MAKING A 4-VALVE MIDGET PORTABLE

PRACTICAL WIRELESS

1/3

AUGUST 1957

EDITOR: F.J. CAMM

CONTENTS

FOR
VALVES
ALPHA
GUARANTEED ALL TESTED BEFORE DISPATCH

0Z4	5/6	6U4GT	14/-	EBC41	10/-
1A3	3/6	6U5G	8/6	EBF80	11/-
1A5GT	6/-	6U5	8/6	EC91	9/6
1A7	12/6	6U7G	8/6	ECC84	12/6
1C2	9/6	6V6G	7/-	ECC85	10/-
1D6	7/6	6V6GT	7/6	ECC91	6/-
1H5GT	10/6	6X4	7/6	ECF80	14/6
1L4	6/6	6X5G	7/6	ECF82	15/-
1LD5	3/6	6X5GT	7/6	ECH35	11/6
1N5	10/6	7B7	8/6	ECH42	10/6
1R5	8/-	7C5	8/-	ECL80	10/6
1S4	10/6	7C6	8/-	ECL82	13/6
1S5	7/6	7H7	9/-	EF80	7/-
1T4	7/6	7Q7	9/-	EF22	8/6
2X2	4/6	7S7	9/6	EF40	12/6
3A4	7/-	7Y4	8/6	EF41	11/-
3D6	5/-	75	11/6	EF85	12/6
3Q4	9/6	77	8/-	EF86	12/6
3Q5	9/6	80	8/6	EF89	12/6
3S4	8/6	807	6/6	EF92	8/6
3V4	9/-	8D2	2/9	EL32	6/6
4D1	3/-	9D2	3/9	EL41	10/6
42	8/-	9001	5/6	EL42	11/6
5R4GY	9/6	9003	5/6	EL48	11/-
5U4G	8/-	9004	5/6	EM34	10/-
5Y3G	8/-	9006	5/6	EM80	11/-
5Y3GT	8/-	954	2/-	EY51	11/6
5Z4G	10/6	955	4/9	EY86	12/-
6A7	13/-	956	3/6	EY91	6/-
6A8G	10/6	10F2	9/-	EZ40	10/-
6AC7	6/6	12A6	6/6	EZ80	10/-
6AG5	5/6	12AH7	8/-	EZ90	8/-
6AK5	6/6	12AH8	11/6	E1148	2/-
6AK7		12AT6	10/6	GZ32	12/6
6AG7	9/-	12AT7	9/-	H30	5/-
6AL5	6/6	12AU7	9/6	KBC32	8/-
6AM6	9/-	12AX7	10/-	KF35	8/-
6AQ5	7/6	12BA6	9/-	KL35	8/6
6AT6	8/6	12BE6	10/-	KT24	4/6
6AU6	10/6	12C8	7/-	KT2	5/-
6B8	5/-	12H6	3/-	KT33C	10/-
6B8G	4/-	12J5	4/6	KT66	15/-
6BA6	7/6	12J7	10/-	KTW61	
6BE6	8/-	12K7	9/-	(KTW62)	
6BJ6	9/-	12K8	13/-		8/-
6BR7	11/6	12Q7	9/6	KTW63	8/6
6BS7	13/-	12SC7	2/6	KTZ41	6/-
6BW6	8/6	12SG7	7/6	LP220	5/-
6BW7	10/-	12SH7	5/6	MH4	7/6
6C4	7/-	12SJ7	8/-	MH41	7/6
6C5GT	6/6	12SK7	6/-	N78	12/6
6C6	5/-	12SL7	8/-	P61	3/9
6CH6	7/6	12SQ7	8/6	P215	3/11
6D6	5/-	12SR7	7/6	PEN A4	15/-
6F6G	7/6	14S7	13/6	PEN25	5/-
6F6M	7/6	15D2	7/9	PEN46	7/-
6F12	14/-	20P3	11/-	PEN220A	
6F33	5/6	20P5	11/6		4/-
6F15	14/-	25L6GT	9/6	PCC84	10/-
6G6G	4/6	25Y5G	9/9	PCF80	11/-
6H6	2/6	25Z4G	9/-	PCF82	12/6
6J5G	5/-	25Z6GT	8/6	PCL83	12/6
6J5GT	5/6	30F5	11/-	PL81	13/6
6J5M	6/6	30FL1	11/-	PL82	10/-
6J6	6/-	35L6GT	9/6	PL83	12/-
6J7G	6/-	35W4	9/-	PP225	3/11
6K6GT	7/-	35Z4GT	8/6	PX25	12/6
6K7G	5/9	35Z5	9/-	PY80	10/-
6K7M	6/9	50L6GT	8/6	PY81	10/-
6K8G	8/9	AC6/PEN		PY82	8/-
6K8GT	9/6		6/6	PY83	12/-
6L6G	9/-	ATP4	3/6	QP21	7/6
6L18	11/6	DAF96	10/6	R19	13/6
6L7	7/6	DF96	10/6	SP220	3/11
6N7	7/-	DH73M	9/-	U10	10/-
6Q7GT	9/-	DK96	10/6	U22	8/-
6SA7GT	8/-	DL96	10/6	U25	13/6
6SG7	7/6	DM70	8/6	U45	13/-
6SH7	6/-	EABC80		U329	13/6
6SK7	6/-		10/-	U404	10/6
6SL7	8/-	EAC91	7/6	UAF42	11/6
6SN7	8/6	EAF42	12/6	UB41	9/6
6SQ7	9/3	EB41	9/-	UBC41	10/-

UBC42	11/-	VR91	
UBF80	12/6	(SYL)	7/-
UCH42	12/6	VR92	
UCH81	12/6	(EA50)	1/6
UF41	10/-	VR105/30	
UL41	11/-		8/6
UY41	10/-	VR116	4/-
UY85	10/6	VR136	6/-
VR21	2/9	VR137	5/6
VR53		VR150/30	
(EF39)	6/6		8/-
VR54		VP23	6/6
(EB34)	2/-	VP41	8/6
VR55		VS70	3/-
(EBC33)		VT52	
	7/6	(EL32)	6/6
VR56		VT501	5/-
(EF36)	5/-	VU39	
VR57		(MU12/14)	
(EK32)	8/-		8/9
VR65		VU64	
(SP61)	3/-	(U12)	9/-
VR65A		VU111	2/6
(SP41)	3/-	W61	8/-
VR66		W77	8/6
(P61)	3/9	X65	10/-
VR91		X76	11/6
(EF50)	4/-	Z759	12/6

TRANSISTORS, RED SPOT, 10/- each. BLUE SPOT, 15/- each.
POSTAGE AND PACKING 6d. per valve. SAME DAY SERVICE

TRANSISTORS
Suitable for audio work, yellow and green spot, 10/- each; red spot, 10/- each.
RF for use up to 1.6 mc/s., blue spot, 15/- each.
RF for use up to 1.5 mc/s. to 8 mc/s., yellow and red spot, 21/- each.

JB gang condensers for transistor working. "0" gang, 1 or 2 gang, 365 PF swing aluminium vanes, steel chassis. 1 gang, 7/6 each; 2 gang, 11/6 each. JB "00" twin gang condenser, 208 PF front section, 176 PF rear section. Price 9/6 each.

TELETRON transistor superhet coils. Set of IF and oscillator coils with Ferrite rod, 36/- per set (circuit included).
Long wave loading coil to match, 4/6 each.

REPANCO
OT1 Combined 1st IF and OSK coil, 11/6.
TT2 2nd IF Transformer (315 Kc/s), 5/-.
TT3 3rd IF Transformer (315 Kc/s.), 5/-.
TT4 Push Pull interstage transformer, 8/6.
TT5 Push Pull output transformer, 8/-.
Circuits included with all types.

BSR MONARCH
4 speed automatic record changer unit plays 7in., 10in. and 12in. records automatically with "MAGIDISK" selector. Unit plate 12¾in. x 10½in. £8.15.0 each, carriage 3/-.

Line Cord, 3 amp. 3 core, 1/9 yard.
Line Cord, 2 amp, 3 core, 1/9 yard.
Electric Buzzers in Bakelite Case, loud tone, 2/6 ea.
Epicyclic Friction Drive with Brass Drum. For use with steel Dial Drive Wire, 1/6 ea.

ELSTONE INTERVALVE TRANSFORMERS
LF.35. Ratio 1-3.5. Primary 40-60H Parallel feed only. Coupling condenser, 25 mfd., 2in. x 1.2in. high, 10/- each.
LF.36. Ratio 1-3.5. Secondary CT for Push-Pull connection: Specification as LF.35, 10/- each.
LF.37. Ratio 1-3 Primary D.C. 3 mA. Mumetal core. Fitted with terminal panel 2in. x 1.2in., 10/- each.
LF.38. With split secondary for Push Pull input, Sectionalised Windings ensure low leakage inductance and brilliant top note response. Primary current 20 mA. The LF.38 makes an excellent blocking oscillator transformer. 18/6 each.

COLLARO. Four speed autochange unit, a fully mixing automatic changer with many advanced features. Unit plate, 12in. x 13½in. £9.15.0 each, carriage 3/-.

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High Quality Sound Reproduction, includes 20-watt amplifier. FM Tuner, Pre-amplifiers, etc.	3/6

MAINS TRANSFORMERS
3 Way Mounting Type
MT1. Primary: 200-220-240 v. Secondaries: 250-0-250 v. 80 m/A, 0-6.3 v. 4 amp. 0-4 v. 2 amp. Both tapped at 4 v., 19/6 each.
MT2. Primary: 200-220-240 v. Secondaries: 350-0-350 v. 80 m/A, 0-6.3 v. 4 amp. 0-5 v. 2 amp. Both tapped at 4 v., 19/6 each.
MT3. Primary: 200-220-240 v. Secondary: 30 v. 2 amps. Taps at 3 v., 4 v., 6 v., 8 v., 9 v., 10 v., 15v., 18 v., 20 v., 24 v., 19/6 each.
Postage and Packing. Please add 2/- per transformer.

• Control Knobs in Modern Styling •
Tastefully and clearly engraved in gold. These Mouldings are available in two colours: Walnut and Ivory. They are suitable for use with ¼in. spindles and are simply and firmly held by means of a grub screw and locking nut.
Type "A," 1/6 ea. Type "B," 1/2 ea.

COLLARO
Model 3/551, 3 speed single player. Automatic Stop, fitted with "Studio T" pick-up. Cream finish. £6.19.6 each. Post 3/-.

LOUDSPEAKER UNITS

	each
Elac Square Type, 3½in. units, PM	19/6
Lectrona, Plessey, 5in. units, PM	17/6
Goodmans, Plessey, 6½in. units, PM	18/6
Goodmans, R. & A., 8in. units, PM	19/6
Plessey, R. & A., Elac, 10in. units, PM	25/6
Plessey, 12in. units, PM	35/-
Rola 6in. x 4in. Elliptical Unit, PM	19/6
Elac 10in. x 6in., Elliptical Unit, PM	25/6

All above PM speakers are 2 to 3 ohms.
RTC 12in. Heavy Duty 20 watts Model, 15 ohms. Speech coil, £5.5.0.

5in. Mains Energised Speaker	20/-
6½in. Mains Energised Speaker (Plessey)	17/6
8in. Mains Energised Speaker (Plessey)	21/-

All have field coils of approx. 600 ohms.
We have just received a few more 8in. Speaker units by Goodmans, etc. PM Types fitted with standard output transformers. Offered again at 21/6 each.

WB SPEAKERS
HF 812 8in. unit, 5 watts, 83/6 each.
HF 1012 10in. unit, 10 watts, 99/9 each.
Both finished with universal speech coils matching to all transformers of 3 ohms, 7.5 ohms and 15 ohms.

CHASSIS
Aluminium Undrilled with Reinforced Corner. Available in the following sizes:

	each
6in. x 4in. x 2½in.	4/6
8in. x 6in. x 2½in.	6/3
10in. x 7in. x 2½in.	7/3
12in. x 3in. x 2½in.	6/9
12in. x 5in. x 2½in.	6/9
12in. x 8in. x 2½in.	8/6
14in. x 3in. x 2½in.	6/-
14in. x 9in. x 2½in.	12/-
16in. x 6in. x 2½in.	8/6
16in. x 10in. x 2½in.	14/-

All are four-sided. Ideal for radio receivers, amplifiers, power packs, etc.

AMERICAN RELAY
45 ohms Impedance with leads, No. AZ6545. 1/9 each.

IRON LEADS
Black and white flat iron leads, bonded ends, 1/3 each.

POTENTIOMETER PANEL
Four potentiometers on Panel. 50 K ohms SP8; 750 ohms W/W; 25 K ohms Carbon; 5 K ohms W/W. All with long spindle, with leads of different colours terminating in an 11-pin plug, 7/6 each.
Wavox choke, max. current 100 m/a D.C., resistance 125 ohms. 6/- each.
Westinghouse 1 m/a Rectifier, wire ends, 9d. each.
6 volt Vibrator Pack, complete with 4-pin Vibrator. 17/6 each.
Pliers Side Cutters, 3/- pair.
Morphy Richards type Replacement Iron Elements, 3/9 each.

2 RANGE POCKET VOLTMETER
Ex Ministry, brand new, 0-15 volts, 0-250 volts, moving coil 345 ohms per volt, complete with leads, 10/- each.

All these and many other interesting radio and TV components are listed in our CURRENT CATALOGUE which is available to you now. Send 1/- in stamps for your copy.

ALPHA RADIO SUPPLY CO.

103 LEEDS TERRACE
WINTOUN STREET
LEEDS 7

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

LASKY'S RADIO

TRANSISTORS

at a reasonable price

Hermetically sealed and unaffected by temperature variations. Tested and guaranteed efficient.

R.F. P.N.P. junction type, suitable for medium and low freq. oscillators, freq. changers and I.F. amplifiers (1.5 to 8 Mc/s). **21/-**

(Double spot—yellow and red.)

AUDIO P.N.P. Junction Type, suitable for high gain and low freq. amplifiers, and for output stages up to 250 milliwatts. **10/-**

(Double spot—yellow and green.) Post Free.

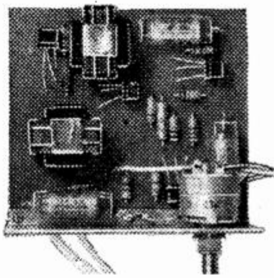
Special prices for 6 and over. *Full operating data and circuit diagrams for receivers, oscillators, amplifiers, etc. with each Transistor.*

MULLARD and BRIMAR Transistors in stock.

COMING SOON! LASKY'S FULLY TRANSISTORISED PORTABLE FOR HOME CONSTRUCTION, using 7 Transistors and 1 Germanium Diode. Watch for full details.

LASKY'S TRANSISTOR AMPLIFIER KIT

(200 milliwatts)



Miniature size: $3\frac{3}{8}$in. x $3\frac{1}{8}$in. Height can be under 1in. Uses our hermetically sealed Transistors and operates from 6-volt battery. Output impedance 5 ohms.

COMPLETE KIT

including 4 Transistors, all brand new components, latest T.C.C. miniature condensers, PRINTED CIRCUIT and full instructions, **86/6**

Post Free.

FULL DETAILS, circuit diagram and shopping list, 1/-, post free.

Free Demonstrations.

All components available separately.

Brand New in makers' cartons

COLLARO 4-SPEED AUTO-CHANGER

Very latest 1957 model RC.456, incorporating auto and manual control enabling records to be played singly or up to 10, all sizes mixed, automatically. Complete with Studio crystal pick-up and sapphire stylus. List £13.17.0. LASKY'S PRICE **£9.15.0**

Carr. & Packing, 3/6 extra.

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Type T901. Circular. Gives large black and white picture. 11in. x 14in. Guaranteed by us for 3 months. List £23.9.10. LASKY'S PRICE **£8.9.6**

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14in., £12.19.6. 17in., £14.19.6.

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FOR ONLY 6d. EXTRA PER ORDER WE WILL INSURE YOUR VALVES AGAINST DAMAGE IN TRANSIT. ALL UNINSURED PARCELS AT CUSTOMERS' RISK.

0Z4	6/-	6AC7	6/6	6F12	9/-	6V6G	7/-	12J5GT	4/-	41MP	12/6	CK523	6/6	EBC41	10/-	EL42	11/-	LN152	10/-	PY82	7/6	UL41	10/-
1A3	3/-	6AG5	6/6	6F13	13/-	6V6GT	7/-	12J7GT	11/-	41MTL	7/6	CK525	6/6	EBF80	9/6	EL81	15/-	LN309	12/6	PY83	9/6	UL46	15/-
1A5	6/-	6AG7	12/6	6F16	9/6	6X4	7/-	12K7GT	8/6	50C5	10/-	CV63	10/6	EBF89	9/6	EL84	10/6	LZ319	7/-	QP21	7/-	UU9	8/-
1A7	12/6	6AJ8	8/-	6F17	12/6	6X5GT	6/6	12K8GT	14/-	50L6GT	8/6	CV85	12/6	EC52	5/6	EL91	5/-	MH4	7/-	QP22B	12/6	UY41	8/6
1D6	10/6	6AK5	5/-	6F32	10/6	6Z4/84	12/6	12Q7GT	8/6	57	8/6	CV428	30/-	EC54	6/-	EM34	10/-	MHL4	7/6	QP25	6/6	UY85	10/6
1H5	11/-	6AK8	7/6	6F33	12/6	6Z5	12/6	12SA7	8/6	58	8/6	D1	3/-	ECC31	15/-	EM80	10/6	MHLD6		QS150/15		V1507	5/-
1L4	6/6	6AL5	6/6	6G6	6/6	6/30L2	12/6	12SC7	7/6	61BT	12/6	D42	10/6	ECC32	10/6	EY51	10/6		12/6		10/6	VLS492A	£3
1LD5	5/-	6AM5	5/-	6H6G	2/6	7A7	12/6	12SG7	7/6	61SPT	15/-	D63	5/-	ECC33	8/6	EY86	10/6	ML6	6/6	R12	14/-	VMP4G	15/-
1LN5	5/-	6AM6	9/-	6H6M	3/6	7B7	8/-	12SH7	5/6	72	4/6	D77	6/6	ECC35	8/6	EZ35	6/6	MU14	8/6	SD6	12/7	VP2(7)	12/6
1N5	11/-	6AQ5	7/6	6J5G	5/-	7C5	8/-	12SJ7	8/-	77	8/-	DAC32	11/-	ECC81	8/6	EZ40	8/-	N142	10/-	SP4(7)	15/-	VP4(7)	15/-
1R5	8/6	6AQ8	10/-	6J5GTG	5/6	7C6	8/-	12SK7	6/-	78	8/6	DAF91	7/6	ECC82	7/6	EZ41	10/6	N150	10/6	SP41	3/6	VP13C	7/-
1S5	7/6	6AT6	8/6	6J5GTM	6/-	7H7	8/-	12SQ7	8/6	80	8/6	DAF96	9/6	ECC83	9/-	EZ80	8/6	N309	11/6	SP42	12/6	VP23	6/6
1T4	7/-	6B4	6/-	6J6	5/6	7Q7	8/-	12SR7	8/6	83	8/6	DCC90	7/-	ECC84	12/-	EZ81	10/-	N709	10/6	SP61	3/6	VP41	8/6
1U5	7/-	6B7	10/6	6J7G	6/-	7V7	8/6	12U5G	7/6	85A2	15/-	DF33	11/-	ECC85	9/6	GZ30	8/6	OC3	9/-	TH30C	25/-	VP133	12/6
2A3	12/6	6B8G	4/-	6K7G	5/-	7Y4	8/-	12Y4	10/6	150B2	15/-	DF91	7/-	ECC91	5/6	GZ32	12/6	OD3	9/-	TP22	10/6	VT61A	5/-
2X26	4/-	6B8M	4/6	6K7GT	6/-	8D3	9/-	14R7	10/6	210LF	3/-	DF96	9/6	ECF80	12/6	GZ34	14/-	P61	3/6	U16	12/-	VT501	5/-
2D13C	7/6	6BA6	7/6	6K8G	8/-	9D2	8/-	14S7	14/-	807	6/6	DH63	8/6	ECF82	12/6	H30	5/-	PABC80		U22	7/6	W76	8/6
2X2	4/6	6BE6	7/6	6LD3	10/-	10C1	15/-	19H1	10/-	866A	12/6	DH76	8/6	ECH35	9/6	H63	12/6		15/-	U25	13/6	W77	6/6
3A4	7/-	6BJ6	8/-	6L6G	9/-	10C2	13/-	20D1	12/7	885	10/6	DH77	8/6	ECH42	10/-	HK90	10/-	PCC84	8/-	U31	9/-	X61	12/6
3A5	7/-	6BR7	11/-	6L7M	8/-	10F1	15/-	20L1	13/6	956	3/-	DK32	12/6	ECH81	8/-	HL23	10/6	PCC85	12/6	U50	7/6	X65	10/-
3B7	8/6	6BW6	8/6	6L18	13/-	10F9	11/6	25L6GT	9/-	1203	7/-	DK91	8/6	ECL80	9/-	HL41	7/6	PCF80	7/-	U52	8/-	X66	11/6
3D6	5/-	6BW7	10/-	6N7	8/-	10F18	12/6	25Z4G	9/-	4033L	12/6	DK92	9/-	EF6	10/6	HL133DD		PCF82	11/6	U76	8/-	X76M	14/-
3Q4	9/-	6BX6	10/-	6Q7G	8/6	10LD3	8/6	25Z6GT	9/6	5763	12/6	DK96	9/6	EF36	4/6		12/6	PCL82	12/6	U78	7/-	X79	12/6
3Q5GT	9/6	6BY7	8/6	6Q7GT	9/-	10P13	17/6	27	7/6	7193	5/-	DL2	15/-	EF37A	9/-	HVR2	20/-	PCL83	12/6	U251	15/-	XD(1.5)	4/-
3S4	8/-	6C4	7/-	6R7G	8/6	11E3	15/-	28D7	7/-	7475	7/6	DL33	9/6	EF39	6/-	HVR2A	6/-	PEN40DD		U329	15/-	XFW10	6/6
3V4	9/-	6C5	6/6	6SA7	8/6	12A6	6/6	30	7/6	9002	5/6	DL92	8/-	EF40	12/6	KL35	8/6		25/-	U404	8/6	XFY12	6/6
5U4	8/-	6C6	6/6	6SG7	6/6	12AH7	8/-	30C1	12/6	9003	5/6	DL94	9/-	EF41	9/6	KT2	5/-	PEN45	19/6	UABC80		XH(1.5)	4/-
5V4	10/-	6C8	8/-	6SH7	6/-	12AH8	10/6	30F5	12/6	9006	6/-	DL96	9/6	EF42	12/6	KT33C	10/-	PEN46	6/6		11/6	XSG(1.5)	4/-
5X4	10/-	6C9	12/6	6SJ7	8/-	12AT6	10/6	30FL1	12/6	AC6PEN		DL810	10/6	EF50(A)	7/-	KT44	7/-	PL81	13/6	UAF42	10/6	Y63	7/6
5Y3	7/6	6C10	10/6	6SK7	5/6	12AT7	8/6	30L1	12/6		6/6	DM70	8/6	EF50(E)	5/-	KT63	6/6	PL82	9/-	UB41	12/7	Y65	10/6
5Y4	10/-	6CH6	7/6	6SL7GT	8/-	12AU7	7/6	30P12	13/6	AC/HL/		EA50	2/-	EF54	5/-	KTW61	6/6	PL83	11/6	UBC41	8/6	Z152	12/6
5Z3	12/6	6D6	6/6	6SN7GT	7/6	12AX7	9/-	31	7/6	DDD	15/-	EA76	9/6	EF73	10/6	KTW62	8/-	PM2B	12/6	UBF80	9/6	Z63	10/6
5Z4	8/6	6F1	15/-	6SS7	7/6	12BA6	9/-	33A/158M		AC/P4	8/-	EABC80	7/6	EF80	8/6	KTW63	8/-	PM12	4/-	UCC85	11/6	Z66	20/-
6A8	10/-	6F6G	6/6	6U4GT	14/-	12BE6	10/-		30/-	AL60	10/-	EAC91	9/-	EF85	7/6	KTZ41	6/-	PM12M	6/6	UCH42	10/-	Z77	9/-
6AB7	8/-	6F7	10/6	6U5G	7/6	12E1	30/-	35/51	12/6	AP4	7/6	EAF42	10/6	EF86	12/6	KTZ63	10/6	PY80	9/-	UCH81	11/6	Z719	12/6
6AB8	10/-	6F8	10/6	6U7	8/6	12H6M	3/-	35A5	11/-	ATP4	3/6	EB34	2/-	EF89	10/-	L63	6/-	PY81	9/-	UF41	9/-	Z729	12/6
								35L6GT	8/-	AZ31	12/6	EB41	8/6	EF91	9/-								
								35Z3	10/6	B309	9/-	EB91	6/6	EF92	6/6								
								35Z4GT	8/-	B329	10/6	EBC3	15/-	EL32	5/6								
								35Z5GT	8/6	BL63	7/6	EBC33	7/6	EL41	10/6								

Terms of business:—Cash with order or C.O.D. only. Orders value £3 or more sent post/packing free. Orders below £3 please add 6d. per valve. C.O.D. orders:—Minimum fee, including post and packing, 3/-. We are open for personal shoppers. Mon.-Fri. 8.30-5.30. Sats. 8.30-1 p.m.

Please enquire for any valve, germanium diode, or transistor not listed. 2½d. stamp, please, or phone.

All valves new, boxed, tax paid, and subject to makers' guarantee. First grade goods only, no seconds or rejects. All orders received by first post despatched same day. S.A.E. for free complete list, with full terms of business.

R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS

6 v. 1 amp.	19/9
6 v. or 12 v. 1 amp.	25/9
6 v. 2 amps.	29 9
6 v. or 12 v. 2 amps.	38.9
6 v. or 12 v. 4 amps.	59 9

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

SELENIUM RECTIFIERS

6/12 v. 1 a,	4 11
6/12 v. 2 a,	8 9
6/12 v. 3 a,	11/9
6/12 v. 4 a,	14/9
6/12 v. 6 a,	19/9
6/12 v. 10 a,	25/9
6-12 v. 15 a,	35/9

L.T. Types H.W.
6-12 v. ½ a. H.W., 2 9

H.T. Types H.W.

150 v. 40 mA,	3/9
250 v. 50 mA,	5/9
250 v. 80 mA,	7/9
250 v. 150 mA,	9 9
250 v. 250 mA,	11 9

BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses, Fuse - holders, Grommets, panels and circuit. Carr. 2/9 extra.

6 v. or 12 v. 1 amp.	22/9
6 v. 2 amps.	25/9
6 v. or 12 v. 2 amps.	31 6
6 v. or 12 v. 4 amps.	53.9

BATTERY CHARGER KIT

Consisting of F.W. Bridge Rectifier 6/12 v. 5 a. Mains Trans., 0-9-15 v. 6 a output and ammeter, 49/9. Post 3/-.

ASSEMBLED CHARGER

6 v. or 12 v. 2 amps. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case, finished attractive hammer blue. Ready for use. With mains and output leads. Double Fused. Only **47/9** Carr. 3/9.

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

Assembled 6 v. or 12 v. 4 amps.

Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Double fused. Louvred steel case with stoved blue hammer finish. **75/-**

Ready for use with mains and output leads. Carr. 3/9

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

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

TOP SHROUDED DROP THROUGH

250-0-260 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a ...	16/9
350-0-350 v. 80 mA, 6.3 v. 2 a, 5 v. 2 a ...	18/9
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
350-0-350 v. 100 mA, 6.3 v. 4 a, C.T. 0-4-5 v. 3 a	23 9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a ...	29/9

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a, Midget type 2½-3-3in. ...	17 6
350-0-350 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a	19.9
250-0-250 v. 100 mA, 6.3 v.-4 v. 4 a, C.T. 0-4-5 v. 3 a ...	26/9
250-0-250 v. 100 mA, 6.3 v. 6 a, 5 v. 3 a, for R1355 conversion ...	31/-
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	23/9
300-0-300 v. 100 mA, 6.3 v.-4 v. 4 a, C.T. 0-4-5 v. 3 a ...	26/9
350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	23/9
350-0-350 v. 100 mA, 6.3 v.-4 v. 4 a, C.T. 0-4-5 v. 3 a ...	27/9
300-0-300 v. 130 mA, 6.3 v. 4 a, 6.3 v. 1 a, for Mullard 510 Amplifier ...	35.9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a	33.9
350-0-350 v. 150 mA, 6.3 v. 2 a, 6.3 v. 2 a, 5 v. 3 a ...	35/9
425-0-425 v. 200 mA, 6.3 v. 4 a, C.T. 6.3 v. 4 a, C.T., 5 v. 3 a. Suitable Williamson Amplifier, etc. ...	49.9
450-0-450 v. 250 mA, 6.3 v. 6 a, 6.3 v. 6 a, 5 v. 3 a ...	69 9

FILAMENT TRANSFORMERS

All with 200-250 v. 50 c/s primaries 6.3 v. 1.5 a. 5 9 ; 6.3 v. 2 a, 7 6 ; 0-4-6.3 v. 2 a, 7 9 ; 12 v. 1 a, 7/11 ; 6 3 v. 3 a, 8 11 ; 6.3 v. 6 a, 17 6 ; 12 v. 3 a or 24 v. 1.5 a, 17 6.

SMALL POTTED MAINS TRANSF. Removed from New Ex-Govt. units. Primary 0-200-230-250 v. Secs. 250-0-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a. Size 3½ x 4½ x 3in. **11/9**

ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s

120 v. 40 mA, 5-0-5 v. 1 a ...	15 9
90 v. 15 mA, 4-0-4 v. 500 mA ...	9/9

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries ; 0-9-15 v. 1½ a, 11/9 ; 0-9-15 v. 3 a, 16/9 ; 0-3-5-9-17 v. 3 a, 17.9 ; 0-9-15 v. 5 a, 19/9 ; 0-9-15 v. 6 a, 23/9.

SMOOTHING CHOKES

250 mA, 5 H 100 ohms ...	12/9
150 mA, 7-10-250 ohms ...	11 9
100 mA, 100 H 200 ohms ...	8.9
80 mA, 10 H 350 ohms ...	5 9
60 mA, 10 H 400 ohms ...	4/11

OUTPUT TRANSFORMERS

Midget Battery Pentode 66 : 1 for 3S4, etc. ...	3 9
Small Pentode, 5,000Ω to 3Ω ...	3.9
Small Pentode 7/8,000Ω to 3Ω ...	3/9
Standard Pentode, 5,000Ω to 3Ω ...	4/9
Standard Pentode, 7/8,000Ω to 3Ω ...	4/9
10,000Ω to 3Ω ...	4/9
Push-Pull 10-12 watts 6V6 to 3Ω or 15Ω ...	15/9
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15Ω ...	16/9
Push-Pull EL84 to 3 or 15Ω ...	16/9
Push-Pull 15-18 watts, 6L6, KT66 ...	22/9
Push-Pull 20 watts, sectionally wound 6L6, KT66, etc., to 3 or 15Ω	47 9

MANUFACTURERS' SURPLUS MAINS TRANSFORMERS. Primaries 250-250 v. 50 c/cs. Drop Through Chassis type, 250-0-250 v. 70 mA, 6.3 v. 2.5 a, 11/9.

SPECIAL OFFERS : Electrolytics. 32-32-32 mfd. 250 v. Dubilier small can, 2/9 ea. 150 mfd. 450 v., 3/9. Small .0005 mfd. 2-gang, 4/9 ea. Westinghouse Rectifiers 250 v. 250 mA., 7 9. **CO-AXIAL CABLE.** 75 ohm. ¼in. 8d. yd. Twin Screened Feeder 11d. yd.

EX-GOVT. TRANSF., 230/250 v. 50 c/cs. HEAVY DUTY OIL FILLED suitable for electric welding or soil heating. Output 12 v. 80/100 amps., £8-19-6. Carr. 7/6.

EX-GOVT. SMOOTHING CHOKES

250 mA, 5 H 50 ohms ...	12/9
150 mA, 10 H 100 ohms ...	11 9
150 mA, 6-10 H 150 ohms Trop. ...	6/9
100 mA, 5 H 100 ohms ...	3/11

EX-GOVT. E.H.T. SMOOTHING CONDENSERS. .02 mfd. 5,000 v. Cans, 2/9 ; .1 mfd. 2,500 v. Bakelite Tubulars, 3/3.

EX-GOVT. METAL BLOCK (PAPER) CONDENSERS
4 mfd. 500 v., 2/9 ; 4 mfd. 1,000 v., 4.9 ; 8 mfd. 500 v., 4/9 ; 10 mfd. 500 v., 3/9 ; 4 mfd. 400 v. plus 2 mfd. 250 v., 1/11.

EX-GOVT. ELECTROLYTICS. Removed from unused equipment. 8-16 mfd. 550 v., 1/3 ; 1,500 mfd. 6 v., 1/9 ; 100 mfd. 50 v. with clip, 9d.

EX-GOVT. DOUBLE WOUND STEP UP/STEP DOWN TRANSFORMERS. 10-0-100-200-220-240 v. to 5-0-75-115-135 v. or REVERSE. 80-100 watts. Only 11/9, plus 2/9 post. 10-0-100-200-220-240 v. to 9-0-110-122-136-148 v. or REVERSE. 200 watts, 35/9, plus 7/6 carr.

EX-GOVT. CASES. Size 14-10-8½in. high. Well ventilated black crackle finished, undrilled cover. IDEAL FOR BATTERY, CHARGER OR INSTRUMENT CASE, OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage. Size 8½ x 13½ x 6½ ins. with undrilled well ventilated cover, finished in stoved grey enamel. Suitable for charger or instrument case, 7.9, plus 2/9 post.

EX-GOVT. VALVES (NEW)

1T4	7/9	EF39	5/9	EF80	7/9
1S5	7/9	6V6G	7 9	EB91	8.9
3S4	8/9	6X4	8 9	EF36	4/9
5Y3G	8/9	6X5GT	7.9	EL32	3 9
5U4G	8/9	6L6G	11 9	EL91	5 9
5Z4G	8/9	807	7 9	KT44	8.9
6K7G	5/9	12A6	7/9	EZ90	8/9
6SJ7GT	6/9	15D2	4.9	EL84	10/6
6SLGT	8/9	35Z4GT	9.9	SP61	2/9
6SN7GT	8/9	MH4	4/9		
6AT6	7/9	ECC83	9/9	35Z4	8/9

EX-GOVT. UNIT RDF1. Brand new, cartoned. Complete with 14 valves, including 5Z4, E.H.T. rectifier. Transformer, Choke, etc. Only 29/9, carr. 7/6.

ELECTROLYTICS (current production) NOT EX-GOVT.

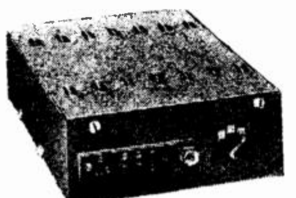
Tubular Types		Can Types	
8μF 450 v. ...	1/9	16 mfd. 350 v.	1/11
8 mfd. 500 v.	2/6	16 mfd. 500 v.	2/9
16μF 350 v. ...	2/3	16μF 450 v. ...	2/9
16μF 450 v. ...	2/9	32μF 350 v. ...	2/11
16μF 500 v. ...	3/9	32 mfd. 450 v.	4/9
32μF 350 v. ...	3/9	100 mfd. 450 v.	4/9
25μF 25 v. ...	1/3	8-8μF 450 v. ...	2/9
50μF 12 v. ...	1/3	8-16μF 450 v.	3/11
50 mfd. 25 v. ...	1/6	16-16μF 450 v.	3/11
50μF 50 v. ...	1/9	32-32μF 350 v.	4/9
100 mfd. 12 v.	1/9	32-32μF 450 v.	5/9
100 mfd. 25 v.	2/3	100-100mfd. 350v.	4/9
3,000 mfd. 6 v.	3/9	64-120mfd. 350v.	7/9
6,000 mfd. 6 v.	3/9	100-200 mfd. 275 v. ...	6/9

Many others in stock.

HUNTS MOLDSEAL CONDENSERS. .005 mfd. 400 v., .01 mfd. 400 v., .04 mfd. 500 v., 5/6 doz. (one type) ; .1 mfd. 350 v., 8d. ea. ; .5 mfd. 500 v., 1/8 ea.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces batteries 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 for use, 46/9.



Type BM2. Size 8 x 5½ x 2½in. Supplies 120 v., 90 v. and 60 v., 40 mA. and 2 v. 0.4 a to 1 amp. fully smoothed. **Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators.** When connected to A.C. mains supply 200-250 v. 50 c/cs. **SUITABLE FOR ALL BATTERY RECEIVERS** normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions 49/9, or ready for use 59/6.

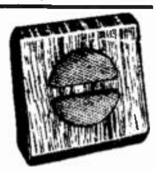
H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Input 200-250 v. A.C. Output 120 v. 40 mA. Fully smoothed and rectified supply to charge 2 v. accumulator. Price with louvred metal case and circuit, 29/6. Or ready for use, 8/9 extra.

T.V. CABINETS. Leading manufacturers' surplus. Attractive designs. Walnut veneered, with doors for 15, 16 or 17in. Tube, £3-19-6. Carr. 7/6.

MINIATURE MOTORS. 24/28 v. D.C. or A.C. made by Hoover Ltd., Canada. Size only 2½ x 1½in. Spindle 1¼in. long, ¼in. diam. Brand New, 9/9.

EXTENSION SPEAKERS

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



VOLUME CONTROLS with long (¼in. diam.) spindle, all values less switch, 2/9 ; with S.P. switch, 3.9 ; with D.P. switch, 4/6.

Stern's introduce . . .

A "fidelity" TAPE RECORDER

WITH EVERYTHING—*EXCEPT A HIGH PRICE*

TESTED AND APPROVED AT THE TRUVOX LABORATORIES.

IT INCORPORATES: The NEW TRUVOX Mk. IV TAPE DECK together with the "fidelity" MODEL HF/TR2 TAPE AMPLIFIER (both illustrated on this page), and a Rola 10in. x 6in. P.M. SPEAKER.

PRICE . . . Including CRYSTAL MIKE and 1,200ft. reel of PLASTIC TAPE.

£49 . 10 . 0.

(OR £3 EXTRA WITH REV. COUNTER.)

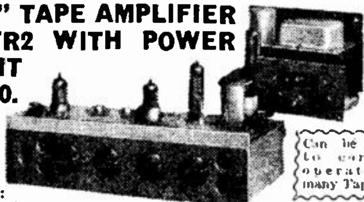
(Plus £1/10/- carriage and insurance, of which £1 is refunded on return of Packing Case.)

● BEFORE CHOOSING YOUR TAPE RECORDER YOU SHOULD HEAR THIS MODEL—TRULY "HI-FI" RECORDINGS ARE OBTAINABLE and it is comparable to much higher priced Recorders.

Alternatively send S.A.E. for ILLUSTRATED LEAFLET.

CREDIT SALE: Deposit £12/8/- and 9 m'thly payments of £4/10/8. HIRE PURCHASE: Deposit £24/15/- and 12 monthly payments of £2/5/11.

The "fidelity" TAPE AMPLIFIER Model HF/TR2 WITH POWER SUPPLY UNIT



PRICE £16 . 0 . 0.

(Carr. and ins. 6/-.)

H.P. TERMS: Deposit £8 and 9 months of a £1.

CREDIT TERMS: Deposit £4 and 9 monthly payments of £1/8/4. When ordering, please advise make of deck in use. Send S.A.E. for full details.

Can be supplied to correctly operate with many Tape Decks.

HOME CONSTRUCTORS
We can supply a COMPLETE KIT OF PARTS to build this TAPE AMPLIFIER for £12 (plus 5/- carr. and ins.) The Assembly Manual, Practical Diagrams, etc., are available for 2/6.
WE MAKE SPECIAL PRICES TO PURCHASERS OF TAPE EQUIPMENT (i.e., buyers of Deck and Amplifier together, etc., etc.) . . . SEND YOUR ENQUIRY TO US . . . H.P. and CREDIT SALE TERMS ARE AVAILABLE.

The NEW TRUVOX MkIV TAPE DECK

THIS IS UNDOUBTEDLY ONE OF THE BEST TAPE DECKS ON THE MARKET. WE HAVE A FEW ONLY AVAILABLE.

PRICE **£27 . 6 . 0.** (Plus 10/- carr. and ins.)

EXCLUDING COUNTER

CREDIT TERMS: Deposit £6 17/- and 9 monthly payments of £2 10/-.

H.P. TERMS: Deposit £13/13/- and 12 monthly payments of £1 5 4.

WE ALSO HAVE A FEW DECKS WITH REV. COUNTERS. Price £30/9/-.

Send S.A.E. for details.

STERN RADIO LTD.
109 & 115, FLEET STREET, E.C.4
Tel.: FLEet 5812-3-4.

WEYRAD

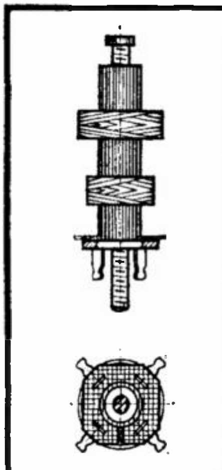
"H" TYPE COILS— FOR MANUFACTURERS, SERVICE ENGINEERS AND INDIVIDUAL CONSTRUCTORS

A low-priced, soundly-designed Range of Coils, providing continuous coverage from 12 to 2,000 metres in 6 Bands.

The coils are supplied in individual aerial, H.F. transformer and oscillator versions for each band. Iron dust cores are adjusted by means of a threaded brass stem with a screwdriver slot which permits fine adjustment of inductance without the danger of damage to cores. Circuit connections are made to 4 tags at the end of the former. Single 6 B.A. mounting.

" H " type coils are recommended for many popular circuits including the " Practical Wireless " AC/DC 3-valve Superhet and are widely used for servicing and conversion purposes.

RETAIL PRICE.................3/9 EACH



RANGES:

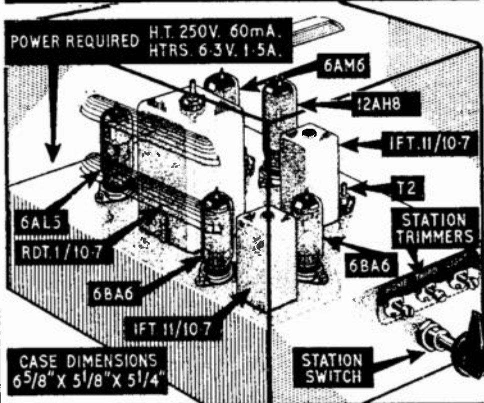
Band 1—800-2,000 mtrs.
Band 2—250-800 mtrs.
Band 3—190-550 mtrs.
Band 4— 90-250 mtrs.
Band 5— 33-100 mtrs.
Band 6— 16- 50 mtrs.
Band 7— 12- 37 mtrs.

Coils are coded according to type and range:
HA 1 = Band 1 aerial
HO 3 = Band 3 oscillator

ILLUSTRATED FOLDER...............3d. A.M./F.M. RECEIVER BOOKLET .... 2/6.

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

MAXI-Q



PRE-SET F.M. TUNER

V.H.F./F.M. HOME, LIGHT AND THIRD PROGRAMMES INSTANTLY SELECTED AT THE TURN OF A SWITCH

Full constructional details, point-to-point wiring diagrams and alignment instructions for building the "MAXI-Q" PRE-SET F.M. TUNER and also the VARIABLE TUNED version are given in Technical Bulletin DTB.8, 1/6.

Completely punched Chassis, Screens and Bronze finished Cover, 19/-. Station Indicator Plate, 1/1. 3-position Switch, 4/3. Station Condenser Trimmers, 3-9 pF, 2/- each. Complete set of RESISTORS and CONDENSERS for either version, 48/-.

RATIO DISCRIMINATOR TRANSFORMER, RDT. 1/10.7 Mc/s. Secondary winding of bifilar construction, iron dust core tuning, polystyrene former, silver mica condensers. Can size: 1in. sq. x 2 5/16in. high, 12/6.

I.F. TRANSFORMER, IFT.11/10.7 Mc/s. Miniature I.F. Transformer of nominal frequency 10.7 Mc/s. The "Q" of each winding is 90 and the coupling critical. Can size: 1 3/8in. x 15/16in. square, 6/6.

COILS TYPE L1, T1 and T2. Specially designed for use in this unit, are wound on polystyrene formers complete with iron dust core tuning, 3/11 each.

THE "MAXI-Q" PRE-SET F.M. TUNER. is available completely wired, assembled, valved and housed in a sturdily made bronze finished cover at £8.11.5, plus £3.8.7 P.T., total £12.0.0.

VARIABLE F.M. TUNER completely assembled, £11.0.0 including P.T. (carriage 3/-, terms c.w.o.).

GENERAL CATALOGUE covering technical information on full range of components, 1/- post free.

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STOP PRESS: "MAXI-Q" 60 kc/s TAPE DECK OSCILLATOR COILS. TDO.1—for high impedance Erase Heads (Truvox etc.), 5/-. TDO.2—for low impedance Erase Heads (Brenell and Collaro), 5/-. *Trading Terms for direct Postal Orders. C.W.O. plus appropriate postal charge.*

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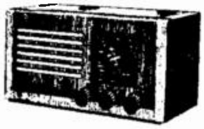

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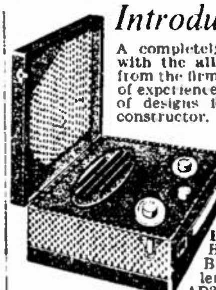

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- ★ Mains Unit will be available later.

Instruction book 1/6.

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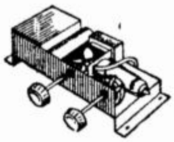

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CREDIT TERMS: DEPOSIT £5 and 8 monthly payments of £4.18.6

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PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXIII, No. 608, AUGUST 1957

EDITOR : F. J. CAMM

25th YEAR OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

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CONTENTS :

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

PORTABLE V.H.F. AND CAR RADIO SETS

THE D.G. of the BBC, in an address to the Radio Industry in a speech to the R.I.C. of Scotland, said that the Radio Industry had been tardy in developing portable V.H.F. sets and car radio V.H.F. sets. He stated that he had seen excellent German portable V.H.F. sets five years ago, and by this time there should be many on the market in Britain. He said that the BBC had been ready to build V.H.F. transmitters immediately after the war, but had been prevented from doing so by financial policy of successful governments. What would have been the purpose of the industry producing V.H.F. sets before the BBC transmitters were ready? There are only comparatively few areas in this country where V.H.F. would have brought any benefit, and it was not to be expected that people would scrap existing receivers giving reasonably good quality reproduction and purchase V.H.F. receivers. Sir Ian here, however, was putting the cart before the horse. The industry is in business to make money. Its own market research, however, showed that there was little likelihood at the time of the public responding to a campaign to sell V.H.F.

THE RADIO SHOW

NEXT month's issue, on sale August 7th, will contain a preview of this year's show at Earls Court, which takes place from August 24th to September 7th. A cordial welcome is issued to all readers to visit us on our Stand No. 117.

THE NEW BBC CHAIRMAN

THE Headmaster of Rugby is to be the new chairman of the BBC governors and we hope he will be permitted to exercise greater authority than some of his predecessors have been enabled to do. In Reith's time the job was a sinecure, merely to comply with the terms of the Charter. Reith seemed to make the decisions. His notes to the staff commenced : "The Director-General has decided . . ." It seems to us that the Director-General should be there to carry out the decisions of the Governors.

WELSH RADIO STATION

A POST Office radio station is now being used to link the two BBC Welsh transmitters, in order to skip the Welsh mountains. Signals from the Wenvoe transmitter near Cardiff are received at the P.O. microwave station at Mynydd Pencarreg, near Lampeter, and are relayed to the new BBC West Wales Television transmitter at Blaen Plwy, near Aberystwyth. During the early stages of testing a "ghost" was seen on the picture transmissions, apparently caused by a cliff face on the 2,900 feet Brecon Beacons, situated some 6½ miles laterally from the direct path from Wenvoe. The unwanted image was eliminated by installing an aerial arranged so that it would not pick up reflections from the Brecon Beacons. F.J.C.

Our next issue, dated September, will be published on August 7th.

Round the World of Wireless

By "QUESTOR"

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of April, 1957, in respect of 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	1,172,439
Home Counties	1,171,933
Midland	895,918
North Eastern	1,164,715
North Western	872,509
South Western	737,992
Wales and Border Counties ...	464,228
Total England and Wales ...	6,479,734
Scotland	836,150
Northern Ireland	193,124
Grand Total	7,509,008

New Anglo-American Company

THE formation of a new company to manufacture transistors and other semi-conductors in England was announced recently in London. To be known as Semiconductors, Ltd., the new company has been formed by The Plessey Co., Ltd., and Philco Corporation of U.S.A.

This joint enterprise, which is likely to have a considerable bearing on the development of the transistor industry in this country, was undertaken following a comprehensive survey of the electronic industry in the United States.

This new Anglo-American company will have an initial paid-up capital of £500,000, of which 51 per cent. will be held by The Plessey Co., Ltd., and the remaining 49 per cent. by Philco Corporation.

The joint board of directors will be as follows: A. G. Clark (chairman), J. M. Skinner, Jnr., J. F. Mallabar, L. J. Woods, A. E. Underwood and P. Marriage.

Pye for U.K. Atomic Energy Authority

PYE, LTD., are designing and supplying all the equipment for a laboratory for the Atomic Energy Authority at Dounreay, in which irradiated fuel elements from the Dounreay fast breeder reactor are to be examined.

The equipment to be supplied includes manipulators, universal cutting machines, lathe, furnaces, X-ray and density measurement, inspection and material testing machines, optical and TV viewing facilities, and all the associated handling and shielding equipment: in fact, the complete laboratory, except for the concrete structure, is being supplied by Pye, Ltd.

Owing to the highly radioactive nature of the elements, which can only be handled by remote control, the laboratory is a cave of U-shaped form—a concrete cave with an area of 1,100 square feet. To form a biological shield, the walls of the cave are 4ft. 6in. thick, partly lined with steel.

For observation of the processes inside the cave there are windows at intervals in the dense concrete walls. These windows are composed of glass-walled tanks containing a saturated zinc-bromide solution, thus providing a shield from radioactivity equal to that of the walls, and at the same time permitting observation of all the processes. At each window, facilities are provided for Pye Master Slave Manipulators for remote handling of the elements. Pye manufacture these manipulators by agreement with AMF Atomics, a division of the American Machine and Foundry Co.

Marconi Radio for B.O.A.C. Britannias

B.O.A.C. has ordered Marconi radio equipment for its fleet of Series 312 long-range Bristol Britannias, some of which are expected to be in passenger service in a few months' time. Each aircraft will have a dual Marconi transmitter/receiver installation for multi-channel H.F. communication, a high discrimination receiver and a dual radio compass.

The communication equipment, Type AD.307, is a multi-channel high-power transmitter/receiver, particularly suitable for pilot-operated radiotelephony. It is simple to operate; any one of 200 crystal-controlled channels can be selected, frequency changing being entirely automatic by self-tuning circuits. The equipment, which is built in unit form to fit the standard aircraft racking, conforms to S.B.A.C. standards and meets all British Civil Airworthiness requirements. It is remotely controlled from two positions.

The receiver, Type AD.118, is intended for direct control only and is provided with a high discrimination scale. Particular attention has been devoted to obtaining a high degree of electrical and mechanical stability so that full use can be made of the high discrimination without constant scale checking.

Solartron to Manufacture Gunnery Trainer

AS a result of arrangements finalised by Mr. John E. Bolton, chairman and managing director of The Solartron Electronic Group, Ltd., Thames Ditton, Surrey, during his recent visit to the United States, Solartron will manufacture under licence in Britain the Rheem F.151 Gunnery Trainer.

The agreement is with the Electronics Division of the large Rheem manufacturing company of New York, whose many factories are spread out over the United States and several continents. This Division specialises in electro-mechanical equipment.

The gunnery trainer gives a full three-dimensional target representation in colour and is in many respects comparable to the Solartron Radar Simulator. The latter enables full-scale tactical radar naval, land or air exercises to be carried out without involving the heavy expenses of full-scale tactical exercises. The gunnery trainer, like the radar simulator, may be attached to a flight simulator.

The Late John V. Palmer

THE news of Mr. J. V. Palmer's recent death was received with sincere regret by his many friends at Mullard, Ltd.

John Palmer, who was 69, was for many years Manager of the Valve Division of Mullard Overseas Ltd., and contributed materially to its leading position in the export field to-day.

Joining the company in June, 1925, Mr. Palmer was appointed valve export Manager in 1926.

His ex-colleagues wish to associate themselves with the grief that will be felt by his family and numerous friends in and outside the industry.

At the funeral, the company was represented by three directors, Mr. S. R. Mullard, Mr. A. W. Welton and Mr. W. Benink, and other senior executives and former colleagues from the company attended.

Radio and TV Sales Recovery Maintained

RETAILERS' sales of radio and television sets and radiograms were higher all round in the first four months of this year than in corresponding period of 1956, according to the monthly retail survey of the British Radio Equipment Manufacturers' Association—radio sets by 21 per cent., television receivers by 20 per cent. and radiograms by 42 per cent.

Retailers' sales of television receivers during April were 66,000, an increase of 6 per cent. on April, 1956, but a decrease on the previous month of 16 per cent. Sales of radiograms were 14,000, the same as in April, 1956, but a decrease of 30 per cent. on March this year. Radio receiver sales, at 78,000, showed an increase on April, 1956, of 20 per cent., but a decrease on the previous month of 6 per cent.

The proportion of hire purchase and credit sales, 53 per cent., for both radiograms and television receivers in March, fell to 50 per cent. and 52 per cent., respectively, in April. For radio receivers the percentage rose from 33 per cent. to 35 per cent.

BBC V.H.F. Station at Rowridge

THE BBC's new V.H.F. sound broadcasting station which has been built on the same site as the television station, at Rowridge, Isle of Wight, transmits the West of England Home Service on 92.9 Mc/s, the Light Programme on 88.5 Mc/s, and the Third Programme on 90.7 Mc/s, each with an effective radiated power of 60 kW. The transmissions are horizontally polarised as at other V.H.F. sound broadcasting stations, which means that receiving aerials must be fixed horizontally.

The area served by this station has a population of nearly three million. It includes the counties of Hampshire and Dorset, most of Wiltshire, and substantial parts of Somerset, Berkshire, Surrey and Sussex.

Testing the "Tellurometer"—a micro-wave measuring instrument. It is claimed that this has an accuracy of 2in. to 6in. over distances ranging from 10 to 30 miles.

Pye at the Poznan Fair, 1957

FOLLOWING their success at the Leipzig Spring Fair, in March, Pye, Limited, launched another export drive in Eastern Europe when they exhibited at the Poznan Fair in Poland in June.

On their stand of over 2,000 square feet, Pye showed a wide range of exhibits, including television transmission equipment for studio and industry, and fixed and mobile V.H.F. communications equipment.

Creation of an International Association of Cybernetics

THE First International Congress of Cybernetics, which was held at Namur from June 26th to 29th, 1956, met with a great success as much because of the number of participants as because of the quality of the work presented.

At the close of the Congress, it was decided to create an International Association of Cybernetics. The latter was constituted at Namur on January 6th, 1957. It counts at present over 1,000 members (of which 300 industrial firms), representing 26 different countries.

The aim of the Association is to ensure a permanent and organised liaison between researchers whose work in various countries is related to different sectors connected with Cybernetics.

It endeavours to promote the development of this science and of its technical applications, as well as the propagation of the results obtained in this field.

It utilises all adequate means for the achievement of these objects.

All enquiries should be sent to the Permanent Secretariate of the Association: 13, rue Basse-Marcelle, Namur (Belgium).

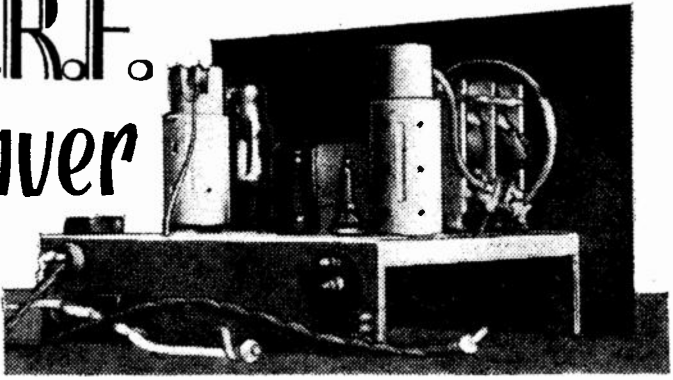
Pye Multi-Channel Equipment for Venezuela

A CONTRACT for the supply of a six-channel radio-communication system has been awarded to Pye Telecommunications, Limited by the Socony Mobil Oil Company de Venezuela. The system will be installed between the company's administration offices in Anaco and the oil field at Guico, a distance of approximately 25 miles.

The equipment will provide the company with a trunk connection between private automatic telephone exchanges at each terminal by means of a V.H.F. multiplex radio link. This link provides six telephone circuits, plus an engineers circuit simultaneously over a single pair of radio frequencies, and consists of Pye V.H.F. 50-watt F.M. transmitters and F.M. receivers at each exchange.

The new link will be connected into the public exchange at Anaco.

A Mains T.R.F. Short Waver

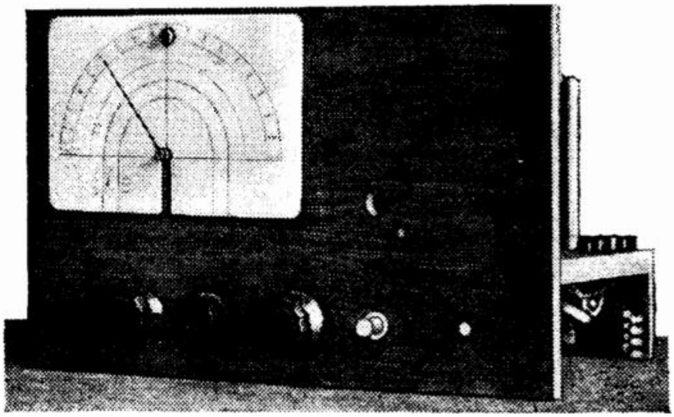


By R. Crompton

THIS receiver was built primarily for use on wavelengths of 10-180 m. and is a fairly conventional T.R.F. type (Fig. 1)—6D6 (R.F.); 6SJ7 (Det.); 75 or 6SQ7 (L.F.); 42 or 6F6 (O.P.). Denco cored coils plugging into Noval holders are used. They have proved most satisfactory in the prototype. Regeneration is controlled by varying the screen grid voltage of the detector valve and is smooth and silent.

Construction

The receiver is built on an aluminium chassis 10in. x 8in. x 2½in. (The power pack is separate.) All construction must be absolutely firm or frequency stability may be poor.



Three-quarter front view of the set.

Chassis drilling dimensions are given in Fig. 3, but the mounting of the gang capacitor is not shown since this depends on the type used by the constructor. The keyways of octal holders or the heater pins of UX6-type sockets face the rear runner of the chassis, with the exception of the keyway of the output valve which points towards the front right-hand corner of the chassis. The locators on the Noval holders face the gang capacitor.

LIST OF COMPONENTS

C1, C6—300 pF gang with ceramic insulation.
C2, C7—30 pF ceramic trimmers.
C3—0.1 μF paper 200 v.
C4, C5, C11—300 v. 0.1 μF paper.
C8, C9—100 pF mica or ceramic.
C10—500 pF mica.
C12, C13, C16—8 μF 300 v. electrolytic.
C14—0.05 μF 500 v. paper.
C15—25 μF 12 v. electrolytic.
C17—0.01 μF 500 v. paper.
C18—25 μF 25 v. electrolytic.
C19, C20—0.01 μF 500 v. paper.
C21, C22—8+8 μF 450 v. electrolytic.

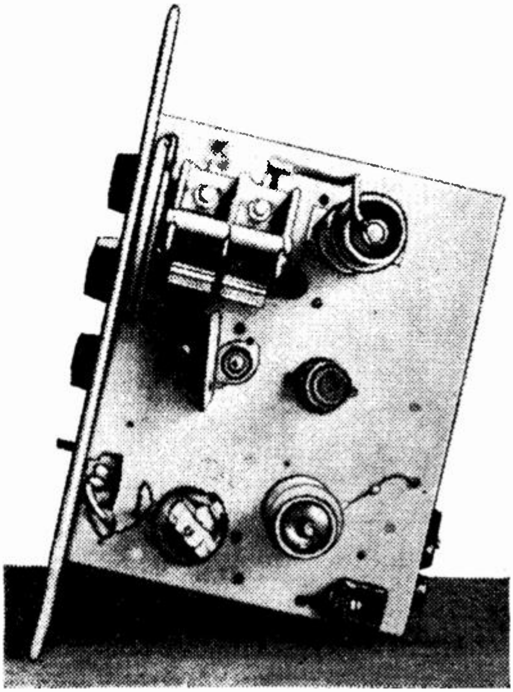
R1—600 Ω
R2—20 KΩ wirewound pot.
R3, R8, R15—100 KΩ.
R4, R12—1 KΩ.
R5—2.2 meg Ω.
R6, R7—10 KΩ.
R9—5 KΩ.
R10—50 KΩ carbon pot. (Dubilier).
R11—75 KΩ.
R13—0.5 meg. Ω.
R14—2,200 Ω.
R16—20 KΩ.
R17—0.22 meg. Ω.
R18—470 Ω ± 10% 1 watt.
(Resistors ± 20%, ½ watt, unless otherwise stated.)

Valves

6D6, 6SJ7, 75, 42, and holders.
MR1, MR2, 250 v. 60 mA metal rectifiers (2 DRM1 B's.).
MT1 250-0-250 60 mA 6.3 v. 2.5 A. Tapped primary.
Two UX6 valve screens and bases.
2—Noval holders.
M.E. speaker 600-1,000 Ω field 3 Ω; with transformer to match 7,000 Ω to 3 Ω (85 : 1).
Aerial-earth terminals, L.S. and 'phone sockets (preferably non-interchangeable), plugs and sockets for power pack.
SW1, 250 v. 1 A toggle or "push-push", SW2, SW3.
1—70 mA fuse, 1—2.5 A. fuse + holder.
2—Dial bulbs 6.5 v. 0.3 A.
4in. dia. drive drum, cord and pulley to give 15 : 1 ratio.
10in. x 8in. x 2½in. chassis.
Nuts, bolts, wire, etc.

Wiring

Wiring of the heaters should be carried out first. Use twin flex and keep it close to the chassis. After this, any order of wiring may be used, but some



Another view of the receiver.

methodical system is preferable. Note that the grid capacitor of the L.F. valve is clipped to the rear runner of the chassis. All screened wiring shown on the

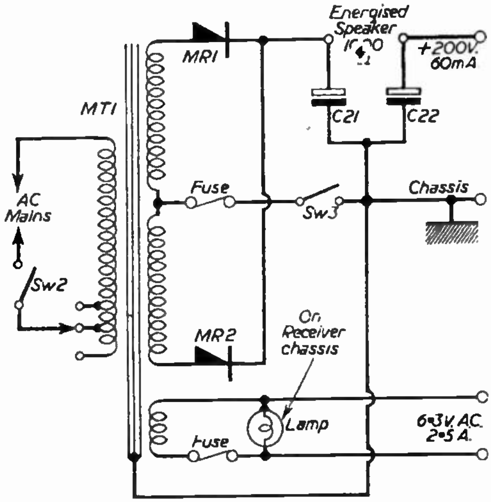


Fig. 2.—The power pack.

circuit diagram was carried out in coaxial cable which has low capacity losses. A 2in. long x 3in. high aluminium screen is mounted between the coil holders and a similar screen will be required for the trimmers if they are not within the screening of the gang capacitor itself. The medium-wave green coil has a 4 KΩ resistor across pins 3 and 4. Care is essential when soldering this.

Power Pack

The construction of the power pack is straightforward and needs little comment. Do not omit the H.T. switch and use it when changing coils. When the receiver and power pack have been completed and the wiring checked, plug in the medium-wave coils and attach 8ft. or so of wire to the aerial terminal.

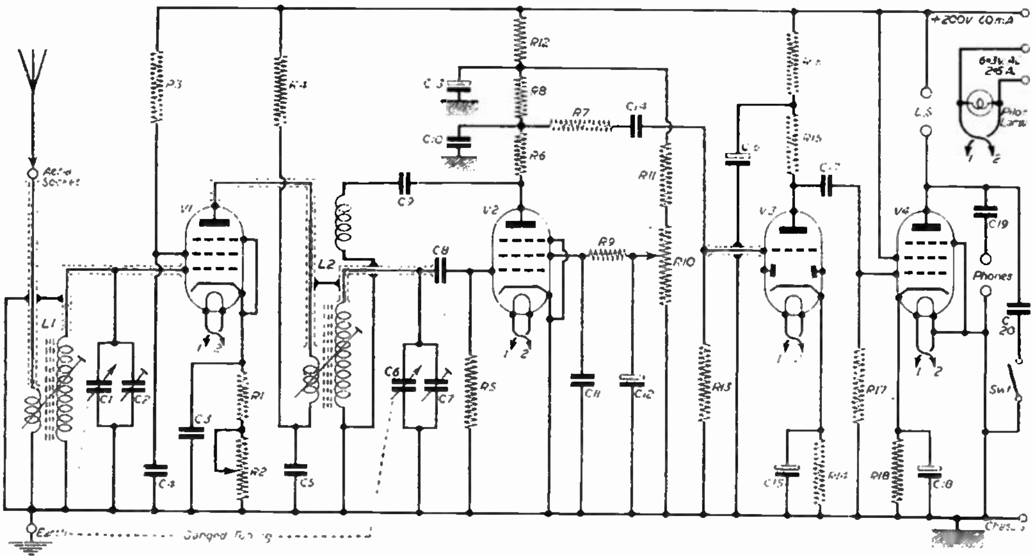


Fig. 1.—Theoretical circuit of the Mains T.R.F. Short Waver.

Adjustment

Adjust the trimmers to minimum capacity with a non-metal tool, and screw the coil cores fully out. Tune a signal to zero-beat at the high-wavelength end of the scale and adjust the core of the blue coil to give maximum signal (it is best to turn the regeneration control back a little). If there is not a noticeable "peaking" of the signal, screw in the cone of the green coil a few turns and repeat. Then turn to the low wavelength end of the band and tune another signal to zero-beat. If the cone of the blue coil must be screwed in, increase the capacity of the R.F. trimmer; if it must be screwed out, increase the capacity of the det. trimmer. Repeat the whole process until the core of the blue coil needs no adjustment (or very little) at any part of the band. The stray capacities of the det. and R.F. circuits are now balanced and on other bands it is necessary only to adjust the coil cores.

Considerable benefit may be derived from tuned aerial systems such as dipoles on the short waves. Even a simple link coupling tuner on the writer's long wire aerial gives an appreciable reduction in ignition noise on 20 metres.

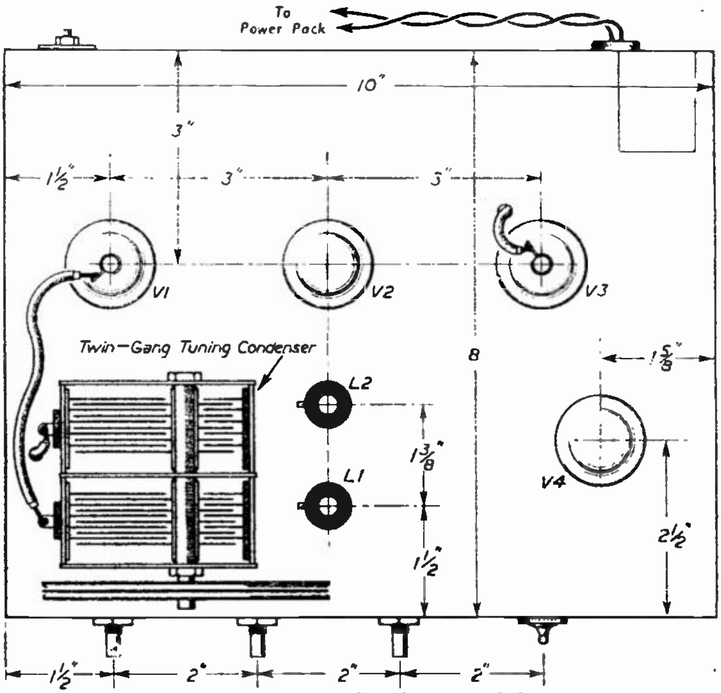


Fig. 3.—Details of the chassis and layout.

Machine for Printed Circuits

A NEW semi-automatic screen printing machine was the highlight of the demonstration of radio and electronic circuits printed by the screen printing method arranged by Gordon & Gotch Ltd. at Trapinex Works on May 23rd.

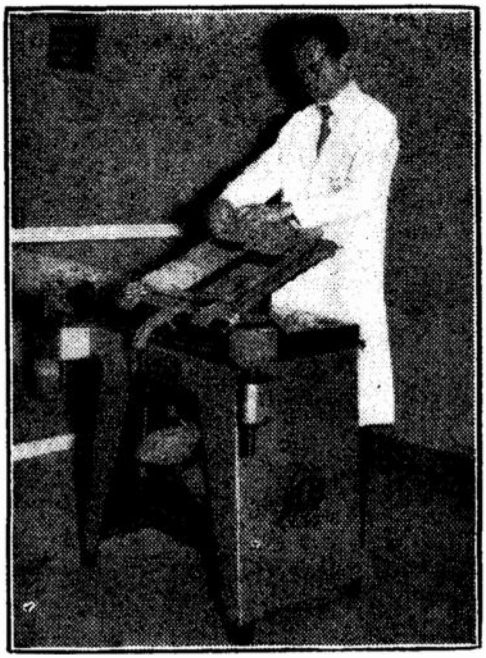
The machine is the SPS Model 90/A which has been specially designed by the manufacturers for the production of printed circuits.

The machine has been specially designed to incorporate an extremely powerful suction over a relatively small area.

The printing base on the machine has a total of 10,000 special apertures. These are connected to an extremely efficient suction system from the vacuum turbine. This is capable of completely flattening material which is in a bowed condition.

This machine for producing printed circuits is equipped with an accurate precision micrometer with an adjustment of 1⅛in. in every direction. The height adjustment is up to 3⅛in. The electrical foot switch on the machine is entirely movable and can be placed in any desired position to suit the operator. This means that one person can operate the machine no matter what the job.

SPS screen printing machinery and equipment is manufactured by the Siebdruckgerate von Holzschuher KG, of West Germany. Sole agents in the United Kingdom and Republic of Ireland for the SPS range are Gordon & Gotch Ltd., 39-40, Farringdon Street, London, E.C.4.



An operator printing a circuit on a laminated insulated sheet by means of a screen-printing process.

STEREOPHONIC Tape Recording

Mr. Gilbert's Stereophonic recorder.

DETAILS OF A READER'S DESIGN FOR 3-D RECORDING

By J. Trevor Gilbert

STEREOPHONIC sound is well known to all of us today in connection with the more recent developments in the cinema. I have heard it said, however, that it is difficult to tell any difference between it and ordinary sound. There is, of course, a vast difference. Unfortunately some cinemas are not as good as others, no doubt due to the acoustics of the building and it is also a fact that the more natural a thing becomes the more we take it as something ordinary. My aim, however, is not to discuss stereophonic sound in the cinema, but to show the average recording enthusiast that this can be comparatively easily applied to tape resulting in a recording that we might call "living."

Briefly, let us examine the function of the human ears. Let us assume we are listening to a piano, a violin and drums equally spaced in front of us. Our left ears will hear the piano, our right ears will hear the drums, but the violin will be heard equally by both ears at the same time. Even if we could not see these instruments we could tell where they were by the direction of their sounds. Now if we replace our ears by two microphones set at angles equal to our ears and couple them to recorders, we can make recordings of what the left ear heard and what the right ear heard. If these are played back simultaneously with the speakers of the two recorders set well apart, we shall hear the piano from the left and the drums from the right. The violin will be reproduced equally by both speakers and will, therefore, give the effect that it is coming from a point midway between the two. In the case of a full orchestra it will be seen that instruments placed at various intermediate positions will be heard with both ears, but more with one than the other. This in a similar way will denote their positions.

It will be seen that stereophonic recordings can be made simply by using two recorders and playing them both back at the same time. The two, of course

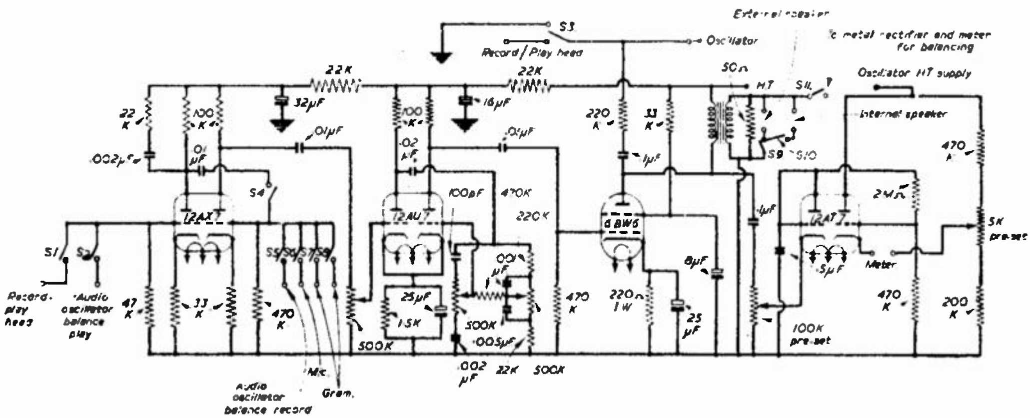


Fig. 1.—Simplified circuit of one amplifier—audio oscillator and rectifier for balancing signal omitted for simplicity. See also table at foot of next page.

See also table at foot of next page.

ust be perfectly synchronised, which is not a practical ·oposition under such conditions, so the obvious ay is to put both recordings side by side on the same pe. This appears to be reasonably simple—a corder comprising one tape deck and two ampli- :rs. This basically is all it does mean, but unfor- ınately there are several things that do not work :at quite as simply as they should.

Although I intend describing my own recorder I el that the majority of readers may have their own another. Unfortunately this caused interaction between the two amplifiers, but was overcome by decoupling in the smoothing arrangement as shown in the circuit diagram. The two oscillators were tuned to the same frequency but at times there was a certain amount of drift and, finally, I settled on one oscillator only. This did not cause too much inter- action during recording as might have been expected. The two erase heads were replaced by one covering the full width of the tape. Balancing was effected by

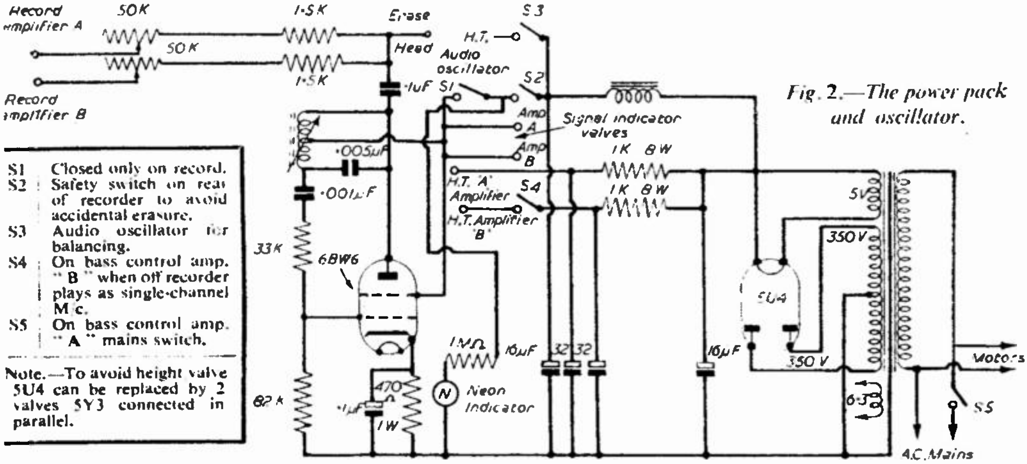


Fig. 2.—The power pack and oscillator.

ıleas as to the amplifier circuits and certain modifi- ations in switching thus expanding the uses for the ecorder to their own requirements. Bearing this in nind I would first like to discuss some of the problems experienced in the development of my own machine nd how I was able to solve them.

My first attempt was not exactly spectacular. I ıought two well-known amplifiers and a tape deck nd fitted them into a large cabinet with two speakers orming a lid, removed the head assembly from the ape deck and fitted two record playback heads and wo erase heads. This arrangement gave me my first tereophonic recordings but was far from satisfactory. t was too large and heavy for one person to carry. The mains hum was bad. Although the two recording :mplifiers were independent there was interaction ıetween them, resulting in a low-pitched whistle on he tape. Finally, there was no method of balancing he two amplifiers to give equal output on playback.

Size, perhaps, was the easiest difficulty to combat. As each other difficulty was overcome the size auto- natically became reduced. One power pack to supply ıoth amplifiers cured most of the hum and it was :ventually brought to a minimum by building both ımplifiers on one chassis and the power pack on the addition of an audio oscillator which could be fed to the input of both amplifiers and the resulting signals measured at the output of each by means of a meter. By use of a peak signal indicator in the first amplifier the volume could be set for recording in the usual manner employed in a single-channel recorder and, by the method just explained, the second amplifier could be set to record at equal volume.

Finally I decided once more to completely rebuild the recorder and build it up in the form it is today. The amplifiers were rebuilt on one small chassis and fitted on its side along the front of the tape deck. All the controls are fitted to a panel level with the tape deck itself and have been kept to a minimum. Separate volume, treble and bass controls are provided for each amplifier but all other switching is syn- chronised into a 10-button selector unit. Pressing the "play tape" button, for example, connects both amplifiers for playback, starts the motors running and completes the circuits for the speakers. All valves were replaced by modern miniature types.

As regards the circuits themselves very little need really be said as can be seen from the diagram. Switching could be reasonably simplified by con-

Switch functions in the circuit, Fig. 1.
Switches are normally open and in some cases contacts earthed. They are closed for the following purposes.

S1	Playback of tape.	S7	Gram or radio for recording.
S2	Balancing for playback.	S8	Amplifying gram or radio.
S3	Recording.	S9	Playback of tape amplifying gram or radio.
S4	Playback of tape.	S10	Switch located on rear of recorder for use of internal speaker.
S5	Balancing for recording.		
S6	Microphone for recording.	S11	Balancing for recording and playback.

trolling each item separately but this, however, would complicate operation. The press button is therefore the answer. At this point, may I say that as such a press-button unit is not on the market, two surplus units were purchased and adapted for this use. The "off" button is entirely mechanical as it only trips the "hold bar" and releases any other button which has previously been pressed down. The stop button is separate from the rest as it only applies D.C. to the motors bringing the tape to a standstill before the "off" button is pressed. Much trouble was caused through feedback in this unit but it was finally overcome by careful positioning of contacts and earthing of circuits which were not being used. Buttons are clearly marked with transfers and are mounted in a perspex panel which shows a diffused light when the main switch is on. They are marked as follows:

OFF — BALANCE PLAY — BALANCE RECORD — PLAY GRAM — PLAY TAPE — RECORD MIC. — RECORD GRAM. — FAST FORWARD — FAST REVERSE — STOP.

Amplification in the first stage of each amplifier differed considerably due to tolerances in component values, and as these are only used for play back, it became necessary to have two balancing positions. For "Balance record," therefore, the balancing signal is fed to the grids of parts "B" of the 12AX7 valves and for "Balance play" to the grids of parts "A." As an extra stage of amplification is employed in the latter position, a reduced balancing signal is tapped off from a pre-set potentiometer.

The power pack chassis is fitted underneath the tape deck and includes the oscillator circuit for recording and the audio oscillator for balancing. All connections between tape deck, amplifiers and power pack are by means of octal plugs and sockets. It will be noticed that two rectifiers have been used in parallel, but this is simply to save height. Resistance smoothing has been used for the amplifiers and choke for the oscillator.

Remaining Controls

The few remaining controls not already mentioned are on the back of the power pack chassis which are readily accessible from the back of the recorder. These consist of an on/off switch for the internal speakers and a safety switch cutting the H.T. from the oscillator to avoid accidental erasure. A neon is employed to give indication when this safety switch is closed. Mains input socket, microphone sockets and various other inputs are also placed at the rear of the recorder. There is also a switch on the tape deck for "normal" or "stereophonic" reproduction. A dual meter has been fitted for signal level indication on both amplifiers during recording. As previously described one only is used for setting the volume controls, but during actual recording it is useful to be able to see what is going on on both channels at the same time. The tape deck has been completely rebuilt. Whilst two record-playback heads are quite satisfactory for making recordings and playing them back on the same machine, it must be remembered that the pre-recorded tapes on the market are recorded with the two tracks in line, one immediately above the other, and, therefore, a special head must be used for playing them. This type of head is rather expensive and could be added at a later date. Having two heads it will follow that one track will be at least the diameter of the head behind the other. Personally, I found the purchase of a "stacked" head was money well spent

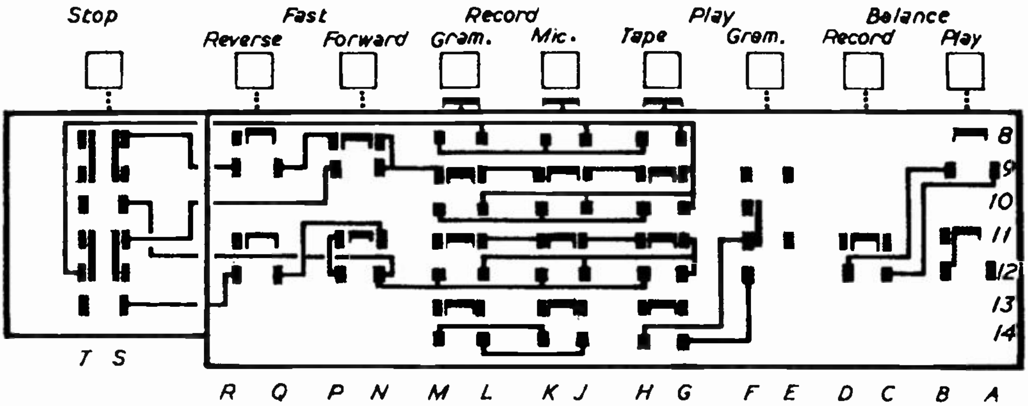


Fig. 3.—Press-button unit with buttons in "off" positions. View from top of amplifier chassis.

A9	H.T. audio oscillator.	M8	Capstan motor resistance.
A12	Potentiometer audio oscillator.	M10	Take up motor resistance.
B9	H.T. audio oscillator.	M14	H.T. supply for record oscillator.
B11	Contact G2.	P9	Take up motor resistance.
G14	Speaker amplifier "B"	S9	Rewind motor.
H14	Earth.	S12	Take up motor.
J14	H.T. peak signal indicator valves.	T8	Mains.
K14	Neon.	T9	Common motor supply.
L12	D.C. braking supply.	T10	Earth.
L14	H.T. record oscillator.	T11	Mains.

as the pre-recorded tapes are exceptionally good and the first one I bought was a great help to me in my experiments. The complete recorder now measures 17¾in. × 15¼in. × 7¾in.

Two speakers built in separate cabinets fitting together for portability complete the equipment and for the sake of convenience, so that recordings can easily be played back for checking purposes, two small speakers are included one at either end of the recorder itself. It must be emphasised, however, that at an angle of 60 to 90 degrees. These microphones are not unidirectional, however, but this may be overcome by placing a felt baffle on the back of each.

Basically, I consider the recorder to be finished, but who can say I might not think of an odd modification here and there? It has been built to suit my own requirements but, no doubt, some readers will consider certain modifications to be advantageous.

In conclusion I would say to the amateur recording enthusiast that if your recording stretches further

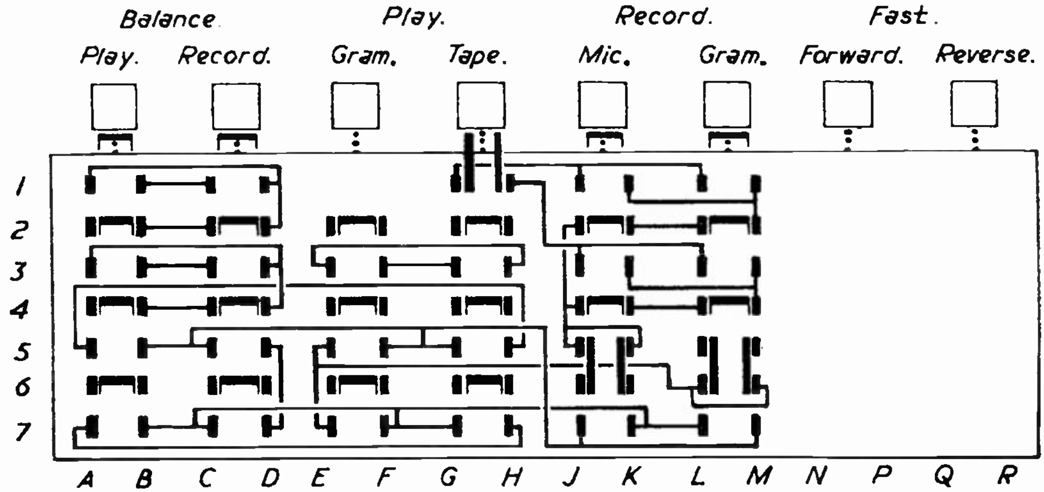


Fig. 4.—Press-button unit with buttons in "off" positions. View from bottom of amplifier chassis.

A2	+ Peak signal to meter amplifier "A."	H1	Head amplifier "B."
A4	– Peak signal to meter amplifier "A."	H2	Grid part A, valve 1, amplifier "B."
B1	+ Balancing signal from output.	H5	Signal from anode part A, valve 1, amplifier "A."
B3	– Balancing signal from output.	H7	Signal from anode part A, valve 1, amplifier "B."
D2	+ Meter.	J4	Earth.
D4	– Meter.	J6	Microphone input amplifier "A."
D7	Audio oscillator.	J7	Grid part B, valve 1, amplifier "A."
E3	Speaker amplifier "A."	K1	Record output for head amplifier "A."
E5	Gram input.	K6	Microphone input amplifier "B"
F3	Earth.	M2	Record oscillator for head amplifier "A."
G1	Head amplifier "A."	M4	Record oscillator and output for head amplifier "B."
G2	Grid part A, valve 1, amplifier "A" and contact B11.		
G7	Grid part B, valve 1, amplifier "A."		

these internal speakers, although reproducing a slight stereophonic effect will not replace the use of the two conveniently spaced external speakers for normal playback. It will be seen that my aim has been for a versatile portable recorder even to the extent of the external speaker cabinets which, when assembled together, measure only 12¼in. × 8¾in. × 14in. They separate at an angle and contain 6½in. speakers. The quality of reproduction is surprisingly good, but many readers will agree that a recorder of this type is worthy of even better speakers.

Microphones

Finally, a word about microphones. I found the ribbon type was the most satisfactory. The first obvious thought, no doubt, is to place them well apart, but in actual fact best results are obtained by placing them side by side or one above the other, set than the wireless and the gramophone then stereophonic recording will open up a new field of reality for you. I hope I have proved that perhaps the building of such a recorder is not as difficult as at first it might appear.

Making an OUTPUT INDICATOR

A USEFUL ACCESSORY FOR THE EXPERIMENTER

By J. Brown

ONE of the main essentials for a radio set to make it work 100 per cent. is alignment. Many times the condensers across I.F. transformer windings alter in value as do the modern iron cored slugs. I.Fs, valve and component changes also affect this most important thing in radio. The instrument to be described was termed an output indicator for one reason—it indicates any change in the settings of the cores or capacitors of the I.F. transformer when being adjusted, and does not measure any particular voltage change. If it did it could rightly be called an "output meter." If accuracy is required, we can make R1-4 wirewound variable resistors, and the meter can be set using known A.C. voltages as standards, or even calibrating it against a multi-range meter. This little instrument will prove an asset to any "shack" or workshop. We will not, however, go into the signal source as this has been covered by many articles in the past. There are also many fine signal generators on the market already built and calibrated for £6 and even less. Multi-range meters can be used for alignment, but have one disadvantage, e.g., the minimum range of most is 5 volts A.C., except in the case of the more expensive types which are "more professional." The aforementioned types when used for alignment on the 5 volts range are inadequate, as the signal source and the audio side of the set under repair have to be turned up to nearly maximum so as to get a reading on the meter. This means that we have the A.V.C. circuit coming into action, and it is this which we are trying to avoid. In the case of the indicator, the lowest range is approximately 1 volt A.C., hence these gain controls are in a much lower position.

We have four ranges to select from, and the

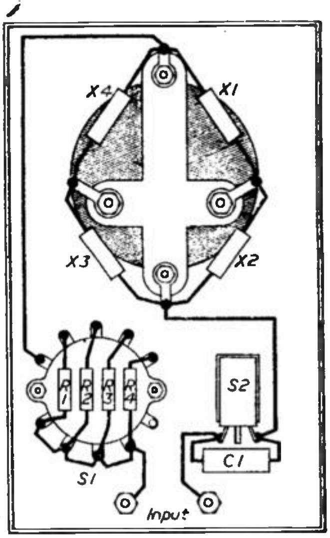


Fig. 2.—Layout and wiring.

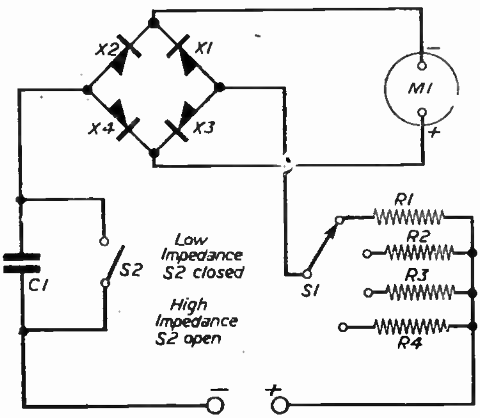


Fig. 1.—Theoretical circuit of the indicator.

COMPONENTS

1—½ amp. R.F. meter (reference 10A/8481)
4—Crystal diodes (G.E.C. type).
1—4-way Yaxley switch.
1—S.P. switch.
1—1 μF paper condenser.
4—Resistors (carbon):

R1—Made up 1.5 KΩ plus 100 ohms in series.
R2—Made up 1-10 KΩ plus 1-50 K in parallel.
R3—Made up 15 KΩ plus 1.5 K in series.
R4—Made up 50 K plus 30 K plus 2.5 K in series.

Or four wirewound potentiometers:

Suitable case made from a beverage cube container.

2—Terminals	2—2BA solder tags.
2—Crocodile clips.	2—6BA solder tags.
Wire for leads.	2—6BA nuts and bolts.

complete instrument could be built for approximately 30s. or less.

The Circuit

This is a bridge type circuit using crystal diodes as the meter rectifiers. The meter used was a surplus

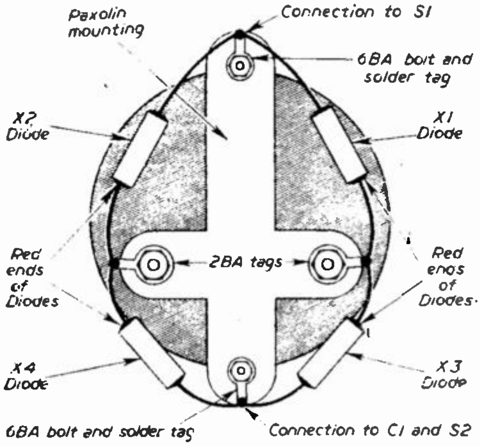


Fig. 3.—Details of the diode mount.

½ amp. R.F. meter, with the thermocouple removed. This, then, gives a 2 mA. movement, and as we are not concerned with measurement the scale calibration does not matter. We have four ranges: 1, approximately 1 volt; 2, approximately 5 volts; 3, approximately 10 volts; 4, approximately 50 volts. These are selected by S1, a four-way single pole switch; S2 selects the input required. In position 1, the input is low impedance for speech coil, extension L.S. connections. In position 2, we have a high impedance

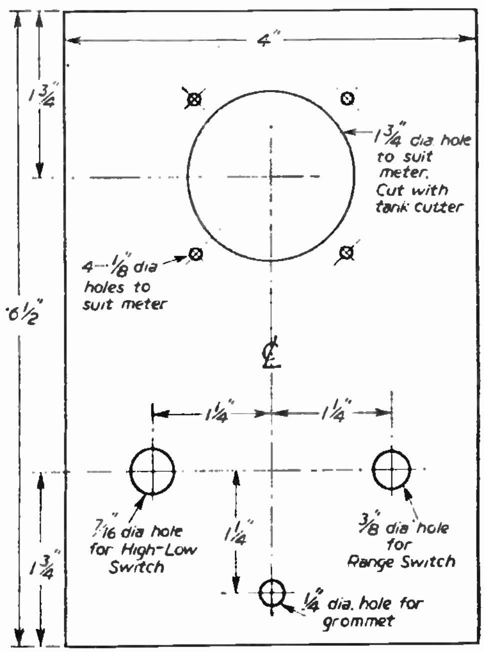


Fig. 4.—Details of the panel.

input. This is via C1 which gives a path for the A.C. and isolates the D.C. and will pass 400 and 1,000 cycles which is the normal modulating frequency of the signal sources. In position 1 the indicator unit is connected to the speaker connections, either the speech coil or the extension L.S. sockets. In position

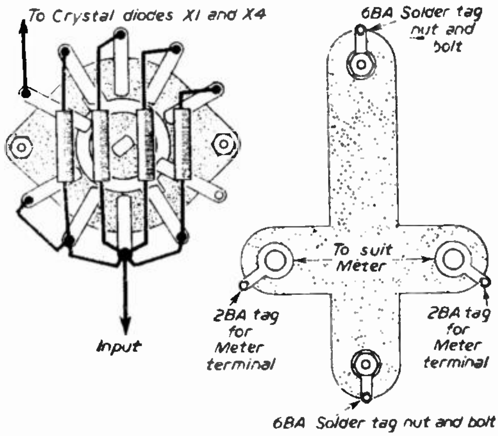


Fig. 5.—The switch, wiring and the diode mount.

2 the connections are: one leads to chassis, the other connects to the anode of the output valve, the D.C. is isolated by the condenser C1.

Great care must be taken when soldering in the diodes, as the heat destroys them. A thermal shunt must be used, or leave the wire ends long and insulate the surplus with sleeving.

Operation

Connect for either high or low impedance whichever is required; set the signal source for the correct frequency; keep input as low as possible to give a reading, trim the cores or the trimmers of the I.F. transformers for maximum reading on the indicator. During the operation, however, as the meter reading increases the audio control of the set must be turned down, so that the A.V.C. does not come into action.

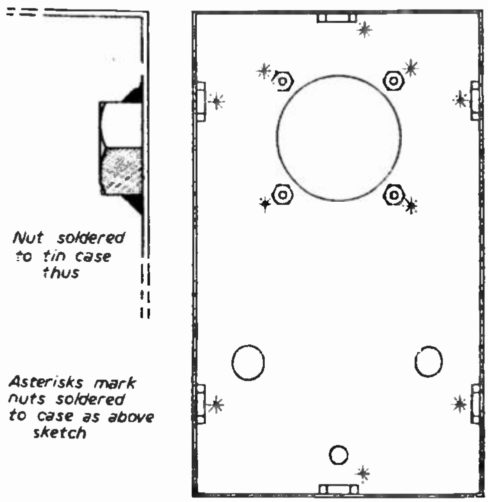


Fig. 6.—Details of the method of mounting.

A Beginner's SHORT-WAVE THREE

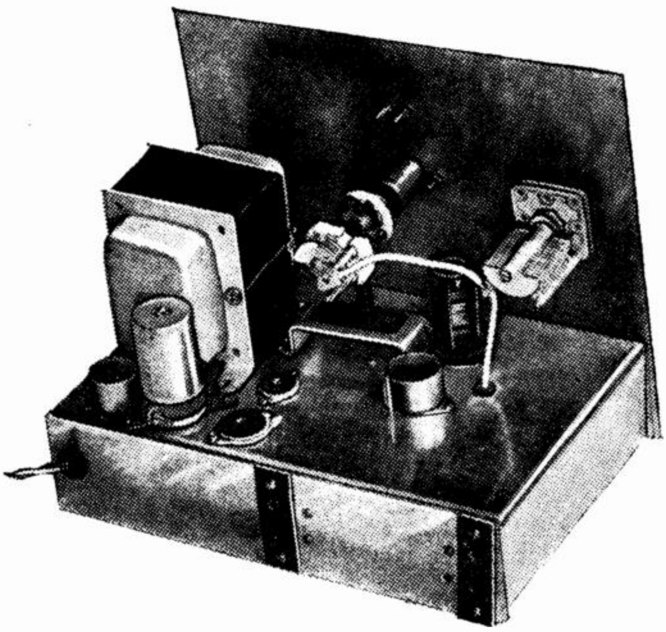
ADDING AN EXTRA L.F. STAGE TO THE RECEIVER DESCRIBED IN OUR ISSUE DATED NOVEMBER, 1956

By V. M. Meadows

IN the November and December, 1956, issues of this magazine, we published details of this A.C. operated short-wave receiver, which was designed specifically for the beginner in radio construction. Since that time, many requests have been received from readers who have built the receiver, asking that details be published on the addition of a further L.F. stage in order to increase the gain as a whole.

The addition of a further L.F. stage to the receiver will not only result in greatly increased audio gain but will also increase the apparent range of the equipment. Signals which were previously only just audible will now become much stronger, and those formerly inaudible will now resolve themselves into intelligible signals.

Before proceeding with the circuit description and other details, however, it is as well to note that the bias resistor of V2 (R8 in the circuit of page 611, November, 1956, issue) should be of 270Ω and not 270 KΩ as inadvertently stated in the component list. The substitution of this much lower value resistor will itself greatly increase the audio gain of the receiver, as it stands, before proceeding with the additional L.F. stage.



Three-quarter rear view of the converted chassis.

Circuit

This is shown in Fig. 1, from which it will be seen that a Brimar 6AT6 double diode triode has been utilised as the additional L.F. stage. The circuit is simple enough, and the extra components required have been kept to a minimum consistent with reasonable efficiency. It will be noted that both of the diode connections are left blank, no connections

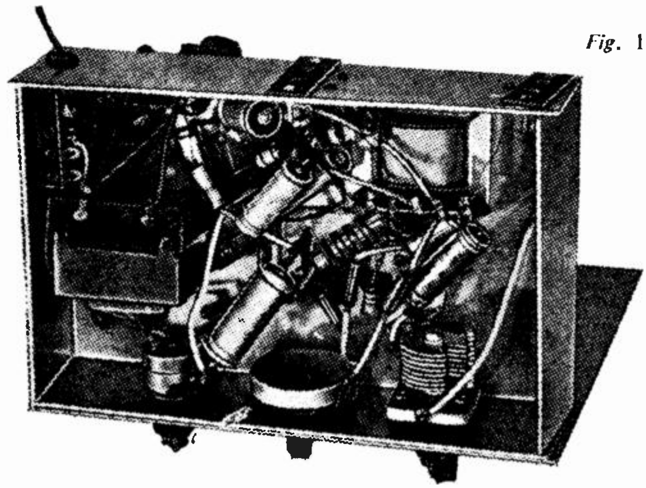
COMPONENT LIST

Modifications to existing circuit
One 8 μF Electrolytic, 350 v. wkg., T.C.C. type CE17LE.
One 220 KΩ ½ watt resistor.

6AT6 Stage
R10—47 KΩ, ½ watt.
R11—220 KΩ, ½ watt.
R12—3 KΩ, ½ watt.
One B7G valveholder.
C11—25 μF, Electrolytic, 50 v. wkg., T.C.C. type CE16DE.
C12—0.01 μF, Tubular, T.C.C. type 37N.
C13—0.1 μF, Tubular, T.C.C. type CP45N.
Valve—Brimar 6AT6.

to these being required. The valve functions very effectively as an L.F. triode—moreover, it is easily obtainable both on the new and the surplus market. The resistors R10 and R11 form the anode load with C12 acting as the coupling component to the output stage 6BW6. Bias for the stage is supplied by the components R12 and C11. C13 is the anode de-coupling capacitor. In this circuit, using the component values specified, the stage gain is approximately 42, this drive to the 6BW6 resulting in more than sufficient audio for the average den or shack. Consequently, more than enough gain is at hand over and above normal requirements—this being ideal; a little gain in reserve for that weak station being often all that is necessary in order to establish station identification.

Before proceeding with the wiring instructions for this stage, however, a few modifications will be required to that circuit of the receiver published in the November, 1956, issue of this magazine. Having drilled the necessary hole for the additional valveholder, the position for this being obvious from the illustration shown herewith, mount the valveholder with pins 1 and 7 nearest the rear wall of the chassis.



An underside view of the chassis after the conversion.

From pin 2 of the output 6BW6, unsolder the connection to the potentiometer R7. In place of this solder one end of a 220 KΩ half-watt resistor, and one end of C12 (the black end). Solder the other end of the 220 KΩ resistor to that earthed tag of the 6BW6. Connect the other end of C12 to pin 7 of the 6AT6. Having done this, solder that end of the lead from the potentiometer—previously removed from the output stage, and solder this to pin 1 of the 6AT6.

From the anode circuit of the detector stage (EF41) remove the condenser C3—an 0.01 μF component. In its place insert an 8 μF electrolytic condenser, T.C.C. type CE17LE, one end of this being soldered to the earthed connection of the potentiometer and the positive end to the junction of R2 and R3.

It may be noted here that the removed C3 may be used again as the C12 of the added circuit.

These are all the modifications necessary before proceeding with the wiring up of the added stage.

Wiring the 6AT6

We have already dealt with pin 1 of this valve above; the next thing to be completed is the heater

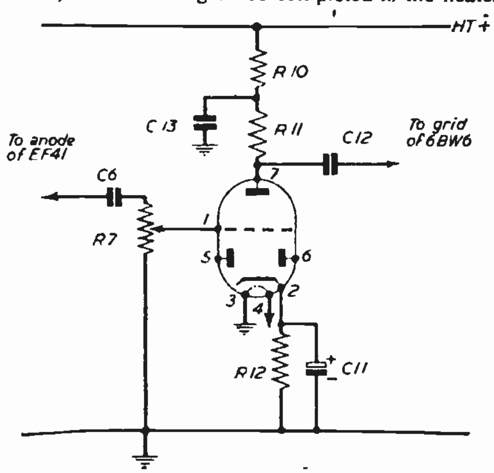


Fig. 1.—The circuit of the extra stage.

wiring. From pin 4 connect, by means of a short length of P.V.C. covered wire, to pin 1 of V1 (EF41). This wire should be the L.T.— connection. Next, connect pin 3 of the 6AT6 to the central metal spigot of the valveholder, and from there to that earthed tag associated with V3. This should be done with a short length of bare wire.

To pin 2 of the 6AT6 solder one end of R12 and the positive end of C11. Solder the other end of R12 to the earthed tag of V3, and the other end of C11 to the earthed tag of the tag strip mounted on the rear chassis wall. Pins 5 and 6 of the 6AT6 are left blank and no attachments at all should be made to them. To pin 7 (to which is already soldered one end of C12), solder one end of R11, the other end of which is connected to a free tag of the tag strip on the rear chassis wall. Next, from this same tag, solder one end of R10, the other end of which should now be soldered to that tag of the tag strip containing the H.T.+ connection. From the junction of these two resistors, solder one end of C13, the negative end being soldered to pin 3 of the 6AT6.

This completes the actual wiring instructions for the addition of the extra audio stage. It will be found that layout is not at all critical and components do not necessarily have to be located as shown in the illustrations. Those readers who have not fitted the tag strip on the rear chassis wall will find no difficulty in wiring the stage provided they follow the circuit, as shown in Fig. 1.

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NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

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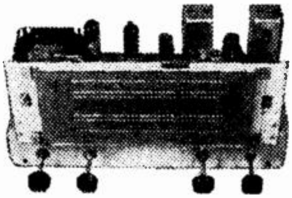
2X2	3/6	6SA7	7/6	EBF80	8/6	HVR2A	7/6
3S4	8/6	6SN7	8/6	ECC84	12/6	MU14	10/6
3V4	8/6	6V6G	7/6	ECC85	10/6	PCC84	12/6
5U4	8/6	6V6GT	8/6	ECF82	10/6	PCF80	10/6
5Y3	8/6	6X4	7/6	ECH42	10/6	PCF82	10/6
5Z4	10/6	6X5	7/6	ECH81	8/6	PCL82	10/6
6AM6	8/6	7S7	8/6	ECL82	12/6	PL81	11/6
6H8	5/6	12A6	7/6	EF37	7/6	PL82	10/6
6BE6	7/6	12AH8	10/6	EF41	10/6	PY80	10/6
6BH6	10/6	12AT7	10/6	EF50	5/6	PY81	10/6
6BW6	8/6	12AU7	10/6	Equiv.		PY82	10/6
6BW7	8/6	12AX7	10/6	EF80	6/6	SP61	5/6
6CH6	10/6	12BE6	10/6	Syl.		UB41	8/6
6D6	7/6	12BH7	10/6	EF86	10/6	UCH42	8/6
6F6	7/6	12K7	8/6	EF91	5/6	UF41	8/6
6H6	3/6	12Q7	8/6	EL32	5/6	UL41	8/6
6J5	6/6	35Z4	10/6	EL84	10/6	UY41	8/6
6J6	7/6	80	8/6				
6J7	8/6	354	1/6	EY51	11/6		10/6
6K6	6/6	EA50	1/6	EZ40	11/6		11/6
6K7	6/6	EABC80	8/6	EZ81	11/6	X79	10/6



1957 RADIOGRAM CHASSIS

THREE WAVEBANDS FIVE VALVES
S.W. 16 m.–50 m. LATEST MULLARD
M.W. 200 m.–550 m. ECH42, EF41, ECB41,
L.W. 800 m.–2,000 m. EL41, EZ40.
12 month guarantee.
A.C. 200/250 v. 4-way Switch: Short-Medium-Long-Gram. A.V.C. and Negative feedback 4.2 watts. Chassis 13½ x 5½ x 2¼in. Glass Dial 10 x 4½in., horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory. Aligned and calibrated. Chassis isolated from mains.

10 gns. Carr. & ins., 4/6.

TERMS: Deposit £5.5.0 and six monthly payments of £1.
MATCHED SPEAKERS FOR ABOVE CHASSIS
8in., **19/6**; 10in., **25/-**; 12in., **30/-.**

RECOMMENDED FOR ABOVE CHASSIS

★ COLLARO ★

HIGH-FIDELITY AUTOCHANGER 1957 Model RC456

7in., 10in., 12in. Records 17, 33, 45, 78 r.p.m.

4 SPEEDS—10 RECORDS
With Studio "O" Pick-up

BRAND NEW IN MAKER'S BOXES

OUR PRICE **£9.15.0** post free.

TERMS: Deposit £5.5.0 and six monthly payments of £1. Space required 14in. x 12½in. 5in. above and 3in. below.

B.S.R. MONARCH 4-SPEED RECORD CHANGERS 1957 MODELS

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NOT JOB LINE REJECT STOCK

Designed to play 16, 33, 45, 78 r.p.m. Records, 7in., 10in., 12in. Lightweight Xtal pick-up, turnover head, two separate sapphire styli, for Standard and L.P., each plays 2,000 records. Voltage 200/250 A.C.

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AMPLIFIER—RECORD PLAYER CABINETS Cabinet size 18½in. x 13½ x 11in. 8½in., with motor board 11 x 12½in., £3.3.0.

GARRARD RC 80m 3 speed Autochange Universal AC/DC 100-250 volts. List price £27.10.0.

OUR PRICE **£15.15.0** Carr. & ins., 5/-.

SUPERHET COIL PACK. 27/6. Miniature size 2½in. x 2¼in. x 1½in. HIGH "Q" Dust cored Coils. Short, Medium, Long, Gram Switching. Single hole fixing with connection diagram and circuit. 465 Kc/s I.F.

B.S.R. MONARCH. 3-speed Motor and Turntable with selecting switch for 33, 45 and 78 r.p.m. records. 100-120 v. and 200-250 v. A.C. 50 cps. Also **B.S.R. MONARCH** Lightweight Pick-up with Acos Xtal turnover head, separate Sapphire styli for L.P. and Standard records.
SPECIAL OFFER, THE TWO: £4.12.6 post 2/6. 14 x 12½in. Cut Out board, **6/-.**

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1½ x 3/16in. Bargain Price 6/6. No transformer required.

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For London, Midland and Northern I.T.A.
MARK I
Suitable all T.V. makes. T.R.F. or Superhet. Coils, valves, components, chassis, wiring plans. COMPLETE KIT for mains operation 200-250 v. A.C., **£3.10.0.**
As ABOVE less POWER PACK. Requires 200 v. 20 mA. H.T. 6.3 v. .6 a. L.T. **£2.5.0.**
Mark II cascode £1 extra each Kit

JASON F.M. TUNER COIL SET. 22/6. H.F. coil, aerial coil, Oscillator coil, two I.F. transformers 10.7 Mc/s. Detector transformer and heater choke. Circuit book using four 6AM6, **2/-. J.C.** Chassis and Dial, **19/6.**
Complete Jason F.M. Kit. **£5.18.6.**
With Jason superior calibrated dial, **£6.15.0.**

Volume Controls

Long spindles. Guaranteed 1 year. Midget, 10,000 ohms to 2 Meg.
No Sw. S.P.Sw. D.P.Sw.
3/- 4/- 4/9
Lin or Log Tracks.

80 ohm CABLE COAX

Semi-air spaced Polythene insulated. ⅜in. dia. Stranded core. Losses cut 50% **9d.** yd.
STANDARD ¼in. Coax **8d.** yd.

COAX PLUGS ... 1/- **DOUBLE SOCKET** ... 1/3
SOCKETS ... 1/- **OUTLET BOXES** ... 4/6
BALANCED TWIN FEEDER, yd. **6d.** 80 or 300 ohms.
DITTO SCREENED per yd. **1/-.** 80 ohms only.
WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., **3/-** ea. 50 K., **4/-.** (Carbon 50 K. to 2 m., **3/-.**)
WIRE-WOUND 4 WATT. Pots 2¼in. Spindle. Values, 100 ohms to 50 K., **5/6**; 100 K., **6/6.**
CONDENSERS. New stock. .001 mfd. 7 kV. T.C.C., **5/6**; Ditto, 20 kV., **9/6**; 100 pf. to 500 pf. **Micas, 6d.**; Tubular 500 v. .001 to .01 mfd., **9d.**; .05, .1, **1/-**; .25, **1/6**; .5/350 v., **1/9**; .1/350 v., **9d.**; .1/600 v., **1/3**; .1 mfd., 2,000 volts, **4/-.**
CERAMIC CONDS., 500 v., .3 pf. to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10%, 5 pf. to 100 pf., **1/-**; 600 pf. to 3,000 pf., **1/3. DITTO** 1%, 1.5 pf. to 500 pf., **1/9**; 515 pf. to 5,000 pf., **2/-.**

I.F. TRANSFORMERS 7/6 pair

465 Kc/s Slug tuning Miniature Can. 2¼in. x 1in. x 1in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.
Wearite M800 IF 465 Kc/s 12/6 per pair.

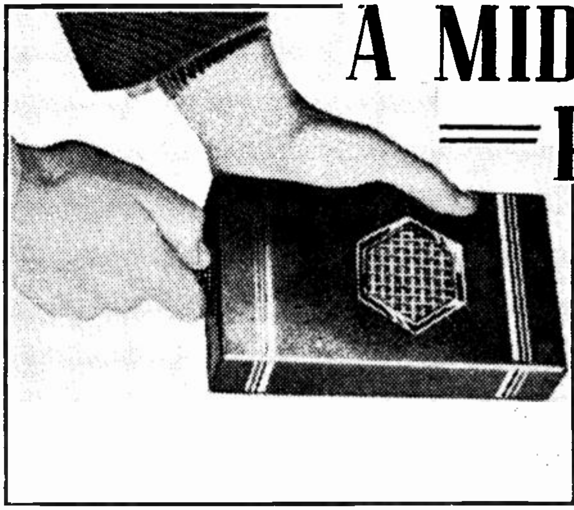
NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350 v.	2/-	100/25 v.	2/-	8+16/500 v.	5/6
2/450 v.	2/3	8+8/500 v.	4/6	16+16/500 v.	6/-
4/450 v.	2/-	16+16/500 v.		25+20/450 v.	5/6
8/450 v.	2/3		6/-	32+32/350 v.	4/6
8/500 v.	2/9	CAN TYPES		32+32/450 v.	6/6
16/450 v.	3/6	Clips	3d.	50+50/350 v.	7/-
16/500 v.	4/-	16/450 v.	3/6	60+100/350 v.	11/6
32/450 v.	5/6	32/350 v.	4/-	100+200/275 v.	12/6
25/25 v.	1/9	64/350 v.	5/6		
50/25 v.	1/9	500/12 v.	3/-	1,000+1,000/6 v.	
50/50 v.	2/-	8+16/450 v.	5/-		6/6

Screw Base Type 512, 8/500 v., **3/-**; 16/500 v., **4/-.**
SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kV., **5/-**; K3/40 3.2 kV., **7/-**; K3/45, 3.6 kV., **7/6**; K3/50 4 kV., **8/-**; K3/100 8 kV., **14/6. MAINS TYPE CONTACT COOLED** 250 v. 50 mA., **8/3**; 250 v. 85 mA., **9/6.**
COILS Wearite "P" type, **3/-** each. Osmor Midget "Q" type adj. dust core, **4/-** each. All ranges.
TELETRON, L. & Med. T.R.F., with reaction, **3/6.**
FERRITE ROD AERIALS. M.W., **8/9**; M. & L., **12/6.**
T.R.F. COILS A/HF, **7/-** pair. **H.F. CHOKES, 2/6.**

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., **4/6**; 9 x 6in., **5/9**; 11 x 7in., **6/9**; 13 x 9in., **8/6**; 14 x 11in., **10/6**; 15 x 14in., **12/6**; 18 x 16 x 3in., **16/6.**

FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 6 or 12 v. 1½ amp., **8/9**; 2 a., **11/3**; 4 a., **17/6.**
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., **13/6**; 4 amp., **21/-.**
VALVE and **T.V TUBE** equivalent books **5/-.**
TOGGLE SWITCHES, S.P. **2/-,** D.P. **3/6,** D.P.D.T. **4/-.**
WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer, long spindle 6/6
2 p. 2-way, 3 p. 2-way, short spindle 2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way, long spindle 3/6
3 p. 4-way, 1 p. 12-way, long spindle 3/6
VALVEHOLDERS. Pax. Int. Oct., **4d.** EF50, EA50, **6d.** B12A, CRT, **1/3.** Eng. and Amer. 4, 5, 6, 7, and 9 pin, **1/-.** MOULDED Mazda and Int. Oct., **6d.** B7G, B8A, B8G, B9A, **9d.**, B7G with can, **1/6.** VCR97, **2/6,** B9A with can, **2/6.** CERAMIC EF50, B7G, B9A, Int. Oct., **1/-.** B7G with can, **1/9.**
BLACK CRACKLE PAINT, air drying, **3/-** tin.



A MIDGET 4-VALVE PORTABLE

A BATTERY-OPERATED SELF-CONTAINED MIDGET

By T. Walker

THIS is a superhet circuit, using the latest Mullard Economy 96 series valves. The total H.T. is only 7 mA and L.T. 125 mA.

To save switch contacts, instead of a tapped long and medium wave frame aerial, two separate frame aerials are used and the trimmers wired across each section.

Only one oscillator coil is used for both wavebands, and C15 and TC3 are switched in parallel to receive the long waves.

A.V.C. is applied only to the I.F. amplifier. There is no volume control, this being replaced by R5. To reduce volume the set is rotated to reduce signal pick up by the aerial.

The set indeed has only one control, this being a three-position switch, one off, two Home, three Light.

Construction

The chassis is made out of sheet brass, and although the prototype set is made up of pieces soldered together, it is possible to make the chassis in one piece.

After cutting, bending and drilling the chassis, an insulated tag is riveted on to form the positive contact for the L.T. cell.

The valve holders are soldered to the chassis after cutting off the bolt tags.

The tags on the switch are cut off short, and short pieces of wire are soldered on to the tags that will be used. This must be done before fitting the switch, as it will not be possible to do this later, due to I.F.T.1 being mounted so near to this switch.

The loudspeaker is bolted to the chassis with a piece of brass gauze in between to form the grille, and the speaker tags face away from the switch.

The output transformer is bolted on, and also the tag strip soldered on to the chassis by V4 holder.

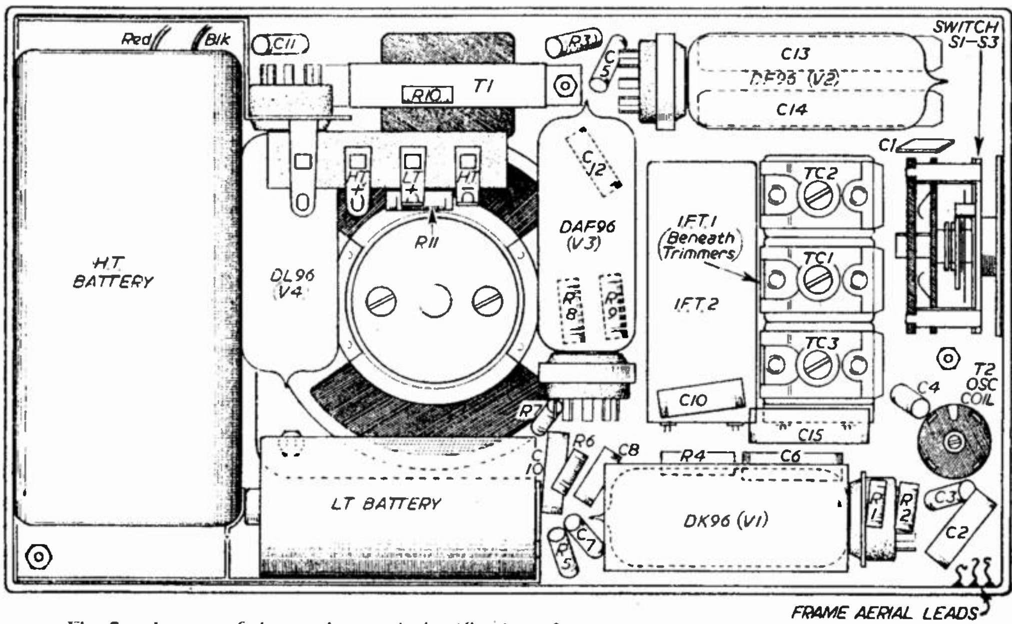


Fig. 2.—Layout of the receiver and identification of components. The circuit is on page 382.

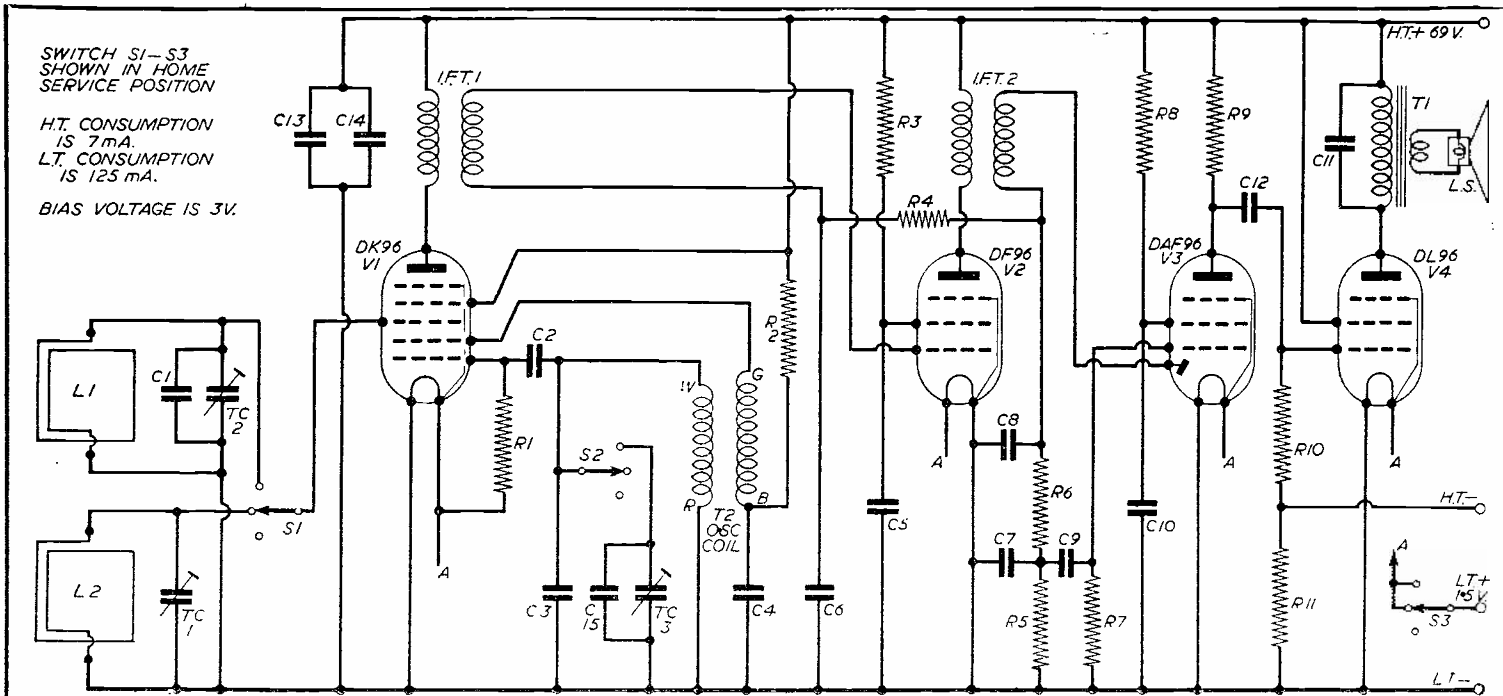


Fig. 1.—Theoretical circuit of the Portable Four.

COMPONENT LIST

R1—47 K.
R2—10 K.
R3—10 K.
R4—2.2 M.
R5—680 K.
R6—47 K.
R7—3.3 M.
R8—3.3 M.
R9—1 M.
R10—1 M.
R11—470 ohms.
All midget ½ watt

C1—100 pF (Radio Spares).
C2—100 pF (Radio Spares).
C3—175 pF (Radio Spares).
C4—.01 μF (Hunts).
C5—.01 μF (Hunts).
C6—.01 μF (Hunts).
C7—50 pF (Radio Spares).
C8—50 pF (Radio Spares).
C9—.01 μF (Hunts).
C10—.01 μF (Hunts).
C11—.005 μF (Hunts).
C12—.01 μF (Hunts).
C13—2 μF }
C14—2 μF } (Electrolytic TCC Picopack).
C15—300 pF (Radio Spares).
H.T. Battery—the H.T. section removed from B114.
L1—Long wave frame aerial, two layers of 36 turns 38 S.W.G. enamelled wire.
L2—Medium wave frame aerial, one layer of 30 turns 32 S.W.G. silk wire.
Loudspeaker—2½ in. M.C. P.M. Celestion.

TC1 }
TC2 } 100 pF trimmer.
TC3 }
IFT1 }
IFT2 } Weyrad P6 2.
1—four tag (one earth tag) strip.
T2—Weyrad HO3.
T1—Personal portable output transformer.
S1 }
S2 } 4 pole 3 way switch (ignore one pole.)
S3 }
Valves—DK96, DF96, DAF96, DL96 (Mullard).
4 valveholders—B7G moulded bakelite.
L.T. is 1.5 v. Baby Cell. It is the next size above No. 8 cell.

Wiring

The wiring of the set is now carried out, except for the oscillator coil and trimmers, using 22 s.w.g. tinned copper wire, and 1 m/m. sleeving.

The connection from I.F.T.1 to the grid of the DF96 is in very thin screened cable.

The oscillator coil as purchased is too long, so the brass mounting nut is removed from inside the coil and ¼in. cut off the coil former and the nut replaced. The coil wires soldered to the tags are removed, the tags cut short, and the wire resoldered. Make a note of the colours before doing this as most of the colour will be removed. The coil is then mounted and wired in circuit.

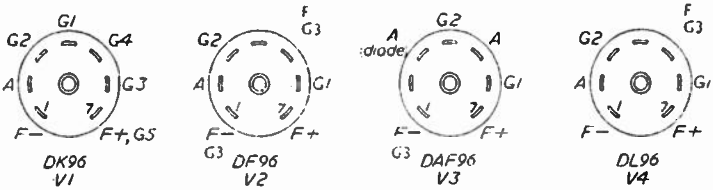


Fig. 3. Details of valve base connections.

Before mounting the trimmers, the adjusting screws are fully tightened down and the surplus thread cut off. The tags are altered as sketch, and are mounted by forcing the earth tag of each between the two I.F.T.s. The other tag is also cut and soldered direct to the switch contacts.

The DK96 valve is screened by bending a thin piece of tin round the valve and soldering the joint; it is insulated by self adhesive plastic tape (as used by cyclists to put round the handlebars) to prevent the screen from touching the contacts of the I.F.T.s. The screen is then soldered to the valveholder and the valve fitted at the same time.

All earths are soldered direct to the chassis.

Batteries

The H.T. battery, which is soldered in, is the H.T. section removed from the Ever Ready H.T. and L.T. battery number B114. This, too, is taped up.

The L.T. is one cell from Baby torch, number 1839, and although small will be found to have an amazingly long life.

The Case

The case is the next job and is made from very thin three-ply wood, obtainable from the model shops, and is held together by glue and the rexine covering.

Before covering the case the frame aerials will have to be wound.

The Frame Aerial

One layer of 30 turns of 32 s.w.g. silk-covered wire is used and the ends passed through holes in the wood by the DK 96 valveholder. This forms the medium wave section. For long waves, two layers of 38 s.w.g. enamel wire are wound one on top of the other with a layer of Selotape in between and the wires also passed through holes in the case. One end of each frame aerial is earthed to chassis. The rexine is not put on the case until the set has been completed as turns may need to be added or removed from the frame aerial.

Testing

Once the wiring of the set has been completed and checked the valves are inserted and the batteries connected, and on switching on some noise should be heard and the oscillator coil adjusted to receive the local Home Service and then adjust TC1.

The I.F.T.s can then be aligned on the signal.

The Light programme is next set by adjusting TC3 and TC2.

It must be pointed out that any adjustment on the oscillator coil for medium waves will make it necessary for the trimmer TC3 to need adjustment for long waves.

The values of C1, C3 and C4 may need altering to suit different sets and Home programmes.

The case can finally be covered with rexine or similar material.

Death of a Radio Scientist

THE recent announcement of the death of Mr. K. W. Tremellen at his home in London records the passing of a pioneer radio scientist whose researches were of immense benefit to this country and, indeed, to the world in general. Mr. Tremellen, who was 68 years of age, had retired from the service of Marconi's Wireless Telegraph Co. Ltd. at the end of 1952.

In his early career he became closely associated with Marconi in many of his early experiments in wireless telephony both in this country and with the Italian Navy between 1912 and 1914.

In 1915, as a Captain in R.E. Signals Branch, Mr. Tremellen was in charge of the establishment and operation of a chain of D.F. stations in France.

After the war, in association with Captain H. J. Round and Mr. T. L. Eckersley, he engaged in the study of long wave propagation and made a world cruise lasting twelve months for the purpose of assessing the possibilities of engineering a projected chain of long wave stations to link the countries of the Empire by wireless.

Birmingham Jamboree

AMATEUR radio enthusiasts all over the world will be hearing unusual messages coming over the air during August this year.

That is the month when 37,000 scouts from 86 different countries, including Russia and Hungary, meet at Sutton Park, near Birmingham, for the World Scout Jamboree. The Jamboree celebrates both the Golden Jubilee of the movement, and also the birthday centenary of its founder, Baden-Powell.

The unusual messages that will be heard will come from a special amateur radio station which the Slade Radio Society, of Erdington, Birmingham, are setting up at the Jamboree. During the Jamboree the radio station will transmit goodwill messages to owners of shortwave sets throughout the globe.

One of the men who will be operating the station is Mr. Arthur Goble, of 150, Trinity Road, Aston, Birmingham, who works for British Oxygen Gases Ltd. Says Mr. Goble: "We hope to man the station day and night and we want to contact as many people as possible over the air to tell them about the Jamboree."

On Your Wavelength

BY THERMION

The BBC Staff

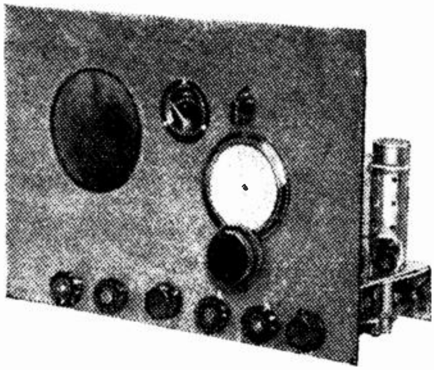
IN the May issue I criticised the tendency of the BBC to alter the standard pronunciation of words and place names. I said that the Director General should really put some period to those snobbish Chelsea types who wish to give Kensington drawing-room type of pronunciation to words and place names, and I went on to criticise the sartorial accoutrements of some of the staff. My remarks were, of course, written in a humorous vein. The Secretary of the Association of Broadcasting Staff in a letter says that his attention has been called to my remarks, which are resented by the members of his union. He tells me that the general impression amongst his "engineering members" is that this journal is waging some kind of a campaign of denigration which they resent. I am sorry that he takes this view, for not one member of the BBC staff has written to me on the matter, and I should be glad to have from the Secretary the names and addresses of these objecting members. Does Mr. Littlewood really think that his union controls not only its members, but Press criticism? I have been associated with the BBC for rather more years than some of his members are old, and certainly for very many years longer than this comparatively small and new union. I have the highest respect for the BBC technicians. I was not referring to the technical side at all, but to the programme side—producers, announcers and to some extent those who broadcast. I seem to be far better informed about this matter than Mr. Littlewood. It may come as a surprise to him to know that many of the BBC technical personnel regularly contribute to this journal, and those who read my paragraph chuckled when they read it, but agreed with the general tenor of my comments. This journal is not waging a campaign of denigration against the technicians. It is, however, waging a campaign against the usurpation by the BBC of the right to set all dictionary pronunciations aside and adopt their own. As an Englishman I resent English pronunciations being changed capriciously. Mr. Littlewood also seems singularly unaware of criticisms similar to mine which have been going on for years. In the *Observer*, the other Sunday, there were quoted some comments of Sir Ernest Gowers in his presidential address to the English Association: "Today the word *incidentally* has become a vague word seemingly indispensible to BBC announcers. Fowler (author of Modern English Usage) had no patience with those who rejected the anglicised pronunciation of foreign words or place names and insisted on speaking them with the accent of a native of their country or origin. If he were alive today he would, no doubt, be disappointed that the BBC announcers evidently hold the opposite opinion." . . . Fowler had fought affected or genteel pronunciations. The conviction seems now to be that when one is before a microphone the dignity of one's position demands, for example, the articulation of the 't' in often. . . . People are influenced by what they hear over the air. It would not be surprising if by the end of the century English and American pronunciation had become indistinguishable." The Americans have always found difficulty with their vowel sounds and have never really learned to speak English.

Any criticism of BBC programmes is always met with the rejoinder that the BBC is really understaffed, to provide a national service for seven days a week. Then why try? We are also told that there is one broadcasting employee to every 5,000 population. This proves precisely nothing, except to indicate that the BBC is overstaffed. By the same argument, at a particular moment, there is only one announcer to 50 million people in this country. These sort of figures mean nothing.

Music and Movement

AS a particular case in point, can anyone see what good purpose is served by that thoroughly inane service to the schools in the morning "Music and Movement." It occupies class time which would be better used to teaching the children how to read and write, in view of the great amount of illiteracy in this country. Some thousands of teenagers cannot read or write today. Of couse, if a census were taken at the schools the children will be all in favour of the programme, and I am certain that the teachers who tap this programme will also be in favour of it. They have nothing to do whilst the programme is on, and the children will naturally prefer it to some dry history lesson. The programme itself is imbecilic in its conception and certainly stupid in the way it is carried out. "Now, children! Spread yourselves all over the room. We are now going to hear some hopping music," etc., etc. What on earth is it intended to teach them? It will not teach them to dance. They will learn that soon enough from their local skiffle rock 'n' roll club. I seriously suggest to the BBC that they drop this nonsensical programme, which merely wastes school time. It is quite laughable to listen to. One wonders what sort of a person it is in the programme planning department who could be persuaded to put on such utter tripe.

An Amateur Communications type Receiver



By F. G. Rayer

(Concluded from page 308 July issue)

THE second wafer of the switch goes to the rear gang of tuning condenser, the top tag of which goes to R.F. valve grid. It is also connected to the fixed plates of the aerial trimmer.

Wafer 3 switches the R.F. valve anode to any of the five H.F. coil primaries. Wafer 4 switches the secondaries of these coils, and is also connected to mixer trimmer (Fig. 5) and the centre section of the tuning condenser. The top tag of the latter is taken to the 6L7 top cap.

The two remaining wafers switch the oscillator coils, wafer 5 also being connected to the front section of the gang condenser. To wire in the M.W. coils it is only necessary to set the switch to its second position and connect the various coils to the appropriate tags throughout the switch sections. Fig. 5 shows the positions of the coils, these being arranged to avoid interaction and secure short wiring in the H.F. ranges. If the coils in each circuit position are located as far as possible with tags similarly placed, then the wiring of other ranges will be merely repetitive of that in the M.W. range. To secure additional screening on the L.W. and M.W. bands, the aerial coils of these are above the chassis.

The smaller oscillator coils have two separate windings in the type listed, but those for M.W. and L.W. have a single tapped winding, so that there are only three connections. Where two windings are provided the fourth tag is earthed. With the tapped coils this is not necessary since the tapping forms a common earthing point (via padder) for both sections. It will have been realised that the bands can easily be chosen to suit individual needs, and the Astral coils actually employed were those numbered 1, 2, 3, 5 and 6 in the following list :

Coil band number	Approx. waveband in metres	Required padder capacity
1	750-2,000	150 pF
2	190-570	500 pF
3	16-48	5,000 pF (.005 μF)
4	12-36	,, ,,
5	34-100	2,400 pF
6	90-270	900 pF
7	250-750	350 pF

In some cases the L.W. band may not be required, though it does increase the general utility of the receiver. The coils used (1, 2, 3, 5 and 6) give continuous tuning from 16 to 2,000 metres, except for the band between 570 and 750 metres, and are probably as suitable as any. Coil 7 would cover this band, if wanted. The No. 4 coil would also cover up to the lower limit of the No. 5 coil, but the L/C ratio grows rather poor, so that the 16-48 metre coil is preferable.

As already mentioned, comparable coil types of other make can be used. In all cases it is essential to follow the maker's tag connecting data and recommendations upon padder values. In a few instances the latter may need to be obtained by wiring two condensers in parallel, e.g., 2,000 pF and 400 pF for 2,400 pF.

Operational Notes

It will be realised that a little care in operation is required if the maximum efficiency is to be obtained, when selectivity and sensitivity will very considerably exceed that of the average domestic superhet. This does not mean that tuning is difficult, since on a great number of stations there will be no need to touch trimmers or the R.F. and I.F. gain controls.

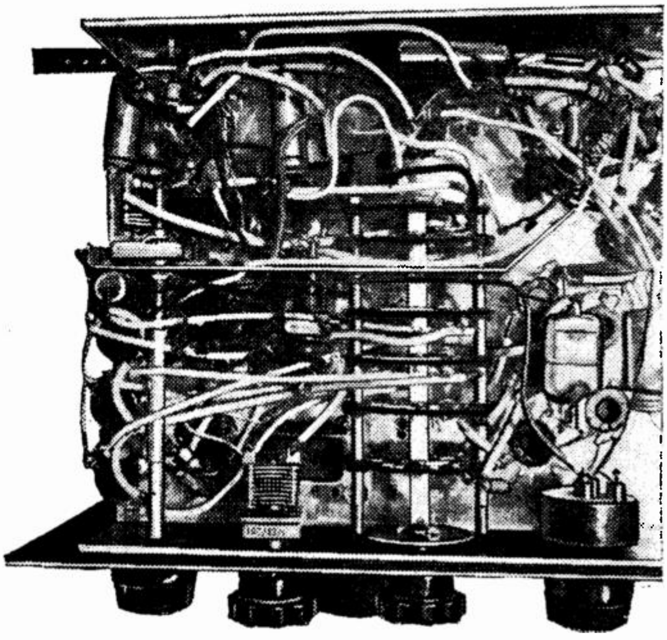
With the transformer set to suit the mains voltage, and valves in position, it is best to place the I.F. switch in the " Low " setting at first, to ensure some signal will be obtained, even under conditions of bad mis-alignment. It should then be possible to tune in the local station. The first and final I.F. transformers are now adjusted, with an insulated tool, to secure maximum indication on the tuning meter (minimum anode current). A metal tool must not be used, as its presence, especially in coils, influences resonance. If there is any tendency for any core or trimmer to come near the limit of its travel in either direction, then the other cores on trimmers are all adjusted a little and alignment repeated.

The switch is then turned to the " High " position and the other two transformers similarly adjusted for maximum signal on the meter. Their setting will be very critical. Due to the change in stray capacity in the switch positions, *all* transformers are then gone over again. When adjustment of any only serves to reduce signal strength, I.F. alignment is complete. When the switch is in the " Low " position one transformer circuit is slightly off peak, due to the extra capacity of the second I.F. valve, but this is no disadvantage.

In some coastal areas it may be desirable to peak the I.F.T.s at some frequency other than 465 kc/s to avoid local Morse, and a variation of 5 kc/s either way is normally quite feasible.

When the I.F.s are aligned, the aerial, mixer and oscillator circuits can be dealt with. This will prove relatively easy if the coils are correctly wired, with the correct padder values, and each band is treated separately.

The 30 pF oscillator pre-set is left at about mid-way position and should not need further adjustment. A station of low wavelength on the band is tuned in, and the two panel trimmers are turned for maximum signal on the meter. They should come to rest at roughly mid-way position, if undue stray capacity between coil connections, etc., and chassis has been avoided. Should one or both trimmers tend to peak near the fully open position, then the 30 pF pre-set can be screwed down a little. With the panel trimmers untouched, a high wavelength station is tuned in and the coil cores adjusted for maximum signal. The procedure is then repeated—e.g., trim at low wavelength, then adjust cores at a high wavelength. Alignment of the band will then be complete and tuning throughout can be with the main control. However, with weak stations it will be found that adjustment of the panel trimmers will often improve signal strength considerably, since even with good quality components *exact* alignment throughout the swing of the condenser is not achieved.



Some of the switch wiring.

If the aerial is other than a very short wire, a 25 pF fixed condenser should be included at the aerial socket so that the R.F. stage may tune sharply.

All other wavebands are then aligned in exactly the same way, the I.F. circuits not being touched again, however. On the S.W. bands, wrong core positioning may result in no signals being heard at first. If so, careful tuning should locate some station near the lower end of the band. The coil cores can then be adjusted, when tuning further up the band will be possible, with final alignment at a high wavelength. If it becomes increasingly necessary to close the panel trimmers as the receiver is tuned to higher wavelengths, this shows that the aerial and mixer coil cores need screwing in. The reverse effect shows they need withdrawing.

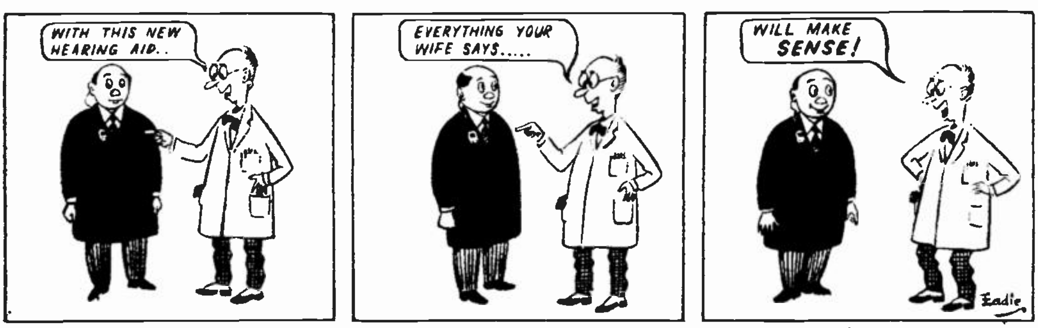
Should instability arise as either gain control is turned towards maximum, this shows that the circuit in question has long grid or anode leads, or that the valves are insufficiently screened. This test should be made with no signal, since any signal reduces gain, so that the set may only be unstable when tuned away from a station. Inaudible oscillation will be shown by a sudden drop in meter reading.

With the coils mentioned oscillation became a little fierce at the bottom of the S.W. bands. If this arises it can be cured by wiring a resistor in series with the oscillator winding of the coil or coils responsible. The resistor should be of quite low value (usually 30 to 100 ohms) as large values will prevent oscillation completely, so that reception ceases.

Aerials

A final word on the question of aerials. Do not imagine that the larger the aerial the better the results. Many users of communication equipment find that best results are obtained by a short vertical wire. A heavy gauge or two lengths of 7/22 twisted may be supported from a length of wood sticking out from the side of the house, and the wire stretched from the top to bottom.

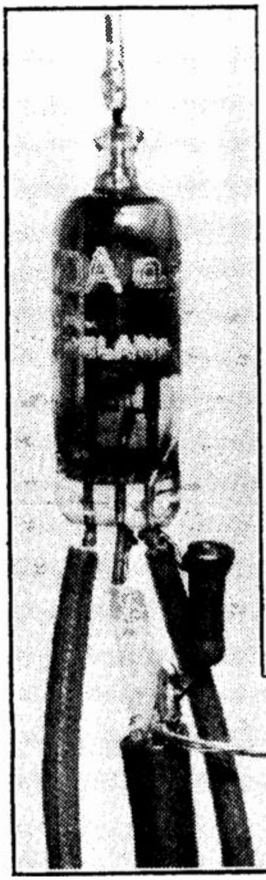
PROFESSOR BOFFIN



A Simple Test Probe

INSTRUCTIONS FOR MAKING A TEST PROBE FOR USE WITH MOST AMPLIFIERS TO FORM A VERY USEFUL AND INEXPENSIVE SIGNAL TRACER

By M. W. Kirby



Details of the assembly.

OFTEN in the course of radio and television servicing and construction it becomes desirable to test each stage in turn for signal continuity and also to get a rough idea of the quality and gain that each stage is giving. It is also useful, particularly in service work to be able to test for hum pick-up and the efficiency of the smoothing circuits. The most convenient way of testing for the above is by signal tracer, but not every experimenter has one of these, nor does he have enough work to justify the cost of obtaining one.

The test probe described herein makes no pretence of being new or comprehensive, but it does have the advantage of extreme simplicity and fulfils quite efficiently the functions described above, although it can be built in a few minutes out of materials from the spares box. Any high impedance amplifier may be used, or even the amplifier of the set under test if the audio stages are not at fault. If desired a simple amplifier can be built for use with the probe and Fig. 2 shows a circuit which has given good results on test.

The circuit of the probe is shown in Fig. 1, an EA50 diode being used in preference to a germanium diode on account of its robustness. A length of 16 s.w.g. wire about 2in. long is soldered to the anode pin of the diode, and a piece of sleeving pushed over this so that it leaves about ⅛in. of wire showing at the end. (Remember to use long-nosed pliers when soldering the diode pins, or the heat will damage the glass: this is shown in the illustration.) Then two 3ft. lengths of wire are connected on to the heater pins, the .01µF condensers soldered in place, and a short piece of sleeving pushed up to cover the pins. Next cut a piece of co-axial cable or screened lead about 3ft. long, push back the outer braid and strip ¼in. of the inner lead and solder this to the cathode pin. The outer braid is the earth terminal for the two condensers, and also a 1ft. length of wire stripped for 1in., which will be the earthing strap to the case and form the earthing fly-lead for the probe. The case can conveniently be made out of a through-chassis electrolytic condenser sawn off at the base, the contents cleared out and a hole drilled in the end to take the probe and sleeving. The open end should then be filed smooth and two cuts made ¼in. long and ⅜in. apart down the tube. The centre piece is lifted up to form a tag to which the earth wire may be connected. Now slide the assembly into the can and connect the earth wire to the tag. Fill with pitch or Chattertons compound and mould the end so that it forms a support for the wires. The base of the can may then be bound with tape to make a neat job. How the other ends of the wires are connected will depend upon the apparatus with which it is to be used, but if this will vary it will be a good idea to fit crocodile clips on all leads.

To test the probe, connect the heater leads A and B to a 6.3 volt supply and earth lead C to the earth of the amplifier and lead D to the input. Switch on the amplifier, and increase volume until there is a

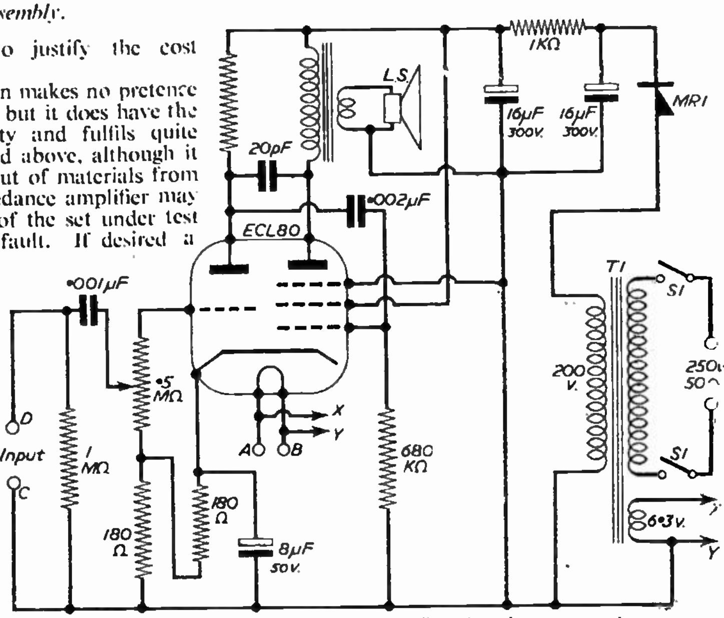
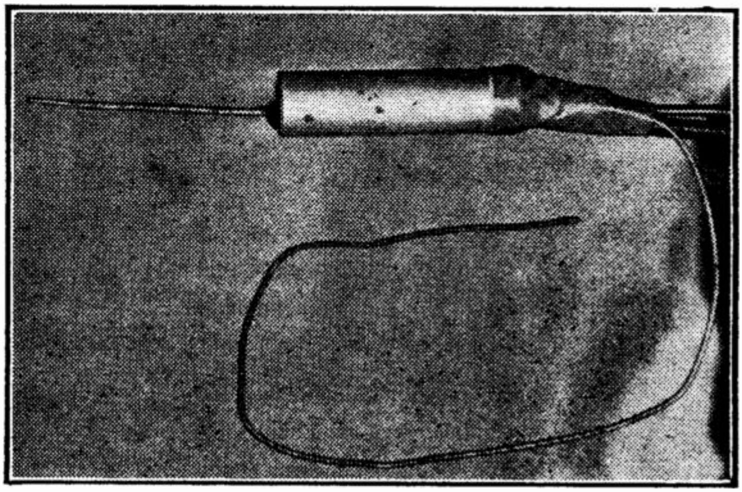


Fig. 2.—The circuit of an amplifier for the test probe.

slight hum present. When the probe tip is touched with the finger a loud A.C. hum should be heard. Then connect the fly lead E to the chassis of a radio set and, without switching on, place the probe on the aerial tuning condenser, when the stations should be heard as the condenser is rotated. Next switch on, and trace the signal from the grid to the anode of each valve in turn and notice that as the output stage is approached it will become necessary to reduce the volume control of the amplifier. So much has already been written on the use of a signal tracer that there is no point in elaborating further, as instructions can be found in most books on radio and television servicing. A word of warning: if the amplifier is not isolated from the mains and an A.C./D.C. set is being tested, make sure that the mains are connected in correct polarity or a short will result.



The finished test probe.

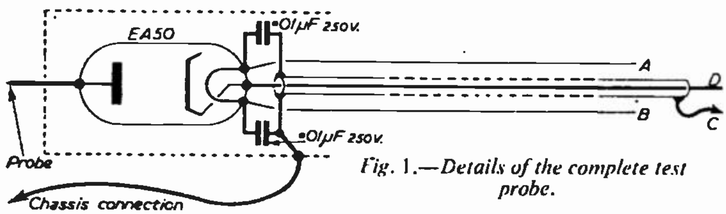
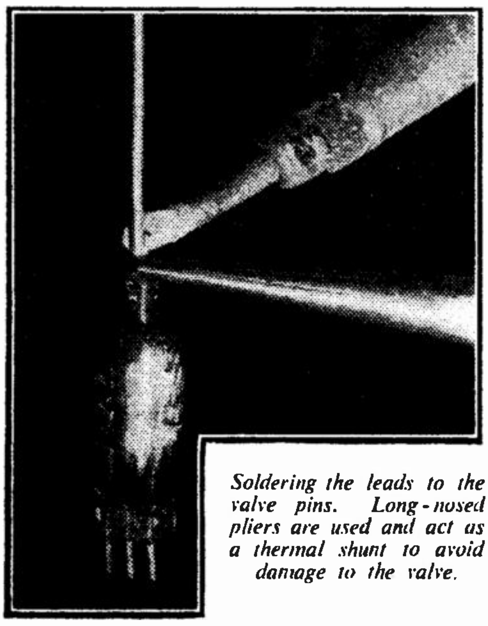


Fig. 1.—Details of the complete test probe.



Soldering the leads to the valve pins. Long-nosed pliers are used and act as a thermal shunt to avoid damage to the valve.

New Versatile Tape Recorder

THE new Selectophon T-5 recording machine is believed to be the most versatile machine of its kind on the market.

It can be used in the home or in the office. This is because the length of the tape it uses can be varied to suit the application—whether it be for recording long-playing records or for office dictation. Its application includes, apart from these, recording conferences; "music-while-you-work" in factories and canteens; background music in shops, hotels and at exhibitions, etc.

It will reproduce through a microphone or from a radio. An attachment enables it to play and record gramophone records. Radio or disc recording can be done silently or otherwise.

The tape is housed in a book-shaped case, which can be stored in a library like a real book. This is known as a Tone-Book.

There are four Tone-Books, each housing different lengths of tape. As the machine has three speeds, the amount of recording depends on the book used and the speed. The books are known as Dictation, A, B and C. The dictation book (for office use) will record for 30 minutes at fast speed. Book C, on the other hand, will record for six hours at the same speed—making it ideal for recording long orchestral works and conferences. Fitted to each book is a register card, enabling a check to be kept of everything recorded.

The tape, 35mm. wide, has 70 tracks, each 0.3mm. wide. They are connected to form one uninterrupted sound track. When recording or play-back reaches the end of a track, it automatically carries on to the next, without any audible brake. A track-selector, controlled by a knob, enables any track to be chosen within a few seconds.

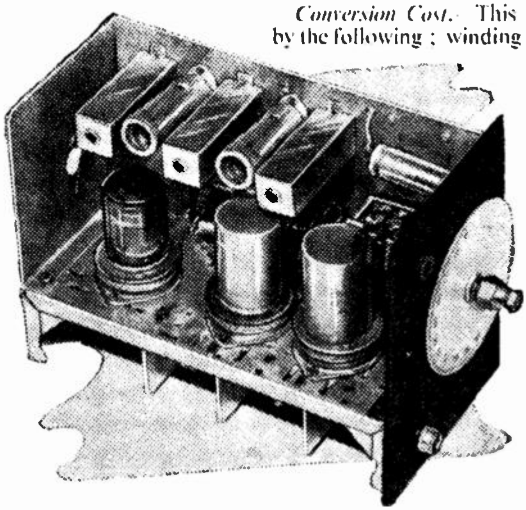
An FM Feeder Unit

DETAILS FOR MODIFYING THE POPULAR R.F.27 UNIT FOR F.M. RECEPTION

By Allen James

THE R.F.27 unit was originally designed as an R.F. amplifier and frequency converter for radar type equipments. It consists of an R.F. amplifier stage, a mixer and a local oscillator, and covers the frequency range of 60-80 Mc/s: the I.F. output being 7·75 Mc/s.

The author has been using one of these units for some years now modified to cover the 56 Mc/s amateur band. With the advent of F.M. to the Midlands the unit was redesigned to receive F.M. transmissions. When redesigning the unit the following points were aimed at, and in the author's opinion adequately fulfilled: freedom from interference and frequency drift, quality of reception, simplicity of operation and modification, and conversion cost as low as possible.



The modified unit.

These points were fulfilled as follows:

Interference.—This is kept as low as possible by a double limiting action, first by the limiter valve V5, and secondly, by the flywheel effect of C39 in the ratio detector.

Frequency Drift.—This is counteracted by use of coaxial cable for the oscillator tuned circuit, which produces a fairly stable oscillator. When the unit is first switched on a frequency drift will occur, and after about five to 10 minutes the frequency will remain almost rock steady; due to its high stability the local oscillator may be operated above or below the signal frequency as required.

Quality.—This is quite good if the transformer winding and alignment procedure is carefully carried out.

Simplicity of Operation.—Only the tuning dial, aerial input socket and audio output jack are mounted on the front panel.

Modification.—The R.F. and frequency stages are easily converted and an I.F. amplifier, limiter and radio detector added.

Conversion Cost.—This is kept as low as possible by the following: winding coils and I.F. transformers, using low-priced valves which can be bought as type CV138 for as low as 5s. each, and by using the lowest possible number of components.

Circuit Description (see Figs. 2a & 2b)

The signal from the aerial is stepped up by the R.F. transformer L1, L2 and applied to the grid of V1 which is operating as a wide band R.F. amplifier. The signal from the anode of this valve is then passed on via C7 to the grid of V2 and its tuned circuit L3, VC2, V3 acts as an inverted Hartley coaxial oscillator of high stability, the output of which is fed through the capacitor C10 to the grid of V2. Additive mixing takes place within V2 and the resultant I.F. of 10.7 Mc/s appears at the anode. This signal is then transferred via coaxial cable to the primary of the first I.F. transformer. From the secondary of I.F.1 the signal

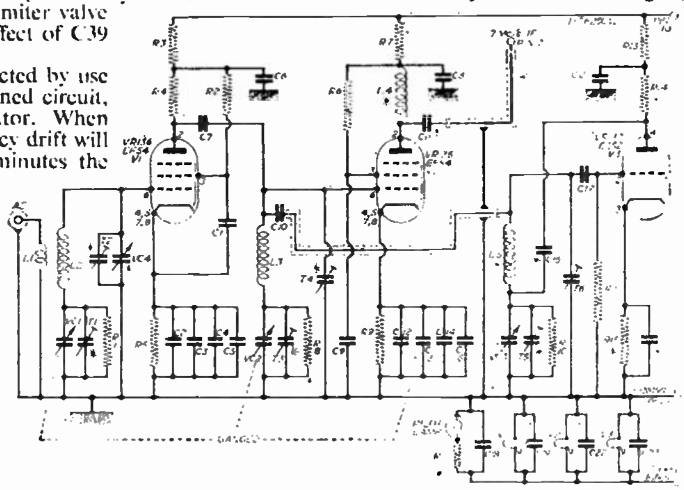


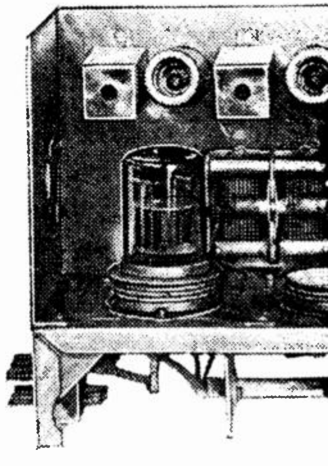
*Fig. 1.—Circuit of the R.F.27 unit. Components marked * are omitted from modified circuit.*

is applied to the grid of the first I.F. amplifier V4. Here the signal is amplified in the usual way and the amplified signal is then fed via T2 to the grid of V5. V5 is operated as a saturated R.F. amplifier. The purpose of this stage is to limit, not the F.M. signal, but electrical interference which is in most cases amplitude modulated (it also to a certain extent limits the voltage which appears across D1 and D2, as too high a voltage here will ruin the germanium diodes). The signal from the anode of V5 is now applied to the ratio detector, a description of which follows.

The Ratio Detector (Figs. 2b & 2c)

The ratio detector is essentially a phase discriminator, the coupling coil Lc taking place of the usual capacitor. When the F.M. carrier is at rest frequency, i.e. unmodulated, the following conditions exist: the voltage across the ends of the primary of T3 is 180 deg. out of phase. The voltage across the ends of the secondary is also 180 deg. out of phase, and the voltage injected by the centre tap is 90 deg. out of phase with reference to the ends of the primary: a state of balance therefore exists in the ratio detector. When the F.M. carrier is deviated, i.e. modulated, in one direction, the balance of phase across T3 secondary, with reference to the centre tap which remains at 90 deg., is upset. Vector addition of the voltage across T3 secondary will now show that the voltage across one half is greater than that of the voltage appearing across the other half; therefore on one half cycle a current will flow through one half of T3 secondary, through Lc, R20, C37, the A.F. load, earth and back via D2. On the next half cycle the current will flow from the other half of the secondary, via D1, R21 and C39in parallel, earth, the A.F. load, C37 and R20, then through Lc and so back to the secondary; the current flowing round this part of the circuit is at audio frequency due to the rectifying action of D1 and D2, C38 being the R.F. by-pass capacitor.

There is also a direct current flowing round the ratio detector circuit, through D2, T3 secondary, D1 and R21. The current flowing through R21 causes a voltage drop R21 which charges up C39 to the D.C. level of the signal. The time constant of R21 and C39 is such that it will allow slow carrier height variations but will absorb rapid carrier height variations, which are usually due to electrical interference or amplitude modulation. C36 and R20 form the de-emphasis network and C37 is the isolation capacitor.



The complet

Modifications to the R.F.27 Unit

Fig. 1 shows the components which are omitted from the modified circuit. First remove the valves, then referring to Fig. 1, disconnect L1 from the aerial socket and unwind it from about L2, unsolder the leads to L2, L3 L4 and L5 and remove these coils from the unit. Now unsolder and remove all the ceramic trimmers with the exception of T6 in the oscillator section. Also remove the parallel resistors, R1, R8 and R10; the aerial trimmer capacitor VC4 is also removed. The dial is now removed, the moving part of which is released by a grub screw located at the bottom right hand side and a grub screw which is accessible when the bulb holder is removed. When the rotor is removed the four bolts holding the stator are exposed, remove this after first unsoldering the wire to the dial bulb. To remove the tuning gang, VC1, VC2 and VC3, unsolder the earth wires from the chassis end and take out the four bolts holding the gang; it may be found that packing pieces are used under some of these capacitors. These are used to keep the spindle in alignment and must be replaced in exactly the same positions when remounting the tuning capacitors. The screened cable and C11, which are connected between

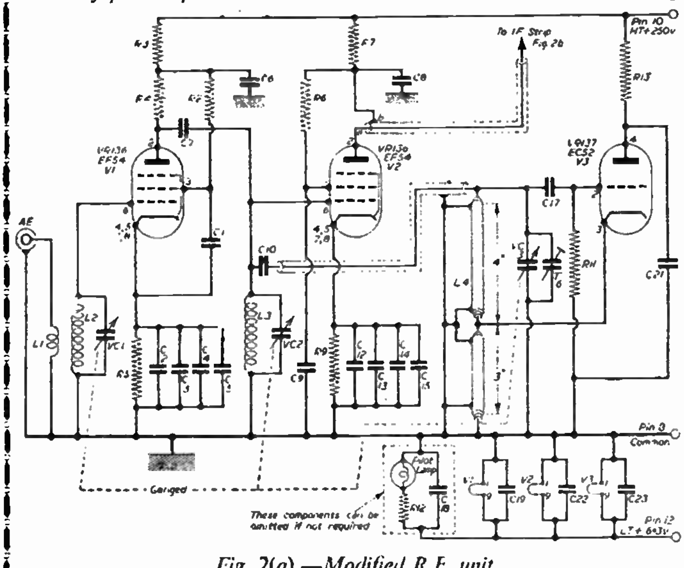


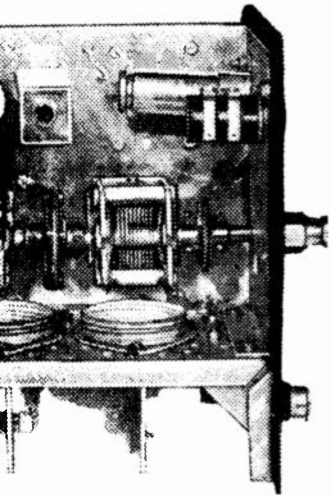
Fig. 2(a).—Modified R.F. unit.

COMPON

C25, 30, 31, 34—10 pF 2 per cent. silvered m L.E.M.
C26, 27, 28—2,200 pF miniature ceramic. T.C Hi K.
C29, 33—0.01 μF 200 v. D.C. T.C.C. CP.112
C32, 35—47 pF 2 per cent. silvered mica. L.E
C36—500 pF mica. Dubilier (C20 from R.F. un
C37—0.02 μF 500 v. D.C. T.C.C. C.P.34 S.
C38—330 pF ceramic. T.C.C. Hi-K.
C39—4 μF 275 v. B.E.C. CE550 (with horizo mounting clip).
R16—1 KΩ ½ w. Dubilier.
R17—150 Ω ¼ w. Dubilier.
R18—47 KΩ ¼ w. Dubilier.

pin 7 on the Jones plug and pin 2 of V2, are removed and also the resistor and capacitor from the cathode circuit of V3, R15 and C20. R14 and C16 are now removed and the junction of R13 and C2 are taken directly to pin 4 on V3 as shown in Fig. 2a.

From the components removed only the following are re-used: the valves, the coilformers without cores, the tuning assembly and C20. The inductance of the coils is too high for the F.M. band, so they are stripped and rewound as shown in the coil table. The capacitors VC1, VC2 and VC3 are all reduced to approximately 27 pF by removing all but three rotor vanes on each: the rotor vanes are held to the spindle by a clamp construction method and can be easily removed by prising out with a pair of long-nosed pliers. Care should be taken not to damage the remaining plates and on completion of this operation each capacitor should be checked for short circuits. These components should now be placed in a safe place whilst the redrilling of the chassis takes place.



feeder unit.

Drilling Details

The drilling details are given in Fig. 3. to enable the the unit to be laid flat it is necessary first to remove the front panel; this is held on by two bolts at the left-hand side and the two handles securing the bolts at the other side; also by two bolts holding the tag panel, containing C18 and R12, and the coaxial aerial socket. It will be noticed that no tag strip drilling details are given in Fig. 3. This is because of the various types of tag strips which are available. The height of the tag strips must not, however, exceed half-an-inch, otherwise they will not fit in the space available.

ENTS LIST

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R19—68 K Ω ½ w. Dubilier.
R20—100 K Ω ¼ w. Dubilier.
R21—22 K Ω ¼ w. Dubilier.
V4, V5—EF91, 6AM6, 6F12, or Z77.
D1, D2—G.E.X. 44, G.E.X. 34, etc.
J1—Jack socket.
2 B7G Valveholders with cans.
3 Aladdin coil formers with cans and cores. 2⅜in. high x ⅞in. sq. (R.C.S.)

MISCELLANEOUS

Screened cable. Coaxial cable.
3, 3-way flat mounting tag strips.
Grommets, nuts, bolts, tags, etc.

The approximate positions of these are shown in Fig. 6.

Details of a new front panel are given in Fig. 4, and when completed this can be used as a template for drilling the front of the unit. Only the following holes should need drilling: Two front panel fixing holes; a hole for the output jack, two holes for fixing the coaxial socket; and fixing holes for the dial. If the original dial is used then turn it through 90 deg. and redrill holes for it. When the dial is remounted it will project about ¼in. above the new front panel, which, in the author's opinion, does not mar the appearance of the unit. The author used a different dial here, the original one being used on a piece of test equipment. Holes for mounting the tag panel (containing C18 and R12) if required, can easily be marked on to the front panel from the rear side and should be countersunk.

Wiring and Mounting Components

The I.F. transformers are now constructed as shown in the table. Readers may find it easier if first the coils are wound and fixed with Durofix. Then take 13 pieces of bare connecting wire about 7in. long and put a small blob of solder on the end of each, then pass these wires down through the holes in the top and base supports of the coil and pull each wire tight whilst soldering to the base, the ends of the coils are then wrapped around and soldered to the appropriate supports, and the capacitors mounted as shown, care being taken to ensure that no short circuits will appear between the coils and cans.

The I.F. transformers are now mounted together with the valveholders and C39. The tuning gang VC1, VC2 and VC3, and the inductors L2 and L3 are then replaced and soldered into the unit, as shown in Fig. 2a, keeping connecting wires as short as possible; the remainder of the unit, including metalwork and tag strips, is now bolted on.

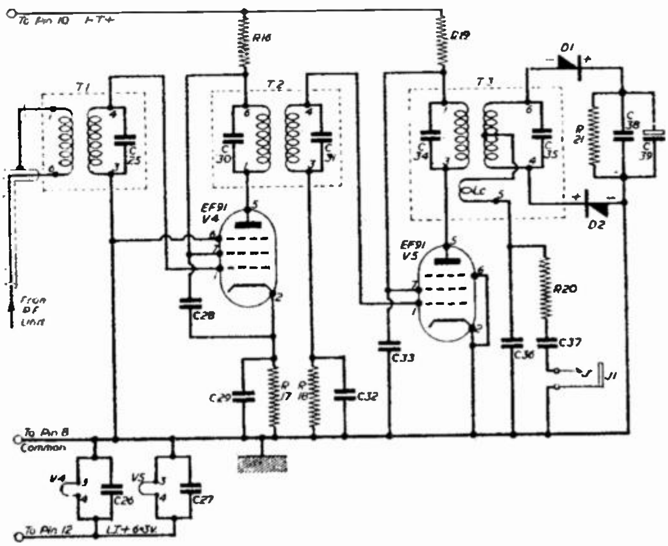


Fig. 2(b).—The additional unit to make up the feeder.

The coaxial cable in the oscillator stage, L4, Fig. 2a, is made up as follows: Take 7in. of 75 Ω ¼in. diameter coaxial cable and cut into two lengths of 3in. and 4in., cut off ½in. of outer sheath on each end and splay out the braiding: then lay the braiding back along the cable sheath, bind with connecting wire and lightly solder. After completing each soldering operation lay the coax. to one side to allow the polythene to reset. When wiring into the unit avoid long earth leads, sharp bends in the cable, and too much heat as polythene melts very easily.

The next operation worthy of mention is the coaxial cable between V2 anode and H.T., and the primary of T1. The author used thin 50Ω TV cable, but almost any type of coaxial cable will be found suitable here.

(To be continued)

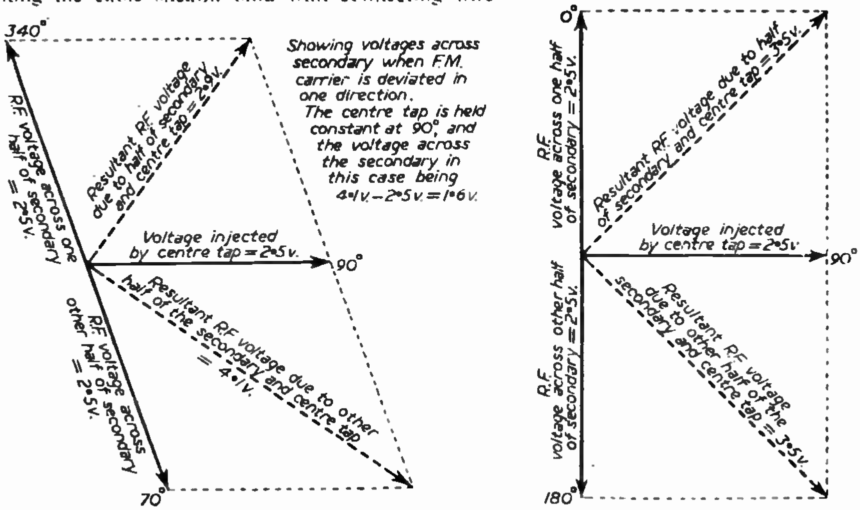


Fig. 2(c). How the detector works.

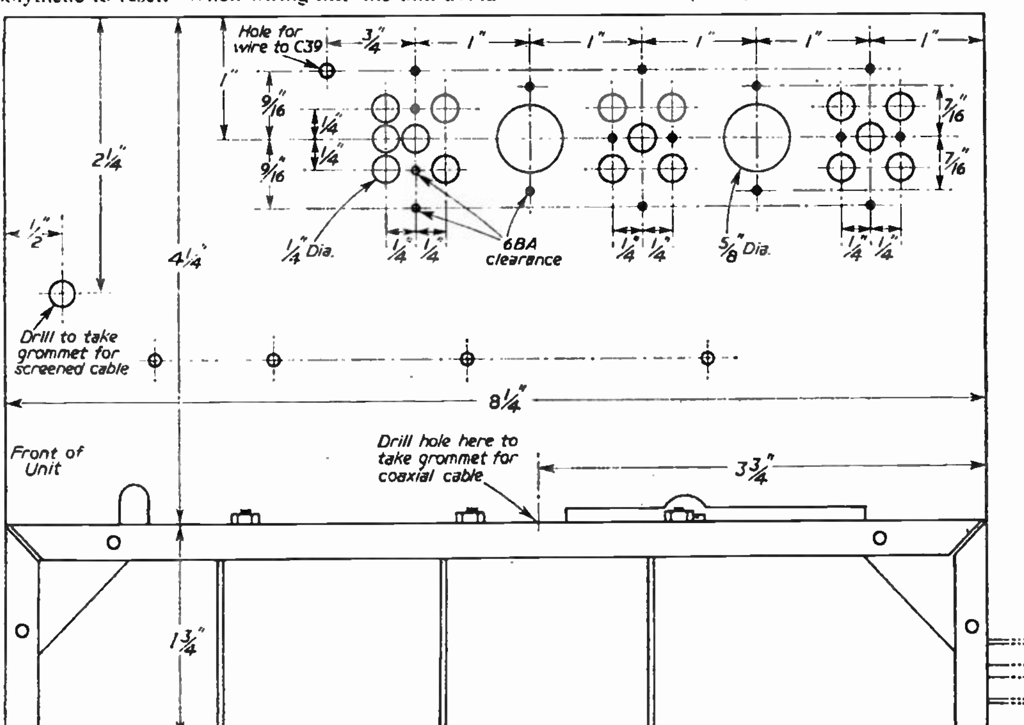
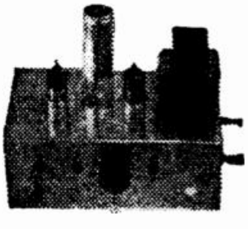


Fig. 3.—Details of the chassis and drilling.



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Suitable for London, Birmingham and Northern Transmissions

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A highly successful unit (*W. World* circuit), incorporating variable oscillator tuning, Midget BVA valves, etc. Chassis size 7 x 4 x 2½in. Thousands already in use. Suitable for most types of T/V sets. TRF or Superhet. Kit of parts 45/-. Blueprint 1/6. Power pack kit 30/-. Switch kit (Band 1—Band 3 Ae switching), 6/6—all Post free. Wiring and aligning of above 20/- extra.
Full range of Band 3 aerials in stock. Adaptors from 7/6 per set. Indoor or outdoor dipoles with 4 yds. cable, 13/9. Band 1—Band 3 cross-over filter unit, 7/6. Variable attenuators 6 db—36 db. 7/6. BBC Break-through Filter, suitable for BBC pattern rejection, 8/6.

Volume Controls

Log. ratios, 10,000 ohms—2 Megohms. Long spindles. 1 year guarantee. Midget Edis-wan type.

No Sw.	S.P.Sw.	D.P.Sw.
3/-	4/-	4/9

Linear Ratio, 10,000 ohms—2 Megohms. Less switch, 4/- each. **Coax plugs**, 1/2. **Coax sockets**, 1/-. Couplers 1/3. **Outlet boxes**, 4/6.

80 ohm CABLE COAX

STANDARD ¼in. diam. Polythene insulated. GRADE "A" ONLY

8d. yd.

SPECIAL — Semi-air spaced polythene. 80 ohm Coax ¼in. diam. Stranded core. Losses cut 50%.

9d. yd.

TWIN-FEEDER, 80 ohms, 6d. yd.; 300 ohms, 8d. yd.
TWIN SCREEN FEEDERS, 80 ohms, 1/3 yd.
50 OHM COAX CABLE, 8d. per yd., ¼in. dia.
TRIMMERS, Ceramic, 4 pf.–70 pf., 9d.; 100 pf., 150 pf., 1/3; 250 pf., 1/6; 600 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/3 each.
RESISTORS.—Pref. values 10 ohms 10 megohms.

CARBON

20% Type, ½ w., 3d.; ½ w., 5d.; 1 w., 6d.; 2 w., 9d.
10% Type, ½ w., 9d.; 5% Type, ½ w., 1/-; 1% Hi-Stab, ½ w., 2/-.

WIRE-WOUND

5 w.	25 ohms —	1/3
10 w.	10,000	1/6
15 w.	ohms	2/-
5 w.	15,000—	1/9
	33,000	
10 w.	ohms	2/3

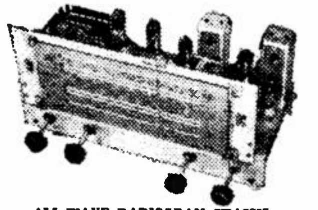
WIRE-WOUND POTS Pre-Set Min. T.V. Type Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track 50 K. to 2 Meg., 3/-.

3w. LAB. COLVERN, Etc. Standard Size Pots, 2½in. Spindle. High Grade. All Values. 100 ohms to 50 K., 5/6; 100 K., 6/6.
W/W EXT. SPEAKER CONTROL, 10 Ω. 3/-.

CONDENSERS.—Mica or S. Mica. All pref. values 3 pf. to 680 pf., 6d. ea. Ceramic types, 2.2 pf.–5,000 pf. as available, 9d. each. **Tubulars**, 450 v., Hunts and T.C.C., .0005, .001, .005, 0.1 and .1 350 v., 9d. .02, .05–1/500 v. Hunts T.C.C., 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1 1,500 v. T.C.C. (Simplex), 3/6. .001 6 kV., T.C.C., 5/6. .001 20 kV., T.C.C., 9/6.
STANDARD 3-WAVEBAND COIL PACK. Size 2½in. x 2½in. in depth, 4-pos. switching Long, Med., Short, Gram. Dust-core coils prealigned for 465 Kc/s I.F. Complete with trimmer, ready to use. A very sensitive and efficient coil pack. **Manufacturers' Surplus. Bargain Offer, 27/6.**
SOLON SOLDERING IRONS (200/220 v. or 230/250 v.) 25 watt Instrument type, 21/6; 65 watt Pencil Bit Type, 26/6; 65 watt Oval Bit Type, 25/-. Comprehensive stock of spares available.

RECORD PLAYER CABINET

Cabinet size 18½in. x 13½in. x Ht. 8½in., with mount motor board 13½in. x 12½in., £3.3.0, carr. 3/6. 2 valve amplifier to fit above, ready wired and tested with 6½in. speaker, £3.12.6, carr. 2/6. Record changers available to suit this cabinet.



ALL-WAVE RADIOGRAM CHASSIS

3 WAVEBANDS — **5 VALVES**

S.W. 16 m.—50 m. — LATEST MIDGET
M.W. 200 m.—500 m. — B V A
L.W. 800 m.—2,000 m. — SERIES

Brand new and guar. A.C. 200/250 v., 4 pos. W.C. sw. Short-Medium-Long-Gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 13½ x 5½ x 2¼in. 10in. x 4½in. hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.**
Chassis isolated from mains. Carr. and ins., 4/6. **BARGAIN PRICE 9½ gns.**
8 or 10in. speakers to match, 20/- and 25/-.
7 Valve De Luxe, push-pull EL41 version. 7 watt output, £12/10/0. Carr. & ins. 5/-.

RECORD PLAYER BARGAINS

Latest Model U.A.8. BSR Monarch 4-speed auto-changer £8.15.0, carr. 4/6. **B.S.R. Three-speed Single Player Model T.U.8, £4.12.6**, carr. 3/-. **Cut mounting board 5/-**, carr. 1/-. **Garrard and Collaro 4-speed Changers from 9½ gns.**, carr. & ins. 4/6. **Ditto 4-speed Single Players from £7.10.0**, carr. 3/6. As available.

SCOTCH BOY, EMITAPE, etc., 1,200ft., 30/-. Long playing, 1,800ft. reels, 45/-. Paper tape, good quality, 1,200ft., 12/6. Reels only, 5in., 3/8, 7in., 4/3.

I.F. TRANSFORMERS—465 kc/s

Brand new ex-manufacturer's midget I.F.T. Size 2½in. x ¾in. x 1in., dust core tuning. Litz wound coils, High Q. Bargain offer, 7/6 pair.

NEW BOXED — **VALVES** — **ALL GUARANTEED**

1R5, 1T4	7/6	DAF96	9/-	ECL80	10/6	PCF82	10/6
1S5, 1S4	7/6	DF96	9/-	EF41	10/6	PCL83	12/6
3S4, 3V4	8/-	DK96	9/-	EF80	10/6	PL81	11/6
5Z4	9/6	DL96	9/-	EF86	12/6	PL82	10/-
6AT6	8/6	35L6	10/6	EF91	8/6	PL83	11/6
6K7	6/6	EABC80	9/6	EL38	15/6	PY80	9/6
6K8	8/6	EB91	6/6	EL41	10/6	PY81	9/6
6Q7	8/6	EBC33	8/6	EL84	11/6	PY82	8/6
6SN7	8/6	EBC41	10/6	EY51	10/6	U22	6/6
6V6	7/6	ECC84	12/6	EZ40	8/6	UBC41	9/6
6X4	7/6	ECF80	12/6	EZ80	8/6	UCH42	10/6
6X5	7/6	ECF82	12/6	MU14	9/6	UF41	10/-
7C5	8/-	ECH42	10/6	PCC84	10/6	UL41	10/6
7Y4	8/6	ECH81	10/6	PCF80	10/6	UY41	8/6

SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4, or 3V4 ... ... 27/6
DK96, DF96, DAF96, DL96 ... ... 35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35/-

SPEAKER FRET.—Expanded Bronze anodised metal 8in. x 8in., 2/3; 12in. x 8in., 3/-; 12in. x 12in., 4/3; 12in. x 16in., 6/-; 24in. x 12in., 8/6, etc.
TYGAN FRET (Murphy pattern).—12in. x 12in., 2/-; 12in. x 18in., 3/-; 12in. x 24in., 4/-; etc.

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends

25/25 v., 50/12 v.	1/9
50/50 v., 4/500 v.	2/-
100/25 v., 2/450 v.	2/-
8/450 v. B.E.C.	2/3
8/500 v. Dub.	2/9
8+8/500 v. Dub.	4/6
8+16/450 v. T.C.C.	5/-
16/450 v. B.E.C.	3/6
16/500 v. Dub.	4/-
16+16/450 v. T.C.C.	5/6
32/350 v. Dub.	4/-
32/500 v. Dub.	5/-
50+50/350 v. B.E.C.	6/6
32+32/350 v. B.E.C.	5/6

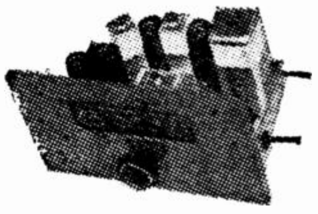
Can Types, Clips 3d. ea.

8/450 v.	2/6
8+8/450 v. T.C.C.	4/6
8+16/450 v. Hunts	5/-
16+16/450 v. T.C.C.	5/6
32/350 v. Dub.	4/-
32+32/275 v. Hunts	4/6
32+32/450 v. T.C.C.	6/6
250/350 v. B.E.C.	8/6
60/350 v. T.C.C.	6/6
60+100/350 v.	11/6
60+250/275 v.	12/6
100+200/275 v.	12/6

SENTERCEL RECTIFIERS. E.H.T. Type. Fly-Back Voltages. K3/25 2 kV., 5/-; K3/40 3.2 kV., 6/9; K3/45 3.6 kV., 7/3; K3/50 4 kV., 7/9; K3/100 8 kV., 12/9, etc.
MAINS TYPES.—RM1 125 v. 60 mA., 4/6; RM2 125 v. 100 mA., 4/9; RM3 125 v. 120 mA., 6/9; RM4 250 v. 250 mA., 16/-; RM4B type 270 mA., 17/6
ENGRAVED CONTROL KNOBS for ¼in. Spindle. 1½in. diam. Walnut or Ivory. Gold filled. 16 Standard engravings, 1/6 ea. Plain knobs to match above, 1½in., 10d. ea., 1¼in. dia., 8d. ea. Superior Walnut or Ivory with gold ring, 1½in., 1/- ea.; 1in., 9d. ea. Pointer Knobs, Black with White Line, 9d.
MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.**—250 v. 60 ma., F.W. sec., 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Htrs., 22/6, etc. **C.R.T. HTR. ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1 : 1.25, 2 v., 4 v., 6 v. or 13 v., 10/6 ea. Ditto with mains primaries 200/250 v., 12/6. Special to order.
L.F. CHOKES.—10 H. 65 mA., 5/-; 15 H. 100 mA., 10/6; 10 H. 120 mA., 10/6; 20 H. 150 mA., 15/6; Simplex, 10/6; Soundmaster, 10/6. **OUTPUT TRANSF.**—Standard pentode, 4/6; ditto tapped prim., 4/9; small pentode, 3/9; Midget battery pentode (1S4, etc.), 4/6.
LOUDSPEAKER.—PM.3 OHM 5in. R. and A. 16/6; 6in. Celes., 18/6; 7 x 4in. Goodmans Elliptical 18/6; 8in. Elac., 20/-; 10in. R. and A., 25/-; 12in. Plessey, 35/-; 12in. Goodmans heavy duty Audiom 50, 15 ohms, 95/-; 2½in. Elac., 17/6.

8in. P.M. SPEAKER

Ex-mfr's. units. Rola, Elac, Celestion, etc. All reconditioned and guaranteed. Ideal ext. unit. 7/6, post and packing 1/-.



F.M. TUNER-UNIT (87 mc/s—105 mc/s) by Jason. As described in Radio Constructor. Designer Approved Kit of parts to build this modern highly successful unit, drilled chassis and J.B. dial, coils and cans, 4 BVA miniature valves and all components, etc., for only **£6.10.0** post free. **SUPERIOR TYPE GLASS DIAL** (as illustrated).—Calibrated in Mc/s and edge lit by 2 pilot lamps, 12/6 extra. Illustrated handbook with full details, 2/- post free.

TRS RADIO COMPONENT SPECIALISTS (Est. 1946)

70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY (THO 2188)

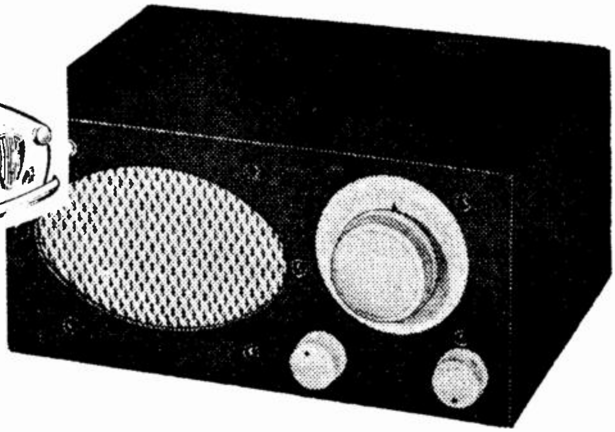
TRS

50 yards Thornton Heath Station. Buses 130A, 133, 159, 166 & 190.

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

Hours: 9 a.m.—6 p.m., 1 p.m. Wed. OPEN ALL DAY SAT.

Terms: C.W.O. or C.O.D. Kindly make cheques, P.O.s, etc., payable to T.R.S. Post/Packing up to ½lb. 7d., 1lb. 1/1, 3lb. 1/6, 5lb. 2/-, 10lb. 2/9.



A MODIFIED VERSION OF OUR 1955 RECEIVER FOR A FORD "CONSUL"

By A. N. Robinson

(*Concluded from page 327 July issue*)

Aerial Connection

A TELESCOPIC aerial is mounted on the top of the offside wing just forward of the windscreen pillar and the co-axial cable is fed through the bulkhead to the R.H. end of the shelf, behind the instrument cluster, and so to the back of the set. The corresponding socket on the back of the chassis is turned through 90 deg. on a small block, to avoid an unnecessary and severe kink in the coaxial cable. If, for any reason, the aerial is mounted on the nearside of the car, it will be necessary to move this block slightly in a nearside direction and point the socket accordingly.

Power Supply

The use of a vibrator or a rotary converter can best be determined by the constructor. As there is very little space below the bonnet of a Consul, particularly when a heater has been fitted, the writer decided to install an ex-W.D. vibrator unit of Pye make in the boot, in the otherwise unused space to the offside of the spare wheel. This is fastened by bolts passing through the floor of the boot.

Heavy screened cables were used for L.T. feed and H.T. return and these were pulled through the appropriate channel in the roof, using a length of expanding curtain wire as a "fish." At the forward end they appeared on the shelf, close to the offside windscreen pillar, and were passed over the steering column, behind the instrument cluster, to the centre of the shelf, at which point the seven-pin plug was attached.

The L.T. feed from the voltage regulator terminal block and the earth connection are taken to the same point through an existing hole in the bulkhead to the right of the voltage regulator.

Installation

The installation of the set is extremely simple if the following sequence is observed. Remove the single Philips-head setscrew and nut securing the front edge of the shelf at the nearside end. This corner of the shelf should now be pressed downwards and a distance piece such as a screwdriver handle inserted to keep it down to increase the gap through which the set must be inserted. There is neither danger nor

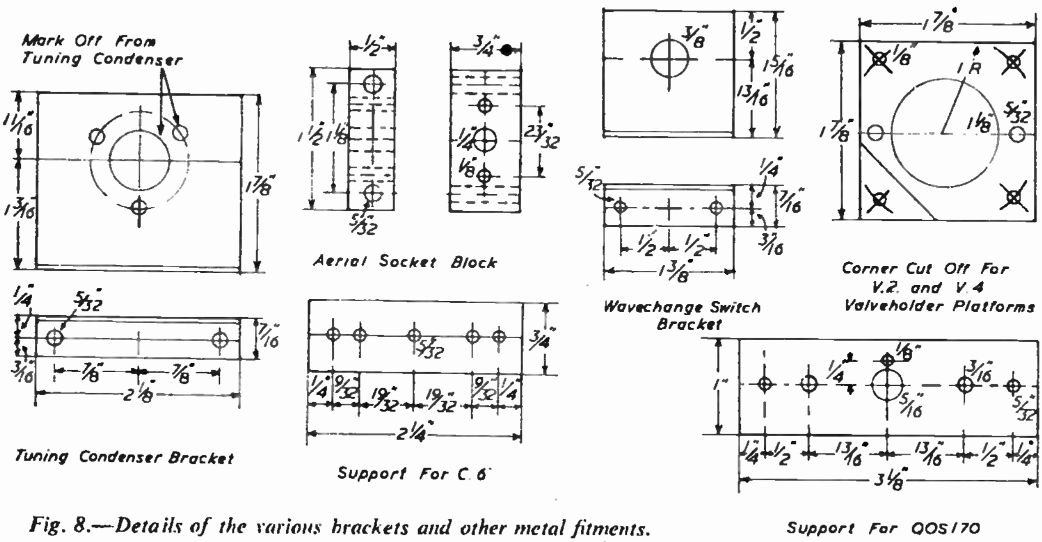


Fig. 8.—Details of the various brackets and other metal fitments.

difficulty in this operation which has been carried out at least a dozen times by the writer.

The set is now slid over the lip of the shelf, the left-hand end leading. In this position the seven-pin plug and the coaxial plug are inserted. The set can now be rotated to face forward, and slid along the shelf to the centre. Replace the Philips-head setscrew.

The prototype is fastened down by two unobtrusive external angle pieces on the sides at the front with small bolts passing downwards through the shelf thickness. These must be located clear of the heater and handbrake controls. In addition it is held down by a piece of eraser rubber wedged between the top

(Continued on page 401)

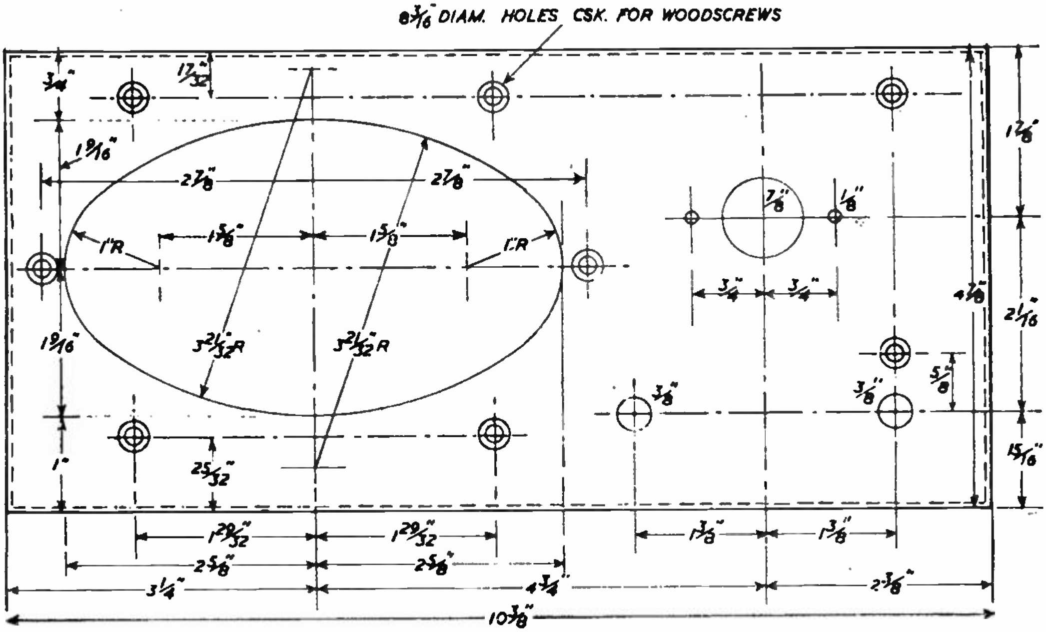


Fig. 7.—Details of the metal containing cabinet.

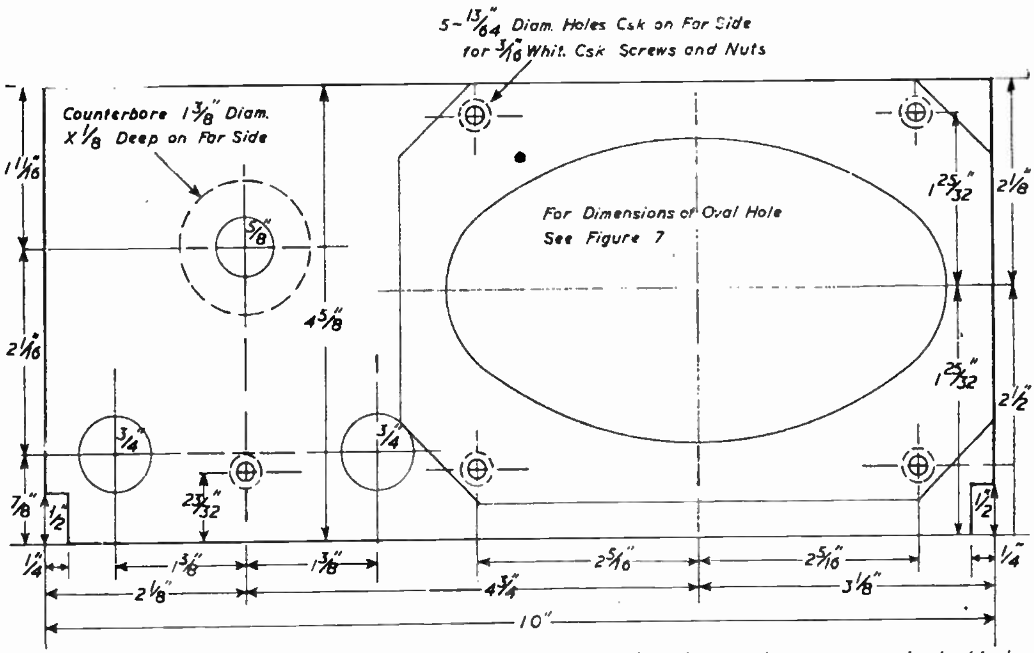
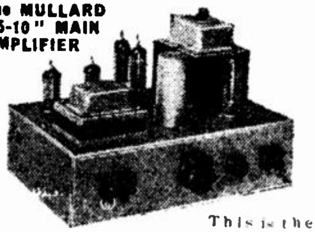


Fig. 4.—Details of the plywood panel, ⅜in. thick, viewed from rear. Shaped area to be cut away to depth of 1 ply.

COMPLETE KITS of PARTS for the "HI-FI" ENTHUSIAST

The MULLARD "5-10" MAIN AMPLIFIER



This is the very latest design and needs no recommendation from us. Our Kit is complete to Mullard's specification, including the latest GILSON ULTRA LINEAR OUTPUT TRANSFORMER and the entire MULLARD Valve line up. ALL SPECIFIED COMPONENTS are supplied. PRICE OF COMPLETE KIT OF PARTS: **£11.11.0.** (Plus 5/- carr. & ins.)

STERN'S "fidelity" PREAMPLIFIER-TONE CONTROL UNIT

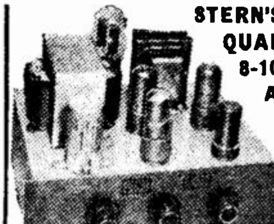
"A design for the music lover"

Briefly it has inputs for all types of MICROPHONES, HIGH and LOW GAIN PICK UPS and a RADIO TUNING UNIT. It incorporates (a) GRAM EQUALISING CONTROL. (b) STEEPCUT FILTER. (c) Continuously variable BASS and TREBLE CONTROLS and a variable OUTPUT CONTROL which enables its use with any type of Amplifier.

PRICE OF COMPLETE KIT OF PARTS (Plus 5/- carr. and ins.). **£6.6.0.** WE ALSO OFFER IT ASSEMBLED, READY FOR USE. £8.0.0.

THE full SPECIFICATION and PRACTICAL BUILDING INSTRUCTIONS for these Units are available for 1/6 each. SPECIAL PRICE REDUCTION. We supply the two complete Kits—Mullard 5-10 and "fidelity" Preamplifier—for £16.16.0. We also supply both fully assembled and ready for use for £19.19.0.

STERN'S "HIGH QUALITY" 8-10 WATT AMPLIFIER



Has power supply for Radio Tuning Unit.

PRICE OF COMPLETE KIT OF PARTS (Plus 5/- carr. & ins.) **£7.10.0.**

SUPPLIED ASSEMBLED and READY FOR USE **£9.10.0.**

Proved one of the most popular models yet offered to the HOME CONSTRUCTOR. Provides excellent reproduction up to 8 watts, employing 6V6's in push-pull, incorporating negative feedback. Provides for use of both 3 and 15 ohm speakers.

WE HAVE THE FULL RANGE OF DULCI CHASSIS IN STOCK

THE MODEL H.4. is illustrated but all Chassis and Tuners are similar—send S.A.E. for leaflets. H.P. and CREDIT SALE TERMS are available.

The following two RADIOGRAM CHASSIS are very well designed and reproduce most excellent quality on both Radio and Gram.

MODEL H.3. A 3 Waveband AM/FM CHASSIS **£20.17.0.**

MODEL H.4. A 4 Waveband AM/FM CHASSIS **£24.6.6.**

TUNER UNIT CHASSIS

THE FM/VHF TUNER CHASSIS with self-contained Power Supply ... ... **£17.10.3.**

MODEL H4/T. A 4 Waveband AM/FM TUNER with self-contained POWER SUPPLY **£20.17.0.**

MODEL H.11. A combined 4 Waveband AM/FM Tuner incorporating a "Hi-Fi" Control Unit—Audio Preamplifier, which has switching and connections for Tape Replay, Gram equalising, Bass and Treble Controls, etc. **£29.3.10.**

"HI-FI" AUDIO AMPLIFIERS

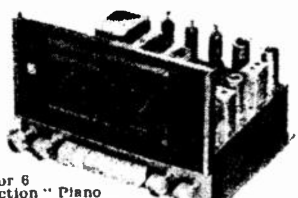
MODEL G.A.4. A self-contained 4 watt Amplifier with adjustable Tone Control Box ... ... **£9.9.0.**

MODEL D.P.A.10. A 10 watt Amplifier with separate Tone-Preamplifier Unit incorporating Bass and Treble Controls and Gram equalising ... ... **£19.19.0.**

MODERNIZE YOUR OLD RADIOGRAM

★ THE LATEST A.M./F.M. RADIOGRAM CHASSIS.
★ A NEW 4-SPEED AUTOCHANGER.

The NEW ARMSTRONG PB. 409 A.M./F.M. Radiogram Chassis

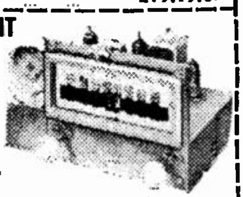


"A chassis for those who want the highest quality." ● A 9 valve line up employing the latest MULLARD preferred-type valves. ● Provides complete coverage of the V.H.F./F.M. Transmissions plus the Short, Medium and Long Wavebands. ● Has Push-Pull Output with Negative Feedback for 6 watts peak Output. ● Quick Action "Piano Key" Selectors and separate Bass and Treble Controls. ● Has "Magic Eye" Tuning Indicator. ● Dimensions 13in. x 9½in. x 8in. high. Dial size 11½in. x 5½in.

PRICE **£29.8.0.** TERMS: Credit £7.7.0 and 9 monthly payments of £2.14.0. (Plus 6/- carr. & ins.). H.P. £14.14.0 and 12 monthly payments of £1.7.3.

SEND S.A.E. FOR ILLUSTRATED LEAFLET.

STERN'S "F.M." TUNING UNIT



A 5-valve Tuner incorporating the latest Mullard Permeability Tuning Heart and a "Magic Eye" Tuning Indicator.

PRICE ASSEMBLED READY FOR USE: **£14.10.0.** (Plus 7/6 carriage and insurance) TERMS: (a) Hire Purchase: Deposit £7.5.0 and 9 monthly payments of 18/4. (b) Credit: Deposit £3.12.6 and 9 monthly payments of £1.6.7.

THE COMBINED AM/FM TUNER is precisely similar in appearance to the above and incorporates 7 valves. It provides complete coverage of F.M. Transmissions and MEDIUM WAVEBAND giving a good selection of foreign stations.

PRICE (Plus 7/6 carr. & ins.) **£18.18.0.** TERMS: (a) Hire Purchase: Deposit £9.9.0 and 10 monthly payments of £1.1.0. (b) Credit: Deposit £4.15.0 and 9 monthly payments of £1.14.7.

RECORD PLAYERS THE VERY LATEST MODELS OFFERED AT GREATLY REDUCED PRICES

Send S.A.E. for ILLUSTRATED LEAFLET.

AN EXCEPTIONAL "CASH ONLY" OFFER £7.19.6.

THE NEW 4-SPEED B.S.R. MONARCH

● Complete with High Fidelity Crystal "Turnover" Head which incorporates separate stylus for L.P. and 78 r.p.m. records. ● A "MIXER" Unit that will autochange on 7in., 10in. and 12in. records of same speed. ● Incorporates the Manual Control position.

Expressly developed for very high quality reproduction of Gram, Records and particularly suitable for high quality reproductions of the F.M. transmissions. Two models are available:

(a) The "COMPACT 5-2" A Two-stage high sensitivity Amplifier having SEPARATE BASS AND TREBLE CONTROLS and designed to give up to approx. 5 watts with very pleasing quality. PRICE £6.6.0. (Plus 5/- carr. & ins.)

(b) The "COMPACT 5-3" A Three-stage version of the "5-2" model but in this case having an additional stage and incorporating Negative Feedback. PRICE £6.16.0. (Plus 5/- carr. & ins.).

A separate POWER SUPPLY UNIT to operate with these amplifiers is available for £2.10.0. Has additional supply available for Radio Tuner, etc.

STERN'S "COMPACT 5" AMPLIFIERS

CALLERS ONLY

We have in stock various designs for HOME CONSTRUCTORS including F.M. Tuners, A.M./F.M. Tuners, Midget Battery Portable, Mains Units, etc., etc.

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

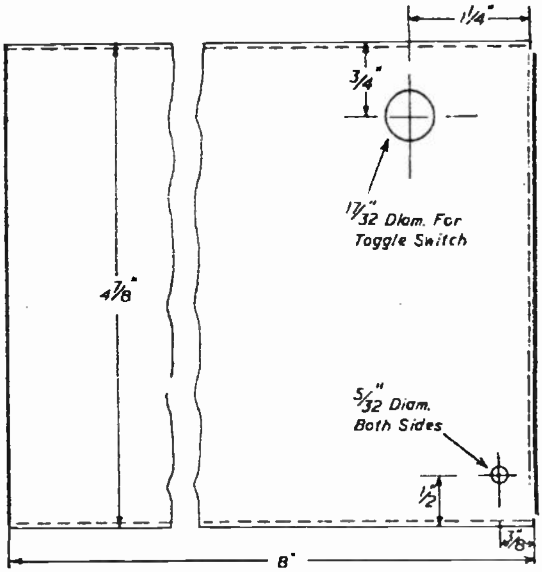


Fig. 7(a).—An extension of the case in Fig. 7.

of the casing and the underside of the windscreen wiper housing. The location of this is readily visible once the central ashtray has been removed.

Suppression of Interference

Very little suppression has been found necessary. Most interference will come from the sparking plug leads, and this will be in the form of a "plop" at every firing stroke. The simplest cure is to fit a suppressor of the TV type to the centre connection (i.e., the coil lead) of the distributor head. Incidentally, if the car is a late model, this type of suppressor will already have been fitted by the makers. If ignition interference should still be troublesome, separate suppressors should be fitted to the individual plug leads, as close as possible to the plugs themselves. "Cut-lead" types can be used here, but a more satisfactory job will be obtained by installing shrouded models.

The second principal source of trouble is the dynamo which emits a whine rising in pitch as engine revs. are increased. This can be eliminated by fitting a 1 μF 150-volt condenser across the "D" terminal and earth, preferably directly on the dynamo itself. A suitable type—much more robust than the normal radio by-pass condenser—is marketed by Radiospares.

The voltage regulator will normally already have been suppressed by the makers, as will also the

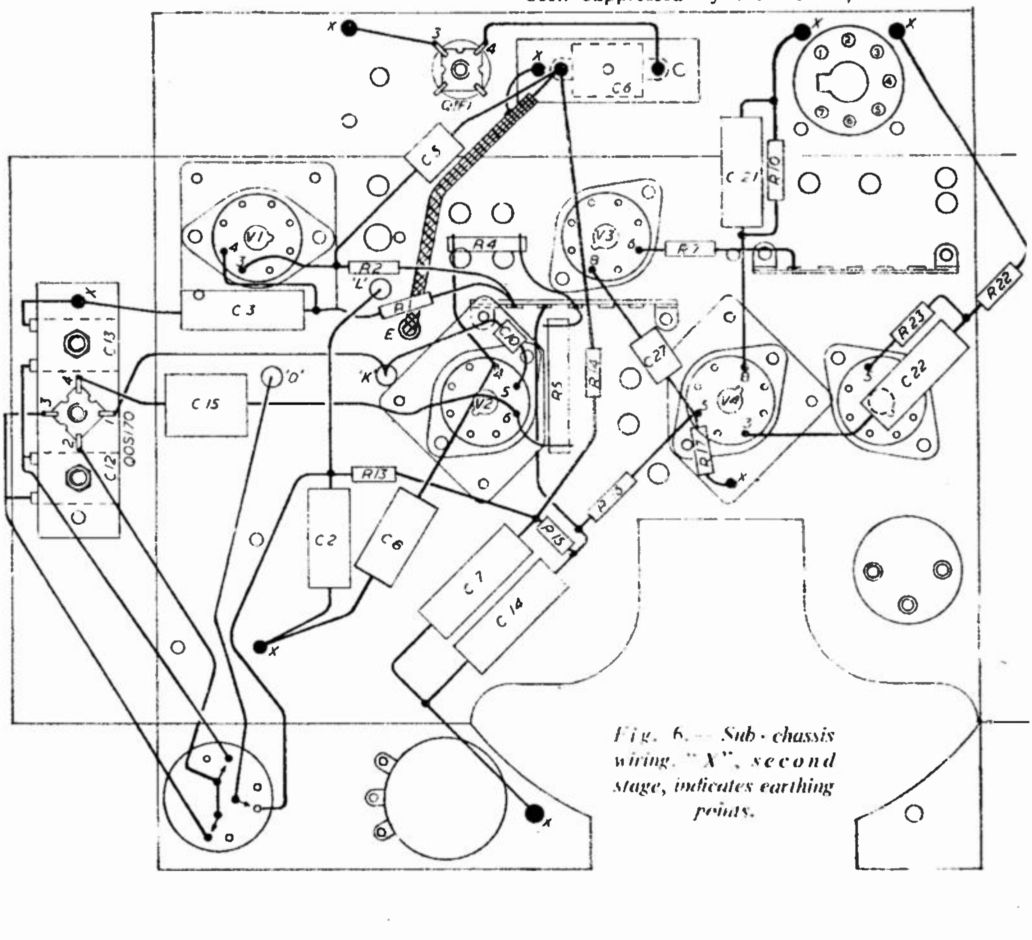
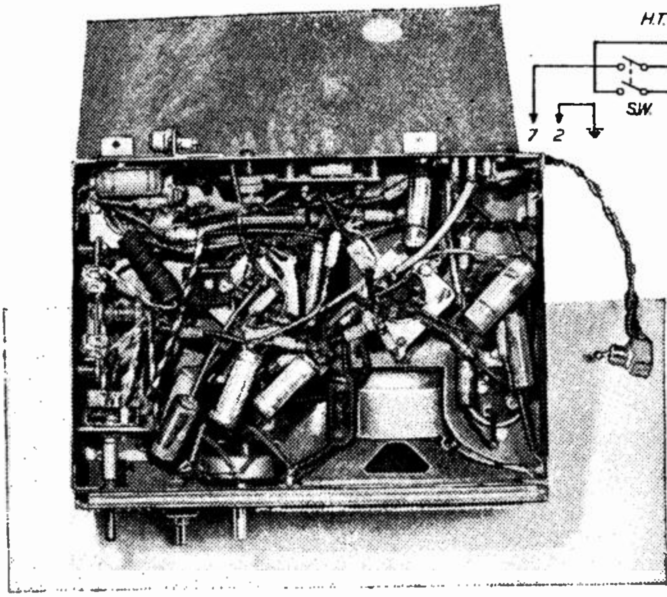


Fig. 6.—Sub-chassis wiring. "X", second stage, indicates earthing points.



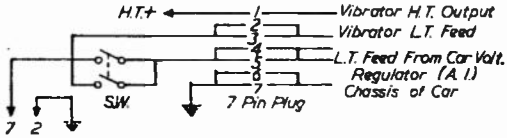


Fig. 9.—Details of wiring to the plug.

blower motor, if a heater has been fitted. A number of minor sources of interference remain, but as their effect is only of a transient or temporary nature, suppression has been ignored. The starter motor will produce a healthy crackle when in use and "blinking" indicators will produce a rhythmical clicking. The stop-light switch will be responsible for a click when the brake pedal is depressed, and braking may result in a slight hiss, presumably from the generation of static electricity, but this seems to be a freak effect and may be dependent on weather conditions.

General

All trimmer screwheads were liberally coated with beeswax after final adjustments had been made, and after continuous service over nearly a year no troubles have been experienced from vibration. Very little suppression has been found necessary, suppressors having been fitted only to the sparking plugs and the generator.

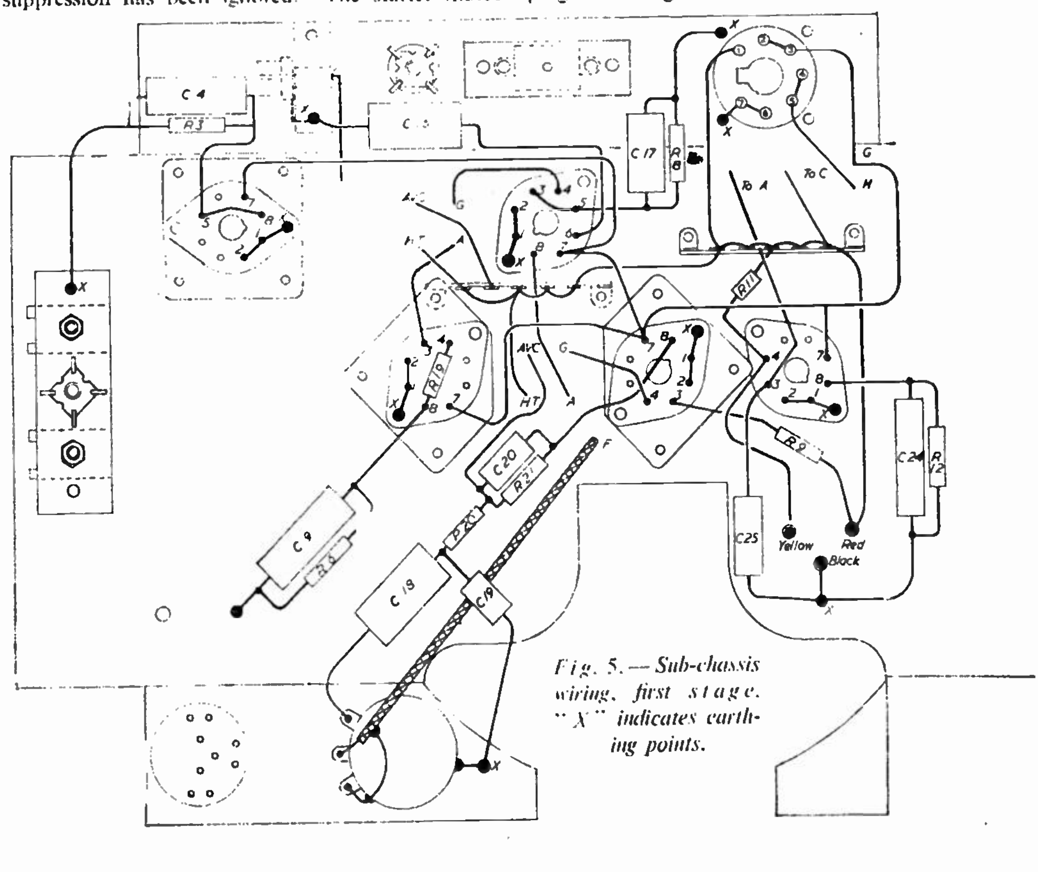


Fig. 5.—Sub-chassis wiring, first stage. "X" indicates earthing points.

TRANSMITTING TOPICS

POINTERS ON BEAMS

By O. J. Russell, B.Sc., A.Inst.P. (G3BHJ)

THE "ultimate" in aerial systems for the average amateur, and indeed the keen S.W.L., is some form of directive beam array. At any rate, where space does not permit of unlimited long wires and rhombic arrays, but where space *is* available for some form of beam, the "dream" of the ham is a beam aerial. While on the subject of "long wire" aerials, however, it should not be forgotten that the "long wire" array is used at many stations consistently working DX in many directions, as apart from the main lobes, the long wire has good general coverage in many other directions as well. However, the long wire does have sharp "nulls" in some directions. This fact was brought home at G3BHJ very recently, when a long wire aerial was lengthened and shifted in direction by a mere 15 to 20 degrees. This reduced the 21 Mc/s signals at a local nearby amateur's QTH, a mere half mile or so, from a S9 plus 30 db to a mere S5 to S7 varying according to wind swaying the aerial from exact null position! Signals on the long wire in that particular direction, in fact, were three S points approximately down on the signal radiated from an odd length of wire lying on the shack floor and tuned up "for laughs" in local tests on the "null" properties of this particular long wire main aerial. This "null" effect was put to good use on reception, as the powerful local ground wave of the other station on reception on the long wire was reduced from an ear-splitting receiver-paralysing signal to a comfortably moderate loudness, thus greatly facilitating mutual DX chasing activities on 21 Mc/s.

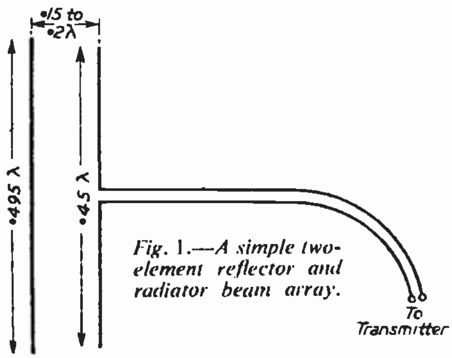


Fig. 1.—A simple two-element reflector and radiator beam array.

The twin points of directivity and reception serve to emphasise two of the important aspects of beam arrays. First there is the directional peaking of the radiated signal, a factor usually regarded as the only function of a beam. However, the directionality on reception serves a dual purpose, for not only are signals enhanced in the forward direction, but QRM arriving from the rear is greatly attenuated. Thus the attenuation of European signals on reception was a much valued aspect of the writer's 20 metre DX chasing with a three-element rotary. Further, of course, the attenuation of noise and even "jammer" QRM is a further boon of the "back to front" discrimination of a beam array. The combination of forward directivity on reception coupled with discrimination against rearward noise and QRM generally, thus effects a double advantage on reception. Coupled with the enhanced signal from one's own transmitter in the forward direction, a threefold gain is thus achieved in increasing solid DX QSOs. To drive home this point, consider two stations, each using simple two-element beams on both reception and transmission. A simple two-element beam may thus give a 5 db gain on transmission to the receiving point. If the receiving point also uses a simple beam giving a 5 db gain, the total "transmission path gain" is thus 10 db over the use of simple dipoles. This alone is equivalent to a tenfold increase in power of the transmitters, and points the moral that a relatively cheap aerial system gives at low cost the benefits otherwise derived only by a high cost increase in transmitter power, a change, say, whom 100 watts to 1 kilowatt—a very expensive change! Furthermore, QRM arriving from the rear may be attenuated by ten or more dbs. This possible 20 db gain on reception gives a "communication effectiveness" equivalent to a hundredfold increase in transmitter power as far as rearward QRM is concerned! This, of course, is old stuff to the hardened amateur, who is asked to bear with us, because we are primarily considering the beginner and tyro in this present article.

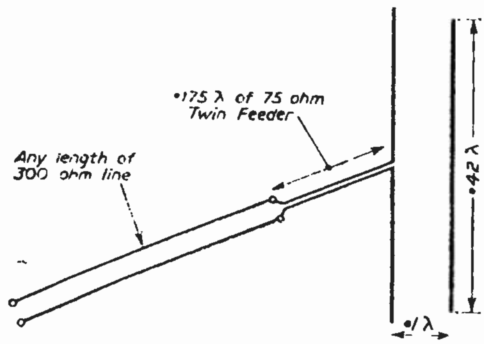


Fig. 2.—A close-spaced array with a transforming length line to match the low centre impedance to a "Flat" 300-ohm line.

Word of Caution

Before the beginner fired with enthusiasm and thirsting for a 20 db increase in "communication effectiveness" rushes out and hangs a reflector wire behind his halfwave dipole, it is necessary to sound a note of caution. Even with the simplest beam, optimum results are not to be obtained without some care and attention to detail. Thus a "simple two-element beam" may produce some surprises. One surprise is that it can have gain, a little gain, in both directions at once, and thus give very little apparent boost in signals and show little, if any, "back to front" ratio. The "simple two-element beam," therefore needs a little further discussion and clarification if good results are to be obtained.

For a "two element" beam, there is a choice between a "radiator and reflector" array and a "radiator and director" array. As is widely known, a "radiator and director" two-element array can give slightly higher gain than a radiator and reflector array. However, there is a price to be paid for this slight increase in gain, as a director-radiator array is liable to have a sharper and more critical tuning adjustment plus a lower radiation resistance than a reflector-radiator array. Thus practically there is little to choose between the two, especially as less than a db of gain is involved. However, a director array is a closer spaced and therefore a compacter affair than a radiator-reflector combination two-element beam. In fact, a spacing of a tenth of a wavelength may be employed with a director plus radiator beam, whereas a spacing of .15 to .20 might be employed with a radiator-reflector array. However, this leads to the fact that variations in spacing of the elements in a two-element array may be compensated for by tuning adjustments of the parasitic radiator length. Thus both types of two-element array may be operated with wide variations in element spacings, provided the beam is "tuned up" for optimum results. The wider spaced arrangements will be far less critical than the closely spaced arrays. Generally, spacings of .1 to .15 wavelength are "close" spacings, while spacings of .2 or .25 or more are "wide" spacings. Unless compactness is a "must," therefore, the recommended "simple two-element beam" is a radiator plus reflector as shown in Fig. 1. No exact element lengths are laid down, however, as these will be subject to many varying factors. The old "cut-and-try" method is unbeatable in beam adjustment. Thus, if wire elements are used a pair of clippers will effect adjustment on trial beam before constructing the final version.

If aluminium or similar metal tube construction is used for the elements, a telescoping end portion of tube will enable "tuning-up" adjustments to be readily effected. In any case it should be stressed that dipole resonant lengths and parasitic element lengths *also* depend upon the diameter of the element used, so that specification of "exact" lengths would require a specification of the element diameter as well. For a two-element beam, resonating the dipole, and then adding the parasitic element and making a first trial adjustment for optimum forward gain is simple enough. The radiating dipole may then be trimmed to resonance at the centre frequency required, and the parasitic element adjusted for optimum back-to-front ratio consistent with reasonable gain. Such tests, while facilitated by a simple field strength indicator, such as a germanium crystal rectifier and milliameter, may be carried out on reception at a pinch. Even the crude but very serviceable indication given by a flash lamp bulb at the centre of a halfwave length of wire may be employed. In all cases, however, the "field strength indicator" should be as far away from the array as feasible, a full wavelength or more being satisfactory.

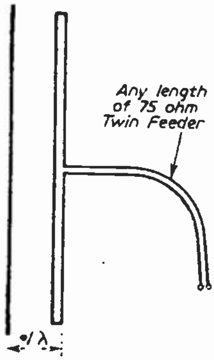


Fig. 3.—A close-spaced array may have the radiator folded to match 75 ohms line.

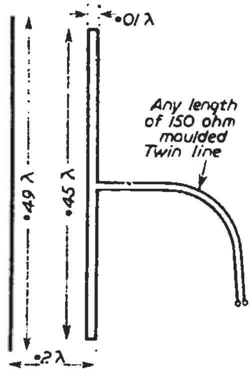


Fig. 4.—A wide-spaced two-element beam may have a folded radiator to give a match to 150-ohm line.

Feeding the Aerial

Having decided upon a simple but two-element beam for initial tentative experiments, the question of "feeding the brute" rears its ugly head. Unfortunately, the feed impedance of the radiator may vary widely with the spacing, and to a lesser extent the tuning of the parasitic element. Thus a close spaced director plus radiator array may have a feed impedance of some 12 to 15 ohms, while a wide spaced array may have a feed point impedance of around 50 ohms. While the wide spaced array could be fed with twin low-impedance feeder without much harm, the close spaced array might be troublesome. Therefore, for a close spaced array, the recommended feed is via a quarterwave matching transformer of 75 ohm twin feeder cable. This will give a tolerable match up to a 300 ohm moulded twin feeder line. The propagation constant of the 75 ohm twin cable should be obtained from the makers, and the length of a quarter wavelength in free space multiplied by this to give the length to which the feeder should be cut. The propagation constant varies slightly from maker to maker, but in an emergency a value of 0.70 is close enough. Thus a length of 0.175 of a free-space wavelength should serve adequately. A "director plus radiator" beam might thus be as illustrated in Fig. 2. A further solution is to use a folded radiator element. If the folded element is made of the same diameter wire or tubing for both upper and lower limbs, this will quadruple the feed point impedance. Thus a two-element close spaced array might be fed by 75 ohm moulded twin feeder as in Fig. 3, while a wide spaced beam could be fed with 150 ohm twin feeder as shown in Fig. 4.

Compact Arrays

Having suffered from confined locations in the past, the question of "compact" beams immediately

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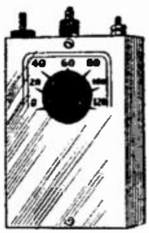

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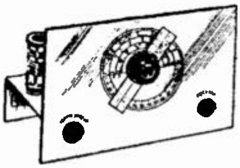

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arises. All but the most confined gardens will accommodate a ten-metre beam. The writer has even had a fixed ten-metre beam indoors with three elements. However, twenty-metre rotaries are a different proposition for indoor use, or even for many gardens or open spaces in city sites. The "loading coil" method may be employed to "cut down to size" a beam array for use in restricted sites. Element *spacings* may *NOT* be cut down, and due to the reduction of feed impedance a spacing of 0.15 wavelengths is suggested. Moreover, the element lengths should not be reduced to less than a quarter of a wavelength, and preferably a third of a wavelength or so should be used. For initial trials experimental loading coils should be used first to resonate the radiator, and then to resonate the reflector. It is suggested that a reflector type two-element beam be tried for a "compacted" array. When initial tests have indicated the coil size required, they should then be made up. Heavy copper tube coils, self-supported, are recommended. Final tuning adjustments are best made by telescoping end pieces on tubular elements. Tube elements are in any case virtually necessary for "compacted" coil loaded arrays, to assist in keeping the bandwidth of operation wide even with the reduced element lengths which tend to produce a low radiation resistance, and hence a sharper tuning beam of reduced bandwidth. Thick elements help to broaden the bandwidth of the beam, and reduce losses which may be quite high in beams of close spacing plus loaded "compacted elements." The use of a centre loading coil in the radiator has one feature that is an advantage, as it enables the feeder to be matched in by tapping across the centre turns of the coil (Fig. 5), or by using a link winding as in Fig. 6. The efficiency of the famous Moseley beams marketed by the American Moseley Electronics Corporation is greatly assisted by the use of this link coil centre-feeding system. The U.S.A. satellite project is in fact using many of these Moseley beams for timing signal and other communication links, a tribute to their efficiency.

A further method of broad banding a compacted beam is to use "skeleton" forms of "fat" elements, somewhat on the lines of the "fat" groundplanes previously described. While there is no space to describe the innumerable variants possible upon this theme of fattened elements, one typical illustration is shown in Fig. 7. This is coil loaded, and resonated by squeezing or pulling the coil turns. A radiator of this type may be fed by the link coil system referred to above, and a reflector of similar construction may be suitably spaced to provide a simple two-element compacted beam. Such an aerial should be docile and easy to load up on frequency. Due to the "broad-banding" effect of the skeleton "fat" elements, operation over a good bandwidth is feasible.

A beam of high gain and directivity is of little use if it cannot be operated over more than a narrow band frequency. Tubing elements rather than wire, or skeleton fat elements bent from number 10 gauge wire or thin tubing are the solution to broadbanding requirements, providing that the beam elements are not spaced too closely. For simple two-element beams the .10 to .20 spacing will be found satisfactory.

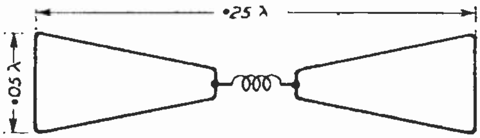

Fig. 7.—A loaded element may be broad-banded by skeleton "Fat" construction from bent wire.

A More Complex Problem

In the case of three or more element beams the situation becomes more complex, as there is an almost unlimited number of combinations of element spacings

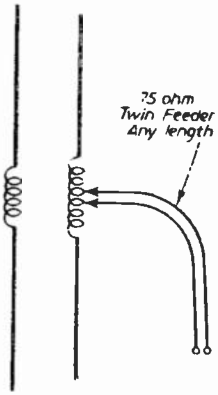

Fig. 5.—Compact coil loaded dipoles may be fed by tapping the feeder into the centre of the loading coil.

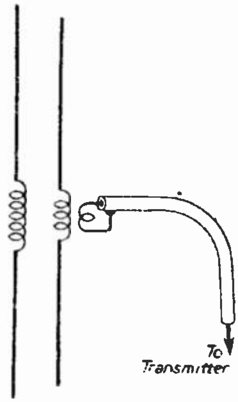

Fig. 6.—Coil-loaded elements enable coaxial cables to be matched in by a small, tightly coupled link winding wound over the loading coil, a very efficient and handy method of feeding "Compacted dipole" elements.

and tunings which will provide approximately the same gain, but often with marked variations of the dipole radiator feed impedance. Here again the use of two close spacing is to be avoided if possible. A close-spaced three-element beam may have little or no gain over a wide-spaced two-element beam that occupies about the same physical area. Moreover "compacting" techniques should also be applied with caution, as these become very tricky with close-spaced multiple-element beams. Indeed, a wide-spaced full-length element beam would probably perform about as well as a multiple-element beam with compacted elements and close spacing between elements. For a three-element beam a reflector spacing of around .15 wavelength plus a director spacing of .20 to .25 wavelengths is a good compromise

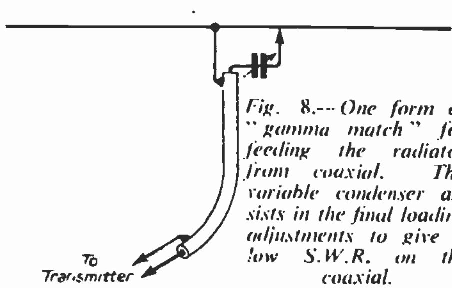

Fig. 8.—One form of "gamma match" for feeding the radiator from coaxial. The variable condenser assists in the final loading adjustments to give a low S.W.R. on the coaxial.

between gain and compactness. A reflector spacing of around .20 plus a director spacing of around .25 to .30 wavelengths will give slightly more gain.

A three-element wide-spaced beam will have a feed impedance of around 20 ohms, and folding the radiator element will provide a very good match into

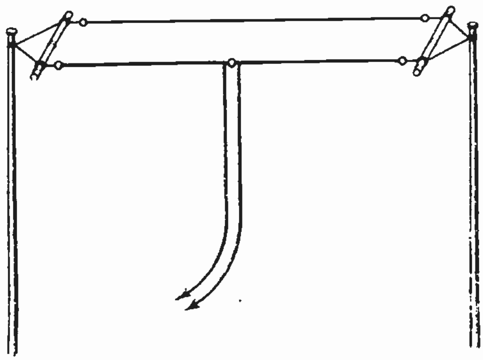

Fig. 9.—A " Flop-over " wire element beam supported on bamboo spreaders.

75-ohm twin cable. Despite the craze for coaxial cable, twin feeder is preferable for beam feeding, as the feed is symmetrical, and avoids the necessity for baluns, bazookas or Gamma Match feeds that are desirable with coaxial cable to avoid parasitic current effects to the coax outer sheath. The Gamma match is sketched in Fig. 8, as some may wish to try it. However, a variable condenser for cancelling residual inductive reactance at the " match " point is advisable to obtain the best transfer of power with a " flat " coaxial line.

A further idea for those in restricted locations, or those who cannot erect rotary beams, is the use of fixed or semi-fixed wire element beams. Thus a two-element " flop-over " beam strategically erected between spreaders, as shown in Fig. 9, would enable the beam to be turned over to cover two directions. Thus, in one direction W and VE might be covered in a N.W. direction, and ZB, ZS, CN8 and MP4 in a S.E. direction by flopping the beam over so that the director and radiator were changed over for the second direction to the rear. An even simpler and less energetic solution would be to clip on or off a short extra length of wire so that the director became a reflector. Providing the wire and clip were kept conveniently to hand, this would enable an all " electronic " switch of direction to be effected by the simple alteration of the effective length of the parasitic element by adding the experimentally determined length. It is a simple extension to this to devise a three-element fixed beam, the directivity of which could be reversed by removing the additional wire length from the reflector which would thus become a director, and attaching it to the erstwhile director to convert it to a reflector, thus again " electronically " reversing the direction of " fire " of the fixed beam array. Indeed, with some ingenuity, the resources of even a small garden, particularly on ten, could be exploited in turn with temporary " fixed reversible " wire beams to sample the DX possibilities of several different directions. Moreover, for some special feat, such as receiving or contacting a " rare DXpedition," a multiple-element fixed beam of high gain could be erected for the occasion, a possibility several amateurs are interested in at the present time, including the writer! Yes, we mention reception, for the really keen SWL types who are the future " hams " of to-morrow will obtain pleasure from experiments with beams . . . even if only simple haywire " wire " affairs . . . in their searching of the

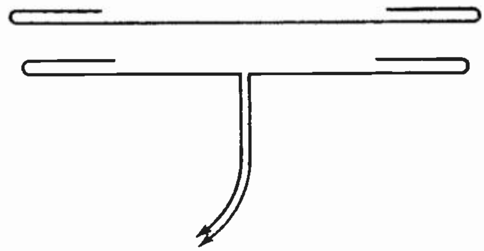

Fig. 10.—" Back-folding " of beam elements permits of compact arrays without use of loading coils.

short-wave bands. A " beam " array of some kind in fact need *not* be an expensive and elaborate rotary affair mounted on a 60ft. tower, and experiments with beams, even with three- and four-element beams, need not cost more than the cost of the wire and insulators involved. In fact, the writer some 10 years ago had a very nice three-element *Indoor* 10-metre beam made from wire elements. Try it sometime and remember that like other forms of " compacted " aerials, the ends of the elements, wire or tube, may be bent hanging down, or even doubled back (Fig. 10) to conserve space, even to halving the lateral spread of the beam elements. Let your motto be not to sigh for the unobtainable, but to *obtain* it in some form or other. You may *not* work or hear *all* the DX, but you will have fun and improved results over plain dipoles or lengths of wire. Assuming you have a restricted space you will not have a long wire, and even if you have, you might fill in the " nulls " earlier referred to, by a simple " wire element " two- or three-element beam.

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Radio and Automation

RADIO APPARATUS IS FINDING INCREASING USE IN MODERN COMMERCIAL PRACTICE. SOME DETAILS ARE GIVEN HERE

By F. E. Sonn

(Continued from page 344, July issue)

AS stated in the previous article, automation, as we know it in the present day, would not be possible unless the electronic valve had been discovered. I will now go further and state that automation could not progress except for the invention of the electronic computer.

The Computer

This is an electronic machine, constructed to be able to perform everything that can be done by a human operator equipped with a desk calculating machine, a set of volumes of tables, pencil and paper for recording intermediate results, and noting the required sequence of operations. Then he has to use his own brain for controlling these sequences until he gets a final result.

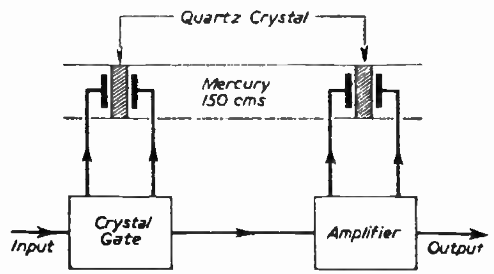


Fig. 1.—A simple form of delay circuit.

An electronic computer, if it is to be completely automatic, must be able to achieve this. Therefore, we may say that it must be able to perform the following operations:—

(1) Arithmetical operations $+$, $-$, $\times$, $\div$, $\surd$, .
(2) Storage or memory.
(3) Transfer data from one section to another.
(4) Reception of data (incoming).
(5) Supply of results.
(6) Control.

Arithmetical Operations

Computers may be constructed to be binary or decimal, or both, by means of a binary/decimal matrix or vice versa. By binary is meant that numbers are represented in the scale of 2, and decimal in the scale of 10. For instance, in the binary scale the number 1011 would be $1 \times 2^3 + 0 \times 2^2 + 1 \times 2 + 1$ and the number 7601 in the decimal scale would be $7 \times 10^3 + 6 \times 10^2 + 0 \times 10 + 1$. Generally the binary system is used, as components and circuits are fewer than in the decimal scale. In the case of a computer acting as a control for a machine tool it is necessary to use the decimal scale as the measurements of the various jobs to be done are practically always to a decimal place.

Memory or Storage

It often becomes necessary when a complex operation is being carried out by the computer, that results of one stage of the operation be stored for a short time, until another stage has been worked out. Then the two results are integrated and the machine carries on with the operation. This can be achieved in several ways.

Firstly, a delay line may be used. A simple form is shown in Fig. 1. Here the electric pulse is converted into an acoustic pulse in the mercury and reconverted at the other end into an electric pulse. If the electric pulse has a spacing of 1 micro second, 150 cms. of mercury would hold 1,000 pulses, which is enough, in a binary system, to represent 30 numbers of 10 decimal digits each, and the information thus becomes available one each milli second. As a pulse group may be required to circulate many thousands or more, before being used, the pulse shape may deteriorate to such an extent as to be unrecognisable: therefore the amplified pulse itself is not transmitted, but is used to open the crystal gate so as to allow a new pulse from the pulse generator to reach the end of the delay line.

The "baby brain"—the first desk-sized computer seen on this side of the Atlantic. It is designed to solve problems which are too complex for efficient solution on desk calculators, but too small for economical solution on "giant brains." This is a Burroughs machine.

Magnetic Storage

This is the method generally used. A magnetic tape or magnetic drum is used. These pass under a head which produces a magnetic field and magnetises the material with the data to be stored. There may be several writing heads and reading heads differently spaced so as to read or write at different positions on the tape or drum.

Some computers have two systems of storage. One, a high-speed storage of small capacity, mostly for arithmetical work, and a slow storage of much greater capacity with facilities for transfer between the two forms of storage.

The Pulse Generator

This is the heart of a computer, and here we go back to the thermionic valve as first used for radio.

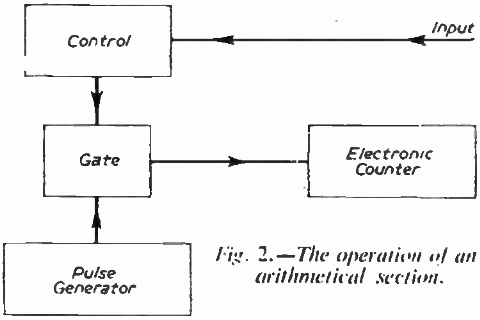


Fig. 2.—The operation of an arithmetical section.

The average pulse generator is generally a multivibrator circuit, although in small machines a squegging type oscillator is often used. An amplifier is also required to ensure a pulse of sufficient amplitude is transmitted. Pulses are produced at a rate of about 100,000 per second. (Different makes and types, of course, vary.) These pulses are routed by gates. If a standard pattern of pulses is repeated every 20 pulse periods, that is, 0.2 milliseconds.

Operation (Arithmetical)

See Fig. 2. Here we see that the control opens or closes a gate according to the data supplied to it, and the pulses from the pulse generator then go to the electronic counter according to plan from control.

Control (Machine Tools)

Here we have automation doing a real job of work. Generally speaking the system used is as follows. A small computer is fed with the necessary data, as to measurements, in three dimensions. This is then transferred to a magnetic tape which is fed to the control box fitted to the machine tool. This control box is connected to an electronic servo-mechanism, which has absolute control over the work the tool has to do. It will keep it accurate to the data supplied by means of its error indicator (see Fig. 3). Under this method of control great accuracy and a definite

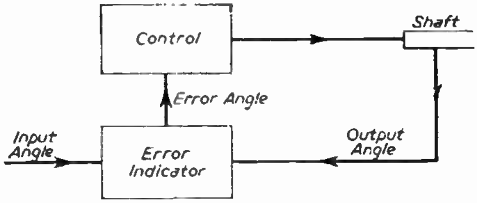
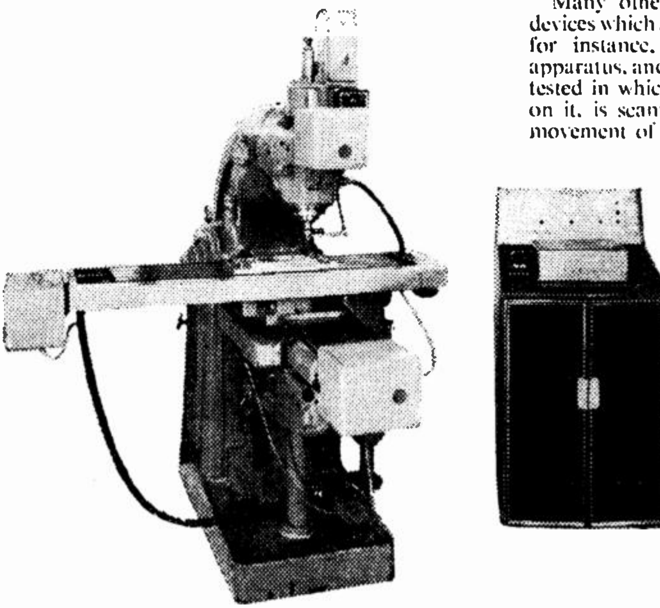


Fig. 3.—The servo-mechanical control.

saving in time and labour are achieved. Of course, in preparing the data for the machine a period of time is taken, but as this tape can be used time and time again, this period is reduced considerably.

Other Uses of Automation

Many other industries are now using automatic devices which are electronic in character. The railways, for instance, are using valves in track-signalling apparatus, and a new method of traffic control is being tested in which a train, with suitable white markings on it, is scanned as it passes by a control box, the movement of the train acting as the horizontal scan. This is amplified and can be read on a C.R.T.



A standard vertical milling machine equipped with a complete three-dimensional control system, using magnetic tape.

Office Equipment

There are now many firms making this type of equipment. One that has just come into use is the electronic calculator. This is similar to a computer, but it only deals with the four basic arithmetical operations in controlled sequences as desired. The results are produced in punched card form. There is also the large computer, which can nearly be considered as the automatic office. It consists of an integrated system of units. Information can be stored on magnetic files and daily information added. Statistics and reports can be prepared in accordance with a preset programme.

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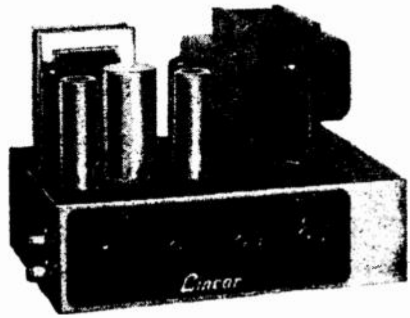

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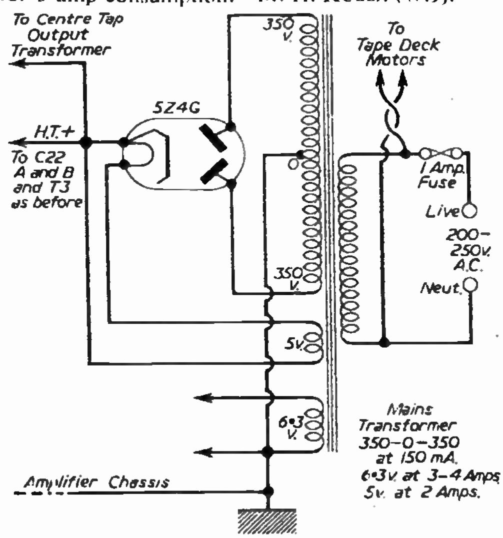
The Editor does not necessarily agree with opinions expressed by his correspondents

A High-cycle Transformer

SIR,—Readers who are interested in using the high-cycle transformer described in the June issue by Mr. Stebbings may like to know that the transformer can easily be converted to an efficient heater transformer.

Only 23 turns are needed and there is ample room to accommodate them. These should be connected in series with the original 6.3 and 5 volt windings so that the voltages add up. This arrangement will give 6.3 volts when the H.T. winding is used as a primary as described in the article. If an output of 4 volts is also needed, then the new winding alone should be used. The gauge of the wire depends on the current required; 18 s.w.g. wire is sufficient for 3 amp consumption.—M. H. KUBBA (W.9).

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.



The power pack for the tape recorder.

A Power Pack for the Tape Recorder

SIR,—In reply to many letters asking for a design for a power pack for the tape recorder with isolating transformer, a circuit diagram is given above for a suitable unit.

The transformer should have a secondary winding of 350-0-350 volts at 150 mA, and a 6.3 volts 3-4 amps for heaters, and 5 volt 2 amp rectifier supply. The valve is a 5Z4G. No other extra components are required.—B. L. PHILLIPS (Preston).

BBC Staff

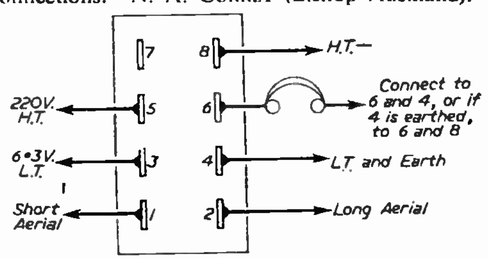
SIR,—My attention has been called to the editorial in your June issue, to which members of this Association take very great exception. On the question of programme content, and the desirability or otherwise of broadcasting matter not specifically directed at the Lowest Common Multiple of popular intelligence, it is a job rather of the British Broadcasting Corporation than myself to reply to your strictures. One would have thought that the Corporation's many years' experience, and the high reputation which it has established among civilised people for the quality of its programmes would, however, be sufficient answer to criticisms of this kind.

Your criticisms of the quality of BBC staff, who are members of this Association, cannot so easily be disregarded. Let me assure you that the standard of appearance, whether sartorial or tonsorial, of the people who work in broadcasting is fully in keeping with their status as public servants. They include "people of ripe experience in the entertainment field and in the realms of literature," who in addition to these qualities combine a profound knowledge of broadcasting. Excluding staff employed on Britain's broadcasts abroad, a national service, available for practically three-quarters of the day, seven days a week, is accomplished on a statistical basis of one broadcasting employee to every 5,000 population. —T. L. LITTLEWOOD (General Secretary).

R1155—Power Pack

SIR,—I should like to draw your attention to the power supply connections for the R1155 as given in the September, 1956, issue of your magazine. The heater should be 6.3 volts not 5.3 volts.

If the H.T.+ is connected to pin seven, then the D.F. stages are brought into operation. I suggest, however, that all connections are traced as various manufacturers have their own ideas about these connections.—N. A. CURREY (Bishop Auckland).



Connections to plug for R1155.

Programme Pointers

Our Critic Maurice Reeve Reviews Some Recent Programmes

FOR those readers who are interested in classical music, "The Fifteenth Variation" was a tribute to Elgar on the occasion of the centenary of his birth. The analogy in the title lies in the finale of the immortal "Enigma Variations," the last of which is a self-portrait. Revised and introduced by Alec Robertson and produced by Charles Parker, it consisted of eulogies by a galaxy of musicians who knew him, and who filled an hour with their personal reminiscences of the master. It was done in the standard BBC formula of such programmes, and was one of the best of them that I can recall.

Should such a programme contain adverse as well as laudatory comment? Doubtless, this problem has been well thrashed out. Setting out as a "tribute," and not a "criticism," the answer would seem to be "no." The trouble is that it makes the programme very lopsided and mamby-pamby. Although Elgar, when he chose, could be an overwhelming genius, he had many detractors among practising musicians. Wouldn't their opinions, concluding with the defence, give such a programme much more bite and fillip, add zest to the desire to discuss it among listeners, and raise generally its level both as entertainment and instruction?

It is the same with their private lives. How cheering and comforting it would be to learn that these great men sometimes did as we ourselves do: arrive home a little bit "muddled," lose our temper over some trifle or other, or to be real human on occasion – as it is certain they were. But no, they must always be drawn as paragons of perfection, just as they must always be supremely great in everything they do in their particular line of work.

"The Critics"

I was surprised to hear "The Critics," one and all, fairly "lay in" to the new panel game, "My Word" which I had praised on this page. I thought they passed a harsh judgment. One of them said she could not hear a word chairman John Arlott said. This fairly staggered me.

Documentary

Another meritorious documentary was "The Fabulous Vidocq," with script by Eric Ewens, based on material supplied by P. J. Stead. Vidocq was the first chief of the modern Sûreté Nationale, having started his career in Napoleon's day as a spy and a detective. He was originally a convict. With Donald Wolfit in the title rôle, an interesting and, at times, exciting narrative was assured.

"Any Answers," is advertised as "a radio correspondence column in which listeners add their comments to the views expressed in last Friday's 'Any Questions.'"

I wonder if it is really necessary? Granted that it is fairly amusing and entertaining, are not the questions sufficiently thrashed out by the four experts who, in their chairman's frequently reiterated words, seldom agree, and whose wanderings from the original starting point "just aren't true?" What it really sets out to do is to animate the correspondence columns of a daily paper. The result, however, is to bring Mr. and Mrs. Muggins into our programmes, instead of leaving them quietly listening-in in their homes. The person who would read the paper at home aloud, would soon be "told off," by those he was hoping vainly to entertain.

Music

An anthology of words and music, inspired by that most romantic and appealing of birds, the lark, made it a pleasant half hour. Selected and presented by James Fisher and Geoffrey Grigson, it brought back nostalgic memories of summer evenings, the river and harvesting. It concluded, almost inevitably I suppose, with a bit of Vaughan Williams's "The Lark Ascending," for violin: a work I find boring and repetitious. So is the lark repetitive, you may well say. But, whereas the one has an ethereal and quite incomparable charm, the other is its naked bones.

The Bristol Old Vic Company gave Miles Malleson's translation of Molière's masterpiece, "Le Misanthrope," under the title "The Slave of Truth." Mr. Malleson compèred. His translations are always diamond-bright and the original French atmosphere considerably anglicised. The Bristol players did it full justice, except that Rachel Robert's Célemène seemed a bit underplayed.

A new series has started of the panel game, "Call the Tune," under its old chairman, Joseph Cooper. The panel was made up of Joyce Grenfell, Stephan Potter and Wynford Vaughan-Thomas. Although specially designed on rather unsophisticated lines, no one among the three seemed to have an undue share of musical perception; not even Mendelssohn's "Fingal's Cave" overture was recognised. Mr. Cooper, as I remarked last season, makes a genial and hospitable chairman, though on this occasion his presiding remarks lacked spontaneity, and sounded as though read from a script. Dennis Brain was the guest.

The Proms will be with us again before this article in in print. One talks glibly, as a rule, of how life has changed since two world wars took a hand at changing it. But few things I can recall, mark those new shapes so completely as the massive, hippopotomi-cum-dinosaur symphony concerts, that rightly draw the musically moronic to Kensington every late summer.

OSCILLATOR COILS, as specified for the "P.W." Hi-Fi recorder, the Hatfield Oscillator coil is the only one sold with a guarantee of "less than 0.03 of 1 per cent. distortion" using only one valve, and backed by an N.P.L. report, **10/6** post free. Patent app. for.

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HAND GENERATORS Mk. 2. Manually operated, originally designed to provide the operating voltages for the American Transreceivers types 18 and 48 but, of course, suitable for a variety of other purposes. Nominal rating is H.T. 162 v. D.C. at 60 mA. and 3.1 v. D.C. at 0.3 A. (With suitable series loading would provide for 2 v. or 1.4 v. heaters. A built-in filter unit provides adequate smoothing and suppression. Ideal for portable rig. Weight of generator approx. 14 lbs. and size 6½ x 6½ x 5½ins. In good condition and unused, with carrying haversack. PRICE 35/-, carriage 8/6 We can also supply the combined mounting legs and seat for these generators as a separate item. PRICE 7/6, carriage 2/6.

0/500 MICROAMMETERS. Moving coil type, 2½in. dia., bakelite cased. PRICE 17/6, post 1/3.

AMERICAN I.F.F. UNITS. Contains wealth of useful components, including relays, 10 valves (6-6SH7's, 2-7193's, 2-6H6's) and a rotary converter rated at 480 v. D.C. output for 18 v. D.C. input. One end of converter is fitted with blower fan which operates from either 6 v. or 12 v. battery. The other end is fitted with a gear box, easily removed if desired, and the two driving shafts which protrude rotate at approx. 4 and 16 r.p.m. for 12 v. input and about half this for 6 v. input. In good condition. PRICE ONLY 30/-, carriage 5/-.

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HEADPHONES.—New, boxed, low resistance, 6/6 pair. Post 2/3.

DOUBLE SPRING H.M.V. CLOCK-WORK GRAM MOTOR.—Brand new Less crank handle and turntable, 9/6. Post 3/-.

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MIXED B.A. NUTS AND BOLTS.—Half a pound box, 1/6. Post 1/6.

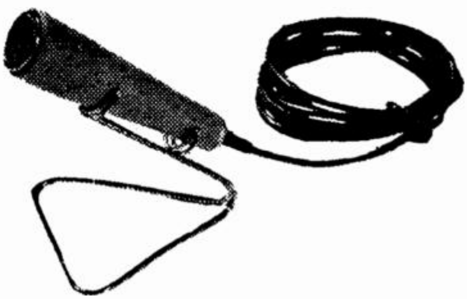
PAINT.—High gloss. Ideal for chassis Quick drying. Red, light blue, dark blue black, green, yellow and all, 2/6 per pint tin. Post 2/-.

RADIO VALVES.—With 90 days' guarantee. Post 9d. per valve ; doz. lots less 5% post free. 12SJ7M, 4/- ; 12SG7M, 4/- ; 12SH7M, 3/- ; 12H6M, 1/3 ; 12SK7M, 4/- ; 12C8M, 4/- ; 12A6M, 4/6 ; 9003, 2/6 ; 9004, 6d. 8D2, 1/- ; 807 (BRIT), 4/- ; VR150/30, 4/- ; PEN46, 2/6 ; 954, 1/3 ; EF50, 3/- ; VR136, 4/- ; VR137, 1/3 ; EF36, 4/- ; 6K7, 2/- ; 6SH7, 6/- ; 6G6, 3/6 ; 6H6M, 1/3 ; 6H6G, 9d. ; VR54, 9d. ; 6D6, 3/- ; 6C6, 3/- ; 6J5M, 4/6 ; 6C4, 4/- ; 6AG5, 4/- ; 6B8, 2/- ; VR92, 9d. ; VR65, 1/6 ; VR66, 1/- ; KT2, 3/6 ; QP220, 3/6 ; 210LF, 1/6 ; DLS10, 2/6 ; 5U4G, 6/6 ; CV63, 1/- ; KT33C, 6/- ; 2X2, 1/6 ; VU111, 1/6 ; VU133, 1/6 ; AC6/PEN, 2/6 ; 7193, 1/6 ; VS110, 1/6.

News from the Trade

COSMOCORD POLYSTYRENE MICROPHONE

A NEW type of microphone is now being manufactured by Cosmocord, Ltd., using Styron 475 polystyrene. These microphones are of unique style and are extremely compact and attractive in appearance. They have excellent tonal qualities, and are particularly suitable for use in conjunction with most tape recorders.—Cosmocord, Ltd., Waltham Cross, Herts.



The new Cosmocord polystyrene microphone.

ELECTRONIC MIXER UNIT

THE latest thing for the tape-recording enthusiast is a four-channel electronic mixer unit incorporating a pre-amplifier. This device will extend the field of tape recording enormously, enabling the user independently to fade in or fade out up to three microphone inputs plus one additional channel. Under certain circumstances it is possible to control a total number of six microphones simultaneously.

This compact, self-contained unit can be put to a number of uses in conjunction with a tape recorder. For example, if you are producing a recorded play at home you can use two microphones for the actors' voices, one microphone for manual sound effects, and the additional channel for incidental music or recorded sound effects. Each control works independently and the user is thus able to fade the sound from any particular source at will. The Grundig GMU3 Electronic Mixer Unit also has the facility for monitoring by a pair of headphones and the built-in magic eye ensures that the recording is being made at the correct level.

These mixer units will operate with any past or present Grundig tape recorders and are suitable for use with most types of microphone. The complete unit costs 16 gns. and is obtainable from Grundig agents all over the country.—Grundig (Great Britain) Ltd., 39-41, New Oxford Street, London, W.C.1.

NEW R.C.A. VALVE

THE R.C.A. Electron Tube Division has recently announced a medium-mu twin triode designated as the 6350. It is a 9-pin miniature type designed for use in a wide variety of applications in electronic computers particularly of the high-speed digital type, and in other "on-off" control equipment.

In such service, the 6350 maintains its emission capabilities even after long periods of operation under cut-off conditions, and, therefore, provides good consistency of plate current during its "on" cycles. Furthermore, balance of cut-off bias between the two units is closely controlled during manufacture. Production controls correlated with typical electronic computer operating conditions as well as rigorous tests for inter-electrode leakage, high-resistance and intermittent shorts, and cathode inter-face, insure long dependable performance from the 6350.

The 6350 has separate terminals for each cathode to facilitate flexibility of circuit arrangement, and a mid-tapped heater to permit operation from either a 6.3-volt or a 12.6-volt supply.

Technical bulletin for the 6350 is available upon request.—R.C.A., Gt. Britain, Ltd., Lincoln Way, Windmill Road, Sunbury-on-Thames, Middlesex.

NEW LOW-PRICED EKCO CAR RADIO

A NEW Ekco quality car radio receiver which, together with a styled installation kit, sells at only 20 gns. (tax paid), and can easily be fitted in practically any make or year of car, is announced by E. K. Cole, Ltd.

Exceptionally neat and compact, this new receiver, Model CR280, combines the receiver and power units in one assembly occupying no more space than the majority of receiver units alone.

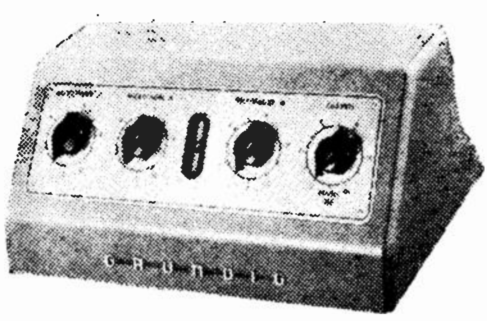
The four-valve superhet receiver unit covers long and medium wavebands with excellent sensitivity and selectivity, while the high standard of reproduction is assisted by negative feed-back. Other features of the receiver unit include a self-rectifying synchronous vibrator, a glare-free floodlit scale, a single slide-action wavechange and easy-to-handle controls.

The standard receiver, finished in dove-grey with a chromium escutcheon, black scale with white figures and black control knobs, is attractively designed to blend with any fascia panel and interior.

Dimensions : 2in. high by 7in. wide by 7½in. deep.

A choice of four speaker assemblies is available, together with a wide range of aerials.

Price : 20 gns. tax paid (including receiver and power unit together with installation kit styled for practically any type of car).—E. K. Cole, Ltd., Southend-on-Sea, Essex.



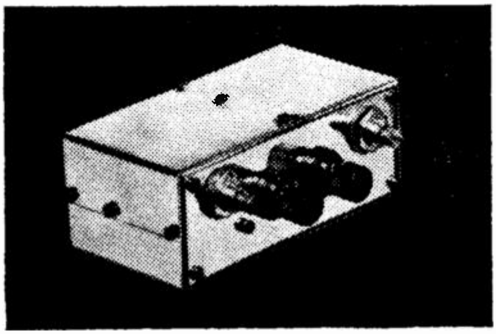
The Grundig electronic mixer unit.

MATCH TEST INDICATOR

A USEFUL type of symmetrical directional coupler employs coupled transmission lines. One physical form of the device employs lead-covered cable. The manufacture of such a coupler entails accurate milling of the flats on the cable, a great care in soldering lest the polythene insulant should melt.

By employing strip-line instead of cable, a printed circuit equivalent is possible and an actual coupler, comprising a through line and two auxiliary lines, has been manufactured. The instrument serves as a match indicator, reflectometer, and true output power monitor over the frequency range 150-500 Mc/s. Standing-wave ratios down to 1·2 to 1 can be measured at 500 Mc/s with an accuracy of 20 per cent. It is simple, compact and robust.

The printed circuit is made from a laminated paper board copper clad on both sides. One side of the board consists of three short sections of transmission line, each having a characteristic impedance



The match test indicator.

of 75 ohms. On the other side of the board the copper is retained. The transmission lines are therefore single strip above an earth-plane type, with laminated-paper dielectric.

The middle strip-line carries the radio-frequency energy and the two auxiliary strip-lines, one on each side of the main line, are coupled to it by virtue of their mutual capacitances and inductances. The direction of the current so induced in each auxiliary line due to the couplings is such that the two components will tend to cancel in one direction and add in the opposite direction. The resulting voltages obtained across the auxiliary line terminations are, therefore, dependent on the direction of power flow in the main line, i.e., the unit will exhibit directional properties. —Millett, Levens Group, Stirling Corner, Barnet By-Pass, Borehamwood, Herts.

HIGH FIDELITY FABRICS

SIMPSON & GODLEE, of Manchester, long established as producers in the textile industry, recently appointed Austen W. Farrell to institute their New Fibres Development Division.

Under the family brand name of "Simplan," Farrell is designing "engineered" fabrics for the radio, television, furniture, motorcar and other industries, specifically to meet each industry's needs.

First into production after six months of preparatory work is a brand new radio and television high-fidelity fret fabric, featuring a combination of excellent acoustical and technical qualities with outstanding artistic design created in Simpson and Godlee's own studios. The designs now available present new possibilities to the cabinet designer, with refreshingly novel styling and textures, but Simpson & Godlee welcome invitations to design fabrics exclusively to meet individual requirements.

"MY LADY CATHERINE" BATTERY PORTABLE

VIDOR announce an additional bright new colour combination for their very popular portable receiver "My Lady Catherine," which has enjoyed sensational sales.

The new colour is in Cambridge blue and light grey with attractive primrose yellow scales and trim. The price remains at 11½ guineas, deliveries to commence immediately.—Vidor Ltd., Erith, Kent.

PHILIPS A.M./F.M. CAR RADIO

WHAT is believed to be the first A.M./F.M. car radio to be launched in this country by a leading manufacturer was introduced by Philips Electrical Ltd. on 1st June, 1957.

Known as Model X61V this new high quality receiver sells at a retail price of 49 gns. (list £37 16s. 8d. (including £2 9s. 6d. for Suppression Equipment) plus P.T. £13 12s. 4d.). It employs seven valves and rectifier and covers long, medium and F.M. wavebands. There are push buttons for station and waveband selection. An outlet socket for operating the "Philishave" dry shaver is incorporated.

A separate power supply unit is provided and the set can be adapted for 6-volt or 12-volt operation.

Specification

Valves—	*A.M.*	*F.M.*
R.F. Amplifier	EF89	ECC85
Frequency Changer ...	ECH81	ECC85
1st I.F. Amplifier ...	EF85	EF89
2nd I.F. Amplifier ...	—	EF85
3rd I.F. Amplifier ...	—	EF42
Detector and A.F. Amplifier	EABC80	EABC80
A.F. Output	EL84	EL84
Rectifier	Metal	Metal

Wavebands—Long 1,053-2,000 m. Medium 186-583m. F.M. 87.5-100 Mc/s.

Controls—On/off and volume. Tuning. Tone (continuously variable). Five push buttons for station and waveband selection.

Power Supply—6 v. or 12 v.

Consumption—55 watts.

Cabinet—Metal, dark grey lacquer. Chrome plated escutcheon.

Dimensions—Control Unit, 6⅞in. x 2⅛in. x 5½in.
Power supply unit, 8¼in. x 3¾in. x 5⅛in.

Features—High Sensitivity.
Small dimensions for easy mounting.
Push button operation for station and waveband selection.

Speaker—7in. complete with baffle and "Philite" housing.

Price—49 gns. (Tax paid).

—Philips Electrical Ltd., Century House, Shaftesbury Avenue, W.C.2.

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AMERICAN TRIPLETT METERS. 0-5,000v. A.C., D.C., 0-250,000 ohms, D.C., M.A., etc., **£5/10/-** each. U.S.A. Precision series 834-S Multi Range Volt-Ohm Milliammeter **£8 10 -** each. All boxed with leads, etc. 0-250v. D.C. Moving Coil Pocket Voltmeter. 17/6. 6,500lbs. sq. in. Pressure Gauges, 5in. dial, 17/6. S.A.E. for list, etc. H. JAMES, 175, Brettenham Road, Walthamstow, E.17.

5,000 ½in. Resistors, ½w., 10,000 ohms, **£10. 3,000** ½in. Resistors, ass., **£7. 12,000** ass. Mica condensers, **£15. 1,200** Electrolytic condensers, 25 mf. 50v, **£15. 3,000** Headbands, **£10. 500** condensers, mf, 600v, D.C., wkg., **£10. 400** condensers, 0.1 mfd., 500v, D.C., wkg., **£8.** GRANGER, 251, Soho Rd., Handsworth, Birmingham, 21.

T.V. TUBES, 30/-, with cathode heater shorts; **15/-** with burn; carr. extra. Ideal for testing; good picture; all types and sizes. Please enquire. DUKE & CO., 623, Romford Rd., Manor Park, E.12. (GRA 6677.)

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AMERICAN MAGAZINES. Year's subscription "Audio" **35/-,** "High Fidelity" **50/-.** Spec. copies **4/-** & **5/-** ea. Cat. free. WILLEN LTD. (Dept. [illegible]), 9, Drapers Grns., London, E.C.2.

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GENEROUS DISCOUNT Valves and CRT'S. 12 months' guarantee. S.A.E. for lists. THE GREEN DOOR, 50, George St., Hyde, Cheshire.

ATTENTION! Our famous "Adaptatape" pre-Amp, is now fitted to the Collaro MK. IV Tape Deck and now incorporates push-pull oscillator, complete with power pack. **40 gns.** Easy terms and full specification on request. SOUND TAPE VISION, The Tape Recorder and Hi-Fi Specialists, 71, Praed Street, London, W.2. (PAD. 2807.)

CHECK YOUR TAPE RECORDER. We supply standard Tapes recorded on the first 1200ft. with Hi-Fi frequency test recording at no extra cost. Scotch Boy, 600ft. **21/-,** 1,200ft. **35/-,** BISPHAM RADIO LTD., 151, Red Bank Rd., Blackpool.

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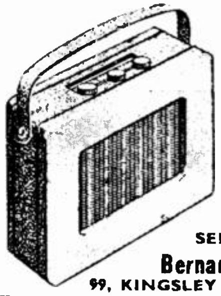

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