavily and in certain cases alter the base current distributions sufficiently to put the stages virtually out of action. Secondly, the low impedance of the transistor input circuit could load the generator termination so that the signal actually appearing across the "loaded" termination was considerably below the value indicated on the attenuator of the signal generator.

Whilst the former condition may be apparent, the latter may simply give a false impression of receiver sensitivity and lead to fault tracing in a fault-free circuit. In some service manuals

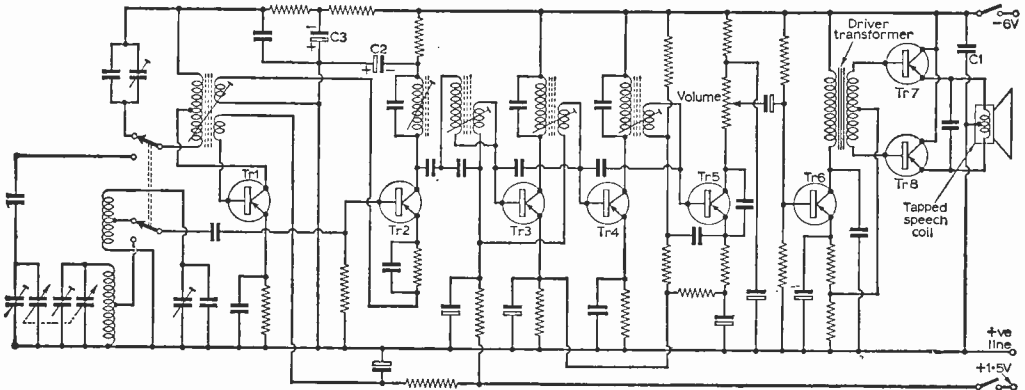


Fig. 29—The circuit diagram of a transistor portable which uses a centre-tapped speech coil coupled direct to the output transistors, Tr7 and Tr8, without a transformer.

relating to transistor sets the approximate sensitivity is given in terms of signal voltage applied across a specific value of load resistance. A load value typical in this respect is  $500\Omega$ , and an I.F. sensitivity value, for example, may be  $5\text{mV}$  for an output of  $50\text{mW}$  (audio, of course).

### Alternative Method

In some manuals, instead of a definite output power being specified, the voltage across the speech coil of the loudspeaker for "standard" output may be given. It will be understood that the signal generator must be modulated (usually to a depth of 30% at  $400\text{c/s}$ ) in order to produce A.F. across the speaker. The reason for a voltage being given instead of a power is because the speech coil impedances differ considerably—from valve sets to transistor sets—and there is also quite a difference between the speech coil impedances of transistor sets of different models.

### Output Loading

The power output across a load of impedance  $Z$  is equal to  $E^2/Z$ , where  $E$  is the r.m.s. voltage measured on an A.C. voltmeter. With valve sets  $Z$  is usually in the region of  $3\Omega$  (at  $1,000\text{c/s}$ ), while in transistorised sets the speech coil impedance may be 30, 60,  $120\Omega$  or some entirely different value, depending upon the design of the output stage. In some cases the speech coil may even be centre-tapped to facilitate connection to a push-pull output stage of a circuit such as that given in Fig. 29 (Tr7 and Tr8). Here there is no

tapped speech coil, the push-pull effect being given by the centre tap on the batteries.

It is now fairly clear why it would be difficult for the manufacturers to stipulate a "standard" output in terms of power in relation to servicing operations on their sets. It is far easier to indicate an A.C. voltage across the speech coil, for then the impedance does not need to be considered after the first computation at the factory.

However, if neither a voltage reference nor impedance value is given, the power output of most class B output stages can be discovered in a very interesting manner. The idea is first to measure the current consumed by the output stages under zero signal conditions, then measure the current when a signal is applied to give the required audio output. The difference in current (in milliamperes) should then be multiplied by three-quarters of the battery voltage and the resulting figure will approximate to the power output in milliwatts. Let us take an example. Suppose we find that the current increases by  $20\text{mA}$  when a signal is applied and that the set is working from an  $8\text{V}$  battery. Three-quarters of 8 is 6 and 6 times 20 is 120. Thus, the output power could be taken as  $120\text{mW}$ . This is not highly accurate, of course, but it is sufficiently accurate for most servicing activities provided (a) that the output stage is of the true class B type and of D.C. parallel mode and (b) that the signal applied is a pure sine wave. For example, the A.F. could be the modulation signal derived from an A.M. signal generator.

### Generator Input Loading

The sensitivity of a receiver (or section of a receiver) is usually given in terms of signal required to produce a "standard" output when the signal is modulated to a depth of 30% at  $400\text{c/s}$ . This is easy to check with valve equipment where one can be fairly sure that the voltage given on the attenuator of the signal generator and R.F. output controls is being applied to the set or circuits under test.

With transistorised equipment the generator may have to be "loaded" by, say,  $500\Omega$  to feed into the base circuit of a transistor stage. There is no difficulty in securing such a loading, since if the signal generator is normally loaded at, say,  $70\Omega$  then it is necessary simply to include a series resistor of  $430\Omega$  to increase the impedance to  $500\Omega$ , as shown in Fig. 32, but now what happens to the output voltage?

Let us suppose that the generator produces the voltage indicated on the attenuator across  $70\Omega$  within the instrument (e.g., without an external  $70\Omega$  load resistor). The signal voltage is thus being applied across the  $430\Omega$  resistor and the  $500\Omega$  load in series, and the load (i.e., the input circuits of the set) will receive only approximately half the voltage indicated on the R.F. controls of the generator. On the other hand, if the generator requires an external  $70\Omega$  load to give the signal voltage outputs indicated on the R.F. controls, then by running the generator without a load the voltage across the two series resistive elements will be twice that indicated, and the signal across the  $500\Omega$  load will be approximately equal to that indicated on the R.F. controls.

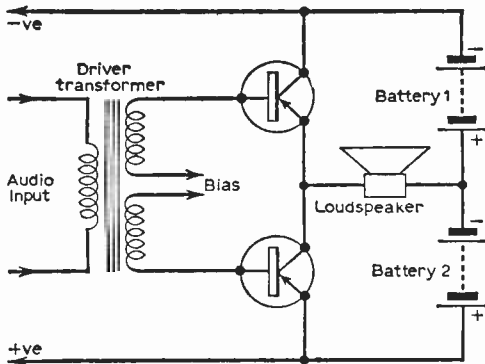


Fig. 30—An alternative transformer-less output stage using a tap on the battery system instead of on the speech coil. This is sometimes called a "D.C. series" output stage.

output transformer, so the loudspeaker impedance must be of a sufficiently high value to match into the emitter circuits of the two transistors.

An alternative "transformer-less" push-pull output stage is shown in Fig. 30. This is sometimes called the "D.C. series" output stage as distinct from the "D.C. parallel" arrangement shown in Fig. 31. The latter uses a loudspeaker transformer in the normal manner, while the former uses neither a transformer nor centre-

These points are well worth bearing in mind when dealing with transistorised equipment and padding the generator for suitable load values.

There is another very important point and that is the signal output lead of the signal generator must be isolated from the transistor circuits by two capacitors (one in each conductor). If such isolation is not adopted there is a strong possibility that D.C. continuity through the attenuator

various stages can be gleaned simply by measuring the voltages across the emitter resistors and comparing them with the voltages given in the manual or service sheet. The voltage is normally fairly low here, usually around one volt or below, hence the reason for a low-reading voltmeter.

Very low or zero voltage across an emitter resistor should lead to a check of the base bias and collector voltage, and if these are normal then one can be fairly certain that the associated transistor is faulty—probably open-circuited. A reading which is higher than normal should, again, lead to a check of the base bias, for excessive base current could cause the symptom. And this may be promoted either by a leak in a coupling electrolytic (in an A.F. stage, for example) or by an alteration in value of one of the base resistors.

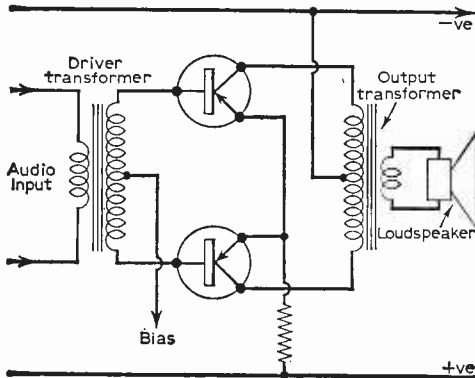


Fig. 31—The more conventional output stage, using a loudspeaker transformer. This is a "D.C. parallel" arrangement, as distinct from the series circuit of Fig. 30.

and R.F. controls of the generator will disturb the base current of the stage to which the generator is connected.

### General Tests

Experience has shown that there are two major causes of trouble in transistorised sets, these being poor insulation in interstage coupling electrolytics and alteration in value of the base potential-divider resistors. Transistors sometimes fail when they are fairly new, but once they have been in operation for some time they rarely give trouble

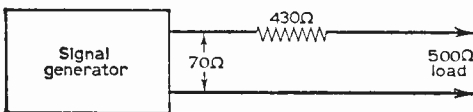


Fig. 32—How the output of a signal generator may be "padded" to give a higher impedance. Care must be taken when using this arrangement, however, since some of the signal voltage is lost across the series resistor and all (or that indicated on the R.F. controls) may not be applied across the load—see text.

unless, of course, they are damaged or overloaded by incorrect servicing techniques.

It most definitely pays to obtain the service manual or service sheet for the receiver under repair. A good idea of the operation of the

### Specific Tests

Signal tracing is practised extensively in servicing transistorised equipment and can quickly lead to the stage which is at fault. There are two methods, one by using the loudspeaker as the "signal detector" and the other by using an R.F. probe and A.F. amplifier. In the latter the signal (modulated) is applied to the input of the set, and the detector probe used to extract the signal at various points in the circuit towards the loudspeaker. The detected signal is then applied to an A.F. amplifier and separate loudspeaker. By moving the probe along the circuit the point at which the signal fails to pass can quickly be discovered.

The other method requires the actual signal (from a signal generator) to be moved from point to point in the set, starting at A.F. in the output stage, until a point is reached where the signal fails to pass through the stages under test. As an example, suppose that an A.F. signal could be heard in the loudspeaker when applied to the base of Tr6 in Fig. 29, and yet could not be heard when applied to the base of Tr5. As Tr5 is the detector stage (dealing also with A.F.) it would follow that the trouble lies either in Tr5 itself or in an associated component.

Similarly, if an I.F. signal could be passed through the set from the base of Tr4 but not from the base of Tr3, then the trouble would lie in Tr3 stage or associated components. If an I.F. signal could be passed through the set from Tr1 base circuit, and yet the set is completely dead to aerial signals, the trouble would almost certainly lie in the oscillator section of Tr1. Tr1 itself could be defective, but the most likely cause would be either in the oscillator coil or associated components or in the base or emitter components.

Distortion in the output should first lead to a check of the battery voltage and, if it is normal, to a check of the two push-pull output transistors. Motor-boating is also invariably caused by a worn battery, but the trouble may be aggravated by a low value or open-circuit H.T. by-pass capacitor such as C1 in Fig. 29.

Impaired battery life should also lead to a check of C1, for this could be slightly leaky without detracting too much from the efficiency of decoupling. Other H.T. decoupling capacitors such as C2 and C3 in the circuit should also be checked.

### SPECIAL BARGAIN OFFER! RECORD PLAYER KITS

**AUTO CHANGER KIT**—Comprising three Units. Contemporary styled Cabinet—2 valve, 2 watt amp. and 7 x 4 in. quality speaker. Variable tone and Volume Controls with feedback circuit and B.S.R. 4-speed 12 Record Mixer. Auto Changer Unit

**BARGAIN PRICE £12.10s.** only  
Cabinet Size: 17 x 14 1/2 x 8 1/2 ins. Carr. 7/6.

**SINGLE PLAYER KIT**—Similar spec. to Autochanger Kit except Player is 4-speed B.S.R. T.U.9. Single Record Player Unit. Attractive Contemporary Styled Cabinet. Size 13 1/2 x 13 x 6 ins. with splendid volume and reproduction.

**BARGAIN PRICE £8.19.6** only  
Carr. 5/-

**ALL UNITS READY WIRED. SIMPLE SCREWDRIVER ASSEMBLY ONLY**

**FULL SATISFACTION—REFUND GUARANTEE**  
Send for leaflet. Full details—3d. stamp.

### 7-VALVE AM/FM RADIOGRAM CHASSIS

Valve line-up: ECC85 ECH81 EF89 EABC80 EL84 EM81 EZ80.

Three Waveband and Switched Gram position. Mid. 200-500 m., Long 1,000-2,000 m., VHF/FM 88-93 Mc/s. Philips Continental Tuning insert with permeability tuning on FM and combined AM/FM IF transformers, 460 Kc/s and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction are of a very high standard. Chassis size 13 1/2 x 6 1/2 in. Height 7 1/2 in. Edge Illuminated glass dial 1 1/2 x 3 1/2 in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation.



Aligned and tested ready for use **£13.10.0** Carr. & ins., 7/6.

Complete with 4 Knobs—walnut or Ivory to choice. Indoor FM Aerial, 3/6 extra. Three ohm P.M. speaker only required. Recommended quality speakers: 10in. Rola (Heavy Duty), 30/-; 13 1/2 x 8 in. E.M.I. Fidelity 35/-; 8in. Rola or Elac (heavy duty), 25/-, p. & p. 5/6.

### BARGAINS 4-SPEED PLAYER UNITS

Single Players Carr. 3/6  
Garrard 4 S.P. £6.19.6  
Garrard T.A. Mk.2 £7.19.6  
Collaro "Junior" 7/-  
B.S.R. Latest TU12 79/6  
E.M.I. Junior '965' 89/6

Auto-Changers Carr. 5/-  
Collaro "C 60" £7.15.0  
B.S.R. (UA14) £7.10.0  
Garrard "Auto-slim" £8.12.6  
Garrard Model RC209 91/6s.

### JASON FM TUNER UNITS

Designer-approved Kits of PARTS:  
FM1, 5 gns. 4 valves, 20/-  
FM2, 27. 5 valves, 37/6.  
JTV MFCURV 10 gns.  
JTV2 £13.9.6. 4 valves, 32/6.

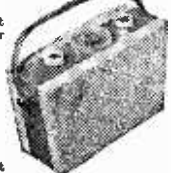
**NEW JASON FM HAND-BOOK**, 2/6. 48 hr. Alignment Service 7/6. P. & P. 2/6.

### SPECIAL BARGAIN OFFER "6 plus 1"

**TRANSISTOR RADIO KIT**

**Now only £6.19.6**

... using 3 latest type surface Barrier Transistors.  
Complete Kit carr. 2/6  
MANUFACTURERS SURPLUS BARGAIN OFFER. PRICE BARRIER BLASHED—A further bulk purchase of this popular Kit enables us to pass on latest price reduction direct to Constructor. Kit is a modern, sensitive, quality Receiver with all latest circuit features and is complete with 7 x 3 1/2 in. Speaker (3 ohms), and all circuit and assembly instructions. 8 BVA Transistors and Germ. Diode. Printed Cot. Med. and L.W. Ferrite Aerial and Car Radio Coupling. 500 mV Output. Attractive Gilt dial and Slow Motion Drive with "Clear Vu" Tuning Knob, etc. Contemp. two-tone Cabinets 9 x 5 x 3 1/2 in., as illustrated, 25/- extra.



### RECORD PLAYER CABINETS

Cabinet Price **£3.3.0** Carr. & Ins. 5/-



Contemporary style, rexine covered cabinet in mottled red and white (P.M. dot). Size 13 1/2 x 13 x 6 1/2 in., fitted with all accessories including baffle board and anodised metal fret. Space available for all modern amplifiers and autochangers, etc. Uncont record player mounting board 14 x 13 in. supplied.

**2-VALVE 3-WATT AMPLIFIER**  
Two-stage ECL82 with vol. and neg. feedback Tone control. A.C. 200/250 v. with knobs, etc., ready wired to fit above cabinet. £2.17.6. P. & P. 1/6.  
6in. Spkr. & Trans., 22/- P. & P. 2/-.

### TYGAN FRET (contemp. pat.)

12 x 12in. 2/-; 12 x 18in. 3/-; 12 x 24in. 4/-; 18 x 24in. 6/-, etc.

### Speaker Fret — Expanded bronze anodised metal tin. x 1/2 in. diamond mesh, non 4/6 sq. ft. Multiples of 6in. cut max. width, 4ft.

Electrolytics	All Types	New Stock	TUBULAR CAN TYPES
26/25V	1/8	8+8/450V	4/6
50/12V	1/8	8+16/450V	5/1
60/60V	2/-	32+32/275V	4/6
100/25V	2/-	100+50/350V	8/6
8/450V	2/3	60+250	12/6
16/450V	3/6	19+16/45V	5/6
19+16/45V	5/6	100+200	12/6
32+32/450V	6/6	275V	12/6

### Transistor Components

Midget I.F.'s—465 Kc/s. 9/16in. dia. 5/6  
Osc. Coil—M/W, 9/16in. dia. 5/6  
Osc. Coil—M. & L.W. 5/6  
Midget Driver Trans. 3-5d. 6/9  
Midget O/Put Trans. P.P. to 3 ohms, 6/8.  
Ferrite Aerial M. & L.W., Car aerial coil, 9/3.  
Elect. Condensers—Midget Type 1 mfd-50mfd ea. 1/9, 100 mfd. 2/-; 12V wks.  
Condensers—0.1mfd. to 0.4mfd. 9d., 0.5mfd. to 1mfd. 1/-; 2.5mfd. 1/3/-; 5mfd. 1/6.

**Tuning Condensers**—"JB" "OO" 208 pF + 176 pF 8/6; with Trimmers 9/6. Single 365pF 7/6. Sub min. tin. J.B. Die min. .001L .0003 or .0005 7/- each.  
Midget Vol. Control—with edge control knob. 55 ohms with switch, 2/8. Ditto to less switch 9/8.  
Speakers—P.M.—2in. Plessey 75 ohms 15/6. 2 1/2 in. Continental 8 ohms 13/6. 3in. E.M.I. 3 ohms 17/6. 7 x 4 in. Plessey 35 ohms 23/6.  
Car Plug Phones—Min. Ccn-tinental type. 3ft. lead, jack plug and socket. High Imp. 8/- Low Imp. 7/6.

### TRANSISTOR BARGAINS

Brand New—BVA 1st Grade	Get114	Get116
OC44	10/6	Get114 6/6
OC45	9/6	OC72 7/6
OC81	7/6	OC70 5/6
20C81	15/6	OC71 5/6
XA02	10/-	OC78 7/6
XA101	9/6	GEX34 2/9
XB103	7/6	OAO7 2/9
XC101	8/6	OAB1 2/9
Special offer: One OC44, two OC81's	21/6	One OC81D, two OC81's (matched pair) 19/6.

### RECORDING TAPE—Reduced Prices

Famous American Columbia (CBS) Premier Quality Tape at **NEW REDUCED PRICES**. A genuine recommended Quality Tape—"TRY IT" Brand new, boxed and fully guaranteed. Fitted with leader and stop rolls.

Standard	Long Play	Double Play
600ft. 13/-	900ft. 17/6	1,200ft. 21/6
53in. 900ft. 16/-	1,200ft. 19/6	1,600ft. 27/6
7in. 1,200ft. 21/-	1,800ft. 23/6	2,400ft. 47/6

P. & P. per reel 1/-, 6d. on each additional reel.  
**SPECIAL BARGAIN**, 3in. mfrs. Tape 225ft. 4/9. P. & P. 6d.  
3in. message Tape 150ft. 3/9. 7in. 2/3  
3in. 1/3, 5in. 2/-, 5 1/2 in. 2/-, 7in. 2/3  
Plastic Spool Containers 5in. 1/6, 5 1/2 in. 2/-, 7in. 2/3

### BSR TAPE RECORDER KIT £16.10s.



Latest 5-valve circuit based on Mullard's design. Magic eye and tone controls. Pressed Circuit. Radio and Mike inputs. A sensitive quality recorder at special Unit Kit prices.  
Amp. Kit 90/- || BSR MONARDEC 4 Valves 37/6 || TAPE UNIT Power Pack 37/6 || £28.10.0  
Send 3d. stamp for full details. Handbook, circuit and instructions 2/6

### ENAMELLED COPPER WIRE—1lb. reels, 14c-20c, 2/8; 25c-20c, 3/-; 30c-40c, 3/9.

Other gauges quoted for Speakers—P.M.—3 ohms 2 1/2 in. E ac. 17/6. 3in. Goodmans 18/6. 7 x 4 in. Goodmans 18/6. 6in. Rola 20/-, 10in. R. & A. 25/-, 10 x 6 in. Goodmans 25/-, E.M.I. Tweeter, 29/6. 12in. R. & A. 35/-.  
Ersin Multicore Solder 60/40. 3d. per yard. 1lb. 2/6, etc.

### Volume Controls—5K-2Meg. 10K, 5W 1/3, 10W 1/6, 15W 2/-, Preset T/V Pots, W/W 25 ohms -50 K 3/-, 50 K-2 Meg. (Carbon) 3/-.

W/W Resistors 25 ohms to 10K, 5W 1/3, 10W 1/6, 15W 2/-, Preset T/V Pots, W/W 25 ohms -50 K 3/-, 50 K-2 Meg. (Carbon) 3/-.

### COAX—80 OHM CABLE

High grade low loss Cellular air spaced Polythene—1 1/2 in. diameter. Stranded cond. Famous mfrs. Now only 6d. per yard. Bargain Prices—Special Lengths:  
20 yd. 9/-, P. & P. 1/8.  
40 yds. 17/6, P. & P. 2/-.  
60 yds. 25/-, P. & P. 3/-.  
Coax Plugs 1/-. Sockets 1/-. Couplers 1/3. Outlet Boxes 4/6.



### Condensers—Silver Mica. All values, 2pF to 1,000pF 6d. each.

Ditto Ceramics 9d. Tub. 450V T.C.C., etc., 0.001 mfd. to 0.01 and 0.1/350V. 9d. 0.02-0.1/500V 1/-, 0.25 Hunts 1/6. 0.5 T.C.C. 1/9, etc., etc. (Close Tol. 8/Micas—10% 5pF-500pF 8d. 600-5,000pF 1/6. 1% 2pF-100pF 9d. 100pF-500pF 11d. 575pF-5,000pF 1/6. Resistors—Full Range 10 ohms-10 megohms 20%, 4 and 1W 3d., 1W 5d. (Midget type modern rating) 1W 6d., 2W 9d. III-Stub 10% 1W 5d., 1W 7d. 5d. 1W 9d., 1W 1W 1/6.

### NEW BOXED VALVES

New Boxed	Valves	All Guaranteed
114	6/-	ECC83 8/-, PCC84 9/6
1R5	7/6	ECL82 10/6, PCF80 9/6
1S5	7/6	ECL80 10/6, PCL83 12/6
384	7/6	EF80 9/6, PCL84 12/6
3V4	7/6	EF86 12/6, PL81 12/6
DAF96	9/-	EL84 5/6, PL82 9/6
DF96	9/-	EY31 9/6, PL83 10/6
DK96	9/-	EY86 10/-, PY32 12/6
DL96	9/-	EZ81 7/6, PY81 9/6
DAB81	8/-	GZ32 12/6, PY82 7/6
ECC82	8/-	EM81 9/6, U25 12/6

Send for detailed bargain lists, 3d. stamp. We manufacture all types Radio Mats Transf. Chokes, Quality O/P Trans., etc. Enquiries invited for Specials, Prototypes for small production runs. Quotation by return.

### RADIO COMPONENT SPECIALISTS

70 Brigatock Rd., Thornton Heath, Surrey. Hours: 9 a.m.-6 p.m., 1 p.m. Wed. THO 2188. Terms C.W.O. or C.O.D. Post and Packing up to 4lb. 9d.; 1lb., 1/3; 2lb., 2/3; 5lb., 2/9; 8lb., 3/6.

# D. & B. TELEVISION

Cherrywood 3955  
Dept. A.6 131 & 131A KINGSTON ROAD  
SOUTH WIMBLEDON, S.W.19

Open Mon.—Sat. 10 a.m.—7 p.m. (Except Wed. 1 p.m.).  
Nearest Tube Station South Wimbledon (Northern Line).

"COMPARE OUR PRICES"

FOR THE FINEST, FASTEST SERVICE IN THE COUNTRY  
Your problems are our Business

LOOK! TRANSISTOR PRICES DOWN AGAIN.

MULLARD. OC44 9/-, OC45 8/-, OCT1 5/-, \*OC72 6/-, \*OC76 7/-, \*OC77 12/-, \*OC81 7/-, OC81D 6/-.

Complete set of 6 Mullard Transistors only 35/-. Comprising OC44, two OC45's, OC81D, two OC81's. Matched Pair.

MULLARD DIODES: OA81 2/9, OA90 2/9, OA92 2/9.

G.E.C. Transistors: GET875 11/6, GET874 6/11, GET873 6/10, \*GET115 7/6, \*GET114 4/8.

Complete Set of 6 G.E.C. Transistors, comprising: GET 874, two GET873's, GET114, Matched Pair GET114. ONLY 28/6.

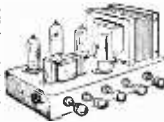
COMPLETE S.T.C. Transistors. Only 25/6.

(\* Available in matched pairs, 1/- extra).

## COMPLETE NEW RANGE OF TRANSISTOR COMPONENTS IN STOCK

THREE BRAND NEW \* STAR \* BARGAINS  
Designed for quality and outstanding value.

\* NEW \* R.T.D. 6 Watt Monaural Amplifier, using heavy duty, double-wound mains Transformer. With separate rectifier winding. Valves: Rectifier, Driver and Output. 5 Controls: Switch, Volume, Bass, Treble, Middle. Heavy duty output transformer. METAL CHASSIS. All components brand new. Ready built.....ONLY £5.5.0. COMPLETE or all parts in kit form. ONLY £3.15.0. P. & P. 3/6.



\* NEW \* FOUR VALVE, Inc. RECTIFIER. A.C. ONLY MAINS RADIO. Medium and Long Wave. Heavy Duty Mains Transformer. Metal Chassis. Ferrite Rod Aerial. Extremely attractive cabinet, two-tone grey. Splendid finish. Ready built for use. ONLY £3.0.0. Supplied with slow motion tuning, 10/- extra.

Or, all parts in kit form. ONLY £6.5.0. P. & P. 7/6. You will be delighted with this purchase. All parts sold separately.

\* NEW \* Undoubtedly the best deal ever offered in Transistor Radios. The most attractive professional finish ever in kit form. 6-Transistor Pocket Superhet. Using the latest components from America. Transistors. Printed circuit. First Grade Transistors and Components. Ferrite rod aerial long and medium wave bands. Must be seen to be believed.



AT ONLY £6.15.0. P. & P. 3/6.  
EASY TO BUILD. All parts sold separately.

Send 6d. for lists of transistor components, Speakers, Transformers, etc.

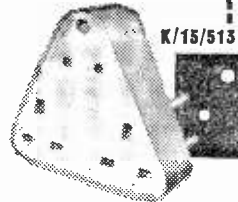
ALL VALUES ARE SOLD SUBJECT TO FULL GUARANTEE  
CURRENT VALVE LIST

AZ31	8/6	ECC85	7/8	KT36	8/6	8P61	2/3	U08	14/8	7C5	7/3
B06	5/6	ECH80	8/-	KT61	8/3	U22	6/6	UY41	6/3	7C8	7/6
CBL31	20/-	ECH21	15/-	KT63	6/3	U24	10/-	UY41	4/-	7S7	8/3
COH35	12/6	ECH35	9/-	KTW61	5/9	U25	12/-	UY85	6/6	7Y4	7/3
CL33	10/-	ECH42	7/8	KTW63	5/9	U26	9/6	W77	4/-	10F1	4/8
D77	3/-	ECH81	7/8	L63	2/9	U31	7/-	Z77	3/-	10C1	10/-
DAF91	5/-	ECL80	7/8	PC84	7/6	U37	17/-	3V4	4/9	10C2	13/-
DAF96	7/-	ECL82	9/9	PCC59	8/9	U50	5/6	3Y3	6/3	10P13	8/6
DF91	3/9	ECL83	11/9	PCF80	7/8	U52	4/9	3Y3	8/9	10P14	8/9
DF96	7/3	EF39	4/3	PCF82	7/9	U91	9/6	3Z4	10/-	12AT6	7/3
HD53	6/-	EF50	1/3	PCF86	14/8	U98	9/-	6AL5	3/-	12AT7	4/8
HD77	4/6	EF50	7/6	PCL33	9/9	U98	14/8	6AM6	3/-	12AU7	5/6
DK91	6/-	EF85	6/3	PCL33	9/9	U99	12/6	6AT6	5/6	12AX7	8/3
DK92	7/6	EF86	8/9	PCL34	7/6	U801	22/-	6AT6	5/6	12BC6	14/8
DK96	7/3	EF89	6/6	PCL35	15/-	UABC80	8/6	6B66	12/-	20D1	8/6
DL91	8/3	EF91	3/-	PL33	8/-	UAF42	8/6	6BW6	7/8	20P2	8/3
DL92	6/6	EF92	4/-	PL36	9/9	UB41	7/8	3CD6	25/6	20L1	12/6
DL94	7/-	EL33	7/8	PL38	14/8	UB41	7/8	3CD6	25/6	20L1	12/6
DL96	7/-	EL38	12/-	PL81	9/-	UBC41	7/8	6D2	3/-	20P1	9/6
EABC80	7/3	EL41	7/9	PL82	6/6	UBF89	7/8	6F1	4/-	20P3	12/-
EAF42	7/8	EL84	8/9	PL83	8/8	UC84	12/6	6F12	3/-	20P4	16/8
EB41	6/6	EM80	9/6	PL84	8/8	UC85	7/8	6F13	6/6	20P5	14/6
EB91	3/-	EM81	8/6	PY31	7/-	UCF80	14/8	6F14	9/-	27B1	14/6
EBC33	4/6	EM84	9/6	PY32	10/-	UCH21	12/3	6F15	9/-	30C1	7/6
EB041	7/8	EY51	7/9	PY80	6/-	UCH42	7/8	6F33	9/3	30FL1	9/3
EBF80	7/6	EY86	7/8	PY81	6/-	UCH81	8/3	6L1	12/-	30L1	7/6
EBF89	8/3	EZ40	6/3	PY82	6/-	UC153	12/6	6L6	9/9	30P4	11/3
EBL31	20/-	EZ41	6/9	PY83	8/-	UH45	9/9	6L18	8/-	30P12	8/-
ECC81	4/6	EZ80	6/6	PY88	12/-	UL41	7/-	6L19	12/-	52KU	10/-
ECC82	5/6	GZ32	8/9	PZ30	8/-	UL44	10/9	68N7	4/8	53KU	10/-
ECC83	6/3	GZ34	12/6	R18	10/-	UL46	7/-	6V6	5/-	54KU	8/6
ECC84	7/8	KT33C	6/-	8P41	2/3	UL84	7/8	6U4	10/-	185BT	12/6

We pride ourselves that we can obtain and supply any TV spare. Please ask us for ANY components you may require we are almost certain to have them.

TERMS: S.A.E. all enquiries. C.W.O. or C.O.D. 3/- extra. Postage on Valves, 6d. each. C.R.T.'s 12/6 inc. insurance. SATISFACTION ASSURED. RETURN POST SERVICE.

# CHANGE PLACES



WITHOUT CHANGING PLUG-TOPS



Each adaptor provides the following outlets:-  
ONE—5 AMP 3 PIN (ROUND) FUSED  
TWO—13 AMP 3 PIN (FLAT)

## K/155 and K/15/513 ADAPTORS

Essential in homes where 15 amp and 13 amp points exist—ideal when moving from room to room, or home to home, these adaptors provide safe connection for electrical appliances fitted with 13 amp or 5 amp 3-pin plug tops.

K/15/513 for 15 amp 3-pin sockets  
Price: Brown 11/9, White 12/9  
K/155 for 13 amp 3-pin sockets  
Price: Brown 10/9, White 12/3

GRELCO LIMITED,  
MINEHEAD • SOMERSET  
Telephone: MINEHEAD 740

London Office;  
130a Gloucester Rd., S.W.7  
Telephone: FREmante 3371

# "There is no Virtue without Courage— No Reward without Labour"

Not simply a school motto but at B.N.R.S. a creed and a way of life. We owe to it all we have and are. If you are prepared to make it your motto and live up to it, we can help you get to the top. It will take time, it will take effort, it will take courage, and as if this were not enough, YOU WILL ACTUALLY BE CHARGED FEES!

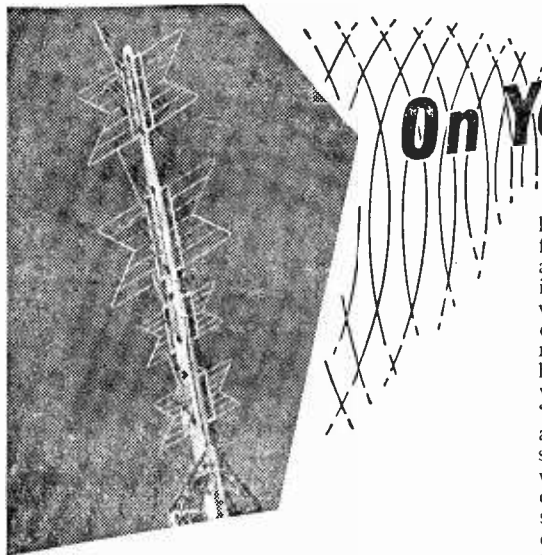
If we haven't succeeded in putting you off, write for details, today, to:

Mr. J. SYKES  
(M.I.E.E., M. Brit. I.R.E., M.I.N.,)

Principal:  
BRITISH NATIONAL RADIO SCHOOL  
Red Lion Court, Stalbridge, Dorset.

Britain's premier Radio Correspondence School specialising in City and Guild's examinations.





# On Your Wavelength

By THERMION

last war, standing about 5ft high and being made from 1in. timber. It was most ornate in design and looked really old fashioned. But when I heard it in operation I had a real shock. The quality was really first class with a most remarkable range of tone, a beautiful round full bass, free from resonance, and a clean, crisp top. It apparently had a switch with two settings, one giving nine valves, and the other only five — a sort of “ordinary/quality” switch. I gathered it employed a push-pull output stage (driving an energised speaker) with two power triodes in each leg, and, what is more amazing, I was assured that all the original valves were still being used. This was a standard commercial receiver of the day and I can assure you that the quality would put to shame many of the receivers which I have heard in recent times and which are so-called “hi-fi” receivers.

### Electronic Games

I AM very surprised that I have not received a single reply to my notes which were published back in December concerning electronic games. Primarily this related to the simple noughts and crosses game which, as probably most of my readers know, may be constructed even in a simple electric form — that is, with sets of on/off switches and battery. What had caused the comment was a report of an electronic form employing hundreds of transistors, which it was claimed, could, in effect, think and work out suitable replies to any move made by the human player and could beat him every time. I wondered if any of my readers had experimented with either this or any other game, and, as I say, I am surprised to have heard nothing from any source. What does this mean? Does it indicate that this particular branch of electronics holds no interest for the home constructor, is too expensive, or that no other games may be adapted for electronic operation? What I now have in mind is an electronic version of “Nim”, in which in place of matches it would be possible to use strips of light (slots in a piece of hardboard, for instance) which could be extinguished by a system of switches. This would be easy to make up and would save laying out the matches each time, a simple master switch serving to cancel the on/off switches, which could be of the two-way type. Surely there must be other games, and it would be interesting to see whether these notes arouse any interest amongst the many keen experimenters who I know read these pages.

### Vintage Sets

I recently was treated to a very pleasing demonstration of a vintage set, which, apart from the pleasure of hearing it, also made me think about modern developments. This set was of American origin and was made well before the

### Speaker Hints

Speaking of loudspeakers, there is an interesting field for experiment in the method of feeding two or more units in equipment designed for high quality. The usual scheme entails a cross-over network designed to feed all frequencies below a certain value to the large unit, and frequencies above to a tweeter or small unit. Now these networks usually work out very expensive in view of the very large chokes which are needed, but I recently heard of two novel methods of building cross-overs which have many advantages over the usual inductance and capacity networks, and which are productive of much better results. One of these entails the use of a simple two valve amplifier (an output valve of the 6V6 class), all values in the amplifier being of such a range that they would accept only frequencies above 2,000c/s. This is certainly a novel approach to the subject and could be productive of some interesting results. The other scheme was on a similar basis, but utilised transistors, each stage also being designed to cover a limited frequency range. I wonder how many hi-fi fans would go to the length of building up similar arrangements in order to make the most of their audio installation?

<b>JOIN THE PRACTICAL GROUP</b>			
<b>PRACTICAL TELEVISION</b>	...	...	<b>1/9</b>
Every Month			
<b>PRACTICAL MECHANICS</b>	...	...	<b>1/6</b>
Every Month			
Devoted to Mechanics, Science and Invention			
<b>PRACTICAL MOTORIST</b>	...	...	<b>1/6</b>
Every Month			
<b>PRACTICAL HOUSEHOLDER</b>	...	...	<b>1/3</b>
Every Month			

# The P.W.

## Troubadour

(Continued from  
page 142 of the  
June issue)

### A SEVEN TRANSISTOR, DUAL-WAVE, SUPERHET RECEIVER

By T. R. Huxley

**W**HEN wiring has been finished according to Fig. 4 (on Blueprint 3, last month), the ferrite rod can be fitted. Its mounting cradle is held by a 4B.A. bolt near the loudspeaker opening. A spare nut or two must be put between the mounting cradle and the panel, so that the rod windings are clear of the trimmers. The M.W. winding is near the tuning condenser, the L.W. winding being to the right in Fig. 6. The coloured leads are then cut down, and soldered to the appropriate points, as in Figs. 2 and 6.

#### Loudspeaker

Four short countersunk bolts secure the loudspeaker to the inside of the cabinet. Two flexible

leads are taken from the loudspeaker, to the receiver. Viewing the cabinet from behind, the loudspeaker tags should be to the right, or they will probably come into contact with other wiring.

One loudspeaker lead goes from the positive end of C17; the other lead is taken from the junction of R23 and the output transformer secondary. The remaining transformer secondary lead is also wired to the positive side of C17.

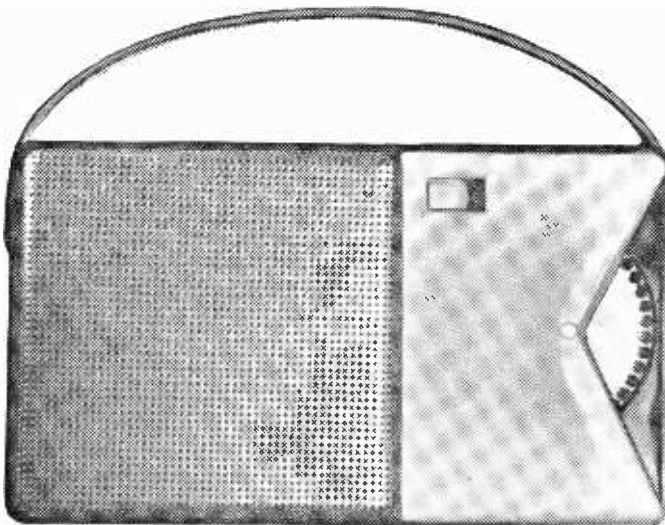
When the receiver is first tested, switch on, leaving the volume control at minimum volume. If the set oscillates, switch off at once, and reverse the secondary leads of the output transformer T2—that is, the lead originally taken to R23 now goes to the positive line, and the lead previously taken to the positive line goes to R23 and the loudspeaker. The oscillation should then be eliminated.

For initial testing, the set is left out of its case, so the loudspeaker leads need to be reasonably long. Subsequently, these can be cut down somewhat, if necessary, as a few inches of flex will allow the receiver to be taken out, and the loudspeaker to be left in its permanent position. The four bolts holding the unit should be tight.

#### Battery

The battery rests to the right of the loudspeaker magnet in Fig. 2, and plenty of space is available. It is absolutely essential that the battery is always properly connected—positive to volume control switch, and negative to C17. Positive and negative snap fasteners should thus be used.

Check that the negative clip cannot come into contact with



The receiver's attractive case.

the tags on the L.W. part of the aerial rod. The lead from C17 can be very short, so that the clip holds the battery in position, or the clip can be insulated with tape.

When the set is first tested, a meter in one battery lead should show about 7mA to 10mA, with no signal tuned in. Transistors differ slightly, and this modifies the current. In particular, best possible results from the set, with individual output transistors depend on R21 and R22. The values given should be satisfactory. But if the output pair take much over 2mA to 3mA or so, with no signal, R22 should be slightly reduced in value. If this stage draws an extremely low current and reproduction is distorted, R22 needs slightly increasing in value. Quite probably no change will need to be made to R22.

For average loudspeaker volume, current will rise to peaks around 15mA to 25mA or so. With maximum volume, peaks may be around 40mA. Current consumption depends on volume. This means that economical running at reasonable volume is possible, yet very good volume is obtainable when wanted, though at increased battery drain.

#### Alignment

This is most readily carried out in three stages — intermediate frequency amplifier, then medium waves, and finally long waves. If a signal generator is to be used, this can provide a modulated output, and a meter in one battery lead will indicate maximum when adjustments are correct.

If the set is adjusted by ear, keep volume down, by selecting weak signals, or by turning the set so that the directional effect of the aerial rod reduces signal strength. During these adjustments, keep the volume control turned up fairly well. If volume is kept down by means of the volume control, accurate adjustment by ear will be less easy.

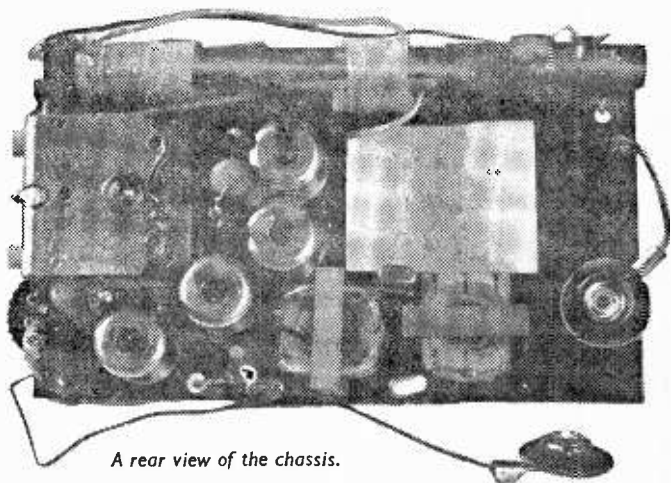
When a signal generator is used, its output can be reduced, as sensitivity increases, but, if the set is aligned by listening to programmes, local stations will only do for initial, rough adjustment, and weak stations should then be sought, for more critical trimming.

The cores should be adjusted with an insulated tool made from a narrow strip of paxolin, or something similar. The same tool will fit the oscillator coil core.

With the generator, apply a 470kc/s signal to the black lead tag of the aerial, and adjust the three IFT's for maximum efficiency. Without a generator, tune in any transmission which can be heard, and adjust the IFT's for best results. Watch that no core is right out, or fully in, as this may bring the circuits too

far away from 470kc/s. Once the three IFT's have been tuned up for maximum results, leave them untouched.

Detailed instructions for ganging aerial and oscillator stages with a signal generator need not be given, because the constructor with a generator will probably be aware of the method of using it. Briefly, trimming (TC1 and TC2) is carried out at a high frequency (low wavelength) on the M.W. band, and inductance adjustments are carried out at a low frequency (high wavelength). These



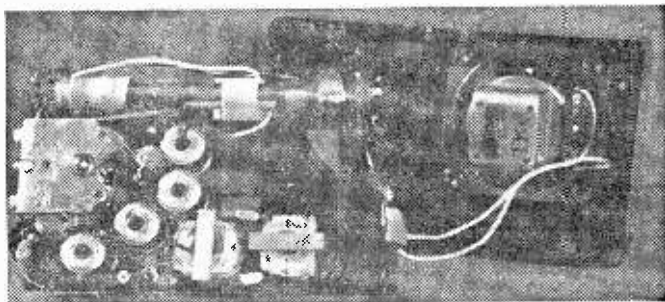
A rear view of the chassis.

inductance adjustments are made by rotating the oscillator coil core, and moving the M.W. winding on the rod. The L.W. band is similarly treated, except that TC3 is the aerial trimmer, while TC4 is the oscillator paddcr trimmer.

#### Alignment on Stations

To align without a generator, move the slide switch to the left (Fig. 4) for M.W. reception. Unscrew TC1 and TC2 fully. Screw the oscillator coil core roughly level with the top of its can, and place the M.W. winding with its tags roughly level with the end of the rod.

It should then be possible to tune in some stations. Choose one heard at moderate volume



The chassis complete and connected to the loudspeaker, ready for mounting in its case.

with the tuning condenser nearly right open. Adjust TC1 and TC2 with an insulated blade, meanwhile, if necessary, keeping the station in tune with the tuning control. It should be found that TC1 and TC2 should "tune" to a definite point which gives best results.

A station is then found with the tuning condenser nearly closed. The M.W. winding is then slid along the rod, and this should give a tuning effect, results being much improved at the correct position.

As one adjustment has some influence on the other, it is usual to repeat the procedure a number of times.

### Long Waves

With the set switched for long-wave reception, the Light Programme should be heard at about the middle of the band. If not, adjust TC4 until this is so. If this station can only be received with the tuning condenser nearly closed, screw the oscillator coil core down a half turn or two. On the

high. They should thus be unscrewed. If they are fully unscrewed, and the set still fails to have a minimum tunable wavelength of around 200 to 205 metres, the plates on the trimmers should be *carefully* separated with a knife. The thin insulation between the plates must not be broken. Some trimmers which have been left tightly screwed down have such a high minimum capacity that it is impossible to reach the low wavelength end of the M.W. band until this has been corrected.

On the M.W. band, a maximum wavelength in the region of 550m should be reached. If this is not so, the oscillator coil core probably needs screwing in slightly. When this core is screwed in, the M.W. part of the aerial has to be moved a little further on to the rod, to match.

Should the set tune much higher on the M.W. band than is required, with the condenser fully closed, unscrew the oscillator coil core, and withdraw the M.W. winding a little, to suit. The oscillator core position depends on the exact capacity of C4, and this is why individual adjustment is needed.

On the L.W. band, C3 and TC4, in conjunction with the oscillator coil core, govern the highest wavelength tuned (condenser closed). The L.W. winding is then adjusted on the rod, for best results. Finally, TC3 is adjusted at a low wavelength on this band (condenser nearly open).

It is best to leave final, careful adjustments until the set is installed in its case. All adjustments (except TC4) can be made from behind.

### Cabinet Fitting

The cabinet mentioned is available in black and cream, red and cream, and blue and cream. The loudspeaker is bolted securely to it, as described, all fixing holes being provided.

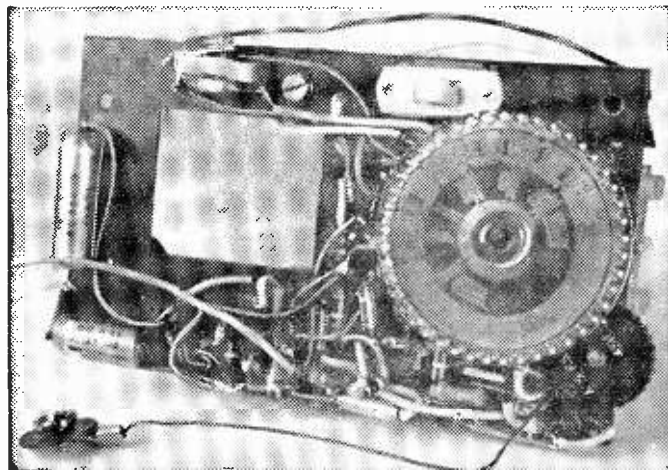
Three 6B.A. countersunk-headed bolts are inserted through the holes in the front of the cabinet. A sleeve about  $\frac{1}{4}$  in. long, or spare nuts, will be needed on the bolt near the loudspeaker. The two other bolts need sleeves about  $\frac{1}{4}$  in. long, or spare nuts adjusted to suit.

The receiver can then be inserted, the volume control fitting in the provided slot. Nuts are placed on the bolts, and tightened. The slide switch should project, without binding.

The gold metal loudspeaker grille can be fitted as soon as the loudspeaker has been bolted in, and it is held by four lugs, which are turned over inside the cabinet.

The tuning dial does not need removing to install the set, as it passes through a large opening in the cabinet. The slide switch extension is then placed on the switch, and the shaped cover, which goes over switch and dial, may be fitted in position. Studs on this engage with holes in the cabinet.

Finally, the handle is fitted with two special pins, which are opened inside the cabinet. The back is a simple push-on clip fitting. ■



The front of the chassis, with the tuning dial in position.

other hand, if the Light Programme is too near the low wavelength end of the band (tuning condenser open) and TC4 is already well unscrewed, the oscillator coil core must be unscrewed a turn or so.

To complete L.W. adjustments, adjust TC3 for best results at a low wavelength (tuning condenser open) and the position of the L.W. winding on the rod at a high wavelength (condenser closed). If the oscillator coil core has been moved, some re-adjustment, particularly of the M.W. winding on the rod, will be needed, to restore full efficiency on the M.W. band.

The whole aligning procedure can be carried out in a few minutes, but if the constructor has no experience with superhet circuits, a few extra points may be helpful.

### Band Coverage

If low wavelengths cannot be reached on the M.W. band, the capacity of TC1 and TC2 is too

# Short-wave Listeners' Log

**M**ANY S.W. receivers, including those of simple type, can perform well with inefficient aerials. For this reason poor aerials are often used and probably give reception of stations over a distance of thousands of miles. Despite this, when really good S.W. results are wanted, an efficient type of aerial is worth while. For real Dx working, such as reception of Australian and New Zealand stations, such an aerial can make all the difference. Remote Dx may be inaudible with a poor aerial but come in well with a good aerial.

The requirements of a good aerial can be put under a number of headings. Very often *all* these points cannot be met, but adhering to even only one or two will greatly improve results if the present aerial is poor.

## Signal Pick-Up

This should naturally be as large as possible. Height above ground and the distance from earthed objects is important. Other things being equal, a doubling of effective height will increase signal strength approximately *four* times. For short aerials pick-up is roughly proportional to length, so time spent in getting a reasonable length of wire as high as possible will be more than justified.

## Lack of Noise

Local noise may blanket out weak signals and so the aerial should be remote from mains wiring, etc., and the downlead should also be clear of such wiring or be of the anti-noise type. The simplest anti-noise down lead is 75Ω coaxial cable, taken to the centre of a dipole cut for a chosen band. An open wire transposed feeder is also helpful and allows the aerial to be used on several bands. An aerial, a  $\frac{1}{4}$ -wave long, may be connected to a 75Ω coaxial downlead, the outer braiding of which is earthed.

## Multi-band use

One aerial for all bands is often the aim of S.W.L.'s and an end-connected wire, taken to the receiver, will work on all bands. An excellent all-band aerial is the tuned doublet, which is an aerial, cut in the centre, with two leads, held roughly 4in. apart with insulated spreaders, descending from this point.

The Zepp feeder will also work well on all bands and is fundamentally the same as the doublet feeder, but one feeder wire goes to the *end* of the horizontal aerial, the other ending at an insulator.

## Single Band Use

Listening on one particular band allows the aerial to be chosen to suit and dipoles, with a coaxial feeder as described, are largely used. The lengths for the popular Dx bands are 22ft. for 21Mc/s and 33ft. for 14Mc/s (the feeder length is unimportant).

## Receiver Matching

Best results are obtained when the aerial feeder impedance matches the receiver input impedance. With a Zepp or doublet feeder an aerial tuner will tune the feeder and allow matching to the receiver. Such a tuner is any air-spaced variable capacitor and parallel coil, tunable to the operating frequency. Each feeder has a clip and is tapped on to the coil equal distances from the centre tap, which is earthed. The receiver aerial lead also has a clip which can be taken to any turn on the coil. Aerial tuning and clips are adjusted for best volume.

## Directivity

Aerials of the kind mentioned are not very directive, so there is no need to orient the wire any particular way and good reception can be expected from all directions. There is also usually no great loss of results if the aerial is sloping.

## Materials

Stranded wire (about 7/26) or solid wire (about 14s.w.g.) will do well. The aerial should be one uncut length or any joints must be soldered. A good ribbed glass or similar insulator should be fitted at each suspension point. If the downlead is not screened it should be well clear of walls, etc.

## Earth

Finally a reasonably stout, short lead to a good earth will always help. A copper or plated earth spike or other non-corrosive metal object actually buried in the ground will do well for this purpose.

---

## Servicing Tape Recorders

(Continued from page 209)

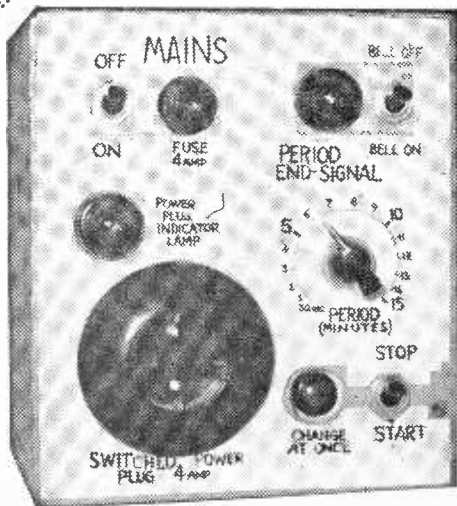
The smaller current required for bias is fed to the recording head through C2 and R1, while the larger erase current is fed through C3 direct to the erase head.

## Prevention of Surges

Resistor R2 and capacitor C4 give a fairly long time-constant which ensures that the bias and erase signal amplitude rises slowly on switching on and falls slowly on switching off, and in this way transient surges of signals are avoided.

To conclude this article, Fig. 15 shows the Meissner oscillator which is also frequently employed in domestic machines. This uses two coils—one for feedback—instead of the tapped coil of Fig. 14. Otherwise the operation is similar to that already described.

(To be continued)

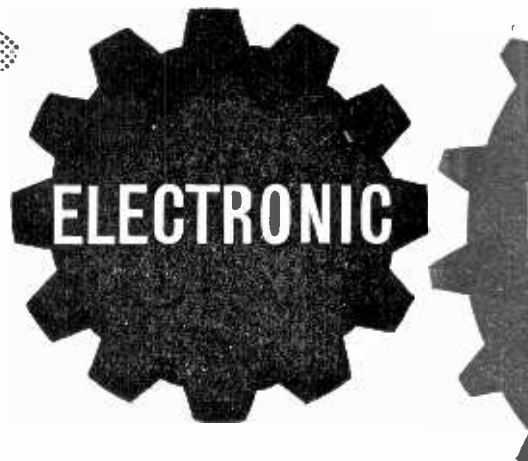


A USEFUL AND ACCURATE  
REPETITIVE TIMING UNIT

**T**HIS unit performs timing functions of any duration from 30 seconds to 15 minutes. By simple alteration of component values it is easy to extend the range of times available from fractions of a second up to several hours. At the end of a run of time of the selected value a red neon signal lamp glows for approximately five seconds, and, if switched to operate too, a bell rings simultaneously for approximately five seconds. Thereafter a new period of the same set length begins automatically, without the need for an operator to restart it, and when this period has expired, lamp and bell operate again and another equal period starts and so on, until the unit is switched off.

The apparatus described has further features too. Not only does it give the above-described audible signals at regular intervals, but it also performs a mains-switching function of up to 4A power at mains voltage, at the termination of each timed period. A mains output power plug is mounted on the panel, and the switching is such that the power at the plug is switched on for one run, off during the whole of the next run, on again during the whole of the third, and so on. A second neon lamp is mounted on the panel near the power plug, to show whether power is on or off during the run in progress at any moment. Finally, the apparatus is fitted with a bell-push labelled "change at once." When this is momentarily pushed, it causes the run in progress, whatever its stage of progress may be, to be terminated immediately, the lamp to light and the bell to ring for the normal five seconds, the power-plug condition to change over, and a new run of the set length to start.

When the reader has read the circuit and building instructions below, it will be apparent to him that the combination of features and operations incorporated into the apparatus here described is only one of a large number of possible variations. Simple circuit alterations, such as different



By E. McLoughlin

dispositions of relay contacts, will easily give a host of other functions.

#### Circuit Principles

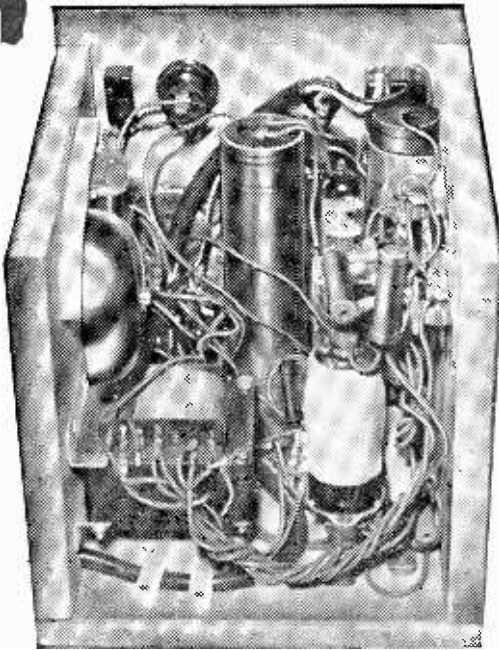
A good-quality condenser is used as the basic timing element, in conjunction with a variable resistor. These are Ct and Rch respectively in Fig. 1a, which shows the basic circuit. The cathode resistor Rk, by virtue of the voltage drop across it due to the anode current of V1, supplies the charging voltage which charges Ct through Rch. At first the anode current is small, only about 1mA or so, to give a voltage about equal to the grid-base of V1 (about 5V) across Rk. The grid is at chassis potential, because Ct is initially uncharged.

Now imagine the charging to have progressed until Ct has attained a potential of 1V. The grid of V1 will then also be 1V above chassis, and, by cathode-follower action, the voltage across Rk must also have risen by one volt. Thus the difference between the voltage on Rk and the voltage on Ct has not changed. It remains constant at roughly 5V. Thus, for every period equal to the basic time-constant Ct.Rch, the condenser Ct will rise in potential by about 5V, and the anode current of V1 and the voltage across Rk will have risen accordingly. This process will continue until the valve reaches its full anode current, and the voltage across Rk and on Ct has risen to 50 or more.

In this manner the charge of Ct is far slower than it would be if the condenser were charged direct from a constant supply of 50V; in fact about 10 times slower. This slowing-up action of the V1 circuit, which is called a cathode-follower bootstrap-circuit, enables large charging times to be obtained with condensers of reasonable sizes.

In fact, the charge is not as steady as in this idealised explanation, but becomes more sluggish towards the end (Fig. 1c). This would cause great errors in time for slight errors in the exact current required to energise the relay in the anode circuit. To overcome this difficulty, the "avalanche amplifier" V2 is added (see Fig. 1b). When the voltage at V1 cathode is still low, V2 is heavily cut-off by its high negative bias, and is effectively

# PROCESS TIMER



shorts most of the charging resistance (except R7), which reduces the period to a fraction of a second. R7 is necessary to prevent too sudden a rise upon pressing the button. R8 is to discharge C1 again at the end of the period, through the relay contacts 'a'.

When a period is complete, and relay Rly1 energises the signal neon is lit via contacts 'b,' and the bell rings via contact 'c,' if S3 is closed. Current passes to the trip-relay through contacts 'd,' and throws it over. At the same time, C1 discharges through R8 via contacts 'a,' and this takes about 5 seconds. When C1 has thus discharged so far that the anode currents are unable to hold Rly1 closed any longer, this relay de-energises, the lamp extinguishes and the bell ceases to ring, and a new run commences. R2 is present to give a permanent current through the relay Rly1, almost equal to that at which it would de-energise after being energised. This is to ensure that the circuits of V1 and V2 and C1 really do return virtually to zero each time before the relay de-energises, and thus the true starting conditions are reproduced each time. The exact value for R2 will depend entirely on the relay used, and will normally be such that about one third of the energising current flows through it.

(To be continued)

Note: Fig. 2. and the Components List appear overleaf on page 230.

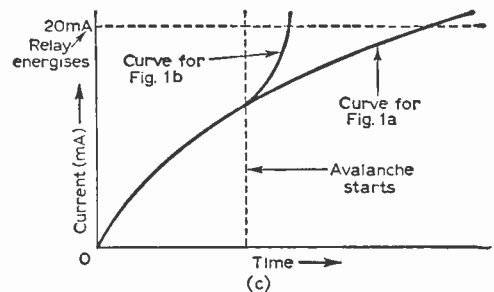
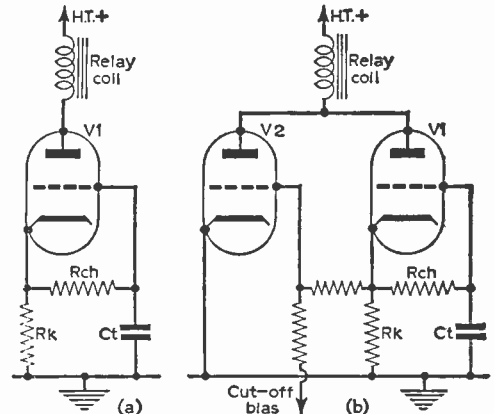


Fig. 1a—Basic 'bootstrap' cathode follower circuit.  
Fig. 1b—Addition of an 'avalanche' amplifier (V2) to the basic circuit of Fig. 1a.  
Fig. 1c—Charging curves for Ct in Figs. 1a and 1b.

not present, but the bias is so proportioned that when the cathode of V1 has risen to about 50V positive, V2 just reaches cut-on at its grid. A small further increase of V1 cathode potential then causes heavy anode current in V2 and this current also passes through the relay. Thus, the total current is rising very rapidly at the point where the relay energises, and small inevitable fluctuations of energising-current value cause little error in the timed periods.

### Actual Circuit Details

The basic circuit elements just described will be recognised in the full theoretical circuit, Fig. 2. R6 is added to determine the shortest period which may be selected; R9 is a grid-stopper to prevent parasitic oscillation. The "change at once" button

ELECTRONIC PROCESS TIMER—CONTINUED

COMPONENTS LIST

Resistors:

- (All carbon types, 10% except where stated)
- R1 100k 1W
- R2 See text (about 75k 2W)
- R3 2.2M 2W (see text next month)
- R4 330k 1W
- R5 5k 2W (wire-wound or  $\pm 5\%$  carbon)
- R6 100k 1W
- R7 180 $\Omega$  1W
- R8 56k 1W
- R9 100k 1W
- VR1 2M linear variable (high power ratings are specified for high stability)

Capacitors:

- C1 32 $\mu$ F 150V to 250V; high insulation; NOT electrolytic
- C2 8 $\mu$ F 350V electrolytic
- C3 1 $\mu$ F 500V paper

Switches and Relays:

- S1 } SPST toggle switches for 250V A.C.
- S2 } S1 4A rating
- S3 } S2, S3 1A rating
- S4 } Small insulated panel-mounting bell-push

- Rly1 Normal relay—300ohm 20mA—see text for alternatives (a, b, c, d are four independent 'make' contacts on Rly1—rating: 350V D.C., 50-100mA.
- Rly2 Trip relay—6.3V magnet; mains 4A contacts (see text)

Valves and Lamps:

- V1 EC92 with B7G ceramic, high insulation valveholder
- V2 SP61 with M.O. valveholder, preferably ceramic
- LP1 } Mains voltage signal neons in panel-mounting indicator lamp Sockets,
- LP2 } with photographically safe red glass

Miscellaneous:

- Mains transformer—primary to suit local mains; Secondaries—250V 40mA, 6.3V 1A, 6.3V 1A, 3V to 8V electric bell
- Panel-mounting 5A three-pin mains socket
- Panel-mounting mains fuse holder and 4A fuse
- MR1 } Metal rectifiers—250V 50mA (E250C50)
- MR2 } Connecting wire with substantial insulation (see text)
- Tag-strips with faultless insulation
- Wood for cabinet

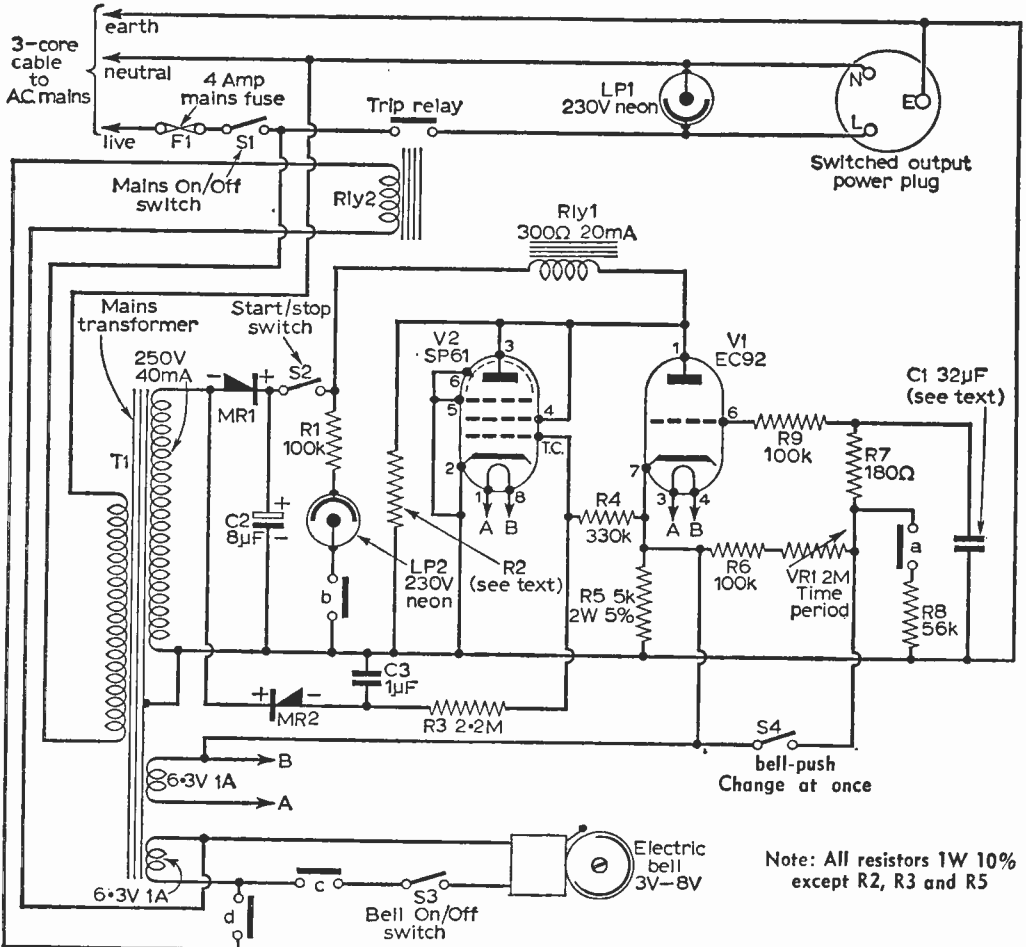


Fig. 2—The circuit of the process timer.

Note: All resistors 1W 10% except R2, R3 and R5



# NEONS

## in the Experimenter's Power Pack

A discussion of some factors of fundamental practical importance in the design of circuits using neon-tubes, leading to some simple but worthwhile further improvement to the "Experimenter's Power Pack" published in PRACTICAL WIRELESS, January 1962, etc.

By M. L. Michaelis

**T**HE conventional valve oscillator was the last topic dealt with by the author last month.

A completely different class of oscillators is formed by those circuit elements which are *inherently* of negative resistance, without any external power-feedback influences being necessary. The simplest example probably familiar to most experimenters is the basic tetrode valve, with its "anode kink" in the region where the anode voltage has fallen just below the screen voltage. Here there is a small range of anode voltages where the anode current rises with decreasing anode voltage, representing negative anode resistance, caused in this instance by effects due to the higher voltage screen-grid capturing secondary electrons proceeding from the anode due to the impact of the main anode current. The constructor may be familiar with various oscillator circuits of the "transitron" or "dynatron" class utilising this negative resistance of the tetrode-kink; he will also doubtless have heard that the introduction of the suppressor grid, connected to the cathode, close to the anode, was made to remove the tetrode-kink, thus producing the stable pentode valve.

### Amplitudes

An important feature of the "tetrode-kink" must be pointed out at this stage, as it is common to *all* cases of *inherent* negative resistance. The "tetrode-kink" is confined to a *small region* of voltages and currents; for all other voltages and currents through the circuit element in question the resistance is positive, i.e. voltage increase is needed to increase current (see Fig. 3). This fact limits the amplitude of oscillation of all oscillators using circuit elements with inherent negative resistance, the amplitude being such that voltage and current excursions are basically limited to the region showing negative resistance. This region may under certain circumstances be very small, so that oscillation at very low amplitudes can occur, possibly little greater than normal hum-levels in a circuit. This effect was obviously present in the author's prototype of the "Experimenter's Power Pack", and it is thus clear that a discussion of the voltage/current characteristics of neon-tubes is now required, seeking regions of inherent negative resistance in such characteristics. Once this is understood, the main question is answered. If we desire the neon-tube circuit to run as an oscillator,

(Continued from page 170 of the June issue)

we must place the would-be operating point within the region of negative resistance. If we desire a stabiliser-function, we must choose an operating point safely removed from the negative-resistance region of the characteristic.

The important conclusion of this discussion on negative resistance, as far as practical issues are concerned, is to realise that common neon tubes form a second example of inherent negative resistance, in addition to the familiar basic tetrode valve.

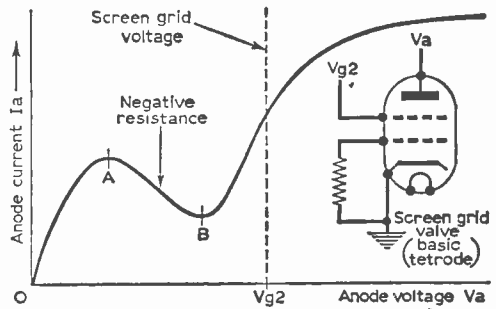


Fig. 3—The anode characteristic of a screen grid tetrode. The region A to B represents negative anode resistance; in this region DECREASE of voltage causes an INCREASE of anode current. All other parts of the curve represent normal positive resistance.

### Anode Characteristic of Neons

Fig. 4 shows the general features of the anode voltage/current characteristic of a neon tube. Starting with zero voltage and current at O, let us gradually increase the voltage. The line O to B is thereby followed, i.e. only an extremely low current flows (far too small to be registered with anything except the most sensitive specialised amplifiers). This low current is due to ionisation in the neon resulting from cosmic and other atomic radiation present in the surroundings, and may be ignored for our present purposes.

The striking-voltage,  $V_s$ , is reached at B, and the real discharge commences in the neon, accompanied

by the first visible appearance of light in the tube. As long as the limiting resistor in the anode circuit does not allow more current to flow than is represented by the point C, the voltage remains constant at the value  $V_s$  for any current value between B and C. Thus, in principle we have here a voltage-stabilisation range, but in practice this range is not useful, as it is very small (only a fraction of a milliamp for most neons), somewhat unstable, and subject to considerable changes according to the age of the neon.

### Effects

If the limiting resistor is, however, of such a value as to cause a current lying between the values for points C and D to flow, in theory, once the neon has struck, then the circuit necessarily goes into the familiar sawtooth oscillation, because the would-be operating point lies on a region of the characteristic having negative resistance. Thus no operating point lying between C and D can be

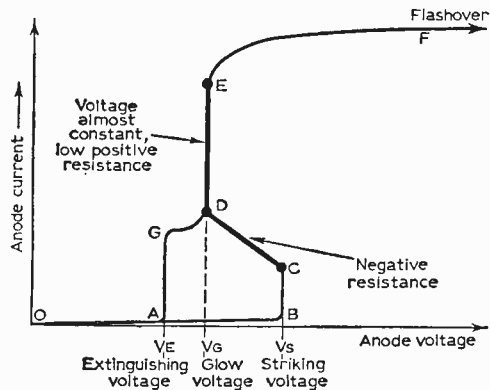


Fig. 4—Anode characteristic of a neon tube. For a neon oscillator, the would-be operating point lies on CD and the cycle of oscillation is ABCDGA. For a neon stabiliser, the operating point lies on DE. The performance will be erratic if the operating point lies too near D, as there is a possibility of the oscillatory cycle DGABCD being followed.

static and stationary. The current rapidly rises and the voltage decreases, as the operating point rushes from C to D. The excess current above that capable of arriving through R in Fig. 2 (last month), required to reach point D, is supplied from the charge on the condenser C. When point D is reached, the voltage would have to increase again slightly for any progress up DE. This it cannot do, as R could not even supply enough current to reach point D, and thus the condenser had to supply this current, and certainly cannot increase its voltage again under these circumstances. The condenser cannot even continue to supply the current represented by point D without further drop in its voltage and thus voltage and current must fall as the portion D to G is traced out on the characteristic. At point G, representing the extinction voltage of the neon, the discharge cannot maintain itself any longer, and stops abruptly, so that the current ceases without immediate change

of voltage, i.e. conditions drop from point G to point A. The condenser then begins to recharge, then, along a portion A to B of the same line O to B as traced out at the initial start. At E the neon strikes again, to start another similar cycle. And so on, until switched off.

It is clear that, to secure oscillation, i.e. to obtain a would-be operating point between C and D, there is a definite lower limit imposed on the value for the resistor R in Fig. 2, such that the current supplied does not exceed the value for point D in Fig. 4. There is also in theory an upper limit for R, though this is considerably less definite and certainly so high that it can normally be ignored, as the point C in Fig. 4 represents a very small current, and is not well-defined. Thus, there being a lower limit for the value of R in a given neon circuit if oscillation is to take place, there is an upper limit to the frequency of oscillation achievable. The frequency is determined by the time constant C times R in Fig. 2, being inversely proportional to this. Thus the highest frequency of oscillation is obtained with the smallest possible values for C and R in Fig. 2. The smallest C is obtained by omitting a physical condenser altogether, so that the remaining stray capacities of the circuit are operative. The smallest tolerable R is dictated by the condition for maintaining oscillation, discussed above, which thus, together with the stray capacities determines the maximum frequency possible. This lies between 10kc/s and 50kc/s in most cases. No limit is imposed on the lowest possible frequency, as the condenser C in Fig. 2 can be made as large as one pleases. The condenser does not affect the decision as to whether oscillation takes place or not. This decision is fixed solely by the H.T. voltage used, the value of R and the anode characteristic of the neon, in the manner discussed above.

Neon tubes particularly suitable as oscillators should have large differences between voltages and currents represented by the points C and D in Fig. 4, i.e. the range CD should be a major part of the whole characteristic of the tube. This is a function of the geometric design of the electrodes within the tube, and their surfaces, as well as the gas pressure.

### Drift of DC with age

A point of great practical importance is that the range CD in Fig. 4 often undergoes considerable change within the first 10 to 100 operating hours of an initially new neon tube. This effect was observed experimentally by the author, and is probably to be explained in terms of changes in the electrode surfaces inside the tube during the initial operating hours. The current-value corresponding to point D in Fig. 4 can be very much less in a brand new tube than in the same tube after some 100 or so operating hours. Thus, an operating point initially within the range D to E, and thus stable, can drift into the range C to D later, so that an initially stable circuit goes into oscillation after some 100 hours of operation. This appears to be the ultimate explanation of the effects noticed with the author's "Experimenter's Power Pack", and accounts for the presence of the low-amplitude oscillations after about 2,000 operating hours, these oscillations having been initially absent.

Neon Stabiliser Circuits

If the circuit is to perform as a voltage stabiliser, then an operating point within the range D to E is required, i.e. the tube must be run with amply sufficient anode current under all circumstances. The value of R (in Fig. 1 last month), has a definite

upper limit which must not be exceeded if oscillation is to be prevented with certainty. This upper value for R permissible in the stabiliser circuit is such that the tube current in the neon still lies safely above the value corresponding to point D in Fig. 4, measured when the output load current drawn has its maximum value, i.e. neon current its minimum. If R has a value small enough to guarantee sufficient current in the neon when no current is drawn from the stabilised output, yet not small enough to leave sufficient neon current when the output is loaded up to the intended maximum, then as the output load current is gradually increased the circuit may burst into oscillation as the operating point of the neon passes point D in Fig. 4. This effect was clearly also present in the author's "Experimenter's Power Pack" after some 2,000 hours of use, due to a drift of the location of point D in Fig. 4. It explains the observed apparently haphazard presence or absence of oscillations, according to the precise loadings of the outputs.

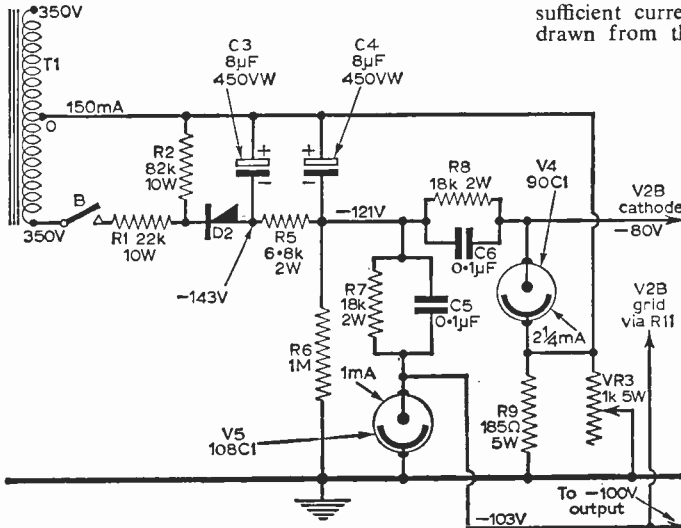
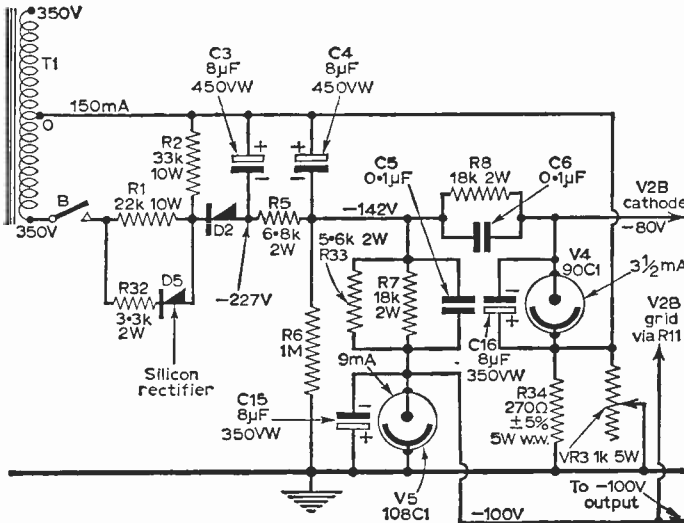


Fig. 5 (above)—Part of the original circuit of the "Experimenter's Power Pack" to show the circuits of the neons V4 and V5. Voltages and currents shown are with respect to earth and as measured after 2,000 hours of operation.

Fig. 6 (below)—Modified version of the circuit in Fig. 5 for greatly improved stability. (Note: Point D in Fig. 4 is quoted as "5mA maximum" for the 108C1. The new operating point in this circuit is at 9mA, and the (-100V) output may be loaded up to 4mA (f.s.d. on the meter) in this version of the circuit without the start of oscillation).



Manufacturer's Ratings for Neon Tubes

The simple conclusion is that neon tubes intended for voltage stabilisation must not be starved of anode current. A glance at data tables for neon tubes, supplied by the manufacturers, reveals that, apart from statements of the stabilised voltage possible with tube, also minimum and maximum tube currents are specified. The maximum current is simply dictated by the need to avoid danger of destruction of the tube (see Fig. 4), but the *minimum* current is far more important than one would think. It represents the highest current value that point D in Fig. 4 is likely to reach at any time during the lifetime of the tube, and thus represents the minimum tube current that must be guaranteed under all circumstances of operation if oscillation is to be permanently prevented with complete certainty. The author must frankly admit his own insufficient awareness of this subtle practical point at the time of design of the "Experimenter's Power Pack", particularly as most textbooks and essays he has read to date—in fact, all of them, including a small handbook devoted *entirely* to

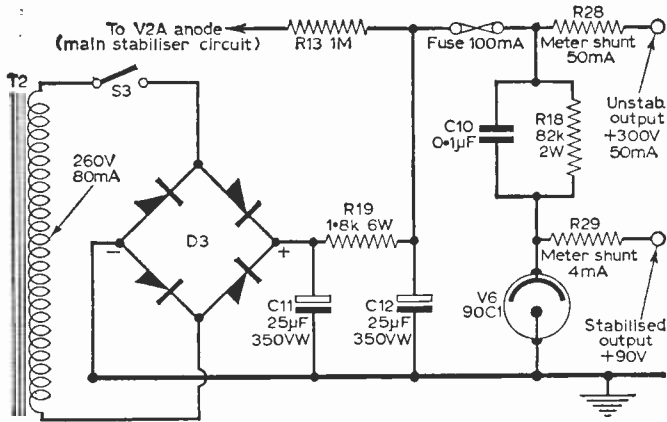


Fig. 7—The unstabilised H.T. circuit of the "Experimenter's Power Pack."

neon tubes — completely omitted to make any mention of it whatsoever. Thus the operating points of the neons in the original design of the Power Pack, whilst sufficiently high in current for most samples of new neon tubes of the specified types, are too low to guarantee stability as the tubes age.

**Modifications made to "Experimenter's Power Pack"**

Figs. 5 and 7 show the original form of relevant portions of the circuit of the "Experimenter's Power Pack", with measured values of important voltages and currents after about 2,000 hours of operation. Figs. 6 and 8 show the new modified versions of the same portions of the circuit, showing changes of resistor-values made to ensure that the neons all receive ample current to ensure complete stability under all conditions.

It should be emphasised that, contrary to common belief, condensers connected in parallel with the neon tube or in parallel with R in Fig. 1 do not affect the decision as to whether the circuit is stable or oscillates, and could probably be omitted in a stabiliser circuit. Yet they do no harm, and certainly shunt any noise-effects from other causes that might be present. Thus they have been maintained, and indeed augmented, in the new modified design of Fig. 6

**Other Modifications**

Only one other modification was found desirable to the "Experimenter's Power Pack", and this has nothing to do with the neons. It was found that the maximum achievable voltage on the main stabilised H.T. output dropped to a mere 250V (instead of the normal 350V) as soon as the unstabilised "300V" output was

simultaneously loaded up to its full capacity of 50mA.

This undesirable effect was not present if only a mere 10mA to 15mA, as required by a valve voltmeter, oscillator, etc. for which this output was primarily intended, was drawn simultaneously from the unstabilised output, which accounts for the fact that this deficiency in the original design was not noticed much earlier. Full-capacity simultaneous loading of both H.T. outputs is rarely required, and thus this shortcoming escaped notice for so long. For this very reason, too, it does not represent a serious fault, yet it is nevertheless desirable to remove it, especially as the cure would be extremely cheap and simple.

The cause was that the feed to V2A anode (see Fig. 7, which gives the relevant portion of the original circuit) came through R13, and thus suffered the same voltage drop as occurred across R19 due to current drawn from the unstabilised output. Thus this voltage drop was passed on to the stabilised output with the result that the stabilised output voltage could not exceed the unstabilised output

(Continued on page 241)

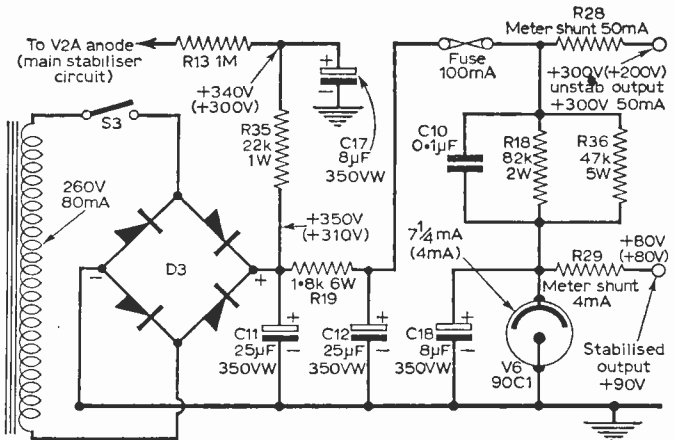


Fig. 8—Modified version of Fig. 7 with improved capacity for simultaneous high loading of the H.T. outputs.

**Simultaneous loading now possible:**

- Main stabilised H.T. output—150-300V, 100mA (f.s.d. on the meter).
- Unstabilised H.T. output—50mA (f.s.d. on the meter).

**Loading of +90V stabilised output:**

- 4mA (f.s.d. on the meter) if the unstabilised H.T. is not loaded; 1.5mA if the unstabilised H.T. is loaded to the rated 50mA.
- (The loading of the main stabilised H.T. has no effect on the +90V output).

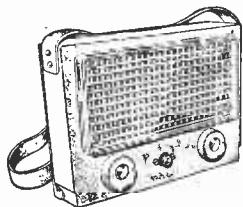
In the diagram, the figures in brackets were taken when the unstabilised output was loaded to the rated 50mA; others refer to the unloaded condition of this output.

# PORTABLE RADIO OR CAR RADIO

## NOW THE SUPER SEVEN 4-WAVEBAND RADIO

(7 Transistors plus 2 Diodes)

- ★ 3 R.F. STAGES.
  - ★ Mullard and Surface Barrier Transistors.
  - ★ Coverage of Medium, Long Waves, Trawler Band and approximately 20-60 metres short wave
  - ★ Use as domestic radio, car radio or fit with strap (not supplied) for carry-about.
  - ★ No aerial required except for use as car radio and for short waves.
  - ★ 3-inch speaker but will drive a larger speaker.
  - ★ Performance comparable to many receivers costing treble.
  - ★ 400 milliwatts output stage.
  - ★ Minimum of 30 stations tuned in excluding S.W.
- May be built for **£6.19.6** SIZE: 7½ x 5½ x 1½ in.  
plus 3/6 post, etc.



PARTS PRICE LIST AND EASY BUILD PLANS 2/-

## TRANSONA-4

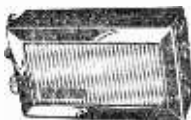
(4 Transistors, plus 2 Diodes)

New design now uses moving coil speaker.

FERRITE ROD AERIAL  
MW/LW & T.B.  
Slide Switches

Handsome pocket case.

May be built for **55/-** P.P. 3/-.



"Best transistor set I have ever built—dozens of stations."—A.G.H., Deal, Kent.

PARTS PRICE LIST AND EASY BUILD PLANS 1/6

## BEGINNERS PUSH-PULL FIVE

(5 Transistors, plus Diode)



- ★ 2½ in. M/C Speaker.
- ★ 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.

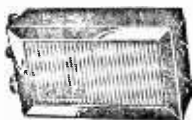
★ Can be built for **59/6** P.P. 3/-, or with 3" speaker

PARTS PRICE LIST, etc. 2/- **68/-**

## 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 grill in red. On test Home, Light, Radio Lux., and many Continental stations were received.

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

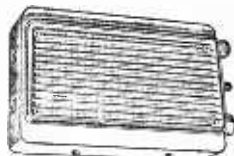
"Truly amazing, Station after Station."—A.D., Surbiton.

EASY BUILD PLANS AND PARTS PRICE LIST 1/6

## TRANSONA-6

(6 Transistors, plus 2 Diodes)

M/L & T. BAND



350 Mw Mullard push-pull output Transistors. Powerful magnet 3in. high grade speaker. Push-pull transformers. This is a top performing receiver. Nearly 30 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.

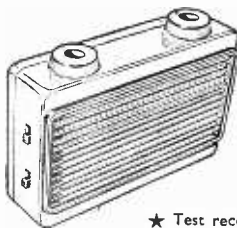
Total building cost **£5.9.6** P.P. 3/-. Size 6½ x 4½ x 1½ in.

"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

## NEW SUPER SIX DESIGN

MED/LONG WAVES, TRAWLER BAND AND S.W. TO APPROX. 40 METRES



- ★ 6 1st grade Transistors (inc. Mullard and Surface Barrier) plus 2 DIODES.
- ★ Top grade 3in. L/speaker.
- ★ 2 R.F. Stages for extra boost.
- ★ High Q 7in. Ferrite Rod Aerial.
- ★ Easy build diagrams.
- ★ No aerial or earth required (except as car radio).
- ★ Attractive pale blue case with speaker grilles in red.
- ★ 350 Milliwatts output stage
- ★ Sockets for car radio.

★ Test receiver tuned in over 30 stations. (inc. Luxembourg loud and clear.)

THIS FINE RECEIVER MAY BE BUILT FOR **£6.9.6**  
Plus 3/- P.P.

PARTS PRICE LIST AND EASY BUILD PLANS 2/-

PARTS SOLD SEPARATELY

AFTER SALES SERVICE

NAME AND ADDRESS CAPITAL LETTERS PLEASE

# RADIO EXCHANGE COMPANY

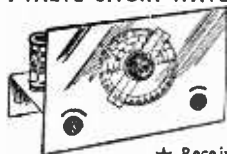
27 HARPUR STREET, BEDFORD

PHONE 2367

(Opposite Co-op)

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

EXPLORE THE WORLD ON THIS I-VALVE SHORT-WAVE RADIO



Total Building Costs

**35/-**

P. & P. 2/-

★ Receives speech and music from all over the world. Construction price includes valve and one coil covering 40-100 metres. Can be extended to cover 10-100 metres. Can be converted to 2 or 3 valve.

PUT YOUR FAVOURITE PROGRAMME ON TAPE with the R.C.S. TAPE TUNER

Will operate on all types of Recorder. High impedance output. Variable Medium wave tuning. Triple wound Super Hi-Q coil. Chassis and components colour coded. Easily constructed from full instruction data and layout diagrams. Size 3 x 1 1/2 x 1 in.

Total Building Costs **30/-** Plus P. & P. 1/6.



The "PIRETTE"

**TWO TRANSISTOR SET**  
Designed for Personal Listening. An amazing little set, with built-in ferrite rod aerial bringing in medium wave at wonderful volume. Sturdy case. Size only 1 1/4 x 3 x 4 in. Fits into the palm of the hand. Drilled chassis colour coded for easy assembly. Two top grade transistors plus diode. Supplied with earpiece.

Total Building Costs **50/-** Plus P. & P. 2/-

## R.C.S. for MINI-SETS

All parts available separately. Constructional details on any one of our Mini-Sets, 1/6 each. (Supplied free with orders)

The "REVILO"

5-STAGE  
POCKET  
TRANSISTOR  
PORTABLE



In attractive two-tone contemporary case, with gold plated speaker grille and attractive dial. Size only 5 1/2 x 3 1/4 x 1 1/2 ins. No aerial or earth required—completely self contained. Genuine 3in. high flux PM speaker. First grade transistors. Push-pull output—250 milliwatts. Volume control with on/off switch. Condenser tuning. Easy assembly on eveluted circuit board. Total Building **£4.19.6** Socket for personal listening. P. & P. 2/6. Earpiece 9/- extra if required.

## The "BOBETTE" 5-STAGE SUPER SENSITIVE TRANSISTOR PORTABLE

Simple to Build. All First Grade Components. A truly portable transistor radio giving full medium wave reception. Incorporates 5in. High Flux Speaker, push-pull output, first grade transistors. High-Q ferrite aerial, socket for car aerial, pre-tagged circuit board for easy construction. Attractive two-tone case.



Total Building Costs **£5.2.6** P. & P. 2/6.

**CRYSTAL RECEIVER**  
Covering medium wave band. Ideal for the beginner. All components including case for **12/6** P. & P. 1/6. Easily converted to 1-transistor or 2-stage transistor receiver.

The "BIJOU"

EASY TO BUILD TWO STAGE TRANSISTOR SET

The set that looks like a Radio Set. Attractive Case. Mini .0005 Tuner. High Q Litz Coil. Works for months off No. 8 Battery. Simple to construct in 15 min.



Total Building Costs **25/-** P. & P. 1/6.

You can't go wrong. We guarantee good results.

Trade Enquiries R.C.S. PRODUCTS (RADIO) LTD. 11 OLIVER RD., LONDON, E.17 Mail Order only  
Welcomed

# ACKNOWLEDGED TO BE THE BEST COMPONENT CATALOGUE

A MUST for every radio enthusiast



NOW  
**166** pages  
Over **600** illustrations  
Over **5,000** components listed

This is today's most up-to-date, most comprehensive component catalogue for the radio constructor, experimenter, engineer and Hi-Fi enthusiast.

**2/6**

PLUS 9d POST

POST COUPON TODAY  
Write CATALOGUE on top left of envelope

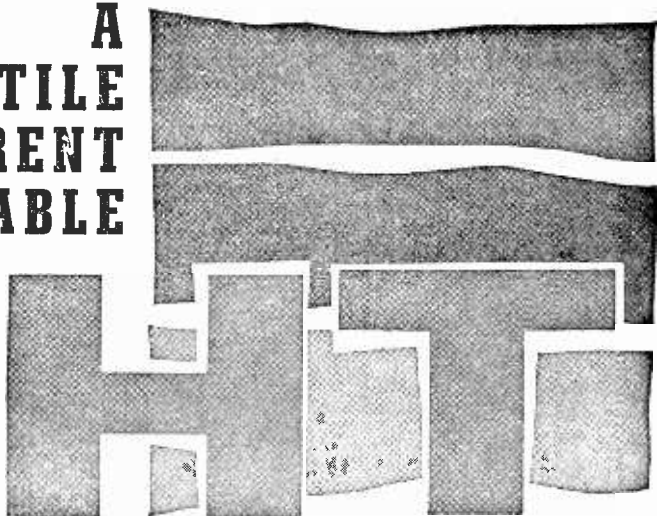
Enclose P.O. 3/3

Name.....

Address.....

Home Radio Ltd. (PW) 187 London Rd. Mitcham, Surrey

# A VERSATILE LOW-CURRENT VARIABLE



## SUPPLY

USING AN OUTPUT PENTODE AS GRID-CONTROLLED H.T. RECTIFIER, A WIDE RANGE OF VOLTAGE CONTROL CAN BE ACHIEVED IN A VERY SIMPLE CIRCUIT.

*(Continued from page 165 of the June issue)*

By D. A. Brandon

**A**LTHOUGH, in last month's article, the author recommends an 807 valve for an r.m.s. A.C. voltage up to 250 at the transformer, a valve of even higher voltage rating, but which is

unfortunately more expensive, as it seldom appears on valve bargain lists, is the EL34, and this is considered to be the most suitable valve of all for the circuit of Fig. 1 (last month). It should, at any rate, be easily obtainable. It has a peak anode rating of 800V, which is certainly sufficient for a 250V transformer, and the peak screen rating is 425V. This figure for the screen is still a little low theoretically, but considering that it applies for a positive voltage, for which sense about 350V can never be exceeded in Fig. 1, and that the negative peak voltage is likely to be permissibly much higher, an EL34 can be relied upon in the circuit of Fig. 1. Accordingly, the writer made all further experiments using an EL34, and performance results are given later in this article.

Using an 807, results will be very similar, but the lowest voltages attainable in the circuit of Fig. 3 will be higher than those obtained using an EL34, because of the lower mutual conductance of the 807.

### Addition of Metal Rectifiers

If the expense of an EL34 is felt to be too great, or the heat generation too high, it is possible to use an ordinary 6V6 or EL84 output valve with perfect reliability if a couple of selenium metal rectifiers are used to remove the inverse voltages. Fig. 4 shows this modification made to Fig. 1, and Fig. 5 shows the modification

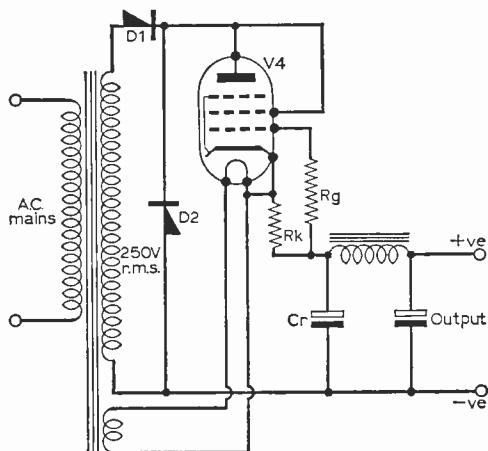


Fig. 4—The circuit of Fig. 1 (page 161, last month) modified to include two selenium metal rectifiers to remove the inverse voltages.

made to the ultimate variable-output-voltage circuit of Fig. 3. These rectifiers should be of 250V A.C. input rating, and about 25 to 50mA current rating. The first, D1, takes up the inverse voltage itself, whilst the second, D2, shorts out any portion of the inverse voltage that may still be reaching the valve. The need for D2 results because we have, on the negative half cycles, effectively two rectifiers in series—the metal rectifier D1 and the output valve. The valve certainly has the higher inverse resistance, thus D1 alone cannot be fully effective in removing all inverse voltage from the valve; hence the need for D2.

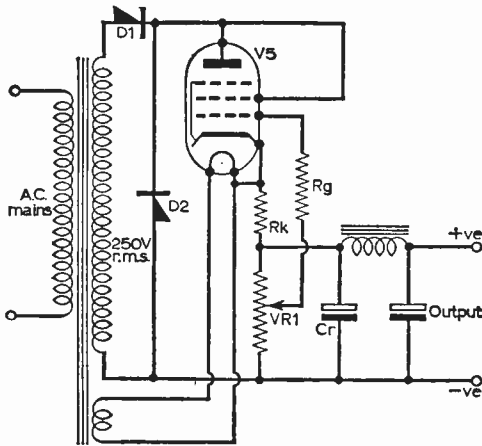


Fig. 5—The circuit of Fig. 3 (page 162 last month) modified to remove the inverse voltages.

**Grid-control to Achieve Variable Output Voltage**

An inspection of Figs. 1 and 3 (last month) will make it clear how the output valve itself is used as "variable resistance" by means of controlling its grid-bias voltage, which is obtained on VR1 from the output voltage itself.

It is clear that the maximum voltage obtainable across any load connected across the output is given when the slider of VR1 is at the top, A, and the circuit (Fig. 3) is virtually identical to Fig. 1.

The minimum output voltage is given when the slider of VR1 is at the bottom, at B. In this state the whole output voltage is applied as grid bias to the valve, and if this voltage is to be small the valve must be virtually cut off, to have sufficiently high resistance to cause the necessary voltage drop. Consequently the minimum voltage down to which one can regulate with VR1 is given approximately by the grid-base of the valve. It will be the lower, therefore, the higher the slope of the valve used.

**Final Circuits**

From the results of the above discussion, two final circuits have established themselves as ultimately the most reliable and suitable—namely, Fig. 3 with an EL34, and Fig. 5 with a 6V6 or EL84.

Fig. 6 gives component specifications for the EL34 circuit, and Fig. 7 a graph of performance results measured by the writer after building this circuit.

Fig. 8 gives component specifications for the circuit using a 6V6, and Fig. 9 performance results of the prototype.

**The Performance Graph**

The graphs are drawn in the form of a number of "load lines" for various effective resistances of the consumer-load connected to the output of the H.T. supply. These load lines are obviously determined solely by Ohm's Law applied to the

(Continued on page 241)

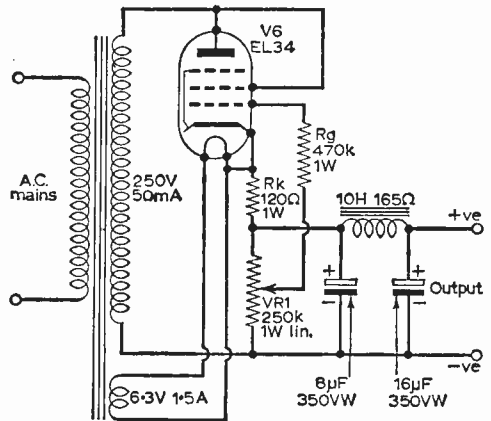


Fig. 6 (above)—The circuit of Fig. 3 with the component values indicated.

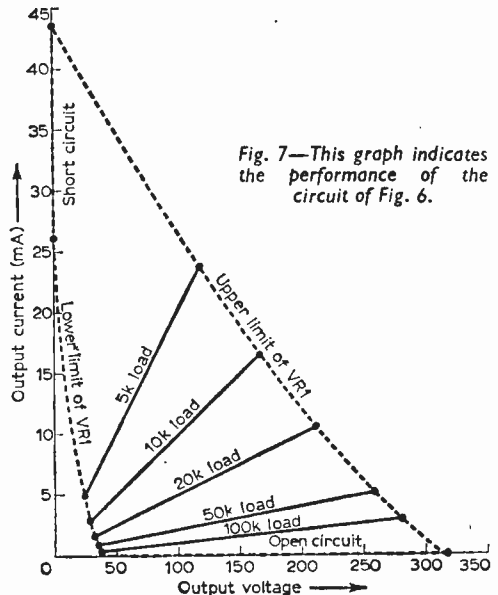
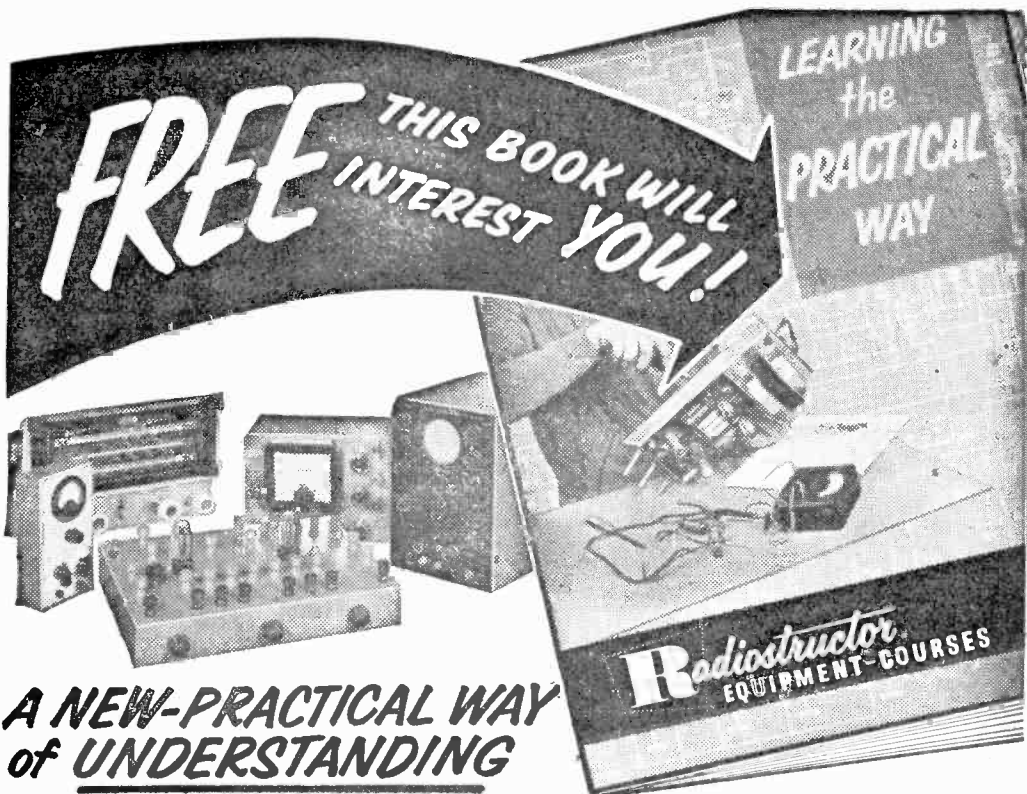


Fig. 7—This graph indicates the performance of the circuit of Fig. 6.





**A NEW-PRACTICAL WAY  
of UNDERSTANDING**

**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, 000*

★ Name \_\_\_\_\_

Address: \_\_\_\_\_

7/62

★ **BLOCK CAPITALS PLEASE**  
*(We do not employ representatives)*



This splendid AVO Instrument has been developed to meet a definite demand for a sturdy pocket-size multi-range test meter at a modest price, suitable for use on modern electronic apparatus as well as for radio and television receivers, motor vehicles, and all kinds of domestic appliances and workshop equipment.

Readings are obtainable quickly and easily on a very open scale, and range selection is by means of a robust, clearly marked rotary switch of the characteristic Avo Meter type. Measurements of A.C. and D.C. Voltage. D.C. Current and Resistance are made by means of only two connection sockets.

Designed and Manufactured by

**AVO LTD**

**M GROUP**

AVOCET HOUSE - 92-96 VAUXHALL BRIDGE ROAD - LONDON - S.W.1  
MM.2

## Just Right for your pocket!

THE

# MULTIMINOR

## 19 Ranges

**D.C. Voltage:** 0-1,000V in 7 ranges

**A.C. Voltage:** 0-1,000V in 5 ranges

**D.C. Current:** 0-1A in 5 ranges

**Resistance:** 0-20,000  $\Omega$ , 0-2M  $\Omega$

**Pocket Size:** 5½ x 3½ x 1½ inches.

**Weight:** 1 lb. approx.

List Price **£9 : 10s.**

Complete with Test Leads and Clips  
Leather Case if required 39/-.

**Sensitivity**  
10,000 ohms per volt  
on D.C. voltage ranges.  
1,000 ohms per volt  
on A.C. voltage ranges.

**Accuracy**  
On D.C. 3% of full  
scale value.

On A.C. 4% of full  
scale value.

To meet special  
requirements, instru-  
ments can be supplied  
to a higher degree of  
accuracy for a small  
additional charge.

Telephone: VICTORIA 3404 (12 lines)

## SENSATIONAL NEW 1962 DESIGNS — BY CONCORD

LOW PRICES ★ PICTORIAL STEP-BY-STEP PLANS ★ EASY AS A.B.C.

### THE NEW "LISBON" TRANSISTOR SET

This is a pocket 2-stage transistor set not much larger than a matchbox. Excellent clear reception covering all medium waves, works for months off a tiny 1½ or 3 volt battery costing only 3d. Easy to build and an excellent introduction to transistor circuitry. Everything can be supplied down to the last nut and bolt incl. **SIMPLE PICTORIAL STEP-BY-STEP PLANS FOR ONLY 19/6**, plus post and packing 1/6. (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.



### THE NEW "VOLKSRADIO" ONLY 19/6

TAKE-OVER BID MAKES THIS FANTASTIC OFFER POSSIBLE—the beautifully compact "5-STAR VOLKSRADIO"

measuring 4½ x 2½ x 1½ in. receives perfectly—in the Bedroom, Office, Garden—over all medium waves (incl. Luxembourg). Under 1d. hour running cost. ANYONE can assemble it in one or two hours using our simple A.B.C. plan. Complete set of parts ONLY 19/6, plus 2/6 P. & P. C.O.D. extra. (Parts can be bought separately). Money Back Guarantee.



### OUR NEW 4-STAGE "MINUETTE"

Build this newly-designed "MINUETTE" 4-STAGE transistor set in very strong ready drilled ULTRA-MODERN CASE, size only 6 x 3½ x 1½ in. Uses three transistors and diode and SELF CONTAINED LOUDSPEAKER. Very sensitive, ideal for office, bedroom, holidays, etc. Months and months of listening off an 8d. battery. Can be built FOR ONLY 39/6, including PROPER CASE, miniature speaker, etc. **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS** etc., plus post and packing 1/6 (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.

39/6



### THE NEW "SAN REMO" ONLY 37/6

This All Transistor Speaker Radio—The "San Remo"—covers all medium waves including "Home," "Light," etc. Reliable and lightweight—Slips easily into the Pocket or Handbag—size only 4½ x 2½ x 1½ in. Works for Months off 8d. Battery! Ideal for holidays, Camping, Bedroom, etc. Anyone can assemble it in an hour or two with our simple-as-A.B.C. PLAN! Complete set of parts including miniature speaker—everything—only 37/6, plus 2/6 P. & P. (C.O.D. 2/- extra.) Parts can be bought separately.



**CONCORD ELECTRONICS Dept. 14/5**  
210, Church Road, Hove, Sussex

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

(Continued from page 238)

resistance-value of the consumer load, and have nothing whatsoever to do with the H.T. supply, as far as location on the graph is concerned. Thus all load lines must necessarily go through the origin O, as at 0 volts the current through any resistance whatsoever is 0 amps. The slope of the load-line, which is Volts needed for Amps caused to flow, is clearly the Ohm's Law definition of the resistance of the load to which the load-line is intended to apply. We can thus draw in all load lines as a fan of lines spreading out from O, without even building the H.T. supply, let alone measuring anything with it. But it is seen that there is one difference in the graphs of Figs. 7 and 9. The load lines are not complete, they start and stop abruptly. The load lines drawn thus represent only those portions realisable—i.e., those of all possible combinations of voltage and current which are actually realisable, using the circuit specified as H.T. supply, and a consumer-

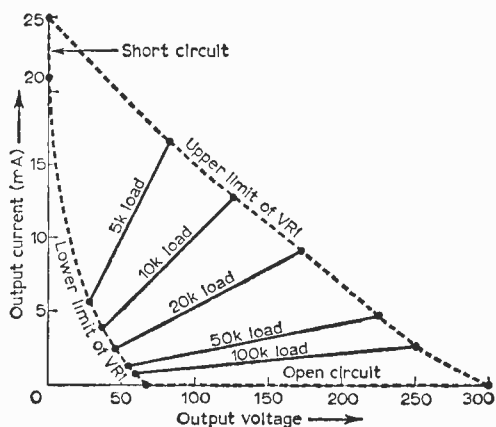


Fig. 9—The performance results of the circuit of Fig. 8.

load of resistance marked on the load-line, connected to the output. The portion of each load-line drawn is passed through from one end to the other as VR1 is turned through from one end to the other.

After joining up all ends of all load lines in the manner shown by the dotted line on Figs. 7 and 9, to form an area on the graph, we have at a glance on paper all possible combinations of output voltage and current whatsoever which the H.T. supply in question is capable of giving. If any desired combination of H.T. voltage and current for a certain consumer circuit lies within the area enclosed by the dotted line, then it is obtainable from the supply, simply by connecting the consumer circuit and adjusting VR1 until the desired condition is reached. If the desired voltage/current combination lies outside the enclosed area, then it cannot be supplied, though a suitable modification of circuit and component values might enable it to be included in the resulting new "operational area".

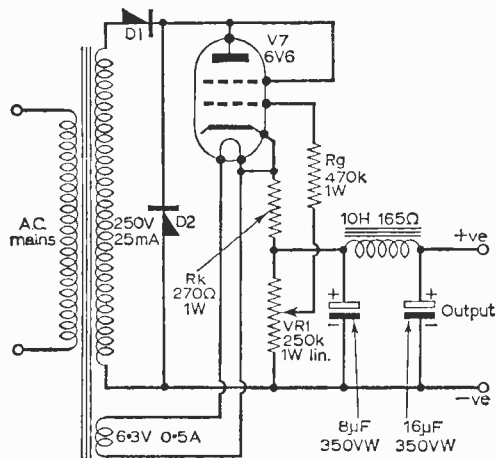


Fig. 8—The circuit of Fig. 5 with the component values indicated.

## Neons in the Experimenter's Power Pack

(Continued from page 234)

voltage. Having realised this, the cure was simple, as shown in Fig. 8. Here the feed for V2A was transferred to the rectifier side of R19, and given its own independent new smoothing resistor and condenser. After this modification, full simultaneous loading of the unstabilised output up to 50mA had no effect upon the stabilised output voltage and its stabilisation for any voltage within the design range of 150 to 300, so that the defect was successfully removed.

### Final Design

These simple modifications discussed in this article further improved the quality of the "Experimenter's Power Pack", which is now a

really valuable piece of equipment. The general reliability and freedom from overheating has proved itself, in that the appearance of the internal construction was still "new", and bright and clean, at the time of the inspection after some 2,000 operating hours which gave rise to the writing of this article.

This period of operation represented some months of virtually non-stop operation day and night, the power-pack being switched off only for short periods of an hour or two at intervals of a week or more, for changes to apparatus in the long-term experiments which were being fed.

It is hoped that this article forestalls any difficulties or disappointments which constructors might experience with their power units, and that it also provides some interesting and useful tips in general for the use of neon circuits.

# BOOKS REVIEWED

**RADAR POCKET BOOK**—by R. S. Boulding. 248 pages. Published by George Newnes Limited. Price 21s.

**L**IKE many of today's books bearing the term "pocket" in the title, this publication is too large truthfully to substantiate the use of that qualification; but as the word "pocket" is nowadays recognised as descriptive of the contents of a book being of the 'handy', reference class (rather than of its dimensions), the foregoing information must be regarded only as a warning for those who, on first reading the title, visualise the whole history of radar published in miniature form.

The author assumes, understandably, that anyone reading this book is already familiar with much of the fundamental knowledge necessary to command an understanding of ordinary radio. But this is not merely a reference manual for experts engaged in work on radar equipment—the first few chapters are devoted to a concise presentation of the electronic principles and formulae which are the basis of radar.

Subsequent chapters deal with the individual units which comprise a modern radar installation, and an informative section on testing and test gear is included.

It appears that the student of radar operation must keep a large store of formulae and equations readily at hand, for several "comprehensive" chapters seem to deal with little else; but comprehensive they no doubt are and for the radar operator, engineer or just the technically minded enthusiast, this book will find a natural home on the workbench along with all the other essential volumes.

**BASIC RADIO COURSE**—by J. T. Frye. 224 pages. Published by Gernsback Library, Inc., 154 West 14th Street, New York 11, N.Y., U.S.A. English agents: The Modern Book Co., 19-21 Praed Street, Londn W2. Price 32s.

**T**HIS is a revised addition of one of the most popular technical books ever published by this company. Much new data has been added and in some cases up-to-date material has replaced earlier information.

The author begins with the basic elements of electricity—the electron theory, which leads to an understanding of Ohm's law, resistance, capacitance and induction. In these opening chapters the reader will gain knowledge slowly but surely through the precise and clear explanations of the author. However, it seems as though the number of illustrations, usually so large in Gernsback Publications, has been kept to a minimum which proves detrimental to the understanding of the more technical points.

As the book proceeds, terms common to radio are explained and the reader is shown how the

component or components, associated with any of the terms operate in accordance with the laws involved. Each chapter in the book ends with a dozen questions on the subjects dealt with in the chapter for the student to answer and so test the knowledge he has gained.

Different stages of common circuitry are dealt with in following chapters—the power supply, the converter stage, some oscillator circuits, etc.

The last three chapters, which are concerned with transistor radios, instruments and tools and servicing techniques, only give elementary instruction on these subjects but this will prove valuable for the student as an introduction to different fields of radio.

The complete beginner to wireless will be a little confused by the discrepancies between American and English terminology when he compares the knowledge he has gained from this book to English radio circuits and literature, but these will soon become obvious.

**RADIO AND ELECTRONIC LABORATORY HANDBOOK**—by M. G. Scroggie, B.Sc., M.I.E.E. 537 pages, including over 300 diagrams and photographs in the text. Published by Iliffe Books Ltd. Price 55s. net; by post 57s. 3d.

**I**N previous editions the title of this volume was "Radio Laboratory Handbook" and, as the new title indicates, this new edition has been broadened in scope to include the field of electronics. Much of the book deals with the measurements involved in testing and assessing the performance of electronic equipment and the explanations given are lucid and in a style which makes for easy reading.

Not only are the means of making measurements discussed in great detail but also the reasons for making them in the first place. The interpretation of results also receives the attention it deserves; all too often the technician is capable of making tests on apparatus but unable to display the results of the tests in as clear a manner as possible so that he may interpret them easily, and so that his report will be clearly understood by those who eventually receive it.

Another valuable section deals with the standards required for very accurate tests and gives valuable information on the use of broadcast signals as frequency standards. Among rewritten sections are those on stabilised power units; indicators, including valve voltmeters and oscilloscopes; crystal attenuators; the construction of experimental apparatus; and those on manufactured equipment. There are new sections on the testing of transistors, diodes and F.M. receivers, on clip-around and digital meters, and on wow and flutter. The large reference chapter at the end of the book contains a concise summary of all the relevant information which may be required.

**UNIVERSAL AVOMETERS**

Guaranteed perfect working order. Supplied complete with Leads. Batteries and Instructions.  
 Model "D", 34 range .. £8.19.6  
 Model "7", 50 range .. £11.10.0  
 Model "8", 20,000 $\mu$ /volt model .. 15 Gns.  
 Registered Post 6/- extra

**ADMIRALTY BLOWER MOTORS**  
 Available 6 or 12 volt D.C. 17/6 each. P. & P. 3/6.

**MINE DETECTORS No. 4A**  
 Will detect all types of metal. Complete equipment with instructions. 39/6. Carr. 10/6. Batteries 8/- extra.

**AUTO TRANSFORMERS**  
 Step Up, Step Down, 115-200-250 volts. 15 w. 8/-; 80 w. 12/6; 150 w. 18/6; 300 w. 42/6; 500 w. 87/6; 1000 w. 99/6. Postage extra. 1500 w. £26.19.6.

**Class D WAVEMETERS No. 2**  
 Frequency coverage 1.3-19.2 Mc/s. Operation 12 volt D.C. or 230 volt A.C. Complete with valves, crystal and callb. charts (like CC.221). Complete with valves, crystal £26.19.6. Carriage 10/-.

**230/250 volt A.C. MOTORS**  
 Size 4 1/2 in. x 3 in. dia. 90 watt. rating. 5,000 r.p.m. 1/2 in. drive shaft. Brand new, 22/6 each. P. & P. 1/6.

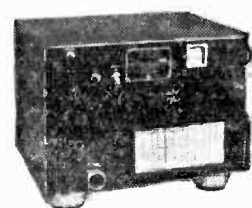
**SELENIUM L.T. RECTIFIERS**  
 Full wave bridge connected.  
 12/18v. 1A. 3/9 24/36v. 2A. 8/9  
 12/18v. 2A. 6/3 24/36v. 4A. 15/9  
 12/18v. 4A. 9/6 24/36v. 10A. 45/9  
 12/18v. 6A. 12/3 24/36v. 15A. 47/6  
 12/18v. 10A. 22/6 48/60v. 2A. 21/6  
 12/18v. 15A. 37/6 48/60v. 10A. 82/6  
 24/36v. 1A. 7/6 PLEASE ADD POSTAGE

**L.T. TRANSFORMERS**  
 All Primaries tapped 200/250 volts.  
 3.5, 5 or 17 volts, 1 amp. .... 9/9  
 Ditto 2 amp. 14/3 Ditto 4 amp. 16/6  
 9 or 17 volt, 6 amp. .... 26/9  
 3, 4, 5, 6, 8, 10, 12, 18, 20, 24 or 30 volt, 2 amp. .... 18/6  
 Ditto 4 amp. .... 27/6  
 Ditto 6 amp. .... 37/6  
 Please add postage

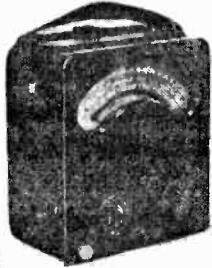
**PARMEKO TABLE TOP TRANSFORMER**  
 230 v. Primary, 620-0-620 v. 250 mA, tapped 650 and 775 v. 2 x 5v. 3 amp. 45/- each. P. & P. 5/-.

**PAINTON MINIATURE JONES PLUGS/SOCKETS**  
 2-pin, 2/6 pr.; 4-pin, 3/6 pr.; 8-pin, 4/- pr.; 8-pin, 4/6 pr.; 12-pin, 5/6 pr.; 35-pin, 10/6 pr. Postage extra.

**COLLINS T.C.S. RECEIVERS**



Superb 7 valve short wave receivers. Frequency coverage on 3 bands 1.5-12 Mc/s. Circuit incorporates B.F.O., R.F. and A.F. gain controls. etc. Power requirements 225 v. H.T. v. L.T. supplied brand new with circuit. £26.19.6 each. Carriage 7/6.



**R.C.A. AR88 L.F. RECEIVERS**

World famous 14 valve receiver. Frequency coverage on six bands 75-550 kc/s and 1.5-30 Mc/s. Variable selectivity, crystal B.F.O., mechanical bandspread, noise limiter, etc. Operation 110/200/250 v. A.C. Output for phone or 3 $\Omega$  speaker. Supplied in perfect working order. £32.10.0 ea. Carr. 30/-

**NATIONAL H.R.O. RECEIVERS**

Supplied with a full Senior Model, table or rack mounting. Special features include: S meter, crystal phasing, B.F.O., etc. Output for phones or speaker. Supplied fully tested, superb condition throughout. 21 Gns. Carr. 10/- Power units available 59/8 extra.

**CT-53 SIGNAL GENERATORS**

A precision instrument covering 8.9 to 15.5 Mc/s and 20 to 300 Mc/s on 6 bands. Variable attenuator from 1 microvolt to 100 millivolts. Operation 110-200-250 volts A.C. Supplied in perfect working order complete with calibration charts. Price 19 Gns. Carriage 10/6.

**CLASS "D" WAVEMETERS MK. II**

Frequency coverage 1,900-4,000 kc/s, and 4,000-8,000 kc/s. 6 volt D.C. input. Supplied complete with crystal and spare 6 volt vibrator. Brand new with instructions, 59/8 each. P. & P. 3/6.

**COLLARO STUDIO TAPE TRANSCRIPTORS**

Very latest model with interlock button and fitted with Bradmatic heads, 3 speeds, 1 1/2 in., 3 1/2 in., 7 in. per sec. 3 motors, digital counter, press button switching. Complete with instructions and spare 7-inch spool. Supplied Brand New and Guaranteed, 10 Gns. each. P. & P. 3/6.

**FIELD TELEPHONES TYPE F**

Ideal for all Intercom. systems, house, garage, office, building sites, etc. Generator bell ringing, 2 line connection. Supplied complete with batteries and wooden carrying case. fully tested, £4.19.6 per pair. P. & P. 5/-.

**COMBINATION PRECISION VOLTMETER/AMMETER**

A.C. and D.C. 2 separate precision instruments housed in polished wood case. Manufactured by Elliott Bros. 8in. scales, knife edge pointers. Ranges: Volts A.C. and D.C. 160, 300 and 600 volts. Amps A.C. and D.C. 25, 50, 150 and 200 amp. Supplied with all current shunts, leads and leather carrying case. Ideal for labs, schools, etc. Brand new, fully checked, £9.19.6 each. Carriage 7/6.

**TRANSISTOR BARGAINS**

XA103	3/8	XA123	7/6	OC45	6/6	White Spot	3/-
XA104	4/6	XA124	7/6	OC44	6/6	Yellow Spot	2/6
XB112	3/-	XA125	7/6	OC75	6/6	Yellow Green	3/6
XC141	10/-	XA126	7/6	OC74pr.	12/6	Yellow/red	4/6

Please add postage.

**R.C.A. AR88D RECEIVERS**

14 valves. Frequency coverage on 6 bands 550 kc/s.—32 Mc/s Variable selectivity, crystal B.F.O., mechanical bandspread, noise limiter, etc. Operation 110/200/250 volt A.C. Output for phone or speaker, £35 each. Carriage 30/-.

**C.B.S. AMERICAN RECORDING TAPE**

Finest quality by the most famous American Co. All fitted with Leader Tape and Stop Roll.  
 5in. std. play, 600ft. .. 13/- 5 1/2 in. dble. play 1800ft. .. 37/-  
 5in. long play, 900ft. .. 18/6 7in. std. play, 1200ft. .. 21/-  
 5in. dble. play, 1200ft. 32/- 7in. long play, 1800ft. .. 28/6  
 5 1/2 in. long play, 1200ft. 19/6 7in. dble. play, 2400ft. .. 47/-  
 Spare Spools: 3in. 1/-, 4in. 1/9, 5in. 2/-, 5 1/2 in. 2/3, 7in. 2/6.  
 Plastic Spool Containers: 5in. 1/6, 5 1/2 in. 2/-, 7in. 2/3.  
 SEND FOR FULL LISTS. Please add postage.

**G.E.C. SELECTEST MULTI-RANGE TESTMETERS**

1,000 ohms per volt. 37 ranges. A.C./D.C. Fitted with automatic cut out. Supplied in perfect condition. Complete with batteries and leads. £9.19.6 each. Reg. post 5/- extra.

**P.C.R. COMMUNICATION RECEIVERS**

6 valves. Frequency coverage on three bands: 850-2,000 metres, 190-550 metres, 9-18 Mc/s. Super slow motion drive, A.E. trimmer, tone control, built-in speaker. AS NEW £8.19.6. Carriage 7/6.

**P.C.R.3 COMMUNICATIONS RECEIVER.**

190-550 metres, 2-7 Mc/s.. 7-23 Mc/s. Output for phone or 3 $\Omega$  speaker. AS NEW 8 Gns. Carr. 7/6. Both above models are available with internal power unit to operate on 200/250 volt A.C. at 39/8 extra or alternatively plus-in external power units are 35/-.



Circuit and details supplied.

**SET OF MULLARD TRANSISTORS**

1xOC44, 2xOC45, 1xOC18D, 2xOC81. Brand new, 30/- P. & P. 9d.

**CADMIUM SULPHIDE PHOTOCELLS**

Type PX1/1. Subminiature, wire ended. Extremely sensitive. 12/6 each. P. & P. 6d. Data supplied.

**CAMBRIDGE SPOT GALVONOMETERS**

5 microamp. Perfect order. £9.19.6 each. P. & P. 5/-.

**CR.100 SPARES KITS**

Contain 15 valves, condenser and resistor packs, pots, output transformer, etc. Brand new, 59/8 each. P. & P. 3/6.

**24 volt D.C. PUMPS**

100 G.P.H. impeller type, suitable for water. 15/6 each. P. & P. 2/6.

**POST OFFICE RELAYS**

3000 Type, 6,000 ohm coil, 6 sets of Clover contacts, new, boxed, 19/6 each. P. & P. 1/- Many other types available.

**PRECISION A.C./D.C. VOLTMETERS**

0-160 v. and 0-320 v. 8in. mirror scale with knife edge pointer. Housed in polished wooden cases, ideal for schools, labs., etc. Supplied brand new. £5.19.6 each. P. & P. 3/6.

**AR88D SPARES**

Complete Wavechange Switch Assembly with Screens, New. Boxed, 17/6 each. P. & P. 2/6 1st I.F. Transformer. Boxed, 3/6. P. & P. 9d.

**1,000 watt ISOLATION TRANSFORMERS**

230 volt Primary, 230 volt Secondary. Ex-Admiralty, Boxed, £5 each. Carriage 10/-.

**7.5 kVA AUTO TRANSFORMER**

Step Up, Step Down, 115-230 volts. Brand new. Boxed. £15 each. Carriage 10/-.

**BRAND NEW NATIONAL H.R.O. RECEIVERS**

Senior Model, table mounting. Supplied with a "complete set of 9 coils" covering 50 Kc/s to 30 Mc/s. Few only available in this condition. Fully checked before despatch. £27.10.0 each. Carriage 10/-.

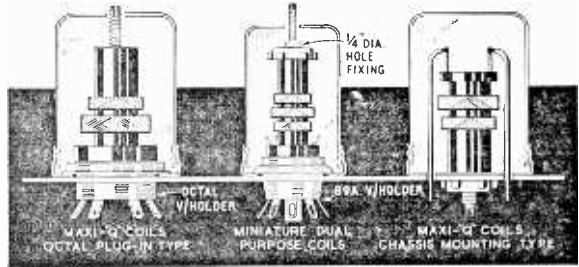
**C.W. SMITH & CO (RADIO) LIMITED**  
 Phone: GERRARD 8204/9155  
 Cables: SMITHEX LESQUARE  
 3-34 LISLE STREET, LONDON, WC2



**"THOUGH THE WORKING WEEK IS SHORTER WITH WAGES AND MATERIALS EVER MORE COSTLY"**

Thanks to you, our Customers who purchase in ever-increasing numbers, we are still able to offer the finest ever coils without increased prices.

Coverage from 3.8 to 2,000 metres in 7 ranges—Each coil is packed in an aluminium container which may be used as a screening can for the coil itself—Brass threaded, adjustable iron cores—Colour coded moulded polystyrene formers—Chassis/Plug-in Technical Bulletin, DTB.1 1/6—Dual Purpose Technical Bulletin, DTB.4 1/6—Colour Code Identified Coils: BLUE Signal Grid Coil with Aerial Coupling winding—YELLOW Signal Grid Coil with intervalve coupling winding—GREEN Grid Coil with reaction and coupling windings—RED Superhet Oscillator for I.F. of 465 Kc/s—WHITE Superhet Oscillator for 1.6 Mc/s. Prices range from 4/1 to 4/9 each. Five-Colour Glass Scale, Back Plate, Pointer, Pulleys and Cord for use with 315 pF tuning condensers. Coverage (1) 150-400 Kc/s.; (2) 530-1,600 Kc/s.; (3) 1.5-4 Mc/s.; (4) 4-12 Mc/s.; (5) 10-30 Mc/s.; Price 19/-.



GENERAL CATALOGUE covering full range of components send 116d. in stamps or P.O. PLEASE SEND S.A.E. WITH ALL ENQUIRIES.

**DENCO (CLACTON) LTD.** (Dept. P.W.), 357/9 Old Road, Clacton-on-Sea, Essex

**Home Constructors LOOK!**

**CRYSTAL MICROPHONES**

- Hand Type ..... 25/-
  - Stick ..... 32/6
  - B.M.3 (Stick) ..... 39/6
  - Stand for B.M.3 ..... 12/6
  - Lapel Type ..... 15/-
  - Dynamic Microphones
  - DX29 and Base ..... 3 gns.
  - Tie Pin ..... 27/6
- P. & P. 1/6.

**SYNCHROTAPE**

- High fidelity recording tapes
  - 5in. Standard play, 600ft. 12/-
  - 5 1/2in. " " 850ft. 15/6
  - 7in. " " 1200ft. 19/6
  - 5in. Long play, " 900ft. 16/-
  - 5 1/2in. " " " 1200ft. 18/6
  - 7in. " " " 1800ft. 27/6
  - Double Play Tape
  - 5in. 1200ft. .... 32/6
  - 5 1/2in. 1800ft. .... 39/6
  - 7in. 2400ft. .... 45/-
- P. & P. 1/6.

**TAPE OFFER**

- Super Quality Standard Play
  - 600ft. on 5in. spool ..... 10/6
  - 1200ft. on 7in. spool ..... 17/6
- P. & P. 7/6.

**TAPE DECK**

- Collaro Studio Deck .. £10.19.6
- P. & P. 7/6.

**TAPE SPOOLS**

- 3in. 1/-, 5in. 2/-, 5 1/2in. 2/3,
- 7in. 2/6. P. & P. 9d.

**AUTO CHANGERS**

- B.S.R. UA14 ..... £7.19.6
  - Collaro C60 ..... £7.19.6
  - Single Players
  - Collaro Junior complete with p/u ..... £3.15.0
  - EM1985 complete with p/u ..... £4.9.0
  - Garrard 4HF ..... £19.18.0
- P. & P. 3/6.

**CARTRIDGES**

- B.S.R. .... 18/-
  - Collaro ..... 18/-
  - Ronnette ..... 25/-
- P. & P. 1/6.

**LOUD SPEAKERS**

- 5in. Speaker ..... 14/6
  - 6 1/2in. " ..... 16/-
  - 8in. " ..... 16/6
  - 6 x 4in. " ..... 14/6
  - 7 x 4in. " ..... 15/-
  - 8 x 5in. " ..... 23/-
  - 10in. " ..... 30/-
  - 10 x 6in. " ..... 25/-
  - 12in. " ..... 32/6
- All above 3 ohms impedance
- 12in. 15 ohm Celestion ..... £4.9.6
- P. & P. 2/6.

**TRANSISTORS**

- Audio ..... 3/6
- R.F. .... 4/6
- Driver V15/20P ..... 15/-

THE VERY LATEST BARGAINS FROM WIRECOMP

**TRANSISTOR KITS**

OUR IMPROVED VERSION OF THE 'JUNIOR 5'

**'JUNIOR MkII'**

NOW SUPPLIED COMPLETE WITH PRINTED CIRCUIT BOARD AND FREE GIFT OF MINIATURE EAR PIECE. An easy "first step" set for the young constructor. This miniature marvel with the BIG performance has an internal Ferrite rod aerial—3 transistors and 1 diode—separate medium and long waveband control—200 milliwatt push-pull output—2in. moving coil speaker—unbreakable plastic case with carrying handle. Complete with full instructions. Circuit diagram 1/6. free if all parts bought. All parts sold separately.

**£2.19.6**

P. & P. 2/-

PORTABLE SUPERHET RADIO

**'REVEL 6'**

TRANSISTOR RADIO

This two-wave band superhet receiver incorporates six first grade Mullard Transistors and one Diode; Printed circuit; Internal Ferrite rod aerial; develops 400mW push-pull output. Driving 8 x 3 speaker; M.W. and L.W.; operates on two 4.5 v. batteries. Although full portable (car aerial socket provided) this set has a performance superior to many mains radios of much greater size. Attractive two-tone cabinet—size 9 1/2 x 6 x 3 1/2in. Price includes full assembly and alignment instructions. All parts sold separately.

**£7.19.6**

P. & P. 3/6

THE SUPER VALUE RADIO KIT

**'SONIC SIXTY'**

TRANSISTOR RADIO KIT

6 Mullard transistors, 1 diode, internal ferrite rod aerial, 7 x 4 high quality speaker, printed circuit, 500mW push-pull output. MW and LW calibrated direct drive assembly. Highly polished handsome walnut cabinet. Inst. Book 2/6. Complete kit, inc. Battery. All parts sold separately.

**£8.19.6**

P. & P. 4/6

**WIRECOMP ELECTRONICS**

378 HARROW ROAD, LONDON, W9.

TEL: CUNNINGHAM 9530

Hours of business: 9 a.m. to 6 p.m. Open all day Saturday. Opposite Paddington General Hospital. Buses 18B and 36 pass the door.

# POWER Rectifier Circuits

A SURVEY OF PRINCIPLES OF PRACTICAL IMPORTANCE, AND USES OF THESE CIRCUITS

By L. N. Nash

(Continued from page 131 of the June issue)

**I**N last month's article, the conventional half-wave rectifier circuit was dealt with.

## The Conventional Voltage Doubler

It is perfectly feasible to feed a positive and a negative half-wave rectifier circuit of the types discussed in last month's article *simultaneously* from the *same* transformer winding, in the arrangement of Fig. 7a. This is, in a sense, a full-wave circuit because use is made of *all* half cycles, i.e., one of the rectifiers is always drawing current,

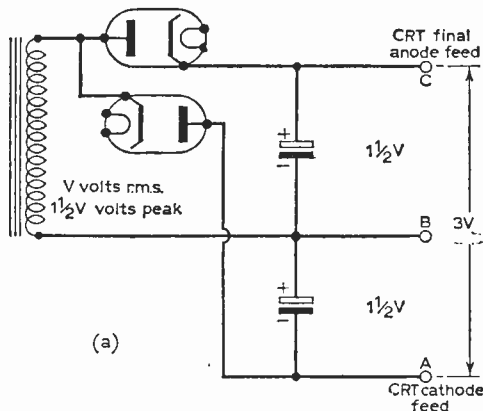


Fig. 7a—The conventional voltage-doubler circuit. (The voltages marked are ratios.)

whatever the polarity of the voltage from the transformer winding may be at any instant. But it is not usually classed as "full-wave", because the total output voltage is in essentially two parts, each of which is of half-wave nature. The circuit is normally known as the "conventional voltage doubler".

Three possibilities exist for practical forms. A voltage equal to about twice the peak A.C. value of the transformer winding is present between points A and C in Fig. 7a, whereas point B is at the half-way voltage-point.

## common and uncommon

### Earthing

Now the three basic practical possibilities amount to the choice of whether we connect A, B or C to chassis. If we connect A or C to chassis, we have a true voltage doubler giving the doubled D.C. output of positive or negative polarity with respect to chassis, respectively. Such circuits are very conveniently used in small EHT circuits for small oscilloscopes. An ordinary 350V transformer winding will then deliver EHT voltages up to 1,000 with the circuits of Fig. 7b or 7d. The circuit of Fig. 7b delivers a D.C. voltage negative to chassis, and would be fed to the cathode of the cathode-ray tube, as indicated. This enables the final anode of the tube to be earthed, and thus the deflector plates to be approximately earthed. In consequence, coupling condensers from the timebase circuits and Y-amplifier need only be of normal H.T. rating.

The circuit has the disadvantage of needing a separate insulated heater winding for the cathode-ray tube, as otherwise the full EHT voltage would appear between heater and cathode, which would cause breakdown!

The circuit of Fig. 7d gives a positive voltage to chassis which would be applied to the final anode of the CRT, the cathode being approximately earthed. This circuit allows the CRT heater to be run off the same heater supply as other valves in the oscilloscope, but requires coupling-condensers of EHT-rating from the timebase and Y-amplifiers. It is very often more convenient to use this latter circuit, and Fig. 8 shows the power-supply section of a miniature test-oscilloscope which the author has designed and built. This instrument has already given two years of trouble-free service, and uses a practical form of the circuit of Fig. 7d. It is at once evident from this circuit, that the same rectifier circuit supplies H.T. for the timebases and amplifiers as well as EHT for the CRT. The positive EHT voltage is tapped at the mid-point B to give the H.T. voltage. This arrangement of supplying the single and the double voltage output simultaneously is in principle possible with any of these voltage doubler circuits, a possibility seldom realised by the average constructor. It is not even necessary to have equal loading of the two possible outputs, or to have even anything approaching equal loading. In such cases of unequal loading, as

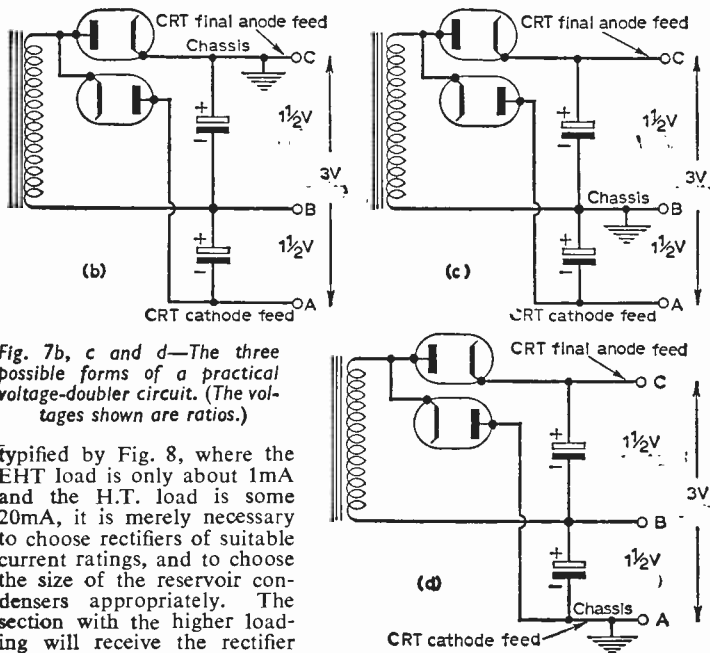


Fig. 7b, c and d—The three possible forms of a practical voltage-doubler circuit. (The voltages shown are ratios.)

typified by Fig. 8, where the EHT load is only about 1mA and the H.T. load is some 20mA, it is merely necessary to choose rectifiers of suitable current ratings, and to choose the size of the reservoir condensers appropriately. The section with the higher loading will receive the rectifier of higher current rating and the reservoir condenser of higher capacity. Values are generally by no means critical.

**Two Supplies**

It is an advantage of the "positive" circuit of Fig. 7d, used in the practical example of Fig. 8, that the "mid-way H.T." point is of the correct polarity for use as valve-H.T. supply. With the "negative" circuit of Fig. 7b the mid-way H.T. is negative to chassis, and is thus unsuitable for application in a circuit such as Fig. 8. But the pioneering experimenter must remember that the polarity is then just right for feeding the transistors in a transistorised oscilloscope, so that the circuit of Fig. 7b would be useful for such cases. A voltage bleeder will easily give the desired negative supply voltage level actually required by the transistors to be used, and thus again the object of running all circuits from a single rectifier assembly is achieved.

Two final points are to be remembered in connection with this conventional voltage doubler and its more unconventional applications. Firstly, great care is required in connecting the electrolytics with correct polarity, as on account of the more unusual nature of these circuits, and consequent less familiarity, the constructor is more liable to make mistakes if he hurries his work. An incorrectly wired electrolytic invariably leads to a drastic short-circuit in part or all of such a circuit. The second point is, that the circuits are not by any means limited to uses for oscilloscope EHT supplies; they may be used for any circuits whatsoever needing just the outputs available, and it is always possible to connect any number of voltage-bleeder chains of resistors across the outputs to obtain any number of intermediate voltages. The intermediate

voltages may be stabilised with neon-tubes in the usual manner, if desired. It is merely necessary to ensure that the total sum current of the bleeders and loadings of the various outputs does not exceed the rectifier-circuit output current rating, and that components of appropriate voltage and current ratings are used throughout. In this manner, a vast variety of rectifier circuits is seen to be possible, all based on this simple fundamental voltage doubler.

**Rectifiers of Differing Ratings**

In Fig. 7c, where the mid-point is connected to chassis, the section positive to chassis can receive a high-current rectifier and large reservoir condenser, and be used as valve-H.T. supply, whereas the negative section can be fitted with a low-rating rectifier and smaller reservoir condenser, and supply negative grid-bias. Fig. 9 shows a typical circuit. If the negative circuit is used to supply grid-bias to sensitive amplifiers, it may, however, be better to use a reservoir condenser even larger than for the H.T. section, in spite of the lower loading, to avoid hum being introduced and amplified at the grids being biased. It is probably most economical not to make C2 too large in Fig. 9, but to use a really large capacity electrolytic for C3, where the voltage is lower—a large-capacity electrolytic of such a voltage rating will be of reasonable price.

If the transformer winding has a tapping, another useful circuit modification is possible, giving  
(Continued on page 249)

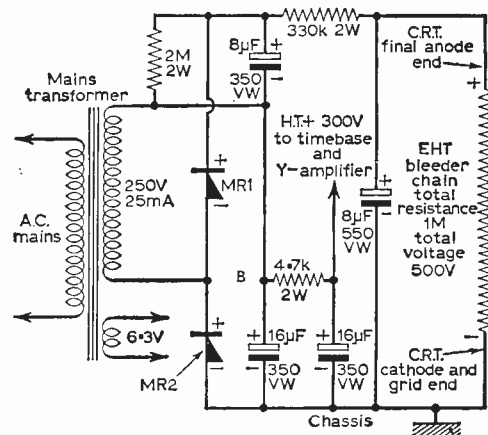


Fig. 8—The power supply used by the author in his miniature cathode-ray oscilloscope.



**SUPERB COMMUNICATION RECEIVERS**

**AMERICAN AR88D RECEIVERS.** Fresh release of these renowned sets. 14 valves, 6 wavebands, covering 50 Kc/s-32 Mc/s. Incorporate every possible refinement and have internal A.C. mains pack for nominal 115/230 v. Thoroughly reconditioned, immaculate in appearance, and in perfect working order. **ONLY £36** (add carriage 30/- and 50/- deposit on returnable transit case). S.A.E. brings illustrated leaflet.

**MARCONI CR. 100/8 COMMUNICATIONS RECEIVER.** Covers 80 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.

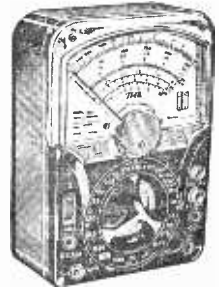
**TEST METERS FOR EVERY PURPOSE & POCKET**



**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 3 1/4 in. x 5 1/4 in. **£3.10.4**



**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 3 1/4 in. x 5 1/4 in. **£5.19.6**



**30,000 O.P.V. MODEL 150a.** Volts to 1,000; D.C. at 30,000 O.P.V.; A.C. at 20,000; 12 Arms D.C. Current; 60 Megs Resistance; -20 to +56 Dbs; Internal buzzer short circuit warning. Size 3 1/4 in. x 6 1/4 in. x 2 1/4 in. **£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 A113.** Ex R.A.F. For normal A.C. Mains use. 5Z4 Rectifications with 6V8 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 £9/8** (carriage etc. 10/6).

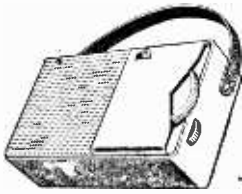
**AMERICAN HALLICRAFTERS 6 VOLT VIBRATOR PACK.** Output 300 volts D.C. at 170mA. Designed to run Communications Receivers from 6 volt car battery. Size 6 1/4 in. x 6 1/4 in. x 7 1/4 in. Complete with 2 valves 6X5, and instructions, in makers cartons. **BRAND NEW & UNUSED. ONLY £9/8** (carr. etc. 3/6).

**12 VOLTS AMERICAN DYNAMOTORS.** Deliver 220 volts at 100 mA. Size 5 1/4 in. x 3 1/4 in. diameter. Ideal for running Electric Shaver etc. from Car battery. **ONLY £2/6** (post 2/6).  
**B.C. 231 FREQUENCY METERS.** The famous American crystal controlled, portable frequency measuring standard. Coverage 125 Kc/s-20 Mc/s. With original calibration book. Perfect order. Illustrated details on request. **ONLY £16.**

**PCR COMMUNICATION RECEIVERS**

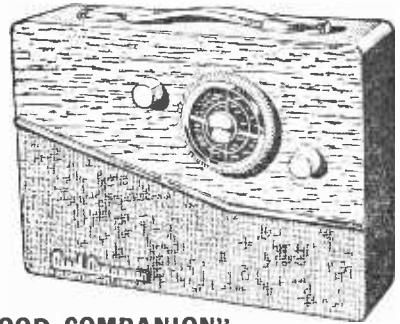
Manufactured by **Pye & Phillips**. One of the Army's most versatile and sensitive sets. RF stage and 2 of I.F., using 6 British I.O. type valves. Large 180 degrees Illuminating and Calibrated Dial. Flywheel Tuning with locking device. Aerial Trimmer, Tone and Vol. Controls. Band switch from panel jacks for speaker or phones. In black metal case, size 17 1/2 in. L x 8 in. H x 10 1/2 in. D. Model PCR covers 6-18 Mc/s. 200-550 metres and 850-2,000 metres and has internal 5-in. speaker. **REME** reconditioned as new. **£9.19.6**. 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**

**"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 £8.10.0.**  
**"P.W. TROUBADOUR ?" Parts List, S.A.E.**



**THE "GOOD COMPANION"**

**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. ★ Pre-aligned I.F.T.'s. ★ Brilliantly styled 2 tone cabinet, size 11 x 8 x 3ins. ★ 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).

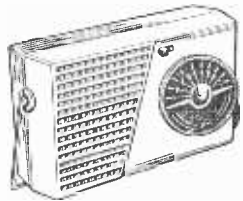
All parts sold separately and full illustrated details will be sent on request.

Total Cost **£9.19.6**

**MARK II VERSION** using transfilters, thereby saving alignment problems—SAME PRICE. With alternative luxury cabinet using 7 x 4in. speaker **£10.19.6**. Either type, plus 5/- post and ins. (Battery 3/6 extra.)

**"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.

**IT'S NEW!!**

**THE "NORPAK" MAINS POWER PACK KIT FOR TRANSISTOR RADIOS**

We are delighted at the response and enthusiasm of readers to this fine new kit.

Saves battery costs, boosts and greatly extends life of old batteries.

Miniature Size—4 x 2 x 1 1/2 in. In attractive two-tone plastic case. Assembled in an hour. Normal output 9 v. 100 mA. (Adjustable) Full Mains Transformer. Full wave germanium diodes. Cartridge fuse.

Complete Kit with Plans **35/-** Plus 1/6 P.P. (Ready assembled 45/-).

**ANNOUNCING!**  
P.W. "MERCURY" 6  
PRINTED CIRCUIT VERSION



**£9.10.0**  
Plus 2/6 P.P.  
All parts required

This exciting new Transistor Superhet gives superb performance on a 7 x 4 in. speaker housed in attractive two-tone cabinet with ferrite aerial.

For both of these fine kits every item down to the last nut and bolt is supplied together with detailed building plans. All parts sold separately. Send 1/6 for Buildings Plans (FREE with Kit).

**PAY AS YOU BUILD SCHEME**

AT NO EXTRA COST the above kits may be bought in 3 complete stages of 5/8 ("PW" 6) or 63/4 ("Mercury" 6) each plus 1/6 P.P. (state A, B, or C).

**ALIGNMENT SERVICE**

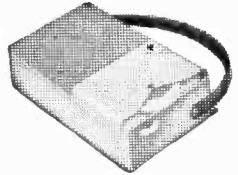
We Offer a very comprehensive service for both the above versions, including Fault Finding, at reasonable charges (write for details).

**LATEST VERSION !!**

**P.W. 6-TRANSISTOR**  
Medium and Long Wave Pocket Superhet

THE CONTINUED POPULARITY OF THIS FAMOUS SET IS PROOF OF ITS VERY HIGH QUALITY AND FINE PERFORMANCE

- 250 mW Push-Pull Output on 2 1/2 in. P.M. Speaker.
- Printed Circuit.
- Guaranteed first grade Miniature Components.
- High Q Internal Ferrite Rod Aerial.



All parts required **£8.10.0** Plus 2/- P.P.

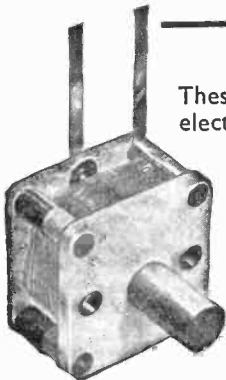
**NORCOL LTD**

**147 LONDON RD., YORKTOWN, CAMBERLEY, SURREY**

Phone: CAMBERLEY 22760

**JACKSON**   
the big name in **PRECISION** components

Precision built radio components are an important contribution to the radio and communications industry. Be sure of the best and buy Jackson Precision Built Components.



**"DILEMIN" CONDENSERS**

These miniature solid dielectric condensers are only 7/8" square. The 1/4" dia. spindle projects 1/2" from the Front Plate. Low loss construction provides Power Factor better than .001.

Write for literature.

**JACKSON BROS. (LONDON) LTD.**  
(Dept. P.W.) KINGSWAY-WADDON, SURREY  
Phone: Croydon 2754-5 Grams: Walfico, Souphone, London

**SPECIAL FOR THE "HAMS" RADIO STATION**

Illustrated

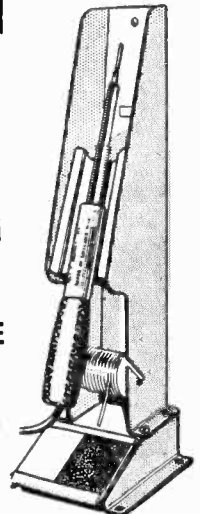
1/4 inch detachable bit soldering instrument  
List No. 70

Combined Protective Unit with Wiper/Abrasion Pad and Solder Reel  
List No. 700

Apply **SALES & SERVICE**

**ADCOLA**  
(INCORPORATED 1959 Trade Mark)

**ADCOLA HOUSE GAUDEN ROAD LONDON, S.W.4**



British & Foreign Patents, Registered Designs, etc.

Telephones: MACaulay 4272-3101

Telegrams: "SOLJOINT, LONDON, S.W.4."

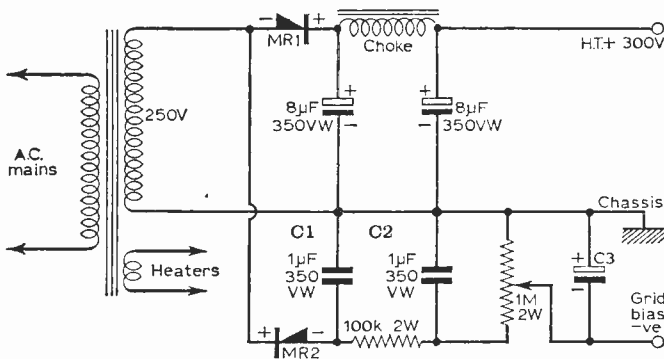
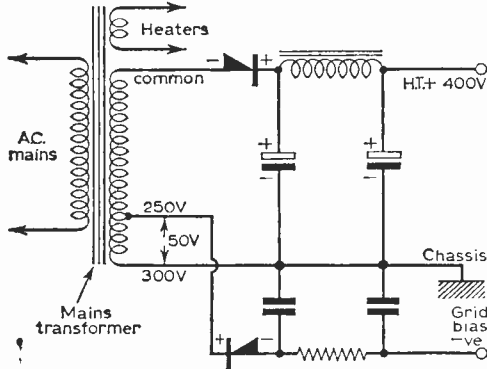


Fig. 9 (above)—A use of the voltage-doubler circuit for generating independent H.T. and bias supplies. (The component values in this diagram are approximate.)

Fig. 10 (below)—A variation of the circuit of Fig. 9 to achieve lower grid bias voltage.



(Continued from page 246)

deliberately unequal voltage outputs for the two halves of the "voltage doubler" right from the start. The smaller output would be polarised negative, to give the grid bias, which is normally required at lower voltage than H.T. This could avoid the need for bleeders altogether, and gives a

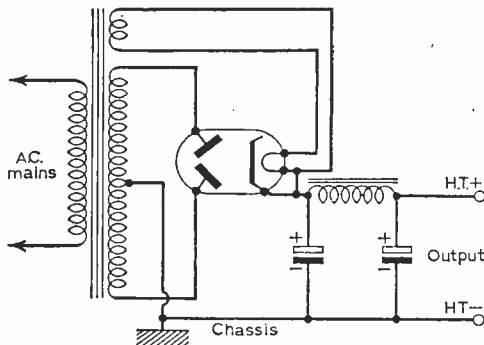


Fig. 11—A conventional full-wave H.T. rectifier circuit (fundamental positive full-wave circuit).

bias-supply of far better stability. Fig. 10 shows a typical example of a circuit possibility for a 300V transformer winding tapped at 250V which is very common. Using it connected in the opposite sense to usual, so that the 250V tapping represents only 50V (this will be clear from Fig. 10), a 300V A.C. input results for the H.T. section, and a 50V A.C. input for the bias section.

**The Conventional Full-wave Rectifier Circuit**

Fig. 11 shows the conventional full-wave rectifier circuit, extremely common in the H.T. supplies of domestic receivers. It is at once seen that the development from the simple half-wave circuit to the full-wave circuit of Fig. 12 is closely analogous to the development from the simple half-wave circuit to the voltage doubler, with one important difference. Whereas the voltage doubler used two rectifiers of opposite polarity on a single transformer winding, the full-wave circuit uses two rectifiers of the same polarity fed from a pair of transformer windings of opposite polarity. The two half-wave rectifiers of equal polarity feed the same single common D.C. output, alternately from alternate transformer windings on alternate half cycles of the A.C. inputs. The interconnection of the two basic half-wave circuits here involved is required to be such that a pair of ends of respectively opposite polarity of the two transformer windings must be connected together. The pair of transformer windings thus degenerate to a centre-tapped winding of twice the voltage, as is familiar in radio mains transformers.

But, to emphasise the principle of the circuit, it is perfectly possible to use two separate windings, even on separate transformers, for the same full-wave rectifier circuit. Thus the circuit of Fig. 12

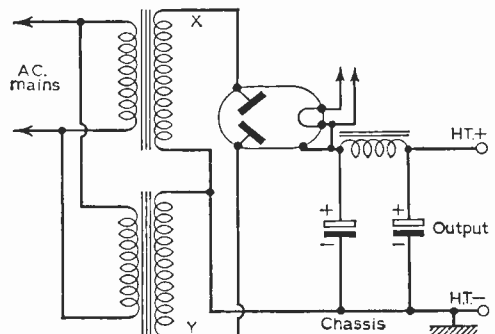


Fig. 12—This circuit gives a performance identical to that of Fig. 11 but uses two separate windings (on two separate transformers even) instead of a single, centre-tapped transformer.

is identical in performance to that of Fig. 11, and may be used by a constructor having a pair of transformers with untapped windings in his junk-box, and not wishing to purchase an extra conventional transformer.

**Windings**

It must be stressed that the two transformer windings in the conventional full-wave rectifier circuits *must be of identical voltage*. If the voltages differ, the loading of the two rectifiers will be unequal to an extent proportional to the voltage inequality, in particular at the higher output currents. A voltage difference of only some 10% to 20% could suffice in many cases for the rectifier connected to the higher voltage to take virtually all of the load, and the other rectifier to idle. This could lead to severe overload of the one rectifier and transformer. Thus it is important in Fig. 11 that the tap be a true centre-tap (which is normally ensured by the transformer manufacturer), and that the windings of the transformers in Fig. 12 have identical voltages.

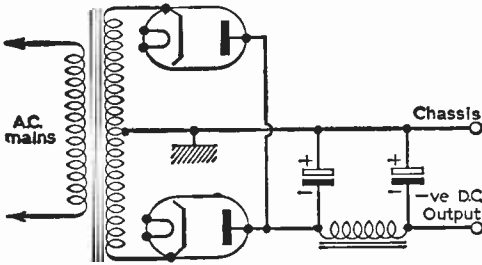
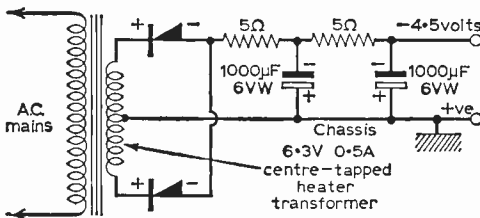


Fig. 13 (above)—A fundamental negative full-wave rectifier circuit.

Fig. 14 (below)—A collector voltage power supply for a pocket transistor radio (a mains adaptor) using a negative full-wave rectifier circuit.



**Phasing**

Furthermore, it is important to observe proper relative polarities for the transformer windings in the circuit of Fig. 12. Proper polarity exists when an A.C. voltmeter connected between points X and Y in Fig. 12 reads twice the voltage of a single winding. Incorrect polarity exists when the voltmeter reads zero or almost zero under these circumstances; one of the transformer windings should then be reversed.

A circuit running with incorrect polarity functions here simply as a pair of simple half-wave circuits in parallel, and is thus equivalent to a

single half-wave circuit of twice the current rating without giving the benefits of the better smoothing and regulation of the full-wave circuit. No damage is likely from incorrect relative polarity, merely a loss of efficiency, as both rectifiers then conduct on the same half-cycles, and both block on the others, instead of conducting alternately. Incorrect relative polarity is also manifest by the output voltage rest-ripple being at mains frequency instead of at twice the mains frequency characteristic of a properly-operating full-wave circuit. This is the main reason for the poorer relative smoothing and regulation of the half-wave

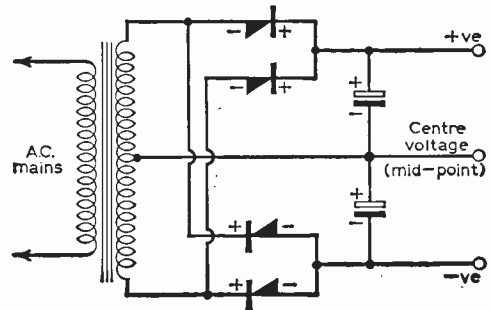


Fig. 15—A full-wave voltage-doubler circuit.

circuit compared with the full-wave circuit, as in the latter the smoothing condensers receive reinforcement current from the rectifiers at twice the frequency of the half-wave circuit, i.e., once each half cycle of A.C. input instead of once each full cycle. Thus, for the same size of smoothing components, the full-wave circuit has at least twice as good smoothing as the half-wave circuit, or, accordingly, smaller components may be used for achieving the same degree of smoothing.

**The Inverse Full-wave Circuit**

Most constructors are possibly not aware of the fact that the conventional full-wave rectifier circuit of Fig. 11 represents only one of several possibilities, namely the *fundamental positive circuit*. Fig. 13 shows the corresponding fundamental negative circuit, obtained by simple reversal of both rectifiers and appropriate reversal of the polarity of the smoothing electrolytics. This circuit is so very unfamiliar because it has little practical use for valve circuits, yet it is likely to receive increasing favour for mains-adaptors for running transistor sets. For such purposes it forms the natural counterpart of the positive valve circuit, transistors of *pnp*-type requiring negative collector voltages. Fig 14 shows a typical collector-voltage power-supply unit as built by the author for operating his pocket transistor superhet from the mains at home. Use is made of a normal 6.3V heater transformer with centre-tap, and two small germanium diodes in the fundamental negative full-wave rectifier circuit. The fact that this circuit is at the low voltage level required by transistors is a mere matter of detail; using components of appropriate voltage and current ratings, the same circuit functions with valve or metal rectifiers at any desired voltage.

(Continued on page 258)

# SURBITON PARK RADIO LTD

## for POST HASTE—POST FREE SERVICE

### F.M. TUNERS

#### JASON F.M. TUNER KITS

MT1	Complete with valves	\$6.17.8
	Deposit £27/8 and 6 monthly	\$11.8
FMT2	Complete less power	\$7.17.8
	Deposit 31/6 and 6 monthly	\$1.4.4
FMT2	Complete with power	\$9.15.0
	Deposit 39/- and 6 monthly	\$1.2.4
FMT3	Complete less power	\$8.12.8
	Deposit 35/6 and 6 monthly	\$1.9.0
FMT3	Complete with power	\$12.0.0
	Deposit 48/- and 8 monthly	\$1.6.8
	Power Pack Kit ready drilled chassis	\$2.12.8
	The instruction book is included in all the above kits, but otherwise is 2/6	
	switched TV sound, powered	\$14.15.0
	Deposit 80/- and 12 monthly	\$1.8
	Mercury 2 as above less power	\$10.15.0
	Deposit 43/- and 8 monthly	\$1.4.0
	The instruction book is again included, but otherwise 3/6.	

#### REQUIRED CHANNELS MUST BE SPECIFIED FOR ALL SWITCHED TUNERS

Marriott	Tape Heads, 4 track R/PB and erase with mounting plate for Collaro Deck.....PAIR COMPLETE	\$4.4.0
	List price for set is \$3.14.0.	
2 Track	R/PB only, with mounting bracket for Studio deck. Ideal for third head position	\$1.7.8

ALL THE ABOVE HEADS ARE BRAND NEW, OBTAINED DIRECT FROM MANUFACTURERS.

#### ARMSTRONG RADIO CHASSIS

T4B	VHT Tuner, self powered	\$21.18.0
	Deposit \$4.0 and 12 monthly	\$1.12.1
ST/8	Mk.2 AM/FM Tuner, powered	\$27.16.0
	Deposit \$5.16.0 and 12 monthly	\$2.0.4
AF208	AM/FM Radio chassis, bass and treble controls, F.U. inputs	
	Single ended output stage	\$22.18.0
	Deposit \$4.18.0 and 12 monthly	\$1.18.0
Jubilee	Mk.2 AM/FM Radio chassis with push-pull output stage	\$30.12.0
	Deposit \$8.2.0 and 12 monthly	\$2.4.11
Stereo	55 AM/FM Radio chassis, single ended output stage, on both channels. Separate tone and volume	\$32.15.0
	Deposit \$6.15.0 and 12 monthly	\$2.7.8
Stereo	12 Mk.2 AM/FM Radio chassis. Push-pull on both channels, separate controls	\$43.10.0
	Deposit \$9.0.0 and 12 monthly	\$3.3.3

Individual leaflets giving full description and technical specification available

Marriott	Tape Heads, 4 Track Type L/RP/87 and L/ES/9, R/PB and Erase with mounting bracket for Studio Deck. PAIR COMPLETE	\$4.4.0
	Marriott list price is \$5.14.0, with brackets.	
Marriott,	2 Track Type D/R/R/P/1 R/PB only, with mounting bracket for Studio Deck. Ideal 3rd head.	\$1.7.8
M.S.S.	Track Type D/R1 and D/R1 R/PB and Erase. Sets only. \$1.2.8 bar.	

### MARTIN RECORDAKITS

We are able to offer for the first time, a proprietary range of Recorders in kit or assembled form. This enables you to take advantage of mass production techniques and prices, should you wish to assemble yourself. The components used are the finest available, with BVA valves, and the decks are the latest having all the improvements B.S.R. and Collaro make from time to time, heads, etc. The amplifiers are packed in special cartons with instructions which enable anyone to build. We are confident you will find these Recorders very good value, they have been built up to a standard and not down to a price.

B.S.R.	TD3 Monardeck, latest model 5 1/2 in. spools.....CASH	\$9.0.0
	Hire purchase deposit \$1.19.0 and 6 monthly	\$1.8.4
Tape	Amplifier for B.S.R. deck, printed circuit ready wired, with EC083, ECL22, EM86 and E281. Complete with all plugs, sockets, panels, knobs, etc. The whole amplifier mounts on to the deck, making a self-contained unit.....CASH PRICE	\$8.8.0
	Hire purchase deposit \$1.14.0 and 6 monthly	\$1.6.8
Cabinet	for above including 7 x 4 in. speaker.....CASH	\$4.4.0
	Total kit as above	\$22.0.0
	Hire purchase deposit \$4.10.0 and 12 monthly	\$1.12.1
	The above recorder can be supplied complete with Mic: tape assembled and tested for.....CASH PRICE	\$25.0.0
	Hire purchase deposit \$5.0.0 and 12 monthly	\$1.18.8
Collaro	Studio Deck. Very latest model 3 speeds	\$12.10.0
	Hire purchase deposit \$2.10.0 and 8 monthly	\$1.7.8
Tape	Amplifier for Studio Deck, with ready wired printed circuit, control and input panels, mains and output trans, complete with knobs, plans, screws, etc., EP83, ECC83, EM84, EZ81, OA81 and 2 EL84, 3 watts output. Magic eye, Radio and Mic. inputs. EX L/8 socket. Tone control. Can be used as an amplifier.....COMPLETE CASH	\$11.11.0
	Hire purchase deposit \$2.7.0 and 8 monthly	\$1.5.8

Cabinet	for above including 9 x 5 in. speaker.....CASH	\$5.5.0
	Total kit as above	\$29.5.0
	Hire purchase deposit \$6.0.0 and 12 monthly	\$2.5.2
	We can supply the above recorder, complete with tape and Mic. in a DE LUXE cabinet, assembled for.....	\$35.0.0
THIS	MACHINE IS LISTED \$41.00 BY MAKEBBS AND IS A VERY GOOD BUY.	
	Hire purchase deposit \$7.0.0 and 12 monthly	\$2.11.4
Tape	Pre-amplifier, for recording and playback, as above less output stage, with power supplies.....	\$8.8.0
	Hire purchase deposit \$1.14.0 and 6 monthly	\$1.6.8
Microphone	for the above recorders, Acoia MIC 40, 25/- 5/6 plug 4/6.	
Synchro	tape 5 in. 600ft. 15/-	5 in. 900ft. 19/6
	Finest 5 in. 850ft. 19/6	5 in. 1200ft. 22/6
	Boxed 7 in. 1200ft. 22/6	7 in. 1800ft. 32/6
Tape	Recorder Speaker Cabinet, Corner, 20 x 10 in. High class finish in two-tone Grey "Vynasir".....	\$2.16.0
	With 3 x 5 in. high flux speaker	\$4.0.0
BM3	Crystal Microphone, with table stand, and on/off switch, black and chrome finish, supplied complete with neck band, and input lead. VERY GOOD VALUE.....	\$2.10.0
DX29	Dynamic Moving Coil, with desk stand.....	\$3.10.0

#### GRAMPHONE EQUIPMENT

B.S.R.	UA14 TC8/H cartridge	\$7.15.0
	Hire purchase deposit \$1.11.0 and 6 monthly	\$1.4.0
Garrard	"Autonin" 6772 cartridge	\$5.14.8
	Hire purchase deposit \$1.14.0 and 6 monthly	\$1.6.8
Philips	AG1016 New semi-auto player	\$13.10.0
	Hire purchase deposit \$2.15.0 and 8 monthly	\$1.9.8

#### REGENCY

Resistors 2/8, Controls 9/-, Condensers 15/-, Knobs 2/8, Station dial 5/8, Jackson gang 8/-, Mullard OC45 10/- each, OC72 Matched pair 18/-, OA71 3/-, Battery 1/-, Wave change switch 2/8, Repanco TT49, TT45, TT46, all 5/- each. FR2 12/8, RFU1 2/8, 7 x 4 inch speaker 17/8, Groupboard 1/3. Complete kit (less cabinet) \$6.10.0.

#### TRANSISTORS

MULLARD HAVE REDUCED THE PRICE OF MANY TYPES TO OC44 11/-, OC45 10/-, OC70 8/8, OC71 8/8, OC72 8/-, OC76 8/-, OC78 8/-, OC81 8/-. ABOVE ARE THEIR NEW LIST PRICES. WHY BUY SURPLUS? MATCHED PAIRS ONLY. Mullard OC72 at 18/- pair.

#### OSMOR PRINTED CIRCUIT VERSION

Osmor Rod Aerial, 8/6. I.F.T.'s and Osc. Coils, 22/-, Osmor Driver, 8/3. Osmor Output, 8/-. Set transistors and diode, 43/-, J.B. Gang, 12/8. Trimmers, 1/3 ea. Set condensers, 15/-. Set resistors, 5/-. Ardent volume control, 8/-. Switch, 3/8. Speaker, 17/10. Hardware 4/-. Printed circuit, 7/8. New case (dial and knob), 12/8. Battery PP4, 2/-, Leadset giving full illustrated details, 1/6.

ALL THE ABOVE COMPONENTS IF PURCHASED AT ONE TIME, \$8.10.0 Osmor undertake to align this receiver for 10/-. Modification kit, 10/-.

#### "WEYRAD"

WEYMOUTH RADIO 6 Transistor Superhet using the P50 coils, as they advertise in this journal. P50/1AC Osc. Coil, 5/4. P50/2CC 1st and 2nd I.F.T.'s, 5/7 ea. P50/3CC 3rd I.F.T., 6/-. RA2W Rod Aerial, 12/8. LFDT4 Driver, 9/6. PCA1 Printed Circuit, 9/6. Instruction Book, 2/6. Set Resistors, 7/8. Vol. Control D/F, 5/6. Set Condensers, 20/-. J.B. Gang, 12/8. Beehive Trimmers, 1/3 ea. W/C 3/8. Dial and Knob, 5/8. Battery PP11, 6/8. OA81 3/-. Set MULLARD transistors, 5/8. Car Aerial Coupling Coil, 1/-. Transistor Cabinet, in two tone "Vynal" 10 x 8 x 3 in., for 7 x 5 in. L/S. Ideal for REGENCY and WEYMOUTH circuits etc. \$1.12.6

## 48 SURBITON ROAD, KINGSTON-UPON-THAMES, SURREY

Established over 30 Years

Telephone KIN 5549

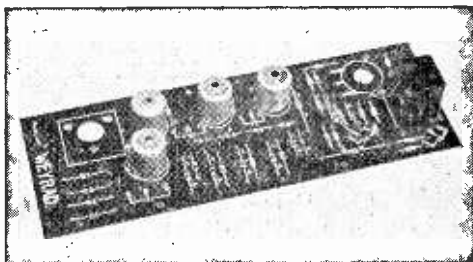
We pay all postage and insurance. All orders despatched same day. Money refund guarantee. Hours: 9 a.m.—6 p.m. (1 p.m. Wednesday) We do not close for lunch. Open all day Saturday.

# WEYRAD

IMPROVED COMPONENTS FOR THE 6-TRANSISTOR  
2-WAVE SUPERHET RECEIVER

NEW ROD AERIAL AND DRIVER TRANSFORMER FOR SIMPLER ASSEMBLY  
AND HIGHER PERFORMANCE

- ROD AERIAL—RA2W  
6 in. long, 3/8 in. diameter, connections to tags  
on Coils. For 208 pF tuning capacity ... .. 12/6
- Car Aerial coupling Coil ... .. 1/-
- OSCILLATOR COIL—P50/1AC  
M.W. covered with 176 pF tuning capacity.  
L.W. by extra padder ... .. 5/4
- I.F. TRANSFORMERS  
1st and 2nd Stage—P50/2CC ... .. 5/7  
(2 required)
- 3rd Stage—P50/3CC ... .. 6/-
- DRIVER TRANSFORMER—LFD4T  
redesigned to reduce size and improve perform-  
ance. Six spills for mounting and connections 9/6



PRINTED CIRCUIT—PCA1

- Size 2 3/4 in. x 8 1/4 in. Ready drilled and printed with component positions ... .. 9/6
- CONSTRUCTOR'S BOOKLET WITH FULL DETAILS AND FREE SCALE ... .. 2/-
- TRANSISTOR A.F. AMPLIFIER TYPE A.F.1—LOW IMPEDANCE INPUT, 500mW OUTPUT.  
MATCHING 3 OHM SPEAKER. FULLY ASSEMBLED WITH VOLUME CONTROL ... .. 63/6

**WEYMOUTH RADIO MANUFACTURING CO., LTD.**

REGENT FACTORY, SCHOOL STREET,  
WEYMOUTH, DORSET



**TRANSISTORS AND DIODES**  
A set of Transistors comprising 1 OC44, 2 OC45, 1 OC81D,  
2 OC81, 37/6, set.

OC73 16/-	OC75 8/-	OC77 12/-	OC78 8/-	OC81 21/6	OC84 6/-	OC170 9/6	OC171 6/6	OC201 5/-	OC202 8/-	OC27 5/-	OC72 8/-	OC71 5/-	OC72 8/-
OC75 8/-	OC77 12/-	OC78 8/-	OC81 21/6	OC84 6/-	OC170 9/6	OC171 6/6	OC201 5/-	OC202 8/-	OC27 5/-	OC72 8/-	OC71 5/-	OC72 8/-	OC71 5/-
OC77 12/-	OC78 8/-	OC81 21/6	OC84 6/-	OC170 9/6	OC171 6/6	OC201 5/-	OC202 8/-	OC27 5/-	OC72 8/-	OC71 5/-	OC72 8/-	OC71 5/-	OC72 8/-

**PRACTICAL WIRELESS POCKET TRANSISTOR SUPERHET.** The New Version in a re-designed 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 "00", 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: Case, 12/6; Capacitors, 15/-; Resistors, 5/-; Trimmers, Type MT31/4A (3 required), 3/9; Constructional Leaflet and "Blown-up" Circuit Diagram. PRICE FOR THE COMPLETE KIT £7.19.6.

## 1962 CATALOGUE

Our 1962 Catalogue is now available. Please send 1/- in stamps for your copy. Trade Catalogue also available for which, please attach your business letter heading.

**REPANCO**  
CHI, 2.5 millihenry choke, wound on Ferrite Core with wire ends, 2/6.  
**REPANCO MINIATURE DOUBLE TUNED I.F. TRANSFORMERS.** 455 to 475 kc/s, boxed with circuit 6/9 each.  
**REPANCO NEW RANGE OF MINIATURE TRANSISTOR TRANSFORMERS.** 2 1/2 in. x 3/4 in. x 3/4 in. TT45 Driver Transformer 5/- each.

All components for Practical Wireless  
**"REGENCY"**  
and  
**"INTERNATIONAL SHORT WAVE TWO"**  
in stock, send for detailed price list.

TT46 Push-Pull output transformer to a 3 ohm speaker 5/- each. TT47 Driver transformer, for single ended output stage, matching to a 3.5 ohm speaker, 5/- each. TT49 L.F. coupling transformer, 5/- each.  
**PICK-UP CARTRIDGES.** BSR TC8H 29/9, BSR TC8M 29/9, BSR TC8S 45/1. Acos GP67/1 23/9, Acos GP67/2 23/9, Acos 73/1 32/6, Garrard GC 23/3, Garrard GC8 20/3,

Garrard GCS10 34/6, Garrard EV26 37/8, Philips AG3016 21/-, Philips AG3063 30/-, Ronette for Collaro Studio P, T and O, 39/9.

**RECORD PLAYER CASES**  
Baseboard cut suitable for a BSR UA14, available in red, turquoise, grey, and black/yellow, 63/- each. Amplifier and Loudspeaker to suit above, 75/-.



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.

# T rade N ews

## NEW OSCILLOSCOPE

A NEW oscilloscope has recently been put on the market by Dartronic Limited, and is selling at £67. It operates from a mains supply of 110-120/200-250V.

The bandwidth of the main Y-amplifier covers D.C. to 10Mc/s and is adjusted for optimum pulse response with no overshoot. Interpolation between the timebase sweep speeds is provided by an uncalibrated continuously variable control.

The display is a 3in. helical PDA cathode-ray tube operated at 3.5kV, which provides a very bright and sharply defined trace at all sweep speeds.

An efficient convection cooling system ensures that the instrument does not run hot even under continuous operating conditions.

The panel controls include brilliance, focus astigmatism, Y-shift, X-shift, input sensitivity selector, A.C. or D.C. Y input selector, mains on/off, etc.

*Dartronic Limited, 3-7 Windmill Lane, London, E.15,* are the makers of this oscilloscope.

## NEW 15W SOLDERING IRON

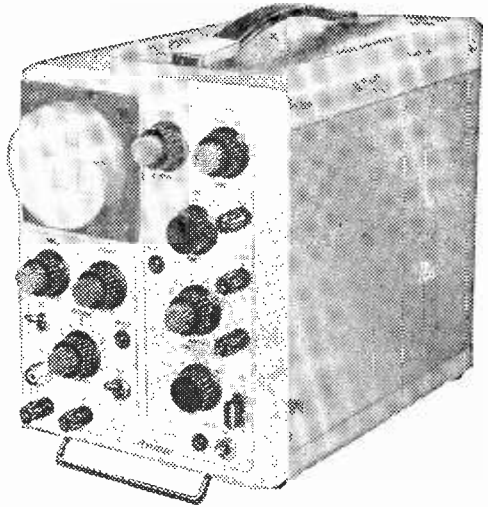
A 15W mains-operated soldering iron, only 8½in. long and weighing 3ozs has been added to the AEI range. It is available for operation from 200/220V and 220/240V, and costs 23s. 4d.

The chromium copper bit is only ¼in. in diameter and the stem only ⅙in. in diameter. The iron is,

therefore, particularly suitable for use in confined spaces and for soldering to miniature components liable to be damaged by the application of too much heat. The iron heats to working temperature in 1½ minutes.

It is fitted with a removable hook so that it can be hung in a convenient place when not in use and a 6ft length of three-core flex is supplied with each iron.

The new 15W Solon iron is on sale at all general electrical and hardware stockists, and is marketed by *Distribution Equipment Sales Department, AEI Cable Division, 145 Charing Cross Road, London, W.C.2.*



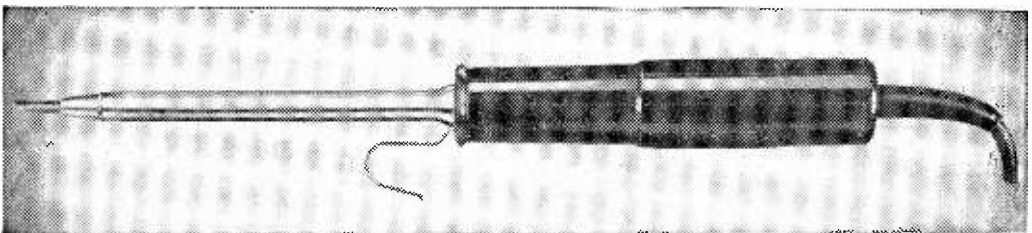
*The Dartronic oscilloscope.*

## LOW-PRICE DIAMOND STYLUS

A NEW system of manufacturing and handling diamond styli now permits Dansette Products Ltd. to market a diamond stylus for record players for 12s. 6d.

The new manufacturing process reduces the number of operations because new automatic grinding and polishing methods have superseded hand polishing. This allows manufacture to closer tolerances.

*J. & A. Margolin Ltd., Plus-a-Gram House, 112-116 Old Street, London, E.C.1.*



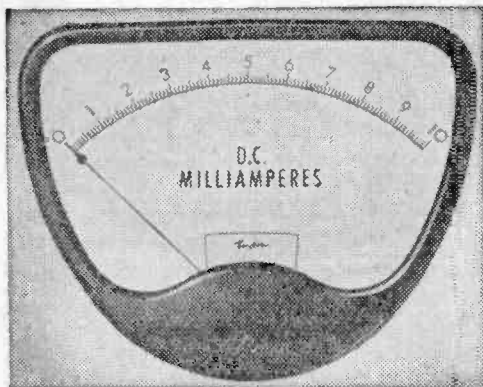
*AEI's new 15W soldering iron.*

### NEW STYLED METER

TO meet the demand for a large scale meter with a modern appearance, the Taylor Model 70 has been introduced. The meter has a nominal scale length of 6½ in. and the dial is designed to provide maximum viewing distance. The open styling of the moulding provides "shadowless" readings and enables several combinations of arcs and scale calibrations to be incorporated. Despite the long scale length, the meter movement "housing" has a diameter of only 3½ in.

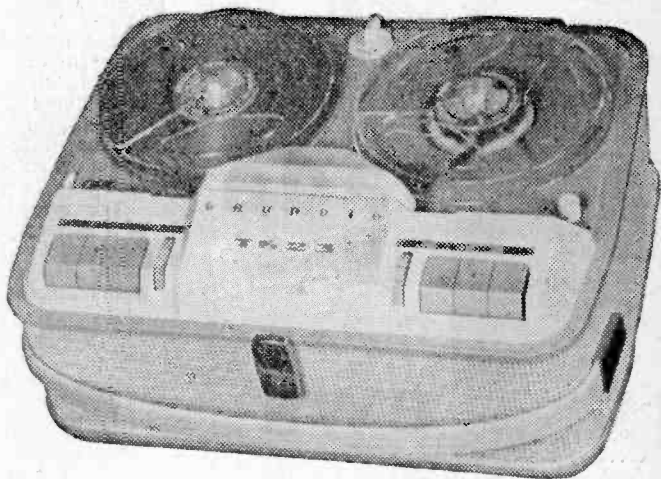
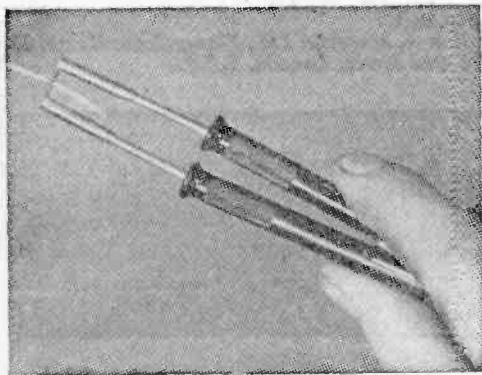
The Model 70 is fitted with a centre pole moving coil movement but moving iron meters can also be supplied.

Taylor Electrical Instruments Ltd., Montrose Avenue, Slough, Buckinghamshire.



Above—A new-styled meter from Taylor Electrical Instruments Ltd.

Below—These Oryx wire stripper tweezers are marketed by W. Greenwood Electronics Ltd.



The Grundig TK.23 4-track tape recorder.

### NEW 4-TRACK TAPE RECORDER

A NEW four-track tape recorder—the TK.23—has recently been announced by Grundig (Great Britain) Limited. Although basically following the design of its twin-track counterpart, the TK.14, several new features have been incorporated. The TK.23 is a single speed machine operating at 3½ in./sec. There is a temporary stop that can be locked in the stop position and quickly released in a single operation, and an automatic stop, the metal foils on the end of the tape causing a solenoid to be energised, releasing the start or fast wind buttons.

There are facilities for superimposition, synchronised superimposition and mixing. A digital position indicator and a magic eye recording level control are fitted.

The valve line up of the recorder is EF86, ECC81, EL95, EM84. An additional valve, reduces the hum and noise figures to a low level and provides the extra gain required by the input mixing controls. The frequency response is level from 60c/s to 12kc/s and the signal to noise ratio is 47dB.

The price of the TK.23 complete is 45 guineas, which includes a Grundig moving coil microphone. The recorder is made by Grundig (Great Britain) Limited, 40 Newlands Park, Sydenham, London, S.E.26.

### WIRE STRIPPER TWEEZERS

LOW voltage wire stripper tweezers have been developed by Oryx to meet the need for speedy and efficient stripping of wire insulation such as PVC, nylon, rubber and thermoplastics.

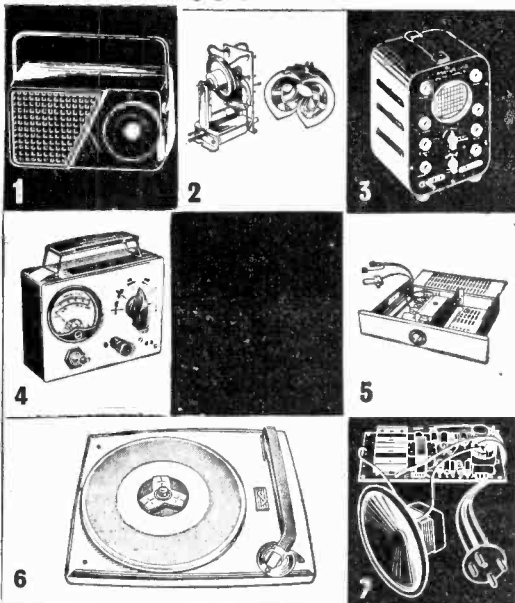
The instrument accommodates wires of up to ½ in. (3mm) diameter and operates at a temperature of 250°C. Each limb of the tweezer has a miniature heating element with a total consumption of 12W at 6V.

The instrument is manufactured by Oryx Electrical Laboratories Ltd., and is being marketed by W. Greenwood Electronic Ltd., 677 Finchley Road, London, N.W.2.



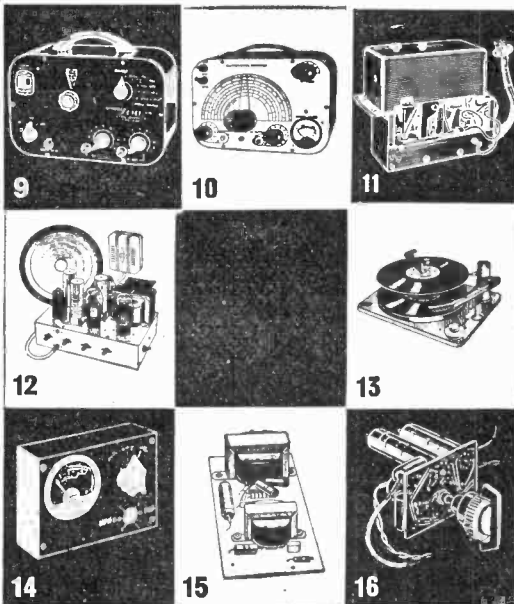
# CHECK with these

# BARGAINS



- 2-TRANSISTOR POCKET RADIO with MINIATURE SPEAKER, FERRITE ROD and 2 GERMANIUM DIODES.** The only 3-transistor radio available at the price. Build it in 1 evening! Tunable over M/L waves. Complete with easy-to-follow instructions and all components (less batteries obtainable anywhere 1/3). 27/6. P. & P. 2/6 (All parts available separately.)
- LINE E.H.T. TRANSFORMERS.** Built-in line width control. 14kV. Scan coil 30m. deflection on ferrite yokes. Frame O.P. transformer pl. 18kV smoothing condenser, suitable for 14in., 17in. or 21in. tubes. With circuit diagram. 29/6 plus 4/6 P. & P. Suitable Focus Magnet (static tube), 10/- plus 3/- P. & P.
- OSCILLOSCOPE for D.C. and A.C. APPLICATIONS** Push-pull X amplifier; Fly-back suppression; Internal Time-base Scan Wave form available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external—1/P and C.R.T. Brightness Modulation. A.C. mains 200/250 v., £18.18.0. P. & P. 8/- or £4.15.0 deposit, plus P & P. 8/- and 12 monthly payments of 26/6. FULL 12 MONTHS' GUARANTEE INCLUDING VALVES and TUBE.
- A.C./D.C. POCKET MULTI-METER KIT.** 2in. moving coil meter, scale, calibrated in A.C./D.C. volts, ohms and milliamperes. 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 24/8, P. & P. 2/-. Wiring diagram 1/-, free with parts.
- CHANNEL TUNER.** Will tune to all Band 1 and Band 111 stations. Complete with P.C.F.84 and P.C.F.80 valves (in series) I.F. 16-19 or 23-28. Can be modified as an aerial converter (instructions supplied), 32/6, plus 4/- P. & P. **HEATER TRANSFORMER** to suit above, 200-250 v., 8/-, plus 2/- P. & P.
- STAAR 45, 9 VOLT BATTERY RECORD PLAYER.** Complete with pick-up and deck. A completely portable record player. Head is protected by a plastic dome, with a brush which cleans the stylus as it rises into playing position. 45 r.p.m. Automatic on-off switch, governed by 9 v. motor, attractive 2 tone grey finish. £2.14.6. P. & P. 2/6.
- TRANSISTORISED AMPLIFIER** can be used with the STAAR 45, output 1 watt. Size 4 1/2 x 2 1/2 in., printed circuit, tone and volume controls, 4 transistors. By altering 2 resistors, 2 watt output can be obtained. Push-pull output, complete with 3in. moving coil speaker. Built and tested, 49/6, P. & P. 2/-.
- SIGNAL GENERATORS.** Cash £7.5.0 or 30/- deposit and 6 monthly payments of 21/6, P. & P. 5/6. Coverage 120 kc/s to 84 Mc/s. Case 10 x 6 1/2 x 4 1/2 in. Size of Scale 6 1/2 x 3 1/2 in. 2 valves and a 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 and moving coil output meter. Accuracy  $\pm 2$  per cent.

- CHANNEL TUNER I.F.** 16-19 Mc/s. Continuously tunable from 174-216 Mc/s. Valves required—6NF80 and PCC84 (in series). Cover BBC and ITA ranges. Also Police, Fire and Taxis, etc. Brand new by famous maker, 10/-, P. & P. 3/-.
- 8-watt PUSH-PULL 5 VALVE AMPLIFIER.** A.C. mains 200-250 v. Size 10 1/2 x 6 1/2 x 2 1/2 in. 5 valves. For use with all makes and types of pick-up and mike. Negative feed back. Two inputs, mike and gram. and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s.  $\pm 2$  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 I.P. records musical instruments such as guitars, etc. Suitable for small halls, £3.19.6. P. & P. 6/-. Crystal mike to suit 15/-, P. & P. 2/-. 3in. P.M. Speaker to suit 12/6, P. & P. 2/-.
- B.S.R. MONARCH UAS with FULL-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: 12 1/2 x 10 1/2 in. Space required above baseboard 4 1/2 in. below baseboard 2 1/2 in. Fitted with Full-Fi turnover crystal head £6.19.6, P. & P. 5/6. With Stereo Head £7.19.6, P. & P. 5/6.
- TRANSISTOR TESTER.** For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case, size 4 1/2 x 3 1/2 x 1 1/2 in. Scale marked in gain and leakage. 19/6, P. & P. 3/-.
- 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.
- PORTABLE AMPLIFIER.** On printed circuit for A.C. Mains 200/250 v. Size 4 x 3 in. with tone and volume control. Complete with Valves: ECL82 and EZ80. Output 2 watts, 39/6, P. & P. 3/-.



**RADIO & T.V. COMPONENTS**  
(Acton) LTD.

**23B HIGH STREET, ACTON LONDON, W.3.**

ALL ENQUIRIES S.A.E.  
GOODS NOT DISPATCHED OUTSIDE U.K.

# LASKY'S RADIO

## TRANSISTOR RECORD PLAYER

Can be built for **£9.9.0** Carr. free 6 v. operation. For all L.P. and standard records. All components available separately.

**AMPLIFIER.** 300 milliwatts push-pull output using two OC71 and two OC72 transistors. Fully assembled. 59/6. Knobs 3/6 extra. P. & P. 2/6.

**LOUDSPEAKER.** 30 ohms 7 x 4in. elliptical, matched to Amplifier. 25/6.

**3-SPEED TUNABLE.** 6 v. complete with t.l. crystal cartridge and two sapphire styl. 79/6. P. & P. 3/6.

**CARRYING CASE.** Smart two-tone finish. 17 x 14 x 5 1/2in. 49/6. P. & P. 7/6. Batteries extra.

**STAAR KINDER 45 r.p.m.** 6 v. Battery Operated Record Player. Complete with pick-up fitted crystal cartridge. Size only 7 1/2 x 8in. Fitted auto stop and start. New and perfect. **LASKY'S PRICE 49/6.** P. & P. 2/6.

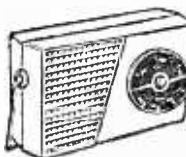
Miniature Distler Electric Motors. 6 v. high speed (as used in Clarion Tape Recorder).

**LASKY'S PRICE 7/11.** P. & P. 2/6.

**SAVE ON COMPONENTS!** Send for the new edition of Lasky's 100-page Components Catalogue. Price 2/- post 6d. Latest 20-page Bargain Bulletin included free.

## TRANSISTOR POCKET RADIOS

### THE "TORONTO 3"



Size 5 1/2 x 3 x 1 1/2in. Uses 3 transistors, plus germanium diode, ferrite rod aerial. Tunable over med. and long waves. Can be built

for **32/6**  
for Post 3/6

All components available separately.

### 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, 2 1/2in. moving coil speaker, ferrite rod aerial. Med. and long wave. Smart plastic Case. 4 1/2 x 3 1/2 x 1 1/2in. overall.



CAN BE BUILT FOR **59/6** Post 3/8  
All components available separately. Full details, circuit diagram. 1/6 post free.

## ● KAPURA Model U1 ● MULTI TEST METERS FURTHER GREAT PURCHASE!

- Complete with test leads.
- Brand new, fully guaranteed.

Sensitivity: 1,000 ohms per volt A.C. and D.C. Ranges: (A.C. and D.C.) 0-15-50-250-500-1000 v. D.C. current 0-100-500 M/A. 0-1 M/A. (Used at 0-10 v. range). Resistance: 1-2000 ohms (centre 24 ohms). 100-200,000 ohms (centre 2.4 K.). Size: 5 x 3 x 2 1/2in.

**LASKY'S PRICE 39/6**  
Carriage and Packing 5/-.

## LASKY'S CAR RADIO



12 v. operation. Transistor output. Medium and long waves. Permeability tuning T.C.C. Printed Circuit. Small size, will fit any car.  
**CAN BE BUILT COMPLETE WITH SPEAKER FOR £9.18.6.** Post 3/6.  
Booklet 2/6 (refunded if you order).

207 EDGWARE ROAD, LONDON, W.2.

Near Praed St, PADDINGTON 3271/2

33 TOTTENHAM COURT ROAD, W.1.

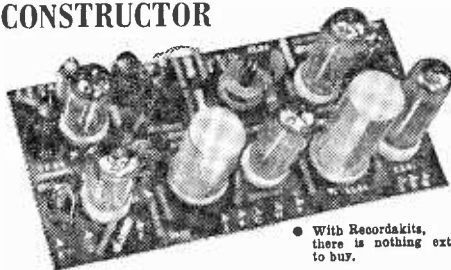
Nearest Stn. Goudge St. MUSEUM 2605

BOTH OPEN ALL DAY SAT. Early Closing Thurs. Mail Orders to Dept. P.W. Edgware Road.

## ANOTHER QUALITY 4-TRACK

# MARTIN 'RECORDAKIT'

## FOR THE KEEN CONSTRUCTOR



To an outstanding successful range of kits is now added Recordakit 'D', designed for use with the Collaro 4-track Studio Deck. Like all Martin Recordakits, it is on a printed circuit base and complete with valves, controls, transformers, leads, etc., down to the last screw. Even the wire supplied is cut to length.

**Amplifier 'D'** as above, 12 gns. Speaker and Case assembly, 5 gns. With Deck, Case, Speaker and Amplifier 84 gns.

**NEW MARTIN RECORDAKIT TAPE PRE-AMP KIT.** For Collaro Deck—2 Track, 8 gns. 4 Track, 9 gns.

From radio and audio stockists. In case of difficulty send direct. For free Leaflet, cut out this ad. and send it with your name and address.

**MARTIN ELECTRONICS LTD**

155 High Street,  
Brentford,  
Middlesex.

## GZAK: This Month's Bargains

### ★ SHADED POLE MOTORS ★

230v. or 110v. operation. Ideal for fans, blowers or models.  
One only, 12/6, plus 2/- p. & p. Or pair, £1, plus 2/6 p. & p.

### ★ AERIAL EQUIPMENT

**TWIN FEEDER.** 300 ohm twin ribbon feeder, similar K25, 6d. per yard. K35B Telecom (round) 1/6 per yard. Post on above feeder and cable 1/6 each length.

**COPPER WIRE.** 14 G., H/D 140ft. 17/-; 70ft. 8/6. P. & P. 2/-. Other lengths *pro rata*.

**RIBBED GLASS.** 3in. aerial insulators, 1/9 each. Shell ins 2in. 9d. each. P. & P. 1/6. up to 12.

**CERAMIC FEEDER SPREADERS.** 6in. type F.S. 10d. each. P. & P. 2/-.

**CERAMIC "T" PIECES.** Type A.T. for centre of dipoles, 1/6 each. P. & P. 1/6.

**2 METRE BEAM 5 ELEMENT W. S. YAGI.** Complete in box with 1 x 2 1/2in. mast head bracket. PRICE 49/-. P. & P. 3/6.

**SUPER AERIAL CABLE.** 75 ohm, 300 watts, very low loss, 1/8 per yard. P. & P. 2/-. 50 ohm, 300 watt coax, very low loss. 1/9 yd. P. & P. 2/-.

**ABSORPTION WAVEMETERS.** 3.00 to 35.00 Mc/s in 3 switched bands. 3.5, 7, 14, 21 and 28 Mc/s. Ham Bands, marked on scale. Complete with indicator bulb. **A MUST** for any Ham shack. 22/6 post free.

**VARIABLE CONDENSERS.** All brass with ceramic end plates and ball race bearings. 50 pF, 5/9. 100 pF, 6/6. 160 pF, 7/6. 240 pF, 8/6, and 300 pF, 9/6. All fitted with rear extension for ganging. P. & P. 1/-. Also Flexible Couplers, 1/- each. B.I. 8 MFD, 1,200 v. D.C. Wkg. Capacitors, 12/6 each. P. & P. 2/-.

## CHAS. H. YOUNG LTD.

THE COMPONENT SPECIALISTS  
Dept. "P", 110 Dale End, Birmingham 4. (CEN 1635)  
(No C.O.D. under £1 please). (By return service)

# 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.

## THE "38" SET

SIR.—By now, many readers will have purchased the "38" set walkie-talkie. Use of this unit entails the wearing of headphones, which can, in certain conditions be inconvenient. No doubt, conversion to a speaker could be attempted, but there is little room in the case for a volume control anyway. However, the receiver uses a very unconventional I.F. of 285kc/s (1,050m) which can be tuned in by many broadcast receivers. There is no need to remove the set from its case, the broadcast receiver simply being placed near it and tuned in to the I.F. The signals received can then be heard at good loudspeaker strength without noticeable distortion. — G. J. POWELL (Marden, Herefordshire).

## AMERICAN STATION

SIR.—I am a keen S.W. listener. On Sunday, April 29th I received an American station on approximately 32m. The transmission consisted of a message in English and another language which I could not recognise. The message was as follows:

"This is a test transmission by single telegraph system, operated by the overseas telephone service of the ———. Please give identification signal on channel A for receiver adjustment".

I wonder if any readers could complete this message and give some facts about this station.— T. GERRARD (Bolton).

## ECHO EFFECT FOR TAPE RECORDERS

SIR.—I feel that a good many of your readers who own tape recorders will be interested in the method I use to produce an echo effect on my machine. Using this idea an echo can be produced which is variable in the time between echos from 0.25sec to 2sec. The only extra components necessary are a variable attenuator (T type for keeping the impedance correct) and an extra record/replay head. The normal head is fed with an A.F. signal (speech, music, etc.) which is recorded on the tape. The extra head is situated  $3\frac{1}{2}$ in. from the first head, therefore giving the tape a time lapse of 1sec at  $3\frac{1}{2}$ in./sec tape speed. The second head picks up the signal and feeds it back via the attenuator, to the amplifier input which feeds it straight back to the first head at approxi-

mately half the output (due to the effect of the attenuator). This signal is again recorded on to the tape. When it is picked up for the second time on the extra head it is again reduced by half, and so as this process continues the signal smoothly fades away. With the extra head set at  $3\frac{1}{2}$ in. from the original, the normal tape speeds will give the following time lapses approximately:

$1\frac{1}{2}$ in./sec = 2sec echo

$3\frac{1}{2}$ in./sec = 1sec echo

$7$ in./sec =  $\frac{1}{2}$ sec echo.

Of course the second head may be set at any convenient distance from the first, giving different time lapses.—R. T. SUMMERS (Worcester).

## COMPONENT STANDARDISATION

SIR.—I know there have been comments previously on the lack of standardisation in certain components, but there is one other point which I feel should be given special consideration. I refer to controls of all kinds which have a standard  $\frac{1}{2}$ in. spindle, but which are, in some cases, supplied with a plain spindle and in others, have a flat on one side. The majority of control knobs which I have obtained have a securing grub screw well sunk into the knob for safety reasons. When placed over the spindle I find, with the pointer type of knob, that it is difficult to position it on the control so that any adjustments made permit the pointer to travel over the desired scale. The same remarks apply to the type of knob having an engraved arrow on the top. Couldn't the spindle be made adjustable, or would a further grub screw prove an additional objection? Alternatively, why couldn't the components be supplied with knob complete, or must these remain in the same category as normal electrical apparatus which is always supplied without a mains plug? — G. BETTERSON (Hastings).

## TAPE TROUBLE

SIR.—I had read previously about people being troubled with radio break-through on their recorders, but never had the trouble myself. Then one day I switched on to take a microphone recording, and made my usual two or three feet test run, to be surprised with a background of radio signal. I made several tests but could not trace the cause. After two or three days I found the trouble, which was not in the recorder at all. The signal was mains fed, either from a neighbouring house or picked up direct on the mains wiring. Reversal of the mains plug feeding the recorder stopped the trouble, and this was confirmed on two or three days subsequently, by reversing the plug when the trouble reappeared. Perhaps one of your readers may like to try this effect to cure a similar fault.—G. PLEASANCE (Northholt).

# Club News

## REPORTS OF CURRENT ACTIVITIES

### AMATEUR RADIO SOCIETY OF CHESHAM AND DISTRICT

Hon. Sec.: Capt. C. G. Stephenson, G3CLJ, 21 Lynton Road, Chesham, Buckinghamshire.

The society's aim to train and assist all to obtain licences has drawn a large number of requests for membership recently.

A communications, radio, and amateur radio demonstration has been planned to be held in late June.

### BARNSELY AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec.: P. Carbutt, G2AFV, 19 Warner Road, Barnsley, Yorkshire.

On May 11th J. Ward gave a lecture on 'Transistors in a Station' and the meeting for May 25th was reserved for a debate.

Future Event:

June 8th—Relays in a station, by D. W. Heath.

### BRADFORD RADIO SOCIETY

Hon. Sec.: M. T. G. Powell, G3NNO, 28 Gledhow Avenue, Roundhay, Leeds 8.

On May 8th members visited the automatic telephone exchange, as planned. On the 22nd May, amateur television was the subject of L. A. F. Stockley's talk.

Future Event:

June 12th—Treasure Hunt.

### EXETER AMATEUR RADIO SOCIETY

Hon. Sec.: S. Line, 46 Roseland Crescent, Heavitree, Exeter, Devon.

At the meeting on 3rd April, members attended an interesting talk and demonstration given by J. Forward on television interference and harmonic detection.

At this meeting also, questions from SWL's concerning the forthcoming RAE, were numerous.

### HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: G. Sunter, 24 Booth Fold, Luddendenfoot, Halifax, Yorkshire.

On June 5th members visited the Ferranti works in Manchester.

Future Event:

July 3rd—Single sideband debate.

### LICHFIELD AMATEUR RADIO SOCIETY

Hon. Sec.: G. Seward, 51 Long Bridge Road, Lichfield, Staffordshire.

The society meets on the first Monday of each month. At a recent meeting, T. Wood gave a talk on suitable aerials for field day use.

### LUTON AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: D. Davister, 70 Crawley Green Road, Luton, Bedfordshire.

The most important event for the society in May was the Mobile Rally held at Stockwood Park, Luton on May 27th.

### NORTHERN HEIGHTS AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogdon, Halifax, Yorkshire.

At a recent meeting, H. Brooke, G3GJV, gave an interesting lecture on mobile equipment. Convertors for 2 and 4 was the title of the talk given by D. Millard, on May 16th. On May 30th members visited the Holme Moss television station.

J. Davidson gave a lecture on June 6th about printed circuitry.

### PETERBOROUGH RADIO SOCIETY

Hon. Sec.: D. Byrne, G3KPO/G3PTC, Jersey House, Eye, Peterborough, Northamptonshire.

At an April meeting, members heard all about the latest techniques in radio direction finding from Mr. J. W. Hewlett, an Air Ministry electronics engineer.

On May 20th, the Mobile Rally and D.F. contest at Hunstanton, was attended by members of the society.

A 40-valve receiver was discussed by G3FUR at the meeting on June 1st.

### PLYMOUTH RADIO CLUB

Hon. Sec.: R. Hooper, 2 Chestnut Road, Peverell, Plymouth, Devon.

The club has now been allocated its own callsign by the G.P.O.—G3PRC—and may be heard on the air any Tuesday evening on 160 and 80m.

The judging for the GSZT trophy took place on April 4th, the winner being G3LWJ, with C. Cummings and E. Fallon coming second and third.

### SLADE RADIO SOCIETY

Hon. Sec.: C. N. Smart, 110 Woolmore Road, Erdington, Birmingham 23.

Power transformers was the title of the talk given by N. B. Simmonds on May 4th. On May 11th a number of members visited the Edgbaston Observatory. On May 18th, in the second part of his series on radio fundamentals, J. E. Smith talked about electromagnetic inductance and capacitance. A. T. Spencer and a number of colleagues gave a talk on June 1st on radio controlled models.

Future Events:

June 15th—Sound and TV magnetic recording, by P. J. Guy.

June 29th—Sound reproduction.

### SPEN VALLEY AMATEUR RADIO SOCIETY

Hon. Sec.: N. Pride, 100 Ralkes Lane, Birstall, near Leeds.

Dr. N. H. Chamberlain gave a talk called "More about counting" on May 9th and the subject of the meeting on May 23rd was the Radio Amateur Emergency Network.

Future Event:

July 4th—Annual general meeting.

### YORK AMATEUR RADIO SOCIETY

Hon. Sec.: N. Spivey, G3GWI, 80 Melton Avenue, Clifton, York.

The society's transmitter, under the callsign G3HWW, has been on the air on 14 Mc/s and several good Dx contacts have been made in spite of the poor location of the headquarters.

The programme for the future includes several tape recorded lectures, which have proved very popular with members in the past. A recent talk on the class D wavemeter was given by G3GJY.

## Power Rectifier Circuits

(Continued from page 250)

### The Full-wave Voltage-Doubler Circuit

It is possible in all cases to advance from the conventional full-wave circuit in the same fashion as from the half-wave to the simple voltage doubler circuit. In other words, it is possible to feed a fundamental positive and a fundamental negative full-wave circuit simultaneously from the same centre-tapped transformer winding, giving two outputs of opposite polarity additively in series (Fig. 15). This is completely analogous to the simple half-wave voltage doubler circuits of Fig. 7, and exactly parallel remarks apply as in the discussion there. Thus, the two outputs may be unequally loaded, making appropriate choices for the rectifiers and smoothing condensers. A pair of identical rectifiers must be used for each full-wave part of the circuit, though the pair for the one half may be different from that for the other.

Fig. 15 shows the basic full-wave voltage-doubler with its two outputs, which may again be subdivided and stabilised with bleeder chains of resistors and neons if desired.

### The Conventional Full-wave Bridge Rectifier Circuit

It is apparent from Fig. 15 that the centre-tap of the full-wave voltage-doubler circuit serves merely to feed the mid-point voltage D.C. output. If this is not required, when only the full output voltage is desired to be used, the centre-tap of the transformer may be omitted altogether, and the circuit has degenerated to the familiar full-wave bridge rectifier circuit, which needs little further comment, as almost all constructors will have seen this circuit in accumulator charging apparatus etc.

(To be continued)

**Superb musical reproduction at low cost!**

**NOW you can record and play back tapes on YOUR OWN Radiogram or Gramophone!**

WITH A **Gramdeck** Instantly turns any gramophone into a Tape-Recorder and back into a record-player in a moment



**IGNS**

OR 19 FORT-NIGHTLY SUMS OF 13/-. Ready to record, complete with Control Unit and 600ft. of Twin-track tape. Special moving coil microphone extra.

**EASY TERMS**

You can hear **GRAMDECK** at **SELFRIDGES** in London or at **LEWIS'S** in Liverpool, Manchester, Birmingham, Glasgow, Leeds, Hanley, Leicester & Bristol. Also: Demonstrations daily at the address on coupon.

Gramdeck is an ingenious invention that instantly turns your gramophone into a tape-recorder and back into a gramophone at will! You simply slip it on your turntable and you are ready to record direct from radio or microphone... the voices of your family... your favourite music—and you can instantly play it back through your own gramophone or radio with *Lifelike Fidelity*. Made by the people who make radar runs for Viscounts and Britannias, the amazing Gramdeck now brings full tape-recording and playing facilities to every gramophone owner, at little extra cost.

**SEND FOR FREE GRAMDECK BOOK**

"Real hi-fi results." "Better than many so-called hi-fi recorders..." These are typical comments of famous technical journals. The fully-illustrated Gramdeck Book tells you all about Gramdeck... what Ted Heath, Max Jaffa and others think about it... how YOU can add **HIGH-QUALITY** tape-recording to **YOUR** gramophone... photographs, Easy Terms, etc... send for the *Gramdeck Book today—FREE!*

- ★ Uses standard tapes. ★ Plays at 7½" per sec. or 3 other speeds.
- ★ Records direct from Radio or microphone. ★ Erase and fast rewind.

**POST COUPON NOW!**

**Free!**

To: **GRAMDECK** (Dept. FA/820)  
29/31 Wright's Lane, London, W.8.  
Please send me Gramdeck book — **FREE**

Name \_\_\_\_\_  
Address \_\_\_\_\_



**Gramdeck** GRAMPHONE TAPE RECORDER

**ADDS A SUPERB TAPE RECORDER TO YOUR GRAMPHONE**

**AWKWARD SPOT?  
MINIATURE COMPONENTS?**

*Soldering is easier with the*

**NEW 15 WATT  
SOLO**  
electric soldering iron

- Ideal for transistorised and printed circuitry.
- ½ in. diam. bit in ⅜ in. diam. stem will reach normally inaccessible connections and components.
- Just the right amount of heat. Melts resin-cored solder within 1½ minutes from cold.
- Spare parts easily replaceable—readily obtainable.
- Designed and made by the team responsible for the highly successful 25-watt Solon.
- 200-220V or 220-240V.

**LIST PRICE 23/4d** Obtainable from your usual electrical stockist, or electrical counter of your hardware store.

AN **AEI** PRODUCT

For further details, write to the local **AEI Stock Depot**, or to:

Associated Electrical Industries Limited  
Distribution Equipment Sales Dept  
145 Charing Cross Rd.  
London WC2





**FOR SALE**  
(continued)

**AUDIO.** America's foremost journal. Year's subscription, 35/-. Specimen copy 4/-. Every American radio journal supplied. Price list free. **WILLEN LTD** (Dept 40), 9 Drapers Gardens, London EC2.

**WANTED**

**WANTED NEW** valves and transistors any quantity. **S. N. WILLETS**, 43 Spon Lane, West Bromwich, Staffs. Tel: WES 2392.

**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.

**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 Pawsons Road, West Croydon, Surrey.

**WANTED!** New valves and transistors, any quantity. Phone: Cherrywood 3955. **D & 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

**MISCELLANEOUS**

**KITS ASSEMBLED** and tested. Radios, test gear, Tx., etc. First-class workmanship. Send details of kit and S.A.E. for price.—Box No. 37.

**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 24 stops—uses 41 valves. With its variable attack you can play Classics and Swins.

Write **NOW** for free leaflet and further details to **C. & S.**, 20 Maude Street, Darlington, Durham. Send 2fd. stamp.

**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 Road, London N8.

**COURSES**

**PLYMOUTH COLLEGE OF TECHNOLOGY**  
Tavistock Road, Plymouth

Principal: **E. BAILEY, B.Sc., F.R.I.C., A.M.I. Chem. E.**

**RADIO OFFICERS COURSES**

Full-time courses start in **September 1962** for **P.M.G.**, Radio, and **M.O.T.** Radar Maintenance Certificate. Applications, giving particulars of previous education, should be made now to the Principal.

City and County of Bristol Education Committee  
**BRISTOL TECHNICAL COLLEGE**  
Principal: **E. POOLE, B.Sc. (ENG.), M.I.MECH.E., M.I.PROD.E.**

**SCHOOL OF MARINE RADIO AND RADAR**

Lecturer-in-Charge:  
**F. E. BARLTROP (ex-A.S.T. Hamble)**

**MARINE RADIO OFFICERS**

A full-time Course for prospective Radio Officers in the Merchant Navy, leading to 2nd and 1st Class P.M.G. Certificates, and M.O.T. Radar Maintenance Certificate, is provided, and entry may be made in **January** or **September** of each year.

Fees: P.M.G. Courses  
Over 18 years of age, **£23.10**, per College year.  
Under 18 years of age, **£2**, per College year.  
**M.O.T. Radar, £5** per term.

A six-week Course of **Pre-Sea Training** is also held, and entry is normally made on completion of Radar Course.

Details from:  
Registrar, Bristol Technical College,  
Ashley Down, Bristol, 7

**COUNTY BOROUGH OF SOUTHAMPTON**  
**EDUCATION COMMITTEE**

**SOUTHAMPTON TECHNICAL COLLEGE**

Principal: **F. T. WEST, M.B.E., A.I.STRUCT.E., M.I.PROD.E., M.R.S.H.**

**Department of Electrical Engineering**

Head of Department:

**K. E. EVERETT, M.Sc. (ENG.), B.Sc. (HONS.), A.C.G.I., A.M.I.E.E., M.BRIT.I.R.E.**

Places are now being allocated in the following full-time courses in the Department of Electrical Engineering from **September 1962**:

**Communication Engineering and Electronics**

Three-year course leading to College Diploma which exempts from Graduateship Examination of British Institution of Radio Engineers. Minimum age 17 years.

**Marine Radio and Radar**

Two-year course leading to the Postmaster General's First Class Certificate for Radio Officers and the Ministry of Transport Certificate in Radar Maintenance. Holders of these qualifications become qualified Radio and Radar Officials in the Mercantile Marine. Minimum age 16 years.

Further details and forms of application may be obtained from the Registrar, Southampton Technical College, St. Mary Street, Southampton.

**EDUCATIONAL**

**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.

**"HOW AND WHY"** of Radio and Electronics made easy by a new, non-maths, practical way Postal instruction based on host 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.

**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 faultfinding on equipment made easy for the first time! No previous experience needed. No mathematics used. Free brochure from: Dept. 11, P.W. RADIOSTRUCTOR, Reading.

(continued overleaf)

**EDUCATIONAL**  
(continued)

**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 subject to

**I.C.S.**

(Dept. 541), Intertext House, Parkgate Road, London, S.W.11

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

DON'T FUMBLE with Formulae. Master Mathematics quickly and easily the Understandable Way.



The Dryden School of UNDERSTANDABLE MATHEMATICS  
117 Dryden Chambers, Oxford St. London, W.1.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
\_\_\_\_\_

BECOME TECHNICALLY QUALIFIED in your spare time. Guaranteed diploma and exam. Home-study courses in Radio, TV Servicing and Maintenance, R.T.E.B., City and Guilds, etc. Highly informative 132-page Guide —FREE. N.I.E. (Dept 363), 148 Holborn, London, E.C1.

**ELECTRONICS**

Key to YOUR future?  
An exciting career - A new Hobby - Your own spare or full-time BUSINESS!



New experimental course includes big kits for building test gear and a complete AM/VHF receiver.



FREE brochure from  
**RADIOSTRUCTOR**  
DEPT. E77, READING, BERKS.

**EDUCATIONAL**  
(continued)

**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.

**SERVICE SHEETS**

**SERVICE SHEETS;** Radio, TV, 5,000 models. List 1/-. S.A.E. enquiries: TELRAY, 11 Maudland Bk., Preston.

**SERVICE SHEETS;** also Current and Obsolete Valves for sale. — JOHN GILBERT RADIO, 20 Extension, Shepherd's Bush Market, London W12 (Phone: SHE 3052).

**SERVICE SHEETS** for all makes of Radio and TV, 1930-1962. Prices from 1/- with free fault-finding guide. Catalogue of 6,000 models 1/8, 125 Radio/TV sheets covering 370 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 or 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.

**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.

**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/-. SAE please. SULTAN RADIO, Pantiles Chambers, Tunbridge Wells, Kent.

**SERVICE SHEETS,** Radio, TV 4/- each. Bickley, 539 Stannington Road, Sheffield 6.

**SOUND RECORDINGS**

**RECORDING TAPE,** save up to 30% send for list; also 50 second-hand recorders in stock. E. C. KINGSLEY & CO., 132 Tottenham Court Road, London W1. EUS 6500.

**METAL WORK**

**METALWORK.** All types cabinets, chassis, racks, etc., to your specifications. PHILPOT'S Metalworks Ltd., Chapman St., Loughborough.

**SITUATIONS VACANT**

**RADIO MECHANIC** required for work on transistor kits. Good wages and prospects for capable person. Savoy Electronics Ltd., 15 Maiden Lane, Strand, WC2. Phone: TEM 5484.

**SITUATIONS VACANT**  
(continued)

**ENGINEERS REQUIRED,** experienced in audio techniques and relay circuitry, for work on public address systems. Also VHF test engineer for television equipment. Write, giving details to: CLARKE & SMITH MFG CO. LTD., Hanworth Air Park, Feltham, Middlesex.

**TV AND RADIO,** A.M.Brit.I.R.E., City and Guilds, R.T.E.B. Cert., etc. or "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.

**A.M.I.Mech.E.,** A.M.Brit.I.R.E., 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.

**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.

**RADIO/RADAR TECHNICIANS** ("Technical Officers") required for Department of Transport and Power, Dublin (at least nine vacancies). Age limit: 50 years with extensions. Salary scale, £540-£1,000. Entry up to £870 in certain circumstances. Experience in the maintenance of V.H.F. Radio and/or Radar Equipment is essential (e.g. Television, Radio Navigational Aids or V.H.F. Communications). Application forms, etc. from Secretary, Civil Service Commission, 45 Upper O'Connell Street, Dublin 1. Latest time for receiving completed application forms 5 pm on 21st JUNE, 1962.

**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 associated experiments.

Men with Service, Industrial or Commercial background 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.

An application form may be obtained by sending a post card quoting your name, address and the reference EL/INST/SK to the Labour Department, A.E.E. Winfrith, Nr. Dorchester, Dorset.





*Servicing electronic computer for Comet simulator*

# Make your hobby your career

In today's R.A.F. you can work on some of the most sensitive electronic equipment ever made

The man in this photograph is an instrument mechanic at work. At least, it's called work, but to him it has the fascination of a hobby—a paid hobby at that. Still, he's an enthusiast; anything to do with electronics and he's not happy until he's ferreted out all the secrets. And there are plenty of secrets in the R.A.F. In fact, you don't really know what advanced equipment is until you've handled some of the R.A.F. stuff.

If you have the flair that makes the born electronics man, the R.A.F. offers you a satisfying career. You will get a skilled training that is yours for life. You get paid well, you live well—and you may travel anywhere in the world. There's no doubt about it,—the R.A.F. gives you a secure career—and an adventurous one.

THE FUTURE IS WITH THE R.A.F.



Fill in this coupon and you will be sent, without obligation, a free copy of "The Man on the Ground", an illustrated booklet giving details of all R.A.F. trades.

NAME .....

ADDRESS .....

DATE OF BIRTH .....

*Send the completed coupon to:*

**R.A.F. Careers Information Centre (PW 116D),  
Victory House, Kingsway, London, W.C.2.**

## EDDY'S (NOTTM.) LTD. 116 ALFRETON ROAD NOTTINGHAM

New or Surplus VALVES—

Guaranteed and Tested by Return Post.			
AC2/	PCF80	8/6	6J5G 2/9
PENDD	PCF82	7/11	6J5GT 3/9
CIC	PCL82	8/6	6J5M 4/3
CL33	PCL83	11/6	6J6 4/-
CY31	PY83	7/6	6K7G 1/11
EB41	PEN46	4/11	6K8G 5/6
EB91	PL33	9/6	6J7G 5/-
EBF80	PL36	10/6	6L6G 7/6
ECC35	PL81	9/6	6P25 8/6
ECC85	PY31	9/6	6Q7G 5/11
ECC40	PY80	6/-	6SA7M 5/9
ECC84	PZ30	9/6	6SG7M 4/9
EF36	PEN36C	8/-	6SJ7M 5/9
EF37	R19	11/-	6SL7GT 5/9
EF37A	SP61	2/6	6SN7GT 4/6
EF40	TDD4	7/6	6U4GT 10/6
EF41	U26	9/9	6V6G 4/9
EF42	U76	5/3	6V6GT 6/-
EF50	UB41	7/6	6X4 4/6
EF86	VP23	6/6	7C5 6/11
EF89	ID5	7/6	7C6 7/11
EF91	IL4	3/3	10F1 5/-
EF94	IT4	3/6	10P13 9/6
EL32	IS5	4/9	12A6 5/-
EL38	IR5	5/6	12K7 5/3
EL84	354	5/11	12Q7 5/3
EF183	3V4	6/9	20D1 8/6
EF184	5U4G	4/9	20P3 12/6
EL81	5Y3GT	5/11	25B8G 6/11
EL91	5Z4G	7/6	25L6GT 7/11
EY86	6AC7	3/3	30F5 6/11
EZ40	6AC7	3/3	30F5 6/11
EZ41	6A5G	3/-	35L6GT 8/6
EZ80	6C4	3/6	35W4 6/9
EZ81	6BWW	6/11	35Z4 5/3
GT1C	6F1	5/-	80 6/11
HL23DD	6F13	5/-	954 1/6
KT33C	6F15	5/-	955 3/6
MU14	6F33	6/6	956 2/6

**CRYSTAL SETS.** Complete 2 wave bands, 19/11; also with trans. amplifier extra, 9/11. P. & P. 2/6.

**HEADPHONES.** High res. to suit above crystal set, 13/11. P. & P. 2/-.

**GERMANIUM DIODES,** 9d. each. 7/- dozen. Post 6d.

**THROAT MIKES,** 2/- each. Post 10d. Super quality model, 3/- could be used for electrifying musical instruments, etc.

**VIBRATORS.** 12 volt 4 pin, 5/11. 6 volt 4 pin, 8/11. Post 1/6.

**NEON TESTERS/SCREW DRIVERS,** 3/11. Post 9d.

**NIFE ACCUMULATORS.** 1.25 v. Size 3 x 2 1/2 x 3/8 ins. Weight 13 ozs., 2/11 each. P. & P. 2/- . One only add 9d. per cell.

**DIMMER SWITCHES,** ideal for train speed regulators, 1/11, post 1/3.

**V.H.F. AERIALS,** 6/11. Post 1/-. Easy to fit. No technical knowledge required.

**LUXEMBOURG AERIALS.** Complete and easy to fit. Greatly improves reception, 3/11. Post 6d.

**JACK PLUGS.** Standard, 1/11. Post 6d.

Any parcel insured against damage in transit for only 6d. extra per order. All uninsured parcels at customers risk. Post and Packing 6d. per valve extra. C.W.O. or C.O.D. only. C.O.D. charge 3/- extra. S.A.E. with enquiries.



# NOW ANYONE CAN AFFORD TO TRAIN TO BE AN EXPERT IN RADIO and ELECTRONICS

EVEN QUALIFY FOR A  
CERTIFICATE

It's the most exciting news of the year! Just imagine. You can get 35 large, fact-packed lessons for little more than 1/- per lesson! The lessons are crystal clear, practical easy to master and use. Early lessons make fundamentals clear even to the beginner, while other lessons will give you the practical "know-how" of an expert.

Compares favourably with some courses costing ten times as much. You save because you receive all the lessons at one time and are not required to purchase equipment you do not need.

This is a real home-study course that has been bound into one giant 8 x 11in. 216 page manual. Each page is divided into two columns. A wide column features the text, while a narrow column at the side has the instructor's comments, helpful suggestions and additional pictures to simplify the difficult parts.

Everyone can benefit from this practical course. No old fashioned (or pseudo modern) methods used here, just straight forward, easy to understand explanations to help you make more money in electronics.

As an optional extra, you can pay a further fee if you wish to complete the questions set at the end of each lesson and have an expert check your answers. Students who attain a minimum of 60% correct answers can qualify for a certificate of proficiency in basic radio and electronics. Details sent with each course ordered.

You must be convinced that this is the best value you have ever seen in electronic training, otherwise you can return the manual (or have your money refunded if sent with order) after you have examined it in your own home for a period of seven days.

The price? Only 36/-, plus postage.

## FREE TRIAL OFFER!

To SIM-TECH TECHNICAL BOOKS, Dept. W.A.1, Gater's Mill, West End, Southampton, Hants.

- RUSH Radio and Electronics Course for seven days examination. If I keep the course I can either pay 37/6d. cash or 12/6d. deposit after seven days and two payments of 12/6d. monthly. Otherwise I will return the course post-paid and owe nothing.
- SAVE! Send only 36/- if paying cash with order. (We pay postage). Same 7-day money-back guarantee.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ County \_\_\_\_\_

# RADIO CLEARANCE LTD.

The oldest Component Specialists in the Trade  
27 TOTTENHAM COURT ROAD, LONDON, W.1.

Telephone: MUSEUM 9188

TRADE ENQUIRIES INVITED

EST. 30 YRS

IN THE HOME, IN THE CAR, BY THE SEA, IN FIELDS AFAR, THE

## "CONTESSA" IS VOTED BEST OF ALL



A really remarkable 2-Band 6-Transistor Superhet Radio—25,000 satisfied customers and still in huge demand.

The Contessa is the professional looking set with the professional performance.

Study these brilliant features which cannot be found in any other Radio—

- 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 410 milliwatts from the single-ended push-pull final stage.
- Specially designed aerial matching coil for use in a CAR.
- Only first-grade fully guaranteed matched transistors and diodes are used.
- Double tuned IF transformers for maximum gain and knife-edged selectivity.
- Fully drilled printed circuit panel marked with component numbers.
- The two-colour case measures 10 x 7 1/2 x 3 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.

Inclusive price for all associated components, cabinet and battery, complete in every detail, or our BUY AS YOU BUILD SCHEME, any parts sold separately. Send for comprehensive descriptive Manual and Parts List, 3/6 post free Plus 3/6 P. & Pkg.

**£10.19.6**

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 and diode are employed in a highly sensitive superhet MW and preset LW circuit embodying the most modern design practice. A special 2 1/2 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 given with each set of parts. The total MEASUREMENTS of the "Capri" are 4 1/2 x 2 1/2 x 1 1/2 in.

SEE AND HEAR A WORKING MODEL TODAY

Inclusive price for all associated components, case and constructional data, complete in every detail or on our BUY AS YOU BUILD SCHEME, ANY PARTS SOLD SEPARATELY. 8 v. battery 2/6 extra.

**£7.10.0**

plus 2/- P. & Pkg

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/-

# "CODAR CLIPPER" ALL BAND RECEIVERS 10-2000 METRES

LISTEN TO AMATEURS, AIRCRAFT, SHIPPING, SHORT, MEDIUM, LONG WAVE BROADCAST STATIONS THROUGHOUT THE WORLD.

## THE MINI-CLIPPER

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 metres, wire solder, full plans, 36/6. P. & P. 2/6. Other coils 10-2000 metres and electrical bandsread available. Parts sold separately. Plans and parts list, 2/-.

NEW LOW PRICE **36/6**

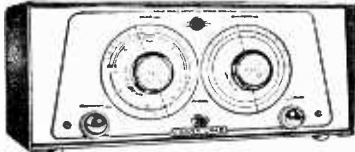


## THE SUPER CLIPPER 88/6

This world-famous hybrid receiver has achieved remarkable success. Tremendous performance with Hi-gain valve detector PLUS two Edison transistor amplifiers which are supplied assembled, only 3 wires to connect. Large precision dial, 7 x 4 in., with 2 pointers, bandset and bandsread, dual slow-motion drivers, air spaced variables. Punched chassis 8 x 5 1/2 in. 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 3 1/2 watts for 2/3 ohm speaker. 3 Planetary vernier slow motion drives, separate electrical bandsread. Covers 10-2000 metres (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 metres, wire, solder, instruction manual, P.&P. 3/6. Optional extra. CR45 Cabinet 12 x 5 x 7 in., slide flap for easy coil changing, Silver grey finish, 27/6.

**£6.19.6**

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, COLEBROOK ROAD, SOUTHWICK, SUSSEX G31RE** Canadian Distributors: JAYCO ELECTRONICS, TWEED, ONTARIO. **G31PA**

**D.C. SUPPLY KIT.** 12 v. 1 a. consisting of a partially drilled metal case, main trans., F.W. Bridge Rectifier, 2 fuseholders and fuses. Change Direction switch, variable Speed Regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains. Limited number available at 29/11.

### SELENIUM RECTIFIERS

F.W. BRIDGE	24 v. 2 a.	.. 14/9
6/12 v. 1 a.	.. 3/11	H.T. TYPES H.W.
6/12 v. 2 a.	.. 6/11	150 v. 40 mA .. 13/9
6/12 v. 3 a.	.. 9/9	250 v. 50 mA .. 3/11
6/12 v. 4 a.	.. 12/3	250 v. 60 mA .. 4/11
6/12 v. 6 a.	.. 15/3	250 v. 80 mA .. 5/11
6/12 v. 10 a.	.. 25/9	250 v. 250 mA .. 11/9
6/12 v. 15 a.	.. 35/9	250 v. 250 mA .. 11/9
<b>CONTACT COOLED.</b> 250 v. 75 mA. F.W. (Bridge). 10/11. 250 v. 50 mA. F.W. (Bridge). 8/11. H.W. 250 v. 60 mA .. 5/11		

**TELEVISION RECTIFIERS.** 250 v., 200 mA. Small size. Only 5/9.

**B.S.R. MONARDECK TAPEDECKS** Speed 3 in. per sec. With high quality recording heads. £6.19.6. Carr. 3/- Cabinets, 39/6.

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

**LINEAR TREMOLOPRE-AMP UNIT** Type TPUII, with 3 controls, volume, amplitude and frequency. Inputs for guitar and microphone. Requires power supply of 250 v., 10 mA and 6.3 v. 1 a., available from any R.S.C. or LINEAR amplifier. The unit is merely connected to normal input socket of hi-fi amplifier or Guitar amplifier. Only 5 gns.

**R.S.C. GRAM. AMPLIFIER KIT.** 3 watts output. Negative feedback. Controls Vol. Tone and Switch. Mains operation 200-250 v. A.C. Fully isolated chassis. Circuit etc., supplied. Only 39/9. Carr. 3/9.

### HI-FI 10 WATT AMPLIFIERS

Brand new. Manufacturer's discontinued line. Fitted latest Mullard valves. Dual inputs for "mike" and gram., etc. Bass and Treble Controls. High sensitivity and quality. Output for 3 ohm or 15 ohm speaker. For 200-250 v. A.C. **£7.19.9** Carriage 7/6.

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

A design of a 3 valve long and medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion detector. Valve line-up 6K7, SP61, 6V6G. Selectivity and quality excellent. Simple to construct. Point-to-point wiring diagrams, instructions and parts list, 1/9, maximum building costs £4.19.6, inc. attractive Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

**R.S.C. TRANSISTORISED GRAM AMPLIFIER.** Output 1 watt, for 3 ohm speaker. Transistors Mullard OC71, OC81D, OC81, OC81. Suitable for any normal crystal pick-up. Only 69/9.

### MULTI-METERS.

**CABY M1.** Sensitivity 2000 ohms per volt. A.C. and D.C. 54/-.  
**CABY A10.** Basic Meter sensitivity 155 micro-amps. A.C. and D.C. ranges £4.17.6.  
**CABY H30.** Sensitivity up to 10,000 ohms per volt. A.C. and D.C. £6.10.0.

**EX. GOVT. SELENIUM RECTIFIERS.** 12 v. 15 amp. F.W. (Bridge). Only 25/9.

**EX. GOVT. SMOOTHING CHOKES.** 200 mA. 5-5 H., 50 ohms, Parmeko 8/9; 100 mA, 5 H., 100 ohms 3/11; 150 mA, 10 H., 50 ohms 9/9; 80 mA, 20 H., 900 ohms 5/9; 120 mA, 12 H., 100 ohms 8/9; 50 mA, 50 H., 1,000 ohms 6/9; 100 mA, 10 H., 100 ohms 6/9; 60 mA, 5-10 H., 250 ohms 2/11.

### EX. GOVT. MAINS TRANSFORMERS

Primaries 200-250 v., 50 c.p.s. A.C.	..	..
250v. 60mA 6.3v. 2a	..	.. 11/9
250-0-250v. 60mA 6.3v. 2a	..	.. 12/9
300-0-300v. 60mA 6.3v. 2a	..	.. 12/11
3.500v. 5mA 2v. 2a	..	.. 39/9
4.35-45-45-50v., 300mA 6.3v. 3a	..	.. 17/9
12v. 20a. (carr. 7/6)	..	.. 59/9

### COMPLETE POWER PACK KIT, 19/11

Consisting of Mains Trans., Metal Rectifier, Double electrolytic, smoothing choke chassis and circuit. For 200-250v. A.C. mains. Outputs 250v, 60mA, 6.3 v. 2a.

**R.S.C. POWER PACK, 39/9.** Louvred metal case only 8 x 5 1/2 x 2 1/2 in. Stove enamelled. For 200-250v. A.C. mains. Output at 4 pin plug and socket 250 v. 60 mA, fully smoothed and 6.3v. 2a. Suitable for power requirements of almost any Pre-amp or Radio Tuner.

**EX. GOVERNMENT ACCUMULATORS.** Size 7 1/2 x 4 x 2 1/2 in., 2v. 16 A.H. brand new, 6/9 ea., 3 for 15/6.

**R.S.C. BABY ALARM or INTER-COMM. KIT.** Complete set of parts with diagrams, etc. Master Unit housed in v-veneered walnut cabinet. High sensitivity. For 200-250v. A.C. mains. Fully isolated. Only 79/6, carr. 5/- Or assembled ready for use £5.15.0.

**R.S.C. (Manchester) Ltd.** MAIL ORDERS to 29 Moorfield Rd., Leeds 12. Terms: C.W.O. or C.O.D. No C.O.D. under £1. Postage 2/9 extra under £2. 3/9 extra under £5. Trade Supplied. S.A.E. with all enquiries please.

<b>BIRMINGHAM:</b> 6 Great Western Arcade, Birmingham	<b>SHEFFIELD:</b> 13 Exchange St. Castle Market Bldgs., Sheffield	<b>HULL:</b> 51 Savile St. Hull (Half day Thurs.)	<b>LIVERPOOL:</b> 73 Dale St. Liverpool 2	<b>BRADFORD:</b> 56 Morley Street (Above Alhambra Theatre), Bradford	<b>MANCHESTER:</b> 8-10 Brown St. (Market St.) Manchester 2	<b>LEEDS:</b> 5-7 County (Mecca) Arcade, Briggate Leeds 1
--	--	--	---	---	--	--

# Premier RADIO

23 TOTTENHAM COURT ROAD,  
and at 309 EDGWARE ROAD,

LONDON W.1  
LONDON W.2

Telephone: MUSEUM 3451/2  
Telephone: PADDINGTON 6963

## THE "PETITE" PORTABLE

MAY BE BUILT FOR **£7.00** P. & P. 3/-  
Batteries extra: H.T. 10/- (Type H120) or equivalent. L.T. 1/6 (Type AD 35) or equivalent.



- High Q frame aerials.
- High sensitivity on both wavebands.
- Medium and long wave superhet circuit.
- Instructionbook1/6

## TRANSISTOR SUPERHET RADIO

MAY BE BUILT FOR

**£8.19.6**

plus 2/6 P. & P.  
PFS Battery extra at 2/6



Using six Transistors and one Diode and internal Ferrite Rod Aerial, with provision for Car Radio Aerial. Full medium and long waveband coverage and 6 x 4 High Flux Speaker. When constructed the receiver is housed in an attractive two tone case, size 10 1/2 x 7 1/2 x 3 1/2.

## WE HAVE BEEN APPOINTED STOCKISTS FOR FULL RANGE OF STERN'S RADIO

(Fleet Street)

Famous Mullard Designs

such as Type 'C' Tape Pre-amplifier and Erase Unit, including separate Power Supply.

Complete Kit of Parts ..... £14. 0. 0  
or Completely assembled and tested, ..... £17. 0. 0  
Also available Less Power Supply at £11.15. 0 and £14.10.0 respectively.

Stern's Model HF/TR3 Mk.2 Tape Amplifier Complete Kit of Parts ..... £13.14. 0  
or Completely assembled and tested, ..... £17. 0. 0

Complete Mullard 6-10 Amplifier with Pre-amplifier on same Chassis.

Complete Kit with Farneko O/P and Mains Transformers ..... £11.10. 0  
Completely assembled and tested, ..... £13.10. 0

Complete Mullard 3-3 Amplifier Kit, ..... £7.10. 0  
Completely assembled and tested, ..... £8.19. 6  
P. & P. 6/6

Mullard 10-10 Stereo Power Amplifier based on the famous Mullard 6-10

Complete Kit of Parts ..... £18.10. 0  
Completely assembled and tested, ..... £21. 0. 0  
(Control Unit on Main Chassis)

Also available with separate dual-channel Pre-amp. Complete Kit for Power Amp. & Pre-amp £26.0.0  
Completely assembled and tested, ..... £30.0.0

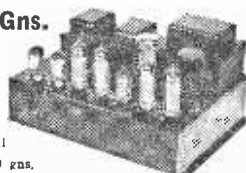
ALL COMPONENTS USED IN THESE KITS ARE OF THE HIGHEST POSSIBLE STANDARDS AND STRICTLY TO CIRCUIT SPECIFICATIONS.

Full descriptive literature available on these products and Circuit Diagrams may be purchased separately.

## STAR FEATURE PURCHASE!

WE CAN OFFER THE FABULOUS SAVILLE DOUBLE 12 STEREO POWER AMPLIFIER AND MATCHING SAVILLE 12P CONTROL UNIT FOR ONLY

**25 Gns.**



P. & P. 12/6

ORIGINAL

PRICE 49 gns.

Brief Specifications:

Input sensitivity P.F. 3 and 45 mv, Tape 1 and 20 mv, Radio 50 mv. Output 12 watts per channel, 20 watts peak. 2 EL84 push-pull output per channel. Control 6-pos. sel. volume on/off bass, treble and balance.

THIS



ARTICLE

IS BRAND

NEW AND

GUARANTEED

## SURPLUS RADIO SUPPLIES

2 LAING'S CORNER  
MITCHAM, SURREY

SEND TODAY FOR OUR  
CATALOGUE

## 400 BARGAINS

At prices below manufacturing cost. Price 2/6, post free.

2/- refunded on first order of 10/- or over.

Fine quality Morse Key 3/9  
Postage and packing 2/-

## NEW REPANCO TRANSISTOR COMPONENTS

- Push Pull Driver Transformer Type TT45 ... 5/-
- Push Pull Output Transformer Type TT46... 5/-
- Interstage Transformer Type TT49 ... 5/-
- Dual Range Ferrite Aerial Type FR2 ... 12/6
- 2.5 millihenry Choke Type CHI ... 2/6

**RADIO EXPERIMENTAL PRODUCTS LTD.**  
33 MUCH PARK STREET, COVENTRY

## AVO METERS

MODEL 7 £11.10.0. MODEL 7 Mark II £12.10.0.  
Guaranteed perfect. Complete with leads and batteries.  
Registered post and packing 5/- extra.

"ERECOM" PANEL METERS. Rectangular 4 1/2 x 4 1/2 in. (3 1/2 in. barrel), 0-500µA. BRAND NEW (Japanese). 52/6.

PANEL METER, 0-500µA. (Surplus). Circular 2 1/2 in. scale, 0-5, guaranteed good quality. 15/-.

SILICON RECTIFIERS. A modern marvel. Type 1EA2 (1/2 x 1 1/2 in.) will handle 350 volts at up to 500 mA. Replaces any TV metal rectifier. 8/6.

H.R.O. RECEIVERS—SENIOR MODEL M.X. Complete with 9 coils from 50 Kc/s—30 Mc/s. A superb communications receiver. Guaranteed in brand new condition. £25, carr. 30/-.  
POWER UNIT 59/6. extra carr. 5/6.

R107 RECEIVERS. 1.2 Mc/s—17.5 Mc/s continuously. 3 wave bands. Completely self contained with speaker and power unit for A.C. mains and 12 v. battery operation. Guaranteed perfect. £13.10.0. Carr. 30/-.

## PCR COMMUNICATIONS RECEIVER

Type PCR. Has self-contained speaker. Covers 850-2000, 200-550 and 16-50 metres.

AS NEW CONDITION ..... £6.19.6

Type PCR-2. Requires external speaker. Covers 850-2000, 200-550 and 13-50 metres.

USED (Good condition) ..... £5.19.6

Carriage (any type) 10/6. Full details S.A.E. Any model fitted with BRAND NEW INTERNAL POWER SUPPLY, guaranteed ready for use on A.C. mains, £2 extra.

Moving Coil Phones. Finest quality Canadian, with Chamols ear muffs and leather-covered headband. With lead and jack plug. Noise excluding, supremely comfortable, 19/6, post 1/6.

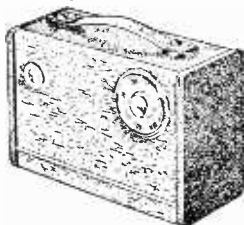
We now stock The Pocket 4, a neat little job which can be made for 42/6. (Printed Circuit Version 52/6), and The Good Companion (a super job equal to the best). Easily constructed for only £9.19.6. Gladly demonstrated to callers.

**CHARLES BRITAIN (RADIO) LTD.**  
11 Upper Saint Martins Lane, London, W.C.2  
Temple Bar 0545 Shop Hours 9-6 p.m. (9-1 p.m. Thursday)  
Open all day Saturday.

# MINISETS LTD. Hatherley Mews London E17

## 6-STAGE PORTABLE TRANSISTOR RADIO

- ★ All parts including transistors direct from manufacturers
- ★ Pre-assembled circuit board ensuring ease of construction
- ★ Full medium-wave coverage
- ★ After-sales service
- ★ Attractive two-tone case 9 x 6 x 4 in.
- ★ Push-pull output, 350 milliwatts
- ★ 5in. high flux speaker
- ★ Built-in Ferrite Rod aerial. No external aerial or earth required
- ★ High performance, many stations received on test



Can be built for **£5.40** P.P. 3/-

Or with long-wave 8/- extra. Full instructions 1/6 (Free with order).

## 6-STAGE TRANSISTOR POCKET PORTABLE

- Can be built for **£4.19.6** P.P. 2/6
- ★ Completely self contained no aerial or earth required
- ★ Push-pull output, 250 milliwatts
- ★ 3in. high flux speaker
- ★ Pre-assembled circuit board with simple instructions ensuring easy construction
- ★ High Q Ferrite Rod Aerial
- ★ After-sales service

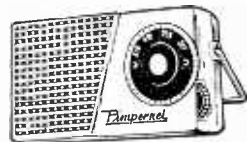


Can be supplied with long-wave 6/- extra. Full instructions, price list 1/6 (Free with order).

## 3-TRANSISTOR RADIO (plus 2 diodes)

Total building **70/-** P.P. 2/6

- ★ Pre-assembled circuit board, ensuring easy construction
- ★ Full medium-wave coverage
- ★ Attractive case 5½ x 3 x 1½ in.
- ★ All components including transistors are brand new and direct from manufacturers
- ★ Ferrite Rod aerial coil, no external aerial or earth required
- ★ 2½ in. high flux speaker direct from manufacturer
- ★ After-sales service



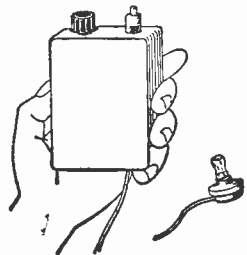
Send 1/6 for instructions, circuit and price list

## 2-TRANSISTOR RADIO (plus 2 diodes)

Ideal for personal listening

- ★ Built-in Ferrite aerial
- ★ Sensitive earpiece
- ★ All parts including transistors direct from manufacturers
- ★ Pre-assembled circuit board and easy-to-follow instructions
- ★ After-sales service

Can be built for **50/-** P.P. 2/-  
Full instructions, etc., 1/6 (Free with order).



## Radio and Television Retailers' Handbook

Whether proprietor or manager, established or aspiring, this book will be a constant companion on your road to success.

by F. X. Carus.

35/- Postage 1/6.

**SPECIMEN ANSWERS TO TELEVISION SERVICING QUESTIONS (C & G & R.T.E.B.)**, by A. R. Bailey & E. C. Bell, 7/6, Postage 6d.

**HI FI YEAR BOOK, 1962.** 10/6. Postage 1/-.

**TV FAULT FINDING.** A Data Pub., 5/- Postage 6d.

**THE LOUDSPEAKER GUIDE**, by J. Borwick, 7/6. Postage 6d.

**THE RADIO AMATEUR'S HANDBOOK**, by A.R.R.L. 1962 ed., 36/- Postage 2/-.

**RADIO CONTROL HANDBOOK**, by H. G. McEntee. New ed., 40/- Postage 1/-.

**RADIO VALVE DATA.** 7th ed. Compiled by "WW" 6/- Postage 10d.

**COMPLETE CATALOGUE** 1/-.

**THE MODERN BOOK CO.**  
BRITAIN'S LARGEST STOCKISTS  
British and American Technical Books

19-21 PRAED STREET  
LONDON, W.2

Phone: PADdington 4185  
Open 6 days 9-6 p.m.

# VALVES SAME DAY SERVICE NEW! TESTED! GUARANTEED!

SETS	1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94 ..	Set 4 for 19/6	4 for 27/6
OA2	11/6	6L18	10/-
1A7GT	11/-	6L19	10/-
1D5	7/6	6L20	8/-
1N5GT	9/-	6P1	7/-
1N5GT	9/-	6P25	8/6
1R5	6/-	6P28	12/-
1S4	8/-	6Q7G	6/-
1S5	5/6	6Q7GT	8/6
1T4	3/6	6SL7GT	5/9
1U5	5/9	6SN7GT	4/9
3A5	9/-	6U4GT	9/9
304	7/-	6V6G	4/6
354	6/-	6V6GT	7/-
3V4	7/-	6X4	4/6
5U4G	4/6	6X5GT	4/9
5Y3G	8/9	7B6	9/-
5Y3GT	6/-	7B7	7/6
5Z4G	9/-	7C5	7/6
6AL5	3/9	7C8	7/6
6AM6	3/6	7H7	7/6
6AQ5	6/-	7S7	9/-
6AT6	6/9	7Y4	6/-
6BA6	5/9	12AT7	7/-
6BE6	5/9	12AT7	7/-
6BH6	5/9	12AU7	6/3
6BJ6	5/9	12AX7	7/-
6BR7	9/6	12K7GT	4/9
6BW6	9/-	12K8GT	9/6
6CD6G	2/7.3	12Q7GT	4/9
6P1	10/-	12SN7GT	7/6
6P6G	6/6	12Z3	10/6
6P13	10/-	20F2	17/-
6P14	10/-	20L1	16/-
6P23	10/-	20P5	14/9
6K7G	1/11	25A6G	8/-
6K7GT	5/-	25L6GT	7/9
6K8G	5/-	25Z4G	8/6
6K8GT	9/-	30F5	7/-
30L15	11/-	30P19	14/6
35A5	14/-	35L8GT	8/8
35Z4GT	5/6	35Z4GT	5/6
35Z5GT	8/3	35Z5GT	8/3
50L6GT	2/7.3	50L6GT	2/7.3
50L6GT	9/-	50L6GT	9/-
85A2	11/6	85A2	11/6
AZ31	9/6	AZ31	9/6
B36	7/6	B36	7/6
CL33	12/3	CL33	12/3
CY31	10/-	CY31	10/-
DAC32	9/-	DAC32	9/-
DAF91	5/3	DAF91	5/3
DAF96	7/6	DAF96	7/6
DCC90	9/-	DCC90	9/-
DF91	9/-	DF91	9/-
DF91	3/6	DF91	3/6
DF96	7/6	DF96	7/6
DH76	4/9	DH76	4/9
DH77	6/9	DH77	6/9
DJ81	9/-	DJ81	9/-
DK32	11/6	DK32	11/6
DK91	9/-	DK91	9/-
DK92	7/6	DK92	7/6
DK96	7/6	DK96	7/6
DL33	8/-	DL33	8/-
DL36	9/6	DL36	9/6
DL92	6/-	DL92	6/-
DL94	7/-	DL94	7/-
DL96	7/6	DL96	7/6
ENB30	8/-	ENB30	8/-
EAF42	8/6	EAF42	8/6
EB91	3/9	EB91	3/9
EBC33	5/-	EBC33	5/-
EBQ41	8/-	EBQ41	8/-
EBF80	8/-	EBF80	8/-
EBF89	8/9	EBF89	8/9
EEL21	13/6	EEL21	13/6
ECC40	13/6	ECC40	13/6
ECC81	5/6	ECC81	5/6
ECC82	6/3	ECC82	6/3
ECC83	7/-	ECC83	7/-
ECC84	8/3	ECC84	8/3
ECC85	7/9	ECC85	7/9
ECF80	7/6	ECF80	7/6
ECF82	8/6	ECF82	8/6
ECH21	13/6	ECH21	13/6
ECH35	6/3	ECH35	6/3
ECH42	8/9	ECH42	8/9
ECH81	7/9	ECH81	7/9
ECH83	8/6	ECH83	8/6
ECL80	7/6	ECL80	7/6
ECL82	9/-	ECL82	9/-
ECL86	15/6	ECL86	15/6
EP35	4/6	EP35	4/6
EP38	4/6	EP38	4/6
EP40	11/6	EP40	11/6
EP41	7/9	EP41	7/9
EP80	4/9	EP80	4/9
EP83	4/9	EP83	4/9
EP86	8/-	EP86	8/-
EP89	7/-	EP89	7/-
EP91	3/9	EP91	3/9
EP92	3/9	EP92	3/9
EL33	9/6	EL33	9/6
EL34	9/6	EL34	9/6
EL41	9/6	EL41	9/6
EL42	9/-	EL42	9/-
EL84	6/3	EL84	6/3
EM34	7/6	EM34	7/6
EM80	8/-	EM80	8/-
EM81	8/6	EM81	8/6
EM84	9/6	EM84	9/6
EX71	7/9	EX71	7/9
EX86	7/9	EX86	7/9
EZ40	6/9	EZ40	6/9
EZ41	7/6	EZ41	7/6
EZ80	6/3	EZ80	6/3
EZ81	5/6	EZ81	5/6
KT33C	6/6	KT33C	6/6
KT41	11/6	KT41	11/6
KT44	5/9	KT44	5/9
KT61	9/8	KT61	9/8
KT63	6/6	KT63	6/6
MU14	6/6	MU14	6/6
N18	7/-	N18	7/-
PC35	10/-	PC35	10/-
PC97	10/-	PC97	10/-
PC84	7/6	PC84	7/6
PC89	9/3	PC89	9/3
PCF80	7/9	PCF80	7/9
PCF82	8/-	PCF82	8/-
PCF86	14/-	PCF86	14/-
PCF92	14/8	PCF92	14/8
PCL83	10/6	PCL83	10/6
PCL84	10/6	PCL84	10/6
PCL85	10/6	PCL85	10/6
PEN44	11/-	PEN44	11/-
PF39C	8/-	PF39C	8/-
PL36	11/6	PL36	11/6
PL81	9/6	PL81	9/6
PL82	7/6	PL82	7/6
PL83	7/6	PL83	7/6
PL84	14/-	PL84	14/-
PX4	10/-	PX4	10/-
PX25	9/-	PX25	9/-
PY32	11/-	PY32	11/-
PY80	7/6	PY80	7/6
PY81	7/-	PY81	7/-
PY82	6/6	PY82	6/6
PY83	7/9	PY83	7/9
T41	7/6	T41	7/6
U22	7/5	U22	7/5
U25	12/-	U25	12/-
U26	9/3	U26	9/3
U50	6/6	U50	6/6
U62	4/6	U62	4/6
U78	4/6	U78	4/6
U191	14/6	U191	14/6
U281	17/-	U281	17/-
U281	16/8	U281	16/8
U301	17/-	U301	17/-
U801	21/-	U801	21/-
UABC80	6/6	UABC80	6/6
UAF42	8/3	UAF42	8/3
UB41	8/8	UB41	8/8
UB41	7/9	UB41	7/9
UBF80	8/3	UBF80	8/3
UBF89	8/-	UBF89	8/-
UCC84	13/3	UCC84	13/3
UCC85	7/6	UCC85	7/6
UCH21	13/6	UCH21	13/6
UCH42	8/-	UCH42	8/-
UCH81	8/9	UCH81	8/9
UCL82	8/9	UCL82	8/9
UCL83	13/3	UCL83	13/3
UP41	7/-	UP41	7/-
UP89	7/-	UP89	7/-
UL41	8/-	UL41	8/-
UL84	6/6	UL84	6/6
UR1C	8/-	UR1C	8/-
UY21	13/6	UY21	13/6
UY41	6/6	UY41	6/6
UY85	6/6	UY85	6/6
VP4B	9/6	VP4B	9/6
VP41	5/-	VP41	5/-
VP1321	16/6	VP1321	16/6
W76	4/9	W76	4/9
Z77	3/9	Z77	3/9
Z77	3/9	Z77	3/9

**READERS RADIO**  
24 COLBERG PLACE, STAMFORD HILL  
LONDON, N.16 STA. 4587

Post 12/- per valve extra.  
Any Parcel Insured Against Damage in Transit 6d. extra.  
Any C.O.D. Parcel 3/- extra.

# THE PEMBRIDGE COLLEGE OF ELECTRONICS OFFERS TRAINING IN RADIO TELEVISION AND ELECTRONICS

## ATTENDING COURSE

(A) Full-time One Year Course in Radio and Television. College course in basic principles for prospective servicing engineers. Next course commences 4th September, 1962. This course is recognised by the Radio Trades Examination Board (R.T.E.B.) for the Radio and Television Servicing Certificate examinations. Provides excellent practical experience on valve and transistor radio receivers and all well-known makes of television receivers.

## HOME-STUDY COURSES

(B) Courses in Radio, Telecommunications and Mathematics for the City and Guilds Telecommunication Technicians' Certificates.

To: The Pembridge College of Electronics.  
(Dept. P11), 34a Hereford Road, London, W.2.  
Please send, without obligation, details of  
A\_\_\_ B\_\_\_ (Please tick).

Name \_\_\_\_\_

Address \_\_\_\_\_

PC15

## H.A.C. SHORT-WAVE EQUIPMENT AND SHORT-WAVE KITS

Famous for over 25 years for... S.W. Receivers and Kits of Quality.

H.A.C. were the original suppliers of SHORT-WAVE RECEIVER KITS for the amateur constructor. Over 15,000 satisfied customers—including Technical Colleges, Hospitals, Public Schools, Hams, etc.

Improved designs with Denco coils: **One-valve Kit, Model "C"**, Price 25/-; **Two-valve Kit, Model "E"**, Price 50/-; **New Addition: Model "K"** Receiver. Super sensitive "All Dry" Receiver. Special Inc. price. Complete Kit, 77/-.

All kits complete with all components, accessories and full instructions. Before ordering call and inspect a demonstration receiver, or send for descriptive catalogue and order form.

### POST THIS COUPON NOW!

"H.A.C." SHORT-WAVE PRODUCTS  
(Dept. TH), 44 Old Bond Street,  
London W.1

Please send me FREE and without obligation your 1962 literature.

NAME .....

ADDRESS .....

## PRICES DOWN

TRANSISTORS FROM 1/6 EACH  
**GREEN SPOT A.F.** 3 volt Transistors 1/6 each.  
**YELLOW SPOT A.F.** 6 volt down to 2/- each.  
**RED SPOTS** down to 2/6 each.  
**WHITE SPOTS** down to 2/6 each.  
**YELLOW/GREEN TRANSISTORS** down to 3/- each.  
**RED/YELLOW R.F. type only 4/6.**  
**MULLARD TRANSISTORS**  
OC44 9/3, OC45 9/-, OC170 9/6, OC171 10/6, AF114 11/-, AF115 12/6, AF116 10/-, AF117 9/6, OC71 6/6, OC70 6/6, OC78 8/-, OC72 8/-, Matched pairs OC72 or OC81 16/- pair.  
**DIODES** OA70, OA79, OA81, OA90 all 3/- each.  
**SURPLUS DIODES** Miniatures, 3 for only 2/-, 7/- doz.  
**CRYSTAL EARPIECES** with Lead and Plug 7/6 each.  
**LOW IMP EARPIECES**, 7.5 ohms, 7/3 each.  
**REPANCO TRANSFORMERS**, Type TT49, Interstage 5/-. TT45 Driver 5/-, TT46 Output 5/-.  
**FERRITE ROD AERIAL**, Type FR2, 12/6.  
**DRX I Coils** 2/6, DRR2 Coils 4/-.  
**J.B. DILECON CONDENSERS**, .0001, .0002, .0003 or .0005, all 4/9 each.  
**MINIATURE TRANSISTOR TRANSFORMERS**, P.P. Driver 4.5 : 1 P.P. Output 20 : 1. Boxed with specifications 9/6 pair.  
**TRANSISTOR HOLDERS** 1/- each.  
**REACTION CONDENSERS**, .0001 3/-, .0003 3/9, .0005 4/-. Miniature .0005 4/-.  
ALL SENT POST FREE IN U.K. by  
**PETHERICK'S**  
**RADIO SUPPLIES**  
22 High Street, Bideford, N. Devon  
Tel.: Bideford 1217  
S.A.E. WITH ALL INQUIRIES PLEASE

## RADIO BOOKS

A BRILLIANT NEW Pictorial approach to understanding **BASIC ELECTRICITY** and **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.

**BUMPER BOOK OF TRANSISTOR CIRCUITS FOR BOYS**, 6/6.  
**ELECTRONIC NOVELTIES**, Bradley 5/6.  
**ELECTRONIC GADGETS**, Bradley 4/6.  
**SERVICING TRANSISTOR RECEIVERS** New and enlarged edition, Pettit, 7/6.  
All above titles include postage.

SEND STAMP FOR LISTS

## SELRAY BOOK CO.

60 HAYES HILL, HAYES, BROMLEY KENT. Tel. HURstway 1818

**18,000 O.P.V. MULTIMETER KITS**  
Ranges 0-0.25 and 2.5V D.C.; 10, 25, 100, 250, 500, 1000V A.C., D.C., and output volts; Ohms 100 ohms to 10 Meg. (two ranges); 0.25, 2.5, 25, 250mA D.C. (2.5A range 4/- extra). Kit comprises new 3 x 24in. 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, pF, mA & V, 10V A.C. scales) i.e. everything except case and battery. Details of 200PF-0.5uF range. Price 69/11, post free. Scale fitted to meter, 2/6 extra.  
300p Press, 1% stability multipliers now supplied while stocks last at no extra cost. Meter only, as above, with circuit, multi-meter scale, etc., 22/6, post 1/6. The resistance of every meter is measured before despatch. Circuit scale, wiring diag., sd., free with meter or kit.

**PLANET INSTRUMENT CO.**  
25 DOMINION AVE., LEEDS 7

# CABINETS & HI-FI EQUIPMENT

We can supply any cabinet to your own specification

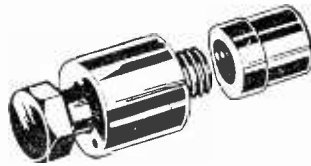


The Lowboy  
Price 24 gns.

This cabinet can accommodate every type, size and make of Hi-Fi equipment. The Lowboy is supplied in Walnut or stripes' Sapele mahogany and polished to a satin finish. This is only one example of—  
**THE LARGEST RANGE OF CABINETS IN THE COUNTRY**  
Equipment is also our specialty. **SEND TODAY for a free copy of the Lewis Radio cabinet catalogue—the most comprehensive ever prepared.**



100 (P72) Chase Side, Southgate, London, N.14. Tel 3733/9666



The **PUNCH** you need!

### HOLE PUNCHES

Instant Type	3/8" diameter	...	...	...	5/6 ea.
Screw-up Type	diameter	...	...	...	6/8 ea.
	"	B7G	...	...	7/2 "
	"	B8A, B9A	...	...	7/8 "
	"	"	...	...	8/3 "
	"	"	...	...	8/7 "
"	"	...	...	9/6 "	Postage and packing 1/-
1 1/2" diameter Int. Octal	"	...	...	...	10/11 ea.
	"	...	...	...	13/3 "
	"	...	...	...	15/6 "
	"	B9G	...	...	17/11 "
	"	Meter	...	...	20/4 "
2 1/2" "	"	...	...	...	27/8 "

Complete set including postage and packing, £7.10.0

**Oliver & Randall Ltd**  
Dept. 7  
40 PERRY HILL, LONDON, S.E.6  
Tel.: Forest Hill 3415

## PADGETTS RADIO STORE

OLD TOWN HALL, KNOWLER HILL, LIVERSEEDGE, YORKS.

Phone: Cleckheaton 2866.

Brand New. Boxed. Wireless Remote Control Unit No. 1 (Canadian) Intercom. Set, 12/6, carr. B.R.S. 6/- Two for £1, carr. 8/- Less phones and mlke.

Complete TV Chassis for Spares. Less valves. 12ln., four for 10/-, carr. B.R.S. 7/6; 14ln. chassis, four for 15/-, carr. 8/6.

1/2 H.P. Motors, 230 volts, ex-equipment. Perfect and guaranteed. 45/-, carr. 5/-.

P.M. Speakers. All 3 ohms, removed from TV sets. Perfect condition. Rola 6 x 4in., 5/-; Goodman 7 x 4in., 6/-; Phillips 5in. round, 6/-; Rola and R. and A. 6in. round, 3/6; 8in. round 6/-. Post extra on any speaker. 2 1/2" up to six can be sent for 3/6.

Coax TV Cable, 75 ohms. Best make, stranded, 5d. per yd. Post free up to 50 yds.

NEW VALVES, Ex-units. All Post Free. 6K7 2/-, 6X5 4/-, 6V6 3/-, 6V6GT 4/-, 6C4 2/-, KT63 4/-, DH63 4/-, EL91 1/6, EB91 1/6, 6J6 2/6, EP50 1/6, 6J per doz., 5U4 4/6, 5Z4 5/6, 954 1/6, 9001 9d., 5/- per doz., VR150/30 4/-.

Valves Removed from TV Sets. All tested on a Mullard Valve Tester and are 100% as new. They carry a 3 months' unconditional guarantee. All Post Free.

EP80 1/6, 10/- per doz. Grade 2, 6d., 4/- per doz.

ECL80	4/6	6LD20	5/6	KT36	5/-
ECC82	5/-	6SN7	2/9	PL81	5/-
EL38	4/6	10C2	2/-	PY31	4/-
EY51	2/6	10F1	2/-	PL82	5/-
EBF90	4/6	10/- per doz.		PY82	5/-
EB91	1/6	10P14	5/-	PY80	5/-
EF91	9d.	10P13	5/-	PL38	5/-
6F25	4/-	20D1	3/-	PZ30	4/-
6P28	4/-	20P1	5/-	PCF80	4/6
6F1	2/-	20L1	5/-	PCC84	4/6
6F13	2/-	185BT	8/6	PL83	5/-
6F14	5/-	U25	5/-	PL33	4/-
6CS7	2/-	U282	5/-	336	4/-
8C6	2/6	U281	5/-	N37	5/-
6Y6	2/6	U329	5/-	L63	3/-

Complete TV Sets Untested. 12in. 20/-, 14in. 30/-, 14in. 13-channel 50/-, 17in. BBC only 50/-. Carriage on any set 10/-. If you wish to insure against damage, 8/6 extra.

TV Converters. Less valves and knobs. Coils fitted 2 and 10. Ekco, Ultra, Pye, Marconi, Murphy, etc., 2/6, post 2/-. Cydon Converters. Complete with knobs less valves. Coils fitted 2 and 10 only. 10/- Post 2/-.

TV Tubes, Regunned. 12 months' guarantee. Old glass not required. 12, 14, 15, 16, 17in. Any make. All same price. £3.15.0. Carr. and ins., 7/6.

Perfect Reclaimed Tubes, 6 months' guarantee. 12in. 17/-, 14in. Mullard only £1.10.0. Carr. and ins., 7/6.

## FIRST-CLASS RADIO COURSES . . .

GET A CERTIFICATE!

QUALIFY AT HOME—IN SPARE TIME

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 Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ. London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship (all branches) etc., together with particulars of our remarkable Guarantee of

### SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.

FOUNDED 1885—OVER 150,000 SUCCESSSES—

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.

## 2 METRES!

The thrills of 144 Mc/s can now be yours for only 39/8, complete kit! Tunable range 150-100 Mc/s, simplified construction, etc., write today for descriptive literature, also if a newcomer—beginner to Amateur Radio ask for free copy of the world-famous "Globe-King" kits and receivers—stamp to cover postage costs appreciated. Write now to makers:

**JOHNSONS (Radio)**  
St. Martins Gate, Worcester

## A.R.R.L. RADIO AMATEURS HANDBOOK 1962

New Edition 36/-, Postage 2/6.  
The Radio Handbook, by Editors and Engineers. 68/-, postage 2/6.  
Single Channel Radio Control by Warring. 3/6, postage 6d.  
The Cabinet Handbook, a new edition by Briggs. 7/8, postage 1/-.  
Mullard Maintenance Manual, 2nd ed., 16/-, postage 1/-.  
World Radio Handbook 1962, by Johansen 18/9, postage 1/-.  
The Microphone Guide by Borwick. 7/6, postage 9d.  
The Amateur Radio Handbook by R.S.G.B., 34/-, postage 2/6.  
The Tape Editing Guide by Hack, 7/6, postage 9d.  
Reference Manual of Transistor Circuits by Mullard. 12/6, postage 1/-.

**UNIVERSAL BOOK CO.**  
12 Little Newport Street, London, W.C.2 (adjoining Lisle Street)



## OUTSTANDING VALUE!!

Model ITI-2 (200H) MULTI-METER 20,000 O.P.V. Complete with test prods.

Our Price £5-19-6

C.W.O. P. & P. 2/-

Size 4 1/2 x 3 1/2 x 1in.

A.C. Voltage: 10, 50, 100, 500 and 1,000 volts. (10,000 o.p.v.).  
D.C. Voltage: 5-25, 50, 250, 500 and 2.5k. (20,000 ohms per volt).  
D.C. Current: 0-50 micro-amps, 0-2.5 mA, 0-250 mA.  
Resistance: 0-6 k, 0-6 meg. (300 ohm and 30k at centre scale).  
Capacitance: 10 pF to .001 mfd., .001 to .1 mfd.  
Decibels: -20 to +22 dB. Knife edge pointer. Money back guarantee. Send today.

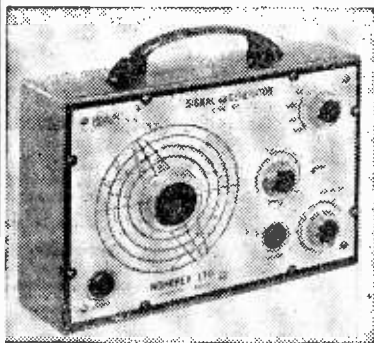
## LEMETRIG

(Dept. P.W.) 2 Vernon Street, LIVERPOOL 2.



# The new NOMBREX

TRANSISTORISED WIDE-RANGE  
SIGNAL GENERATOR, 27  
220 kc/s to 220 Mc/s.



CHECK THESE FEATURES

COMPACT! Only 6 1/2" x 4 1/2"

PORTABLE! Weight 2 lbs.

ACCURACY! Under 2%

ECONOMY! 9v. Battery

DIRECT Calibration

RETAIL **£7.10.0** Post and Ins. 3/6 Battery 2/-

CASH WITH ORDER. REGRET NO C.O.D. NOW IN QUANTITY PRODUCTION ALL ORDERS IN STRICT ROTATION

Trade and Export Enquiries Invited

S.A.E for full technical leaflet.

## GIVE YOUR RADIO A PROFESSIONAL FINISH



SET OF LUSTRE CRYSTAL PLASTIC KNOBS, PUSH-ON TYPE, SUITABLE FOR ANY RADIO OR RADIOGRAM. Diameters: Large 2 1/2in., Small 1 1/2in.

- |  |   |      |
|--|---|------|
| <b>LIST</b>                                |   |      |
| 47/48                                      | Three knobs, as illustrated, for direct drive tuning, with attractive red centre discs.   | 7/6  |
| 48/48                                      | As above, with cursor dial for slow-motion.   | 8/6  |
| 49   | Tuning scale, diameter 2 1/2in., lustre gilt finish, printed MW and LW stations and wavelengths in red and black.   | 2/6  |
|  | Above knobs, with smart gold lustre centres, extra per set.   | 1/-  |
| <b>RADIO CASE TRIMMINGS AND COMPONENTS</b> |   |      |
| 51R  | Case handle brackets, red plastic, to suit 1in. flexible handle, 4 BA x 1/4in. fixing.  | 2/3  |
| 51G  | Brackets as above, but brilliant gilt lustre finish pair.   | 2/9  |
| 52R  | Speaker escutcheon grille, red plastic, 5 1/2in. x 3 1/2in.   | 3/8  |
| 52G  | Grille as above, but attractive gilt lustre finish.   | 4/8  |
| 53   | Feet for case, black plastic, 1/2in. x 1/2in.   | 1/-  |
| 55G  | Personal set escutcheon, 4 1/2in. x 3 1/2in., brilliant gilt finish.  | 3/-  |
| 54   | Tuning knob for above, edge control, 200-500M and long.   | 1/9  |
| 35/37                                      | Set of 4 Miniature Osc./I.F. Transistor Transformers, High gain, High Q, 9/16in. diam.  | 23/- |
| 38/40                                      | Pair of Matched Driver and Output Transformers, Class B output, 500mW, 1 1/2in. x 1 1/2in. x 1 1/2in.   | 18/- |
|  | Six transistor basic components, as previously advertised, still available, 55/-, Circuit diagrams and manual, 2/6. Send S.A.E. for full list of transistor components. Trade and export enquiries invited. Prompt despatch. No C.O.D. under £2 in value. Please include postage. |      |

## NOMBREX LTD.

Instruments Division 31

ESTUARY HOUSE, CAMPERDOWN TERRACE, EXMOUTH, DEVON. Phone: 3515.

## Lyons Radio Ltd

3 Goldhawk Road, Shepherds Bush, London W.12  
Telephone SHEpherds Bush 1729

**"PROGRESSIVE" SHORT WAVE RECEIVER.** Specially designed kits employing plug-in coils with exceptionally clear wiring plans and instructions which enable even the beginner to construct a one-valve short wave radio to which a second and then a third valve stage can be added. The chassis supplied is already drilled to take all three stages. Can be operated from dry batteries or from a simply constructed mains power unit. Cost of all parts to build 1 valve radio, including coil for 40 to 100 metres, only 35/-, post 2/-; 2 valve, conversion kit, 7/6; 3 valve, conversion kit, 10/-. Extra plug-in coils to cover 10-20, 20-40, 100-200 metres and medium wave band, 4/- each. High resistance headphones, 12/9 pair and, if supplied separately, 1/3 postage. Plans supplied separately 1/9, credited if kit ordered.

**RADIO RECEIVERS TYPE RAY 5.** 11 valve special purpose fixed frequency (26.5 Mc/s) American receiver units. Size 12 x 9 x 8in., fitted 24v. D.C. input rotary converter supplying 250v. D.C. at 125mA. Includes plug-in 7.8 Mc/s crystal, output level meter scaled 0/2v. A.C., 2-125N7, 32AB7 and one each 6H6, 12X5, 12SR7, 6AC7, 12S7 and 12A8 valves. Brand new condition. "Give away price" ONLY 35/-, carriage 7/6.

**ROTARY TRANSFORMERS.** Size of both 6in. long x 3in. dia. Type 31 Input 12v. D.C. Out put approx. 250v. D.C. at 125mA. PRICE ONLY 12/6, post 3/-. Type 32 Input 6v. or 12v. D.C. Output approx. 250v. or 500v. D.C. respectively at 65mA. PRICE ONLY 8/6, post 3/-.

**SUPPLY UNITS W/S.** No. 19. Mk. 3. Complete 12v. D.C. input power units containing one each of the above rotary transformers, starter relay, fuses, switch pilot light holder, etc. Housed in metal case, 10 x 8 x 6in. PRICE ONLY 21/-, carriage 6/6.

## The SAVOY SUPER-3 3-TRANSISTOR POCKET RADIO

with miniature loudspeaker  
No SOLDERING No DRILLING



3 transistors and 2 diodes. Full medium wave coverage Size 4 1/2" x 2 1/2" x 1 1/2". Aerial required in certain areas. Full instructions provided.

ONLY 49/6 Battery 1/- P/P 2/- extra

All parts sold separately

or SAVOY-4 With 4 transistors and 2 diodes, in 5 stage reflex circuit. Size 5 1/2" x 3" x 1 1/2".

85/-

Battery 2/3, P/P, 2/3 extra.

## SAVOY ELECTRONICS LTD

15 Maiden Lane, Strand, London, W.C.2. (Behind the Adelphi Theatre).

## RES/CAP. BRIDGE 38/-

p. & p. 2/6

Checks all types of resistors, condensers 6 RANGES

Built in 1 hour. Direct reading. READY CALIBRATED

Stamp for details of this and other kits. RADIO MAIL (DEPT. ZP)

Raleigh Mews, Raleigh Street, Nottingham



Your most useful on-the-job "tool"! Quickly and easily pin-points the exact trouble in any TV set. Covers 70 symptoms, 700 trouble spots. Over 340 cross-indexed pages; 50 time-saving Check-Charts; 280 diagrams and photos; explanation of circuits and designs.

**SEND NO MONEY!**

Just mail coupon for free trial. After 7 days send only 3/- weekly or return book and pay nothing!

**FREE TRIAL OFFER!**

Mail Coupon NOW!

Mail Order Division, SIM-TECH BOOK COMPANY, Dept. W.P.L., Gater's Mill, West End, Southampton, Hants.

I WISH to receive 'TV Troubles' 31/6d. plus 1/6d. postage for 7 day FREE TRIAL as per offer.

Tick here if enclosing full price, we pay postage: Same 7 day money back guarantee.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ County \_\_\_\_\_



**MODEL 500**

30,000 ohms per volt multi-meter

**£8.19.6**  
P.P. 2/-  
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 6 1/2" x 4 1/2" x 2 1/4". With Leads, Batteries and Instructions.



**MODEL 200H**

20,000 ohms per volt.  
Size 4 1/2 x 3 1/4 x 1 1/2 in.

**£6.19.6** P.P. 1/6.

With Test Leads, Battery and Instructions.

6 Ranges D.C. voltage to 2 1/2 kV.  
5 Ranges A.C. voltage to 1 kV.

3 Ranges D.C. current to 250 mA.  
Resistance to 6 megs.  
Capacity and dB ranges.

Fully Guaranteed.

**MODEL TP55**

A.C./D.C. voltage up to 1,000 in 5 ranges.  
D.C. current 4 ranges up to 500 mA.  
4 range resistance to 10 megs. Capacity, dB scales, etc.

20,000 ohms/volt  
Fully Guaranteed

**£5.19.6**  
P.P. 1/6.

With Test Leads, Battery and Instructions.

Size 5 1/2 x 3 1/4 x 1 1/2 in.



**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, 15/-, P.P. 1/6.

1. 4-Transistor 2-way Intercomm. 2-way buzzing, 2-speakers, ready to use, 8 gns., P.P. 2/6.

2. Miniature 15 watt Solder Iron, 1/2 bit. Ideal for all printed circuit work, 29/6, P.P. 1/6.

3. New Model Control Book with 60 pages of transistor circuits, 7/6, P.P. 6d.

4. Complete Set of Meter Leads with Prods. Clips etc. with pouch, 8/6, P.P. 1/-.

5. Telephone Recording Coil to record conversations. For all amplifiers and recorders, 14/-, P.P. 9d.

6. Printed Circuit Kit, to etch your own circuits. Complete with boards and details, 19/6, P.P. 1/-.

7. Miniature 850 ohm Record/Playback Head, with mounting block, 12/6, P.P. 9d.

8. 4,000 ohm lightweight Headphones with leads. Very sensitive, 12/6, P.P. 1/-.

9. Transistor Pocket RF, IF Generator for Radio, TV etc. Fault finding, 52/6, P.P. 1/-.

10. 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.

11. GS12C (Dekatron) Bi-directional 12 way indicator tube. Brand new, 12/6.

12. Caby M1 Pocket Multimeter, 2,000 ohms per volt. With leads and instructions, 54/-, P.P. 1/6.

13. 4 1/2-9 volt Tape Recorder Motor, 12/6, P.P. 1/-.

14. 30 watt Pocket Solder Iron, with pocket pouch and mains plug, 18/6, P.P. 1/-.

15. 931A Photo Multiplier. Brand new, 60/-.

16. 1 Kc/s Transistor Audio Test osc., variable output, 39/6, P.P. 1/6.

17. Crystal Contact Microphone. Very sensitive. Ideal for Guitar, 12/6, P.P. 9d.

18. 4-Transistor Telephone Amplifier. Amplifies without connection to phone. Ideal for office, works or home, £5.10.0, P.P. 2/6.

19. Practical Transistor Circuits. 40 circuits to build, 3/6.

20. Personal Earphones with leads, Jack plug and socket, 600 ohm 10/6; 1000 ohm 12/6; Crystal 9/6; 8/10 ohm 9/6.

21. W/W Erase Head, FE7, 7/6, P.P. 6d.

22. Dynamic Microphone, 49/6, P.P. 1/6.

23. Battery Eliminator and Charger, for PP3 type 9 volt batteries. To run pocket Radios from mains and charge battery, 29/6, P.P. 1/-.

24. Extension Speaker Unit. Plugs into phone socket of most portables. Gives big set volume. Ideal for car use, 57/6, P.P. 1/6.

25. Transistor Portable Tape Recorder. Ideal for dictaphone, with tape mic, etc., £11.19.6.

<p><b>Miniature Panel Meters</b></p> <p>0/500µA (DC) 39/6 0/500µA (DC) 32/6 0/1mA (DC) 27/6 0/5mA (DC) 27/6 0/300 volts (DC) 27/6</p> <p>Brand New Boxed</p>	<p><b>Components</b></p> <p>We stock the largest range of miniature components in the country. Send 1/- stamp for new catalogues.</p>
--	---

26. 7-Section Telescopic Aerial, 12/6, P.P. 1/-.

27. LA1 Ferrite Pot Core, 12/6, P.P. 6d.

28. FX1011 Miniature Ferrite Pot Core, 7/6, P.P. 6d.

29. Miniature Jack and Socket, 3/6, P.P. 6d.

30. No. 19 Set Crystal Calibrator with Handbook, 79/6, P.P. 2/-.

31. New 2-way Intercomm with 2-way calling. Supplied with cable, battery, etc. Housed in moulded cabinets. 89/6, P.P. 2/-.

**BABY SITTER**



**ALL TRANSISTOR BABY OR INVALID ALARM**

HOUSED IN ATTRACTIVE GOLD HAMMER FINISH PORTABLE CABINET. Battery operated, push-pull, 400MW output. Low impedance microphone enables unit to be used up to 200 yards. Output on quality speaker.

★ **GUARANTEED** for 12 MONTHS and 100% SAFE.

★ **MICROPHONE** is placed within 10ft. of baby; twin flex is taken to amplifier unit and placed in any room required. **COMPLETELY BUILT & TESTED.** P.P. 2/6. **£5.10.0**

★ **Used All Night, Every Night.** Battery Life 3 to 4 months.

**1 WATT TRANSISTOR AMPLIFIER**

★ **EMI 4-Transistor Amplifier** with 7" x 4" speaker, tone and volume controls. Ready assembled. For use with crystal pick-ups. 6-9 volt operated, 89/6, P.P. 1/6



**BATTERY RECORD PLAYER**

● 6-7 1/2 volt Garrard turntable with crystal pick-up. Plays 45 r.p.m. Ideal for above amplifiers **65/-** P.P. 1/6.

● Suitable cabinet for amplifier and player 22/6.

**TYPE 38, TRANSMITTER RECEIVER**

Complete with 5 valves. In new condition. These sets are sold without guarantee but are serviceable. **22/6** P.P. 2/6

7.4 to 9 Mc/s.  
Headphones, 7/6 pair. Junction Box, 2/6  
Throat Mike, 4/6, Aerial Rod, 2/6.

**TRANSISTORS**

**100% GUARANTEED**

AF102 27/6	OC45 8/6	OC139 13/6
AF115 10/6	OC44 9/3	OC140 29/-
AF117 9/6	OC71 5/6	OC200 10/6
AFZ12 35/-	OC72 7/-	OCP71 29/-
AC107 14/6	OC78 7/-	2N1742 25/-
OC25 12/6	OC81 7/-	XU612, 40
OC22 23/-	OC83 6/-	Volt RMS
OC35 18/-	OC84 8/6	750mA 3/-
OC41 9/-	OC26 25/-	XU604, 140
OC42 9/6	OC75 7/-	Volt RMS
SB305 8/6	SB078 6/6	500mA 6/6

Send for New List of Fully Guaranteed Transistors, Diodes, Zener Diodes, Silicon Rectifiers etc. No extra charge for matched pairs.

SPECIAL REDUCTIONS FOR SETS

**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**

# 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	Title	Number	Price
<b>CRYSTAL SETS</b>			A.C. Fury Four	PW20	2/6
Junior Crystal Set	PW94	2/-	Experimenter's Short Wave	PW30a	2/6
Dual-wave Crystal Diode	PW95	2/6	Midget Short Wave Two	PW38a	2/6
<b>STRAIGHT SETS</b>			Band-Spread Three (Battery)	PW68	2/6
<b>Battery Operated</b>			Crystal Receiver	PW71	2/-
Modern One-valver	PW96	2/6	Signet Two (Battery)	PW76	2/6
All-dry Three	PW97	3/6	Simple S.W. One-valver	PW88	2/6
Modern Two-valver	PW98	3/6	Pyramid One-valver	PW93	2/6
<b>SUPERHETS</b>			BBC Special One-valver	AW387	2/6
A.C. Band-pass Three	PW99	4/-	A One-Valver for America	AW429	2/6
A.C. Coronet-4	PW100	4/-	Short-Wave World Beater	AW436	3/6
A.C. D.C. Coronet	PW101	4/-	Standard Four Valve S.W.	WM383	3/6
The PW Pocket Superhet	—	5/-	Enthusiast's Power Amplifier	WM387	3/6
<b>MISCELLANEOUS</b>			Standard Four Valve	WM391	3/6
The PW 3-speed Autogram	—	8/-	Listener's 5-Watt Amplifier	WM392	3/6
The PW Monophonic Electronic Organ	—	8/-	<div style="border: 2px dashed black; padding: 5px;"> <p style="text-align: center;"><b>QUERY COUPON</b></p> <p>This coupon is available until 6th July, 1962, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.</p> <p style="text-align: center;">PRACTICAL WIRELESS, JULY, 1962</p> </div>		
The PW Roadfarer	—	5/-			
<b>TELEVISION</b>					
The PT Band III converter	—	1/6			

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/asia), 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 £1.7.8 (Canada £1.5.0.). Registered at the General Post Office for the Canadian Magazine Post.

# PROVE IT YOURSELF! SEE HOW EASY IT IS TO BUILD ONE OF OUR RADIOS

DETAILS OF ANY MODEL ON REQUEST—WRITE NOW

## "CAPRI" - POCKET SIX RADIO



Size only  
4½ x 2½ x 1½ in.

Really  
Pocket  
Size!

**£7.10.0** P.P. 2/-  
(Battery 2/6).

A new design 6-Transistor Printed Circuit Superhet for Medium and Long Waves. Uses all sub-miniature parts. Sub-min. Mullard Transistors. Quality speaker output, fitted earphone/record Sockets. Moulded Cabinets Red/White or Blue/White with Gold fittings.

## "RANGER 3"

Size 4½ x 3 x 1½ in.



**69/6** P.P. 1/6.

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.

## "TRANSIVE" PORTABLE RADIO



Medium  
and  
Long Wave  
Portable  
8½ x 6½ x 3½ in

**£6.19.6.**

P.P. 2/6

A 5-Transistor and Diode. Printed Circuit, Medium and Long Wave Portable. Features 5in. speaker. Car aerial socket, Mullard transistors and carded components. THE IDEAL PORTABLE.

PW Troubadour.  
PW Mercury.  
PW Regency.  
PW Minnette.  
PW Mini-amp.  
PW Citizen.  
PW Superhet.  
PW Shortwave 2.  
PW Tuner.

All parts in stock for these 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

## "CONTESSA" PORTABLE CAR RADIO 6 TRANSISTOR MEDIUM AND LONG WAVE SUPERHET RADIO.



Unbeatable in  
performance and  
appearance.

Features the latest in design and performance, giving ease of station selection. Excellent Tone and Volume with amazing sensitivity and selectivity. Attractive two colour cabinets. Size 10 x 7½ x 3½ in. Blue/White or Red/White. Fitted 5-inch speaker giving up to 425mW Push-Pull quality output. Full avc. fitted car aerial socket. 6-matched transistors. 2-diodes.

Total Cost **£10.19.6** P.P. 3/6.

GUARANTEED THE BEST OBTAINABLE

## MODEL TH-L33

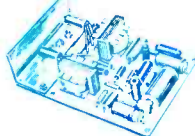
2,000 ohms  
per volt.  
AC/DC. Size  
5" x 3½" x 1½".

**79 6**

P.P. 1/6.  
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

## 3/4 WATT 4 TRANSISTOR AMPLIFIER



● 1 watt peak  
output.

±3db 70c/s  
to 12 kc/s.

Output to 3  
ohm speaker

9 volt oper-  
ated  
Details on  
request

Built and  
Tested  
**69 6 OR 62 6**  
P.P. 1/6 P.P. 1/6

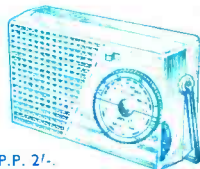
A printed circuit high gain amplifier size 4 x 2½ x 2 in. using Mullard OC71/OC81D and 2-OC81 Transistors. Ideal for Intercomm. Record Player, Tuner Amplifier or any application requiring a quality and reliable amplifier. Suitable 5in. speaker 15/-.

## "QUINTET" POCKET RADIO

Size  
5½ x 3 x 1½ in.

Red or Blue  
and  
Gold trim

**£5.10.0** P.P. 2/-.



A Five Transistor Medium and Long Wave Printed Circuit Loudspeaker Radio, with Excellent Results including Luxembourg, guaranteed with full station separation. Supplied with Mullard Transistors and Carded Components. Fitted earphone/record socket.

Performance will amaze you.

## "RANGER 2"

A Two Transistor Two Diode Personal Pocket Radio. Covering medium waves and top band.

Supplied with battery and quality Personal Phone. No aerial or earth.



Size  
4½ x 3 x 1½ in.  
**55 -** P.P. 1/6.

## "PW-6" SUPERHET RADIO

Medium  
and  
Long Wave  
Radio

Size  
5½ x 3½ x 2 in.

**£8.10.0** 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 6-Transistors. New 2½ inch quality speaker and new illustrated building instructions.

## NEW! "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 40 metre band crystal. Send 1/- stamp for full Booklet. No modifications to car radio at all.