

AN ELECTRONIC REPETITIVE TIMER

PRACTICAL 16 WIRELESS

APRIL
1960

CONTENTS

TRANSISTORISED
SUPER-REGENERATOR

RECORD PLAYER WITH
CABINET

FREQUENCY METER BC 221

TRANSISTORISED MORSE
PRACTICE OSCILLATOR

MODEL CONTROL CIRCUITS

ETC. ETC. ETC.



RADIO & TV TABLES

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

Price £3. 7. 6 (inc. P.T.)

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

Price £4. 0. 0 (inc. P.T.)

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

Price £3. 15. 0 (inc. P.T.)

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

Price £5. 5. 0 (inc. P.T.)

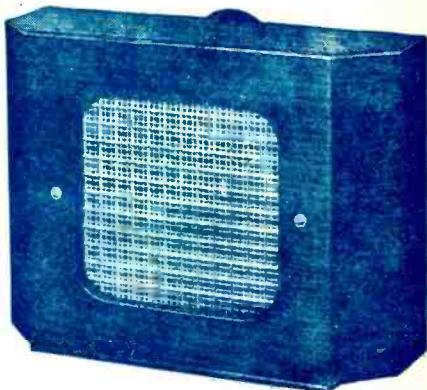
"SENIOR," of ample dimensions (18" x 24" x 25" high).

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



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

WHITELEY ELECTRICAL RADIO CO. LTD.
MANSFIELD . NOTTS

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

Prices include P.T.

**For Safety's Sake
use
AVO Prodclips**



Safety first every time with these patented spring-loaded AVO Prodclips.

Cleverly designed for use as insulated prods, they are invaluable for reaching and holding test points which are difficult of access.

Suitable for use with AvoMeter, Multiminor and Avo Electronic Test Meter Leads.

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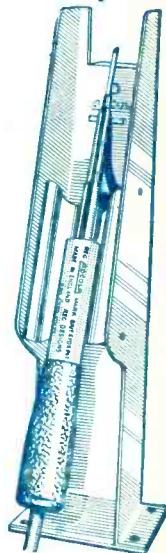
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The ideal combination for transistor and other intricate work.

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1A5	6/-	6E5GT	10/-	10F1	26/2	35A5	10/6	CL4	12/6	ECH82	12/6	HL41	12/6	PCL83	12/6	U281	20/-
1A7	14/6	6F6	15/6	10F9	17/6	35L6GT	15/-	CL33	18/6	E79	21/-	HL41DD	PENA4	17/6	U282	22/6	
1D5	14/6	6F7	6/9	10F9	12/6	35W4	8/-	CY1	15/9	E22	17/6	HL1DD	PENB4	17/6	U301	22/6	
1D6	10/-	6F7	15/-	10LD3	15/6	35Z3	10/6	CY31	15/9	E36	7/6		PEN4D	15/9	U329	17/6	
1H5	10/6	6F12	4/9	10LD11	15/-	35Z4	7/6	D41	12/6	E37	8/6	HL42DD		22/6	U339	17/6	
1L4	6/-	6F13	17/6	10P13	21/-	35Z5	9/6	D42	12/6	E37A	8/6		PL33	18/6	U403	11/6	
1LN5	4/6	6F14	17/6	10P14	20/-	40SUA	15/-	D63	3/6	E39	5/-	HY90	PL38	23/9	U404	10/-	
1N5	10/6	6F15	14/9	11D3	17/6	41STH	23/6	D77	5/6	E40	15/-	IW4/350	PL81	14/9	U801	29/6	
1R5	9/-	6F17	12/-	11D5	17/6	42	15/-	D152	6/-	E41	9/3	IW4/500	PL82	8/-	U4020	15/6	
1S4	8/6	6F33	5/6	12A6	6/6	43	15/6	DAC32	10/6	E42	10/6	KBC32	PL83	10/6	UA680	8/6	
1S5	9/-	6H6	2/6	12AH8	10/-	50C5	15/-	DAF91	7/6	E50(E)	3/6	KF35	PL820	21/6	UAF42	9/6	
1T4	5/6	6J5GT	4/6	12A7	8/6	50CD6G		DF33	10/6	E50(A)	4/-	KL32	PM2A	12/6	UB41	9/6	
1U5	10/-	6J6	7/6	12A7	8/6			DF91	5/-	E80	7/-	KLL32	PM2HL	14/-	UBC41	9/6	
2D21	8/6	6J7GT	9/6	12A7	9/6	50L6GT	9/6	DF92	7/-	E85	6/6	KL35	PM22A	13/6	UBF89	9/6	
2X2	5/-	6K7G	3/-	12AX7	9/6	61BT	17/6	DF96	9/6	E86	11/-	KT2	PM24M	21/6	UBF89	8/6	
3A5	12/6	6K7GT	10/6	12BA6	9/6	61SPT	17/6	DF97	9/6	E89	10/-	KT32	PM202	16/-	UCC85	10/6	
3D6	14/6	6K8GT	12/6	12BE6	9/6	62BT	17/6	DH63	10/-	E91	4/9	KT33C	PY31	16/6	UCH42	9/6	
3Q4	8/6	6K25	19/6	12EJ	17/6	75	12/6	DH76	7/6	E92	5/-	KT36	PY32	15/6	UCH81	9/6	
3Q5	10/6	6L1	15/6	12J7GT	9/6	77	12/6	DH77	8/3	E93	7/6	KT41	PY80	8/6	UCL82	12/6	
354	8/6	6L6	7/6	12K7GT	8/6	78	12/6	DH107	13/6	E95	15/-	KT44	PY81	7/6	UCL83	13/6	
3V4	9/-	6L18	12/6	12K8GT	12/6	80	10/-	DH719	7/6	EL31	12/6	KT55	PY82	8/6	UF41	9/6	
5R4GT	9/-	6L19	21/-	12Q7GT	8/6	85A2	12/6	DK91	9/6	EL32	5/-	KT61	PY83	8/6	UF42	11/6	
5U4G	7/-	6L34	10/-	12SA7	8/6	150B2	12/6	DK92	9/6	EL33	18/6	KT63	PZ30	18/6	UF80	9/6	
5V4	9/6	6/30L2	10/-	12SC7	8/6	150B3	15/6	DK96	10/6	EL35	12/6	KT66	QP25	14/6	UF85	9/6	
5Y3GT	8/6	6LD3	9/6	12SG7	8/6	185BT	32/-	DL33	9/6	EL37	18/6	KT71	QP231	17/6	UF89	8/6	
5Z3	10/-	6LD20	15/6	12SH7	8/6	303	7/6	DL38	23/6	EL38	23/6	KT74	QP20	12/6	UL41	9/6	
5Z4G	10/-	6N7GT	7/6	12S17	8/6	304	7/6	DL92	6/6	EL41	10/6	KT76	R10	21/-	UL44	24/6	
6A7	18/6	6M1	10/6	12SK7	8/6	305	7/6	DL94	9/6	EL42	10/6	KT101	R19	19/6	UL46	21/6	
6A8	10/6	6M2	10/6	12SQ7	11/6	328	7/6	DL96	9/6	EL81	14/9	KTW61	SD6	8/6	UL84	9/6	
6AB8	12/6	6P1	17/6	12SN7	17/6	329	7/6	EAS0	2/-	EL84	7/-	KTW62	SP4	14/6	UL6	20/11	
6A18	9/6	6P25	19/6	12Z3	15/6	807	7/6	EABCB0	7/6	EL85	10/6	KTW63	SP41	3/6	UL7	15/6	
6AK5	8/6	6P28	18/6	13D3	12/6	955	4/-	EAC91	7/6	EL90	8/6	KTZ41	SP42	12/6	UL8	26/6	
6AK8	7/6	6Q7GT	10/6	14H7	12/6	5763	7/6	EAF42	10/6	EL91	5/-	KTZ63	SP61	3/6	UY15	16/6	
6AL5	6/6	6S4GT	7/6	14R7	12/6	9002	7/6	EB41	7/6	EM80	10/-	L63	T41	22/6	UY41	7/6	
6AM	4/9	6S7	7/6	14S7	21/6	9003	7/6	EB91	5/-	EM81	10/-	LN309	TD44	17/6	UY85	7/6	
6AM5	5/-	6SH7	6/6	15A2	17/6	AC4/PEN		EBC33	5/-	EY81	10/6	LZ319	TDD13C		VP2B	17/6	
6AM6	5/6	6S17	5/6	15D2	23/9		25/-	EBC41	9/6	EY84	10/6	MH4		17/6	VP4B	17/6	
6AN5	7/6	6SK7	7/6	19AQ5	10/6	AC5/PEN		EBF80	9/6	EY86	9/6	MHD4	TH41	23/9	W17	8/6	
6AQ5	8/3	6SL7GT	6/6	19B6G24/4			22/6	EBF89	9/6	EY91	9/6	MHL4	TP22	17/6	W76	7/6	
6AQ8	9/3	6SN7GT	5/6	20D1	12/6	AC6	21/-	EBL21	22/-	EZ35	7/-	MKT4 (5/7)	TP25	17/6	W77	5/6	
6AT6	8/3	6U4GT	11/6	20D2	23/-	ACTP	32/-	EBL31	21/6	EZ40	7/6		U14	15/9	W81	6/-	
6AU6	10/-	6U5	7/6	20F2	26/6	ACHL	12/6	EC90	9/6	EZ41	7/6	MS4B	U16	10/-	W142	9/6	
6B7	10/6	6U7	7/6	20L1	26/6	AC/PEN		EC91	9/6	EZ80	7/6	MSP4	UB18/20	10/-	W719	7/6	
6B8	4/6	6V6G	5/-	20P1	26/-		17/6	ECC31	10/-	EZ81	7/6	MU14	U22	10/6	W727	7/6	
6BA6	7/6	6V6GT	8/6	20P3	23/-	ACTH1	34/9	ECC32	10/-	EZ90	7/6	MX40	U24	29/6	X18	11/6	
6BE6	7/6	6X4	5/-	20P4	16/-	ACVPI	17/6	ECC33	5/-	FC2	21/-	N18	U25	16/6	X61M	21/6	
6BG6G	21/-	6X5GT	5/-	20P5	22/6	ACVP2	17/6	ECC34	15/-	FC13	17/6	N19	U26	12/6	X65	23/9	
6BJ6	7/6	7B7	8/6	25L6GT	9/6	AC2/PEN		ECC35	8/6	FC13C	21/6	N37	U31	9/6	X66	21/6	
6BR7	15/6	7C5	8/6	25Y5	10/-		21/-	ECC40	21/-	FW4,500		N78	U33	21/6	X78	21/6	
6BV6	8/6	7C6	8/6	25Z4	9/6	AC2/		ECC81	8/6		10/-	N108	U35	21/6	X79	21/6	
6BW7	6/6	7D5	15/-	25Z5	9/6	PENNDD	21/-	ECC82	9/6	FW4,800		N142	U37	25/6	Y61	10/6	
6BX6	7/6	7D6	15/-	25Z6	10/6	AZ1	15/6	ECC83	9/6		10/6	N147	U45	21/6	Y63	9/6	
6BY7	7/6	7D8	15/-	27S1	17/6	AZ31	10/6	ECC84	9/6	GZ30	10/6	N150	U47	21/6	Z21	12/6	
6C4	6/6	7H7	8/6	30	13/6	B36	21/-	ECC85	9/6	GZ32	11/6	N153	U50	8/6	Z63	7/6	
6CSGT	8/6	7K7	10/6	30C1	12/6	B65	8/6	ECC91	5/6	GZ34	13/6	N309	U52	7/6	Z66	19/6	
6C6	6/6	7Q7	11/6	30F5	11/6	B152	8/6	ECC92	5/6	H30	5/6	N329	U57	7/6	Z77	4/9	
6C9	12/6	7R7	12/6	30FL1	10/6	B309	9/6	ECC93	12/6	H63	9/6	N727	U76	7/6	Z79	8/6	
6C10	12/6	7S7	10/6	30L1	11/6	B329	9/6	ECC94	12/6	HBC90	9/6	N729	U81	8/6	Z152	7/6	
6CD6G	27/6	7Y4	7/6	30P4	22/6	B339	9/6	ECH42	10/-	HL92	6/6	P2	U145	15/6	ZD152	9/6	
6D1	8/6	8D3	5/6	30P12	11/6	B719	9/6	ECH81	9/6	HL133DD		PCC84	U147	7/6			
6D2	5/-	9BW6	14/9	30P16	10/6	CBL1	17/6	ECH35	9/6		10/-	PCF80	U153	9/6			
6D3	15/-	10C1	18/-	30P11	15/-	CBL31	21/-	ECL80	9/6	HL23	12/6	PCF82	U191	20/6			

METAL RECTIFIERS

RM1	6/-	18RA	1-1-8-1	4/6	16RE	2-1-8-1	8/6
RM2	8/-	18RA	1-1-16-1	6/6	18RA	1-2-8-1	11/-
RM3	9/-	16RC	1-1-16-1	8/6	14A86		17/-
RM4	16/6	14RA	1-2-8-2	18/-	14A97		23/6
RM5	22/-	14RA	1-2-8-3	21/-	14A100		24/-

CATHODE RAY TUBES

Type 43/69 £10.00

Type 36/44 £8.10

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

OBsolete VALVES A SPECIALTY.
QUOTATIONS GIVEN ON ANY TYPE
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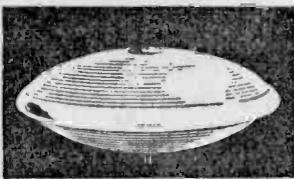
W.D. Circuit Details

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

- A.134 R.109
- BC.348 HRO Receiver
- BC.312 R28/ARCS
- R.103A RL116/A
- BC.342 RA-1B
- RA-1B ARRD
- R-203 AN/APA-1
- R-1155 78
- R-1124A R.T.18
- R-1132A/R-1481 CAY-46-AAM-
- R-1147 RADAR
- R-1124A A.S.B.-3
- R-1082 Indicator 62A
- R-1355 Indicator A.S.B.3
- B.C.1206-A/B Indicator 62
- B-455-A (or-B) Indicator 6K
- B-454-A (or-B) R.F. unit 24
- B-456-M-A (or-B) R.F. unit 25
- Transmitter T1154 R.F. unit 26
- Fifty-eight walkie R.F. unit 28
- Walkie R.F. unit 27
- Frequency meter Wireless set No. 19
- B.C. 221 Demobbed valves

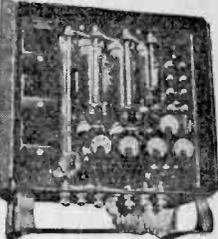
Circular Fluorescent Lighting

Introducing the "Saturn"
 The "Saturn" is our newest circular fluorescent lighting unit. It really is a wonderful unit which will enrich your room not only by its elegance but the bright warm light from the fluorescent tube will light up every corner of the room and bring out the richness and colour of your furnishings and decorations.



The top and bottom spheres are available in red, yellow, blue, opal and green so you may choose the colour or pair of colours to suit your taste and furnishings. The "Saturn" is made in two models, 40 watt and 80 watt, both approx. 16in. in diameter. The price of the 40 watt is £5.19.6 and the 80 watt is £6.19.6. These prices include a warm white tube and suspending chain. In fact you have nothing else to buy. Nor is extra wiring required, you simply take down the existing fitting. The wires that went to this, join to the wires of the "Saturn" and that's all. Running cost of the "Saturn" is approx. 25 hours per unit for the 40 watt and 12 hours for the 80 watt. Light output of the 40 w. is equivalent to the average 150w. lamp and the 80w. equivalent to two 150w. lamps. We manufacture Fluorescent lighting units from 6 inches to 8 feet; a stamped envelope will bring our illustrated list. Trade inquiries welcome.

Charging Switchboard



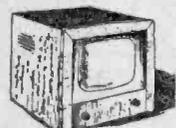
Offered at about one-twentieth of original cost. This is an ex-Government switchboard. It contains three reverse current relays, one voltmeter, one main ammeter, two secondary ammeters and three variable resistors for controlling circuits. These are original cases. Price £2/15/0, carr. 10/-.

Avo Proclips

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



Now reduced to 19/6



14in. T.V. cabinet of the latest styling - beautiful veneered and polished - limited quantity, sale price

9/6 extra. Carriage and packing 3/6 extra. Masks 10/- extra.

Band III Converters



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

Please send two more kits, the one you sent last week is performing magnificently. We receive this sort of letter every day of the week, so if you have hesitated because you thought our kits too cheap you need hesitate no longer.

Waterproof Heater Cable 14 n per foot, 10d. per yard.

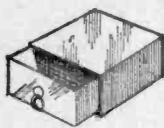
Radio Stethoscope

This can be slipped into the pocket rather like a fountain pen. With it in most districts a receiver can be checked from the grid of the first valve right through to the output without a signal generator, the stethoscope will operate in both L.F. and R.F. circuits without alteration. It is a complete fault-finder. All the necessary parts to make this tracer 6/6, post 1/-.



Component Storage Drawers

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



RI155 for Spares

These are less valves but otherwise reasonably complete—ideal for spares—prices £2 to £4 depending on condition—carriage 7/6.

THIS MONTH'S SNIP Super Transistor Set



Makes ideal bedroom radio, uses one transistor and one crystal diode complete with case 19/6, post and insurance 2d.

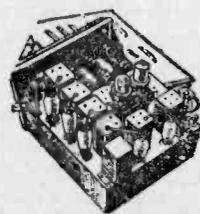
Motor Snip

Miniature motor 2 1/2 in. long x 1 1/2 in. diameter, laminated poles and armature, separate winding for reversing. Operates off 20-30 v. D.C. or off A.C. mains through stepdown transformer. Original cost at least £3 each. Snip price for one month only 8/6, plus 1/6 postage and insurance.



10 Valve 1 1/2 Metre Superhet

Ideal for Commercial TV. These contain 6 valves type SF61 and one each RL7, RL16 and EA50. Six I.F. transformers, 12 Mc/s band, and hundreds of other useful components. Price 29/6, plus carriage and packing 7/6. These receivers are unused.

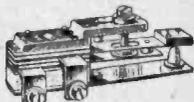


Novelty Radio

Completely wired tunable medium and long wave, originally intended for ETG valves and external batteries but could easily be converted for transistors with internal batteries. Less valves and speaker, otherwise complete. 15/-, plus 1/6 postage.



Thermostats



Useful for the control of appliances such as convector, gluepots, vulcanisers, hot plates, etc. Adjustable to operate over temperature range 50-550 deg. F. fitted with heavy silver contacts. 8/6. Other types: 11 amp., 3/6; 5 amp., 8/6; 2 amp. QMB, 5/6; 15 amp. QMB, 16/- amp. encased wall mounting type, 29/6.

A.C./D.C. Multimeter Kit

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



Cabinet Snip



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

FOR ADDRESS SEE OPPOSITE PAGE

Special This Month

Moving Coil Meters:
 0-500 microamp, 2in. flush .. 17/6
 250-0-250 microamp, 2in. surface .. 27/6
 750 microamp, 2in. surface .. 17/6
 5-0-5 milliamp, 2in. flush .. 17/6
 0-30 milliamp, 2in. flush .. 17/6
 0-100 milliamp, 2in. flush .. 15/-
 0-300 milliamp, 2in. flush .. 15/-
 0-500 milliamp, 2in. flush .. 15/-

Luminous Switch. Double pole designed for electric blankets, neon indicators glow when appliance is switched on. 10/-.

Unbreakable Mains Lead. Type of lead fitted to electric razors makes fine lead for test meters and any other devices where subject to continuous bending. Twin figure eight construction, soft cream p.v.c. covered. Normally costs 2/- per yard. Three 6ft. leads for 2/-.

Metal Rectifier. Equivalent RM5, 12/6.

Metal Rectifier. 60/80 mA 250/300 v., 4/6.

Output Transformer. Standard Pentode, 4/6. Multi ratio, 6/6.

Bi-metal Strip, with heavy duty contact, ideal for thermostat, fire, lamp, etc., etc., 2/6.

Neon Lamp. Midget wire ended, ideal mains tester, etc., 2/-, ex. gov. 1/6.

Phillips Trimmers, 0-300F, 1/- each, 9/- doz.

Set of 8 Allen Keys, 3/6.

Install those extra Points, 3,029 twin flat T.R.S. cable. Big purchase enables us to sell this at 45/- per 100 yds., carriage 3/6.

Low Resistance Head Phones. Ideal crystal sets, etc., 7/6, plus 2/6.

Goodmans Multi Ratio Output Transformer, 6 watt, 8 ratios, from 12-1 to 72-1. Centre tapped for push/pull, 7/6 plus 1/-.

Ditto unbranded, 6/6, post 1/-.

Cold Cathode Valve CV43. Voltage regulator or trigger switch—unused but ex-equipment, 2/- each.

Tag Panels. Ideal for constructors, experimental circuits, etc., 3 of each of 12 different types, 5/-, post 1/6.

Slydlok Panel Mounting Fuses with carrier, 5 amp, 2/- each, 15 amp, 2/6 each.

Belling Lee 2BA fully insulated terminals for mounting through metal panels 2/- each.

Terminal Heads, insulated 4BA, 2/- doz.

0.1 mFd 350 v. Small tubular metal cased condensers made by Dubilier, 2/6 doz.

50 Assorted Resistors. Well mixed and useful values 1 and 1/2 watt, 5/- for 50.

Ditto, but 1 watt, 6/6 for 50.

Mains Transformer, Standard 230 v., input 250-0-250 at 80 mA, 6.3 v. at 5 A, 12/6.

Toggle Switch. Standard metal body type with round dolly, fixing ring and on/off indicating plate, 1/3 each or 12/- doz.

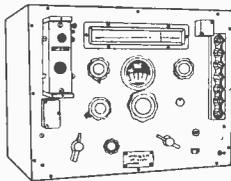
Screened Cable. Rubber covered, flexible with metal braiding, ideal for microphone or gramophone extensions, 4d. per yd., 30/- per 100 yds.

Miniature Microphone

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



B.29 Receiver



A fine receiver made by the famous Marconi Company. Covers the shipping bands 15 k/c to 360 k/c in four switch stages. Has Vernier tuning and all refinements. Works off A.C. mains with internal power pack. A few only, in good working order £15 each. Also some needing servicing £12.10.0 each.

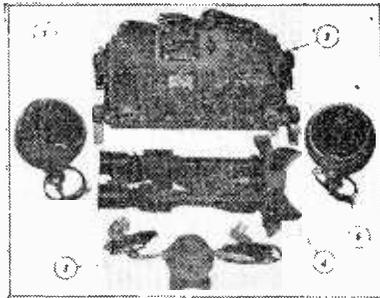
Making a Solder Gun



A 7-second solder gun of the type costing £2-24 was described in "Practical Mechanics". Only two essential parts are required—(a) the transformer and (b) the push switch. These we can supply at 11/6, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

Another Car Battery Charger Bargain
Components would cost more

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



TABBY EQUIPMENT COMPLETE

Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, powerpack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—£2-19.6 or 10/- deposit and 15 fortnightly payments of 10/-.

Fluorescent Light Bargain

Kit of Parts comprising: choke, two lamp holder, starter holder and starter, 40 watt, 19/6, 80 watt, 23/6. Plus 2/- Post and insurance.

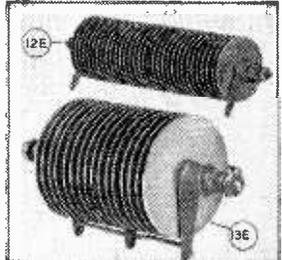
Transistor Set Parcel



Cabinet as illustrated—with handle and motifs—2 gang tuning condenser—printed circuit—tuning scale—full necessary

diagram showing other parts—separate value £3—will all be sent for 29/6, plus 2/6 post and insurance.

Rectifier Bargains



Selenium rectifier type 12, 500 v. ! A half-wave, easily rebuilt into full wave or multiple type, contains 30 35 mm. discs. Price 8/6, plus 1/6 post. Type 13, 36 volt, 9 amp, easily rebuilt into six full wave charger rectifiers suitable for 6 or 12 volt batteries at 3 amps, contains 24 84 mm. discs. Real bargain at 19/6, plus 1/6 post.

Speaker Bargain



12in. Hi-fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 32/6, plus 3/6 post and insurance.

1960 All Mains Amplifier



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

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3Q4	7/6	6J5GTM	6/6		15/11	30P12	8/-	CL33	19/3	ECC83	8/-	FW4/500		PEN4B	26/6	UI21	30/-	VP4(7)	15/-	
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5Z3	12/6		12/6	12AH8	12/6	35W4	7/6	D77	5/6	ECH35	9/6	HABC80		PEN45	19/6	U45	9/6		9/-	
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6CSG	6/6	6V6G	7/6	18	23/3	5763	12/6	DM70	7/6	EL34	15/6	KTZ63	10/6	QP21	7/-	UCH21	23/3	Z66	20/6	
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AZ31	10/-	EF98	13/3	PL820	18/7	UL84	9/-	6C5GT	6/6	10F18	15/3	12S17	6/-	30L1	9/-	210DDT	4/6
AZ41	13/11	EL32	5/6	PX25	12/6	U06	19/11	6C5	5/-	10L1	15/11	12SK7	6/-	30L15	23/3	210VPT	3/6
B36	10/-	EL33	14/-	YP31	16/7	U08	26/6	6C9	17/3	10LD11	12/-	12SL7	8/-	30P4	15/-	82	10/-
CB11	26/6	EL34	19/11	YY32	17/11	UYIN	12/6	6C31	7/6	10M2	23/3	12SN7GT		30P12	12/6	301	10/6
CB131	23/3	EL36	19/11	PY80	7/6	UY41	7/6	6CD6G		10P13	15/-	12SQ7	10/-	30P16	9/6	302	10/6
CCH35	23/3	EL38	26/6	PY82	7/6	VP13C	7/-	29/10		10P14	19/3	12SQ7	8/6	30PL1	12/6	304	10/6
CL4	12/6	EL41	10/6	PY82	7/6	VP135	7/-	6D6	6/6	12A6	6/6	14S7	17/-	30PL1321/11	305	10/6	
CL33	19/3	EL42	10/6	PY83	8/6	VP135 (PM)	7/-	6CH6	10/6	12AT6	10/6	15D2	7/9	35L6GT	10/-	306	10/6
CY31	16/7	EL81	16/7	PZ30	19/11	VR23	6/6	6FG6	7/6	12AT7	7/6	19AQS	9/9	25Y5	9/9	607	6/6
CY1	18/7	EL83	19/11	PEN4DD		VR22	6/6	6F1	7/6	12AU7	8/-	20D1	15/3	35Z4GT	8/-	955	4/-
CV73	4/-	EL84	9/-	PEN4VA		VP41	8/6	6F13	14/-	12AX7	8/-	20F2	26/6	35Z3	16/7	956	3/6
C36A	6/6	EL821	26/6	PEN25	6/-	VR105/308	8/-	6F14	26/6	12BA6	9/-	20L1	26/6	35Z5GT	9/-	5763	9/-
DAF96	8/9	EM34	9/6	PEN46	7/-	VR150/307/6	8/-	6F15	14/-	12BE6	9/-	20P1	26/6	50C5	11/6	9002	5/6
DF96	8/9	EM80	10/-	PEN383	23/3	VU120A	3/6	6F23	18/7	12H6	3/6	25L6GT	10/-	50CD6G		9004	5/6
DH63	7/6	EM81	10/6	PEN220A	4/-	VU39(MU)	6/33	7/6		12J5GT	3/-	25Z4	9/6	29/10		9006	5/6
DK96	8/9	EY51	10/-	PEN45DD		VU111	2/6	6H6GT	2/6	ACOS MICROPHONES							
DL96	8/9	EY81	13/3			W75	7/6	6J5GT	5/-	Acos Mic 39/1. Crystal Stick							
DM70	7/6	EY86	10/-			W77	8/6	6J5M	6/6	Microphons for use as hand,							
EA50	1/6	EZ35	16/7			W79	10/6	6J6	6/-	desk or floor stand units for							
EABC80	9/-	EZ40	7/6			X78	21/3	6J7G	6/6	high quality recording, broad-							
EAF82	10/6	EZ41	7/6			Y63	9/-	6J7M	9/-	casting and public address							
EB34	7/6	EZ80	7/6			Z309	7/6	6K7G	7/6	work. List Price £5.5.0.							
EB41	8/6	EZ91	7/6			Z359	7/6	6K7M	6/9	OUR PRICE 39/6. With							
EB91	5/6	EZ90	7/6			1A3	3/6	6K8G	7/6	stand 47/6. With floor							
EBC33	6/6	EI148	2/-			1A7GT	12/6	6K6GT	7/9	stand adaptor 52/6. Postage							
EBC41	9/6	FC4	26/6			1C2	11/6	6K7GT	5/9	1/6.							
EBC81	11/4	FC13	6/6			1CSGT	12/6	6K8GT	10/-	BATTERY BUZZERS							
EBC90	12/7	FW4/500				1D5	12/6	6K25	19/11	3/9 each.							
EBC91	12/7					1D6	12/6	6L6G	8/6	MORSE KEYS							
EBF80	9/6	GT1C	20/6			1L4	10/6	6L6M	9/6	3/- each.							
EBF89	9/6	GZ32	12/-			1L5GT	10/6	6L7G	7/6	MORSE KEYS							
EBL21	23/3	H30	5/-			1L4	6/6	6L7G	7/6	3/- each.							
EBL31	23/3	H63	10/-			1L5	3/6	6L18	11/6	DUBILIER TYPE "C"							
EC31	7/6	HL23DD	8/6			1N5	10/6	6L18	11/6	controls 500 K. 6/6 each.							
ECC40	23/3	HL22	6/6			1R5	7/6	6L19	23/3	CO-AXIAL CABLE, semi-							
ECC81	8/-	HN309	24/7			1S4	10/6	6LD20	15/11	airspaced 75 ohms. 6d. yard.							
ECC82	7/6	K40N	9/-			1T5	6/6	6M1	17/3	CRYSTAL CARTRIDGES.							
ECC83	9/6	KF35	8/6			1U6	6/6	6N7GT	7/6	Complete with styli. Acos							
ECC84	10/6	KK32	21/11			2C26	1/6	6P1	19/3	HEP3Y/1, HGP59/5C, BSR.							
ECC85	9/6	KLL32	24/7			2P	26/6	6P26	19/11	TCB. Collaro Studio. All							
ECC80	12/-	KT2	5/-			2X2	4/6	6P28	26/6	15/6 each.							
ECCF82	13/-	KT24	5/-			3A4	7/-	6Q7G	7/6	CHARGER							
ECH3	26/6	KT32	14/-			3A5	12/6	6Q7GT	9/6	TRANSFORMERS							
ECH31	23/3	KT33C	8/6			3ABGT	6/-	6SA7GT	8/6	Tapped primary 200/240 v.,							
ECH32	23/3	KT36	29/10			3D6	5/-	6S7G	7/6	secondary 3.5 v., 9 v. and 17 v.							
ECH42	9/6	KT61	13/6			3Q4	8/-	6SH7	6/6	1 amp. type 13/6; 2 amp.							
ECH81	9/-	KT63	7/6			3Q5GT	9/6	6S17	8/6	type 15/6; 4 amp. type 21/-;							
ECH83	13/11	KT66	17/6			3S4	7/6	6SK7	6/6	6 amp. type 32/6. Postage 2/-.							
ECL80	10/6	KT101	10/6			3V4	8/6	6SL7GT	8/6	HEATER							
ECL82	12/6	KTW61	6/6			4D1	3/-	6SN7GT	7/6	TRANSFORMERS							
ECL83	19/3	KTW63	7/6			5R4G	9/6	6SQ7	9/3	Tapped primary 200/240 v.,							
EF9	23/3	KTZ41	3/6			5U4G	6/6	6U4GT	12/-	All 24v. input. 4v. 3 amp. 10/-.							
EF22	8/6	MH41	7/9			5V4	11/6	6U5G	8/6	6.3v. 1 1/2 amp. 6.9. 6.3v. 3 amp.							
EF36	5/6	ML4	8/6			5Y3G	8/-	6U7G	8/6	19. 12.6v. 1/2 amp. 5/9. 5v.							
EF37A	15/-	MSP4/5	7/6			5Z4G	9/-	6V6GT	7/9	2 amp. 10/-, 2v. 3 amp. 8/3.							
EF39	5/9	MSP4/7	7/6			5Z4M	10/-	6X4	7/6	METERS. PANEL MOUNTING (Round)							
EF40	14/6	N37	19/11			6ABG	9/-	6X5GT	7/6	Make F.S.D. Res.							
EF42	11/-	N339	17/6			6AC7	5/-	6X5GT	12/6	Weston (U.S.A.) 1mA 150 ohms							
EF50	4/-	OZ4	5/6			6AG5	5/6	7B6	10/6	Weston (U.K.) 1mA 75 ohms							
EF50SYL	7/-	P61	3/6			6AK5	6/6	7B7	8/6	W.D. (U.K.) 5mA 0.0037 ohms							
EF54	6/-	PABC80				6ALS	4/6	7B8	8/6	W.D. (U.S.A.) 500mA -							
EF55	10/-					6AMS	7/6	7C5	8/-	0-600 2 1/2 in. 15/6							
						6AM6	4/6	7C6	8/-	PUBLICATIONS							
						6AQ5	7/6	7D6	13/6	Wireless World Valve Data							
						6AT6	8/6	7H7	9/-	Book, 5/-, post 4d. Data TV							
						6AU6	10/6	7Q7	9/-	Fault Finding Book, 5/-, post							
						6BBG	4/-	7S7	9/6	4d. Mullard Circuits for Audio							
						6BEA	7/6	7Y4	8/6	Amplifiers, 8/6, post 6d.							
						6BE8	8/-	8D2	2/9	Short Wave Receivers for the							
						6BG6G	23/3	9D2	3/6	Beginner, 6/-, post 5d.							

MICRO SWITCHES 3/9 each.

REGUNDED Television Tubes, 12-month guarantee, 12 to 14in. £5.10.0. 15 to 17in. £6. Carriage and Insurance 10/- extra.

OUTPUT TRANSFORMERS

Elstone OT3 for Mullard 3-watt Amplifier, 25/- Elstone OT6 Low Load, OT8 Normal Load, OT/ML Dist. Load, all 45/- and all for Mullard 5/10 amp. Single ended 5000/3 ohms, 40mA, 4/6; 5000/3 ohms, 60mA, 5/9; 10000/3 ohms, 30mA, 4/6. Universal 18 Ratio Type 40mA, 5/9 each.

ACOS CRystal PICK-UPS

Turnover Head (2 sapphire styl), 29/11. P.P. 2/6.

SCOTCH RECORDING TAPE

1200ft Reels Standard 23/- 1800ft Reels Extra Play 37/6

RECTIFIERS

RMI 5/3, RM2 6/9, RM3 7/6, RM4 13/6, RM5 19/6, 14A 8/6 19/6, 14A 97 19/6 14A 100 19/6, LW17 1/6, 18RA 1-1-16-1 6/-, FC31 (14RA 1-2-8-3) 22/6, FC101 (14RA 1-2-8-2) 16/6.

METERS. PANEL MOUNTING (Round) MOVING COIL.

Make F.S.D. Res. Scale Size Price Weston (U.S.A.) 1mA 150 ohms 0-100 3 1/2 in. 27/6 Weston (U.K.) 1mA 75 ohms 0-100 3 1/2 in. 22/6 W.D. (U.K.) 5mA 0.0037 ohms 0-20 2 in. 9/6 W.D. (U.S.A.) 500mA - 0-600 2 1/2 in. 15/6

CATALOGUE

Our 1960 catalogue is now available, please send 1/- in stamps for your copy.



103 LEEDS TERRACE WINTOUN STREET LEEDS 7

TERMS: Cash with order or C.O.D. Postage and Packing charges extra; as follows: Orders value 10/- add 1/-, 20/- add 1/6; 40/- add 2/-; £5 add 3/- unless otherwise stated. Minimum C.O.D. fee and postage 3/-. For full terms of business see inside cover of our catalogue. Personal Shoppers 9 a.m. to 5 p.m. Mon. to Friday; Saturday 10 a.m. to 1 p.m.

Stern's "fidelity" TAPE EQUIPMENT

A SELECTION OF HIGH FIDELITY PORTABLE TAPE PREAMPLIFIERS

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

IN ALL MODELS WE INCORPORATE THE TYPE "C" PREAMPLIFIER

AND OFFER IT COMPLETE IN CASE WITH

- (a) The new COLLARO "STUDIO" 3 Speed Deck H.P. Deposit £7.6.0, 12 months £2.13.6 **£36.10.0**
- (b) The COLLARO Mk. IV "Transcriptor" 3 Speed Deck H.P. Deposit £8.6.0, 12 months £3.0.11. **£41.10.0**
- (c) The new TRUVOX Mk. VI. Tape Deck H.P. Deposit £8.14.0, 12 months £3.3.10. **£43.10.0**
- (d) The BRENNELL Mk. V 3 Speed Deck H.P. Deposit £10.6.0, 12 months £3.15.7. **£51.10.0**
- (e) The WEARITE MODEL 4A Tape Deck Deposit. £12.4.6, 12 months £4.9.5. **£61.0.0**

STERN'S MULLARD TYPE "C" TAPE PREAMPLIFIER-ERASE UNIT

INCORPORATING THE NEW FERROXUCUBE POT CORE PUSH-PULL OSCILLATOR and 3 SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE POT CORE INDUCTOR. PRICES INCLUDING SEPARATE SMALL POWER SUPPLY COMPLETE KIT OF PARTS. **£14 0 0** ASSEMBLED AND TESTED **£17 0 0**



Dep. £3.8.0 and 12 of £1.4.11.

ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT

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



FOR PERMANENT HIGH QUALITY INSTALLATIONS WE ALSO OFFER (excluding case)

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

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

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

STERN RADIO LTD.

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

Telephone: FLEET STREET 1812/3/4

YOU CAN BUILD A COMPLETE TAPE RECORDER

for **£36.0.0**

H.P. TERMS Deposit £7.4.0, 12 months £2.12.10.

FOR THIS WE SUPPLY:

- * COMPLETE KIT OF PARTS TO BUILD THE HF/TR3 TAPE AMPLIFIER.
- * THE NEW COLLARO "STUDIO" TAPE DECK.
- * PORTABLE CARRYING CASE (as illustrated).
- * ROLA CELESTION 10in. x 6in. P.M. LOUDSPEAKER.
- * ACOS CRYSTAL MICROPHONE. 1.200ft. SPOOL E.M.I. TAPE.

For those who prefer another type of TAPE DECK we will supply precisely as above—but IN PLACE OF THE COLLARO "STUDIO" DECK—WE INCLUDE:

- (a) The Mk. IV COLLARO "TRANSCRIPTOR" DECK H.P. Deposit £8.0.0 and 12 months £2.18.2. **£39.15.0**
- (b) The New TRUVOX Mk. VI DECK H.P. Deposit £9.0.0, and 12 months £3.6.0. **£45.0.0**

(Carriage and Insurance on all above is 12/6 extra.)

For Constructors with their own Cabinet WE OFFER

- (a) COMPLETE KIT to build the HF/TR3 Amplifier, together with the COLLARO "STUDIO" DECK. **£28.0.0**
- (b) As above but with HF/TR3 supplied ASSEMBLED and TESTED H.P. Deposit £2.6.6.0, and 12 months £2.6.6.0. **£31.10.0**
- (c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK. **£30.15.0**
- (d) As above but HF/TR3 supplied ASSEMBLED and TESTED (£1 extra if we are to wire up Deck Switch Banks.) **£34.10.0**
- (e) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK. **£36.0.0**
- (f) As above but HF/TR3 supplied ASSEMBLED and TESTED H.P. Deposit £7.18.0, and 12 months £2.17.11. **£39.10.0**
- (g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENNELL Mk. V TAPE DECK. **£41.10.0**
- (h) As above but HF/TR3 supplied ASSEMBLED and TESTED H.P. Deposit £9.0.0, and 12 months £3.6.0. **£45.0.0**

Carriage and Insurance on each above is 10/- extra. The Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA CELESTION 10 x 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1.200ft. SPOOL E.M.I. TAPE—ALL FOR £9.0.0. Carriage and Insurance 5/- extra.

WE HAVE THE NEW 2 SPEED TWIN TRACK TRUVOX Mk VI TAPE DECK IN STOCK £26.5.0

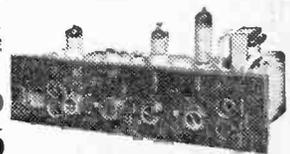
DEPOSIT: £5.5.0 and 12 MONTHS £1.18.6.

THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING 3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE POT CORE INDUCTOR.

PRICE for COMPLETE KIT OF PARTS **£12.15.0** PRICE FULLY ASSEMBLED & TESTED **£16.10.0**

HIRE PURCHASE. Deposit £3.6.6 and 12 monthly payments of £1.4.2. A very high-quality Amplifier based on the very successful TYPE "A" design completed in the MULLARD LABORATORIES. ONLY NEW HIGH-GRADE COMPONENTS are incorporated including MULLARD VALVES and a GILSON OUTPUT TRANSFORMER. Other features are—Magic Eye Recording hand indicator—Effective Tone Control—Monitoring and Extension Speaker Sockets—has own Power Supply and can be used as independent Amplifier for direct reproduction of Gram Records or from Radio Tuner. Overall size 11 x 8 x 6in. Can be supplied for use with Truvox—Collaro—Lano—Brenell or Motok Decks. Please specify which. Send S.A.E. for leaflet or 2/6 for complete Assembly Manual.



STERN'S MULLARD DESIGNS

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

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

For use with the MULLARD 2-stage Pre-amplifier with which an undistorted power output of up to 10 watts is obtained. We supply SPECIFIED COMPONENTS and NEW MULLARD VALVES, including PARMEKO MAINS TRANSFORMER and choice of the latest Ultra-Linear PARMEKO or the PARTRIDGE Output Transformer. PRICE COMPLETE KIT (PARMEKO Output Trans) **£10.00**
Alternatively we supply ASSEMBLED **£11.10.0** and TESTED.

ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, £1.6.0 EXTRA



MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EFB8 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE, COMPLETE **£6.6.0** Alternatively we supply ASSEMBLED AND TESTED **£8.0.0** KIT OF PARTS.

Supplied strictly to MULLARD'S SPECIFICATION and incorporating

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



COMPLETE MULLARD "5-10"

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

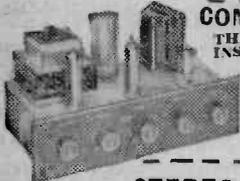
KIT OF PARTS **£11.10.0** OR ASSEMBLED AND TESTED **£13.10.0**

Amp. only) DEPOSIT **£2.14.0.** 12 months at: **£9.10.0.** ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. **£1.6.0** extra



COMPLETE MULLARD "3-3"

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



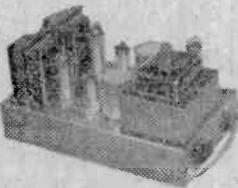
STEREO "3-3" MAIN AMPLIFIER

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

PRICE: COMPLETE KIT **£10.0.0**

Alternatively ASSEMBLED AND TESTED **£11.15.0**

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



SPECIAL PRICE REDUCTIONS

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

(d) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. **£31.6.0** and 12 months of **£1.7.8** **£18.18.0**

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

(f) The DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED **£25.0.0**

H.P. Terms: Deposit **£5** and 12 months of **£1.6.8**

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

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

H.P. Terms: Deposit **£5**, 12 months of **£1.6.8**.

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

(j) TWO "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0**
H.P. Terms: Deposit **£7.4.0**, 12 months **£2.12.0**.

Carriage and Insurance 7/6 extra. Prices quoted are subject to **£1.6.0** extra for Partridge Transformer.

STEREO DUAL CHANNEL PRE-AMPLIFIER

This model incorporates two Mullard 2-valve Pre-Amplifiers combined into a Single Unit enabling it to be used for both STEREOPHONIC or MONAURAL operation. It is designed primarily to operate with our range of MULLARD MAIN AMPLIFIERS but will also operate equally well with any make of Amplifiers requiring an input of 250 mvolts.

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

OF PARTS Operates equally well for MONAURAL only operation with one "5-10" Main Amplifier to which the second Main Amplifier can at any time be added, thus very easily providing for both STEREO or MONAURAL reproduction.

THE ASSEMBLY MANUAL is available for 3/-.

COMPLETE STEREO AMPLIFIER

A thoroughly recommended Mullard design that very effectively meets the many requests for a low-priced but good quality DUAL CHANNEL STEREOPHONIC AMPLIFIER. Output power is 4 watts from STEREO or MONAURAL gram inputs.

PRICE: COMPLETE KIT OF PARTS **£8.10.0**

ALTERNATIVELY ASSEMBLED AND TESTED **£10.10.0**



!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET

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

£6.19.6

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

£9.18.9

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

£7.10.0

The COLLARO 4-speed Single Record Player, Studio Pick-up.

£6.15.0

The NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER.

£8.7.6

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays LP, and 78 Records.

£10.10.0

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

£8.10.0

GARRARD MODEL RC/12/4. Autochanger 4-speed. High output. Crystal Pick-up.

£10.0.0

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



! RADIOGRAM CHASSIS !

and V.H.F. RADIO TUNING UNITS

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

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

STERN RADIO LTD.



Stern's "fidelity" TAPE RECORDERS

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

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

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

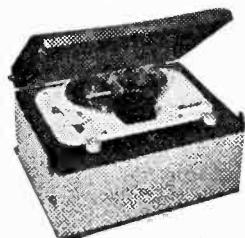
MODEL CR3/S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-Speed Deck **£41.0.0**
H.P. Terms: Deposit **£8.4.0** and 12 months of **£3.0.2**.

MODEL CR3/T Incorporates the very popular 3-Speed COLLARO Mk. IV "TRANSCRIPTOR" Deck **£49.10.0**
H.P. Terms: Deposit **£9.18.0** and 12 months of **£3.12.7**.

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

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

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



and NOW WE INTRODUCE

● The MODEL HF/G2P TAPE PREAMPLIFIER

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

● The MODEL HF/G2A TAPE AMPLIFIER

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

... AS A RESULT WE PRESENT...

TWO UNITS METICULOUSLY MATCHED TO CORRECTLY OPERATE

The NEW GARRARD "MAGAZINE" TAPE DECK

**THE EQUIPMENT
and
Descriptive Leaflets
will be
Available early in April**

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

- WE OFFER THEM AS FOLLOWS:
- (a) Complete Portable TAPE RECORDER (as illustrated).
 - (b) Complete Portable TAPE PREAMPLIFIER (similar to illustration).
 - (c) HF/G2A AMPLIFIER incorporated on TAPE DECK. Both ASSEMBLED and TESTED. READY FOR USE.
 - (d) HF/G2P PREAMPLIFIER incorporated on TAPE DECK. BOTH ASSEMBLED and TESTED. READY FOR USE.
 - (e) THE ASSEMBLED and TESTED HF/G2A AMPLIFIER only.
 - (f) THE ASSEMBLED and TESTED HF/G2P PREAMPLIFIER only.

OVERALL PERFORMANCE IS REALLY EXCELLENT BUT OUR PRICES ARE GOING TO BE REMARKABLY LOW FOR SUCH HIGH QUALITY EQUIPMENT.

A SPECIAL CASH ONLY OFFER !!

This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched F.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—

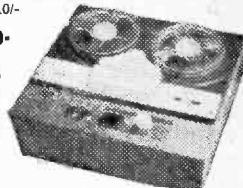


- (a) The 2-stage (plus Rectifier) AMPLIFIER **£4.2.6**
- (b) THE PORTABLE CARRYING CASE **£3.17.6**
- (c) F.M. SPEAKER 18/9 Carriage and Insurance 4/- extra.

THE "ADD-A-DECK" incorporating the NEW I.S.R. "MONARDECK" and Matched Preamplifier

Carriage and Insurance, 10/-
Deposit **£3.12.0** **£17.17.0**
12 mths. **£1.6.2**

Designed to operate through the Pick-up Sockets of the standard RADIO RECEIVER through which first-class results are obtained. It consists of a Twin Track Tape Deck, incorporating matched Preamplifier, and operates at 3 1/2 in./sec. speed. Supplied fully tested and completely assembled on an attractive wood plinth, and only requires connections to the mains supply and the Pick-up Sockets, for which purposes "floating" leads are incorporated.



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

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

HIRE PURCHASE. Deposit **£2.17.0** and 12 Monthly Payments of **£1.0.11**

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the correspondingly MULLARD VALVE LINE-UP. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps at 6.3 volts and 25 m/s at 230 volts.



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

"Hi-Fi" LOUDSPEAKERS
WE HAVE IN STOCK A COMPLETE RANGE BY **GOODMANS—WHARFEDALE—W.B.**
Illustrated and Priced Leaflets on request.

HOME CONSTRUCTOR

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

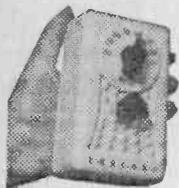
109 & 115 FLEET ST., LONDON, E.C.4

Telephone: **FLEET STREET 5812/3/4**

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

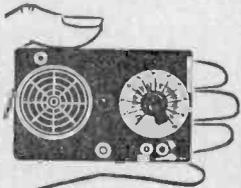
EASY AS A.B.C. TO BUILD

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

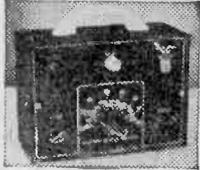


AT LAST! WRIST RADIO!
29/6

Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1 1/2 in. x 1 in. x 1/2 in.!! —"Feather-weight"—yet gives clear, crisp, personal-phone reception over all medium waves. Tiny battery inside lasts months at costs 5d. No Snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only **29/6** (add 2/6 Post, etc.). C.O.D. 2/- extra. (All parts sold separately, priced parts list 1/6.) Send Now!



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



THE SENSATIONAL POCKET RADIO!
29/6

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



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

MATCHBOX SIZE RADIO!
17/6

This amazing "Tiny-Tim" model—no larger than a matchbox—costs nothing to run—ever! No batteries! No Valves! No complete electricity! Will never run down or burn out. Uses the latest **TRANSISTOR TYPE GERMANIUM DIODE**, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can build it within an hour using our step-by-step instruction book, etc., for only **17/6**, plus 2/- Post and Packing (C.O.D. 2/- extra). (Parts sold separately, priced parts list 1/8.)



Choice of beautiful walnut or ivory cabinet or veneered bakelite. This is the **107/6**



lowest possible price consistent with high quality. No radio knowledge whatever needed. Can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact, everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12 in. x 8 in. x 6 in. Build this long-range powerful midjet **NOW!** **TOTAL BUILDING COST INCLUDING PLANS, ETC., £5/7/6.** (Post and Packing 3/6.) Parts sold separately. Priced parts list and plans 1/9. C.O.D. 2/- extra.

Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step! Remarkably sensitive—covers all medium waves, inc. Luxembourg, Home, Light, Size only 2 1/2 in. x 3 in. x 5 1/2 in.—Not a Tow! But a Real, Personal-phone, Valve Radio With Detachable Aerial! **IDEAL FOR BEDROOM, GARDEN, etc.** We supply ALL parts necessary, together with plans, etc., for the special price of **39/6**, plus 2/6 post and packing. (C.O.D. 2/- extra.) **BUILD YOURS NOW!** (All parts sold separately, priced parts list 1/9.) Send Today! Money refunded if parts returned intact within 7 days



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

CONCORD ELECTRONICS
210, Church Road, Hove, Sussex

Dept. PW17

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

TUBES

DIRECT FROM OUR FACTORY New low prices
New top quality guns. ALL GUARANTEED

Carriage and Insurance 12/6
 CRM92, MW22-7, MW22-14, MW22-14C, MW22-17, MW22-18
 12KPA, 121K, C12B, CRM121, CRM121A, CRM121B, CRM122, CRM123, MW31-14C, MW31/16, MW31-18, MW31/74
 141K, 7201A, C14FM, CRM141, CRM142, CRM143, 171K, AW36/21, C17FM, CRM171, CRM172, MW43-64, MW43-69
 7401A, AW43-80, C14BM, C17BM, CRM151, CRM152A, CRM152B, CRM153, CRM173, MW43-80, MW41-1
 AW58-80, CRM212, MW53-20, MW53-80

8 MONTHS REVAUCUED £2-10
 12 MONTHS REGUNNED £4-10
 12 MONTHS NEW TYPES £4-15
 MW31/74 £4-15
 MW36/24 £7-19
 MW43/64 £8-10

NEW 108K (Equiv-3/16) TUBES SPECIAL OFFER: 49/-
 PLEASE NOTE: Many other types not listed available. S.A.E. enquiries.

13 CHANNEL TV's

TABLE MODELS, FAMOUS MAKES. Complete with all valves and tubes. These sets are unequalled in value due to huge purchase direct from source. They are untested and are not guaranteed to be in working order. Carr. Free.

12" — £3.19.
 14" — £7.10.
 16" — £12.10.

12" 5 CHANNEL TV's 55/-

Complete Table Models as Above. Carr. Free.

B.S.R. MONARDECK TABLE DECKS £9.10.0.

12in. TV's 5 channel table models including speaker, line transformer, cabinet. Top makes requiring only valves and tube to complete, your choice if available (carr. 4/-). (Or 28 per dozen, carr. free.) 15/-
 14in. TV's 5 channel as above (carr. 4/-). 35/-

100 CONDENSERS 10/-

A must for your spare box. A well-balanced assortment of miniature silver mica and ceramic condensers. 3-10,000 P.F. List value over £3.

100 RESISTORS assortment 7/6

CO-AX standard and low loss, 25 yds., 12/6. 50 yds., 22/6. 100 yds., 42/6.

CO-AX 1/8. Wall outlet boxes, 3/6.

SINGLE RECORD PLAYERS

COLLARO 4-speed 4/548 ... 28 19 0
 GARRARD 4-speed 4SP ... 27 7 0
 GARRARD 4-speed TA MKII ... 28 19 0
 GARRARD 4-speed 4HF ... 27 15 0

10 RECORD AUTOCHANGERS

GARRARD RC75A Senior ... 27 19 0
 GARRARD RC120D MKII ... 29 7 0
 GARRARD RC121A MKII ... 29 19 0

Carr. and Pack. 4/-.
 B.S.R. AUTOSWITCHERS, £6.15.0. RED SPOT 4/6
 I.P., L.F. and Output up to 800 kc/s. (45/- dozen). WHITE SPOT. R.F. and I.F. 2.5 Mc/s. (6/- per dozen). S.T. 100. XA104, 17/6; XB104, 10/-; GET15, 25/-

INFRA RED HEATERS

Under Half Price. Super finish. Choice of 800 w. 1,200w. 2,000w. 59/- each

PICK-UP CARTRIDGES

ACOS 22/6 POWER POINT 18/6
 STEIG AND REUTER 15/- SONOTONE 17/6

PORTABLE RECORD PLAYERS

Collaro 4-speed auto-changer, 24 watt high gain amplifier. Super-two-13 Gns. Or case only 59/-. 21-watt Amplifier complete on battle with Speaker, 43/10/-.

STEREO SINGLE PLAYERS

4-speed. Famous make. £6-19-0
 Stereo head. Unreplaceable.

VALVES ALL GUARANTEED 3 MONTHS

PL81 SOILED AMAZING 5/-
 VALUE AT ONLY
 EY51 SHORT 5/- U25 SHORT 7/-
 ENDS ENDS

DIODES

General purpose, famous make, pd. 8/- doz. GEX44 type, 3/8.

B.S.R. AUTOSWITCHERS, £6.15.0.

RED SPOT 4/6
 I.P., L.F. and Output up to 800 kc/s. (45/- dozen). WHITE SPOT. R.F. and I.F. 2.5 Mc/s. (6/- per dozen). S.T. 100. XA104, 17/6; XB104, 10/-; GET15, 25/-

RECTIFIERS

For Chargers, selenium, full wave bridge, 12 volt 3-4 amps, 9/6. (Carr. 1/-) 28 per doz. 250 v. 80 ma. 5/- RML, 6/8; RM2, 8/-; RM3, 9/-; RM4, 15/8; RM5, 21/-; 14A85, 17/-; 14A97, 23/-; 14A100, 25/-; 16RC1-10-1, 7/9; 18R1-1-1, 7/9; 18R2-2-1, 14/-; 14R1-2-2, 17/-; 14R1-2-3, 20/-.

COLLAR CONQUEST CHANGERS £7.10.0

3 ohms, top makes, performance guaranteed.

PM SPEAKERS

8in. 8/- 5in. 7X4 11/- 10in. 13/-
 6in. 10X6

CONNECTING WIRE

25 FT. P.V.C. Insul., excellent 1/-
 (5 coils, diff. colours, 4/8)
 CRTs ECR30 (VCR139A), 15/-; 5FP3, 19/-;
 ECR35 (VCR138), 9/-; VCR97, 12/6
 TRANSCRIPTION TABLE DECKS £13-10-0

VALVES BY RETURN OF POST

10% DISCOUNT SPECIAL OFFER
 on all SIX VALVES marked in black type (15% in dozens). Post: 1 valve, 6d.; 2-11, 1/-.

NEW LOW PRICES
 GUARANTEED 3 MONTHS

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

024	5/8	6AT6	7/-	6J7GT	7/6	6X5G	5/6	12E1	12/6	42	7/6	DAF96	8/3	EC81	6/-	EL91	4/6	N108	18/-	T41	7/6	UC181	9/-	
1A6GT	5/8	6AU6	8/6	6K6GT	6/6	6X5GT	6/6	12J5GT	3/6	43	7/6	DF33	9/9	EC82	6/6	EM34	8/6	N12	10/6	TH30C	12/6	UC182	11/6	
1A7GT	12/6	6B7	6/6	6K7	5/9	6Z4	4/9	12K7G	6/-	50C5	6/6	DF91	4/9	EC83	7/8	EM89	9/18	P18	4/9	U14	8/6	UC183	13/6	
1C5GT	11/6	6B8G	3/6	6K7G	2/3	7A7	10/8	12K8GT	12/-	50L6GT	9/3	DF96	9/3	EC84	8/9	EM81	9/3	P18	2/9	U18	8/6	UF42	7/9	
1D5	9/6	6B8	6/6	6K7GT	5/6	7B5	12/6	12K9GT	9/-	53K10	10/6	DH83	6/6	EC85	9/3	EM84	9/3	PAB80011/	U22	6/9	UF42	9/9		
1D6	9/6	6B9	6/6	6K8	6/-	7B6	9/6	12K9GT	6/-	54K10	8/9	DH76	6/6	EC80	10/3	EM85	10/6	PCC84	7/9	U24	7/8	UF80	9/9	
1HGST	9/6	6B9GG	12/6	6K8GT	11/-	7B7	7/3	12S7J	5/6	61SPT	11/-	DH77	7/7	EC82	9/9	EN31	16/-	PCC85	9/3	U25	12/6	UF85	9/9	
1L4	3/9	6B8H	6/6	6K85	7/8	7C5	7/6	12S7K	5/6	75	8/-	DK32	12/6	EC821	14/-	EY61	9/6	PCC88	19/-	U26	12/6	UF86	14/6	
1LD5	3/6	6B3E	6/-	6L1	12/6	7C6	7/3	12S7GT	8/8	77	8/6	DK91	8/9	EC835	7/8	SMALL	9/-	PCC89	13/9	U31	8/3	UF89	7/3	
1LN6	4/6	6B7	10/6	6L6	9/6	7E7	7/9	10P2F	8/6	155BT	16/-	DL81	8/9	EC838	14/8	EZ51	7/8	PEN45	4/6	U52	5/6	UF16	12/6	
1NGT	9/9	6B7W	3/9	6L4G	7/6	7H7	7/6	14S7	14/8	80	6/6	DK96	6/6	EC831	8/3	EZ35	6/6	PCF82	9/-	U35	8/9	UF14	12/6	
1R5	6/9	6B7W	6/6	6L7	9/-	7K7	6/-	19A05	7/8	83	9/6	DL33	8/9	EC838	11/-	EZ40	7/3	PCL82	9/3	U37	26/6	UF46	9/9	
184	8/9	6B2X	5/9	6L18	9/-	7K7	10/6	19B6G015-	90AV	4/6	DL35	11/8	EC830	8/3	EZ41	7/6	PCL83	11/8	U43	9/3	UF54	8/6		
185	6/-	6C4	3/6	6L19	11/6	787	9/6	20D1	9/6	117Z7	10/6	DL82	9/6	EC82	10/0	EZ80	8/9	PCL84	9/9	U50	6/-	UF56	9/6	
1T4	4/9	6C5	5/6	6LD3	8/6	7V7	7/9	20P2	8/6	155BT	16/-	DL81	8/9	EC838	14/8	EZ51	7/8	PEN45	4/6	U52	5/6	UF16	12/6	
2D81	4/9	6C8	4/6	6LD12	7/6	7Y4	7/6	20L1	9/6	723A	35/-	DL92	6/6	EP22	12/-	GT1C	7/6	PEN45	4/6	U52	5/6	UF16	12/6	
3A4	5/8	6C9	6/6	6LD20	8/6	7Z4	7/9	20P1	11/8	807A	5/-	DL94	7/6	EP36	3/8	GZ32	8/9	PEN46	5/8	U78	6/-	UF8	18/6	
3Q4	7/3	6CD6G	18/6	6N7	6/6	8D7	3/9	20P2	12/8	807E	3/9	DL96	8/3	EP39	4/8	GZ34	12/8	PL38	9/3	U107	11/-	UY11	11/6	
3Q6GT	8/9	6C8H	9/3	6P1	14/-	10C1	11/-	20P4	17/-	808	15/-	E450	9d.	EP40	13/8	HAB80	9/6	PL38	12/-	U191	5/8	UY21	11/6	
394	8/6	6D1	9d.	6P25	9/-	10C2	13/6	20P5	18/-	955	3/9	E460	3/9	EAC80	7/6	EP41	5/8	ED19	6/8	PL38	14/6	U281	9/6	
3V4	7/6	6D2	9/6	6P22	9/-	10C3	13/6	20AGG	8/-	956	2/9	EAC80	7/6	EP41	5/8	ED19	6/8	PL38	14/6	U281	9/6	UY41	6/6	
4B4G	11/-	6D3	3/9	6P27	6/9	10P1	6/6	25L6G	6/9	2050	3/6	EAF42	3/6	EP50	8/6	EP50-RR-2	K35	7/9	PL32	7/9	U301	14/-	VRL50	9/6
5V4G	5/6	6D6	4/6	6Q7GT	9/3	10P9	10/3	25L6GT	9/-	5763	10/6	EB84	1/6	EP50-AM-2	KT32	6/9	PL43	8/9	PL43	8/9	U309	12/6	WGLM	11/-
5V4G	9/9	6P1	6/9	6P7G	9/6	10L14	8/-	25Y5G	9/-	9001	4/-	EB41	7/7	EP64	3/8	KT33	6/8	PL44	11/-	U322	12/6	WGLM	11/-	
5Y3G	6/-	6P6G	6/8	6S47	5/9	10LD3	8/3	25ZAG	8/-	9003	4/-	EB1	3/9	EP80	9/6	EP80	9/6	PX35	16/9	U39	11/-	WTE	6/6	
5Y3GT	6/6	6P6M	7/6	6S47	4/8	10LD12	8/9	25Z8	8/-	ATP4	8/-	EC83	6/6	EP85	7/7	KT44	9/6	EPY31	8/3	U403	9/6	WT7	4/6	
5Z4GT	11/-	6P13	6/9	6S47	4/8	10P14	8/6	25Z6	8/-	AZ31	9/-	EB41	4/8	EP86	11/-	KT45	8/8	PY32	11/-	U404	8/6	WT81	5/9	
6A7	11/-	6P14	9/6	6S37	6/6	10P18	8/3	30C1	7/8	B85	4/9	EBF80	8/8	EP81	3/9	KT03	6/8	PY31	7/6	U801	17/-	XCM	12/6	
6A8G	9/6	6P15	9/6	6S8K7	5/3	12A6	8/3	30F5	7/-	CB131	23/8	EBF89	8/6	EP82	4/8	KT06	12/6	PY32	7/6	U842	8/6	X66	11/-	
6A8GT	13/8	6P16	9/6	6S8K7GT	6/6	12A47	6/9	30F11	8/6	CC135	7/6	BL21	14/-	EP85	6/9	KT81	14/-	PY38	8/3	U841	8/6	X66	11/-	
6A8T	4/8	6A8	6/-	6S87	4/9	12A16	9/3	30L1	7/9	CL33	13/-	EB121	16/-	EK32	7/9	KTW61	5/8	PZ80	12/6	UBC41	8/8	X78M	9/6	
6A8G5	4/8	6A8	2/-	6S87	6/3	12A76	7/9	30P14	12/6	CY31	9/9	EC52	3/9	EL32	4/8	KTW63	4/8	PY38	11/8	UBC81	10/0	X78	14/6	
6A8T	8/6	6A8	2/-	6S87	6/3	12A77	6/-	30P12	8/-	D63	1/6	EL30	3/8	EL33	9/6	KTZ63	5/-	R19	12/6	UBT80	8/6	X79	18/6	
6A8T	8/6	6A8	2/-	6S87	6/3	12A77	6/-	30P16	7/8	D77	3/9	EB91	4/8	EL35	11/8	LS3	2/9	SD6	9/-	UB121	14/6	X63	6/8	
6A8K6	6/9	6A8G	2/9	6S8G	6/3	12A77	7/9	30P11	10/6	D82	6/6	EC81	9/6	EL37	11/8	LN152	8/6	SP6	3/9	UC884	14/6	X63	6/8	
6A8L5	3/9	6A8GT	3/9	6S8G	6/3	12A77	7/9	30P11	10/6	D82	6/6	EC81	9/6	EL37	11/8	LN152	8/6	SP6	3/9	UC884	14/6	X63	6/8	
6A8M5	4/8	6A8	4/-	6V8GT	6/6	12B66	8/9	35W4	6/9	DA90	2/6	EC832	4/-	EL38	12/6	LN219	7/9	SP41	2/6	UC885	8/6	Z66	9/6	
6A8M6	3/9	6A7	7/6	6X2	9/-	12B17	10/6	35Z4GT	6/-	DAC32	8/9	EC834	9/-	EL42	9/6	N78	11/-	8U25	15/-	UCB21	14/6	X182	5/9	
6A8Q5	6/-	6A7G	5/8	6X4	6/-	12B18	8/6	35Z5GT	8/6	DAF91	6/-	EC835	6/9	EL84	8/-	N78	11/-	8U25A4/6	15/6	UCB48	5/6	Z719	5/9	

Post: 2 lbs. 1/6, 4 lbs. 2/-, 7 lbs. 2/9, 15 lbs. 3/6 etc. No C.O.D. ALL ITEMS LESS 5% & POST FREE IN DOZENS. (Callers always welcome). LIST OF 1000 S NIPS 6d

TECHNICAL WIRELESS CO.

P.O. BOX 21 (W)
 350-352 FRATTON ROAD, PORTSMOUTH.

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

REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN 1 HOUR
 The Recorder incorporates the Latest Colliaro Studio Tape Transcriber. The Linear LT45 High Quality Tape Amplifier listed £12.20. High Flux P.M. Speaker listed 30/-, empty Tape Spool, a Reel of Best Quality Tape listed 2/6, and a Hand-size 18 x 13 x 8 1/2 in. high, listed £4.10.0, and circuit. Total cost if purchased individually approx. £40. Performance equal to units in the £60-£80 class. Send S.A.E. for leaflet.

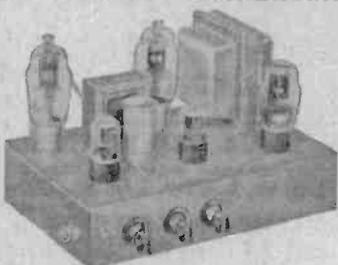
251/2 GNS. H.P. TERMS. Deposit
 3 gns. and 12 monthly Carr. payments 45/9. Cash 17/6 price if settled in 3 mths.

R.S.C. A8 HIGH FIDELITY 12 WATT AMPLIFIER

Ultra Linear Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages, high sensitivity. Includes 5 valves (807 outputs). High Quality sectionally wound output transformer, specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. **INDIVIDUAL CONTROLS FOR BASS AND TREBLE** "Lift" and "Cut." Frequency response +3 db. 30-30,000 c/s. Six negative feedback loops. Hum level 71 db. down. **ONLY 70 MILLIVOLTS INPUT** required for **FULL OUTPUT.** Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs.

£7-15-0

For **STANDING or LONG PLAYING RECORDS.** For **MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS, etc. OUTPUT SOCKET** with plus provides 300 v. 30 mA and 6.3 v. 1.5a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-230-250 v. 50 c/s. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value at **£7.15.0** or factory built 45/- extra. Carriage 10/-
 If required louvred metal cover with 2



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

HI-FI 10 WATT AMPLIFIERS

Slightly store soiled but guaranteed unused and in perfect order. Fitted Mullard valves. Dual inputs for "mike" and gram, etc. Bass and Treble Controls. High sensitivity and quality. For 200-250 v. A.C. mains.

£5-19-9 Carr. 7/9

STAAR GALAXY 4-SPEED MIXER AUTO-CHANGERS

Brand new, cartoned. Turnover sapphire styl. Many exclusive features. Unique design motor virtually free from rumble. For 200-250 v. A.C. mains. Only **£5.19.6.**

PORTABLE CABINETS

Full range of attractive designs from **15/9**

SPECIAL OFFER. Two tone Portable cabinet. Gram amplifier. Staar. Changer and 7 x 4 in. P.M. Speaker. 10 gns. Carr. 10/- or with B.S.R. UAS. 12 gns.

THE SKYFOR T.H.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. Power pentode output. Valve line-up 6K7, 6P6L, 6X6G. Selectivity and quality are well up to standard, and simplicity of construction is a special feature. 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. PORTABLE TAPE RECORDER

A completely assembled unit in attractive two-tone rexine covered carrying case. Excellent frequency response. Auto-erase. Fast rewind. Takes up to 6in. tape, spools. High Flux speaker, 3 watts output. Inputs for Radio/Gram and "Mike." For 200/250 v. 50 c.p.s. A.C. mains. Sensational value! Price, including "Mike" Reel of best quality tape and empty spool. Usual 12 months' guarantee. H.P. Terms: Deposit 44/- and 12 monthly payments of 33/4.

19 GNS. Carr. 10/6

COSSOR VHF/FM RADIO RECEIVER KITS

Including 6 valves, Printed Circuit and Goodmans 10 x 4 in. Elliptical Speaker. Pre-aligned I.F.T.S. Made to retail at 15 GNS. **£8-19-6** limited number at

PICK-UP ARMS complete with HI-FI turnover crystal head. Aco GF54. Lipped number brand new, perfect, at approx. half price. Only 29/11.

ACOS CRYSTAL MICROPHONES. M1c 40 hand or desk. Listed 45/- Only 25/9. Type 33-1. hand or desk. List price 50/- Brand new, cartoned. 35/9. 33-1 stick types. List price 5 gns. Brand new. 39/6.

EXTENSION SPEAKERS

Ready for use in walnut veneered cabinet.
 6in. 2-3 ohms. 29/11.
 8in. 2-3 ohms. 35/9.
 10in. 2-3 ohms. 56/9.
 Very limited number.



RECORDING TAPE AT BARGAIN PRICES. Leading makes. Brand new. P.V.C. based. 3in. 150ft. 5/11; 225ft. 7/9; 5in. 600ft. 15/11; 650ft. £2/6; 7in. 170ft. 35/-

EMPTY SPOOLS. (Plastic.) 3in., 2/9; 5in., 2/11; 7in. 3/9.

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

Interwound and impregnated. **Primaries 200-230-250 v. 50 c/s. Screened TOP SHROUDED DROP THROUGH**
 250-0-250 v. 70 mA. 6.3 v. 2a. 5v. 2a. 17/9
 350-0-350 v. 80 mA. 6.3 v. 2a. 5v. 2a. 18/9
 250-0-250 v. 100 mA. 6.3 v. 4a. 5v. 3a. 25/9
 350-0-350 v. 100 mA. 6.3 v. 4a. 5v. 3a. 25/9
 350-0-350 v. 100 mA. 6.3 v. 4a. 5v. 3a. 25/9
 350-0-350 v. 100 mA. 6.3 v. 4a. 4a. C.T. 0-4.5 v. 3a. 25/9
 350-0-350 v. 150 mA. 6.3 v. 4a. 5v. 3a. 29/9

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA. 6.3 v. 2a. 5v. 2a. Midret. type 21-3-3in. 17/9
 250-0-250 v. 100 mA. 6.3 v. 4a. 5v. 3a. 26/9
 300-0-300 v. 100 mA. 6.3 v. 4a. 5v. 3a. 26/9
 350-0-350 v. 100 mA. 6.3 v. 4a. 5v. 3a. 26/9
 300-0-300 v. 130 mA. 6.3 v. 4a. 6.3 v. 1a. for Mullard 610 Amplifier. 35/9
 350-0-350 v. 150 mA. 6.3 v. 4a. 5v. 3a. 35/9
 425-0-425 v. 200 mA. 6.3 v. 4a. C.T. 6.3 v. 4a. C.T. 5v. 3a. Suitable Williamson Amplifier, etc. 49/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS

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

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



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

ELIMINATOR TRANSFORMERS

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

SMOOTHING CHOKES

150 mA. 7-10 H260 ohms 11/9
 100 mA. 10 H 200 ohms 8/9
 80 mA. 10 H 350 ohms 5/9
 60 mA. 10 H 400 ohms 4/11

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries:
 0-9-15 v. 1 1/2 a. 12/9; 0-9-15 v. 3 a. 16/9;
 0-9-15 v. 5 a. 19/9; 0-9-15 v. 6 a. 23/9.

AUTO TRANSFORMERS. 50 watt 0-110/115-230/250 v. 8/11 each.

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. Brand new. Cartoned. For 200-250 v. 50 c.p.s. A.C. mains. Our price **£7.19.6.** Carr. 5/6.

COLLARO 4-SPEED SINGLE PLAYER UNITS. Type AC/4/564 with turnover crystal head. £6.12.6. Carr. 4/6.

R.S.C. A12 STEREOPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 8 watts. For A.C. mains input of 200-250 v. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and point-to-point wiring diagrams supplied. Only good quality Carr. and pkg. components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

£3-19-6

STEREO EQUIPMENT OFFER.
Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acco 170 Stereo head with diamond stylus suitable most pick-ups.

£6-19-6
Carr. 7/6

BUILD A TRANSISTORISED RECORD PLAYER to operate from 6 v. Dry Batteries. Total cost of parts Only **£7-19-6**
Unit is housed in attractive portable cabinet and will play standard 7in. 45 r.p.m. records at ample output level. All parts available separately. Garrard Player with pick-up. £3.19.6. Portable Cabinet 29/6.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stares. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response 43 db. 20-30,000 c/c.s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used. EF96, E236, ECC83, 6X4, 6X5, 6X6, 6X8, 6X4, 6X5, 6X6, 6X8. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts or that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records, OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 35/9. The amplifier can be supplied, factory built with 12 months' guarantee, for £13.19.6. TERMS: DEPOSIT 24/9 and 12 monthly payments of 24/9.

11 GNS.
Carr. 10/-

LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER. For 200-250 v. A.C. mains. Valves ECC83, ECC83, EL84, EL84, EZ81. Self-contained Pre-amp Tone Control stage. Separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets. Outputs for 3 and 15 ohm speakers. Only 12 GNS.; or Deposit 22/3 plus 10/- carr. and 12 monthly payments of 22/3. Send S.A.E. for leaflet.

LINEAR L50 50 WATT P.A. AMPLIFIER. High quality and sensitivity. 19 GNS. Send S.A.E. for leaflet.

GARRARD 4-SPEED AUTO-CHANGERS. Type RC120H. Very limited number at only £10.19.6. Carr. 5/6.

R.S.C. 3-4 WATT A7 HIGH-GAIN AMPLIFIER
For 200/250 v. 50 c/s. Mains Input. Appearance and Specification, with exception of output wattage, as A5 amplifier. Complete Kit with diagrams. £3.15.0. Carr. 3/6.

LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER. Suitable for use with any record playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5-6 1/2 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 are fitted all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. down, 15 db. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-230-250 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/-, or assembled ready for use 22/6 extra, plus 3/6 carr. or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

R.S.C. PORTABLE GUITAR AMPLIFIERS

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

£8-19-6 Carr. 7/6

Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12 in. for Bass notes and a 7 x 4 m. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 19 x 18 x 9 in. H.P. Terms. Deposit 26/9 and 12 monthly payments of 26/9. Both models for 200-250 v. A.C. mains.

15 GNS. Carr. 10/-

19in. 10 WATT HIGH QUALITY LOUD-SPEAKERS IN POLISHED WALNUT FINISHED CABINET



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

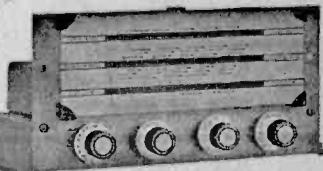
12 in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 8 in. Finish as above. Terms: Deposit 12/10 and 12 monthly payments of 13/10. Only £7.19.6. Carr. 8/6.

PHILIPS CONCENTRIC (Dual Cone) 10in. P.M. SPEAKERS. 3-5 ohms. Limited number at only 20/9.

TERMS: C.W.O. or C.O.D. No C.O.D. order £1. Post 19 extra under £2. 2/9 extra under £5. Open 9 to 6; Weds. until 1 p.m. Trade supplied. S.A.E. with all enquiries.

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

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



PLESSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER (12,000 lines) with built-in tweeter (completely separate elliptical speaker with choke, condensers, etc.), providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rated 10 watts. Price only £5/17/6.

HI-FI CRYSTAL PICK-UP HEADS. Turnover type with sapphire stylus. HGP59. Standard replacement for Garrard and B.S.R. B.S.R. Full-D. Garrard GC2. 10/9.

POWER PACK KIT. Output 250 v. 50 mA, fully smoothed and 6.3 v. 1.5 a. Consisting of Mains Trans., Selenium Rectifier, Smoothing Choke, Double Electrolytic Condensers, Chassis 6in. x 3 1/2 in. and Circuit. Only 18/9.

P.M. SPEAKERS. 2-3 ohm, 2 1/2 in. Perdio 21/9. 5in., 17/6. 8in., 16/9. 8in., 19/9. 8 x 6in., 25/9. 10in., 26/9. 10 x 8in., 29/9. 12in., 29/11. 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts, high fidelity type. Recommended for use with our A8 Amplifier, £4.10.9. 12in. Lessey 3 ohms 10 watts (12,000 lines) 50/6.

TWISTERS. Plessey 3 ohms 10/9.

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

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner Unit (especially suitable for use with any of our Amplifiers). Delayed A.V.C. employed. The W.Ch. Sw. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-point wiring diagrams, instructions and priced parts list with illustration, 2/6. Total building cost £4/15/-, For descriptive leaflet send S.A.E.

E.M.I. 4-SPEED SINGLE RECORD PLAYER UNITS with turn-over crystal head for Stereo and Monaural. Only £6/10/9, carr. 4/6

Mail Orders to 29-31 Moorfield Rd., Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1, and 8-10 Brown St. (Market St.), Manchester 2, or 56, Morley Street. (Next to Majestic Ballroom) Bradford.

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

PHILIPS Continental F.M. UNIT

The smallest and cheapest F.M. Unit of its kind on the market. Simplicity itself to install. Consists of a two-valve chassis-mounted tuner fitted with one EF41 and one EF42 valve (which are under 12 months' guarantee).

Actual dimensions: 4½ x 3½ x 1½ in.
Permeability tuned and detected output.

59/11

Including Valves and Postage.

USA THROAT MIKES 7/6



Painting is Easy!
Electric PAINT SPRAYER

with built-in motor

only **79/-** complete

Fully Guaranteed

Completely self-contained. Needs no Extras. Just plug in and Spray. Easy and Fast. Sprays All Paints, Distemper, Varnish, Enamel, Shellac, Lacquer, Insecticide, etc.,

Only 5/- down and 16 fortnightly at 5/- or 79/-. Post 2/6.



RADIO BULLS VALVES
246 HIGH ST. HARLESDEM HAVEN

DEMOSSED VALVES 2/6 MANUAL

Giving equivalents of British and American Service and Cross Reference of Commercial Types with an Appendix of B.V.A. Equivalents and Comprehensive Price List. We have still some Valves left at very old Budget Rates (33 1/3%) which are actually sold at the old price (1951). Also ready our **NEW COMPREHENSIVE VALVE LIST**

9/6 REDUCED FROM 21/- 9/6

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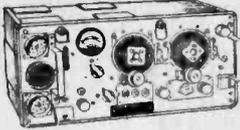
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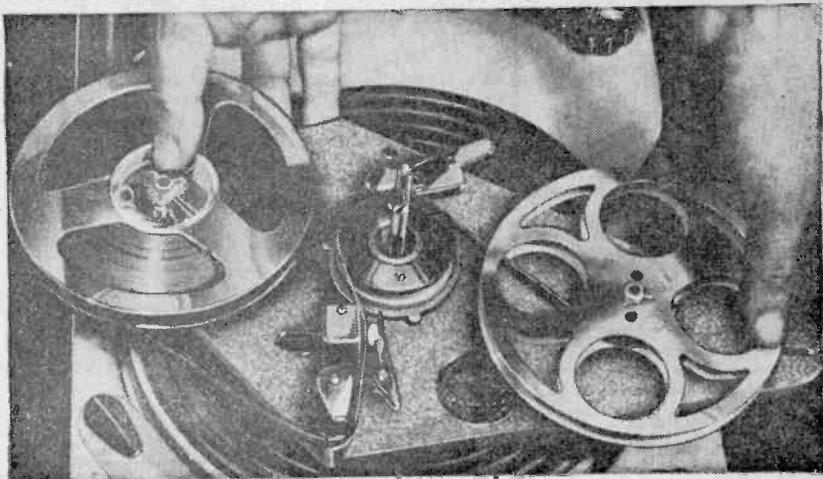
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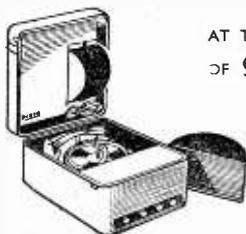
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with extension speaker cabinet.

Portable 1960 show model in two tone colours. Extension speaker cabinet secured in lid. (Arrow indicates position when fixed.) Size 18 x 14 x 8½ in. high. This stereophonic player retails at 35 gns. in the shops today. A must for teenagers, and an essential for the enthusiast. Carr. & Ins. 5/6 with order.

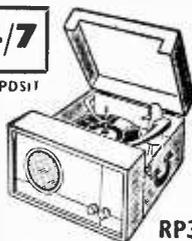
OR 6/1 initial payment and balance at 4/11 for 19 weeks.



AT THE AMAZING OFFER OF **99/6**

Model S.T.1 (including extra speaker cabinet) 99/6 plus insurance and carriage 6/6

4/7
DEPOSITS



RP3

Balance at 3/5 per week for 19 weeks. A delightful looking cabinet. Size 14½ x 17½ x 8½ in. in 2-tone leatherette. Will take a B.S.R. Monarch 4-speed autochanger and 6 in. round speaker. Carr. & Ins. 4/6.

Cash Price **69/9**

PL10 CABINET

Size 14½ x 12½ x 6 in. Takes a B.S.R. T.U.9 4-speed record player unit. 8 x 3 in. elliptical speaker. Single control amplifier. Carr. & Ins. 4/6.



39/6

TAPE RECORDER CABINET

19/6



A must if you are building your own tape. Suitable for the Truvox Tape Recording Desk. Less front cast speaker panel. Size 13½ x 15 x 8½ in. deep. Detachable lid with compartment for spare tape. Covered in green washable plastic material. P. & P. 4/6.

EXTENSION SPEAKERS
19/9



Polished oak cabinet of attractive appearance. Fitted with 8 in. P.M. speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms). Switch and flex included. Ins. & Carr. 3/9.

8 in. P.M. Speaker 8/9

Std.; 2-5 ohms. With O.P. Trans., 10/-, P. & P. 2/6.

Elliptical Speaker 19/6

7 x 4 in. Elliptical Speaker 22/6

7 x 4 in. B.S.R. FUL-FI Crystal Turn-over cartridges 19/6

Brand new, including sapphire needles for L.P. and Standard, giving fullest range and finest tone obtainable for any player. can be fitted to all standard pick-up arms. P. & P. 9d.

De-Luxe Tape Recorder Cabinet

ONLY **29/9**



Beautifully made Tape Recording Cabinet. Size 14 x 11 x 8½ in. Covered in 2-tone coloured rexine cloth. Stylish design. Carrying handle and detachable lid with lock and key. Easily adapted to Record Player Cabinet. Exceptional value at this very low price.

P. & P. 4/6

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

£6/19/6

4-speed auto changer. Incorporating auto and manual control complete with turn-over crystal P.U.



and Sapphire stylus. A.C. Post. & Ins. 5/6 or Initial Payment 8/11 plus Post. & Ins. and 19 weekly payments of 6/11.

T.U.9. B.S.R. 4-speed single player £4.9.6

Collaro Conquest 4-speed Autochanger £6.19.6

Collaro Conquest Stereo Autochanger 11 gns.

P. & P. on all above 5/6.

DUKE & CO. (DEPT. D.4)

621/3 ROMFORD ROAD

MANOR PARK, E.12

Tel. 1LF 6001/3

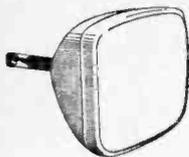
SEND FOR A FREE CATALOGUE

CONTEMPORARY EXTENSION SPEAKERS

ONLY **19/9**

Ideal for that extra stereophonic speaker. Covered in smart two-tone leatherette colour scheme Takes Bin. P.M. Speaker. P. & P. 3/9.

NO DEPOSIT - INTEREST FREE - 20 or 36 WEEKS TO PAY!



**REPLACEMENT
REBUILT
TV TUBES**

Yours for initial payment of **8/6**

Balance at 8/6 for 19 weeks.
12 months full guarantee.

All sizes except 10in. Completely rebuilt gun assembly, new cathode, heaters, etc., giving the high standard required for long picture life, quality and value. Carr. & Ins. 15/6.

EXPRESS DESPATCH SERVICE

Please phone to confirm Tube in stock. Telegraph Money Order. Tube despatched Passenger Train same day. This service is only available with remittance by a telegraph Money Order and cash sales, not terms.

A CHASSIS FOR SPARES. ALL THIS FOR ONLY **9/6**

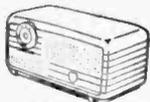
56 Resist. incl. 7 variable Controls Condensers, incl. electrolytics, Coils, 71.F. and R.F. Trans. 14 valve holders. 9 B7G, 5 B5G. 3 octal, 4 trans. Mains—O.P.P.—Line—Frame. Chokes 250 mA. Metal rec. 300 volt 250 mA. Fuse panel—scanning coils—focus magnet. Plugs—sockets—switch—chassis screws—tag strips etc. I.F. strip is separate. Power pack can be used without dismantling. Chassis have been used but were working—when stored. Seven pages of circuits and instructions showing position of each component. Carriage 10/6.

BAKELITE CABINETS

only **5/9**

Brand new. Colour brown. Attractive design. Size 12 x 7 x 5 1/2 in. Ideal for small receivers, converters, etc.

P. & P. 3/9.

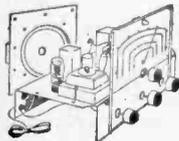


SOLO SOLDERING TOOL **12/6**

110 v., 6 v., 12 v. (special adaptor for 200/250 v., 10/- extra). Automatic solder feed including a 20ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 3/6.



SUPER CHASSIS **3/11 per week**



On the initial payment of 5/11 plus carriage of 5/6, this chassis will be despatched. Balance at 3/11 for 19 weeks. Cash price 79/6. 5-valve Superhet chassis including Bin. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four wavebands with position for gram p.u. and extension speaker. A.C. Ins. & Carr. 5/6

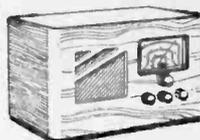
DUKE & CO. (DEPT. D.4)
621 3 ROMFORD ROAD
MANOR PARK, E.12

Tel.: ILF 6001/3

SEND FOR A FREE CATALOGUE

**HOME RADIO
A.C. or UNIVERSAL**

79/6



A.C./D.C. Universal mains 5-wave octal superhet. 3-waveband receiver can be adapted to gram p.u. In attractive wooden cabinet. Size 9 1/2 x 18 1/2 x 11 1/2 in. Ins. & Carr. 4/6. Terms available.

FOCUS MAGNETS **9/9**

Brand new. 30 mm. incorporating picture shift control. P. & P. 1/3

FOCUS MAGNETS **12/6**

38 mm Brand new. P. & P. 1/3.

SCANNING COILS **10/6**

Low impedance. 38 mm. Brand new. P. & P. 1/3.

SCANNING COILS **15/9**

Wide angle 90 deg. 38 mm. Low impedance. P. & P. 1/3.

TV MASKS **2/9**

Gold plastic for 15in. tubes. Post. 1/3.

CHASSIS **1/-**

6 or 8 valve latest type midget valve design for A.M. or F.M. Brand new. Cadmium plated. Size 12 1/2 x 7 1/2 x 2 1/2 in. P. & P. 1/9.

MAINS TRANSFORMERS **7/9**

Primary 200-250. Secondary 300-0-300. 6 v. at 3.3 amps. P. & P. 2/9.

MAINS AUTO **8/9**

0-205-225-245 Volts at 300 mA.

Isolated windings of 6.3 v. at 2-6 amp. 6.3 v. at 3-6 amp. 2 v. at 1-4 amp. P. & P. 3/9.

O.P. TRANSFORMERS **1/3**

Standard size. 2-5 ohms. P. & P. 1/-. 20 for £1. P. & P. 5/6.

MODERN

17" TV

CHASSIS

COMPLETE

AND WORKING

22 Gns.

A chassis including 17in. tube, permanent magnet speaker, 13 channel Turret Tuner (any two selected channels fitted). Other Channels supplied on request at 7/6 each. 13 valves. Chassis and valves guaranteed for three months. CRT 2 months' full guarantee. Sound I.F. 19.5 Mc/s. Vision 16 Mc/s. A.C. only. Ready and working to fit into your own cabinet. Carr. & Ins 25/-. As above with 14in. tube, complete and working, £19.19.0.

TV AERIALS **23/6**

For all I.T.A. channels. Outdoor or loft. 3 elements. P. & P. 2/6.

AERIALS **15/6**

BBC indoor type. Folded dipole with 12ft. co-ax cable fitted. P. 1/9.

TV AERIALS **35/-**

Combined I.T.A. or B.B.C. New. L/SD. P. & P. 2/6.

CAR AERIALS **6/9**

Plates. Whip antennae. 50in. long collapsing to 11in. One hole fixing. P. & P. 1/-. (Not telescopic).

SOUND/VISION & I.F. STRIP **7/9**

Plessey I.F.s. 11.5 Mc/s sound. 14 Mc/s vision. 8 valve holders. Less valves. Size 8 1/2 x 5 x 4 1/2 in. Circuit incl. The tuner unit plugs directly into this chassis. P. & P. 2/6.

SOUND/VISION & I.F. STRIP **2/9**

Salvaged. Complete sound and vision strip. 8 valve holders. Less valves. I.F.s 16-19.5 Mc/s. Size 8 1/2 x 4 1/2 x 4 1/2 in. Drawings free with order. P. & P. 2/6.

TIMEBASE **2/9**

Containing scanning coils, line transformers, etc., less valves. Drawings free with order. P. & P. 2/6.

GO-AX CABLE **6d. YARD**

Good quality. Cut to any length, 1/6 postage on 20 yards.

INSULATING TAPE **1/6**

75ft x 1/2 in. In sealed tins. Post 9d.

Easy-to-build kit-sets of**Heathkit**
DAYSTROM**highest quality at lower cost****HI-FI F.M. TUNER**

Tuning range 88-108 Mc/s. For your convenience this is available in two units sold separately as follows: Tuner Unit (FMT-4U) with 10.7 Mc/s I.F. output (£22.0), inc. P.T.). I.F. Amplifier (FMA-4U) complete with cabinet and valves (£10.10.6).
Total £13.12.6

HI-FI 16W. STEREO AMPLIFIER Model S-88

10 mV. basic sensitivity (2 mV. available, 30/- extra). Ganged controls. Stereo/Monaural gram., radio and tape recorder inputs. Push-button selection. Two-tone grey metal cabinet. £25.5.6

6-TRANSISTOR PORTABLE Model UXR-1

Pre-aligned I.F. transformers, printed circuit, 7 x 4in. high-flux speaker. Real hide case. £15.18.6

DUAL-WAVE TRANSISTOR RADIO UJR-1

This sensitive headphone set is a fine introduction to electronics for any youngster. £2.16.6

RES.-CAP. BRIDGE Model C-3U

Measures capacity 10pF to 1,000µF., resistance 100Ω to 5 MΩ and power factor. 5-450 v. test voltages. With safety switch. £7.19.6

AUDIO SIGNAL GENERATOR Model AG-9U

10 c/s to 100 kc/s., switch selected. Distortion less than 0.1%. 10 v. sine wave output metered in volts and dB's. £19.3.0

VALVE VOLTMETER Model V-7A

Measures volts to 1,500 (D.C. and R.M.S.) and 4,000 pk. to pk. Res. 0.1Ω to 1,000 MΩ. D.C. input Imped. 11 MΩ. Complete with test prods, leads and standardising battery. £13.0.0

R.F. PROBE Model 309-CU

Extends the frequency range of our V-7A to 100 Mc/s. and enables useful voltage indication to be obtained up to 300 Mc/s. £1.5.6

5 in. OSCILLOSCOPE Model O-12U

Has wide-band amplifiers, essential for TV servicing, F.M. alignment, etc. Vertical freq. response 3 c/s. to over 5 Mc/s. without extra switching. T/B covers 10 c/s. to 500 kc/s. in 5 ranges. £34.15.0

ELECTRONIC SWITCH S-3U**(Oscilloscope Trace Doubler)**

Enables a single beam oscilloscope to give simultaneous traces of two separate and independent signals. Switching rates approx. 150, 500, 1,500, 5,000 and 15,000 c/s. £9.18.6

CAPACITANCE METER CM-1U

Direct-reading 4½in. scale. Full-scale ranges 0-100µµF. 0-1,000 µµF 0-0.01µF and 0-0.1µF £14.10.0



CM-1U



S-33



USP-1



S-88



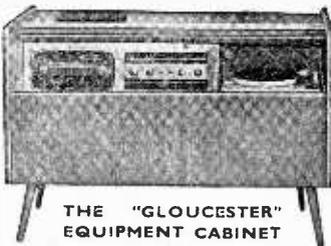
F.M. TUNER



S-3U



DX-100U

THE "GLOUCESTER"
EQUIPMENT CABINET**6-W STEREO AMPLIFIER Model S-33**

3 watts per channel, 0.3% distortion at 2.5 w/chnl., 20dB N.F.B. Inputs for Radio (or Tape) and Gram., Stereo or Monaural, ganged controls. £11.8.0
Sensitivity 100 mV.

TRANSCRIPTION RECORD PLAYER RP-1U

4-speed A.C. motor. Ronette Stereo Mono pick-up. Complete with plinth £12.10.0

HI-FI SPEAKER SYSTEM Model SSU-1

Ducted-port bass reflex cabinet "in the white". Twin speakers. With legs £11.12.6. £10.5.6

"HAM" TRANSMITTER Model DX-40U

From 80-10 m. Power input 75 w. C.W., 60 w. peak C.C. phone. Output 40 w. to aerial. Compact and self-contained. Prov. for V.F.O. £29.10.0

AMATEUR TRANSMITTER Model DX-100U

Covers all amateur bands from 160-10 metres. Self-contained including Power Supply. £78.10.0
Modulator and V.F.O.

"GLOUCESTER" EQUIPMENT CABINET

46½ x 30 x 21in. deep. Mk. I houses Record Player, Stereo Amplifier, F.M. Tuner, records, etc. Mk. II will house a Tape Deck in addition. Left in the white for finish to personal taste.

Mk. I ... £15.18.6 Mk. II ... £17.8.6

"COTSWOLD" HI-FI SPEAKER SYSTEM KIT

Acoustically designed enclosure "in the white" 26 x 23 x 15½in., housing a 12in. bass speaker with 2in. speech coil, elliptical middle speaker and pressure unit to cover the full frequency range of 30-20,000 c/s. Compete with speakers, cross-over unit, level control, etc. £19.18.6

COMPLETE MATCHED STEREO OUTFIT

Includes record player, amplifier and twin speaker systems (pedestal speaker legs optional, £42.10.0 £2.14.0 extra).

AUDIO VALVE MILLIVOLTMETER AV-3U

1 mV. to 300 v. A.C. 10 c/s to 400 kc/s. £13.18.6

AUDIO WATTMETER Model AW-1U

Up to 25 w. continuous, 50 w. intermittent. £13.18.6

STEREO-HEAD BOOSTER USP-1

Input 2 mV. to 20 mV. Output adjustable from 20 mV. to 2 v. 40-20,000 c/s. Also suitable as high-gain monaural amplifier. £5.19.6

VAR. FREQ. OSCILLATOR VF-1U

From 160-10 m. Ideal for our DX-40U and similar transmitters. £10.12.0
Price inc valves £8.19.6

Prices include free delivery UK
Deferred Terms
available on orders over £10

Please send me FREE CATALOGUE (Yes/No) _____

Full details of model(s) _____

_____ Deferred Payments (Yes/No) _____

NAME _____

ADDRESS _____

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DEPT. P.W.4, GLOUCESTER, ENGLAND

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WORLD'S LARGEST-SELLING ELECTRONIC KITS

Practical Wireless

VOL. XXXV, No. 638 APRIL 1960

Editorial and Advertisement
Offices:

PRACTICAL WIRELESS

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Contents

	Page
Editorial	1021
Round the World of Wireless	1022
A Comprehensive Pre-amp	1024
Improving the 19 Set	1027
A Quality Octet	1029
On Your Wavelength	1035
Model Control Circuits	1036
Transistorised Super-regener- ator	1039
Miniature Add-in I.F. Stage	1043
Frequency Meter BC 221	1045
Record Player and Cabinet	1048
Choosing Detector Circuits	1051
Simple Morse Oscillator	1054
Repairing "Staar" Motors	1057
Rectification and Smoothing	1061
A Repetitive Timer	1062
Becoming an Amateur	1069
Club News	1073
News from the Trade	1077
Open to Discussion	1081

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IMPORT CONTROLS

WITH effect from Monday, November 9th, 1959, many controls on imports from the Dollar area, Western Europe and a number of other countries, were removed. Electrical equipment and apparatus was included in the list of freed goods although, as we stated in our Editorial in the January issue, the heading "Electrical equipment and apparatus" included valves but not transistors. We pointed out that relaxation of import control of transistors would be of benefit both to industry and to the home constructor. However, in reply to a Parliamentary Question, the President of the Board of Trade, Mr. Reginald Maudling, announced that, with effect from February 1st, control has been removed from a further number of Dollar imports. Transistors are no longer subject to import restrictions from the Dollar and Relaxation Areas although imports of Japanese transistors and transistorised radio sets will remain subject to control.

STEREOPHONIC BROADCASTING

SEVERAL systems have been proposed for the broadcasting of two-channel programmes but most have been over-complicated or expensive. The proposals have varied from the straightforward use of separate transmitters for each channel to methods of modulating the same carrier with two sets of information. For instance, experiments have been carried out using VHF with frequency modulation for one channel and amplitude modulation for the second channel. However, all of the techniques which have been given trials have been found to have several disadvantages. The system of stereophonic broadcasting which will eventually be used must be economical in the use of transmitted bandwidth and also compatible; listeners who do not wish to receive the programmes in stereophonic form must be able to receive them using their existing receivers without modification and the results to be expected from such receivers should be equivalent to those obtained from normal monophonic transmissions. A new system of stereophonic broadcasting has recently been proposed by Mullard Ltd. and seems to fulfil most of the requirements for such transmissions. The system utilises time multiple \times communication techniques, is applicable to normal F.M. (Band II) transmissions and is also suitable for bilingual or other twin signal purposes. The system is summarised, in a report from the Mullard Research Laboratories, as follows: "The system is a twin-channel application of the principles of pulse amplitude time multiplexing under conditions in which the bandwidth, after multiplexing but before modulation of the transmitter, is restricted to a logical minimum. The system is essentially symmetrical in character . . . and leads, in particular, to simplicity and therefore economy in receiver design and construction. Its implementation would also require only minor modifications to normal F.M. broadcast transmitting equipment".

In view of the interest which will be aroused in this system we propose to deal with it in an article in our next issue and give some details of the circuitry employed although such information will naturally be tentative.

Our next issue, dated May, will be published on April 7th.

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of December, 1959, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued* to blind persons without payment.

Region	Total
London Postal	835,634
Home Counties	799,813
Midland	588,728
North Eastern	656,252
North Western	546,532
South Western/	473,047
Wales and Border Counties	291,492
<hr/>	
Total England Wales ..	4,191,498
Scotland	494,608
Northern Ireland	145,087
<hr/>	
Grand Total	4,831,193

New NATO Headquarters

THE new NATO headquarters in Paris, inaugurated this month, has what is claimed to be the most up-to-date electro-acoustical installation of any public building in Europe, possibly the world. The equipment has been supplied by the Philips Organisation with the co-operation of its companies in Holland, Germany and Belgium. It will now be possible to feed transmissions from the NATO building directly into the Eurovision network. The camera set-up is such that it permits direct connection between crucial points in the building to broadcasting vans parked outside. Reporters, watching monitor screens, will be able to describe the scene. A simultaneous interpretation equipment for a thousand delegates has also been provided. This has been installed in the main council chamber, the Press theatre and in six smaller conference halls in the building. It involves hundreds of microphones and more than a thousand headsets and languages selectors as well as small personal loudspeakers for



Mr. A. T. Collins, Editor of PRACTICAL WIRELESS and Practical Television opens our film show held at Caxton Hall, Westminster, on January 22nd last in collaboration with Mullard Ltd. On Mr. Collins' left are Mr. C. H. Gardner and Mr. P. I. Nicholson of Mullard Ltd.

use in some of the more important conference rooms.

International Instrument Show

FOR the last five years B & K Laboratories Ltd. have organised the annual International Instrument Show, but there will be no I.I.S. this year, and, to appreciate the reason, it is necessary to recap on its origin. The idea was conceived in 1955 when all of the then existing "big shows" were national rather than international. However, this year there is certainly no reason why any British engineer should not compare products from overseas in at least one British show. B & K Laboratories Limited are not exhibition organisers and hope that specialists in this field will continue the trend towards larger and better international exhibitions.

New Depot at London Airport

A NEW service depot at London Airport has been opened by Marconi's Wireless Telegraph Co. Ltd. to replace the temporary one previously in use.

The new depot, which is in the No. 1 Maintenance Area and therefore conveniently situated,

is considerably larger than its predecessor and can handle a much wider range of work with greater speed and efficiency. All post-war Marconi airborne equipment can be serviced and kept up to its full specification and to the standards demanded by the Air Registration Board. The telephone number is Skyport 1039.

Suez Contract

A CONTRACT worth many thousands of pounds has been placed with Pye Telecommunications Limited by the Suez Canal Authority for the supply of VHF radio equipment for the control of the Authority's vessels in the Canal. The system will be used to direct tugboats, dredgers and other official craft in the Suez Canal from points on shore.

International Award

THE establishment of an annual award in memory of Guglielmo Marconi, the world-famed radio pioneer, is announced by Permindex, the World Trade Centre in Rome. This award will be made to the individual making the greatest contribution to the development

of Marconi's discoveries. Recipients will be chosen by a Committee composed of important international personalities, a member of the Marconi family and representatives of Permindex. This announcement followed the dedication of the Marconi obelisk, to be known as the Marconi Antenna, in the Piazza Italia around which are grouped the four majestic buildings shortly to be occupied by Permindex. To celebrate the occasion the Square itself was renamed Piazza Guglielmo Marconi. The prize consists of a small reproduction in gold of the obelisk to be executed by Commandator Ventrella, Italy's leading jeweller, under the supervision of Arturo Dazzi, the sculptor of the obelisk.

BBC Appointments

THE BBC announces the appointment of Mr. C. J. Dolan, A.M.I.E.E., as Engineer-in-Charge, Television, Belfast. This is a new post and it reflects the increase in BBC Television Service activities in Northern Ireland.

Mr. Dolan joined the Corporation in 1932 as an Assistant Maintenance Engineer in the London Control Room. Towards the end of the same year he was appointed to Glasgow, where he became Maintenance Engineer in 1936 and Senior Maintenance Engineer in 1941.

In 1952 Mr. Dolan transferred to the Scottish Television Unit in Glasgow and became a Senior Television Engineer later that year, which post he has held until taking up his new duties on 1st February, 1960.

The Hon. R. T. B. Wynn, C.B.E., will on April 19th retire from the position of Chief Engineer of the BBC after thirty-four years' service with the Corporation. He will be succeeded by Mr. F. C. McLean, C.B.E., Deputy Chief Engineer, who will have the title of Deputy Director of Engineering. The post of Deputy Chief Engineer will be abolished.

Mr. Wynn, who was born in North Wales, served with the Experimental Section, Designs Department, of the Marconi Wireless Telegraph Company at Writtle from 1922 to 1926. He was concerned with the first regular broadcasting transmissions in this country. His first post with the BBC was as Head

of the Technical Correspondence Department. He became Senior Superintendent Engineer in 1934 and was appointed Chief Engineer in 1952.

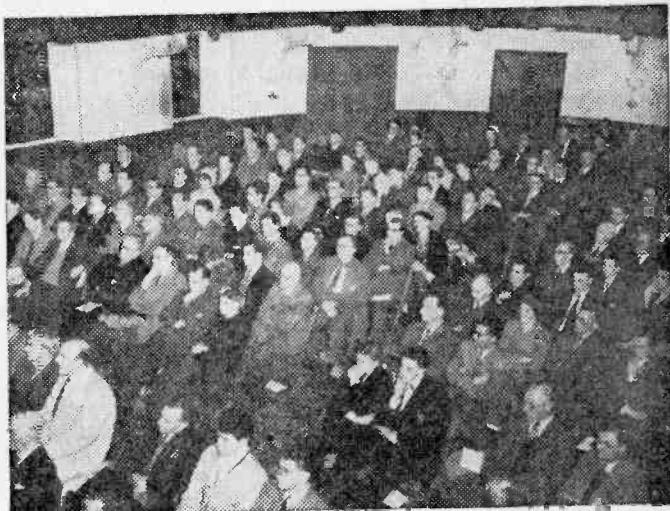
Obituary

THE Dubilier Condenser Co. (1925) Ltd. announce with regret the death on January 3rd of their technical director, Philip R. Coursey, B.Sc.(Eng.), M.I.E.E., F.Inst.P., F.Phys.Soc., M.R.I. He was 68 and was a well-known figure in the industry. He was with the Admiralty and the technical Press before joining Dubilier in 1923, and was the author of several books.

vision receivers in order to reduce (a) interference caused by them and (b) their susceptibility to interference other than that picked up by the aerial/earth installation. It deals also with anti-interference and communal aerial systems.

Methods of test for determining compliance with the various requirements of the standard are specified in detail.

The Foreword to the standard carries a recommendation on the choice of intermediate frequencies for television receivers, frequency-modulation sound broadcast receivers and combined television and frequency-modulation sound broadcast receivers.



A section of the large audience which was present at our recent film show.

New British Standard

Interference characteristics and performance of radio receiving equipment for aural and visual reproduction
(B.S. 905 : 1959)

THE work of one of B.I.S.'s many committees of experts, this revised publication brings up-to-date the first (1940) edition of B.S. 905, *Interference characteristics and performance of radio receiving equipment for aural and visual reproduction (excluding receivers for motor cycles and marine equipment)*. It specifies requirements which should be complied with in the design of sound radio and tele-

The new publication concludes with four appendices: they deal separately with: 'Recommendations for protection against atmospheric electricity', 'The standard reference aerial for long and medium wave bands', 'Measuring equipment' and 'Measurement of oscillator voltage appearing at the aerial terminals of television and F.M. sound broadcast receivers'.

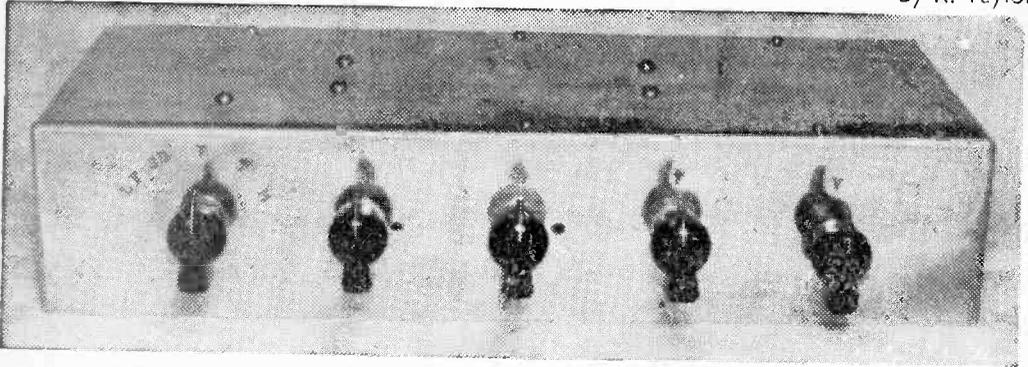
Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London W.1. Price 12s. 6d. (Postage will be charged extra to non-subscribers).

Comprehensive Pre-Amp

(Continued from page 954 of the March issue)

FURTHER CONSTRUCTIONAL DETAILS

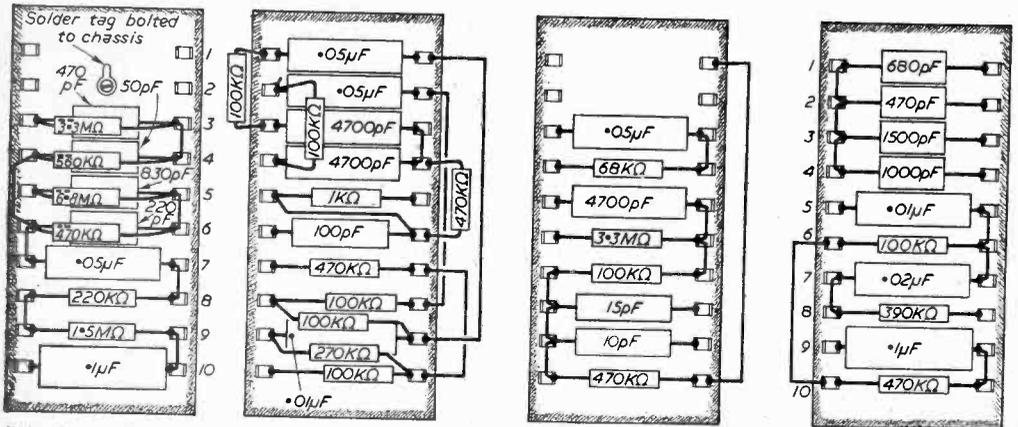
By R. Taylor



Front view of the completed amplifier.

In the previous article, details of the circuit and a complete list of components were given. The chassis drilling details were also given and having drilled the holes in the chassis for mounting switches, potentiometers and coaxial sockets, this should be set on one side. The components for group board (1) should be placed in position on the appropriate tags (Fig. 4a), soldered, and the excess wire removed. As will

On the opposite side of the board a 470k resistor links tag (4) to (6). Further down the group board two resistors are mounted diagonally across tags; from tag (8) a 100k resistor terminates at tag (9) on the opposite of the group board. Similarly a 270k resistor from tag (9) terminates on the opposite side at tag (10). Note also the shorting links in insulated wire from tags (1) to (9), (2) to (8) and (7) to (10).



(a): Group board 1. (b): Group board 2. (c): Group board 3. (d): Group board 4.

Fig. 4.—Wiring of the four group boards.

be seen, some of the components are joined in series across the tags, e.g. (3), (4), (5) and (6), and some are linked by means of connecting wire, which may be bare wire when going from tag (3) to (4), etc., but must be insulated if bypassing a tag, e.g., a link from tag (4) to tag (6).

Assembly

The assembly of components on group board (2) (Fig. 4b) should be completed in a similar manner. It will be noted that a 100k resistor links tag (1) to (3), and another 100k resistor links tag (2) to (4).

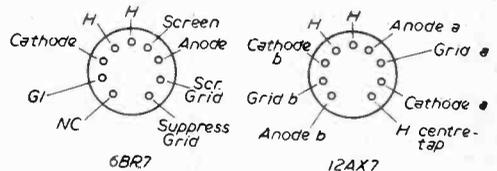


Fig. 4a.—Valve base wiring details.

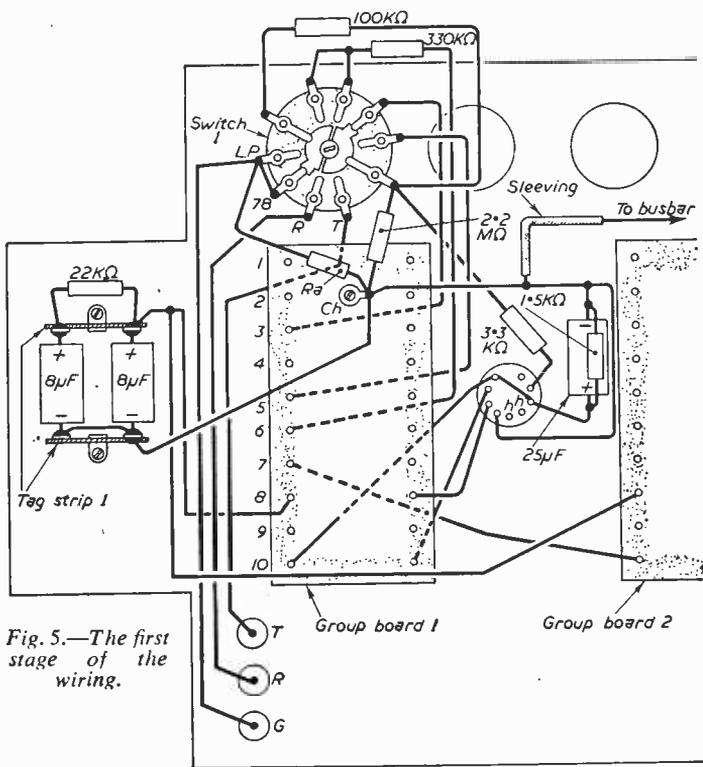


Fig. 5.—The first stage of the wiring.

joined to it. If switch 2 (three-pole, three-way) is liable to foul this earth bus-bar, the termination should be made to tags (2) and (2) on the group board (3). The shorting link from tags (1) to (10) on this group board must be correspondingly altered, i.e., tags (2) to (10).

Other Components

The switches, potentiometers and coaxial sockets may now be attached to the chassis, and then the brackets holding the valve sockets. For the next stage of construction reference should be made to Fig. 5. It should be noted that the valve bases shown in Fig. 5 and Fig. 7 are depicted as if mounted in a vertical position, in order that the wiring may be more easily identified.

Screening leads are run from the coaxial input sockets to switch 1 (two-pole, four-way), the ends of the screens being connected together and soldered to a wire which is then joined to the earth bus-bar. Care must be taken to avoid shorting between the screens and other components. It should be noted that the Gram. input is linked to ways 1 and 2 of the switch.

Group boards (3) and (4) (Figs. 4c and 4d) are similarly assembled, and then all four group boards may be bolted to chassis, with a spacer nut between paxolin and chassis to allow for the passage of connecting wires.

Group board (1), is secured at one end by the passage of a bolt (head outside the chassis) through the normal eyelet hole, and secured by a nut, but at the end nearest to the controls, a hole is drilled midway between tags (2) and (2), for the securing bolt and nut. A soldering tag is located underneath the nut, and this is the only earth connection to chassis. A length of heavy gauge copper wire (at least 18s.w.g.) should be run from this tag, which is terminated across tags (1) and (1) of group board (3). The position of the wire relative to other components can be seen from the main wiring diagrams, and must be insulated by sleeving where it is liable to contact other components, or the chassis, **other than those to be directly**

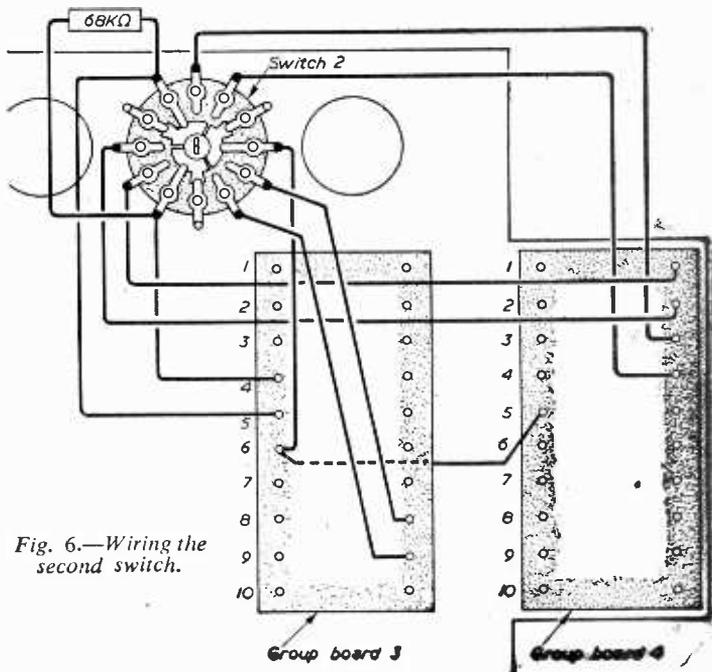


Fig. 6.—Wiring the second switch.

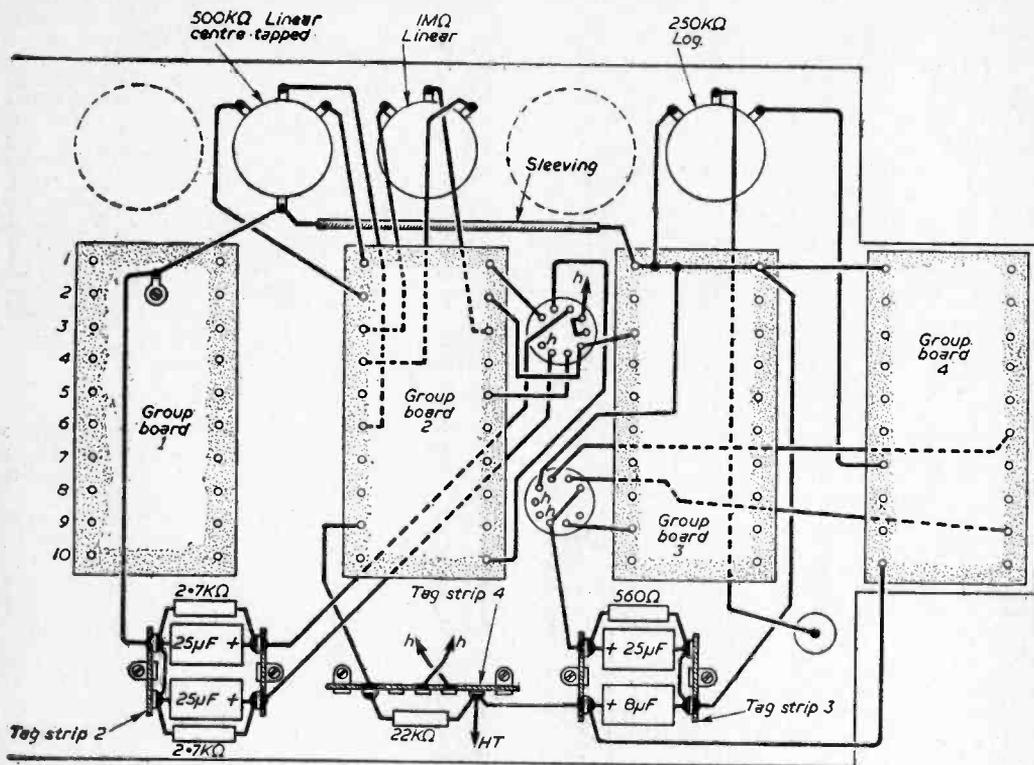


Fig. 7.—Completing the wiring.

The other wiring is straightforward, and dotted wiring signifies passage beneath the group board. The bias resistor and capacitor for this stage are sandwiched between the valve bracket and group board (3). The 8μF electrolytics are mounted on tag strips soldered as shown

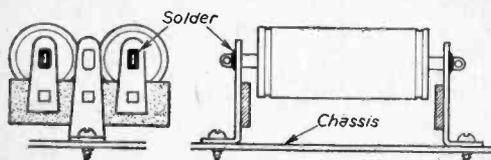


Fig. 8.—The 8 and 25μF condensers are soldered to tag strips for mounting on the chassis.

in Fig. 8, and bolted to chassis, with a 22k resistor linking the positive ends. It should be remembered that resistor Ra may have to be changed if the output of the pick-up is greater than 59mV. The modified circuits for other pick-ups were shown in Fig. 2 (last month).

Final Wiring

This stage having been completed, the wiring to the other switch (three-pole, three way), as shown in Fig. 6, may now be undertaken. No difficulty should be found in this stage, and then the final section can be started (Fig. 7).

The mounting of the electrolytic capacitors on tag strips (2) and (3) is identical to that used for

tag strip (1) (Fig. 8); tag strip (5) (Bulgin T 24) is used only as an anchoring strip.

The electric power supply from the main amplifier or power pack is taken to a junction block on the rear of the chassis. Wires are then fed through a hole in the chassis, protected by a rubber grommet, from the junction block to the anchoring tag strip (5), but only the tags insulated from the chassis are used. The heater wiring consists of an insulated pair of tightly twisted wires run from tag strip to V3 (6BR7), and then on to V2 (12AX7), and a separate pair from the tag strip to V1 (6BR7).

The power requirements are 250-300V H.T., and 6.3V at 0.6A, centre tapped to earth.

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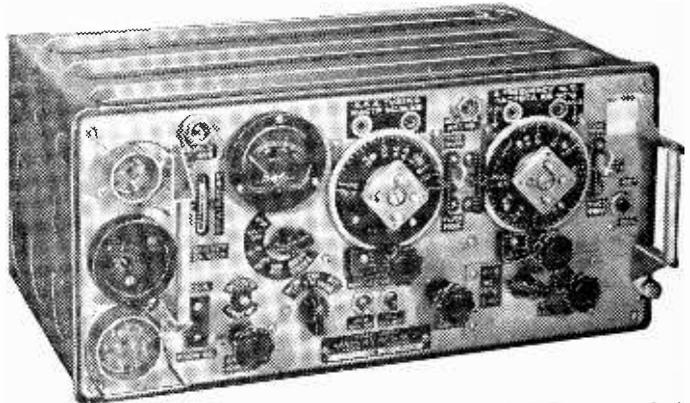
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The "No. 19" Set

FURTHER IMPROVEMENTS

By D. W. Dillon

(Continued from page 962 of the March issue)



AFTER the modifications for 6V operation and to the tank coil, etc., have been carried out as described last month, the set is ready for trial.

Intermediate Testing

For testing, a suitable power unit supplying 250-300V and 6-3V is necessary. If only the receiver portion is required, a power unit similar to that shown in Fig. 4 should be constructed or purchased. If, however, the transmitter portion is also required, the circuit of Fig. 5, which includes a relay supply, should be constructed. The smaller power unit could also contain a small speaker, the connections to it being through the chassis and the unused 500V pin on the power socket. The circuit for an output stage will be given later.

The power unit is connected to the set, switched on, and a pair of low impedance headphones plugged into the new jack. The P.A. tuning should be set to approximately the same frequency as the main tuning. A long wire aerial is attached to the feed-through insulator. Rotation of the aerial tuning condenser should show a point where a great increase of signal level, or noise, results. The R.F. gain control is turned down, the AVC off, and the receiver tuned into a signal. No movement of the AVC meter should result. If all works correctly, the next stage of alteration may be commenced.

Selectivity

The most important part of the receiver modifications is the improvement of the selectivity. Although the replacement of the fixed condensers in the I.F.T. cans, removal of damping resistors, and complete realignment does help greatly, and has, in fact, been carried out on the author's set, the need was felt for even more selectivity. In the circuit to be described, this modification need not be carried out, although it is advisable to do so. Until a few years ago, the only solution to this problem would have been in the use of a crystal filter, involving the

entire rebuilding of the second I.F. stage, but recently the idea of the Q-multiplier circuit has been imported from the U.S.A. A circuit suitable for use in the "19" set is shown in Fig. 6.

The 6K7 valveholder beside the aerial tuning unit (Fig. 3, February issue) is removed by filing the tops of the aluminium rivets, and a B9A valveholder mounted on small aluminium strips. Holes are drilled in the chassis to hold an I.F.T. can over the valve, with the valve in one corner of it. A coaxial lead is connected to pin 3 (anode) of the 6K8 frequency changer (V2A). The outer sheath is not connected at this end. Coil L1 is mounted at the bottom of the can in such a position that the core can be adjusted from the side of the set. The coil L2 is mounted directly above L1, and the coil-shaped trimmer at the top of the can. The condensers C3 and C4 should be high stability 2 per cent or 5 per cent types. The 5k wirewound potentiometer is used to vary the sensitivity, and can be substituted for the B set gain control; but if the transmitter modifications are to be carried out, it can be wired in temporarily

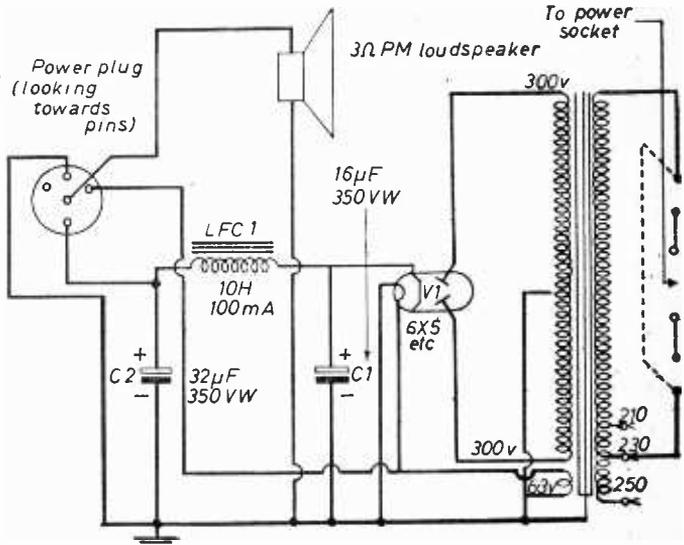


Fig. 4.—Circuit of a power unit.

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A SENSITIVE VHF/FM RECEIVER

By A. Sydenham

THIS receiver was built around the well-known RF27 unit, a chassis which has proved its worth, being virtually a ready made VHF front end. The hazards of F.M. front-end construction—the length and position of practically every wire; the orientation of each component, etc.—is therefore successfully bypassed and a complete self-powered—and surprisingly efficient—receiver results, the cost of which is less than that of most unpowered front ends. The inductors contained in the unit do not need rewinding as by removing all trimmers but one the operating frequency rises in excess of 100Mc/s. Where an RF26 unit is available it might be possible to use this instead of the RF27, but the mixer and oscillator inductors will need to be rewound to 4½ and 3½ turns respectively; however, as the author has no practical knowledge of the RF26 no further reference to it will be made.

Circuit

The complete receiver, the circuit of which is illustrated in Figs. 1 and 2, brings in the desired transmissions at full loudspeaker strength in a fringe area, the aerial used being a thin wire dipole, attic mounted.

The diagrams are largely self-explanatory and it will be seen that the I.F./Discriminator strip is

mounted on an inverted “L” of tinfoil secured to the side runner of the RF27 unit (see Fig. 3) so that all valves are operated upright.

The audio and power sections are contained on a separate chassis the same size as the R.F. unit, and spaced one inch from it so that the I.F. transformer cores are accessible. The layout used gives thorough inter-section screening. Front and rear panels ¼in. thick retain both chassis simultaneously.

Note that in Figs. 1 and 2, components are numbered separately. In Fig. 1 those items with only the value specified beside them are already *in situ* and are only mentioned for reference; the remainder (with reference and value) must be added. The circuit diagram of an unmodified RF27 unit has appeared in previous issues and will not be repeated here.

Modifying the R.F. Unit

Remove all trimmers above and below chassis except the one adjacent to the oscillator inductor at the rear and also any resistors connected across them. Remove the aerial socket, front panel trimmer, both inductors in the front compartment and also the one in the third compartment together with its parallel-connected 10k resistor. Remove the short length of coaxial cable connected to the

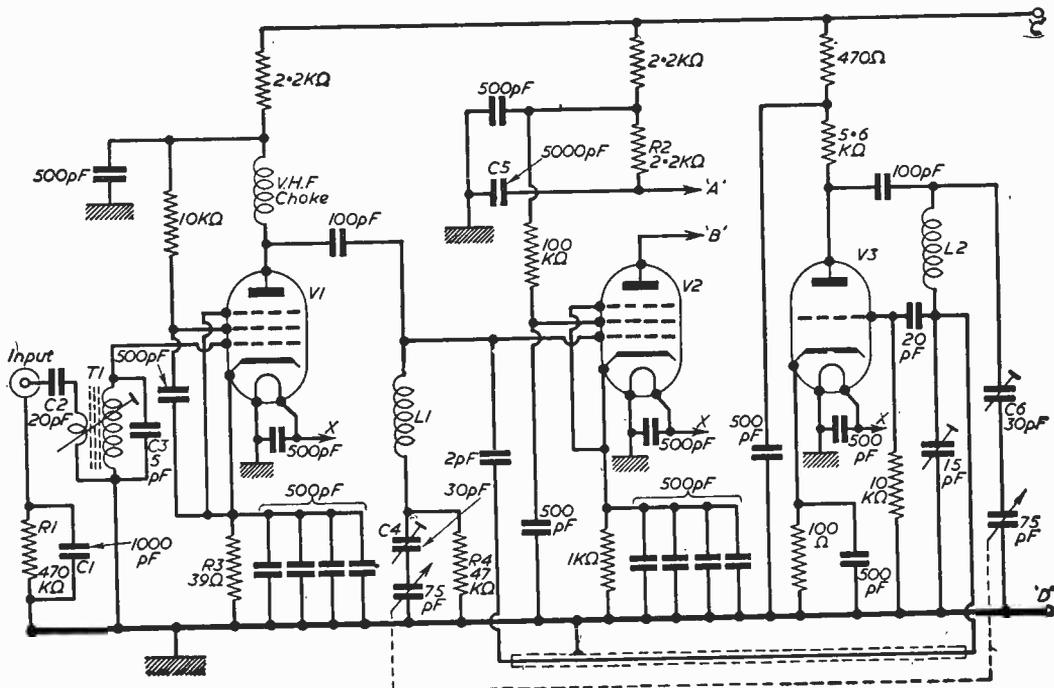


Fig. 1.—Circuit diagram of the modified RF27.

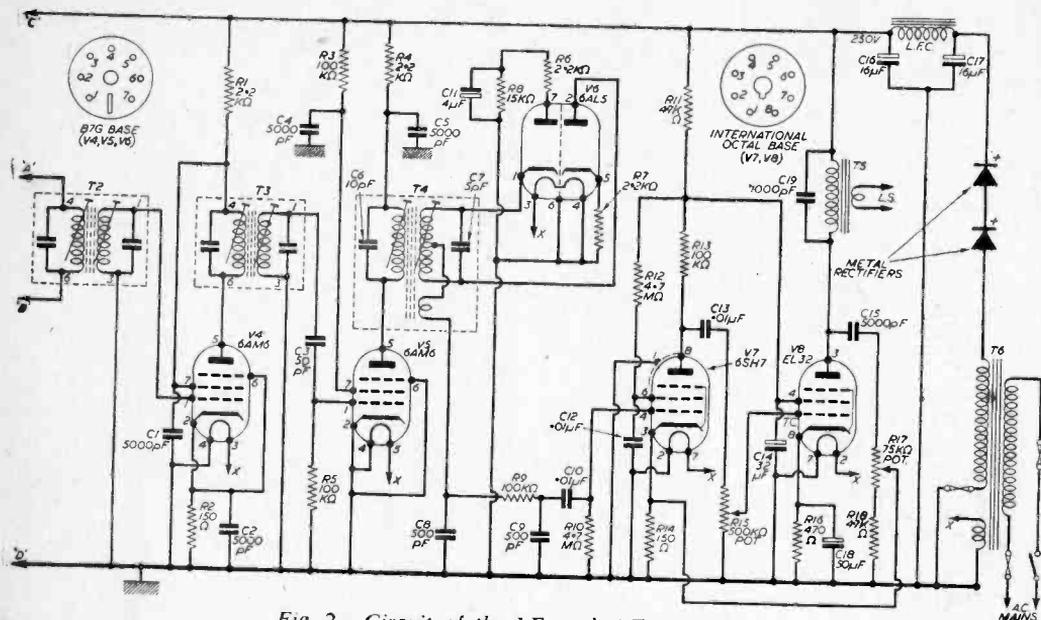


Fig. 2.—Circuit of the I.F. and A.F. amplifiers.

Jones plug and put aside, for use later, the stand-off insulator associated with it. Prise off both lugs at the rear of chassis and re-position the stand-off insulator (the one adjacent to the oscillator inductor which carries the L.T. wiring) in one of the vacated holes. Remove the dial bulb holder and locate the dial fixing bolt and loosen it, together with another at the bottom right-hand side of the dial. Take off the dial after disconnecting the live lead of the dial bulb. Remove the panel and the handle so that the chassis stands level. Either remove or disconnect the front section of the 3-gang tuning capacitor.

Disconnect the wire which runs through a rubber grommet in the chassis connecting the mixer inductor to one section of the fixed vanes of the tuning capacitor. Take a 30pF beehive trimmer

(C4) and solder a length of wire to its long terminal, and pass it through the grommet, soldering the free end of the wire to the fixed vanes and the free trimmer terminal to the inductor terminal at its base. Connect a 47k resistor (R4) from chassis to the junction of the trimmer and inductor. Insert a 30pF beehive trimmer (C6) similarly in the oscillator section, but no resistor is required here. For both of these operations a pencil bit is necessary on the soldering iron. Screw both trimmers fully home then unscrew one half a turn, leaving both available to assist trimming later.

Aerial Coil

Remove the 10k resistor feeding the anode of V1 and insert the VHF choke in its place. Replace.

COMPONENTS LIST

For R.F. unit.

Capacitors—

C1—1,000pF.
C2—20pF.
C3—5pF.
C4, 6—30pF trimmers.
C5—5,000pF.

T1—QAFM (Osmor).

Choke—VHF type (Osmor).

Aerial socket—Belling Lee.

Resistors—

R1—470k.
R2—2.2k.
R3—39Ω.
R4—47k.

C10, 12, 13—0.01μF.
C11—4μF. elec.
C14—32μF. elec.
C16, 17—16μF, elec.
C18—50μF. elec.
C19—1,000pF.

R15—500k pot.
and switch.
R15—470Ω.
R17—75kΩ pot.

Valves—V4, 5—6AM6
V6—6AL5.
V7—6SH7.
V8—EL32.
Rectifiers—RM3 (2).
LFC—midget 10H.

Chassis—16s.w.g. aluminium four sided type, size 8½ x 4½ x 1½in.

Transformers—T2, 3—QIFM (2) (Osmor).

T4—(see text).

T5—Output transformer.

T6—Mains isolating transformer (see text).

Valve bases—Three B7G, Two I.O.

For I.F. Strip and Audio Sections.

Capacitors—

C1, 2, 4, 5, 15—5,000pF.
C3—50pF.
C6—10pF.
C7—5pF.
C8, 9—500pF.

Resistors—

R1, 4, 6, 7—2.2k.
R2, 14—150Ω.
R3, 5, 9, 13—100k.
R8—15k.
R10, 12—4.7M.
R11, 18—4.7k.

also, the bias resistor of this valve by one of 39Ω (R3). Prise out the rubber grommet in the first compartment and into the vacated hole plug the aerial transformer, T1, upside down and with its can removed; a perfect fit will result.

After removing the S-shaped spring retainer on the rear flange of the chassis, bolt the aerial input socket to a piece of Paxolin and fix the assembly in position, using the existing holes in the chassis.

secondary. The completed windings are covered with cellulose cement, capacitors C6, C7, inserted and the can replaced after making a note of the terminations.

The bracket is retained by means of the bolts securing the tuning capacitor and the necessary holes should be drilled before wiring up is commenced. When correctly mounted the I.F. transformer cans should be level with the top of the RF27 side flange. The stand-off insulator retrieved earlier is positioned centrally on the underside of the bracket and forms the H.T. feed point for this section.

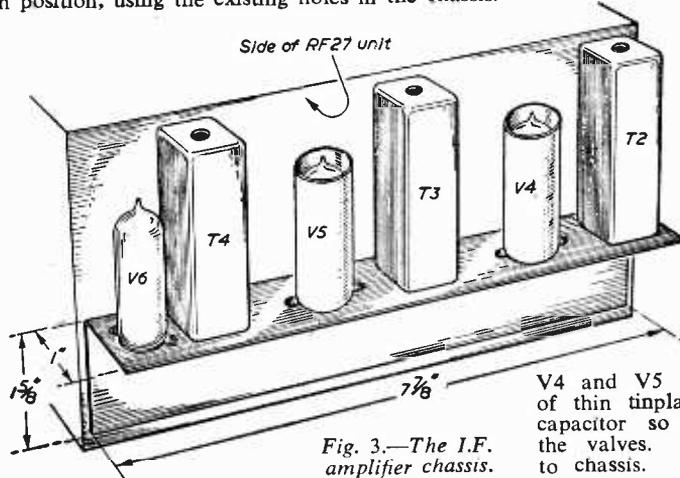


Fig. 3.—The I.F. amplifier chassis.

Wiring up may now be commenced, it being essential to use modern, miniature V.H.F. capacitors to maintain efficiency and prevent the strip from becoming unduly congested. Normal short wave wiring techniques (not shown in the diagrams) should be employed and care taken to ensure that the I.F. transformer cores remain accessible. Cans for

V4 and V5 can be made by bending lengths of thin tinplate around a suitable size tubular capacitor so that they fit comfortably over the valves. These cans should be connected to chassis.

Connect up C1, C2, R1, and run a length of coaxial cable along the chassis and through to T1.

Removal of the Jones plug is optional as the rear panel can be shaped to cover the points.

Audio and Power Section

The layout is shown in Fig. 4 and no difficulty should be experienced here. Loudspeaker trans-

The I.F. Strip

The inverted "L" of tinplate is now prepared and main components mounted as illustrated in Fig. 3. The figures in Fig. 2, incidentally, refer to the correct connecting terminals of the I.F. transformers and appear on the bases. For convenience they should be copied off on to the cans prior to mounting as the originals become obscured.

A commercially-made ratio discriminator transformer can be used if desired, but that used in the prototype was home-made as experience shows that this can be done successfully (and more cheaply). A dual-core former and can, type Aladdin PP5937-TV1, is required and is wound as follows: Primary, 28 turns 28s.w.g. enamelled copper wire closewound; Secondary, 15 + 15 turns 28s.w.g. enamelled copper wire, bifilar wound and spaced 3/16in. from primary; Tertiary, 10 turns 36s.w.g. D.S.C. wire wound over a paper interlay over primary at the end farthest from the

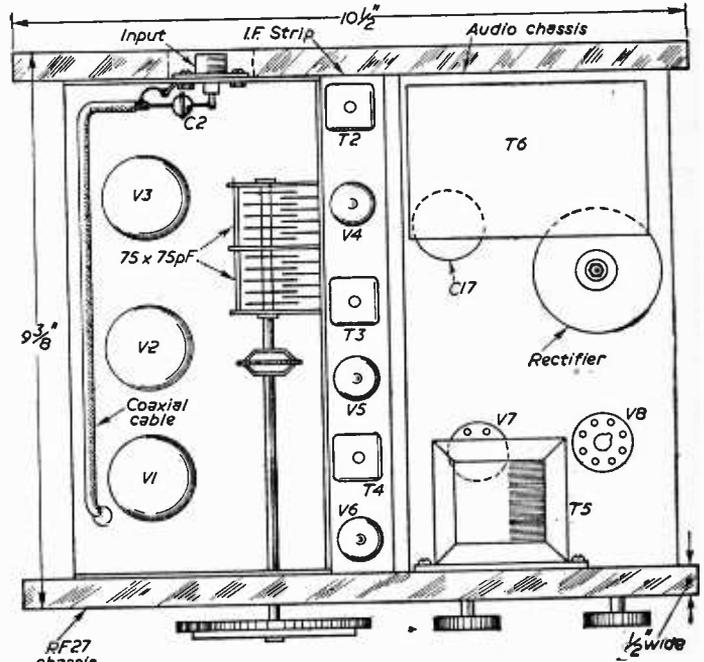


Fig. 4.—Above-chassis layout.

former T5 is mounted on the inside of the front panel and C18 forms part of a triple electrolytic type, though adequate space is available for a separate component. In the prototype, half-wave rectification supplies 250V at 80mA for the H.T. line with negligible hum level. Other arrangements are possible and full-wave rectification in conjunction with a valve rectifier might make possible the use of one less smoothing capacitor. The EL32 output pentode was chosen for its moderate current demands. The volume control is placed in its grid circuit, this position being found superior to the more usual one of associating it with V7 grid. The L.T. requirements are 6.3V at 3A.

Miscellaneous

When both chassis are complete, front and rear panels may be prepared and bolted in position, care being taken when refixing the dial to ensure that no fouling occurs. If the first section of the

(Continued on page 1058)

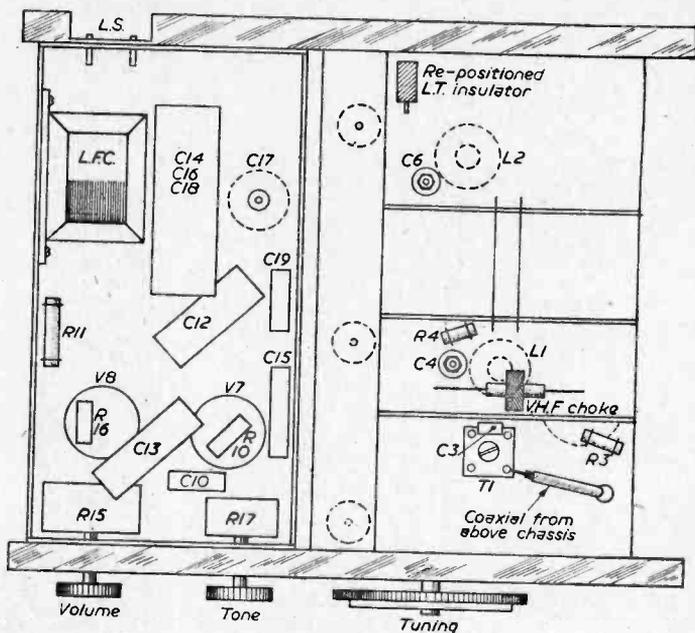


Fig. 5.—Under-chassis layout.

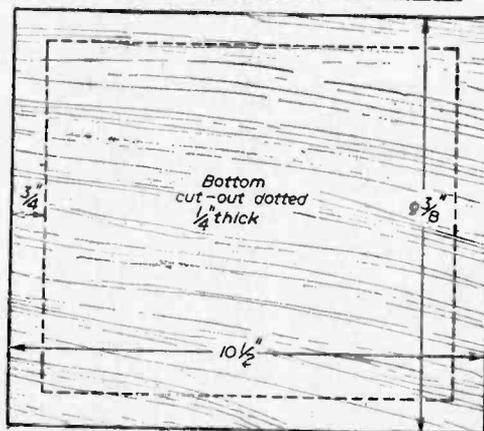
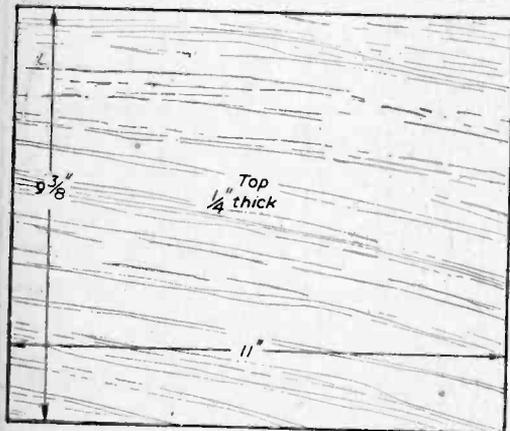
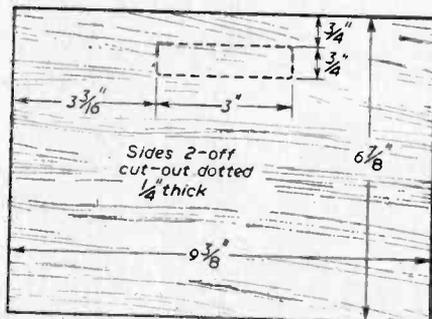
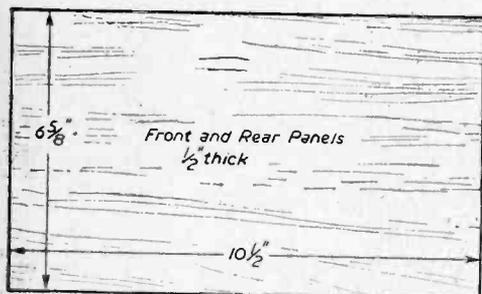
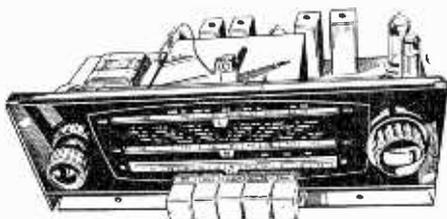


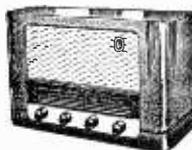
Fig. 6.—Dimensions of the front and rear panels.

Fig. 7.—Dimensions of the sides and bottom.

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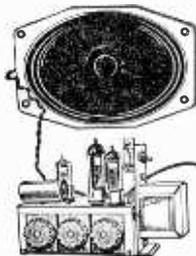
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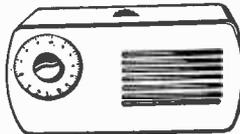


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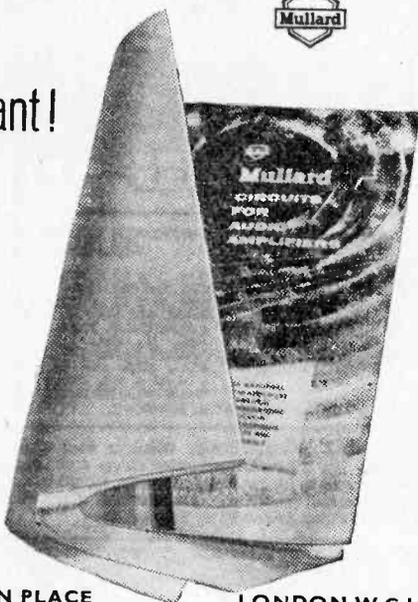
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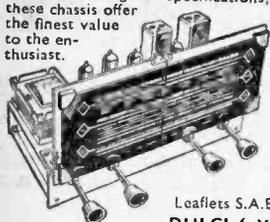
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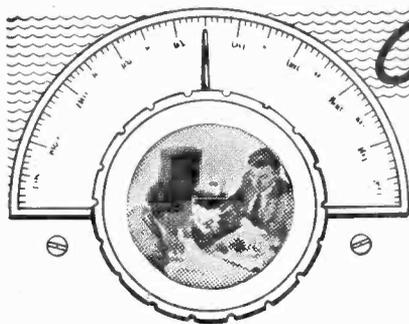
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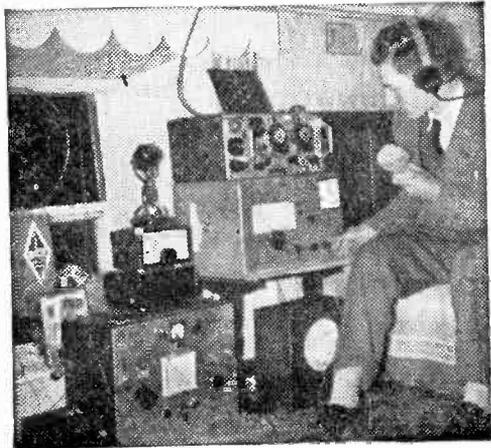
On Your Wavelength

BY THERMION

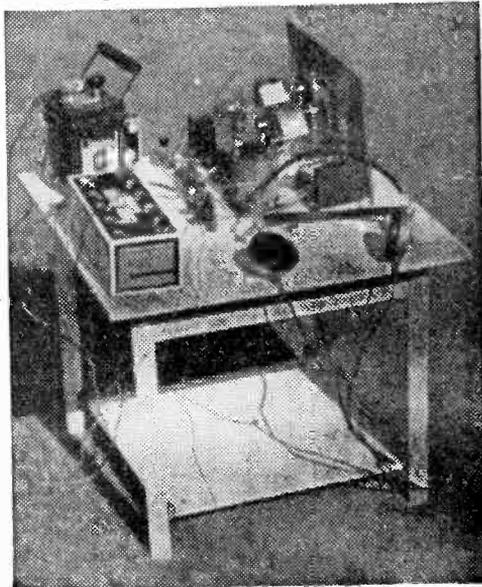
for his amateur band transmitter, the driver and P.A. stages not yet having been built. To the left of the modulator is a self-contained direct measurement resistance/capacity bridge (built to a PRACTICAL WIRELESS circuit). In the window is an aerial tuning unit, 350V stabilised power pack and

FOLLOWING my article in the December 1959 issue on the lack of a real spirit of home construction in the world of amateur radio today. Mr. T. Sutton has written to me with reminiscences of his youth and says he remembers abstracting a piece from his mother's broomstick to make a former for a coil. The illustration opposite shows one of his early constructional efforts and the receiver is a 0-V-1 using two Hivac D210's which cost about 3s. 9d. each in those days. This set was built in 1934 when Mr. Sutton was fifteen. One of the Telsen coils with the aerial capacitor on the top can be seen in the picture. The headphones were bought for 2s. 6d. from a junk shop and were of German manufacture bearing the trade name of "Dr. Nesper". They had adjustable magnets and were very sensitive and also had a marked resonance in the middle of the audio band which was most useful for CW DX reception.

The illustration below is of Mr. D. W. Dillon in his den. All the gear shown (with the exception of the 19 set) is home-built and includes an 11-valve double conversion superhet covering 100kc/s to 30Mc/s. It has I.F.s of 1.6Mc/s and 50kc/s and contains a Q-multiplier (giving selectivity down to 50c/s), reflex I.F. stages and a 10W modulator. The large unit on the floor on the left is a 60W modulator and 750V power pack and on top of this is an 80m VFO with a measured accuracy of 0.0005 per cent. Both these units are



D. W. Dillon in his den.



An early receiver built by Mr. T. Sutton.

a 4W 10m walkie-talkie. The 19 set shown has been considerably modified and is completely self-contained except for the aerial and microphone. Miniature valves have been used in the I.F. stages and a Q-multiplier installed. A link coupled aerial tuning unit is built in and enables loading into almost any aerial.

Our Film Show

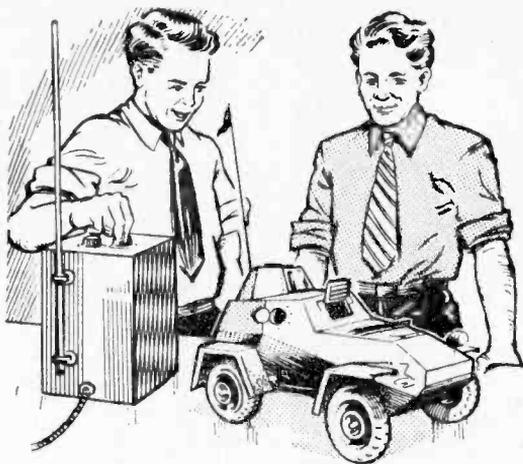
ONCE again our film show at Caxton Hall was attended by several hundred of our readers and once again I was able to meet many old friends and we had a most enjoyable evening chatting about old times and the recent advances made in the world of radio. Three very interesting films were shown at the meeting which were presented by Mr. C. H. Gardner of Mullard Ltd., who introduced Mr. A. T. Collins, Editor of this, and our companion journal, *Practical Television*. A tribute was paid to our late Editor Mr. F. J. Camm by Mr. C. Clark Ramsay of Newnes Book Sales Department.

All in all, with the help of the free refreshments provided to all in the interval, a very enjoyable evening was had, and all of those to whom I spoke expressed the wish that the film show would become an annual occurrence.

Model-Control Circuits

SIMPLE RECEIVERS FOR OPERATING RELAYS

By C. Stone



MOST model control receivers employ simple circuits which can be made up in compact form. The best type of circuit depends on the purpose in view. For example, short range working with a powerful transmitter would require a much less sensitive receiver than would long range control, possibly with a low power transmitter only.

Values

The gas-filled triode type of receiver is quite often used, and is fairly easy to adjust, and can be controlled at considerable range. A circuit of this kind is shown in Fig. 1, and may be used with the Hivac XFG1 valve, with 45V H.T. supply and 1½V for filament. The valve acts as a super-regenerative detector, and the anode current is

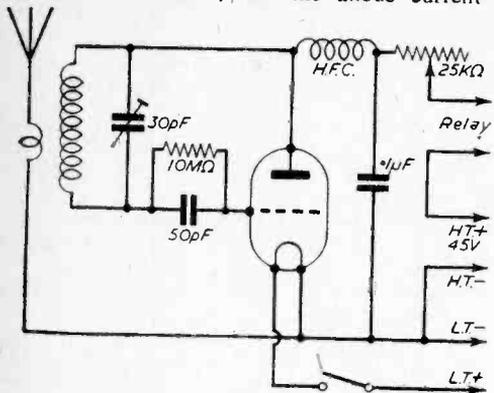


Fig. 1.—Circuit using a gas-filled triode.

normally up to 2mA or so, dropping to ½mA or so when the transmitter is keyed. Component values are not very critical, but a high value grid leak is necessary. The H.F. choke may be omitted if the H.T. circuit is taken to a centre tap on the coil.

The working life of the valve will be much increased if the anode current is kept low by setting the 25k potentiometer to a fairly high value. A good model control relay can be adjusted to operate with a current change of 0.1mA, so when only moderate range is needed, maximum anode current may be about 1mA, falling to perhaps ½mA when the transmitter is keyed. Valve life may also be extended by taking the 10M grid leak to H.T. negative. In use, the 30pF trimmer is rotated until a reduction in anode current, as shown by a meter wired in the H.T. circuit, shows that the signal has been picked up. The aerial can be coupled to the set by a 2-turn loop near the tuning coil. Or if a short aerial is used, this can be taken

directly to the tuning coil, the best tapping point being found by trial.

Diode and Valve Amplifier

The circuit shown in Fig. 2 uses a "hard" valve, which will have a normal, long life. A high-slope pentode for battery running is most satisfactory, and suitable types will be found in the "all dry" portable range, such as the 1S5, 1S4, 3S4, etc. The H.T. voltage can be according to the anode current required, provided the maximum rating of the valve is not exceeded.

Adjustment is extremely simple, the 30pF trimmer being tuned for maximum current change. When the transmitter radiates, the signal is rectified by the crystal diode, and provides bias for the valve and its anode current thus changes. An increase or fall in anode current can be obtained according to the polarity with which the diode is wired. Grid bias must be adjusted so that the valve is operating on the best part of its characteristic curve, so that a small change in bias produces a fairly large change in anode current.

The aerial may be taken directly to the coil, since the question of damping preventing oscillation does not arise as with Fig. 1. The range achieved is very much less than with the circuit in Fig. 1, but is sufficient for boats on a small pond, and

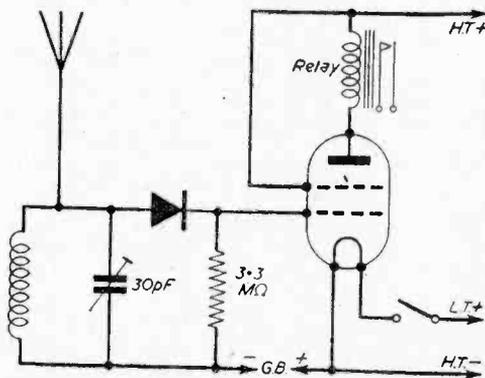


Fig. 2.—Hard-valve circuit.

similar purposes, with a powerful transmitter. The main advantage of the circuit lies in its ease of adjustment, and the fact that a gas-filled valve having a relatively short life is not required.

Single Transistor Circuit

A transistor may be used to amplify the voltage obtained from a diode, instead of a valve and a circuit of this type can be constructed upon a small piece of paxolin as shown in Fig. 3. In this case

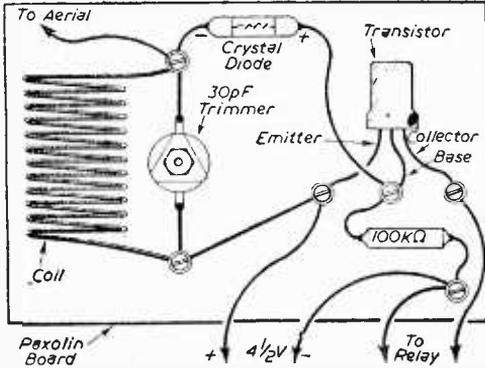


Fig. 3.—Wiring of a transistor circuit.

the output from the diode serves to bias the transistor, resulting in a collector current change which is sufficient to work the relay.

The tuning coil can be self-supporting. If a length of 18s.w.g. or other fairly stout wire is wound tightly round an object about 1/2 in. in diameter, this will provide a self-supporting coil with an outside diameter of nearly 1 in., when the temporary former is removed. This coil is then pulled out until eleven turns form a winding about 1 1/4 in. long. The ends can be cut off and loops formed to fit small 8B.A. bolts, as in Fig. 3. The trimmer is wired directly across the coil, and is best of the 30pF air-spaced or beehive type.

A coil made in the same way can be used with any of the other circuits described. The gauge of wire, diameter, and number of turns are not very important provided the coil can be tuned to the transmitter signal without the trimmer being closed down very far.

A piece of ebonite rod or small diameter tube, shaped to engage the trimmer, should be used for tuning. Re-tuning is necessary if any change is made to the aerial, or layout of the receiver etc. A meter wired in series with the relay forms the best tuning device because it will show when rotation of the trimmer has brought the receiver into resonance with the transmitter.

As with the circuit in Fig. 2, control cannot be maintained at anything like the range achieved with a gas-filled triode. But it is sufficient for small ponds, etc., with a transmitter providing a good output.

Twin Diode Circuit

In few cases very short range is sufficient, and a powerful transmitter may be used. A sensitive

relay can then be worked directly by the rectified radio frequency picked up by the receiver. A circuit for this purpose is shown in Fig. 4. The 1 1/2V to 4 1/2V battery, with 5k potentiometer, provides a standing current through the relay, which is adjusted in conjunction with the 5k control, for maximum sensitivity. When the transmitter is keyed, and the receiver tuned in, the change in current operates the relay.

A Three-valve Circuit

A receiver for use with a modulated transmitter is shown in Fig. 5. The valve types are not in any way critical. The first valve acts as detector, and the second as audio amplifier. The third valve is just sufficiently biased to prevent anode current passing. When modulation is applied to the transmitter carrier, this is picked up and amplified, and applied to the grid of the third valve, which passes anode current on positive peaks of the audio signal. These pulses are smoothed by the 0.1μF condenser, and provide anode current to operate the relay.

Such a circuit is best adjusted by wiring phones or speaker in place of the relay, and applying normal bias to this stage. The 50k potentiometer and tuning coil tapping should then be adjusted for maximum possible volume, at range. Cut-off bias may then be applied, and the relay connected.

It is important that the super-regenerative oscillation of the detector does not provide an audio signal which causes the third valve to conduct. This can most easily be arranged by keeping the quench above audibility, in the phones or speaker, and by

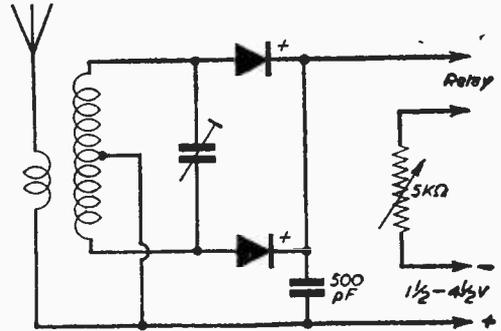


Fig. 4.—Circuit using two diodes.

shunting the coupling transformer, and choke, if necessary, with a fairly large condenser (say, 0.005μF.) A modulation tone of some 1,000c/s or so will then be strongly heard at the output valve anode, while the quench frequency, usually in the neighbourhood of 10kc/s or so, will not.

Direct Coupled Amplifier

If a circuit like that in Fig. 1 is made up with a "hard" valve it will be difficult to obtain a reliable anode current change of more than perhaps 0.1 or 0.2mA even at short range. It is for this reason that a gas-filled valve is substituted.

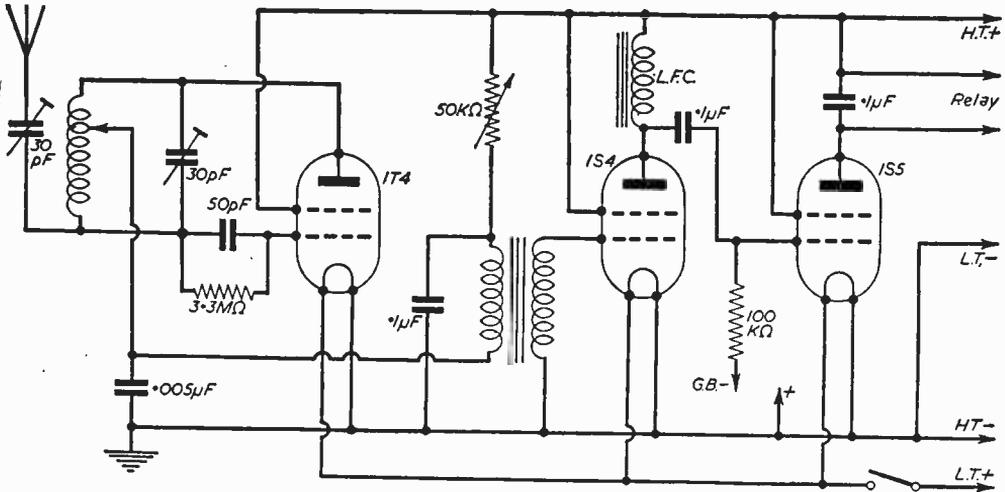


Fig. 5.—Receiver for use with a modulated transmitter.

Another method is to use a directly coupled stage, as shown in Fig. 6. Various circuits may be employed, that shown being perhaps the simplest.

In use, bias is adjusted by means of the 50k potentiometer until the valve is in the condition explained for the circuit in Fig. 2. The triode receiver may be wired as in Fig. 1. When the signal is received, the slight change in anode current causes a change in the voltage drop arising in the 30k potentiometer. This change in voltage is applied as bias to the second valve, causing a much increased change in anode current, so that the relay operates.

Batteries

Correctly adjusted, such a circuit has a range approaching that of the gas filled valve. Unfortunately it requires separate L.T. batteries for the two valves, and either separate H.T. batteries, or a tapped H.T. battery of fairly high voltage. It is thus only suitable for large models.

With any receiver, a fairly good change of current is obtained when the transmitter is near the receiver. As the model, and receiver, move to greater range, the change in current falls, until control is eventually lost. This is the maximum range for the equipment, and depends to quite a large extent on the careful adjustment of the relay.

When a model control relay is first obtained, a little time spent experimenting with its adjustment will be well worthwhile. This is most easily done by wiring a dry battery, variable resistor, and meter in series with the relay. Current can then be varied at will, and the relay adjusted as necessary.

For sensitive operation, a very small armature movement is necessary. For example, if poorly adjusted, the relay may rise at perhaps 0.5mA, but not draw down until the current reaches 1mA or more. With gap reduced, and tension adjusted if necessary, it may easily be drawn down at

0.6mA, while still rising reliably at 0.5mA. This would represent a considerable increase in range for the model.

It is also necessary to adjust the relay in accordance with the change which will be experienced

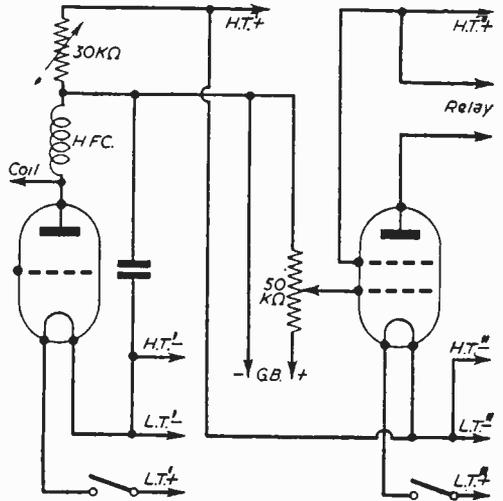


Fig. 6.—Using direct coupling.

at range. For example, with the circuit in Fig. 1, the change in current might be from 2mA to 1/4mA at short range, but only 2mA to 1/2mA at considerable range. If the relay were set to rise at currents just under 2mA, control would still be achieved at range. But if it were set to draw down when the current exceeds 1/4mA, control would be lost as soon as the model moved away. This must, therefore, be kept in mind, and the relay adjusted accordingly, or the model must be adjusted at the maximum range at which control will be wanted, before releasing it. The latter method is preferable.

Transistorised Super-Regenerator

A TWO-TRANSISTOR
CIRCUIT FOR
HEADPHONE
RECEPTION

By L. Baker

SUPER-REGENERATIVE receivers have been well known to amateurs and radio experimenters since the very early days of radio. This type of detector has a very high sensitivity and gain but suffers from one drawback, however, and that is a loud hissing noise. In the two transistor super-regenerative receiver to be described, this drawback, whilst not eliminated entirely, is reduced to negligible proportions and when the set is tuned to a station the hissing noise is scarcely audible. The circuit is suitable for all frequencies but, with this type of detector, operation is most efficient on the higher frequencies. With this in mind, the set was designed to operate on the 10m amateur band and frequencies adjacent to this band. The set uses two transistors, a type SB344 acting as the detector and a type OC72 as audio amplifier. It is constructed around the front panel

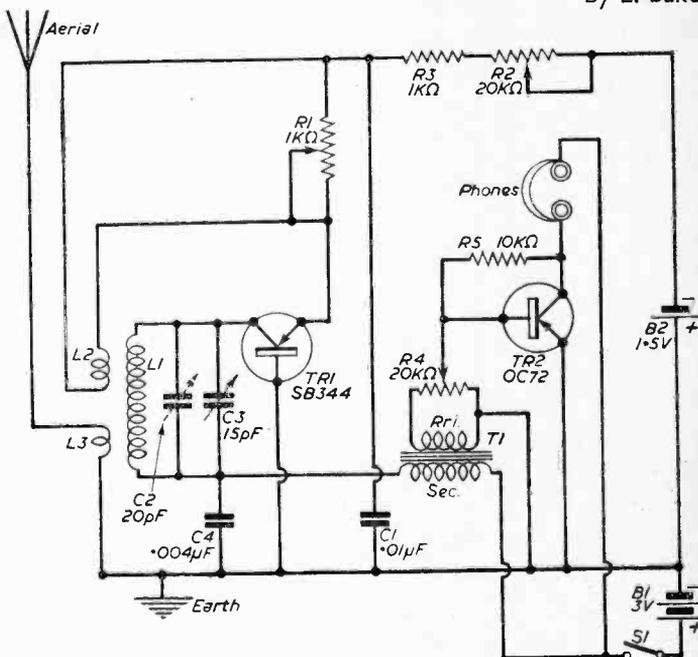


Fig. 1.—The circuit diagram.

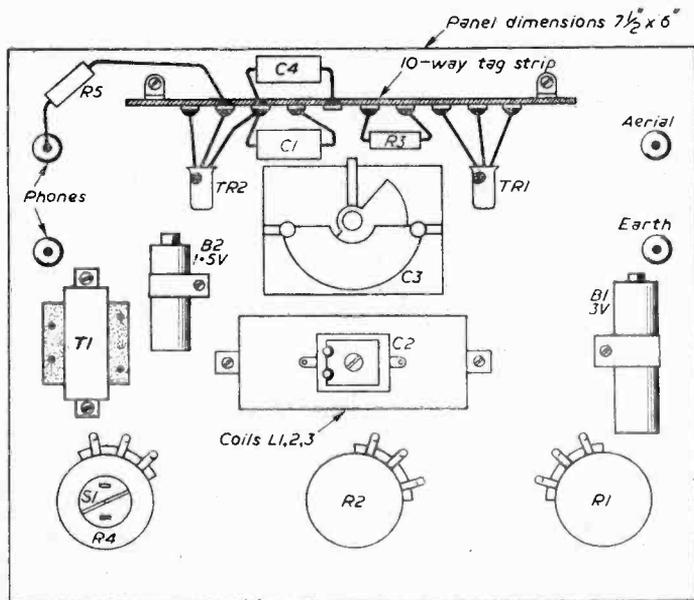


Fig. 2.—Layout of the parts.

of the cabinet and no "chassis" is necessary. All controls are mounted on the front panel, and the tuning condenser C3 is rotated by means of a slow motion dial. The bandset condenser C2 in the original model is of the semi-variable type.

Bandsetting

If required C2 can be of the fully variable type and a further control could be put on the front panel for this condenser which would give greater coverage. In the original set however, interest was mainly in the 10m amateur band and therefore C2 was made of the semi-variable type. It was adjusted until the 10m band was heard with C3 approximately half open. This made the amateur band "spread" over the full travel of C3. The coils L1, L2 and L3 are wound on a ceramic former.

The coil is constructed first. The former should be of ceramic or similar material. The tuned coil, L1, consists of $7\frac{1}{2}$ turns of 20 gauge enamelled wire evenly spaced out over a length of 1in. Coil L2 is three turns of the same wire at the

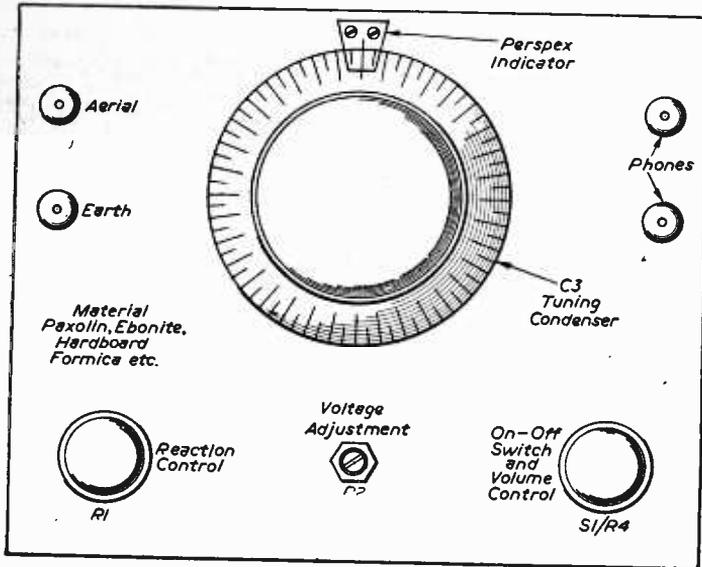


Fig. 3.—Front panel.

"hot" end of L1. The aerial winding, L3, is two turns of the same gauge wire wound at the remote or "cold" end of L1 (see Fig. 4). All the coils should be given a coating of cement after trial to ensure that the turns do not slip. The wire for these coils should be free from kinks. The coil should be provided with mounting brackets as shown and the entire assembly should be quite rigid. If the intending constructor desires to have C2 of the semi-variable type (as in the original) then, C2 can be made part of the coil assembly as shown.

Coupling Transformer

The interstage transformer T1 is of the ordinary intervalve type connected so that its primary (low resistance winding) is feeding into the base circuit of the OC72. This arrangement gives approximately correct impedance matching. The audio gain potentiometer, R4, is of the midget type and is ganged with the on/off switch S1. R2 is a midget potentiometer of value 20k, and since this will only need very occasional adjustment it is of the preset type.

The sensitivity control is R1, and since it has to be adjusted for practically every station it is best to use a component of the wire-wound type which will give much better wear and service than a carbon type. Condenser C1, which controls the quench frequency, should be of known good quality with high insulation. The value of C1 is given as 0.01 μ F. This may have to be altered to suit different sets. For the rest of the components, use should be made of good quality parts, and dubious items should be avoided. In the original model, C3 was made by stripping down a "surplus" air-spaced trimming condenser until only two stators and one rotor remained. The batteries are held in place by spring clips made from pieces of scrap brass sheet.

Panel

The front panel of the receiver should be of insulating material. If plywood is used, it should be perfectly dry. The panel should be cut to the dimensions shown and drilled to take the mounting bushes of the various controls as shown. The mounting lugs of the coil and transformer T1 should be carefully marked out and drilled on the panel. Clips for the batteries should be mounted likewise. The tag strip for the smaller components should be positioned and holes drilled to hold it to the front panel. When drilling for the mounting bush of C3 (tuning), the assembly holes for the dial and pointer should also be drilled.

Wiring

Having mounted all the components on the rear of the front panel, wiring may be commenced. The wiring for the coil and inter-connections for the detector stage should be of the heavy, stout type. Loose or wandering connections should be avoided. Each joint should be carefully soldered using a clean, hot iron in conjunction with a resin-coated solder. Normal hook-up wire may be used

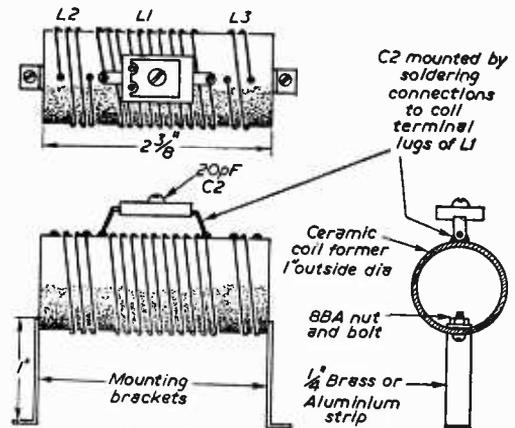


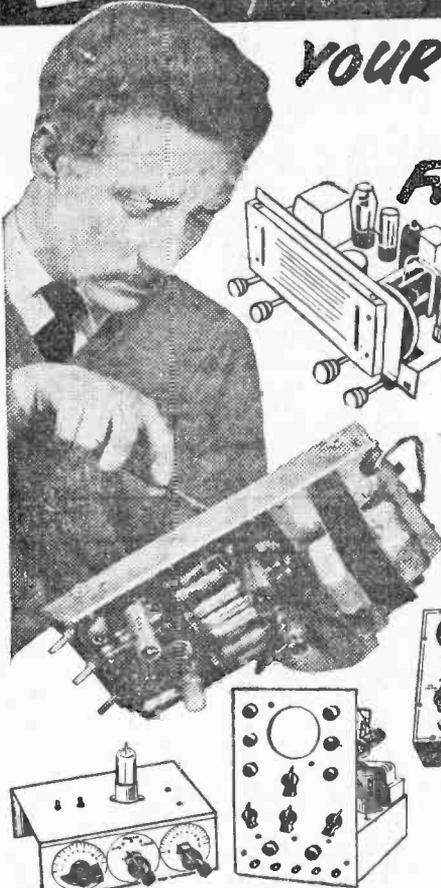
Fig. 4.—Coil winding details.

for the audio amplifier section. The transistors should be wired in last of all, using a heat shunt on each connecting wire when the soldering iron is applied. This will avoid damage to the transistors. The batteries should not be connected until all connections and interwiring has been very carefully checked to avoid the possibility of mistakes. Having made sure that all is in order, the ear-phones should be connected to the set and the batteries connected with the set switched off.

(Continued on page 1058)

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Miniature Add-in I.F. Stage

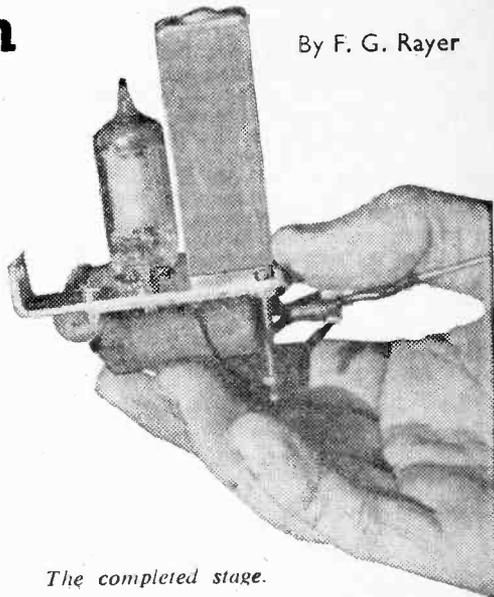
By F. G. Rayer

IMPROVE SELECTIVITY AND SENSITIVITY

VERY many receivers have one I.F. stage only, and it is usually possible to add an extra I.F. amplifier to these. Such a stage will give a quite considerable increase in sensitivity. There will also be an improvement in selectivity, and in the ability of the automatic volume control circuit to control fading. The addition is a relatively simple matter because the I.F. circuits are fixed tuned.

Heater Wiring

The I.F. stage shown here is of small size and space could often be found for it even in compact table receivers. The 6BA6 requires a 6.3V, 0.3A heater supply and if the receiver is of the AC/DC type, with 0.3A heaters in series, the 6BA6 heater is wired between the present I.F. stage and frequency changer, and the resistance of the line cord or mains dropper reduced by approximately 21ohms. In the case of receivers with heaters fed from a 6.3V transformer, the extra 0.3A can usually be drawn without overloading. If the heater transformer is fully loaded already, and of small size, an economy may be made elsewhere, so that current for the extra valve is available.



The completed stage.

The H.T. consumption is up to about 15mA, depending on the voltage. Good results can be obtained with less current, and the cathode bias resistor R1 can be increased in value if necessary. It should, however, be possible to obtain the small extra H.T. current needed.

The extra stage is particularly intended for receivers having one I.F. stage only. Care is needed if two I.F. stages are already present, or instability will be caused. If layout and screening cannot be improved, R1 may be increased from its usual value of approximately 68ohms (for the 6BA6 type) up to 250 or 500ohms. This will reduce gain, and help to restore stability.

Circuit and Layout

The circuit is shown in Fig. 1. The existing connection from the I.F. transformer to the present I.F. valve control grid is removed, the transformer being wired to the 6BA6 grid by means of a screened lead. The grid lead of the transformer in the new stage is then taken to the existing I.F. valve control grid. The new stage should be so positioned in the receiver as to allow short leads from it to the I.F. transformer and valve.

The stage is completely wired as shown in Fig. 2. Leads being left for AVC, H.T., and other connections. Transformer wiring must be correct, so the positions of leads or tags should be checked on the maker's leaflet.

Size

If very small size is not important, a little extra space can be allowed for the stage. An enclosed chassis would, however, make wiring up rather difficult, unless it is considerably larger.

The stage is fixed securely in the receiver in the position chosen. This can be done with brackets, long bolts with lock nuts, or any other means, according to circumstances.

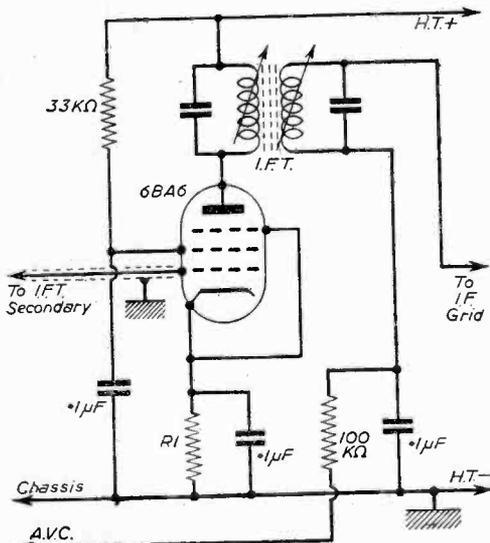


Fig. 1.—The circuit diagram.

This may be done by replacing a pair of 0.3A dial lights with 0.15A bulbs. If there is only one bulb, of 6.3V 0.3A rating, this can be replaced by a 6V, 0.04A bulb with a resistor of about 25ohms in series. But in most receivers the extra current may be taken without difficulty.

Connections

The important leads are those from the I.F. transformer to the new stage, and from the new I.F. transformer to the existing I.F. valve. These wires should be short, as mentioned. The grid lead to the existing valve may also need screening, but this depends on the layout.

The AVC connection is taken to the receiver AVC line. This can usually be traced from the existing first I.F. transformer. The H.T. voltage is best around 180 to 250V. The baseplate or chassis of the new stage must be in good contact

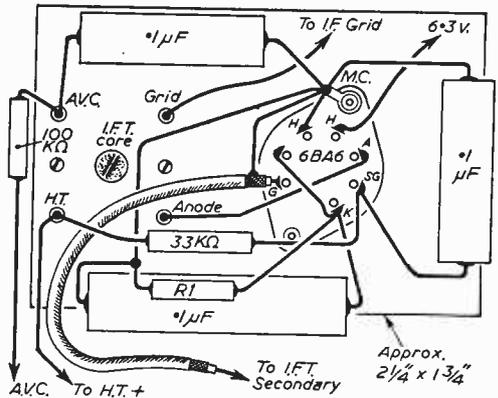


Fig. 2.—Wiring diagram.

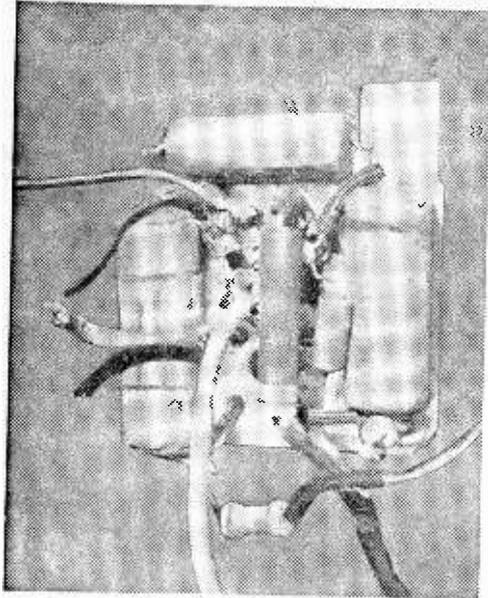
Normally it is only necessary to tune in a weak station, and adjust the cores of the new transformer for best volume. An insulated rod or trimming tool should be used, and the position of the transformer adjusting holes must be such that they can be reached.

Adjustments

If maximum possible selectivity is required, as in a short-wave set, the existing transformers in the receiver should be very slightly adjusted, as necessary for optimum results. But with an average receiver used for general purposes, it is not desirable to peak all the I.F. circuits exactly, but to stagger them slightly to give a "band-pass" characteristic in the interests of maintaining a good top response.

If instability arises as the new stage is adjusted, the steps mentioned should be taken. In some cases screening the stage may help, or the effect of decoupling the H.T. feed to the stage, by adding a 4.7k resistor and 0.1μF or similar condenser, can be tried.

The I.F. transformer in the unit must be adjustable to the intermediate frequency of the receiver. This will generally be around 465kc/s. and a 465kc/s transformer is then suitable. If there is any doubt about the intermediate frequency this should be ascertained first.



Underchassis view.

with the receiver chassis. In AC/DC receivers, or sets employing a centre-tapped 6.3V transformer, twin leads must be taken from the socket marked "H" in Fig. 2, because one side of the heater is not then taken to chassis.

RECIPROCAL TRADE FAIRS

AN agreement on the holding of reciprocal exhibitions of Soviet and British trade and industry in London and Moscow respectively during 1961 was signed in London recently.

The agreement was signed by Mr. M. V. Nesterov, President of the All-Union Chamber of Commerce of the USSR, Mr. V. G. Sherren, managing director of Industrial and Trades Fairs Limited, organizers of the British Exhibition, and Mr. F. Bower, President of the Association of British Chambers of Commerce.

The Soviet Exhibition which will occupy about 250,000sq ft, will be held in Earls Court, London, and will open on 7th July and close on 29th July, 1961. The price of admission will be 3s. 6d.

Soviet exhibits are expected to include both capital and consumer goods. The most comprehensive range of Russian machinery and other

equipment for the engineering industry ever to have been seen in the U.K. will be on display. There will also be features depicting the achievements of Soviet industry, science and technology. Russian foods and drinks will be served in the restaurants.

The British Exhibition will open on 19th May and close on 4th June, 1961. It will be held in the Sokolniki Park of Culture and Rest, Moscow, and will make use of the Glass and Dome pavilions, which were erected for the American Exhibition in Moscow earlier this year. Price of admission will be three roubles.

The exchange of exhibitions has the active support of Her Majesty's Government, and the Board of Trade will participate in the British Exhibition with a specially designed exhibit.

Frequency Meter BC 221

ITS PRACTICAL APPLICATIONS
AND USES

By H. J. Long, B.E.M. (G5LO)

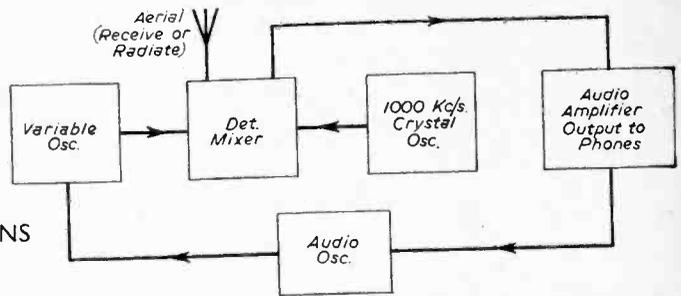


Fig. 1.—Block diagram of frequency meter BC221.

THE frequency meter or wavemeter as it is sometimes called is a useful piece of apparatus that should be found in most amateur stations. Amateur transmitting stations must be operated strictly within the allotted frequency bands; there must be no excuse for off-band operation, at least as far as the authorities are concerned. The importance of this is reflected by questions usually posed in the City and Guilds Radio Amateur's Examination, when the would-be amateurs knowledge of the use and application of a frequency meter will no doubt occur. The following notes are intended as a description and guide for the beginner in the practical use of the frequency meter, with particular reference to the popular American BC 221.

A frequency meter is an apparatus capable of measuring frequencies in any pre-determined band to which it has been calibrated. They can be as simple as the absorption type, which consists of a variable condenser and an inductance (coil), calibrated to cover the required range, or they can be complicated items costing thousands of pounds. As far as the radio amateur is concerned, the frequency meter must be fairly inexpensive, but must be capable of reasonable accuracy. Fortunately, large numbers of frequency meters were produced for use by the forces during the war, and became available on the "surplus" market afterwards.

Perhaps the most popular and sought-after frequency meter is the American BC 221. This is a portable instrument, battery operated, but can be adapted to mains operation by the addition of a small power pack. This requires about 150V H.T. at about 20mA, and 6.3V at 1A for the heaters.

Frequency Meter BC 221 contains:

- (1) A crystal controlled oscillator used as a reference standard;
- (2) A heterodyne oscillator with two fundamental tuning ranges which, with their useful harmonics, are calibrated to provide continuous coverage from 125 to 20,000kc/s;
- (3) A high gain detector provided with means of coupling to each of three sources of excitation;
- (4) An audio frequency amplifier;
- (5) An audio frequency oscillator, provided with means for modulating the heterodyne oscillator.

The block diagram (Fig. 1) shows how these five principal parts are lined up. Three valves are employed in the frequency meter: a 6K8, triode-hexode, and two 6SJ7s, pentodes.

Crystal Circuit

The crystal circuit uses the triode section of the 6K8 valve. The fundamental frequency of the crystal oscillator is approximately 1,000kc/s. A variable condenser is connected across the crystal for the purpose of adjusting the frequency of the crystal to a closer tolerance if required. The crystal is mounted inside an airtight enclosure to protect it from dust and moisture.

The crystal controls a valve oscillator, and the latter emits a virtually constant frequency of 1,000kc/s with additional harmonically related frequencies. These additional frequencies are exact integral multiples of the fundamental frequency; i.e., these added harmonics are 2, 3, 4, etc., times the fundamental frequency and are therefore 2,000kc/s, 3,000kc/s, 4,000kc/s, etc., and each has the same percentage of accuracy as the fundamental. They may be used as reference frequencies throughout the range of the meter. The highest harmonic used as a "crystal check point" is the 15th, or 15,000kc/s, but harmonics of much higher order are present although they become progressively weaker as the frequency increases.

The crystal circuit has two functions: It furnishes constant, exactly measured, frequencies by which to check and correct the calibration of the variable frequency oscillator. It radiates exactly known marker frequencies by which other equipment, such as a receiver, may be calibrated.

Variable Frequency Oscillator

The variable frequency section of the frequency meter consists of three essential elements, the tuning condenser, the coil assembly and the valve. The valve used is a 6SJ7 and is a pentode. Its function is to produce a signal the frequency of which may be adjusted as desired, and which is rich in harmonics to extend the useful frequency coverage without a large number of frequency bands. This signal may be radiated from the frequency meter into an adjacent receiver thereby acting as a frequency standard against which to set the receiver. The output of the variable oscillator may be mixed in the converter valve with signals picked up from a transmitter to produce zero beat and thereby obtain a measure of the frequency of the transmitter. This variable oscillator may also be modulated by the internal audio oscillator for use with receivers without a beat oscillator.

Detector Valve Circuit

The pentode portion of the 6K8 valve is the detector in the frequency meter. When making measurements on transmitters, energy from the transmitter is fed into the control grid of this valve through the aerial connection on the meter, while energy from the variable oscillator is also fed into the same grid. When the frequencies differ by only a few hundred cycles, a distinct audio beat note, equal in frequency to the difference between the two impressed frequencies, is

The calibration book contains a list of closely spaced frequencies together with their corresponding readings (dial). The scope of this list can be shown best in tabular form (Table 1).

Reading the Dial

The drum behind the small window on the front panel of the frequency meter indicates the reading of the dial setting in hundreds. The large dial shows the units; the vernier scale above and

Table 1. Scope of a typical calibration book.

LOW BAND

Harmonic Order	Frequency Range	Interval Between Listed Frequencies	No. of Listed Points
Fundamental	125—250kc/s	100c/s (0.1kc/s)	1251
Second	250—500kc/s	200c/s (0.2kc/s)	1251
Fourth	500—1000kc/s	400c/s (0.4kc/s)	1251
Eighth	1000—2000kc/s	800c/s (0.8kc/s)	1251

HIGH BAND

Fundamental	2000—4000kc/s	1000c/s (1kc/s)	2001
Second	4000—8000kc/s	2000c/s (2kc/s)	2001
Fourth	8000—16000kc/s	4000c/s (4kc/s)	2001
Fifth	16000—20000kc/s	5000c/s (5kc/s)	801

produced in the anode circuit of the detector and passed on to the audio amplifier.

For this, the operation switch is set at HET Osc.

When the switch is turned to XTAL CHECK, the signal from the variable oscillator is impressed on the control grid of the 6K8 valve, while the voltage from the crystal oscillator (triode portion of the 6K8 valve) is impressed on the injector grid of the pentode portion producing detection in the fashion of the familiar pentagrid converter.

The output (anode) circuit of the mixer is made responsive to low audio frequencies by using a choke of high inductance in the anode circuit, and has its high frequency response reduced by a condenser connected across the inductance.

Audio Amplifying Circuit and Audio Modulator

The audio amplifier is a conventional self-biased circuit except that the 6SJ7 pentode valve used is connected as a triode. The audio signal transmitted to the headphones can be adjusted manually by the gain control to suit the operator's requirements.

The audio oscillator is a simple oscillating circuit generating a tone of approximately 400c/s. Some of the earlier models of the BC 221 do not have this audio oscillator.

Calibration Book

Each BC 221 frequency meter should have a calibration book in the front cover of the meter case. Without it, the frequency meter is useless. Each book is different and bears the serial number of the meter to which it belongs. In the event of loss or damage, a new book must be calibrated. The book from another instrument can never be substituted.

adjacent to the large dial shows the tenths place of the setting. To read the vernier, find the line of the vernier scale which coincides most closely with a line of the large dial. The number of this vernier line (counting the arrow as zero) gives the tenths place of the complete dial setting. Fig. 2 shows the dial set for a reading of 0961.7. Before using the frequency meter for actual measurements, it is advisable to practice on the dial until settings can be read off quickly and accurately. It should be noted that these dial readings are not actual frequencies, but must be referred to the calibration book to find the frequency to which they refer.

Determining Frequency When Dial Reading is Given

Very often the desired frequency (when the frequency meter is being used to calibrate a radio transmitter) or the observed dial setting (when the frequency meter is being used to measure an unknown frequency) may fall between the values listed in the calibration book. To aid in calculating the proper dial setting or measured frequency corresponding to these intermediate values, the following method can be used. If, for example, the observed dial setting is 2428.8 and lies between two successive book values of 2430.2 and 2428.1, and their corresponding frequencies are 2936 and 2935kc/s (fundamental), the frequency (f) corresponding to the 2428.8 dial setting is determined as follows:

Dial Readings	Frequency
2430.2	2436kc/s
2428.8	f kc/s
2428.1	2935kc/s

Therefore, when the frequency generated increases by 1kc/s, the dial reading increases from 2428.1 to 2430.2, that is, by 2.1 divisions.

Therefore, no. of kc/s per dial division = $[1/2.1]$.
 When the frequency increases from 2935kc/s to f kc/s, the dial reading increases by 0.7 divisions.

$$\text{Therefore, } f = \left\{ \frac{1 \times 0.7}{2.1} + 2935.0 \right\} \text{ kc/s}$$

$$= 2935.333\text{kc/s}$$

Further Explanation

The difference between the two book values of frequency is 1kc/s and corresponds to 2.1 dial divisions. The frequency in kilocycles or dial divisions is then found by dividing the 1kc/s by the 2.1 dial divisions (and is 0.4762). The difference between the observed dial setting and the book value dial setting for the lesser book frequency is 0.7 of a division. The frequency which this difference represents is then the product of the difference and the number of kilocycles per division. 0.4762×0.7 or 0.333kc/s. This is then added to the lesser book frequency, $2935 + 0.333$, or 2935.333kc/s, the frequency corresponding to the 2428.8 dial setting.

Determining Dial Reading When Frequency is Given

Conversely, to adjust the frequency meter to a given frequency which falls between the book values, it will be necessary again to make an interpolation to determine the exact dial setting to be

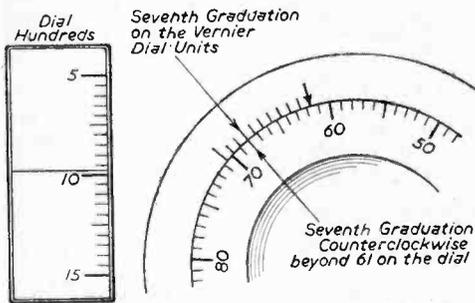


Fig. 2.—Reading the vernier scale; the dial is set at 0961.7.

used. For example, it is desired that the frequency meter be adjusted to 2935.333kc/s. The necessary calculations follow:

Dial Readings	Frequency
2430.2	2436.0kc/s
D	2935.333kc/s
2428.1	2935.0kc/s

Therefore for an increase in dial reading of 2.1 divisions the frequency increases by 1kc/s.

Therefore no. of dial divisions per kc/s = 2.1.
 When the dial reading increases from 2428.1 to D the frequency increases by 0.333kc/s.

$$\text{Therefore } D = \left\{ (2.1 \times 0.333) + 2428.1 \right\} \text{kc/s}$$

$$= 2428.8\text{kc/s}$$

This method is accurate for all frequency columns (harmonics) in the calibration book. For practical purposes, the nearest book value would suffice.

The Frequency Meter in Use

In use, the frequency meter should be switched on and allowed to warm-up for at least 15 minutes to allow for any drift that might take place. Also, whenever a frequency is to be checked, the variable oscillator should be adjusted to "zero beat" at the nearest "check-point" in the calibration book. Furthermore, when a transmitter frequency is being checked, this type of heterodyne frequency meter should always be used in conjunction with a simple type of absorption frequency meter. The heterodyne frequency meter gives an indication at the fundamental frequency and also its harmonics, whereas the absorption type, although not so accurate (it need only be roughly calibrated to the required band) will only respond to the fundamental frequency to which it is tuned, and is a valuable safeguard.

BBC YEARBOOK 1960

THE BBC Yearbook for 1960 was published on January 27. The following are some points from the book:—

Television

The Television Service maintained its two-fold aim, first to present programmes which have a general appeal and which attract very large audiences, secondly to provide programmes which stimulate thought, widen people's horizons and enhance their artistic appreciation. Something approaching half of the BBC's total output during the year consisted of material of this kind.

Alternative Television Service

The Corporation reaffirms its belief in the need for a planned alternative television service, in the interests of the viewing public.

The BBC Regions

The development of television facilities and resources in the BBC regional centres meant that regions were able to play an increasingly responsible and representative part in the service of programmes broadcast to the country as a whole. In sound radio, the coming into service of more V.H.F. transmitters allowed further extensions of area broadcasting and the broadening of existing area services with new programme material catering for local interests.

Jamming

The penetration of jamming by broadcasts to the Communist-dominated countries of Europe was confirmed by evidence of wide-spread listening in the U.S.S.R. and the satellite countries.

Coverage

During the year the substantially interference-free V.H.F. service was extended to make BBC programmes available on this system to 96.4 per cent of the population. This is in addition to the existing long and medium wave systems which cover the whole of the British Isles.

By the first quarter of 1959 BBC television programmes could be received by 98.5 per cent of the population, and the planned building of fourteen satellite stations would increase coverage by 200,000 people and an improved service become available to a further 940,000 people.

The Yearbook is published by the BBC and the price is 6s. 0d. exclusive of postage and is obtainable from booksellers and BBC Publications, 35 Marylebone High Street, London, W.1.

Record Player and Cabinet

By R. S. Higgs

A HIGH quality record player that looks really professional with a low, modern cabinet can be constructed by any handyman who can use the simplest carpentry tools and a soldering iron. The record player described will give really high quality reproduction of modern high fidelity records that will satisfy the most critical music lover.

Panels

The cabinet is designed to avoid anything that is tricky or difficult in carpentry and to this end, use has been made of the ready prepared, fully

The amplifier can then be constructed and all components fixed in place on the front panel. Countersunk screws should be used for speaker and chassis fixing in order to leave a flat surface for the speaker cloth panel which will later cover all screw heads. It should be noted that the Cossor chassis brackets should be fixed by the nuts and bolts provided only in the case of the top holes. The lower fixing holes should be used for a $\frac{1}{2}$ in. wood screw driven in from the back otherwise the front panel will be spoilt by two unsightly bolt heads which would show below the speaker cloth panel.

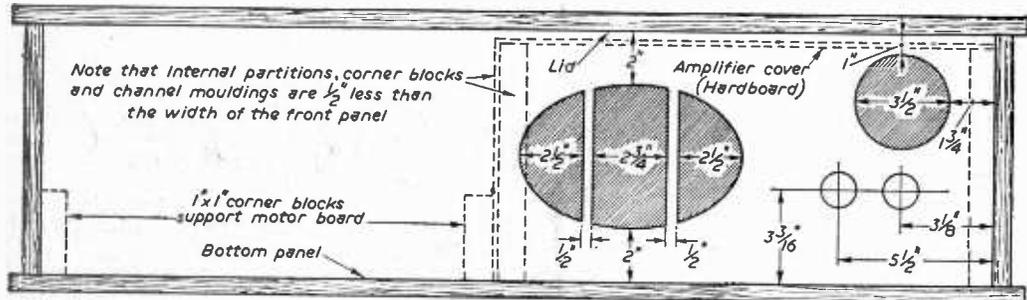


Fig. 1.—The front panel showing the cut-outs required for the loudspeakers and control knobs.

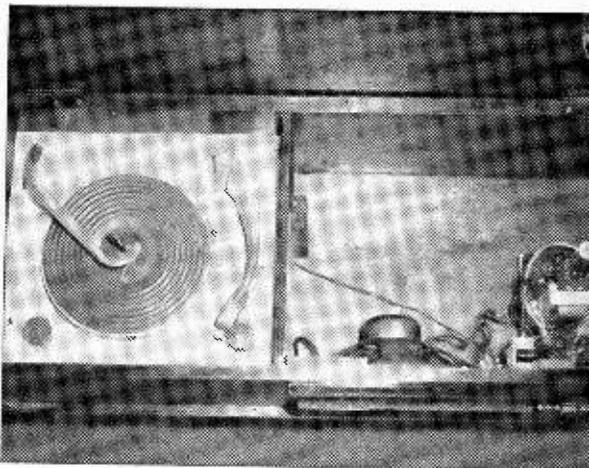
veneered chipboard panels now obtainable in standard sizes. These panels are veneered on all sides and edges and are simply glued and panel-pinned together with corner blocks inside for strengthening where possible.

The gramophone unit and amplifier are readily obtainable from many radio component dealers. The units used in the record player described were the B.S.R. Monarch U.A.8., 4 speed, 10 record autochanger obtainable for about £6 12s. 6d. and the amplifier was the Cossor 3W audio amplifier obtainable in kit form from many radio dealers for about £5 19s. 6d. This kit has the advantage of having twin loudspeakers included and is easily constructed with printed circuit and most of the components already mounted and connected.

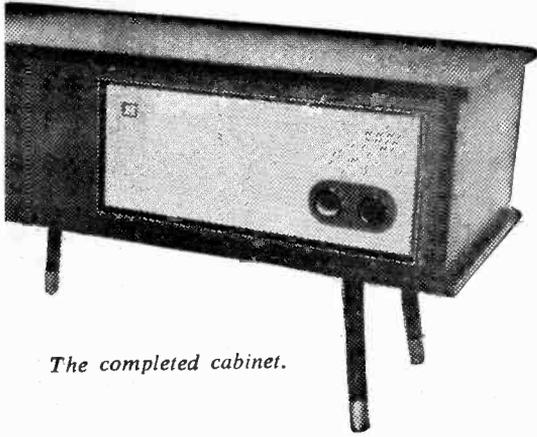
Procedure

A start is made by taking the best of the 9in. wide boards for the front panel. The necessary cut-outs for the speakers and holes for the control knobs are cut after reducing the length of the panel from 3ft to 2ft 9 $\frac{1}{2}$ in. The shape of the cut-outs and holes will of course, vary according to the components used, but in the case of the Cossor equipment, the pattern will be as shown in Fig. 1. A paper pattern is included in the Cossor kit which would need to be re-arranged to suit the "long low" cabinet.

The cabinet can then be assembled as follows:—
Cut one 3ft. x 9in. panel 2ft 9 $\frac{1}{2}$ in. long to form the back. The remaining 3ft x 9in. panel is used for the two ends. This is done by cutting a 15in. length from each end of the panel, leaving the 6in.



The record player from above.



The completed cabinet.

of waste in the middle. Thus each end piece will have a veneered edge to face the front. Glue and panel-pin the parts together as in Fig. 2. Note that the front panel is set back $\frac{1}{4}$ in.

The whole of the cabinet so far assembled should then be sandedpapered with fine sandpaper. Note that the only cut edges now showing are the two rear edges of the side panels.

The bottom panel should then be fixed in place using glue and $1\frac{1}{2}$ in. countersunk screws all the way round. This panel will overlap the sides by $\frac{1}{4}$ in. each end and of course will continue the recessing of the front panel also by $\frac{1}{4}$ in.

Motor Board

The next stage should be to prepare the motor board. This board consists of a piece of plywood not less than $\frac{1}{4}$ in. thick and about 13 in. by 14 in. A cutting pattern will be included with the record turntable unit, and this rather complicated shape can be easily managed with a keyhole saw or padsaw. Do ensure, however, that when mounted on the board there is at least $6\frac{1}{2}$ in. clear in each direction from the spindle centre, otherwise there will be difficulty in playing 12 in. records.

The internal partition can then be fitted to form the separation between the motor compartment and the amplifier. This can be a piece of veneered plywood about $\frac{1}{4}$ in. thick and is kept in place by pieces of 1 in. square timber glued in place on the base of the cabinet and also in the corners to form the supports for the motor board. These supports should be $3\frac{1}{2}$ in. long and should be repeated below the opposite end of the motor board as in Fig. 2.

Record Compartment

The remaining partitions to protect the amplifier and to form a compartment for storage of 7 in. records can be constructed easily by using some hardboard channel moulding into which a piece of

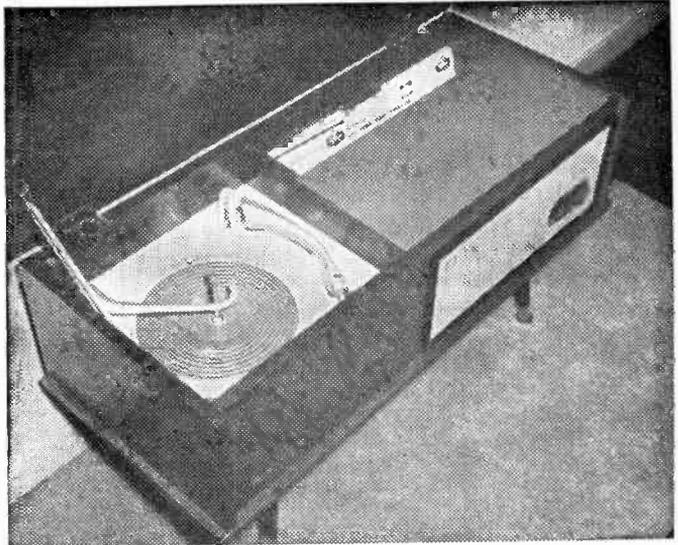
hardboard can be slotted with a similar piece forming a cover over the amplifier.

Wiring

Wiring up the unit is carried out as in Fig. 3 by providing a twin flexible lead from the mains through a 2A fuse to the porcelain connector. The mains supply cables of the amplifier and motor can then be connected to the porcelain block. When connecting the pick-up lead from the amplifier to the pick-up connector tags below the motor unit, you must use coaxial cable, connecting the centre core to the red lead of the pick-up and the outer sheath to the earthed lead. It will probably be found advisable to earth the metal panel carrying the motor independently to the outer sheath of the coaxial cable in order to reduce hum to a minimum. The unit may now be tested and if all is well—and there is no good reason why it should not be—the finishing touches can be added.

The lid is fitted with two 3 in. cabinet hinges and is supported with a cabinet lid stay.

The speaker cover panel is made up by using a piece of stiff cardboard of the necessary size to cover the speaker apertures, i.e. approximately $7\frac{1}{2}$ in x 18 in., cutting out suitable openings in front of the speakers and a shaped section to coincide



The finished cabinet has a professional appearance.

with the control knob panel. The cardboard is then covered with speaker cloth. An impact adhesive will be most useful for this in order to obtain a really neat finish. If the Cossor amplifier is used the clear plastic panel provided can be mounted behind the knobs before the speaker cloth panel is fixed, but in order to make the plastic panel with its gold transfer lettering show up better, give the panel a couple of coats of enamel (black or brown is suitable) over the gold lettering on the wrong side. When this is dry, the gold transfer stands out well against its enamelled

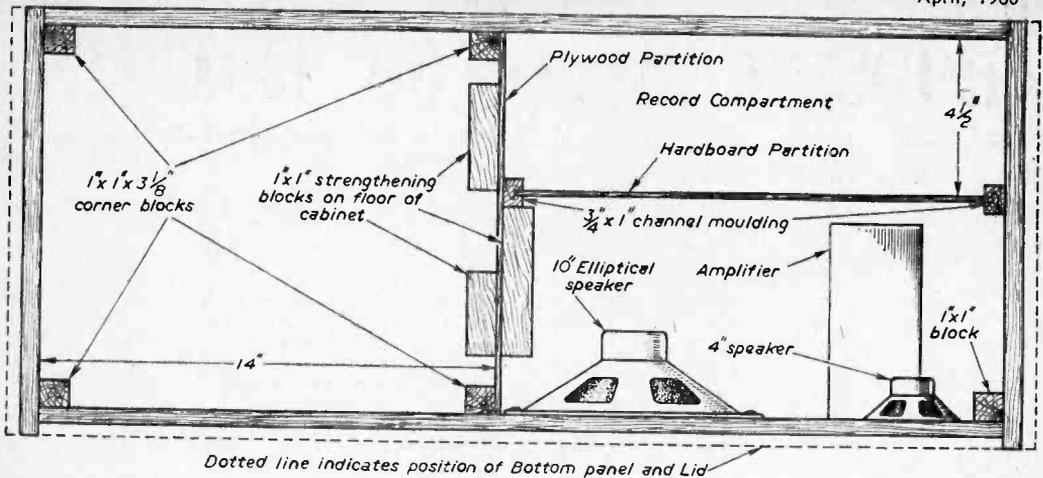


Fig. 2.— Plan view of the cabinet.

background. The speaker cloth panel can then be mounted in place using impact adhesive. A finishing touch can be given by framing the panel. This is ordinary modern picture frame moulding mitred and glued and then enamelled black. Before fixing in place, the front edge only is carefully sandpapered to expose the bare wood, this is then polished with wax polish and the frame glued into place.

The legs can be purchased already polished black and fitted with brass ferrules, and the fixing plates are quickly screwed into place. As the brass ferrules may dig rather unpleasantly into the carpet, a set of lin. rubber heels of the ordinary revolving kind can be screwed on to the base of the ferrules.

Finishing the cabinet consists of filling all pin holes and joint cracks with wood filler, carefully sandpapering down to a good finish and then

applying stain and a coat of wood sealer. Further sanding using the finest grade obtainable and a good coating of wax polish will produce a finish that will bear comparison with the far more expensive items in the local radio shops.

The Interior

To give a smart appearance inside the unit, the motor board, and the walls of the motor compartment to a height of about 4in. can be covered with

PARTS REQUIRED

- 1 4 speed autochanger record player unit.
- 1 Audio amplifier (about 3-4W output).
- 1 Set 9in. legs with metal fixing plates.
- 2 Veneered chipboard panels 36in. x 15in.
- 3 Veneered chipboard panels 36in. x 9in.
- 1 Cabinet stay.
- Tygan speaker cloth 19in. x 9in.
- Picture moulding (6ft).
- Adhesive plastic sheet— $\frac{1}{2}$ yd.
- 1 Porcelain junction block.
- 1 2A fuse and holder.
- 2ft coaxial cable.

Screws, panel pins, glue, solder, mains connecting lead, odd blocks of wood and plywood or hardboard for internal divisions, wood stain, filler and wax polish, hinges, etc.

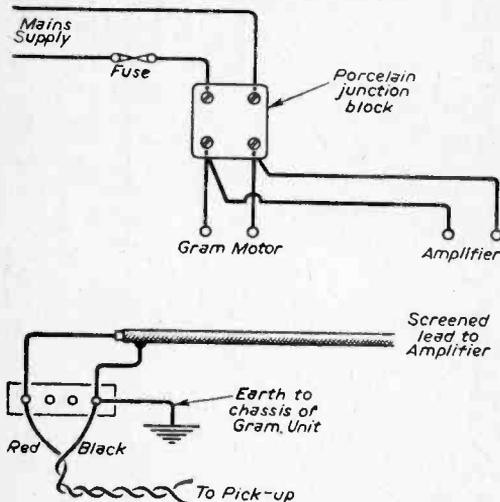


Fig. 3.— Mains and amplifier wiring.

a white plastic sheeting. This is also used to cover the hardboard cover of the amplifier. The remainder of the interior can be polished to match the outside.

Criticism

In conclusion, it may be stated that the pleasing appearance of the cabinet will put an end to the oft-voiced criticism of home-constructed apparatus—that it is only fit for the workshop or laboratory. The final touch to the author's record player was given by using some adhesive metal foil letters bought in a large store, to decorate the front with his initials.

CHOOSING DETECTOR CIRCUITS

CIRCUITS AND CHARACTERISTICS OF DIFFERENT TYPES

By J. B. Dance

EVERY radio and television receiver employs some form of detector (also known as a demodulator) which converts the incoming radio frequency signal into an audio frequency signal. The various types of detector circuits each have their own particular advantages and disadvantages.

Diode Detectors

The simplest form of detector circuit uses a diode. A form of diode was used in the crystal sets which were made in the early days of radio but nowadays a germanium diode would be used for a crystal set in order to achieve reasonable mechanical stability.

A simple diode detector circuit is shown in Fig. 1 with the filter circuit which removes the carrier frequency from the audio output. The filter consists of a resistor (R1) and two condensers (C2 and C3); the condensers are chosen so that they present a low impedance to the carrier frequency and a high impedance to the audio frequency. If the carrier were not removed it might cause instability or overloading of the amplifier which follows the detector. The condenser C4 prevents the D.C. output from the

supply and to keep the size of the circuit to a minimum.

The diode detector will handle large signals and the linearity is very good providing that the signal input amplitude is not less than about ten volts peak. It is, therefore, suitable for use in high fidelity circuits providing care is taken to avoid A.C. shunting of the detector output circuit which consumes power from the previous tuned circuit

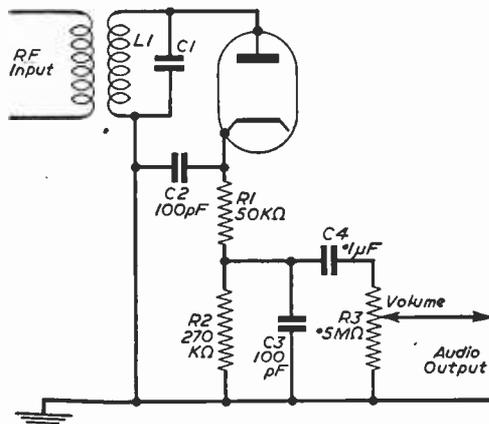


Fig. 1.—A practical diode detector circuit.

and, therefore, reduces the effective Q and the selectivity. The diode gives no gain and therefore the sensitivity of the diode detector circuit is low. This disadvantage is overcome in most simple broadcast and superhet receivers by the use of a double diode triode valve as shown in the circuit of Fig. 2. In this circuit the upper diode is the audio detector. The output from the detector is applied to the triode grid for amplification and the other diode is used to provide delayed AGC.

Leaky Grid Detectors

Leaky grid (or cumulative grid) detectors give a greater gain than any other type of single valve detector except the super-regenerative circuits. They are therefore very useful in battery receivers where the number of valves must be kept to a minimum in order to keep the power consumption low and are also usually used in simple one or two valve receivers. This type of detector circuit is not usually used in super-heterodyne receivers because it is so easily overloaded.

A typical circuit of a leaky grid detector is shown in Fig. 3 (neglecting, for the moment, the components shown dotted). The grid of the valve acts in the same way as the anode of the

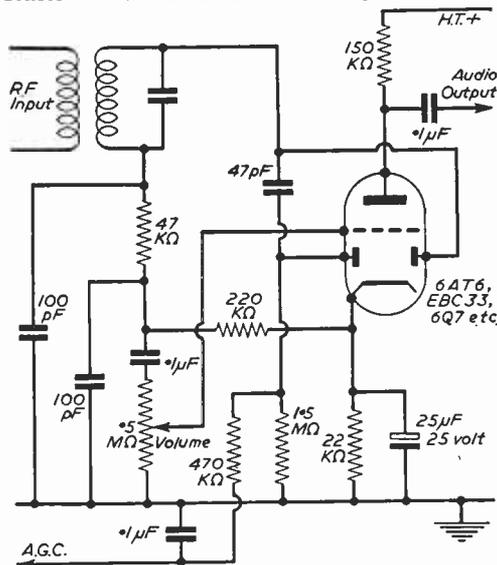


Fig. 2.—A double-diode-triode used as a detector, audio amplifier and AGC rectifier.

diode from passing into the volume control and the audio amplifier. The flow of D.C. through a high resistance gain control may cause "scratchy" noises. A suitable germanium diode (e.g. OA73) may be used instead of the valve diode in order to avoid the need for a heater

diode detector; the detection takes place in the grid circuit. The grid is biased by the rectified signal, no other bias being required. The condenser C2 and the grid leak resistor R1 are chosen so that the biasing voltage changes at the

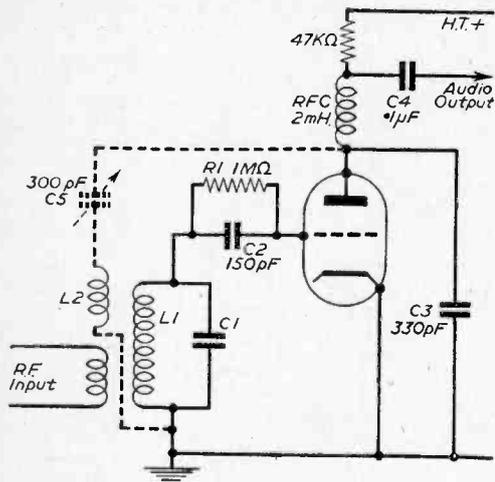


Fig. 3.—A leaky grid detector. The components shown may be used to make the stage regenerative.

audio frequency but not at the radio frequency. The audio biasing voltage is amplified by the valve in the ordinary way. C3 and RFC remove the carrier from the output of the detector. This type of detector is really equivalent to a diode detector followed by an audio amplifier.

Alternative Values

The amplification of the circuit can be increased by raising the value of R1 to about 3M but this will also reduce the signal handling capability of the circuit. Alternatively R1 may be reduced to about 100k and C1 to about 50pF in order to increase the signal handling capacity and the high audio frequency response at the sole expense of sensitivity; a leaky grid detector operated under these conditions is often called a power grid detector.

The gain of the circuit may be increased by the use of a pentode valve as shown in Fig. 4. Alternatively if a triode is used, the resistor R2 of Fig. 3 may be replaced by the primary of an audio transformer in order to obtain more gain. The output would then be taken from the transformer secondary and C4 of Fig. 3 would not be required. If a pentode is used it is not practical to use a transformer because pentodes have a very high anode resistance. The same performance will be obtained from the circuit if the grid leak resistor R1 is connected between the grid and cathode of the valve instead of in the position shown in Fig. 3. A valve having a low mutual conductance and a low amplification factor will operate satisfactorily at higher input voltages than modern valves, but the gain is lower.

Although the high gain of a leaky grid detector is often useful, the circuit has a number of disadvantages and is not often used in modern receivers. The tuned circuit feeding the detector is loaded by R1 and its selectivity is therefore reduced. The linearity is poor and the signal handling capability is very limited so that the circuit is not used when good quality reproduction is desired. The circuit is not very efficient at small input voltages.

Regeneration

The sensitivity and selectivity of the leaky grid circuits can be improved considerably by the use of some positive feedback (reaction or regeneration). This is not possible with diode detectors because they do not amplify. The only components required to make a leaky grid detector circuit regenerative are shown dotted in Fig. 3. As the condenser C5 is increased in value, the amplification of the detector circuit increases until it eventually oscillates. The sensitivity and selectivity are greatest just before oscillation commences. It is important to connect L2 (the feedback or reaction) the correct way round or the feedback will be negative and the sensitivity will be reduced. If no regeneration can be obtained the connections to the reaction coil should be reversed. It should be at the earthed end of the grid coil and the number of turns used should be the minimum which will allow the circuit to oscillate on all the input frequencies. Generally the number of turns should not be more than about one sixth of the number of turns on the grid coil, L1. For a certain setting of C5 the amount of regeneration depends on the input frequency.

Anode Bend Detectors

In anode bend or plate detectors rectification takes place in the anode circuit of the valve. Negative bias is applied to the grid (or positive

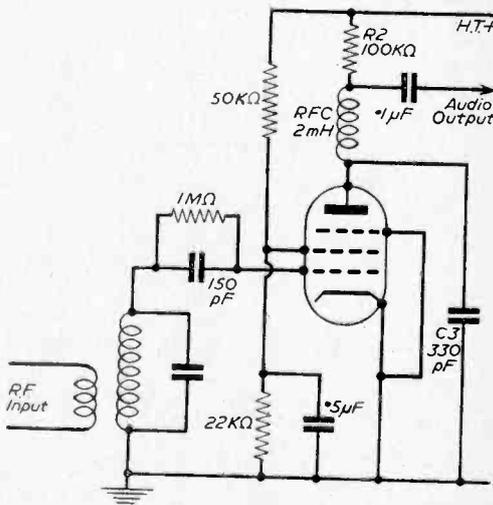


Fig. 4.—A leaky grid detector circuit using a small pentode.

voltage to the cathode) so that the valve is almost cut off; i.e., the anode current is very small. When a signal is applied to the grid, the anode current increases. A triode may be used as shown in Fig. 5, but more gain can be obtained from a pentode. Both audio and R.F. frequencies are by-passed by C4. The RFC and C3 remove R.F. frequencies from the audio out-

put at audio frequencies (but not at radio frequencies) and audio distortion is much reduced. The loss of gain is also very considerable. The results obtained from an anode bend detector with negative audio feedback are intermediate between those which can be obtained without feedback and those obtained from a cathode follower detector circuit.

Cathode Follower Detector

This type of detector imposes a smaller load on the tuned circuit feeding it than any of the circuits described above. It is, therefore, sometimes known as an infinite impedance detector. A circuit is shown in Fig. 7 (page 1066). The condenser C3 is of such a value that it bypasses R.F. signals but not audio signals. If C3 is much too small the detector can become unstable. C4 prevents the D.C. voltage from being applied to the following audio amplifier and C5 in conjunction with R3 filters out the carrier.

The cathode follower detector is very similar to the anode bend detector except that the signal is taken from the cathode; negative feedback therefore occurs at audio frequencies. The output voltage is always slightly lower than the input voltage. The signal handling capabilities of the

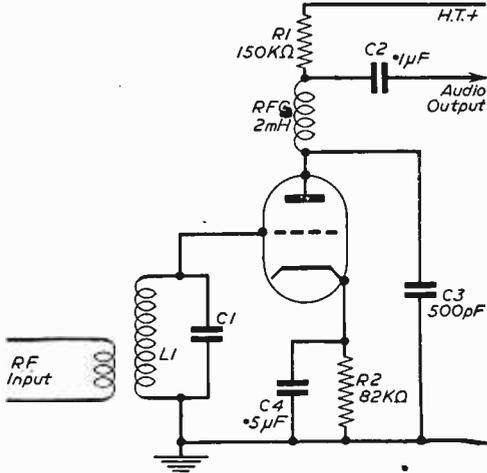


Fig. 5.—An anode bend detector using a triode.

put. The output from an anode bend detector cannot normally be transformer coupled to the next stage because the anode resistance of the valve when biased nearly to cut-off is very high.

The value of the bias voltage required for an anode bend detector is too critical for it to be obtained from a grid bias battery and a resistor should be used in the cathode lead as in Fig. 5. If the characteristics of the valve change during life or if the valve is replaced at any time, the self compensating action of the circuit will provide the correct bias under all conditions.

The anode bend detector has the advantage that it does not impose an appreciable load on the tuned circuit (providing the detector is not overloaded) and therefore maximum selectivity is obtained. Although the amplification obtained from an anode bend detector is less than that obtained from the leaky grid circuit, it is nevertheless much more sensitive than the diode circuit. The anode bend detector will handle larger signals than the leaky grid circuit but it is much inferior to the diode in this respect. The linearity for small inputs is very poor.

Anode Current

When a signal is tuned in, the anode current of an anode bend detector increases but that of a leaky grid detector decreases owing to the extra negative bias. It is therefore possible to ascertain which of these two types of detector circuit is being used in a receiver by placing a milliammeter in the detector anode circuit and noting the reading with and without a signal.

Much less distortion at the expense of sensitivity can be obtained from an anode bend detector if the value of C4 in the circuit of Fig. 5 is reduced to about 200pF. Feedback then occurs

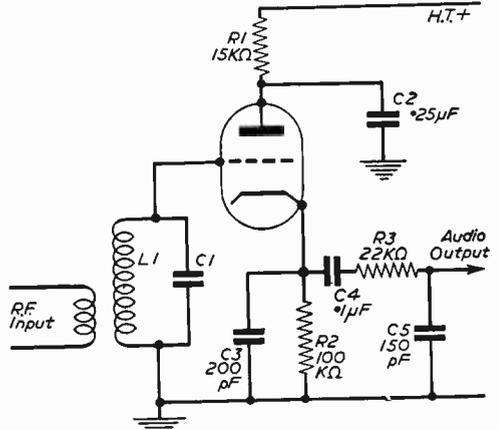


Fig. 6.—A cathode follower detector circuit.

cathode follower detector are good. The linearity of the anode bend detector is only fair, but this is vastly improved in the cathode follower circuit by the negative feedback. The cathode follower detector can, therefore, be used in high fidelity circuits and is especially useful for TRF tuner units for local station reception when it is desired not to load the previous tuned circuit in order to obtain maximum selectivity. The distortion and sensitivity of the cathode follower detector are about equal to that of the diode circuit. The cathode follower detector gives its best performance at fairly high input voltages (about ten).

Obtaining AGC

One of the greatest disadvantages quoted against the cathode follower circuit is that AGC cannot easily be obtained. This is probably the major reason why it is not used to a greater extent
(Continued on page 1066)

Simple Morse Oscillator

A TRANSISTORISED CIRCUIT

By J. H. Talbot

IF, as is hoped, the would-be amateur transmitter has followed the instructions given in the February issue of PRACTICAL WIRELESS, in memorising the morse code, he should be in a position to think about having some practice in sending on a morse key, for it is only by constant practice that one is able to master the art of sending and receiving morse code.

Suitable Key

The first requirement is a suitable morse key. There should be no difficulty in obtaining, at moderate cost, a well balanced, adjustable morse key from one of the many dealers in ex-government equipment.

The function of the morse key is to make and break the transmitted carried wave (CW), into a

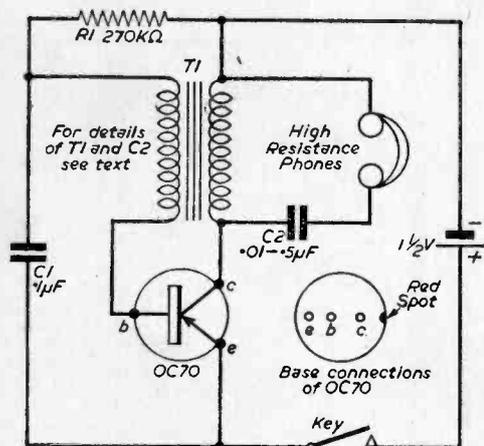


Fig. 1.—The circuit diagram.

timed sequence, so that the intelligence of the morse symbol is conveyed to the receiver. Remember that a dash is equal to three dots in time, while the interval between the dots and dashes in a sequence equals a dot in time, between two letters in a word the interval equals three dots and between two words five dots.

Oscillator

For practice purposes, some form of audio frequency oscillator will be required. A signal generator could be used, provided it has a modulated tone and can be keyed. However, it is strongly recommended that the transistor audio frequency oscillator, of which details are given, should be constructed. It has several advantages over the usual type of audio oscillator.

The cost is very modest, as apart from the purchase of the transistor, most of the few components required will no doubt be found in the

"spares" box. Power requirements are also very low: a single $1\frac{1}{2}V$ battery will give a good signal in the headphones. Also, on being keyed, the oscillator is free from key clicks, thump or chirp, which can be rather distracting to the beginner.

Circuit Details

The circuit, which uses an OC70 transistor, is shown in Fig. 1. Oscillation is produced at audio frequency by feedback from collector to base of the transistor by means of a small intervalve transformer. The type of transformer does not appear to be at all critical, provided it has two separate windings, with a fair amount of turns on each. It will have some bearing on the frequency of the tone produced, but if the value of condenser C_2 is varied, it should be possible to produce a tone of approximately 400c/s frequency, which is about right for a morse practice set. Resistor R_1 , which is 270k, provides the bias and limits the current drawn by the collector. With the values shown in the circuit and with $1\frac{1}{2}V$ applied, the total collector current as measured was just on $300\mu A$ (0.3mA). If, on testing, no signal is heard in the headphones, the leads on one of the transformer windings should be reversed.

Construction

Apart from the usual care needed when soldering transistor leads (by the heat-shunt method) the actual constructional details are left to individual requirements. If the transformer used has a tag-board, the few components could be grouped on this, and the whole unit, including the battery, housed in a small box, with a couple of jack sockets on the lid for plugging in the headphones and morse key.

One other point, be sure that the battery is connected so that negative voltage (—) is applied to the collector of the transistor. If positive voltage (+) is applied, if only for an instant, the transistor will be destroyed.

Other Uses

In conclusion, it might be mentioned that this handy little unit might well have other uses. In the writers case, so well did it perform, that it was promptly installed into a resistance/capacity bridge, in place of an existing mains-driven audio oscillator, where it is giving excellent service.

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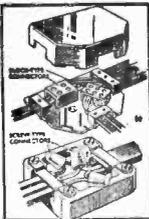
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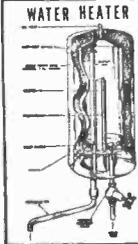
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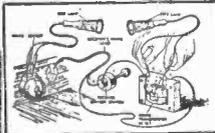
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Repairing "Staar Motors"

WINDING NEW COILS FOR "GALAXY" RECORD CHANGERS
By D. Brammer

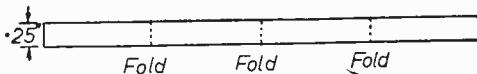
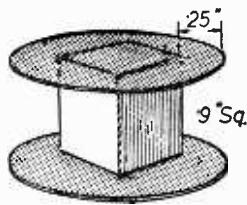


Fig. 1.—The coil former.

THE motor fitted to Staar Galaxy record changers is very compact, and quiet in operation. No cooling-fan is fitted, and as a result it overheats with prolonged use, the insulation suffers and one or both of the two coils shorts to the frame, which is earthed, and it burns out. Repairing the motor is not a difficult task, providing care and patience are exercised.

Dismantling

Before the motor can be removed, the grub-screw securing the motor pulley to the shaft of the motor must be removed, or else difficulty will be found in withdrawing the motor later on. First remove the top cover by undoing the Phillips screw next to the speed selection lever, and by lifting the record-steady arm and swinging it sideways, after the tone arm has been lifted from its rest, it will be easy to lift the cover clear. A small Allen key will be required to loosen the grub-screw. If one is not available, a simple substitute can be made by bending over the end of a piece of 20s.w.g. piano wire, and this should just fit in the grub-screw. When the motor pulley has been removed, it should be put aside in a small box, and as work progresses, other small pieces should be added, for they are easily lost. As the unit will be upside down whilst the next stages are in progress, it is a good idea to remove the turntable, because of its weight. This is done quite simply by removing the spring-clip which holds it in place, and lifting it out. Before the unit is inverted, the clip anchoring the wires which lead from the motor to the voltage selector and to the micro-switch (if fitted) should be unscrewed. Note down carefully where the motor wires are connected, and disconnect them. On some models the connections are made under the "chassis"

and cannot therefore be reached yet. Now the unit must be inverted. If it is mounted on a plastic base, leave it on for the time being; it makes it easier to handle.

Raise the record-steady arm and swing it inwards (towards the speed selector) as far as it will go. Holding it in that position, invert the unit and place it on the bench so that it rests on the centre-spindle and the record-steady arm. Lift the plastic base, and put it away. Having made sure that the motor is disconnected, remove it. This is done by removing the spring clips from the three supporting pillars, and lifting it clear. It will be evident on examination that before any work can be done on the motor, the mounting plate must be removed. It is riveted on to the frame of the motor at two diagonally opposite corners, and the rivets can be drilled out easily.

Bearings

The next step is to remove the two black steel spring clips which secure the bearing cages. In the bottom bearing is a small ball. It must not be lost. When the rotating part of the motor is removed it will be seen that there are four pieces of metal which can be withdrawn (see Fig. 3) from the frame of the motor by sliding them out, either upwards or downwards. A metal strip (see Fig. 3) is bent around each coil, holding it against the frame. When these have been removed, the coils can be eased out. Assuming that only one coil has burnt out, and that the other one is still usable, it is a good idea to improve the insulation of this coil by packing thin pieces of Paxolin, transformer paper, or some other insulator around it, so that the coil does not touch the frame anywhere.

Cardboard Former

A former should be made up, of thin cardboard, as in Fig. 1, and the parts fixed together with self-adhesive tape. Fix the former on a coil winder, and wind on 40s.w.g. enamelled wire until the former is nearly full. Test its resistance, which should be about 500Ω. Adjust the number of turns until this figure is obtained. Cut the wire, remove the coil, and cut the tape away carefully with a sharp modelling knife or razor blade. When the former has fallen away from the coil wind on the insulating tape, tightly. The ideal tape width is 3/4 in., and as this may not be available, normal 1/2 in. tape may be cut in half down the centre to produce this. When two or three layers have been wound on, solder on the connecting wires, and add another two layers to secure these wires.

Testing

When the motor has been re-assembled, it should be tested before replacing it in the player. The

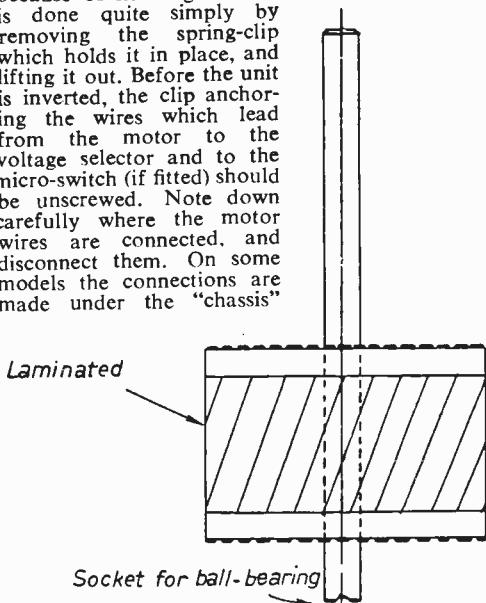


Fig. 2.—The rotor of the unit.

coils should be connected in series for operation on 210-240V A.C. mains, and it should run noiselessly. If it is noisy, the motor is probably off centre. To cure this, just loosen the two block clips and move one of the cages slightly. Replace the clips and test the motor again. If the fault persists it is possible that one or more of the "pole pieces" inside the motor are slightly out of position. This can be checked by removing the bottom cage and sliding the motor out. When the motor is running satisfactorily, the top mounting plate may be soldered on, after first scraping off the varnish.

Should the motor run too slowly, one of the coils is out of place, and its connections should be reversed.

Final Assembly

The motor may now be replaced in the player. Check all the winding very carefully before connecting to the mains. The only other point to watch is that the motor pulley is at the correct height for the speed change to operate and that its grub-screw is well tightened. The rest should be plain sailing!

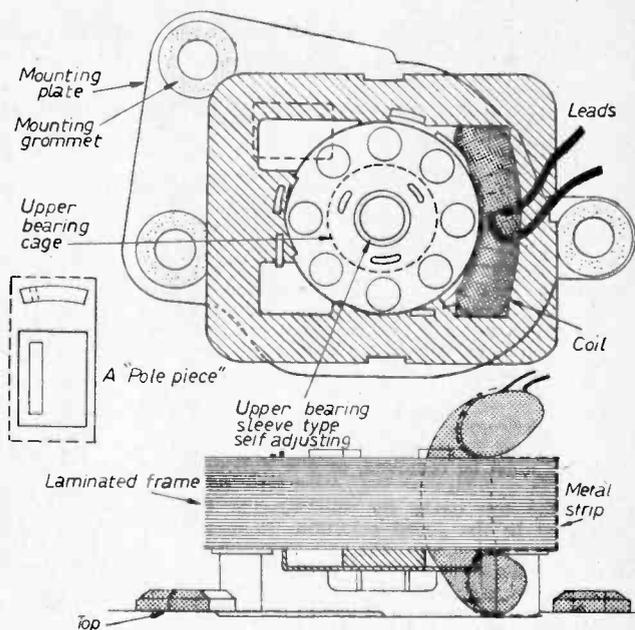


Fig. 3.—Diagram of the motor.

A QUALITY OCTET

(Continued from page 1032)

3-gang capacitor has been removed a length of $\frac{1}{4}$ in. spindling will be required. Final interconnecting leads can then be soldered in position. Note that in the original the dial has been countersunk in the front panel, but some patience is required for this operation.

A small speaker is inadequate for F.M. quality reception and the prototype feeds a 10in. baffle-mounted unit leaving little to be desired.

Alignment of the I.F. strip—which operates at 10.7Mc/s—should be carried out with a signal generator, etc., but alignment of the R.F. stages may be carried out on signals when a dual tuning wand will be found useful.

Cabinet

The author professes no skill in carpentry and the simple plans detailed in Fig. 5 could doubtless be improved. However, the final result looks pleasing and, except for the front and rear panels is made entirely from 5-ply wood. The top, sides and bottom are secured by $\frac{1}{2}$ in. wood screws projected into the front and rear panels, the resultant edges being obscured at the front by a frame of $\frac{1}{2}$ in. beading glued securely, after covering the panel with a suitable shade of wallpaper. When the glue is dry, the protruding edges of the paper are trimmed away and that remaining treated with clear nail varnish, etc., to strengthen it. The greater part of the bottom plate is cut away to assist ventilation and to make components accessible. Ventilation is further assisted by rectangular cut-outs made in the sides of the cabinet so that air is convected from below. These cut-outs also act as carrying handles.

TRANSISTORISED SUPER-REGENERATOR

(Continued from page 1040)

The set can now be switched on, whereupon a hissing sound will be heard in the phones indicating that the detector is operating properly. A short vertical aerial of approximately 15ft, together with a good earth, should be connected to the set. Signals should now be heard. Potentiometer R2 may now be adjusted for maximum gain consistent with good selectivity and low background noise with a station tuned in. Thereafter, R2 will need little, if any, adjustment. It will be found that R1 also has an effect on signals, and this control should be used and adjusted in conjunction with the tuning control C3, adjusting R1 as each station is tuned to suit personal requirements. The gain control, R4, may be adjusted to give a comfortable level of volume. In the event of no oscillation, or spasmodic operation over the range of C3, the coil L2 may be adjusted closer to L1 and the condenser C1 altered in value up to a maximum of 0.1 μ F.

The coil, L3, may also be adjusted for best sensitivity in a similar manner.

Results

It is, of course, important that one should listen when the 10m band is "open". There are times when no signals at all are heard on this band.

A few hours later signals may be heard very strongly.

A cabinet to suit the taste of the individual constructor can be made to fit the front panel. Plywood covered with one of the self-adhesive plastic materials gives a very pleasing effect for very little expense and trouble.

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6V6 7/6	ECL80 0/6	MU14 9/6
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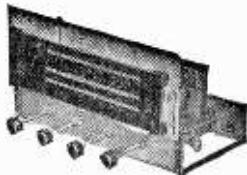
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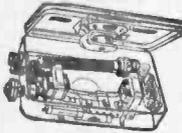
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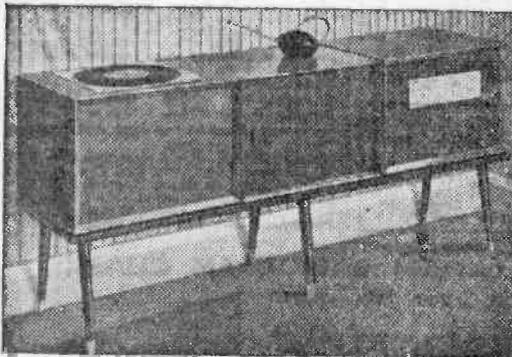
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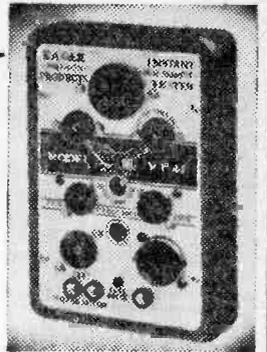
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Rectification and Smoothing

VARIOUS FILTER CIRCUITS

By J. Ball

ONE of the main decisions which must be made when constructing a power pack is whether a mains transformer will be used. Mains transformers are fairly expensive and cannot be used in equipment designed for A.C./D.C. operation. The advantages of using a mains transformer are that any desired voltage can be obtained, full-wave rectification can easily be used and the chassis can be isolated from the mains and earthed. In A.C./D.C. receivers and other equipment without a

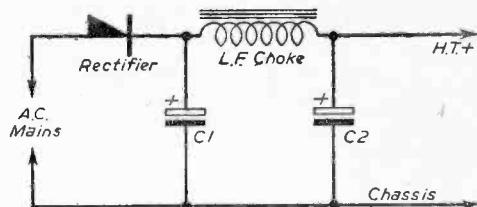


Fig. 1.—An H.T. supply which does not employ a mains transformer. Half-wave rectification is used and the chassis is "live".

Common Circuit

The circuit of Fig. 2 is perhaps the most commonly used circuit for providing H.T. in broadcast receivers. Full wave rectification is used and therefore smaller values of smoothing components can be employed than in the similar half-wave circuit shown in Fig. 3. The transformer used in the circuit of Fig. 2 must have a centre-tapped H.T. secondary winding such that the total voltage (r.m.s.) across this winding is nearly double the H.T. output required. The H.T. secondary winding of mains transformers for use in normal broadcast receivers is usually rated at about 300-0-300V at 80 to 120mA.

Where possible an indirectly heated rectifier should be chosen so that, after switching on, the H.T. voltage is not applied to the valves in the equipment until they have warmed up. This prolongs valve life and prevents condensers from having to withstand a much higher voltage than normal just after switching on. For similar reasons, the use of metal rectifiers is not always advisable.

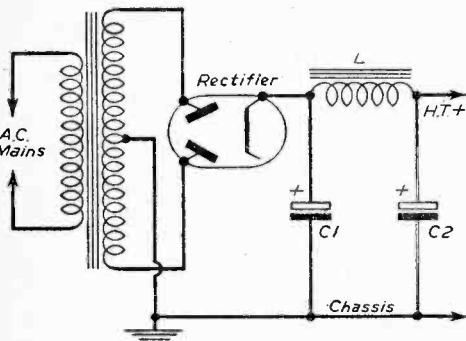


Fig. 2.—A typical full-wave rectifier circuit.

mains transformer, the chassis is connected to one side of the mains; as this may be the "live" side, the chassis should not be touched when the receiver is connected to the mains. Constructors who enjoy experimenting are therefore strongly advised to use a mains transformer.

Metal rectifiers are especially useful in A.C./D.C. equipment, as they do not require a heater supply. A typical half-wave rectifier circuit for use without a mains transformer is shown in Fig. 1.

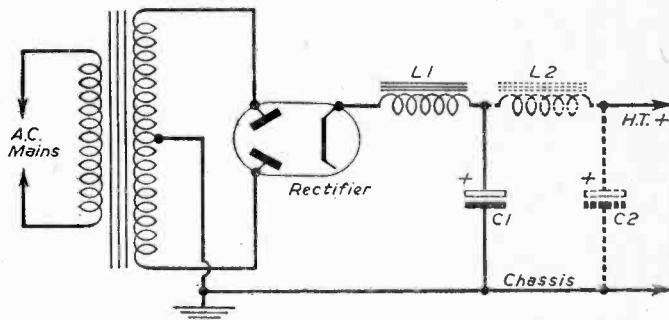


Fig. 4.—A full-wave rectifier circuit employing a choke input filter. The components shown dotted will give a further reduction in hum.

Smoothing

The output from any rectifier contains a considerable amount of 50c/s hum voltage or "ripple." Most of this must be eradicated or hum will be present in the output of the receiver. A trace of hum always remains in the output from a power pack after smoothing, but this hum voltage is further reduced by the decoupling components used in certain stages.

The two condensers and choke used for smoothing in Figs. 1, 2 and 3 form the commonly used simple smoothing circuit known as a π -filter

(Continued on page 1074)

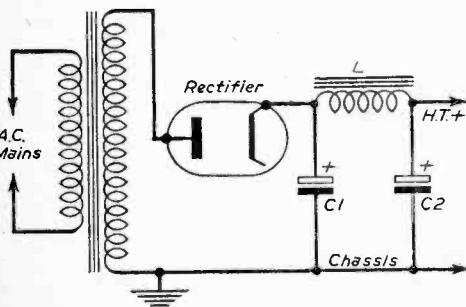


Fig. 3.—Simple half-wave rectifier circuit.

Repetitive Timer

A VERSATILE CIRCUIT

By E. Leatherland

THE writer was asked to construct a repetitive timer to be used in lightning chess; the requirements being that a bell should ring automatically every 15 seconds when the players were required to make their next move.

This is, of course, only one of the many uses to which a device of this nature could be put. For instance, in photography it could be most useful as a timer for developing and printing purposes.

Circuit

It was decided to make the "time on" and "time off" periods variable; from 1 to 30 seconds "time off" and from 1 to 5 seconds "time on".

The circuit used is based on multivibrator principles (see Fig. 1). Its action is as follows:—

Valve V2 conducts and a negative voltage is applied to the control grid of V1 cutting it off. As C1 charges through VR1 the control grid of V1 becomes less negative, until after a given time, depending on the time constant of C1 and VR1, V1 conducts.

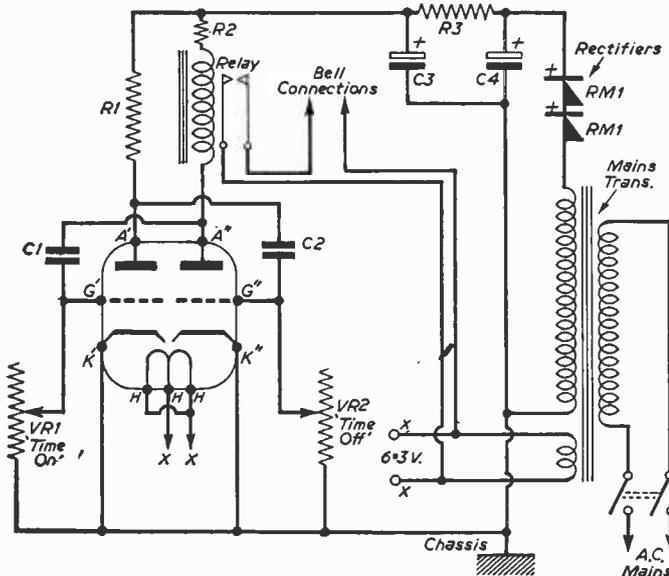
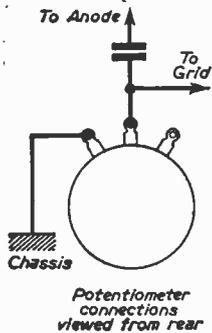
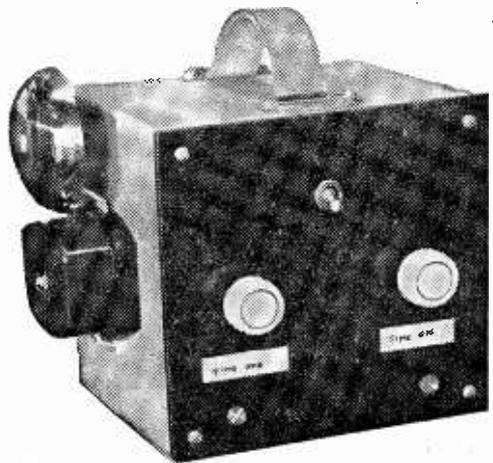


Fig. 1.—Circuit diagram and potentiometer connections.



The completed timer.

This action now cuts off V2 because its grid has now a negative voltage applied to it and it will remain in this state until C2 has charged up through VR2 when V2 will conduct once again and the whole operation is repeated.

As will be seen, here an unbalanced arrangement is being used inasmuch as C1 and VR1 are 2μF and 100k and C2 and VR2 are 2μF and 5M respectively. This is due to the fact that it is unlikely that the "time on" period would ever be required to exceed three or four seconds. Should a long "time on" period be required, the constructor should increase the value of VR1.

Construction

The unit is extremely simple to construct and no special layout of components is necessary. The illustration shows the prototype both in and out of the case, giving the constructor a good idea of the lines to follow. The dimensions of the unit are approximately 5½ in. × 5¼ in. × 5¼ in., making it very compact. The only controls are on the front panel and consist of the mains "on-off" switch, and the "time on" and "time off" regulating potentiometers. Calibration scales and pointer knobs should be used and calibration carried out with the aid of a stop-clock. It should be appreciated that if the potentiometer marked "time on" is turned to absolute minimum, then the bell will ring continuously, and likewise if the "time off" potentiometer is turned to absolute minimum, the unit will not operate.

The valve used in the unit is an ECC81 double triode which has a B9A base. The connections are shown in Fig. 2. The relay used in the prototype has a resistance of 1,000Ω. The rest of the anode load for V2 is made up to 10k by

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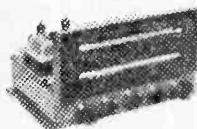
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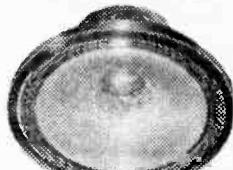
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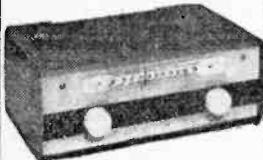
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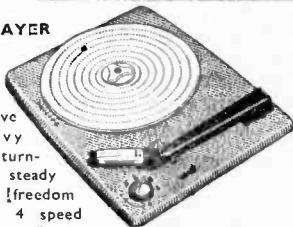
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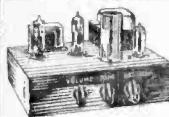
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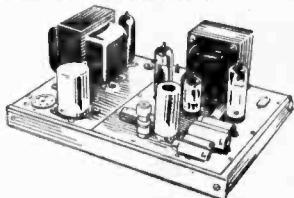
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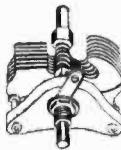
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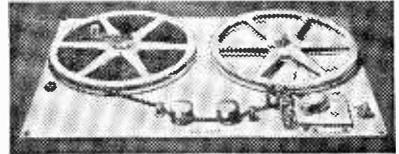
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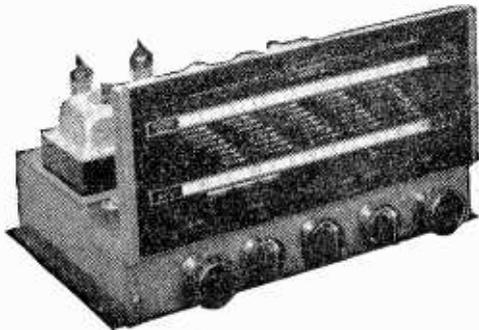
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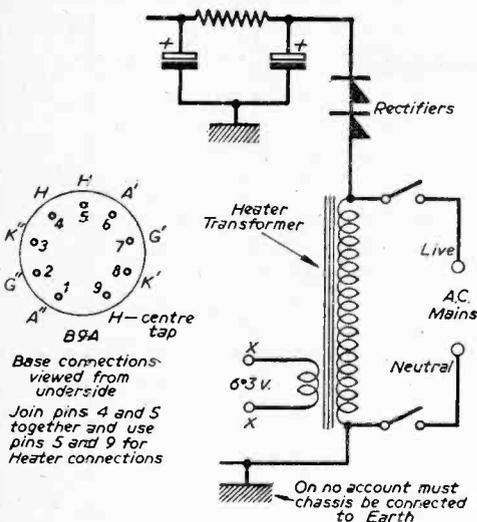


Fig. 2 (Left).—Valve base wiring.

Fig. 3 (Right).—Power pack circuit using the mains connected to the chassis.

suitable resistors. However, a 10k relay operating on a current of up to 10mA will be suitable. These are readily obtainable at most "surplus" shops, and are very cheap. The bell was obtained from a well-known store for a few shillings. This is

driven from the power pack transformer using the 6.3V heater winding. Rectification is by means of two RM1 metal rectifiers in series. These can be obtained cheaply, though any metal rectifier rated 240V at 20mA upwards would be suitable. The circuit diagram shows the mains transformer used as having a separate H.T. winding. This is desirable, as it isolates the mains from the chassis. However, if the constructor happens to have only a heater transformer available, and decides to use this, he must make sure that the fixing screws for the chassis which will be inserted through the front panel are suitably isolated by applying a sealing compound over the screw heads.

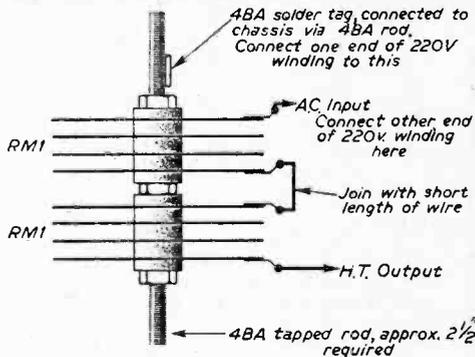


Fig. 5.—Mounting the two metal rectifiers.

Fig. 3 shows the method of connection when using a mains transformer with a heater winding only.

The box should be made of wood, and the front panel of Paxolin or similar insulating material.

Layout

As stated earlier no special layout of components is necessary, but it is felt that the less experienced constructor may prefer to work from a definite layout. Fig. 4 shows the one used in the prototype; comprehensive drilling details are not given because the components used by the constructor may be of a different mounting style from those used by the writer. If two RM1s are used for rectification, they should be mounted vertically, bolted together and fixed to chassis with a length of 4B.A. rod, as shown in Fig. 5. If an ex-government relay is used, they usually have two mounting studs at their base. Suitable brackets can be attached to these which are then bolted to the chassis. The smoothing capacitor (16-16μF) and smoothing resistor R3 along with R1 and R2 (if used) are mounted below the chassis. The wiring for the bell passes through a small hole

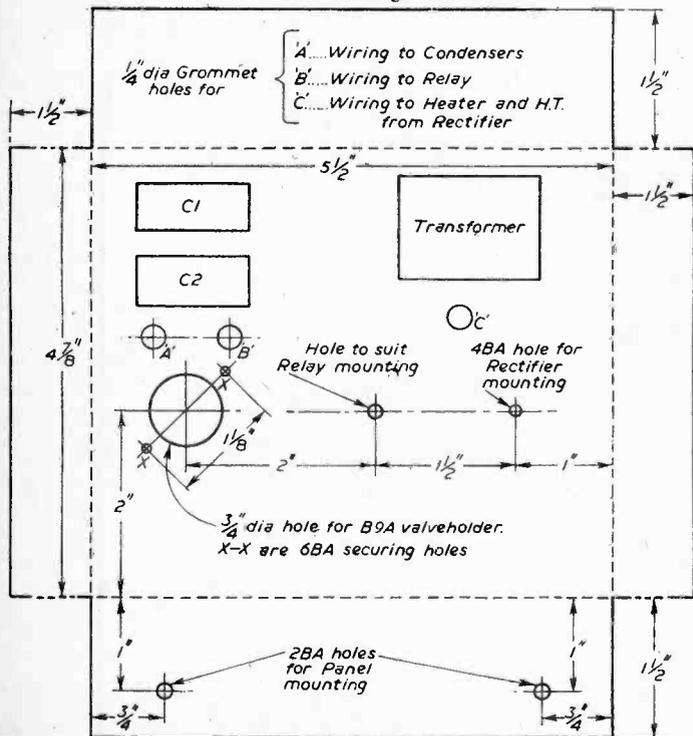


Fig. 4.—Chassis drilling details.

COMPONENTS LIST

- C1, C2—2 μ F 350VW.
- C3, C4—16 + 16 μ F 350VW, electrolytic.
- R1—10k, 1W.
- R2—Dependent on the relay resistance. See text.
- R3—2.2k, 1W.
- VR1—100k linear potentiometer.
- VR2—5M linear potentiometer. Valve: ECC81 or equivalent.
- Valve base B9A.
- Metal rectifiers (RM1) (2).
- Mains transformer, Primary to suit mains voltage. 220V at 20mA. } Secondaries. 6.3V at 1A.
- Electric bell 6-8V.
- Relay up to 10k coil resistance.
- Mains switch toggle type, double pole, on/off.

drilled in the side of the case just underneath the bell. This should be of sufficient length to allow withdrawal of the chassis from the case. Panel dimensions and drilling details are shown in Fig. 6.

The case should be constructed of five pieces of $\frac{1}{8}$ in. board, the dimensions as follows:—
 Top and bottom 6 $\frac{1}{2}$ in. \times 5in.
 Sides 5 $\frac{1}{2}$ in. \times 5in.
 Back 6 $\frac{1}{2}$ in. \times 6 $\frac{1}{2}$ in.

These should be panel-pinned and glued. Brackets for the front panel fixing should be made out of $\frac{1}{8}$ in. \times $\frac{1}{8}$ in. brass or steel, 1in. long, with a $\frac{1}{8}$ in. right-angle bend. Centre holes should be drilled and tapped 4B.A. and fixed in the four corners of

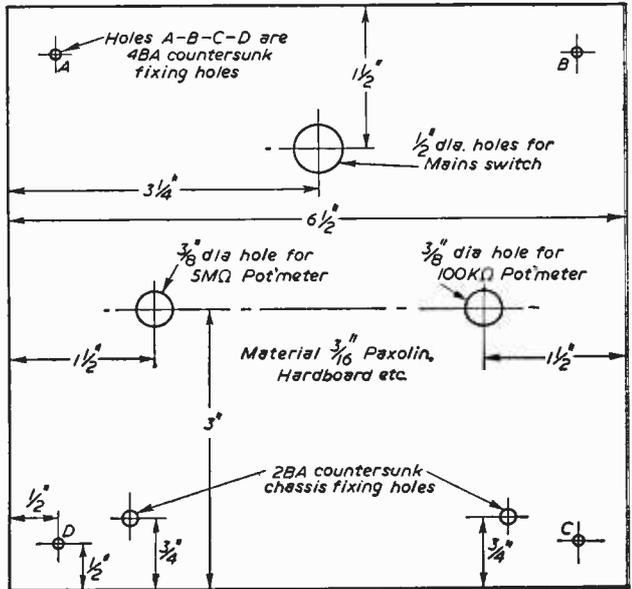


Fig. 6.—Panel drilling details.

the case, using countersunk screws. The screws fixing the brackets to the case should be as short as possible, otherwise they will foul the front panel screws. Three $\frac{1}{8}$ in. holes should run across the centre line of the back to allow for ventilation, not forgetting a further hole near the transformer for the mains lead.

The case can then be suitably polished, and a handle attached, to give a professional looking finish to the job.

CHOOSING DETECTOR CIRCUITS

(Continued from page 1053)

in broadcast receivers. Although a D.C. voltage is present at the cathode of the detector, it is positive and becomes more positive with increase of signal strength; it is therefore of the wrong polarity for AGC purposes. If however, an additional resistor is placed in the anode circuit as shown in Fig. 7, it is possible to obtain an R.F. voltage from the detector anode with the advantage that it is slightly amplified. This amplified R.F. voltage is then detected by the diode V2 so that a negative voltage is obtained for AGC purposes. Whilst it would be possible to place the diode (V2) circuit across the tuned input to the detector, the previous circuit would then be loaded and no AGC amplification would be obtained. If no delay is required the diode cathode may be earthed, but R8 and R9 may be included to give the desired delay. The value of R8 is usually several megohms.

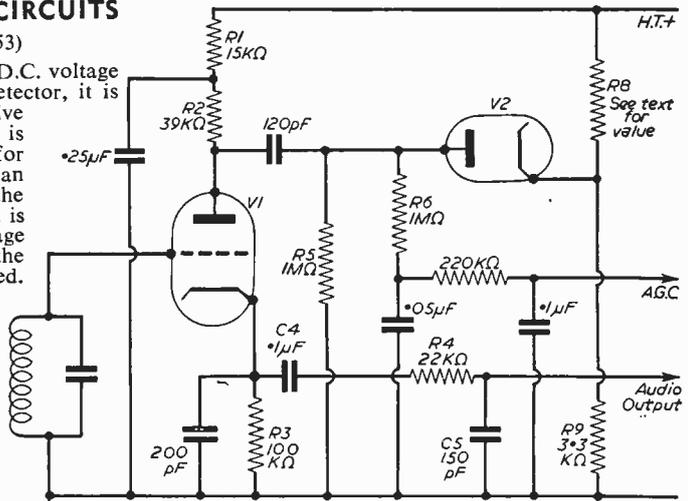


Fig. 7.—The use of a cathode follower detector to amplify AGC. An EAC91 diode-triode is convenient for V1 and V2.

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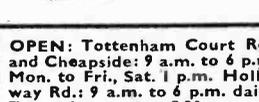
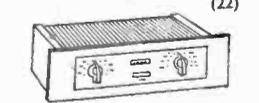
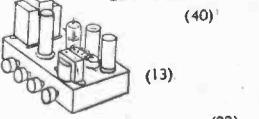
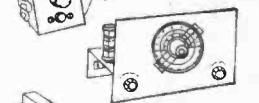
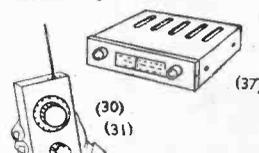
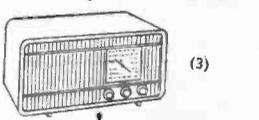
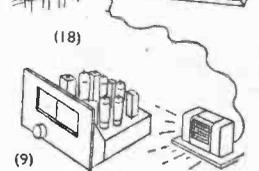
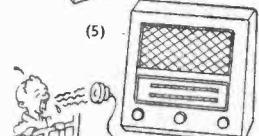
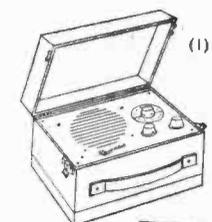
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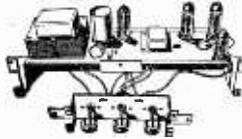
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(Page 855 February Issue.)

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FOR GLADSTONE RADIO ON PAGE 1033

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300 mv.	15 v.	30 ma.	150 ma.	10,000 ohms
1.5 v.	75 v.	150 ma.	750 ma.	
3 v.	150 v.	300 ma.	1.5 amp.	
15 v.	300 v.	1.5 amp.	7.5 amps.	
30 v.	600 v.	3 amps.	15 amps.	
150 v.	750 v.	15 amps.		
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750 v.				
1,500 v.				

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Becoming an Amateur

No. 7—ADDITIONS TO THE
ONE-VALVER

(Continued from page 866 of the February issue)

By J. D. Pearson, G3KOC

WHEN the beginner has built and operated the simple single-valve receiver described in previous issues he will, eventually, require some means of increasing output, thereby making the weaker stations more readable. This can be done in two ways: (a) by the addition of an R.F. stage, preceding the detector valve; or (b) by the addition of an L.F. stage after the detector. In the present context the word "stage" refers to a single valve together with its associated circuitry and components. One could, of course, add both stages at the same time thus converting the one-valver into a three-valve T.R.F. set of the type so common before the war. The beginner is advised, however, to deal with additional stages separately, and to understand fully the design and operation of each before progressing further.

L.F. Amplification

The detector stage is the "heart" of any receiver. For the moment, it will be sufficient if the reader visualises the function of this stage to be the separation of the "intelligence", or modulation, which is "impressed" upon the carrier wave at the transmitter from the carrier wave. The carrier wave, of course, owing to its very high frequency, is inaudible.

In the superhet receiver, which normally uses a simple diode detector, the above process is performed by a separate valve and tuned circuit, the complete unit being known as a Beat Frequency Oscillator, or BFO.

The main point the student should impress upon his memory is that, technically speaking, an unmodulated radio frequency wave is inaudible unless one of the two systems briefly described above is used in the receiver. The "note" he hears when taking down CW (not to be confused with Modulated CW) is supplied by his own receiver. The R.A.E. paper may include a question on the purpose and operation of the BFO.

Coupling Transformers

To return to the simple detector. Assuming we have separated the audio content from the now useless carrier we can amplify the audio to whatever level we wish. For headphone reception a single stage is usually sufficient. Probably the simplest way is transformer coupling using an L.F., or intervalve, transformer. This usually has a turns ratio of 3 : 1 or 5 : 1. The primary is connected in series with the H.T. supply to the detector, whilst the secondary is in series with the bias supply to the grid of the L.F. stage.

Mutual inductance, on which the action of the transformer depends, has not yet been discussed. This is deliberate. The writer firmly believes

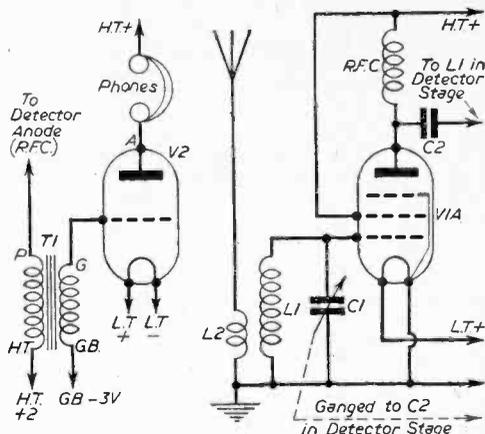


Fig. 1 (Left).—A simple L.F. stage.

Fig. 2 (Right).—Simple R.F. stage.

that the student's mind is much more receptive as to what happens, and why, in the equipment he builds, *after* he has built it than it is before.

The circuit of a suitable L.F. stage for adding on to the simple detector circuit given previously is shown in Fig. 1.

R.F. Amplifier

Sometimes known as "high frequency" amplification, the beginner will find this stage not quite so simple to adjust and operate as an L.F. stage. As the name implies, the method involves amplification of the signal as received on the aerial, and the amplified signal is then passed to the detector for rectification, or demodulation.

An efficient R.F. stage will often bring in stations which previously were inaudible; an L.F. stage cannot do this—it will only amplify that which is already there.

Tuning

The beginner should study as many T.R.F. circuits as possible, noting the difference in inter-stage coupling between detector and L.F. and R.F. and detector. Whilst the former is usually accomplished by the use of high inductance iron-cored transformers or resistance-capacity networks, the latter requires very efficient high-"Q" tuned circuits, which are tuned "in step" with the detector tuned circuits, by way of ganged condensers. The R.F. and detector stages can, of course, be tuned individually using separate controls; this procedure would overcome any tracking errors caused by differences in inductance values when using home-wound coils in both stages. However this also entails sacrificing the facility of "single knob" tuning. The interested beginner may care to try both methods; the only effort entailed is to release grub-screws on the flexible coupler and move the R.F. stage tuning condenser to a more convenient position.

When building and operating experimental circuits of the simple type described, it is advisable to begin with a fairly large chassis; one then has space for subsequent additions and modifications.

The circuit of the R.F. stage is given in Fig. 2 and a suggested layout is shown in Fig. 3.

Circuit Description

When describing straight receivers, on SWL reports, etc., certain abbreviations are used. The letter "V" is used to denote the detector stage; the figures before and after the "V" represent the number of stages of R.F. and L.F. amplification respectively. In the case of receivers not

and quickly smoothed out with a clean, soft, cotton rag. The iron is now "tinned".

Most components and valveholder wires and tags when purchased new are already tinned, and unless dirt has accumulated or oxidation occurred during storage, soldering will "take" satisfactorily. Assuming that a good mechanical joint has been made, apply the iron to both the wire and the tag together where possible, and allow a second or two for the surfaces to reach iron temperature, or thereabouts. Then apply the solder. If the joint is hot enough, the solder will "run" immediately. Use only enough solder to make a good electrical joint. Remove both iron and solder from the joint, and it should set with a smooth bright surface.

Never carry solder to the joint on the iron, and never place the solder on a cold joint with the iron on top. The resultant joint may look all right but will eventually give trouble owing to a minute layer of cold air having been trapped beneath the hot solder and iron, causing a high resistance, or "dry" joint.

Difficulties

At this stage the student should be devoting his time equally between Short Wave Listening, building a receiver for that purpose and studying theory.

He should by this time be fully conversant with the licencing rules and regulations governing the issue of an Amateur Sound Licence (this knowledge can earn up to thirty marks out of a possible hundred, when taking the R.A.E.).

He will also by this time have reached a point in his textbooks at which he finds himself "out of his depth", and it is not always easy to determine just where this occurred. If the student can say precisely at what point he parted company with the author of his textbook, then the problem is halfway to solution. The writer will be pleased to assist readers with problems of this nature, but queries must be addressed to the Editor, and be accompanied by the query coupon from the current issue.

(To be continued)

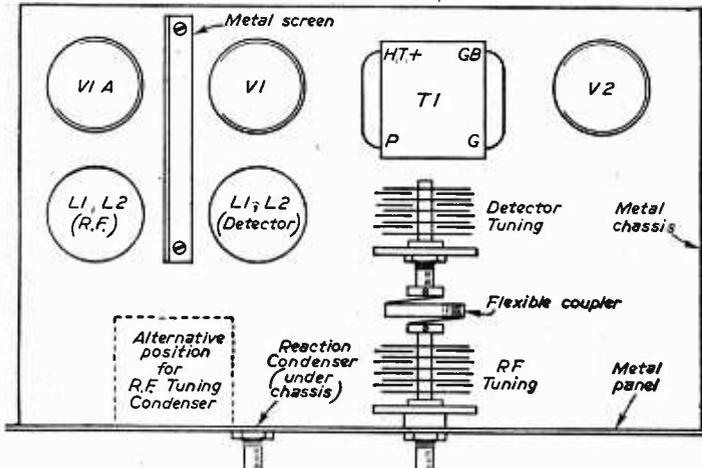


Fig. 3.—A suggested layout.

fitted with any particular stage an "0" is substituted in the group. The simple one-valve receiver for instance, would be written as 0-V-0; whilst the three-stage receiver is covered by the term 1-V-1.

Soldering

Newcomers to the hobby of radio-construction may have doubts about their ability with a soldering-iron. Properly soldered, oxide-free joints are essential in radio work, and are very easy to achieve if the process is understood and the job tackled properly at the outset.

The golden rule is to have the surfaces to be joined, and the iron (electric or otherwise), scrupulously clean. A 25W lightweight soldering iron will handle almost any radio job the constructor may undertake. Resin-cored wire solder only should be used; corrosive fluxes must not be employed.

It is often recommended that a sound mechanical joint be made before soldering is attempted, using long-nosed pliers to secure component wire ends to valveholder tags, etc., but this is a matter for choice after experience has been gained. Remember that wiping a speck of dust from a component tag with the finger can do more harm than good by depositing an invisible layer of moisture or grease.

Tinning the Iron

The copper bit of the iron should be rubbed smooth with a fine file. When the iron has reached working temperature, solder should be applied to various points on the working surface of the bit

ADDITIONAL COMPONENTS

T1: L.F. transformer (Ratio 3 or 5:1).

V2: Triode valve (LP2 etc.).

L1, L2, C1: values as for detector stage given in the February issue.

C2: 100pF.

RFC: Radio frequency choke.

V1A: IN5, DF33, SG15 etc.

C.R.T. ISOLATION TRANSFORMERS
 TYPE A. OPTIONAL 25% and 50% BOOST.
 2 V. OR 4 V. OR 8.3 V. OR 10.8 V. OR
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HIGH STABILITY. 1/2 w., 1s. 2/- Preferred values,
 100 Ω to 10 meg. Ditto, 5%, 100 Ω to 5 meg. 4/-, 9d.
 5 watt **WIRE-WOUND RESISTORS**
 10 watt 25 ohms—10,000 ohms 1/6
 15 watt 25 ohms—10,000 ohms 2/-
 15,000 ohms—50,000 ohms. 5 w., 1/8; 10 w., 2/3.

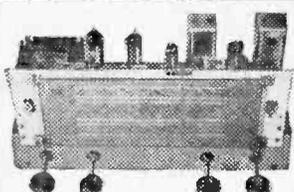
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 2 a. or 4 v. 2 a. ditto, 350-0-350 ... 22/6
 200 v. 20 mA, 6.3 v. 1 a. ... 10/6
 MIDGET. 220 v. 45 mA, 6.3 v. 2 a. ... 15/6
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 STD. 250-0-250, 65 mA, 6.3 v. 3.5 a. ... 17/6
 HEATER TRANS. 6.3 v. 1 1/2 amp. ... 7/8
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 ohms per ft., 2-way, 6d. per ft., 3-way, 7d. per ft.
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HIGH RESISTANCE PHONO, 4,000 ohms, 16/8 per
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174	6/-	6NT7M	6/6	8BC33	8/6	8HVR2A	10/6
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384	7/6	6SA7	6/6	8HF80	10/6	8P61	3/6
3V4	7/6	6X57M	6/6	8CC84	9/6	8PC384	8/6
414	7/6	6X5	6/6	8CF80	8/6	8CF80	9/6
5V3	7/6	6V6G	7/-	8CI44	10/6	8POLR2	11/8
5Z4	9/6	6X4	7/6	8CLR2	10/6	8PNS25	6/6
6AM6	5/-	6X5	6/6	8F39	5/6	8PLR2	10/6
618	5/6	12AT7	8/-	8F41	8/6	8P780	7/6
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6B6W	10/6	12BE6	10/6	8F91	5/-	8SF61	3/6
6D6	6/-	12K7	6/6	8F92	5/6	8UBC41	10/6
6F6G	7/6	12Q7	8/6	8L34	5/6	8UBC42	10/6
6H6	9/6	618	9/6	8L44	8/6	8UP41	8/6
6J5	5/6	6Z524	7/6	8E81	8/6	8U141	9/6
6L6	5/6	80	10/6	8E70	7/6	8UY2	8/6
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 (Stereo heads 2/2 extra). Leaflets, S.A.E.

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 No. Sw. D.P. Sw. Losses cut 50%. Fringe Quality **1/-** yd.
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 1/8; 0.01/2,000 v., 1/8; 0.1 mfd., 2,000 volts, 3/6
CERAMIC CONDS. 500 v. 0.3 pF. to 0.01 mfd., 9d.
SILVER MICA CONDENSERS. 10% 5 pF. to 500
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 (± 1 pF.) 1.5 pF. to 47 pF., 1/8. Ditto 1/50 pF.
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 16/450v. 3/8 8+8/500v. 5/- 32+32/350v. 4/6
 16/500v. 4/- 8+16/450v. 5/- 32+32/450v. 6/6
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VALVEHOLDERS. Pax. Int. Oct. 4J. EP50, EA50,
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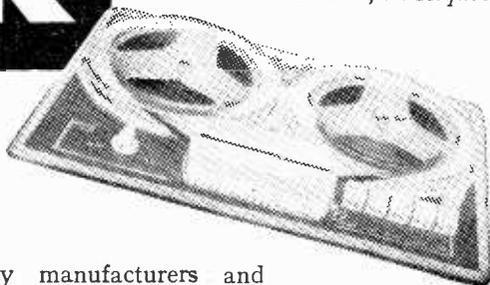
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EDISWAN.—Set of Seven Transistors. XA102, two XA101,
XB102, XB103, two XC101. ONLY 60/6 per set.
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OC68, 25/-; OC70, 14/-; OC71, 14/-; OC72, 17/-; 2/OC72 (Matched
Pair), 34/-; OC170 (70 Mc/s), 50/-; OCPT1, 50/-.
ANY TYPE OF TRANSISTOR CAN BE SUPPLIED.

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ELECTROLYTICS.—(Can Type) 32-32/450 v., 6/6; 100-200/275 v.,
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4/6; 100-100/200/275 v., 13/-; 60-50-50/350 v., 9/10; Wire ended, 16
mfd./450 v., 2/4; 16-16/450 v., 4/-; 8-8/450 v., 2/9; 8-16/450 v., 2/9; 50
mfd./50 v., 1/6; 25 mfd./25 v., 1/8; 100 mfd./6 v., 2/3.
Miniature, 25 mfd., 2/8; 50 mfd., 2/3; 3 mfd., 2/3; 2 mfd., 2/6.
SUB-MINIATURE, 32 mfd., 25 mfd., 16 mfd., 8 mfd., 4 mfd., 2 mfd.
All 3/6; 100 mfd., 2/9; 0.1 mfd., TCC, 4/-.
CONNECTING WIRE.—Six assorted colours. 1 yard of each colour
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Club News

REPORTS OF CURRENT ACTIVITIES

BARNET AND DISTRICT RADIO CLUB

Red Lion Hotel, High Barnet, Herts.

Hon. Sec.: K. Robinson, 3 Castle Road, North Finchley, N.12.

Meetings are held on the last Tuesday of each month. The club has a transmitting licence—G3FFA—and puts out a slow morse practice on about 1930kc/s every Monday evening at 8.

Future events:

March 29th.—Talk on Radio in Antarctica illustrated with coloured slides and films by Major G. Watson.

April 26th.—Lecture on the Collins range of equipment.

May 31st.—Special meeting to make final arrangements for National Field Day.

June 28th.—Lecture on Metal Rectifiers by Rectifier Division of S.T.C.

July 26th.—A talk on receivers.

August 30th.—To be announced.

September 27th.—Annual General Meeting.

BRADFORD AMATEUR RADIO SOCIETY

Cambridge House, 66 Little Horton Lane, Bradford 5.

Hon. Sec.: David M. Pratt (G3KEP).

Two very interesting lectures were held recently; on January 12th, "Colour Photography" by A. R. Bailey, M.Sc., and on February 9th, "Inexpensive Sound Fidelity" by Secretary D. M. Pratt.

Future events:

March 8th.—Talk on radio and television interference by Mr. J. G. Belcher, A.M. Brit., I.R.E. (G5FCS).

March 22nd.—Annual General Meeting.

April 5th.—Field Day Arrangements.

April 26th.—Lecture by D. G. Enoch on the "Development of Television".

THE BRITISH INSTITUTION OF RADIO ENGINEERS

9 Bedford Square, London, W.C.1.

Meetings for March.

London Section.—Meetings are held at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1.

March 14th at 6.30 p.m.—Radar Group. Discussion on "Short Range Navigational Aids".

March 24th at 6.30 p.m.—Medical Electronics Group. "The Continuous Recording of Heart Activity" by Dr. I. Boyd and W. R. Eadio.

March 30th at 6.30 p.m.—"Silicon Photo-Voltaic Cells for Instrumentation and Control Applications" by V. Magee, Ph.D., and A. A. Shepherd, Ph.D.

Birmingham—West Midlands Section.—Meetings are held at Matthew Boulton Technica College.

March 8th at 7.15 p.m.—"Transistor Power Amplifiers" by F. Butler, O.B.E., B.Sc.

Bristol—South Western Section.—Meetings are held at the School of Management Studies, Unity Street.

March 30th at 7 p.m.—"Training for Operating and Maintaining Television Studio Broadcasting Equipment" by K. R. Sturley, Ph.D., and A. E. Robertson, B.Sc.

Cardiff—South Wales Section.—Meetings are held at the Welsh College of Advanced Technology.

March 16th at 6.30 p.m.—"Recent Development in Printed and Potted Circuits" by H. G. Manfield.

Edinburgh—Scottish Section.—Meetings are held at the Department of Natural Philosophy, The University, Drummond Street.

March 25th at 7 p.m.—"Radio Guidance in the Automatic Landing of Aircraft" by J. Shaylor, B.Sc. Tech.

Glasgow—Scottish Section.—Meetings are held at the Institution of Engineers and Shipbuilders, 39 Elmbank Crescent.

March 24th at 7 p.m.—"Radio Guidance in the Automatic Landing of Aircraft" by J. Shaylor, B.Sc. Tech.

Liverpool—Merseyside Section.—Meetings are held at the University Club.

March 7th at 7 p.m.—Short informal papers by members.

Malvern—South Midlands Section.—Meetings are held at the Winter Gardens.

March 29th at 7 p.m.—"Microwave Propagation—Some Characteristics and Curiosities" by M. W. Gough, M.A.

Newcastle-upon-Tyne—North Eastern Section.—Meetings are held at the Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road.

March 9th at 6 p.m.—"Silicon Photo-Voltaic Cells in Instrumentation and Control" by A. A. Shepherd, Ph.D.

BRITISH SOUND RECORDING ASSOCIATION

The B.S.R.A. is holding a Convention on Saturday, 23rd April, at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, in conjunction with the

London Audio Fair. Morning, afternoon and evening sessions will be held and the papers to be presented will survey post-war development in tape and disc recordings, pick-up design and cinema sound systems. Registration will cost 5s. for B.S.R.A. members and 10s. for non-members. Full details can be obtained from S. W. Stevens-Stratton, Greenways, 40 Fairfield Way, Ewell, Surrey.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Sub-basement, Derby College of Art, Green Lane, Derby.

Hon. Sec.: F. C. Ward (G20VV), 5 Uplands Avenue, Littleover, Derby.

The Annual General Meeting was held on February 3rd and the transmitting and receiving contest for the President's and the G4YY Trophies on February 7th.

Future events:

March 9th.—Open Evening in the club rooms.

March 16th.—"A Top Band Converter for use with the SWL in conjunction with a Broadcast Receiver"—Room No. 4, 119 Green Lane, at 7.30 p.m.

March 18th at 7.15 p.m.—Annual Dinner and Social Evening at the Irongates Grill.

March 23rd.—Open Evening.

August 14th.—Third Annual Mobile Rally at Rykeld School.

GRIMSBY AMATEUR RADIO SOCIETY

R.A.F.A., Abbey Drive West.

Hon. Sec.: Mr. Owen Gilliat, 24 Station Road, Healing, Lincs.

Meetings are held on the first and third Thursdays in each month at 8 p.m.

Future event:

March 31st.—Talk and demonstration by G3ELZ on his new six band TX.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, Candy Cabin, Ogden, Halifax.

On January 5th the members met for a lecture dealing with TVI by G3ADG, and on January 8th the Annual Dinner was held. A Ragweek was held on February 16th and a Film Show on March 1st.

Future events:

March 15th.—National Field Day arrangements.

March 29th.—Informal Evening.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: H. James, 448 East Prescott Road, Knotty Ash, Liverpool 14.

Future events:

March 8th.—"Stereo Amplifiers".

March 15th.—Swap Night.

March 22nd.—The Panadapter.

March 29th.—Film Show.

April 5th.—Junk Sale.

MIDLAND AMATEUR RADIO SOCIETY

The Birmingham Midland Institute, Paradise Street, Birmingham.

Hon. Sec.: C. Haycock (G3JJD).

Future events:

March 15th.—"Frequency measurements and VHF demonstrations by R. Rew.

April 7th.—"The New Trunk Dialling Scheme" by Brig. F. Jones.

April 19th.—"Radio Pictures" by Mr. K. Stevens.

April 24th.—"Mobile Rally at Trentham Gardens, Stoke-on-Trent.

May 5th.—"Complete Construction of 70cm Transmitter" by R. Rew and T. F. Douglas.

THE OXFORD UNIVERSITY RADIO SOCIETY

President: C. E. Chatwin, Jesus College, Oxford.

On February 9th a talk was given by B. Marsden of Associated Television on "The Operation of Commercial Television", and on February 17th, Mr. W. J. Morcum of Marconi Ltd. gave a talk on "High Power Transmitters".

Future event:

March 8th.—"Single Sideband Radio Communication" by N. Elson of Racal Engineering Ltd.

RADIO SOCIETY OF GREAT BRITAIN

Region 14, Glasgow

Hon. Sec.: Richard Craig (G3NIF), 272 Bellrock Street, Glasgow, E.3.

Meetings are held on the last Friday of each month in the Christian Institute, 70 Bothwell Street, Glasgow, C.2, commencing at 7.30 p.m.

THE READING AMATEUR RADIO CLUB

Palmer's Hall, West Street, Reading.

Hon. Sec.: R. J. Nash (G3EJA), "Peacehaven", 9 Holybrook Road, Reading.

At the January meeting G5HZ was again voted Chairman for the coming year, G3KH as Treasurer and G3EJA as

Secretary. The meeting was well attended and G3GKH continued morse instruction with the largest class he has had to date. A discussion was held on RSGB matters, field days and a Scout Jamboree. A junk sale in aid of funds followed. All meetings are held on the last Saturday in each month at 7 p.m.

Future event:
 March 26th.—Films and lecture on the practical application of transistors to receivers and transmitters.

REIGATE AMATEUR TRANSMITTING SOCIETY

Hon. Sec.: F. D. Thom, 12 Willow Road, Redhill, Surrey.

The first annual general meeting was held on January 16th and was very well attended.

Future events:

March 19th.—Talk on TVI by G4ZU at The Tower, Redhill.
 April 9th.—Talk by G8KW.

SPEN VALLEY AMATEUR RADIO SOCIETY

Hon. Sec.: N. Pride, 100 Raikes Lane, Birstall, Leeds.

The annual dinner was held on January 23rd and was attended by 61 members. The silver cup for outstanding services to the Society was awarded to Mr. F. Varley, G2FCP.

Future events:

March 16th.—Visit to Mains Radiograms Ltd., Bradford.
 March 30th.—"Electronics in Industrial Research" by Dr. N. H. Chamberlain.

April 13th.—Post Office Mechanisation at Leeds G.P.O.
 April 27th.—Open Meeting.

SOUTH YORKSHIRE AMATEUR RADIO SOCIETY

Stag Inn, Dockin Hill Road, Doncaster.

Hon. Sec.: W. Farrar, 2-A Highbury Avenue, Bessacarr, Doncaster.

At the meeting on January 14th it was decided to hold meetings on the second Tuesday and fourth Thursday of each calendar month. These meetings will be held at 7.30 p.m.

WEST KENT AMATEUR RADIO SOCIETY

Culverden House, Tunbridge Wells.

Hon. Sec.: H. F. Richards, 17 Reynolds Lane, Tunbridge Wells, Kent.

Meetings are held at 7.30 p.m. on alternate Fridays.

Future events:

March 14th.—A practical demonstration of wiring, layout, and testing, principally for the benefit of younger members.

April 1st.—Informal evening.

April 29th.—Annual General Meeting.

THE WANSTEAD AND WOODFORD RADIO SOCIETY

Wanstead House, The Green, Wanstead, E.11.

Hon. Sec.: P. J. Seaman, 39 Kensington Drive, Woodford Green, Essex.

The club continues to meet every Wednesday at 8 p.m.

RECTIFICATION AND SMOOTHING

(Continued from page 1061)

because of the resemblance between the circuit diagram and the Greek letter π . In this type of filter there is a condenser, C1, across the output from the rectifier; it is therefore one type of condenser input filter. The condenser, C1, which stores the electrical energy supplied by the rectifier is known as the reservoir condenser. The working voltage of this condenser should not be less than $\sqrt{2}$ (i.e. about $1\frac{1}{2}$) times the mains voltage in the circuit of Fig. 1, $\sqrt{2}$ times the voltage from either end of the transformer winding to the centre tap in the circuit of Fig. 2, or $\sqrt{2}$ times the voltage of the transformer winding in the circuit of Fig. 3. The working voltage of the smoothing condenser, C2, need only be a little above the H.T. voltage. If a valve rectifier is used, the value of the reservoir condenser, C1, must not exceed the maximum value recommended by the valve manufacturers or the peak cathode current of the rectifier may be exceeded momentarily during each cycle.

The smoothing circuit shown in Fig. 4 is known as a choke input filter because a choke is the first filter component. The components shown dotted may be used for extra smoothing.

Outputs

The D.C. output voltage obtained with condenser input is higher than that obtained with choke input assuming that other conditions (including the output current and mains transformer voltage) are identical. The output voltage from a condenser input filter drops steadily as the output current increases; in other words the regulation is poor. The D.C. output from a choke input filter drops very suddenly when a small current is taken from the unit, but, after this initial drop, the voltage falls only slightly with further increase in output current. The regulation over this region is therefore good. Actual measured output voltages of the circuit of Fig. 2 when $C1 = C2 = 16\mu\text{F}$ and $L = 20\text{H}$ are shown in Fig. 5 for various output currents together with the output voltage from the choke input filter of Fig. 4 when $C1 = C2 = 16\mu\text{F}$ and $L1 = L2 = 10\text{H}$. In each case, the transformer winding was rated at 350-0-350V at 80mA.

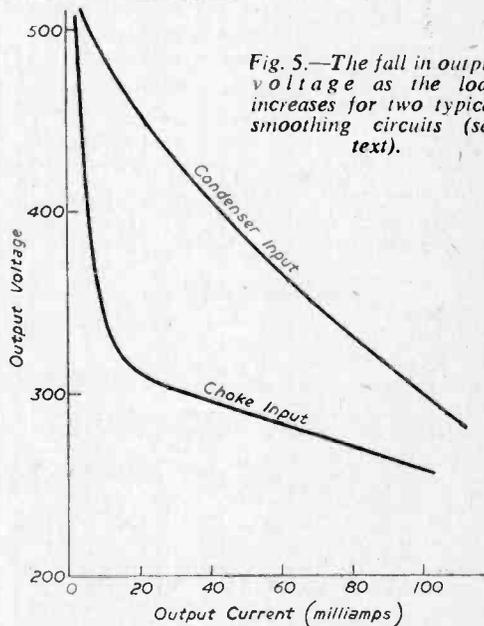


Fig. 5.—The fall in output voltage as the load increases for two typical smoothing circuits (see text).

When the output current required from a power pack is not more than a few milliamps, the smoothing chokes in any of the circuits shown can be replaced by resistors of a few thousand ohms. In addition to lowering costs, this also saves space, but the output voltage is reduced and the regulation is poor. It is important that the resistors should have an adequate power rating.

Generally the values of smoothing components are not very critical and any remaining hum voltage can often be reduced by placing extra smoothing condensers in parallel with those already in the power pack. Electrolytic smoothing capacitors should be placed well away from hot objects such as valve rectifiers. If one of the circuits shown is used to operate an ordinary radio receiver, satisfactory results will normally be obtained if a 10H choke and 16 μF electrolytic condensers are used.

RETURN-OF-POST SERVICE

NEW ILLUSTRATED LISTS

New illustrated lists are available on all the following. Any will be sent free upon request.
TEST GEAR. Test meters, Signal Generators, etc., by AVO, Jason, Pullin and Taylor.

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MULLARD. 12in. and 14in. types. £10.10.0. H.P. Deposit £2.2.0. and 12 monthly payments of 15/8. 17in. Types (except MW43/43), £12.0.0. H.P. Deposit £2.8.0. and 12 payments of 17/8. 17in., MW43/43 £14.0.0. H.P. Deposit £2.16.0. and 12 payments of £1.0.6. 21in. Types £16.0.0. H.P. Deposit £3.4.0. and 12 payments of £1.3.6.
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	Cash	Price Deposit	Mthly. Pmts.
RECORD CHANGERS			
COLLARO Conquest (Studio O PU)	£7.18. 6	£1.12. 0	6 of £1.4.7
GARRARD RC11 (GC8 PU)	£9.18. 6	£1.8. 6	12 of 15/-
GARRARD RC88 (GC8 PU)	£18. 8. 0	£3. 6. 0	12 of £1.4.0
GARRARD RC98 (GC8 PU)	£18.12. 8	£3.15. 8	12 of £1.7.3
BSR UA8 Monarch (TC8 PU)	£7. 5. 0	£1. 9. 0	6 of £1.2.8
BSR UA12 Monarch (TC8 PU)	£9.18. 6	£1.18. 6	12 of 15/-
BSR UA12 Monarch (TC8S Stereo PU)	£10.17. 6	£2. 3. 6	12 of 16/2
SINGLE RECORD PLAYERS			
GARRARD TA (GC8 PU)	£3.10. 0	£1.14. 0	12 of 13/-
BSR TU8 (TC8 PU)	£4.10. 0	£1. 5. 0	3 of £1.5.0
COLLARO RP384 (O, P or T PU)	£8.18.11	£1.15.11	12 of 13/7
COLLARO RP394 (O, P or T PU)	£9.18. 9	£1.18. 9	12 of 15/-
TRANSCRIPTION UNITS			
E.M.I. (Acos Stereo PU)	£6.15. 0	£1. 7. 0	12 of 10/8
COLLARO 4T/200 (CX88 PU)	£18.13. 0	£3.15. 0	12 of £1.7.4
COLLARO 4TR/200 Motor only	£13.18. 3	£2.15. 3	12 of £1.0.5
GARRARD HIF (GC8 PU)	£18. 9. 9	£3.15. 9	12 of £1.7.0

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

MULLARD TAPE PRE-AMPLIFIER

This unit is intended for use with an existing amplifier and provides all the circuits necessary for tape recording and playback. Instruction manual, giving full constructional information is available price, 2/10, post free.
COMPLETE KIT containing every item required down to the last nut and bolt. First-class items only included, £14.7.0. H.P. Deposit £2.17.0. and six monthly payments of £2.2.6. Kit less valves, £10.18.6. H.P. Deposit, £1.18.6. and six payments of £1.13.4. Power Unit kit, £3.18.6.

LATEST CABY TEST METERS

Now in stock. CABY SUPREME MULTI-RANGE METERS. Made abroad. We can confidently recommend these meters as being accurate, well made and very good value for money.

MODEL A-10. Sensitivity 2,000 ohms per volt A.C. and D.C. Five voltage ranges 10-1,000 volts A.C. and D.C. Three D.C. current ranges 0.5-250 mA. Two resistance ranges. Size 5 1/2 x 3 1/2 in. Price, £4.17.6. H.P. Deposit £1.7.6. and three monthly payments of £1.6.8.

MODEL B-20. Sensitivity 4,000 ohms per volt A.C. and D.C. Voltage ranges—Five D.C. 10-1,000 volts. Four A.C. 10-1,000 volts. Four D.C. current ranges, 0.5-250 mA. Four resistance ranges. Price £6.10.0. H.P. Deposit £2. and three monthly payments of £1.13.4.

Illustrated leaflet giving full details of both models free upon request.



LOUDSPEAKERS. Full details of Goodmans, Whiteley, Wharfedale and Elac types.
TAPE DECKS. All popular makes with a special offer.
RECORDING TAPES. A very wide range of all tapes and accessories.
GRAMOPHONE EQUIPMENT. Details of many types of Auto Changers, Single Record Players and Transcription Units including all the latest models. Many at special prices.

RECORDING TAPE

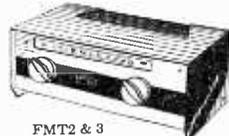
DOUBLE PLAY
BASF. 300ft. (3in.), 14/-; 600ft. (4in.), 25/-; 1,200ft. (5in.), 42/-; 1,600ft. (5 1/2in.), 52/6; 2,400ft. (7in.), 77/6.
SCOTCH BOY. 300, 600ft. (3 1/2in.), 17/-; 1,200ft. (5in.), 45/-; 2,400ft. (7in.), 80/-.
TELEFUNKEN. 1,200ft. (5in.). In plastic container, 40/-; 1,800ft. (5 1/2in.), in plastic container, 50/-; 2,400ft. (7in.), 75/-.
SPECIAL OFFER. 1,200ft. Standard Tape. Brand new. Famous maker. Fully guaranteed. 25/- Four for 95/- Full range standard and L.P. tape and accessories also stocked. Send for list. All tape post free.

LATEST AVO TEST METERS

AVO METER MODEL 8. The finest multi-range meter available. 20,000 ohms per volt on D.C. ranges. Eight D.C. Voltage ranges 2.5 v. to 2,500 v. Seven D.C. current ranges 50 microamps, to 10 amps. Seven A.C. Voltage ranges 2.5 v. to 2,500 v. Four current ranges 100 mA to 10 amps. Three resistance ranges. Fully detailed leaflet available. Price £23.10.0. H.P. Deposit £4.14.0. and 12 monthly payments of £1.14.6. Price with leather carrying case, £27.8.0. H.P. Deposit £5.8.0. and 12 payments of £2.0.4.
 Other AVO Meters available include the Model 7, £19.10.0. H.P. Deposit £3.18.0. and 12 payments of £1.8.8. and the Multi-mpor price £9.10.0. H.P. Deposit £1.18.0. and 12 monthly payments of 14/4.

JASON FM TUNER

There are no less than four different Jason FM Tuner Kits now available to the Home Constructor. Brief details are given here and individual lists on any are available free.
MOST IMPORTANT. We take great pains to see that the kits we supply are *absolutely complete* in every detail and also that all components supplied are entirely suitable in every way. This accounts for differences in price you may notice between our prices and those of some of our competitors. **THIS SHOULD BE BORNE IN MIND WHEN COMPARING PRICES.**



Hire Purchase Terms available. FMT2 & 3

STANDARD TUNERS

STANDARD TUNER, FMT1. The very popular tuner which is supplied with a chassis assembly fitted with a gold hammer finish front panel and glass dial. Employs four EF81 valves. External power supply is required. Complete kit £8.19.6. Power pack kit 39/-.
STANDARD TUNER IN SHELF MOUNTING CASE, FMT2. This is a new version of the above tuner. The circuit has been brought up to date and is built into the very attractive live shelf mounting case of the new Fringe Tuner mentioned below. The circuit uses four EF80 valves and the power supply can be built into the case if desired. Complete Kit £7.17.6 without power supply components, £9.16.0 with power supply.
MERCURY SWITCHED TUNER. This is a tuner in chassis form which has a three position switch for the three BBC programmes. Uses one ECF80 and four EF80 valves. External power supply is required. Complete Kit £9.19.0. Power Pack Kit 39/-.

FRINGE TUNERS

NEW FRINGE TUNER IN SHELF MOUNTING CASE, FMT3. This is an entirely new Fringe Tuner and is supplied complete with a very attractive green shelf mounting case with Perspex dial. The tuner is fitted with variable AFC. Internal power supply if desired. Valves used are one ECC81 and five EF80. Complete Kit £9.16.0 without power supply components, £11.18.0 with power supply.

INSTRUCTION MANUALS

All our kits include the appropriate instruction manual. All available separately as follows:
 Manual covering both Standard Tuners and the new Fringe Area model, 2/10; "Mercury," 2/3. All post free.

Hire Purchase Terms are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5% but minimum charge 10/-; Six and Twelve months: Deposit 4/- in the £. Service charge 10% but minimum charge 20/-.

Terms of Business.—Cash with order or C.O.D. Postage extra under £3. We charge C.O.D. orders as follows. Up to £3, postage and C.O.D. fee minimum 2/8. Over £3 and under 25, C.O.D. fee only 1/6. Over £5 no charge.

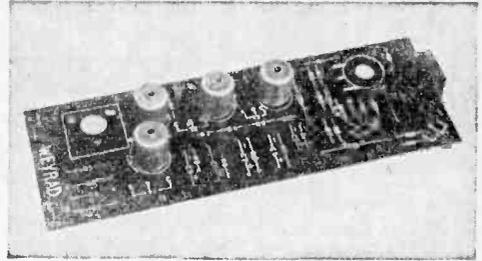
WATTS RADIO 54 CHURCH STREET, WEYBRIDGE, SURREY
 (MAIL ORDER) LTD. Telephone: Weybridge 4556

Please note: Postal business only from this address.

WEYRAD

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

LONG AND MEDIUM WAVE AERIAL—RA2W
On 6 in. rod, 7/16 in. diameter, flying lead connections, 208 pF tuning 12/6
OSCILLATOR COIL P50/IAC
Medium wave in screening can. For 176 pF tuning condenser 5/4
1st AND 2nd I.F. TRANSFORMERS—P50/2CC
470 Kc/s operation with 250 pF tuning in cans. 11/16 in. diameter by 3/4 in. high 5/7
3rd I.F. TRANSFORMER—P50/3CC
Last stage transformer to feed diode detector. Size as P50/2 6/-
DRIVER TRANSFORMER—LFD2T
Upright mounting with six connecting tags—1 3/8 in. x 7/8 in. x 1 3/4 in. 9/6



PRINTED CIRCUIT—PCAI

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

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

Constructor's Booklet with full details, 2/-

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

VALVES

SAME DAY SERVICE

NEW! TESTED! GUARANTEED!

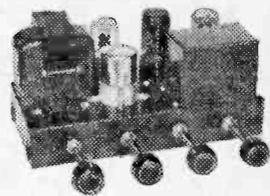
SETS

1R5, 1S6, 1T4, 3S4, 3V4, DAF91, DF91, DK81, DK92, DL92, DL94, any 4 for 23/6
DAF96, DF96, DK96, DL96 4 for 30/-
6K7G, 6AR6G, 6Q7G, 6V6G, 6X5G, or 5Y3G 5 for 27/-

1A7GT 12/-	6L1 15/-	25Z4G 8/-	EBC41 8/6	EY86 8/3	PZ30 17/-
1D5 9/-	6L18 12/3	25Z6GT 9/6	EBF80 8/-	EZ40 6/9	SP61 3/6
1H5GT 10/-	6P25 9/-	30C1 8/-	EBF89 8/9	EZ41 7/6	T41 15/6
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1R3 6/9	6Q7GT 9/6	35L6GT 10/-	EC92 11/-	EZ81 7/-	U26 12/-
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1T4 4/9	8U4GT 11/-	43 8/-	ECC83 7/-	KT33C 7/-	U78 6/-
3U5 6/6	6V6G 5/-	50CD6G 26/9	ECC84 8/9	KT41 14/6	UABC80 7/9
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5V4 7/6	7B7 7/6	CL33 13/-	ECH21 20/6	6V 6/-	UBF89 8/6
5U4G 5/3	7C5 7/6	DAC32 10/-	ECH35 6/8	MU14 8/-	UBL21 20/6
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5Y3GT 6/9	7H7 7/6	DAF96 8/3	ECH81 8/6	N18 8/6	UCC85 8/-
6Z4G 9/6	7S7 9/9	DCC90 10/6	ECL80 8/-	PCC84 8/-	UCF80 14/-
6AL5 3/9	7Y4 7/-	DF33 10/-	ECL82 10/-	PCC89 14/-	UCH21 20/6
6AM6 5/-	10C1 14/6	DF91 4/9	EP39 4/6	PCF80 8/-	UCH42 9/-
6AM2 3/6	10M2 17/6	DF96 8/9	EP41 8/9	PCF82 9/3	UCC88 8/6
6AQ5 6/-	10F1 15/6	DH76 6/6	EP42 11/6	PCL82 9/3	UCL82 11/6
6AT8 7/3	12AH8 10/6	DH77 7/3	EP80 6/6	PCL83 11/-	UCL83 13/-
6BA8 6/-	12A17 5/9	DK32 12/-	EP85 6/9	PCL84 8/-	UF41 8/9
6BE8 9/-	12A16 7/6	DK40 14/-	EP88 10/6	PEN44 11/-	UF42 8/6
6BH8 5/9	12A17 6/6	DK91 8/9	EP89 8/-	PEN38C 8/6	UF89 7/6
6BU6 5/9	12AX7 7/-	DK92 8/6	EP91 3/6	PEN45 8/-	UL41 8/-
6BR7 10/-	12BA6 8/-	DK96 8/3	EP92 4/6	PEN46 5/6	UR4 8/-
6BW6 10/-	12K7GT 5/6	DL33 9/-	EL33 10/-	PL36 11/9	URIC 8/-
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6CD6G 28/9	12Q7GT 5/6	DL92 6/9	EL41 8/-	PL81 10/-	UY41 6/6
6F1 14/6	12Z3 7/6	DL94 7/6	EL42 10/6	PL82 7/6	UY85 6/9
6FG6 6/6	14S7 16/9	DL96 8/3	EL84 7/6	PL83 8/-	VP4B 8/6
6F13 12/6	19AQ5 7/-	EABC80 7/9	EM34 8/-	PY32 12/-	VP41 6/-
6F14 17/6	20F2 17/6	EAC91 4/6	EM80 9/-	PY80 7/6	W76 6/6
6K7C 3/9	20L1 17/6	EAF42 8/6	EM81 8/-	PY81 6/9	W77 4/6
6K7GT 6/-	25A6G 11/-	EB91 3/9	EM84 10/-	PY82 7/-	XT6M 11/6
6K9G 6/9	25L6GT 9/-	EBC33 5/-	EY51 9/-	PY83 7/9	Z77 3/6

BARGAIN OFFER

DE-LUXE 4 WATT
GRAM AMPLIFIERS
LIST PRICE £9-7-6
OFFERED AT



£4-0-0

Guaranteed for 12 months

This Amplifier is a high quality unit by a well known manufacturer. It has independent boost and cut on treble, middle, and bass. The response curve can be varied to compensate for non-linearity in pick-up or speaker. The hum level is virtually non-existent and voltage negative feedback gives a very low distortion level. The Amplifier is finished in stove enamel, with fully shrouded transformers and modern knobs with gold rings. Valves 6SN7, 6V6, 6X5. Size 9 x 4 1/2 x 4 1/2 in. Mains 200-250 volts A.C. fully isolated.

C.W.O. or C.O.D. P. & P. 3/6

A.G. SUPPLIES

241A THE BROADWAY, S.W. 19

READERS RADIO
24, COLBERG PLACE, STAMFORD HILL,
LONDON, N.16. STA. 4587

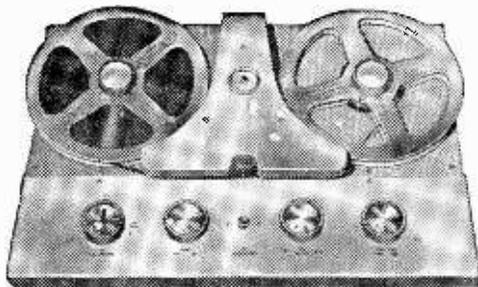
Post 6d. per valve extra.
Any Parcel Insured Against Damage in Transit 6d. extra.
Any C.O.D. Parcel 2/6 extra.

NEWS FROM THE TRADE

LATEST DEVELOPMENTS IN RECEIVERS AND COMPONENTS

MULTIMUSIC TAPE DECK

A NEW tape deck has been introduced by Multimusic Ltd. There are no belts or interwheels and in operation there are only five moving parts. Three of these are the motors, all specifically designed for the purpose, one being the main drive motor, synchronous or alternatively hysteresis synchronous, and two side motors. The only other moving parts are the pinch-wheel and a gear-driven clock type tape position indicator. The main motor, which gives direct drive, can be

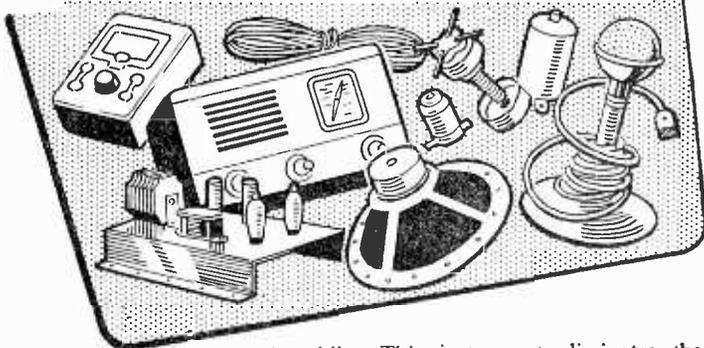


The Multimusic tape deck.

reversible and provision is made in the head assembly unit for three heads to be accommodated each side of the capstan. It is therefore possible to produce for stereo quarter track recording a model which will record one way, stop, reverse and record the other way and then switch off. The deck is supplied for use with reels up to 8½in. diameter, and is standard rack size—19in. wide. It will be used with a new range of Reflectograph tape recorders. This tape deck will soon be available from manufacturers of high fidelity equipment and is made by *Multimusic Ltd., Maylands Avenue, Hemel Hempstead, Herts.*

NEW "RAI-TEL-ADE"

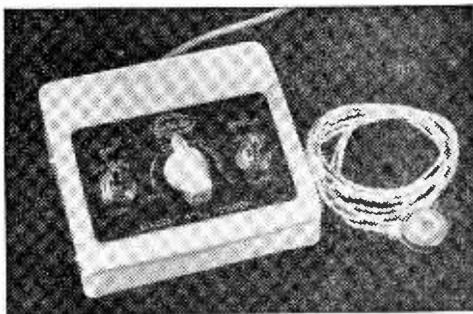
AFTER four years consumer research with the original "Rai-Tel-Ade" Electric Ades have now produced the improved "Rai-Tel-Ade" Mark 2, which provides remote control over TV, Radio and Radiograms, and assistance to the deaf and hard of hearing to enable them to enjoy sound programmes fully. By use of switches and control knobs the unit provides complete armchair control for the listener or viewer and improves tone quality for both the hard of hearing and the



general public. This instrument eliminates the distortions picked up by the usual practice of dangling the deaf aid microphone in front of the source of sound. The "Rai-Tel-Ade" costs £5 5s. and is made by *Electric Ades Ltd., 4, Eastbourne Road, Hanworth, Middlesex.*

MINIATURE POTENTIOMETER

IN response to growing demand for miniaturised equipment the Plessey Co. have introduced the Type L potentiometer, the smallest of the spindle-operated type in production. Housed in an aluminium case, it is only 0.5in. in diameter. The L series incorporates a brush assembly of unique design. Two tracks are included in the moulding; a carbon, resistive outer and a silver-

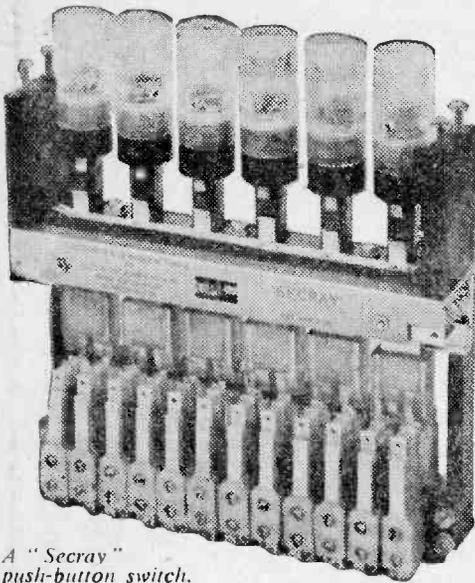


The "Rai-Tel-Ade" Mark 2.

loaded, conductive inner. They are bridged by a single tension-located brush housed in an insulated carrier. By reducing the number of pressure contacts, greater reliability is achieved. The L potentiometer operates within the temperature range -55 deg C to 58 deg C and has a voltage limitation of 350. It is made by the *Plessey Company Ltd., Ilford, Essex.*

PUSH-BUTTON SWITCH

A BRITISH company has now produced the prototype of a precision push-button switch for mass production. It is especially suited to high-frequency applications and is designed to

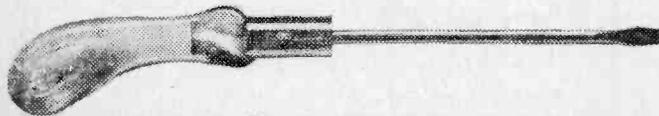


A "Secray" push-button switch.

reduce maintenance and the likelihood of mechanical breakdown. The switch can be made with any number of buttons up to 16. Each button has a standard contact arrangement of two double-pole changeovers. Only one push-button can be operated at one time and the contacts of the operated button are cleared before a new contact is made. The manufacturers are *Seton Creaghe Engineering Ltd., G.W. Trading Estate, Park Royal Road, N.W.10.*

A.E.I. EDUCATIONAL AIDS

PRACTICAL aids to the teaching of basic electronics theory are now available from the Special Products Department of A.E.I. Radio and Electronic Components Division. They have been designed to form the basis of an extensive range of laboratory experiments to be carried out in conjunction with courses in radio and electronic theory. Eleven chassis are available, to teach the basic connections of International Octal, B7G and B9A valves, and the operation of an R/C coupled amplifier, R/C coupled and tuned-anode oscillators, low-pass and high-pass networks and a power output stage. The units have been designed to operate in the audio frequency range. The circuit diagram of each major unit is printed on top of the chassis and where a terminal or switch occurs in the



The Steadfast ratchet screwdriver.

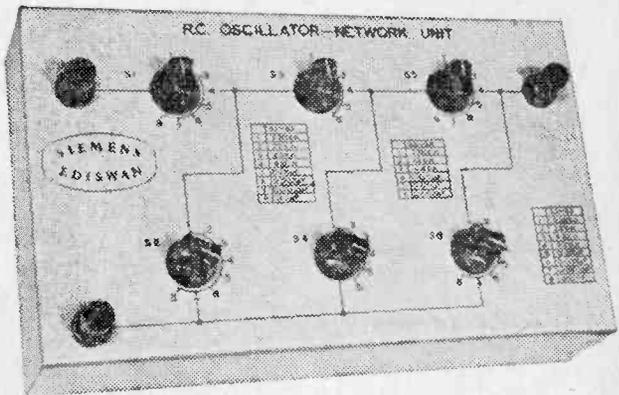
theoretical circuit, there the actual component is mounted. Each unit is supplied with instruction sheets covering a number of experiments and the underlying theory. Further information can be obtained from *Associated Electrical Industries (Woolwich) Ltd., 155, Charing Cross Road, London, W.C.2.*

NEW SCREWDRIVER

THE Steadfast Ratchet Screwdriver has a handle shaped in a pistol grip fashion making it easy to use and comfortable to handle. The blades are chromium plated, six inches in length, and the handle is made from translucent amber plastic which is virtually unbreakable. The ratchet action is robust and positive. This tool should prove very useful to handymen and constructors, and it may be purchased from most tool dealers and iron-mongers and the retail price is 10s. 6d. The makers are *J. Stead and Co. Ltd., Manor Works, Cricket Inn Road, Sheffield 2.*

A.M.G. STANDARD

A NEW standard has been published by the Technical Committee of the Audio Manufacturers' Group on inter-unit connectors. The aim of the standard has been to facilitate the inter-connection of units of different manufacture, provided that their electrical characteristics are matched.



One of the A.E.I. educational aids.

When considering the various forms of connectors, priority has been given to performance and safety requirements. This standard applies to equipment which has its chassis isolated from the mains by a double wound transformer. This standard, "Recommended Practice for Plugs, Sockets and Connectors for use with Audio Amplifying Equipment" is free of charge and is available from *The Secretary, Audio Manufacturers' Group, 49, Russell Square, London W.C.1.*

C.W.S. RADIO SET

A C.W.S. Defiant radio set has been chosen by the Council of Industrial Design for a special exhibition which the Council is staging in Liverpool in May. The set, Model AF21, is a six valve receiver in a modern cabinet and retails at 21 guineas.

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

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



OUR LATEST OFFER: THE FAMOUS COSSOR (Traveller's Friend) TRANSISTORISED POCKET RECEIVER

This set can be built for £7.19.6. Size 6 x 3½ x 1¼ in.

£7.19.6

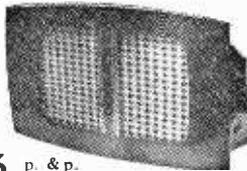
Weight 17 ozs. This set covers medium waveband 190/500 metres intermediate frequency. 470 kc/s using 4 transistors (Ediswan) and 2 diodes on a printed circuit board, plus a 2¼" moving coil speaker. Instruction book with point to point wiring diagram, 2/6 each. Batteries, PP4 (Ever Ready) 2/- each. P. & P. 2/-.



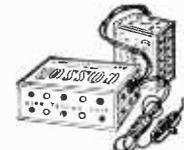
ALL PARTS CAN BE SOLD SEPARATELY

AMPLIFIER AND CABINET

3-watt Amplifier, using an ECL82 Valve and Metal Rectifier, housed in a modern attractive styled walnut cabinet with 5" P/M Speaker and on/off and tone controls. £4.12.6



p. & p. 3/6.



Convert your Battery Set to Mains with a COSSOR BATTERY ELIMINATOR

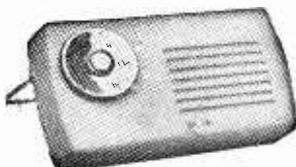
MU2. For operation on 200/250 v. 50 c/s A.C. mains. Output: L.T., 1.5 v 125 mA.; H.T., 90 v. 10 mA. OUR PRICE 37/6 p. & p.



AMPLIFIER KIT

This is the famous Cossor 562K, 3-watt Audio Amplifier Kit, using 1 EF86, 6BQ5 and 5V4 valves, a 10" x 6" elliptical speaker and a 4" round speaker. This kit can be easily assembled to provide a compact and versatile printed circuit amplifier suitable for operation from radio microphone gramophone inputs. The circuit design includes negative feed-back and high performance loudspeakers, an easy-to-build instruction pamphlet. Original list price £9.15.0.

OUR PRICE £5.19.6 P. & P. 2/6.



TRANSISTOR KIT

A six Transistor pocket radio, can be built for £9.19.6

plus 3/6 post. Full medium and long wave superhet. Printed circuit construction, using latest miniature components, 2¼" moving coil speaker, Ferrite Aerial. Choice of an attractive plastic cabinet in Cream, Blue or Red. Complete easy-to-build instruction book included. All Parts Sold Separately.

SPEAKERS

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

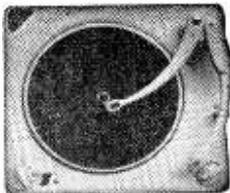
AUTO-CHANGERS BRAND NEW OFFER

COLLARO 4-SPEED AUTO-CHANGER

Incorporating auto and manual control. Complete with Studio crystal p.u. and sapphire stylus. Plus 3/6 p. & p.

OUR PRICE

£7.19.6



B.S.R. 4-spd. mixer Auto-Changer type UA8, complete with latest B.S.R. "ful-fi." Carr. & Pkg. 3/6. **£6.19.6.**

MAINS TRANSFORMERS

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

STANDARD ELECTROLYTICS

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

SUB-MINIATURE CONDENSERS

All at 2/3 each

8 µF x 6 volt.
10 µF x 6 volt.
30 µF x 6 volt.
50 µF x 6 volt.
100 µF x 25 volt.

BARGAIN OFFER

90° 17" Tube by well-known manufacturer, Type CME/1702 (Substandard). Price **£5.19.6.** (Callers only.)

WIRECOMP ELECTRONICS

378 HARROW ROAD, LONDON, W.9. TEL.: CUNNINGHAM 9530

Hours of business: 9 a.m.-6 p.m. Open all day Saturday.

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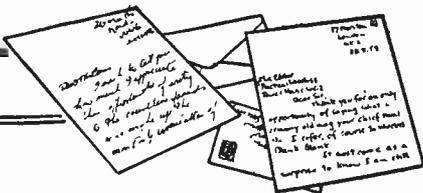
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Open to Discussion



The Editor does not necessarily agree with opinions expressed by his correspondents.

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

Naval Amateur Radio Society

SIR,—It has been proposed by several serving, and ex Royal Navy amateur radio enthusiasts that a Society be formed to enable all those interested to keep in touch with old friends and to foster the Amateur Radio movement within the Royal Navy as a whole. Already a sizeable list of those eligible for membership has been compiled, but it is known that there are far more amateurs eligible who have not yet forwarded their names. Any serving, or ex member of the Royal Navy is eligible, who holds, has held, or hopes to hold an amateur radio licence. SWL's are also welcome. Anyone who is interested should contact either G8IX, 11 Dotteslow Street, Manley, Stoke-on-Trent, Staffs., or G3JFF, PO's Mess, H.M.S. Ganges, Shotley, Suffolk. Members of the Commonwealth Navies are also invited to forward their names and relevant details. If you know the names or call-signs of any other eligible hams please let us know, so that we can contact them. Please forward name, call-signs, home address, serving QTM (if any), rank/rate and official number along with brief details of rig, operating times and special interests.—M. T. MATTHEWS (G3JFF).

An Inexpensive T.R.F.

SIR,—After constructing "An Inexpensive T.R.F." (January 1960 issue) I found that the gain control was inadequate to control the overall gain of my receiver. This was attributed to the high gain of the 6K7 stage. I carried out a modification to the circuit as follows. I disconnected R3 both from the cathode and the "top" end of the potentiometer and connected it between the chassis and the bottom end of the potentiometer. The slider of the potentiometer I connected to the cathode of the valve (and C8 of course) and wired a 22k $\frac{1}{2}$ W resistor between the "top" of the gain control and the H.T. line. This 22k resistor is the only additional component required.—W. R. B. SPEAKE (Southbourne, Bournemouth).

Wow and Flutter

SIR,—My sympathies go out to G. Brian James (January issue) as I too abhor that most unpleasant rise and fall of a long sustained note

heard on some long playing records, a fault known technically as "wow". It can be due to many causes such as oversize record holes, eccentric or warped records, undersize or eccentric turntable pins, uneven turntable speeds or even poor recordings—fortunately rare occurrences these days. My experience however tends to suggest that it is almost always a problem of the record grooves not being cut concentrically with the centre hole, the pick-up therefore making its path across the record in a series of side swings to the aural distress of the discerning or musically minded listener. The simple remedy is very carefully to draw over the centre hole in the direction of maximum pick-up swing, using a fine round file, and taking repeated checks with the pick-up until little perceptible sideways movement is left. An arrow inked on the record label then indicates which end of the elongated centre to butt up against for future playing. This operation often has to be performed for both sides of the record as the pressing of one side never seems quite the same as the other.—J. C. WILLIAMS (Crawley, Sussex).

SIR,—I was interested to read of G. Brian James' experience with inconstant performance from a classical LP record. There are, of course, very many mechanical faults which can be associated with record players these days but I am assuming that since he refers to a Hi-Fi gramophone he must be using "transcription" equipment. On this assumption, he might transfer his attention to other physical properties of the disc itself. Is it really flat? Despite the fact that there is a British Standard Specification which defines within reasonable limits the tolerable distortion that a record may have when it leaves the factory. I have been obliged to return 12in. hi-fi records of a certain manufacture to the makers for replacement. In each case the disc was badly dished and in some cases warped. A warped record could, if torque were of a low order, cause inconstant performance. To a lesser extent, a dished record could produce similar effects since the stylus is tracking "on the side of a hill".—W. J. HUNTINGFORD (Guildford, Surrey).

27Mc/s Transmitter

SIR,—With reference to Mr. C. Goddard's letter concerning the 27Mc/s transmitter, the effect noticed may be due to one of two things happening.

If the receiver used for monitoring is a superhet, the 27Mc/s signal is probably overpowering the local oscillator in the superhet. If the I.F. of the receiver is 465kc/s, stations on 27 ± 0.465 Mc/s

will be heard. Only strong signals will break through, as the receiver's R.F. stages will be 465kc/s off the frequency of the station.

However, if the receiver is a T.R.F., one of the R.F. stages or detector is acting as a mixer, and signals will be heard on $27\text{Mc/s} \pm$ the frequency to which the receiver is tuned. Stations heard in this case will probably be in the long wave band.

There are probably more, similar, explorations but I have often noticed the effect in the first case myself. When monitoring signals from a top band transmitter, Radio Luxembourg can often be heard, no matter what frequency the receiver is tuned to, i.e. $1.86\text{Mc/s} - 0.465\text{Mc/s}$ (I.F.) = 1.4Mc/s .—J. BEDDOWS (Walsall).

Correspondents Wanted

SIR,—I would like to communicate with other readers interested in short wave radio and also tape recording. My recorder is a Grundig TK20. All letters and tapes will be answered.—D. B. HORGSON (21 Carlisle Road, Lincoln).

SIR,—I am 14 years old and would like to correspond by tape with other aspiring amateurs of my own age.—D. WILSON (Deepdene, 48, Godstone Road, Purley, Surrey).

SIR,—I am $13\frac{1}{2}$ years old and I have been interested in radio construction for about 5 years now. I would like to correspond with someone about my age.—R. PATON (183, Brampton Road, Carlisle, Cumberland).

Information Required

SIR,—Does any reader know where I could obtain some 6S7 valves. These are metal valves and used as R.F. and I.F. amplifiers in the Hammarlund H.Q. 120X? Also has any reader done any modifications of any sort on this receiver? I should be pleased to hear from anyone with information on this receiver.—SYDNEY BROWN (9, Roland Avenue, Nuthall).

SIR,—May I ask if your readers have any information on circuits, etc., for building a communications receiver with transistors using OC170 for R.F. and OC35 in class B?

I look forward to your magazine and have taken it for years. My interest now lies with transistors. It is a pleasure not having to carry heavy power packs, etc.—JACK BROOKES (1, Dean Street, Blackpool, S.S., Lancs.).

Aerial Tuning Unit

SIR,—Regarding the circuit of my Aerial Tuning Unit which was published in the previous issue, I would like to point out two things. Firstly, the unit is intended to match a high-impedance to a low-impedance aerial input, and if it is used with a receiver which has a high-impedance input, a mis-match will be the result. Those using ex-Government receivers may find the signals go up a great deal owing to the fact that many surplus sets have a low-impedance aerial input. Secondly, I have found that the circuit may be improved by not having the link winding joined to the rest of the circuit.—M. REYNOLDS (Nailsea, Somerset).

Satisfaction

SIR,—I wish to thank you for your very prompt reply to my inquiry about a hum when connecting an amplifier and a record changer. Your observation on the point of earthing both chassis was the one thing I had overlooked: when applied, the hum ceased. Thank you once again from a recent convert to hi-fi and also a new reader of PRACTICAL WIRELESS.—R. B. AVIS (Tonbridge).

Variometers

SIR,—In February, PRACTICAL WIRELESS Open to Discussion. Variometers were mentioned. Variometers in the early days of Wireless were the thing, one of the best tuners you could have. The coverage of the wavelength was small, compared with a variable condenser. To obtain the wavelength coverage many sets had a variometer together with a loading coil. The Dutch valve was a soft valve and rectified, without the use of a grid leak. It had a low vacuum. The soft type of valve was at that time gradually going out of use and the all-purpose hard valve came into use. The hard valve was as good for rectification as the soft, in conjunction with a grid leak. The Dutch valve had an H.T. in the neighbourhood of 22V. At that time, I bought one for the sum of 3s. 6d. and very good it was. Soft valves were generally very sensitive to filament control and it was frequently possible in those days to tune out an interfering station by judicious use of the filament resistance. Valves of this type are useless as low-frequency amplifiers.—B. J. LEE (Wimborne).

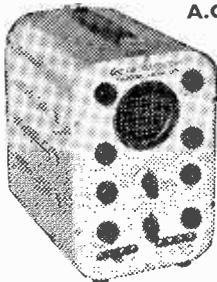
The "Old Days"

SIR,—I was somewhat amused by the majority of the statements made by Mr. A. Trowbridge in the March issue. Of course, amateur radio is not what it used to be—that goes for most things—and a good thing too! The situation would be odd if all of Mr. Trowbridge's wishes were current practice. We need modern components of the "solder-in" type, and as for the statement that every amateur does not own a soldering iron, anyone that has not taken the trouble to buy even a cheap, simple, "gas" iron should go back to bricklaying. Mr. Trowbridge is very much behind the times with knowledge of components—he quotes a capacitor as being "a plain roll covered in wax with wires sticking out of each end". Perhaps he should know that capacitor manufacturers today produce so many different types that they require large catalogues to illustrate them. As for requiring a pretty box to buy them in, whoever heard of such packing improving the performance of the component? I know too of the old metal-cored resistors—inefficient, noisy and have as much use today as an early car would be on the M1. The same goes for the old transformers—what monstrosities they were—the tuning capacitors "Delimiters"—inefficient then, and no use now.

No, Mr. Trowbridge, if you work on the old lines using modern components, your product would look like a bird's nest! Would it work? My guess is that whatever it was supposed to be, it would either oscillate or destroy itself in despair!—H. N. KIRK (Rotherham).

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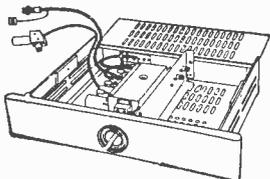
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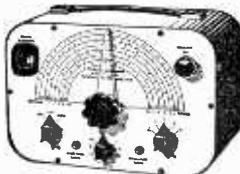
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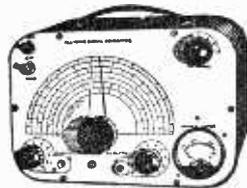
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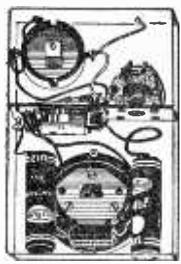


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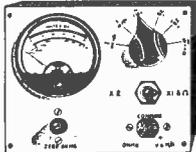


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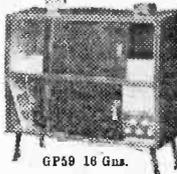
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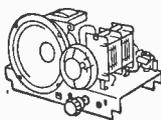
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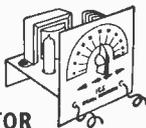
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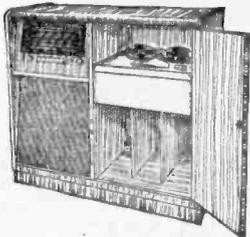
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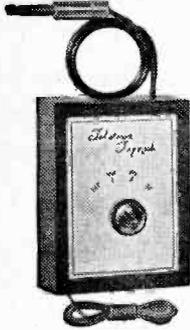
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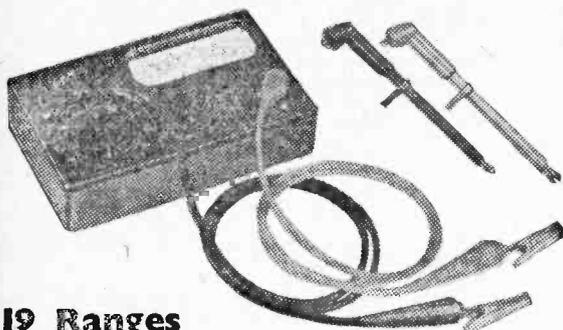
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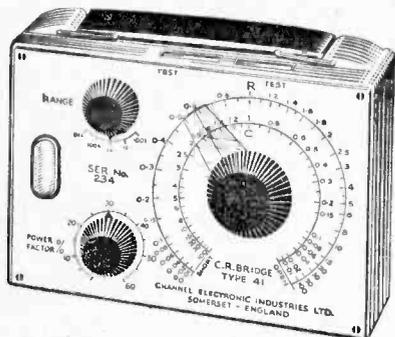
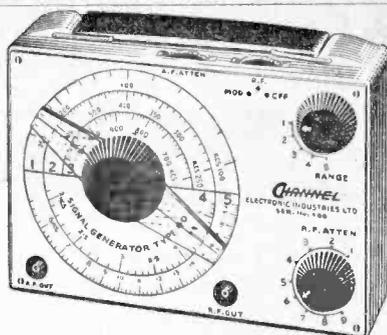
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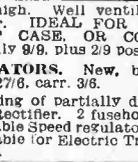


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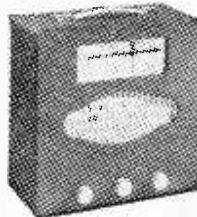
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SEE BACK PAGE

Practical Wireless

BLUEPRINT

SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, an asterisk in the list below denotes that constructional details are available free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to

PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Title	Number	Price
CRYSTAL SETS		
Junior Crystal Set	PW94*	2/-
Dual-wave Crystal Diode	PW95*	2/6
STRAIGHT SETS		
Battery Operated		
Modern One-valver	PW96*	2/6
All-dry Three	PW97*	3/6
Modern Two-valver	PW98*	3/6
SUPERHETS		
Mains Operated		
A.C. Band-pass Three	PW99*	4/-
A.C. Coronet-4	PW100*	4/-
A.C./D.C. Coronet	PW101*	4/-
MISCELLANEOUS		
The PW 3-speed Autogram	—*	8/-
The PW Monophonic Electronic Organ	—	8/-
TELEVISION		
The PT Band III Converter	—*	1/6

Title	Number	Price
A.C. Fury Four	PW20*	2/6
Experimenter's Short Wave	PW30a*	2/6
Midget Short Wave Two	PW38a*	2/6
Band-Spread Three (Battery)	PW68*	2/6
Crystal Receiver	PW71*	2/-
Signet Two (Battery)	PW76*	2/6
Simple S.W. One-valver	PW88*	2/6
Pyramid One-valver	PW93*	2/6
BBC Special One-valver	AW387*	2/6
Short-Wave Two	AW429*	2/6
Short-Wave World Beater	AW436*	3/6

Standard Four Valve S.W.	WM383*	3/6
Enthusiast's Power Amplifier	WM387*	3/6
Standard Four Valve	WM391*	3/6
Listener's 5-Watt Amplifier	WM392*	3/6

TELEVISION

Argus Television Receiver	—*	3/-
Simplex Television Receiver	—*	3/6

QUERY COUPON

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PRACTICAL WIRELESS, APRIL, 1960

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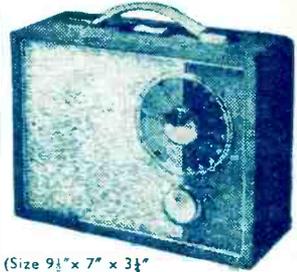
- ★ Plessey Printed Circuit
- ★ 6 Ediswan Transistors
- ★ 5" High Fidelity Speaker
- ★ 400mW Push-Pull Output
- ★ Internal Ferrite Aerial
- ★ Slow Motion Tuning
- ★ Full Instructions
- ★ Printed Circuit marked with Component Numbers
- ★ Trimming Tool Supplied
- ★ Double Tuned I.F.s

All components available separately. Send for descriptive leaflet and prices. **CALL FOR DEMONSTRATION**

Total Cost of all Components

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including Cabinet, Battery, Transistors, Car Radio, AVC and all necessary items.



A highly sensitive and selective portable fully tunable on medium and long waves. Performs equally well as a car radio. Low running costs, good looks and care of construction combine to produce a radio equal to commercial receivers in the 20 gns. class.

(Size 9½" x 7" x 3½"
Weight 4 lbs.)

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MAJOR—2

(Two-transistor Pocket Radio)



69/6 TOTAL COST
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- ★ 4-stage reflex !
- ★ Medium wave : tunable !
- ★ Very sensitive !
- ★ No aerial or earth !
- ★ Complete layout !
- ★ Over 6 months on one battery.
- ★ 4½ x 3 x 1½ in.
- ★ Weight only 4 ozs.
- ★ Personal phone.

RED-SPOT TRANSISTORS

5/- EACH

WHITE-SPOT

7/6

NEW FREE LIST ON REQUEST (See below)

MAJOR—3

(THREE TRANSISTOR POCKET RADIO)



(As Described in "R.C." Sept. 9)

- ★ 5-stage Reflex Circuit.
- ★ No Aerial or Earth.
- ★ Min. Volume Control.
- ★ 3 Ediswan Transistors.
- ★ Medium Wave Tuning.
- ★ Size 4½ x 3 x 1½ in.
- ★ Personal phone.

NEW BOOKLET FREE : All components sold separately. (Beware of Imitations.)

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