

MAKING A SET ANALYSER

PRACTICAL 13

WIRELESS

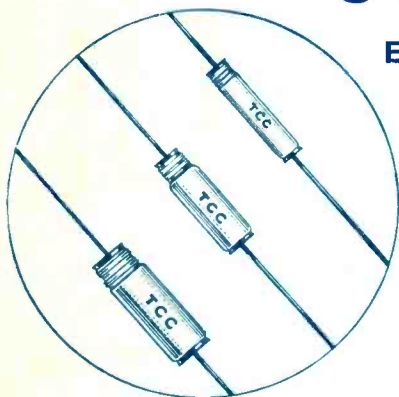
JUNE
1959



Contents

- A NOVEL VOLT-OHM-METER
- A RECORD PLAYER AUTO-STOP
- PRINTED CIRCUITS
- SERVICING RADIO RECEIVERS
- SIMPLE TONE CONTROLS

SUB-MINIATURE ELECTROLYTIC CONDENSERS



Tolerance of capacity : -20% +50%
Temperature range : -30°C. to +60°C.

Since we introduced this range, the use of transistors has become more widespread with the result that the range of capacities has been increased to keep pace with current design. The condenser element is hermetically sealed in an aluminium tube with rubber bungs (T.C.C. Patents 578487, 587072 and 578409) and the general assembly has been modified to permit the wire terminations to be flexed right up to the body of the condenser. Any slight increase in length of some ranges is more than offset by the advantage gained in the reduction of overall space required.

Capacity In μ F	Pk. Wkg. Volts	Dimensions in inches		T.C.C. Type Number	List Price Each
		Length	Diameter		
6	1.5	1.1	1/8	CE58	5/-
4	4	1.1	1/8	CE58AA	5/-
2	8	1.1	1/8	CE58A	5/-
6	3	1.1	.18	CE68AA	4/-
10	3	1.1	.18	CE68AA	4/-
4	6	1.1	.18	CE68A	4/-
2	12	1.1	.18	CE68B	4/-
1	25	1.1	.18	CE68C	4/-
8	6	1.1	.2	CE69A	4/-
2	25	1.1	.2	CE69C	4/-
1	50	1.1	.2	CE69D	4/-
32	1.5	1.1	1/4	CE67	4/-



THE TELEGRAPH CONDENSER CO. LTD.

RADIO DIVISION NORTH ACTON, LONDON, W.3 Telephone: ACOrn 0061

THE NEW



STENTEREO STEREOPHONIC SPEAKER SYSTEM

(Pat. App. 33293/58)

Corner Cabinet £7.10.0
Plinth for floor mounting 17/- extra.

H.F.810 and H.F.812

These are both 8" Units, with a handling capacity of 5 watts. Frequency response, 50 c.p.s. to 12,000 c.p.s. Bass resonance, 65 c.p.s.

H.F.810 incorporates a 10,000 gauss magnet and has a steel chassis. £3.2.0 (inc. P.T.).

H.F.812 incorporates a 12,000 gauss magnet, is fitted with cambric cone and universal impedance speech coil, and has a die-cast chassis. £4.3.6 (inc. P.T.).

S.510 is a 5" unit, with a 10,000 gauss magnet. £2.2.0 (inc. P.T.).

CX.1500 Crossover Unit. £1.18.3.



This consists of two corner loudspeaker enclosures, each divided into two sections, the lower taking the form of an infinite baffle. Into this may be fitted a W.B. Stenterian speaker, H.F.810 or H.F.812, to provide the lower and part of the middle register of sound.

For the upper and remainder of the middle register a W.B. S.510 is used and the two units are coupled by a crossover unit.

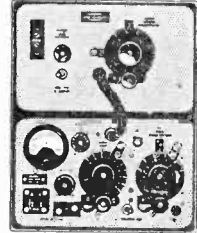
The high frequency spectrum tends to be directional, and provision is made in the upper section for rotating the baffle to give the best stereo effect.

WHITELEY ELECTRICAL RADIO CO. LTD.
MANSFIELD NOTTS.

PORTABLE TRANS/RECEIVER No. 18

A fully portable self-contained Transmitter Receiver for voice and C.W. covering 6-9 Mc/s (50-33.3 meters) and fully tunable, operating from standard dry batteries. The Receiver is a four valve superhet having a signal frequency amplifier, frequency changer, I.F. amplifier and second det. A.V.C. and A.F. stage. The Transmitter incorporates a 500 micro amp. meter for instant check of all battery voltages, total emission current of all the valves, and aerial current. There is a sensitivity switch to reduce H.T. consumption on strong signals. The 18 Set is the perfect Transmitter Receiver for the keen radio enthusiast and can be operated with ease and the Receiver and Transmitter portions can be operated separately. We offer this exclusively complete with Power Microphone, Headphones, Morse Key, Aerial, circuit and instruction book all for only 70/- carriage 10/-.

70/- CARR. 10/-



CONTROL BOX - B.C. 602.

Complete push-button control box. 4 position and on/off with dual coloured indicators for instant channel check. In black crackle case 5 1/2 in. x 3 1/2 in. x 1 1/2 in. Bargain price, each P. & P. 1/6. Two for 8/- P. & P. 2/6

BARGAIN OFFER. Relay package containing: one 6, 12 and 24 volt stepping relay giving 4 break positions alternatively, two miniature 12 and 24 volt coils with one make position, one 12 and 24 volt heavy duty relay with 2 make and break and 1 break positions, one miniature gate switch double pole press to make 1 amp. 250 volts. Made by leading American manufacturers, all for only 8/- P. & P. 2/-

TELEPHONE HANDSET Brand new. 12/6. P. & P. 1/-

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

PICTURE FRAME AERIAL Incorporates MW and LW aerial with provision for tuning out unwanted signals, noise, etc. Size 8 1/2 x 11 1/2 x 1 1/2 in. Magnificent appearance. Brand new with full instructions. 12/6. P. & P. 2/6.

WESTINGHOUSE J.50 PEN-CIL RECTIFIERS. 500 v. 5 mA., 3/6. P. & P. 1/6

HEADPHONES - BRAND NEW. U.S.A. lightweight. Type H.S.30. 15/- Dynamic D.L.R.5. 8/6. Low resistance 120 ohms, 6/6. P. & P. 1/6 on each.

SOLDERING IRON. Instrument type 230 to 250 volt A.C. 25 W. with neon indicator. Only 16/6. P. & P. 1/6

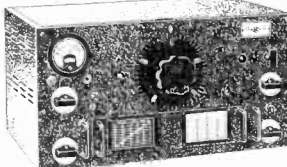
MICROPHONES - BRAND NEW. Throat magnetic. 4/6; No. 7 carbon with switch, 6/6; No. 7 moving coil, 8/6.

PORTABLE AMPLIFIER. PRINTED CIRCUIT. 6 in. x 2 1/2 in. x 3 in. Will suit all crystal pick-ups. Output 3 watts. Uses UCL82 output. UY85 rectifier. Volume and tone controls. With circuit diagram. ONLY 45/- P. & P. 2/6. 7 in. x 4 in. elliptical speaker for above. 14/6.

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



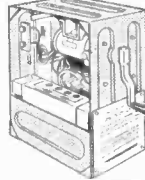
H.R.O. SENIOR RECEIVERS



Total frequency coverage is 50 Kc/s-30 Mc/s. obtained by inserting coil sets of which 4 receivers are supplied with every receiver. Incorporates 9 valves, 2 R.F., 2 I.F. and 2 audio amplifiers. Crystal gate with crystal phasing control. Variable gain controls. Effective tuning scale of 12 feet. R.F. and L.F. gain controls. Signal strength meter. B.F.O. on/off and pitch control. H.T. and S meter on off switch. Phone jack and loudspeaker terminals. Black crackle cabinet. 17 in. x 9 in. x 12 in. deep. Fully tested and guaranteed. Complete with 110 volt or 6 volt (state which preferred) power pack. ONLY £16.19.6. Carr. 20/6.

selectivity. Effective tuning scale of 12 feet. R.F. and L.F. gain controls. Signal strength meter. B.F.O. on/off and pitch control. H.T. and S meter on off switch. Phone jack and loudspeaker terminals. Black crackle cabinet. 17 in. x 9 in. x 12 in. deep. Fully tested and guaranteed. Complete with 110 volt or 6 volt (state which preferred) power pack. ONLY £16.19.6. Carr. 20/6.

SUPPLY UNIT No. 5



Contains Hand Generator giving 6 v. output with over-load cut-out ideal to boost a flat car battery; 6 volt Vibrator Pack giving 3 volts and 150 volts with output leads, plugs, etc., for Army 38 and 18 sets; battery box for three 2 v. accumulators. This is a fully portable and multi-purpose power supply unit. BRAND NEW. ONLY 30/- carr. paid.

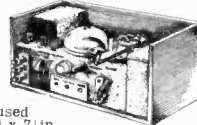
WALKI/TALKI INTERCOM



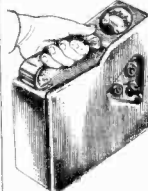
Boys! They're terrific! Two "space styled" hand telephone units in beautiful two-tone finish. Fits neatly into palm of your hand. No batteries or soldering required. Simply connect twin wire between the two units and talk into microphone or listen on one and listen to speaker or talk on the other. Ideal for intercom from house to house, room to room, tent to tent, etc., operates anywhere even up to 200 yards. Brand New! Complete with 25 ft. of wire. Only 6/6 Per Set. P. & P. 1/-

CANADIAN TELEPHONE SETS

Latest release! Brand new fully portable telephones with built-in hand generator, ringing device, hand telephone, morse key, buzzer and indicator lamp to give speech or morse reception over distances up to three miles by simply connecting twin wire and batteries to two sets. Housed in portable transit case 12 x 9 x 7 in. We offer two complete sets at the ridiculous price of only 60/- plus carriage 10/-



GEIGER COUNTERS



Designed to detect and measure variations in gamma-ray intensity. I.E. emissions of radio active potassium, minute traces of uranium and thorium, etc., in ordinary soil and rock. The readings being measured on a 50 micro-amp meter, working battery life is approx. 2,000 hours. Instrument housed in tough plastic case, hermetically sealed. All components I.S.C. Tech. C. approved. Size 9 1/2 x 3 1/2 in., weight 6 1/2 lbs. Supplied with canvas carrying case. Fully guaranteed. £7.10.0. P. & P. 7/6.

U.S.A. DYNAMOTORS manufactured by EICOR. Input 12 v. output 400 m.A. Size 7 in. x 4 in. x 4 1/2 in. Brand new 45/- Same as above, output 250 v. at 100 m.A. size 5 1/2 in. x 3 in. x 3 in. 30/- P. & P. 3/6 on each.

VIBRATOR PACKS. 12 volt input 300 volts output at 150 mA. Fully smoothed. ONLY 25/- carry 7/6. Also 6 v. input 230 v. output at 100 mA. Fully smoothed. 25/- each. P. & P. 3/6.

TYPE 100. HIGH QUALITY SPEAKER. Supplied in magnificent cabinet complete with 30ft. of lead and plug. Ideal for Hi-Fi and Stereo. Brand New in original packing. 45/- each. carriage 5/-

AERIAL VARIOMETERS. These magnificent instruments will enable you to receive maximum signal strength on all S.W. receivers. Precision calibrated control. Complete with connection details. 10/6. P. & P. 2/6

HOOVER ROTARY TRANSFORMERS. 12 v. input. 500 v. output at 65 mA. or 6 v. input. 250 v. output at 75 mA. ONLY 10/6 each. P. & P. 2/-

HI-FI HEADPHONES. Uses high-quality permanent magnetic speakers with regular voice coil. The padded chamois earmuffs give correct spacing for optimum acoustic load, giving finest music and voice reproduction. Each unit has a built-in Hi-Fi 50Ω trans. total 100Ω. ONLY 25/- P. & P. 1/6

WIRELESS STATION No. 19. Complete station comprising Trans. Receiver 2.8 Mc/s. 12 v. supply unit. Aerial. Variometer. control box, headphones, microphone and all leads, circuit and instruction book. S.A.B. for full details. £9. carr. 20/-

TRANSMITTER BC625. Covers 100 156 Mc/s. will deliver 15 watts, consists of seven valves (2-832), 3 for modulation, 4 for R.F. Complete with operating details and circuits. only 25/- P. & P. 5/-

12 VOLTS 10 WATT AMPLIFIER. Complete with internal dynamotor. 2-61.6s push-but. 2-6N7. Incorporating mike and gram inputs, speaker outputs, tone and volume controls. Size 12 1/2 x 6 1/2 x 8 in. Sprung mounted. ONLY £8.10.0. Carr. 10/-

U.S.A. WHIP AERIALS. 12ft., 12/6. P. & P. 2/6

COMPLETE HEADPHONE & MICROPHONE ASSEMBLY. A must for every Constructor and "Ham." consists of moving coil, padded headphones and "press to talk" microphone. 10/- P. & P. 3/6.

Kelada Radio Ltd.

Callers : 87, TOTTENHAM CT. RD., LONDON, W.1
 Mail orders : (DEP. P.) 32a, COPTIC STREET, LONDON, W.C.1
 Telephone : MUSeum 9607.
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BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS. 38 CHALCOT ROAD, LONDON, N.W.1.

Telephone: PRIMROSE 9090.

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

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

0B2	17/6	6C6	6/6	6X4	7/-	19H1	10/-	7475	7/6	DL33	9/6	EL32	5/6	KTZ63	10/6	PY82	9/-	UCC84	20/6
0Z4	6/-	6C8	12/6	6XS5GT	6/6	20DF1	16/-	9002	5/6	DL66	15/-	EL33	19/4	L63	6/-	PY83	9/6	UCC85	10/6
1A3	3/-	6C9	12/6	6/30L2	10/6	20P2	27/10	9006	6/-	DL92	7/6	EL34	17/6	LN152	12/6	PZ30	20/-	UCF80	22/6
1A5	6/-	6C10	12/6	7A7	12/6	20L1	27/10	AC/PEN	5/6	DL94	9/-	EL38	26/8	LZ319	9/-	QP21	7/-	UCH21	23/4
IA7GT	22/-	6CD6G	30/-	7B6	20/2	20P1	27/10	or 7 pin	23/4	DL96	10/-	EL41	11/-	MH4	7/-	QP25	15/-	ULC44	11/6
IC5	12/6	6CH6	12/6	7B7	8/6	20P3	24/4	AC2PEN	10/6	DL10	10/6	EL42	11/6	MHL4	7/6	QS150/15	10/6	UCL82	15/6
ID5	16/6	6D3	20/-	7C5	8/-	20P4	27/10	24/4	DM70	8/6	EL81	15/6	MHL6	12/6	QV04/7	15/-	UCL83	24/8	
ID6	10/6	6D6	6/6	7C6	8/-	20P5	24/4	AC2PEN	10/6	EA50	2/-	EL84	10/6	ML4	12/6	R12	10/6	UF41	9/-
IHS5GT	17/-	6E5	12/6	7D5	23/4	25A6G	20/2	DD	26/8	EA76	9/6	EL91	5/-	ML6	6/6	R18	17/6	UF82	18/6
IL4	6/6	6F1	26/8	7H7	8/-	25L6GT	10/-	AC4PEN	10/6	EABC80	9/-	EL95	10/6	MPT4	5/6	R19	20/-	UF85	10/6
ILD5	5/-	6F6G	7/-	7R7	12/6	25Y5	10/6	26/8	8/6	EAC91	7/6	EM34	10/6	7 pin	23/4	R19	20/-	UF86	10/6
ILN5	5/-	6F6GTM	8/-	757	10/6	25Y5G	10/-	ACSPEN	10/6	EAF42	10/6	EM71	23/4	ML4	10/-	SD6	12/-	UF86	23/4
ILNSGT	11/-	6F8	12/6	7V7	8/-	25Z5	10/6	23/4	10/6	EB34	2/6	EM80	10/6	MX40	26/8	SP4(7)	15/-	UF89	10/6
IR5	8/-	6F11	17/4	7Y4	8/-	25Z4G	10/-	AC6PEN	7/6	EB41	8/6	EM81	10/6	N37	20/-	SP41	3/6	UF89	10/6
IR5	8/-	6F12	7/6	8D2	3/6	25Z6G	10/-	AC/HL	10/6	EB91	6/6	EN31	34/9	N78	20/-	SP42	12/6	UL41	10/6
IT4	6/6	6F13	12/6	8D3	7/6	25Z6GT	17/5	DDD	15/-	EB33	7/6	EY51	10/6	N108	18/8	SP61	3/6	UL46	26/8
IU5	10/-	6F14	26/8	9D2	4/-	27S20	20/11	AC/PA	8/6	EB41	10/-	EY83	16/8	N308	20/8	SU25	26/8	UL46	15/6
2A7	10/6	6F15	15/4	9BVC	15/4	28D7	7/-	AC/TP	33/4	EB81	14/-	EY86	14/6	N339	26/8	SU61	10/6	UL46	11/6
2C26	4/-	6F16	9/6	10015	5/6	30C1	9/-	AC/VP1	10/6	EBF80	10/-	EZ35	6/6	OA70	5/-	T41	23/4	UM4	17/6
2D13C	7/6	6F17	12/6	10C2	26/8	30F5	8/-	15/-	15/-	EBF89	9/6	EZ40	8/-	OA71/81	6/-	TD4	24/8	UR16	16/8
2P	26/8	6F32	10/6	10D2	12/-	30FL1	10/-	AC/VP2	10/6	EBL21	23/4	EZ41	10/-	OC72	30/6	TH4B	26/8	UJ6	20/6
2X2	4/6	6F33	7/6	10F1	19/6	30LI	9/-	23/4	10/6	EBL31	23/4	EZ80	9/6	P61	3/6	TH41	26/8	UJ8	26/8
3A4	7/-	6G6	6/6	10F9	6/6	30P12	12/6	ATP4	5/6	EC52	5/6	EZ81	9/6	PABC80	10/6	TH233	33/4	UJN	16/8
3A5	12/6	6H6GTG	3/-	10LD3	10/-	30P16	10/-	AZ1	16/8	EC54	6/-	FC24	24/8	15/-	TH232	20/6	UY21	17/6	
3B7	12/6	6H6GTM	3/6	10LD11	16/6	30P12	12/6	AZ31	10/6	EC70	12/6	FC4	26/8	PCC84	9/-	TP22	15/-	UY41	8/6
3D6	5/6	6J5C	5/-	10P13	17/6	31	7/6	AZ41	14/-	EC33	15/-	FC13	26/8	PCC85	12/6	TP25	19/6	UY85	10/6
3Q4	7/6	6J5GTG	6/6	10P14	19/4	33A/158M	B36	24/8	10/6	EC32	10/6	FC13C	26/8	PCC89	30/6	TP2620	33/4	VMP4G	15/6
3Q5GT	9/6	6J5GTG	6/6	11D3	24/8	30/-	BL63	7/6	10/6	EC33	8/6	FW4/500	10/6	PCF80	9/-	TY86F	20/-	VP2(7)	12/6
3S4	7/6	6J6	5/6	12A6	6/6	35/51	12/6	C1	12/6	EC34	24/8	10/-	10/-	PCF82	12/6	UI12/14	12/6	VP4(7)	15/6
3V4	9/-	6J7G	6/6	12A6C	6/6	35A5	20/2	C1C	12/6	EC35	8/6	FW4/800	10/6	PCL82	12/6	U16	12/6	VP4B	23/4
5R4G	17/6	6J7GT	10/6	12AD6	17/4	35L6GT	9/6	CBL31	23/4	EC38	8/6	GZ30	10/6	PCL84	22/6	U22	8/6	VP3	6/6
5U4G	8/6	6K6GT	8/6	12AE6	14/-	35V4	8/6	CHK35	23/4	EC82	7/6	GZ32	12/6	PEN4DD	U24	30/-	VP41	6/6	
5V4G	11/6	6K7G	5/-	12AH7	8/-	35Z3	10/6	CK506	6/6	EC38	10/6	GZ34	14/-	26/8	U25	18/-	VR105/30	9/-	
5X4G	12/6	6K7GT	6/6	12AH8	10/6	35Z4	7/6	CL33	19/4	EC38	10/6	H30	5/-	PEN25	20/-	U26	12/6	9/-	
5Y3G	8/-	6K8G	8/-	12AT6	10/6	35Z5GT	9/-	CV63	10/6	EC35	9/6	H63	12/6	PEN36C	U31	10/6	VR150/30	9/-	
5Y3GT	8/6	6K8GT/G	8/6	12AT7	8/-	41MTL	8/6	CV85	12/6	EC35	5/6	HABC80	13/6	23/4	U33	26/8	9/-		
5Y4	12/6	6K8	12/6	12AU6	23/4	42	24/4	CV271	10/6	ECF80	13/6	13/6	PEN40DD	U35	26/8	VT61A	5/6		
5Z3	12/6	6K25	20/2	12AU7	7/6	43	24/4	CY1	16/8	ECH2	23/4	HL13DD	12/6	25/-	U37	26/8	VT501	5/6	
5Z4G	10/6	6L1	23/4	12AX7	10/-	50C5	12/6	CY429	30/-	ECH3	26/8	10/6	PEN44	U43	10/6	W61M	26/8		
5Z4GT	12/6	6L6G	9/6	12BA6	9/6	50CD6G	CY1	16/8	EH8	23/4	HL23	10/6	10/6	PEN45	26/8	U45	10/6	W76	7/6
6A7	26/8	6L7GT	12/6	12BE6	10/-	31/4	10/6	CY31	16/8	ECH21	23/4	10/6	PEN45DD	U52	8/6	W81M	6/6		
6A8	10/-	6L18	13/6	12BH7	15/4	50L6GT	9/6	D1	3/6	ECH35	9/6	HL23DD	10/6	10/6	U50	8/6	W81M	6/6	
6A87	8/-	6L19	23/4	12C8	15/-	53KU	20/11	D15	10/6	ECH42	9/6	10/6	10/6	U52	8/6	W107	12/6		
6A88	12/6	6LD20	12/6	12E1	30/-	72	4/6	D42	10/6	ECH81	9/6	HL41	12/6	10/6	U52	7/6	W729	18/8	
6AC7	6/6	6N7	8/-	12J5GT	4/6	75	25/9	D63	5/-	ECL80	12/6	HL41DD	12/6	PEN46	26/8	U76	7/6	X31	26/8
6AG5	6/6	6P1	19/4	12J7GT	10/6	77	8/6	D77	6/6	ECL92	12/6	10/6	PEN46	26/8	U78	7/6	X31	26/8	
6AK5	8/-	6P25	23/4	12K5	18/-	78	8/6	DAC32	11/-	ECL83	24/8	HL42DD	10/6	PEN46	26/8	U78	7/6	X41	26/8
6AL5	6/6	6P28	26/8	12K7GT	7/6	80	9/-	DAF91	8/-	EF9	23/4	19/4	PEN453DD	U191	16/8	X42	26/8		
6AM6	7/6	6Q7G	10/-	12K8GT	8/6	83	12/6	DAF96	10/-	EF22	14/-	HN309	24/8	PEN/ID0	U281	15/-	X61	12/6	
6AQ5	8/6	6Q7GT	11/-	14/-	83V	15/6	DD41	14/-	EF36	6/6	HVR2	20/8	40/20	33/4	U282	22/4	X63	10/6	
6AT6	8/6	6R7G	10/-	12Q7GT	7/6	85A2	15/-	DDT4	24/8	EF37A	8/-	HVR2A	6/-	PL33	19/4	U301	23/4	X65	12/6
6AU6	10/6	6SA7GT	8/6	12SA7	8/6	150B2	15/-	DF33	11/-	EF39	6/6	KF35	8/6	PL36	23/4	U329	15/6	X66	12/6
6B7	10/6	6SCT	10/6	12SC7	8/6	185B7	34/9	DF91	6/6	EF40	15/-	KK32	22/6	PL38	25/8	U339	15/6	X76M	14/6
6BBG	4/6	6SCTGT	8/6	12SG7	8/6	185BTA	DF96	10/6	EF41	9/6	KL35	8/6	PL81	16/6	U403	16/8	X78	21/4	
6BBGTM	5/-	6SH7	8/-	12SH7	8/6	349/	DH63	10/6	EF42	12/6	KL32	24/8	PL82	8/6	U404	10/6	X79	21/4	
6BA6	7/6	6S17	8/-	12S17	8/6	203THA	DH63(M)	10/6	EF50(A)	7/6	KT2	5/-	PL83	11/6	U801	30/-	X109	17/6	
6BE6	7/6	6SK7GT	8/-	12SK7	8/6	27/10	17/6	EF50(E)	5/6	EF50	5/6	KT33C	10/-	PM28	12/6	U4020	16/8	XD(1.5)	6/6
6BR7	23/4	6SL7GT	8/-	12SQ7	12/6	220TH	25/9	DH76	7/6	EF54	5/6	KT36	30/6	PM12	6/6	UABC80	XFG1	18/6	
6BG6G	23/4	6SN7GT	7/6	12S7	8/6	30S	10/6	DH77	8/6	EF73	10/6	KT41	26/8	PM12M	6/6	10/6	XH(1.5)	6/6	
6BH6	9/-	6SQ7GT	9/-	12T4	10/6	402PENA	DH107	14/-	EF80	8/-	KT44	15/6	PM24M	21/4	UAF42	10/6	X5G(1.5)	6/6	
6B16	7/6	6SU7	8/-	1457	17/-	24/4	DK32	22/-	EF85	7/6	KT61	19/4	PX4	33/4	UB41	12/6	Y63	10/6	
6BV6	9/6	6U4GT	12/6	15D1	26/8	807	7/6	DK40	21/4	EF86	14/-	KT63	7/6	PX25	60/6	UBC41	10/-	Z63	10/6
6BV7	8/-	6U5G	7/6	18	23/4	956	3/-	DK91	8/-	EF89	10/-	KTW61	8/-	PY31	16/8	UBC81	14/-	Z66	20/6
6BX6	8/-	6U7G	8/6	19AQ5	11/-	1821	17/5	DK92	10/6	EF91	7/6	KTW62	8/-	PY32	20/6	UBF80	9/6	Z77	7/6
6C4	7/-	6V6G	7/-	19BG6G	5/6	12/6	DK96	10/-	EF92	5/6	KTW63	8/-	PY80	8/-	UBF89	10/6	Z719	8/6	
6C5	6/6	6V6GTG	8/-	23/4	7193	5/-	DL2	15/-	EK32	8/6	KTZ41	8/-	PY81	9/-	UBL21	23/4	Z729	14/6	

NEW METAL RECTIFIERS—FULLY GUARANTEED

DRM-1B	15/4	RM-2	9/-	WX3	3/6	14A100	27/-	14RA 1-2-8-2	19/-	16RE 2-1-8-1	8/6
DRM-2B	16/2	RM-3	9/6	WX4	3/6	14A124	28/-	14RA 1-2-8-3	23/6	18RA 1-1-8-1	4/6
DRM-3B	23/3	RM-4	18/-	WX6	3/6	14A163	38/-	14RA 2-1-16-1	21/-	18RA 1-1-16-1	6/6
LW7	22/6	RM-5	24/-	14A86	18/-	14B130	35/-	16RC 1-1-16-1	8/6	18RA 1-2-8-1	11/-
RM-O	7/11	W4									

THE BEST VALUE ON THE MARKET

Stern's "fidelity" TAPE RECORDER

DIRECT—MANUFACTURER to USER

NO "MIDDLEMAN'S" DISCOUNT IS INCLUDED IN OUR PRICES.

IT INCORPORATES

- The latest COLLARO TRANSCRIBTOR TAPE DECK.
- The model HF/TR3 "fidelity" AMPLIFIER. (Described below.)
- Matching elliptical 7in. x 4in. P.M. Speaker.
- 1,200 reel HIGH QUALITY EMITAPE.
- ACOS Crystal Microphone.

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

(Plus £1.00 Carriage and Insurance, of which £1 is refunded on return of Packing Case.)



PRICE
£49.10.0

Terms: Dep. £9.18.0 and 12 monthly payments of £3.12.7 or Dep. £16.10.0 and 12 monthly payments of £3.06.

THE LEGS SHOWN IN THE ILLUSTRATION ARE READILY DETACHABLE, AND ARE AN OPTIONAL EXTRA AT £1.2.8.

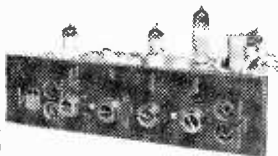
THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING

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

PRICE FOR COMPLETE KIT OF PARTS **£12.15.0**

PRICE FULLY ASSEMBLED & TESTED **£16.10.0**



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

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

STERN'S—MULLARD TYPE "C" TAPE PRE-AMPLIFIER-ERASE UNIT

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

PRICES... INCLUDING SEPARATE SMALL POWER SUPPLY

COMPLETE KIT OF PARTS **£14.0.0**

ASSEMBLED AND TESTED **£17.0.0**

Deposit £3.8.0 and 12 months of £1.4.11.



ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT FOR £11.15.0 and £14.10.0 respectively.

(Carriage and Insurance is 5/- extra.)

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



HOME CONSTRUCTORS YOU CAN BUILD THIS PORTABLE TAPE RECORDER from £39.15.0

TO ADD FULL TAPE RECORDING FACILITIES

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

- AVAILABLE ON HIRE PURCHASE WITH (b) or (d) below.
- (b) THE COLLARO MK. IV TAPE DECK (£25.0.0) and the HF/TR3 AMPLIFIER Assembled and Tested. FOR... **£34.10.0**
- H.P. Deposit £6.18.0 and 12 months of £2.10.8.
- (c) As in (b) above, but HF/TR3 supplied as COMPLETE KIT OF PARTS... **£30.15.0**
- THE NEW MK. VI TRUVOX TAPE DECK with (d) The assembled and tested HF/TR3 AMPLIFIER H.P. Deposit £7.8.0, 12 months £2.14.3 **£37.0.0**
- (e) As in (d) above, but the HF/TR3 supplied as COMPLETE KIT OF PARTS... **£33.10.0**

- To any modern "HI-FI" AUDIO AMPLIFIER (such as our Mullard "5-10" and 2 valve. Pre-amplifier)... ALL YOU NEED IS... THE TYPE "C" PRE-AMPLIFIER and a TAPE DECK... WE OFFER—
- (a) THE COLLARO MK. IV TAPE DECK and the MULLARD TYPE "C" PRE-AMPLIFIER with Power Unit **£35.0.0**
Assembled and Tested
H.P. Deposit £7.0.0 and 12 months of £2.11.4.
- (b) As in (a) above but the Type "C" supplied as COMPLETE KIT OF PARTS... **£32.0.0**
- (c) THE NEW TRUVOX MK. VI TAPE DECK with the assembled and tested TYPE "C" PRE-AMPLIFIER and POWER UNIT... **£37.10.0**
H.P. Deposit £7.10.0, 12 months £2.15.0.
- (d) As above but the TYPE "C" UNIT supplied as COMPLETE KIT OF PARTS... **£34.10.0**

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

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

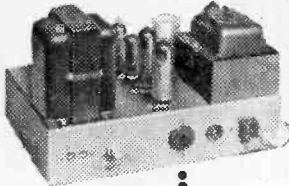
Please send S.A.E. with all correspondence.

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

**MULLARD DESIGNS FOR
THE
HOME CONSTRUCTOR**

MODEL 510/M

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

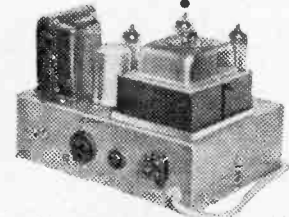


**MULLARD'S
NEW 2-STAGE
PRE-AMPLIFIER
TONE CONTROL**



MODEL 3-3/M

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



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

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

COMPLETE KIT £10.00 Alternatively we supply **£11.10.0**
OF PARTS **ASSEMBLED & TESTED**
(Carriage & Insurance 5/- extra.)

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

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

- Equalisation for the latest R.I.A.A. characteristics.
- Input for variable reluctance. ● Magnetic Pick-Ups.
- Input for Crystal Pick-Ups. ● Input for Tape replay.
- (a) Direct from High Impedance Tape Head.
- (b) From a Tape Amplifier or Pre-amplifier.
- Sensitive Microphone Channel.
- Wide range Bass and TREBLE Controls.
- Attractive Perspex front control panel.
- Our Kit is strictly to MULLARD'S SPECIFICATION.

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

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

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

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

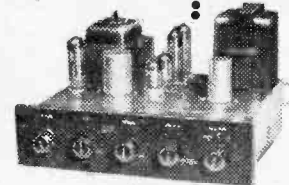
SPECIAL PRICE REDUCTIONS

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

- (a) The "3-3" and the 2-STAGE PRE-AMPLIFIER **£15.0.0**
both ASSEMBLED and TESTED
H.P.: DEPOSIT £3.0.0 and 12 Monthly Payments of £1.2.0.
- (b) The "5-10" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED **£18.18.0**
H.P.: DEPOSIT £3.18.0 and 12 Monthly Payments of £1.7.8.
When ordering include an extra 7/6 to cover Carriage and Insurance.

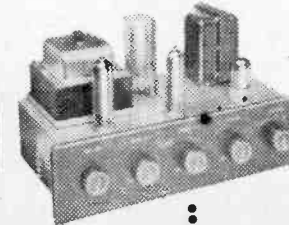
MODEL 510/RC

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



MODEL 3-3/RC

**THE NEW
COMPLETE
MULLARD 3-3**



Designed for a simple domestic installation with Genuine High Quality reproduction up to a maximum of 10 watts. Separate BASS and TREBLE Controls are incorporated with switched inputs for 78 and L.P. Records plus Radio Tuning Unit.

We incorporate SPECIFIED COMPONENTS, NEW MULLARD VALVES. We also give the purchaser the choice of two of the best ULTRA-LINEAR OUTPUT TRANSFORMERS made—first the latest by PARMEKO LTD., and also the latest by PARTRIDGE (£1.6.0 extra). We also supply the PARMEKO MAINS TRANSFORMER, and this has extra power available to supply a Radio Tuning Unit. The Control Unit can easily be detached from the Amplifier Chassis for use in a remote position.

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

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

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION

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

H.P. Terms: Dep. £2.0.0 and 8 Months of £1.0.0. Developed from the very popular 3-valve 3-watt Amplifier designed in the Mullard Laboratories. Our kit is complete to MULLARD'S SPECIFICATION including supply of specified components, Mullard valves and a PARMEKO OUTPUT TRANSFORMER. Send S.A.E. for leaflet or 1/6 for ASSEMBLY MANUAL.

STERN RADIO LTD.

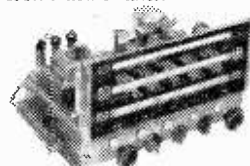
"MODERNISE YOUR OLD RADIOGRAM"

IT IS CHEAPER AND BETTER VALUE TO REPLACE YOUR OLD CHASSIS AND GRAM UNIT

!! RADIOGRAM CHASSIS !! !! RECORD PLAYERS !!

ARMSTRONG "STEREO TWELVE" £37.16.0

The most complete unit yet produced for Stereo, giving 6 watts high-fidelity push-pull output on each channel, 12 watts for monaural. Full VHF band, medium and long wavebands. Stereo and monaural inputs or records, tape and radio, and a tape outlet for stereo and monaural tape recording. Comprehensive matching for all types of crystal pick-ups. The perfect basis for a complete monaural reproducing system or for a complete stereophonic system now or later.



ARMSTRONG "JUBILEE" £29.8.0

An AM/FM chassis with nine valves and two diodes and with push-pull output stage providing 6 watts. Full VHF, medium and long wavebands with automatic frequency control on FM and ferrite aerial on AM. Tape record and playback facilities. Can be adapted for stereo at any time by the addition of our compact, easy-to-fit converter amplifier.

ARMSTRONG "STEREO 44" £28.7.0

Provision is made for Stereo and monaural playback from pick-up or tape. Outputs provided for Stereo or Monaural tape recordings. Alternative inputs enable the use of most crystal pick-ups, together with tape recorders or tape preamplifiers (such as our type "C" unit). 8 Watts output. Radio covers med. waveband and the complete VHF/FM transmissions 87-108 Mc/s.

DULCI "H4PP" £27.16.6

An eight-valve AM/FM 4 waveband chassis giving 6 watts ultra linear output. Covers short, long, medium wavebands plus the VHF/FM band and has internal aerial on the medium and long wavebands. Tape outlet incorporated and suitable for 3 to 15 ohm loudspeakers.

DULCI "H3" £19.17.6

A 6-valve AM-FM chassis giving 4 watts output. Covers medium and long wavebands, on which an internal aerial operates, plus the VHF/FM band. Full AVC on all wavebands and Tape outlet incorporated.

AM/FM RADIO TUNING UNITS

Containing own Power Supply Units.

ARMSTRONG "S.T.3" £27.6.0

A self-powered high-fidelity tuner covering full VHF, medium, and long wavebands with automatic frequency control on VHF.

DULCI "H4/T" £23.15.8

A 4 waveband self-powered high-fidelity tuner covering the VHF/FM transmissions plus the long, medium and short wavebands. NEW HIRE PURCHASE TERMS are available on all above. Illustrated leaflets available—send S.A.E.

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

WE OFFER PRE-AMPLIFIER and AMPLIFIER AT SPECIALLY REDUCED PRICES

Send S.A.E. for full details.

A SPECIAL CASH ONLY OFFER !!

This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER.

ALL for ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

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

The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Maroon and Grey Rexine. WE ALSO SUPPLY SEPARATELY—

(a) The 2-stage (plus Rectifier) AMPLIFIER **£4.2.6**

(b) The PORTABLE CARRYING CASE **£3.17.6**

(c) P.M. SPEAKER **18/9** Carriage and Insurance 4/- extra.



STERN'S 12 VOLT "CAR RADIO"

- PRINTED CIRCUITS
- POWER TRANSISTOR
- MEDIUM AND LONG WAVEBANDS



by ... UNIT ASSEMBLY ... CONSISTING OF THREE SEPARATE UNITS FULLY WIRED, ALIGNED and TESTED, requiring only 12 solder points to complete the Receiver.

A versatile design with low current consumption. Does not require a separate vibrator power Unit.

PRICE ... for the THREE COMPLETELY ASSEMBLED UNITS **£15.0.0**

Send 1/6 for the complete design data.

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

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

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

£6.12.6



The COLLARO "CONQUEST" 4-speed Autochanger, Studio Pick-up **£7.10.0**

The latest COLLARO "CONTINENTAL" 4-speed MIXER Autochanger, Studio "O" Pick-up **£8.10.0**

The COLLARO 4-speed Single Record Player, Studio Pick-up **£6.6.0**

THE NEW B.S.R. Model UA12 is in Stock. A 4 "SPEED" MIXER AUTOCHANGER. **£8.7.6**

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records **£10.10.0**

B.S.R. MODEL TU9 4-speed Single Record Player, complete with separate Crystal Pick-up **£4.5.0**

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

HIGH FIDELITY UNITS ARE ALSO IN STOCK ... as follows:

GARRARD MODELS 301 ... 4HF ... TA/Mk11 ... RC98 ... RC121/4 ... T.P.A.12 PICK-UP ... etc.

Send S.A.E. For Leaflet.

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

SPECIAL CASH ONLY BARGAIN

A bulk purchase enables us to offer this very useful

INTERCOM SET or BABY ALARM for only £5.5.0.

Consists of MASTER UNIT (Illustrated) and one EXTENSION providing 2-WAY TALK-LISTEN facility. Complete in polished wood cases, size of each only 7 1/2 x 4 1/2 x 6 in. high.

Send S.A.E. for full details.

STERN'S MK. II fidelity F.M. TUNING UNIT PRICE **£14.5.0** (Plus 5/- Carr. and Ins.)

HIRE PURCHASE: Deposit £3.0.0 and 12 Monthly Payments of £1.0.9.

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP comprising ECC85, 2 type EF85s (or EF86s) EB54 Tuning Indicator, plus 2 type OA.739 Germanium Diodes. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps at 6.3 volts and 25 mA at 250 volts.

HOME CONSTRUCTORS: YOU CAN BUILD THIS TUNING UNIT FOR ONLY £10.1.0 (Plus 5/- Carr. & Ins.)

Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6.

Send S.A.E. for full details.

HOME CONSTRUCTORS

A RANGE OF "EASY TO ASSEMBLE" PREFABRICATED CABINETS

Designed by the W.B. "STENTORIAN" COMPANY for "Hi-Fi" Loudspeaker systems or to accommodate high-quality equipment. The acoustically designed Bass Reflex Cabinets containing the very successful "Stentorian" Speakers give really first-class reproduction and are well recommended. Models are also available to accommodate high-quality Amplifiers, Pre-amplifiers, Tuning Units, Record Players, etc. All models are very easily assembled, in fact, only a screwdriver is required. Fully illustrated leaflets are available, including complete specifications of the various STENTORIAN LOUDSPEAKERS. PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE.

Send S.A.E. for full details.

STERN'S 12 VOLT "CAR RADIO" CONSISTING OF THREE SEPARATE UNITS FULLY WIRED, ALIGNED and TESTED, requiring only 12 solder points to complete the Receiver.

A versatile design with low current consumption. Does not require a separate vibrator power Unit.

PRICE ... for the THREE COMPLETELY ASSEMBLED UNITS **£15.0.0**

Send 1/6 for the complete design data.

Send S.A.E. for full details.

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109 & 115 FLEET ST., LONDON, E.C.4
Telephone: FLEET STREET 5812/3/4

**be TRANSISTORWISE!
be POCKET-WISE!**



**"RECO" MIDDY
TRANSISTOR
ONE KIT**

(Med. and Long or Med. and Short Waves). Size: 4 1/2" x 3 1/2" x 1 1/2". Variable sensitivity control. High gain dynamic min. earpiece. Mths. of listening pleasure from pencil battery. 37/6, p.p. 2/-.

"RECO" PUSH-PULL FIVE. M/L. Waves. Indoors or outdoors this brilliant radio with Celestion 2 1/2 in. M/C spkr. brings Light, Home and Continental stations to your finger tips. 5 transistors including Mullard OC45 R.F. stage and push-pull output for tone and punch. Pale blue case with grille in red. Complete kit, £67.6, p.p. 2/6. Data Only 2/6. Size 6 1/2 in. x 4 1/2 in. x 1 1/2 in.

"RECO" TRANSGEN THREE



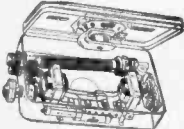
KIT (Med. & Long Waves or Med. & Trawler Band). Size:

6 1/2" x 4 1/2" x 1 1/2". Entirely self contained (no external aerial req.). R.F. stage with Mullard OC 45 transistor followed by two high gain transistor stages. On test tuned in Third, Home, Light, Radio Luxembourg after dark and many others at good listening level. The receiver was tested at approx. 50 miles from nearest transmitter. Complete kit with easy build practical wiring diagrams. "Sonotone" super dynamic min. earphone with insert or bal. arm. reproducer. Pencil battery for months of listening pleasure. 75/-, p.p. 2/6.



"RECO" SUPER SPECIAL THREE KIT (Med. Long or Med. & Short Wave). Bal. arm.

reproducer which in areas of good signal reception may be mounted under red contrasting grille. Sensitivity control for distant stations. A fine kit, complete with pencil and easy build diagrams. 65/-, p.p. 2/6.



"RECO" PUSH-PULL FOUR KIT

As above, but with push-pull output stage and 2 1/2 in. moving coil speaker which fits under red contrasting grille. Gleaming pale blue polystyrene case. Size: 6 1/2 in. x 4 1/2 in. x 1 1/2 in. Complete with data. 99/6, p.p. 2/6. Practical wiring diagrams, parts price list, circuits, 1/6 each.

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SETS 1R5, 1S5, 1T4, 354, 3V4, DAF91, DF91, DK91, DK92, DL92, DL94 any 4 for 27 6
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1A7GT 14/8	6Q7GT 9/6	30L1 8/-	EB41 9/6	EZ80 7/9	U25 13/3
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1N5GT 10/-	6U4GT 11/-	3Z5GT 8/8	EBL21 20/8	CZ32 8/8	U52 6/6
1R5 7/8	6V6G 6/-	43 12/6	ECC81 8/-	KT33C 8/8	U76 7/6
1S4 10/6	6V6GT 7/6	50CD6G 26/9	ECC82 7/8	KT41 14/8	U78 6/9
1S5 7/8	6X4 6/9	50L6GT 9/9	ECC83 8/-	KT63 6/6	UABC80 9/-
1T4 6/3	6X5G 6/-	AZ1 12/6	ECC84 8/8	KT71 12/8	UAF42 9/6
3A5 10/8	6X5GT 6/-	B38 15/6	ECC85 9/8	KTW61 10/8	UBF41 8/6
3Q4 8/8	7B7 8/-	CCH35 20/6	ECC80 11/6	LN152 10/8	UBF80 9/6
3S4 7/6	7C5 8/-	CL33 15/9	ECP82 11/6	MH4 8/-	UBF89 9/6
3V4 8/6	7C6 8/-	CY31 12/6	ECH21 17/8	MU14 9/-	UBL21 20/6
5U4G 6/6	7H7 8/-	D77 5/6	ECH35 6/9	N18 8/8	UCC84 17/-
5V4G 11/-	7S7 9/9	DAC32 10/-	ECH42 9/8	PCC84 8/8	UCC85 9/-
5Y3GT 7/6	7Y4 8/-	DAF91 8/8	ECH81 8/8	PCC89 17/8	UCF80 18/6
5Z4G 9/6	10C1 14/8	DAF96 8/6	ECL80 10/8	PCF80 8/8	UCH21 20/6
6AL5 5/6	10C2 17/8	DCC90 10/6	ECL82 11/6	PCF82 10/8	UCH22 9/9
6AM5 5/-	10F1 17/8	DF33 10/-	EF39 5/6	PCL82 10/6	UCH81 9/6
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6AT6 7/3	12A7 8/-	DH76 7/-	EF80 8/8	PEN44 11/-	UF41 9/3
6BA6 7/6	12A7 7/6	DH77 7/3	EF86 13/6	PEN46 12/6	UF89 9/-
6BE6 7/-	12AX7 8/-	DK32 14/8	EF89 9/-	PEN45 12/6	UL41 9/3
6BH6 8/-	12BA6 8/8	DK40 10/-	EF91 6/3	PEN46 12/6	UL44 21/6
6BJ6 7/-	12K7GT 7/6	DK91 7/8	FK92 5/-	PL36 15/-	UL94 8/8
6BW7 7/-	12K8GT 12/6	DK92 8/6	EL33 15/9	PL38 21/6	UPC 9/6
6CD6G 26/9	12Q7GT 12/6	DK96 8/6	EL38 21/6	PL81 12/6	U08 10/6
6F1 14/8	17Z3 7/6	DL33 9/-	EL41 9/6	PL82 8/6	UY1N 12/6
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6F13 12/6	19Y3 8/6	DL32 7/8	EL84 8/8	PY32 16/-	UY41 7/6
6F14 17/8	20P2 17/6	DL94 8/8	EM80 8/8	PY80 8/-	VP48 9/6
6K7G 3/9	20L1 17/6	DL96 8/8	EM81 9/6	PY82 7/6	VP41 6/-
6K7GT 6/-	21A6 13/6	EABC80 7/9	EM84 13/8	PY81 8/8	W76 7/-
6K8G 6/9	25A6G 11/-	EAC91 5/6	EY51 10/6	PY82 7/6	W77 8/-
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6L18 12/3	25Z8GT 9/6	EB91 5/6	EZ40 7/6	PZ30 17/-	W79 8/-
6Q7G 8/-	30C1 8/-	EB33 7/-	EZ41 9/6	SP61 3/6	Z77 6/3

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- 1 Controlled temperature means no damage to components, long-life elements, no oxidation or alloying, no filing of bit. Extra wattage (70 watt) means heavier work can be done than comparable size models.
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Produced specifically for the electronics industry, the Ceco Instrument Soldering Iron is now available to amateurs. Thermostatically maintained within 15 C. of a temperature set by you, the Ceco gives efficient professional soldering—even on the most intricate work.

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ILLUSTRATED LISTS.

We now have available separate illustrated lists on all of the following:—

GRAMOPHONE EQUIPMENT.—This list details no less than 14 different items including Record Changers Single Record Players and Transcription Units. Some at special prices.
READY BUILT AMPLIFIERS.—Hi-Fi and less expensive popular types.
TEST GEAR.—Test Meters, Signal Generators, etc., by AVO, Pullin and Taylor.

LOUDSPEAKERS.—Full details of Goodmans, Whiteley, Wharfedale, G.E.C. and Elac types which we stock.
TAPE DECKS.—All the popular makes including a special offer.
RECORDING TAPES.—We have a very wide range of tape and accessories by all the well-known makers.
 Any of these lists will be sent free upon request.

JASON FM TUNER KITS

There are no less than five different Jason F.M. Tuner Kits now available to the Home Constructor. Brief details are given here and individual lists on any are available free.
MOST IMPORTANT. We take great pains to see that the kits we supply are *absolutely complete* in every detail and also that all components supplied are entirely suitable in every way. This accounts for differences in price you may notice between our prices and those of some of our competitors. **THIS SHOULD BE BORNE IN MIND WHEN COMPARING PRICES.**

STANDARD TUNERS

STANDARD TUNER. The very popular tuner which is supplied with a chassis assembly fitted with a gold hammer finish front panel and glass dial. Employs four EF91 valves. External power supply is required. Complete Kit £6.18.6. Power Pack Kit 39/-.

STANDARD TUNER IN SHELF MOUNTING CASE. This is a new version of the above tuner. The circuit has been brought up to date and is built into the very attractive shelf mounting case of the new Fringe Tuner mentioned below. The circuit uses four EF80 valves and the power supply can be built into the case if desired. Complete Kit £7.19.6 without power supply components. £9.18.0 with power supply.

MERCURY SWITCHED TUNER. This is a tuner in chassis form which has a three position switch for the three BBC programmes. Uses one ECF80 and four EF80 valves. External power supply is required. Complete Kit £9.19.0. Power Pack Kit 39/-.

FRINGE TUNERS

NEW FRINGE TUNER IN SHELF MOUNTING CASE. This is an entirely new Fringe Tuner and is supplied complete with a very attractive green shelf mounting case with Perspex dial. The tuner is fitted with variable AFC. Internal power supply if desired. Valves used are one ECC81 and five EF80. Complete Kit £10.5.0 without power supply components. £12.3.6 with power supply.

TV SOUND/PM SWITCHED TUNER

This tuner, also supplied in an attractive shelf mounting case, has a TV type Coil Turret fitted to provide TV sound from any BBC or ITV Sound channel as well as the three BBC P.M. programmes. Fitted with internal power supply. Valves. One ECC84. One ECF80. One EF80. One ECF89. One EM81 and one EZ80. Complete Kit £15.15.0.

INSTRUCTION MANUALS

All our kits include the appropriate instruction manual. All available separately as follows:—
 Manual covering both Standard Tuners and the new Fringe Area model. 2/10; "Mercury" 2/3; TV Sound/PM. 3/-. All post free.

LATEST TEST METERS

	Cash Price	Hire Purchase	Deposit	Mthly.	Pmts.
AVO Model 8	£23.10.0	£2. 7.0	12	of £1.18.9	
AVO Model 8 with leather case	£26.10.0	£2.13.0	12	of £2. 3. 9	
AVO Model 7	£19.10.0	£1.18.0	12	of £1.12. 2	
AVO Model 7 with leather case	£22.10.0	£2. 5.0	12	of £1.17. 1	
AVO Multimeter	£9.10.0	£1. 8.0	6	of £1. 9. 6	
AVO Multimeter with case	£11. 2.8	£1.13.6	6	of £1.14. 0	
TAYLOR Model 71A	£12.10.0	£1.17.6	6	of £1.18. 2	
PULLIN Series 160	£12. 7.6	£1.16.6	6	of £1.17.10	
TAYLOR MONTROSE	£3.10.0	£1. 0.0	3	of £1. 0. 0	
PFCO All-in-One	£1.12.6				

HIRE PURCHASE. H.P. Terms are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5% but minimum charge 10/-. Six months: Deposit 3/- in the £. Service charge 7 1/2%. but minimum charge 15/-. Twelve months: Deposit 2/- in the £. Service charge 10%-. but minimum charge 20/-.

Terms of Business.—Cash with order or C.O.D. Postage extra under £3. We charge C.O.D. orders as follows. Up to £3. postage and C.O.D. fee minimum 2/8. Over £3. and under £5. C.O.D. fee only 1/6. Over £5 no charge.

AMPLIFIER KITS

MULLARD 510 AND GEC 912 PLUS
 We carry full stocks for all versions of these popular Amplifiers and our price lists are available free.

MULLARD 2 VALVE PRE-AMPLIFIER
 Latest Mullard circuit for use with the 510 Amplifier. Booklet giving full details now available 1/3 post free. Complete Kit, including drilled chassis and control panel. £6.12.0. H.P. Terms. Deposit 19/- and six monthly payments of £1.1.4.

JASON STEREO

We stock the "Jupiter" and J.S.A.2 Kits. Fully detailed lists available.

GRAMOPHONE EQUIPMENT

	Cash Price	Deposit	Hire Purchase	Mthly.	Pmts.
RECORD CHANGERS					
COLLARO, Conquest	£7.19.6	£1. 5.6	6	of £1. 4.10	
GARRARD, RC121/4	£10. 2.6	£1.10.6	6	of £1.11. 2	
GARRARD, RC88/4	£14. 3.0	£2. 3.0	6	of £2. 3. 0	
BSR UA8 Monarch	£6.19.6	19.6	6	of £1. 2. 6	
BSR UA12 Monarch	£9.19.6	£1.10.6	6	of £1.10. 8	
SINGLE RECORD PLAYERS					
GARRARD, Mk. 2	£5. 6.6	17.6	6	of £1. 9. 0	
GARRARD 4SF	£7.10.0	£1. 2.0	6	of £1. 3.10	
BSR TC9	£4.10.0	£1. 5.0	3	of £1. 5. 0	
TRANSCRIPTION UNITS					
COLLARO, 4T/200					
with PU	£18.12.0	£1.18.0	12	of £1.10. 8	
COLLARO, 4TR/300					
Motor	£13.17.6	£1.19.6	6	of £2. 2. 8	
GARRARD, 4HF					
with GC8 PU	£18. 9.8	£1.16.8	12	of £1.10. 7	
GARRARD, 301					
Motor	£25. 4.5	£2.10.5	12	of £2. 1. 8	

All the above are fitted with Monaural cartridges. Some can be supplied with Stereo inserts and details are given in our illustrated list of Gramophone Equipment.

GRAMOPHONE STYLI

All genuine replacement styli made and packed by the actual Pick-up manufacturer concerned.
 ACOS, GP15, GP25, GP27, GP29, GP30, GP31, GP61, HGP33, HGP35, HGP37, HGP39, HGP41, HGP45, HGP55, HGP57, HGP63, All 6/11 each. B.S.R. TC4, TC8, 6/11 each. COLLARO, Studio O, OS, P. T. 9/9 each. Studio PX, 14/7. DECCA, XMS, 14/8. POSTAGE 3d. on all Styli.

MULLARD TAPE "C" PRE-AMPLIFIER

This unit consists of a recording amplifier with bias oscillator and play-back pre-amplifier, the output of which is fed into an existing amplifier for play-back. A special push-pull oscillator circuit using a special Ferroxcube coil is employed. The coil is designed for use with various makes of tape deck and is suitable for all the following without alteration: Brenell, Collaro, Lane, Motek and Truvox. A booklet giving full technical details and constructional information is now available. Price 2/10, post free. **COMPLETE KIT** containing every item needed right down to the last nut and bolt. First-class items only are included. Ready drilled chassis and gold finished front panel. Price £14.10.0. H.P. Terms. Deposit £2.2.0 and six monthly payments of £2.4.4. **POWER PACK KIT** £4.0.0. All components are available separately and our detailed list is available free. **CONVERSION KIT** to convert original version to the new model. Instruction manual included. 52/6, post free.

TRANSISTORS

AUDIO. BTH Red Spot. Latest type, 7/6; GEC Yellow/Green, 10/-; Brimar TS3, 13/6; Ediswan XB102, 10/-, XB104, 10/-; Goldtop V10/15A, 15/-; Mullard OC70, 21/-, OC71, 24/-, **AUDIO OUTPUT.** Mullard OC72 Matched pair, 60/-; Ediswan XC101 Matched pair, 60/-; R.F. GEC Yellow/Red, 17/6. Ediswan XA101, 35/-; XA102, 40/-; XA103, 15/-; XA104, 18/-; Goldtop V6/R2, 24/-; Mullard OC45, 35/-; All transistors post free.

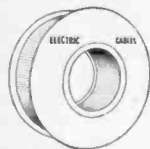
WATTS RADIO (ORDER) LTD.

54 CHURCH STREET, WEYBRIDGE, SURREY. Telephone: Weybridge 4556

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Closed for Annual Holidays August 8th to 22nd.

Versatile Wire



Single-strand 18-gauge with P.V.C. covering which makes it rustproof. Extra strong, will stand tremendous strain. Ideal for gardening, clothes lines, indoor aerials, etc., etc.

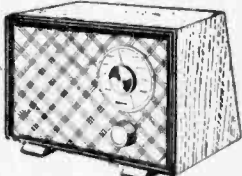
Also being steel alloy and having a resistance of approximately 1 ohm per yard this can be used for electrical work, soil heating, wrapping round water pipes, etc. New on drum containing 3,000ft. Price 8/6 plus 3/6 carr.

W.D. Circuit Details

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

- A.1134 R.109
- BC.348 HRO Receiver
- BC.312 R28/ARC5
- R.103A R1116/A
- BC.342 RA-1B
- RA-1B AR8D
- R-208 AN/APA-1
- R-1155 78
- R-1124A 76
- R-1124A R-1481 R.T.18
- R-1147 C.V.48-AAM-
- R-1124A RADAR
- R-1082 A.S.B.-3
- R-1355 Indicator 62A
- B.C.1206-A B Indicator A.S.B.3
- B-453-A (or -B) Indicator 62
- B-454-A (or -B) Indicator 6K.
- B-455-M-A (or -B) R.F. unit 24
- Transmitter T1154 R.F. unit 25
- Fifty-eight walkie R.F. unit 26
- Lalkie Wireless set No. 19
- Frequency meter Demobbed valves
- B.C. 221

LAST FEW



The Skysearcher

This is a 2-valve plus-metal receiver set useful as an educational set for beginners, also makes a fine second set for the bedroom, workshop, etc. All parts, less cabinet, chassis and speaker, 19/6. Post and ins., 2/6. Data free with parts or available separately, 1/6. 3-valve battery version also available at the same price.

Glass Panels

Size 10 1/2 x 9 1/2—parcel of five panels.

7/6

Plus 3/6 carr.

Navigation Compass

In carrying case but less fluid, may be slightly damaged, 4/6, plus 2/6.



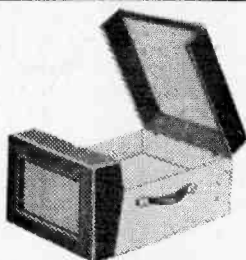
THIS MONTH'S SNIP Unique Opportunity to build Fine Transistor Set

Constructor's parcel : to build Pocket 6 Transistor Set as currently being sold at £17.17.0. Parcel comprises Motifed two-tone cabinet as illustrated, tuning dial, two gang tuning condenser, combined bakelite chassis / printed circuit and easy to follow circuit. Costing value 57/6—offered while supplies last at only 29/6, plus 2/6 post. Suitable for your own circuit or to build original circuit. All parts available at highly competitive prices. Do not miss this tremendous bargain.



CABINET SNIP

Extremely well made portable amplifier case finished in two-tone and very modern in appearance. Large enough for stereo outfit with tape deck or auto-changer. Snip price 59/6, plus 3/6 carriage and insurance.



Parmeko (Neptune Series) "C" Core Transformers (Potted)

Model No. 6000/53 15 Watt output transformer 6,500 Ohms centre tapped, primary, secondary 2.4 Ohms centre tapped. Price 27/6.
Model No. 6000.85—mains transformer, primary standard 50 cycle mains 200-240 Volt (5 volt tappings) and 115 Volt.
Secondary 0.525 at 250 mA, 335-0-335 at 180 mA. Price £5 each.

THIS MONTH'S SNIP



Special introductory offer to introduce our new inductor 40 Fluorescent fitting. This is a batten type fitting nicely finished, white enamel. Suitable for chain suspension or direct fixing, uses fully compounded choke ballast and radio suppressed starter. Offered at a special price this month to introduce it, namely 39/6 complete with tube. Carriage up to 150 miles 5/6, up to 250 miles 7/6.

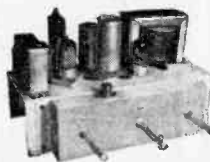
Rotary vane type. Spline drive shaft—threaded inlet and outlet, also makes good compressor. Price 22/6, plus 2/6 post and packing.

Vacuum Pump

Rotary vane type. Spline drive shaft—threaded inlet and outlet, also makes good compressor. Price 22/6, plus 2/6 post and packing.

LAST FEW

HIGH FIDELITY AMPLIFIERS



3 valve 4 watt with frequency response better than 40-15,000 C.P.S. Control Panel size 8 x 2 1/2 in. comes fixed to chassis but is intended for independent mounting. Separate bass and treble controls giving fullest variation of cut and lift. Separate switch, absolutely no mains hum. Remarkable value at £4 19/6.

FOR ADDRESS SEE NEXT PAGE

A.C./D.C. Multimeter Kit

Ranges : D.C. volts 0.5, 0-50, 0-100, 0-500, 0-1000. A.C. volts 0.5, 0-50, 0-100, 0-500, 0-1000. D.C. milliamperes 0.5, 0-100, 0-500. Ohms 0-50.000 with internal batteries. 0-500.000 with external batteries. Measurements A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2 1/2 in. moving coil meter, selected resistors, wire for shunts, range selector switches, calibrated scale and full instructions, price 19/6, plus 2/6 post and insurance.

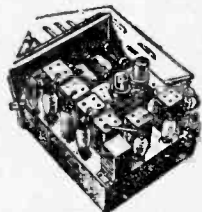


Cabinet Snip



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

10 Valve 1 1/2 Metre Superhet



Ideal for Commercial T.V. These contain 6 valves type 6P61, and one each RL7, RL16 and EA50. Six I.F. transformers, 12 Mc/s band, and hundreds of other useful components. Price 29/6, plus carriage and packing 7/6. These receivers are unused.

Adapt Your Gram for Stereo

Cartridges for adapting existing record players for stereo—available £2.15.0 each—please state make or player when ordering.

All-Mains Amplifier



Powerful three-valve mains amplifier ideal for dances, parties, etc. Complete, less chassis, cabinet and speaker (available if required)—size 16 (free with parts). Price 19/6, plus 2/6 post and insurance.

Bargains

Install those extra points.—3.029 twin flat T.R.S. cable. Big purchase enables us to sell this at 45/- per 100 yds. carriage 3/6.

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

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

DiTto. unbranded. 6/6 post 1-.

Cold Cathode Valve CV413. Voltage regulator or trigger switch—unused but ex-equipment, 2/- each.

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

Slydlok Panel Mounting Fuses with Carrier. 5 amp 2/- each. 15 amp 2/6 each. Beling Lee 2BA fully insulated terminals for mounting through metal panels. 9/- each.

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

Twin Twisted V.I.R. Flex. 7/10035 (11/36 equiv.). 17/6 100 yd. coil. Mains Lead. 4 core rubber insulated and circular braided overall. Has prepared ends suitable converter or similar. 6 ft. long 9d. each. 7/6 doz.

Metal Rectifier. Equivalent of RM5—250 mA. 250 v. 1/6.

Welding Transformer. 12v.-50 amp. continuous rating—intermittent rating for spot welding—exceeds 2,000 amps. 45/- carriage and packing 5/-.

6ft. Unbreakable Mains Lead. Type of lead fitted to electric razors. makes fine lead for test meters and any other devices where subject to continuous bending. Twin figure eight construction. soft cream P.V.C. covered. Normally costs 2/- per yard—we offer three leads for 2/-, 1 mfd 350 v. Small tubular metal cased condensers made by Dubilier. 2/6 doz.

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

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

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

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

Metal Rectifier. 250 v. 60-80 milliamps, ideal for mains set or instrument or to replace that expensive valve. 4/6.

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

Install 2-way Switches. Our outfit comprises : 30 yd. multicore cable, two 2-way switches, two wood blocks. Full instructions. 9/6 each. post and insurance 2/6.

Neon Lamp, midget wire ended. Ideal for making mains tester or for any of the dozen-and-one applications to which a neon can be put. New 2/-. Ex-equipment 1/6.

Instrument Transformer. Input 200-230 v., output 6.3 v. at 3/4 amps., and two separate 85 v. 10 milliamp windings which can be joined in series or parallel. 8/6 plus 1/6 post & packing.

31in. Meter Moving Coil. Bush mounting, really beautifully made by G.E.C. Two types available 500-0-500 microamp and 1 milliamp i.s.d. 37/6 plus 2/- p. & l.

Winking Eye, telephone or circuit indicator. 5/-

E.H.T. Transformers. Standard mains input, three secondaries. one gives 1,540 v. at 20 mA, another gives 2 v. at 2 amps., the third 4 v. at 1 amp. This is a heavy duty potted transformer in a cast case but where extreme ruggedness is not required it can be taken out of its case. Price 20/-, carriage 3/6.

TWO OUTSTANDING METERS

The Taylor Meter Model 100A

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

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Ohms—0-200 Megs. in 4 ranges (self-contained).

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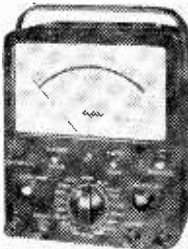
5 ranges of output.

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Ohms—0-20 ohm in three ranges (self-controlled).

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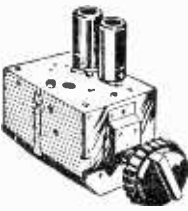
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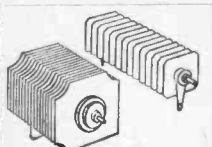
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Phone : RUISLIP 5780.
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266, London Road,
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Phone : CRO 6558.
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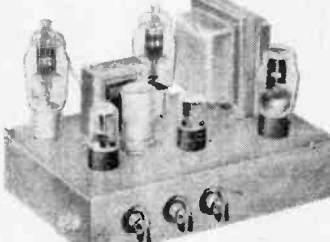
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11 GNS.

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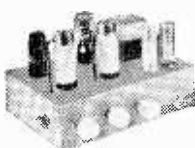
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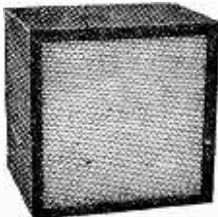
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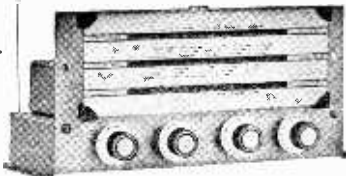


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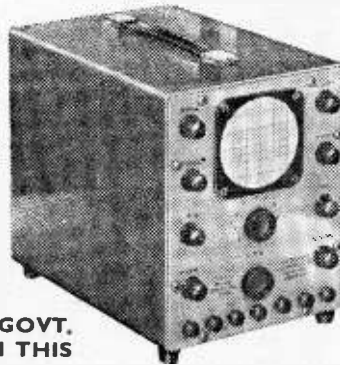
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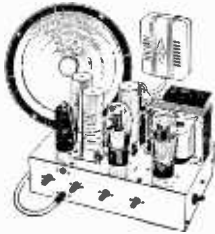
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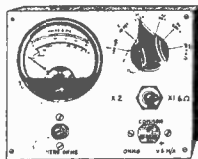
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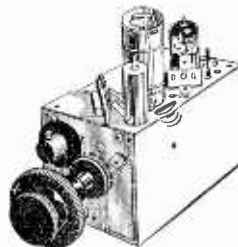
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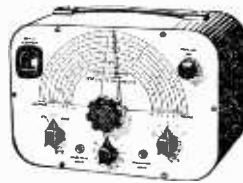


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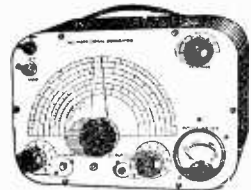


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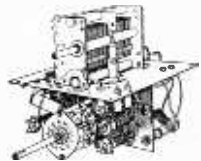
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†Maximum collector dissipation at 25°C—150mW
" " " " 45°C— 90mW

*Maximum collector dissipation at 25°C—120mW
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PRACTICAL WIRELESS

EVERY MONTH

27th YEAR
OF ISSUE

VOL. XXXV, No. 630, JUNE 1959

BY THE EDITOR

COMMENTS OF THE MONTH

HEATERLESS VALVE

Editorial and Advertisement Offices :
PRACTICAL WIRELESS

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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.

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THE first major advance in the design of valves for many years was announced recently in the USA. A new valve has been developed which outwardly is of conventional appearance, but inwardly is considerably different from normal types. The principal difference is that there is no heater.

The effect which has made this possible was discovered in 1952. A thin layer of magnesium oxide was being bombarded with an electron beam to produce secondary emission, which was increased by maintaining a high positive charge near to the surface of the layer. However, when the bombarding beam of electrons was switched off it was found that emission continued; the magnesium oxide emitted electrons under the influence of the positive charge near its surface.

In the practical valve design, the first grid (g1) is positively charged and ensures that the emission continues when once it has been started. By heating a very small filament near to the cathode for less than a second, electrons are produced which hit the cathode and start the emission. This disadvantage may be eliminated in later designs, possibly by mixing an electron-producing substance with the emissive layer, thus making the valve "self-starting."

Of course, such valves will not be readily available for some considerable time, but their development will have far-reaching effects; it will be possible to reduce the size of the power supplies of electronic equipment because in many present applications the heater consumes nearly all of the power used by the valve; cathode-heater shorts will no longer occur, and the useful life of valves should be considerably increased.

CONTRIBUTIONS

WE are always pleased to consider articles for publication in this and our companion journal, *Practical Television*. Such articles should be of a practical nature, involving constructional work; we do not require long erudite discussions on the finer points of radio theory. The articles should be 1,000-1,500 words in length and well illustrated with diagrams and photographs. Rough sketches only are needed, but sufficiently accurate to enable our artists to supply the special drawings required. All information necessary for the construction of the apparatus described must be given, including sources of supply of the various components. Authors should remember that other readers may not be as experienced as they, and the omission of what seem to them trivial points may seriously hinder another constructor. If possible, send us the apparatus for testing and photographing. Please write or type on one side of the paper only, using double spacing, and leaving ample margins at both edges.

It should be noted that resistors and capacitors specified in the list of components should be "preferred" values; that is, they should be readily available as new parts from any component stockist and not have some unusual value as may occur when old parts from surplus chassis are used.

Our next issue, dated July, will be published on June 5th

ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

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

Region	Total
London Postal	914,273
Home Counties	906,223
Midland	666,452
North Eastern	805,671
North Western	628,335
South Western	549,326
Wales and Border Counties	338,046
<hr/>	
Total England and Wales	4,808,326
Scotland	589,369
Northern Ireland	164,901
<hr/>	
Grand Total	5,561,696

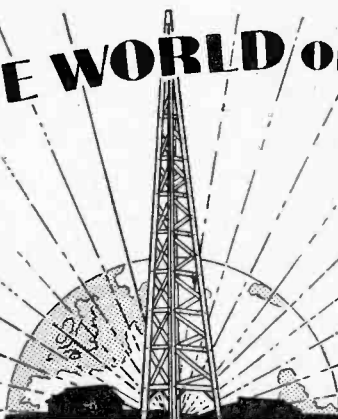
Radio Receiver Despatches

THE despatch figures for radio receivers, 87,000, were the same as in January, 1958, and 11 per cent. down on those for January, 1957. Radiograms, at 15,000, were 17 per cent. down and 42 per cent. down respectively, according to the monthly estimates of the British Radio Equipment Manufacturers' Association.

Despatches are net figures of deliveries by manufacturers to the home trade on firm and other accounts, including those to specialist rental and relay companies, and car radios.

Marconi Transmitters for Pakistan

MARCONI'S WIRELESS TELEGRAPH CO. are to supply three high-power H.F. communications transmitters to the Posts and Telegraphs Department of Pakistan, to provide additional circuits for the Overseas Telecommunications Service. Each of the transmitters is complete with drives to provide both independent sideband telephony and frequency shift keying services. All three transmitters are motor-tuned for the selection of any one of six separate



By "QUESTOR"

frequencies, and will be installed in the main transmitter hall alongside similar Marconi equipment already supplied.

Telex to Singapore and Malaya

TELEX services between this country and Singapore and the Federation of Malaya are now open. The charge for a call of up to three minutes is £3 15s. Each additional minute or part of a minute is charged at the rate of £1 5s.

The opening of these new services now meets the growing need of United Kingdom Telex subscribers with business interest in the Far East for direct

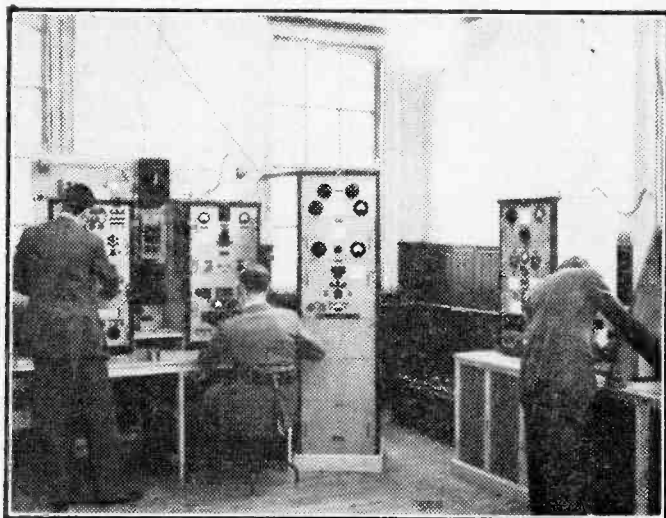
communication and is a further example of co-operation between the Post Office and Cable and Wireless Ltd. who operate the radio terminal at Singapore.

Radio Officers' College Equipped

MARINE communication equipment for the newly-opened Radio Officers' Training School, Belfast College of Technology, has been supplied by Siemens Edison Swan Ltd. The college is an independent establishment.

The equipment, all of the approved type for use on ships, consists of a T.36 high-frequency wireless telegraphy transmitter, T.10 medium-frequency w/t transmitter, F.20 radio telephone equipment, E7/AA emergency assembly (comprising transmitter, receiver and auto alarm with emergency and loudspeaker watch receiver), a portable lifeboat wireless set and a single loop rotating direction finder.

Being part of the Electrical Engineering Department, the



Future radio officers at the Belfast College of Technology.

Head of which is Mr. J. Fitton. M.Sc., the Radio Officers' Training School is in the charge of Mr. S. A. Rowlinson. Training is given for both First and Second Class Certificates of Competency awarded by the Postmaster-General.

Norwegian Multi-channel Radio Survey

THE Norwegian Telegraph Administration has recently conducted a super high frequency radio path survey between Oslo and Trondheim, using Marconi survey equipment.

The illustration on this page shows a 100ft. radio mast used on the survey. It is fitted with vertical rails on which the survey equipment is raised or lowered for height-gain tests. The recording equipment is in the tent at the base of the mast.

A.A. Plans Big Expansion

THE A.A. radio network is to be extended to three new areas, giving an overall coverage of more than 47,000 sq. miles. Over 300 new vehicles are to be provided for the road patrol service, including many with diesel engines and radio equipment. There are to be more A.A. roadside telephone boxes—some 250 new or modernised boxes will appear on Britain's roads during the year. Larger headquarters in London and the provinces are to be provided to meet the greater demand for service resulting from the ever-growing membership (now over 2,150,000), and the A.A. teleprinter network is to be extended to include the three remaining offices not yet equipped, giving a total of thirty-three in the chain.

R.C.A. Reorganisation

FOLLOWING a reorganisation of the sales force, R.C.A. Great Britain Limited announce that R. F. Collins is appointed sales manager of a newly formed department to be known as Cinematograph and Sound Products Sales.

This new group is formed by the merging of Consumer Products and Cinema Sales Departments, and centralises the sales of all high fidelity, cinema, 16 mm. equipment and public address apparatus.

The marketing structure for all high fidelity consumer goods is unaltered and will continue to operate through the established wholesale channels, offering the famous New Ortho phonic High Fidelity range of matched equipment, together with F.M. tuners. President record reproducers, other established lines, and, in addition, the new R.C.A. living stereo high fidelity stereo phonic disc reproducers.

R.C.A. have been leaders in the field of 35 mm. cinema sound reproducers and sound recording channels since 1929 and during 1958 introduced their range of Hollywood 16 mm. projectors on the British market.

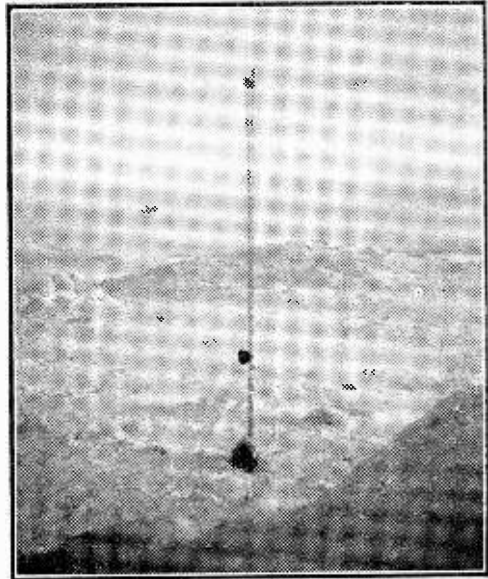
Contracts Received

A PART of a large order received by Messrs. Wales & Edwards Electric Vehicles Ltd. has been placed with the Rectifier Division of Westinghouse Brake and Signal Co. Ltd. This is for vehicle battery charging equipment amounting to £15,960, involving chargers with a special tapering characteristic in order to achieve reduced charging time without resorting to the usual two rate feature.

Ultra Electric Limited

THE directors recently announced that negotiations have been completed for the purchase for cash of Pilot Radio Limited.

They have also acquired all the issued capital of Pilot Radio Limited, which company now becomes a wholly owned subsidiary of Ultra Electric Limited. Ultra have also acquired the "Pilot" trade marks in 17 European countries from the Pilot Radio Corporation of U.S.A.



Showing the 100ft. radio mast used on the Norwegian Multichannel radio survey.

Pilot Radio Limited, a private company with works at Park Royal, Middlesex, are manufacturers of radio and television receivers and radiogramophones. The company was founded in 1935 and has association with the Pilot Radio Corporation of U.S.A., with whom it has maintained close ties.

Pilot state that their identity will be preserved, and that present services and supplies will be maintained.

Brit.I.R.E. Medical Electronics Group

THE British Institution of Radio Engineers announces the formation of a medical electronics group. This is in accordance with the policy of the council to establish specialist groups to foster the holding of meetings, the writing of papers and the general dissemination of information in the specialised fields of radio and electronic engineering.

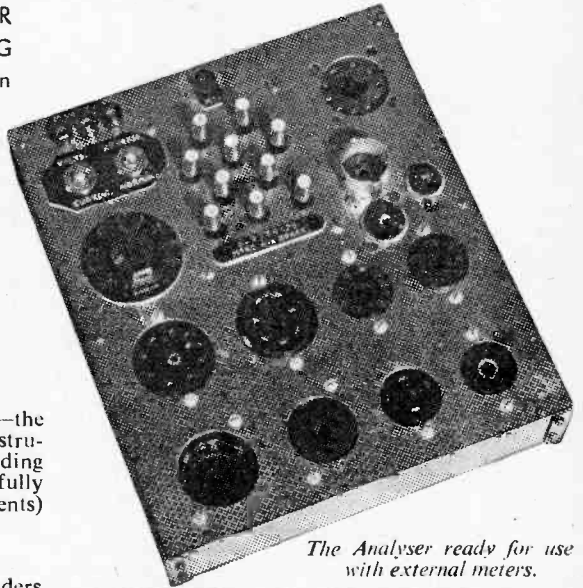
The chairman of the group committee, Mr. W. J. Perkins, Member, was the Institution's representative at the International Medical Electronics Conference held in Paris last May. There are five meetings of the Brit.I.R.E. Medical Electronics Group during the current session.

Making a Set Analyser

CHECK YOUR RECEIVERS AND OTHER RADIO EQUIPMENT WITH THIS SERVICING ACCESSORY

By R. Ellison

THE instrument described here has been designed for external meters, either multi-range or separate. The circuit also fulfils the requirements of those who wish to use built-in multi-range meters, using a different design of panel. Whatever the arrangement, the instrument will be found to be of value in checking the valve and circuit conditions. An interesting feature is the use of two double-pole changeover switches. Apart from selecting volts, and current at normal or reverse, they perform the important function of isolating the current meter while voltage is being taken. The reverse takes place when measuring current—the voltmeter is automatically isolated. The instrument is not completely foolproof, but providing the operating instructions are followed carefully (which applies even to commercial instruments) the meter will be quite safe.



The Analyser ready for use with external meters.

The panel

In Fig. 2 the holes for bolting the valveholders to the panel are not indicated. It is easier to use the holders as a template, by placing them into or over the holes prepared (depending on the type) and to mark the bolting holes on the panel. Provision has been made for a BR9 valveholder, but valves using this base are very rare and can be ignored (if desired) and

one of the UX types used. The holes for the meter terminals will vary according to the type used. Therefore it is suggested that you obtain all the components and check the dimensions against those in Fig. 2. The difference,

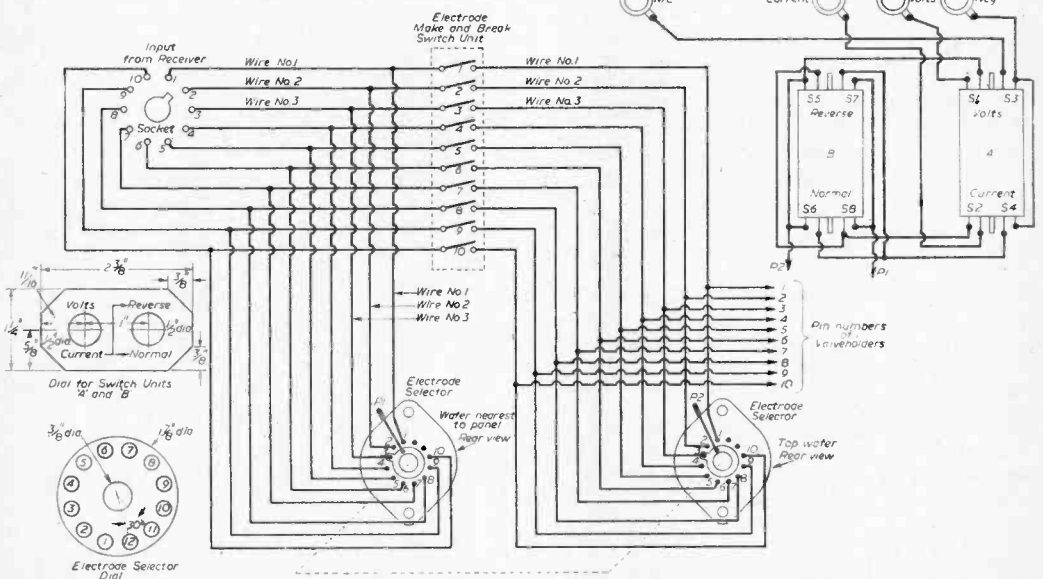
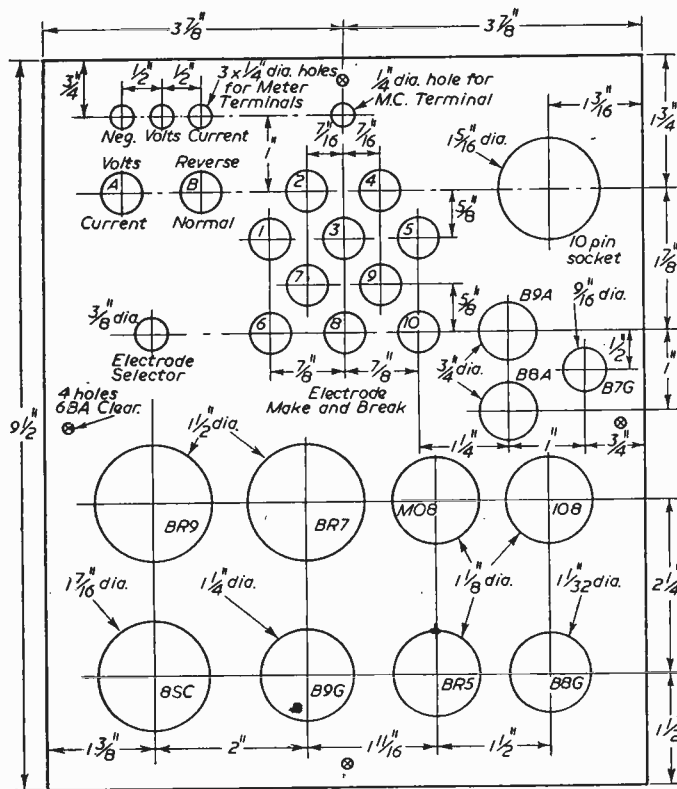


Fig. 1.—The chief wiring of switching units A and B, and both wafers of the 2-bank 1-pole 12-way switch unit, viewed from the rear. The meter terminals and terminal M.C., which must be insulated from panel, are also viewed from the rear.



Holes A, B and 1-10 are 1/2 dia. Material...16SWG. Aluminium

Fig. 2.—Front panel drilling data.

if any, should not depart from the measurements given to the centres.

Details of the cabinet sides are shown in Fig. 3. Two of each are required for the frame. It can be made of aluminium or tinplate .036in. thick. The back plate is 9 1/2in. x 7 1/2in.

Electrode Make and Break Unit (Fig. 5)

Mount the 2 3/4in. piece on top of the 3 3/4in. piece as shown in Fig. 5(b). Clamp these two pieces together in the middle and mark out the holes "A." Drill through both pieces for 6 B.A. clearance. Secure temporarily by passing nuts and bolts through the holes. Remove the clamp, and mark out the 20 holes on the 2 3/4in. piece. Drill through both pieces using a No. 43 drill for 6 B.A. tapping.

Prepare the 10 pieces of steel spring about .010in. thick Fig. 5(c). The 1/4in. square pieces of paxolin fastened to one end of each piece serve the definite purpose of isolating the user from possible shock, and under no circumstances should they be omitted. The side elevation of Fig. 5(b) shows two rows of contacts with controls, i.e., 1, 3 and 5 second row. 6, 8 and 10 fourth row; the first row 2 and 4 and third row 7 and 9 being omitted for sake of clarity.

Electrode Selector

This consists of two wafers, each of the one-pole twelve-way type, mounted on one spindle.

In Fig. 1 the wafers are shown separate to give a clear understanding of how they should be wired. Note that pin No. 3 is selected on both wafers. It must be observed that the pointer knob should be pointing to the pin numbers on the dial in relation to the correct pin numbers of the double-bank wafer switches. Since this type of switch is usually the fully clockwise type, i.e., without stops, it is suggested that the switch be set in No. 1 position and a small saw cut made on the spindle half way across its diameter facing No. 1 position on the dial. The purpose of this is in case the knob should work loose, and quick reference can be made to the pin number to which the saw cut is pointing (See Fig. 4).

Leads and Adaptors

There are several ways of making up the leads and adaptors. One lead could consist of a 10-pin plug and eight-way cable with octal valve base plug at the other end, as in the original model. To meet present day requirements the contents in Table will show one method; and a suitable length for the cable is 18in. which should be wired up preferably with colour-coded leads built up round a flexible core consisting of either thick cord or rubber.

Operating Instructions

(1) Set the "volts/current" switch to the "current" position or "volts" position as necessary.

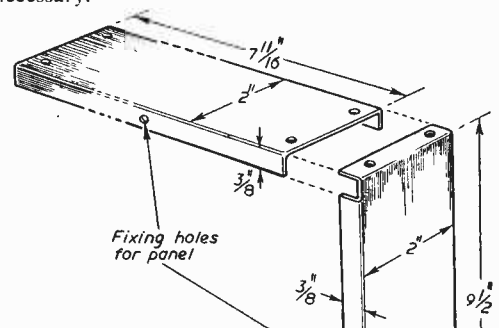


Fig. 3.—Details of the cabinet construction.

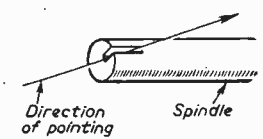


Fig. 4.—Saw-cut on spindle of electrode selector.

Fig. 5.—Electrode make-and-break switch unit, drilling data and spring contact details.

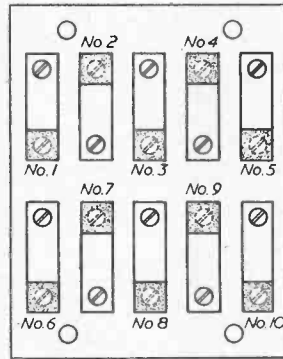
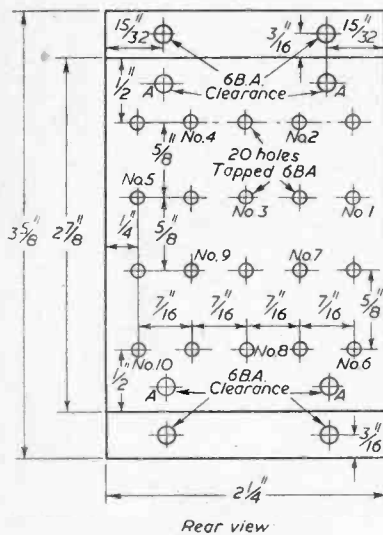
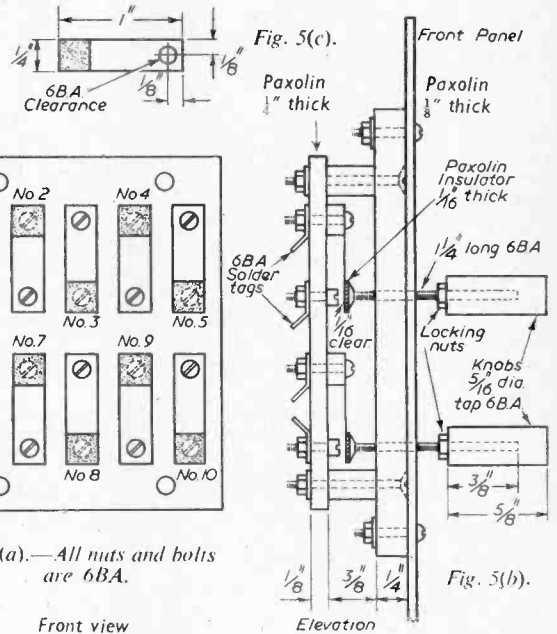


Fig. 5(a).—All nuts and bolts are 6BA.



(2) Set "reverse/normal" switch to "normal" for anode and screen grid currents.

(3) Set "reverse/normal" switch to "reverse" when measuring total current of valve, as in the cathode circuit.

(4) Select required pin number of electrode on "electrode selector" for volts or current checks.

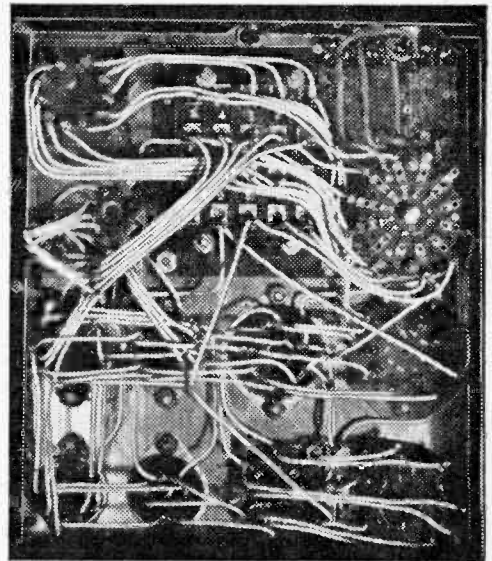
(5) All contacts on "electrode make and break unit" should be closed for voltage checks.

(6) For current checks, break (unscrew) selected electrode contact.

(7) For voltage checks a lead should be taken to the receiver chassis via M.C. of the analyser in the case of an A.C. only circuit, but in the A.C./D.C. circuit, connection must be made to the negative rail and not true chassis.

(8) Make sure the meters are connected with correct polarity to the correct meter terminals of the analyser, and that they are set to their highest ranges on each individual test, reducing as necessary. As soon as the test is complete, return the meter to its highest range immediately.

(9) Switching from one electrode to another while receiver is still switched on, applies only when electrodes with similar potentials are next to each other regards to their pin numbers. Otherwise switch off receiver before setting up.



View of the underside showing the wiring.

Leads		Receiver Adaptors		
Analyser plug	Cable	Receiver plug	Valve holder	Valve base (plug)
10 pin	9 way	B9A	B9A	B9G
10 pin	8 way	B8A	B9A	BR9
10 pin	7 way	B7G	B8A	108
Details of Leads and Adaptors mentioned on page 289			B8A	MO8
			B8A	B8G
			B8A	8SC
			B7G	BR7
			B7G	BR5
			B7G	BR4

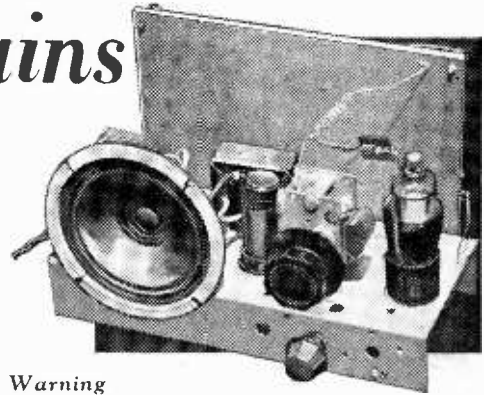
Position of the "reverse/normal" switch is not important when "volts current" switch is in "volts" position, but must be observed when measuring current.

Beginners' Mains 2-Valver

AN INEXPENSIVE RECEIVER WHICH USES
A MINIMUM NUMBER OF COMPONENTS

By R. F. Graham

(Concluded from page 204 of the May issue)



Operating Details

As the frame aerial is directional, some increase in volume can be achieved by turning the set, if necessary. For an external aerial a few feet of insulated flex will be sufficient, and this can be arranged anywhere in the room, as convenient. The 100 pF condenser included in the component list should be soldered to the fixed plates tag of the tuning condenser. The aerial is then taken to the free tag of the 100 pF condenser. This fixed condenser should never be omitted. It should also be of high quality manufacture, as it keeps mains voltages out of the aerial lead in the event of mains connections being reversed in error.

For local stations no aerial is required. For more distant reception a few experiments can be made to obtain the best signal pick-up. It is also best to keep the aerial wire away from house wiring, or interference may be introduced into the set. In the event of mains interference proving troublesome, a .05 μF, 750 v.w. condenser can be wired from rectifier negative to receiver chassis.

A Warning

As this receiver is intended for the beginner, a word of warning will not be out of place here. If the circuit diagram (Fig. 1, page 202 of last month's issue) is studied, it will be seen that the mains input is taken on one side to the rectifier, but on the other it is connected direct to the chassis. It is of the utmost importance, therefore, that the mains connections as detailed last month be carefully followed. In addition it is worth while to fill the screw holes (which take the grub screws of the tuning and reaction condenser) with wax or Chatterton's compound. If this precaution is not taken it is possible for your finger to come into contact with the grub screw and thus be in direct contact with one side of the mains. Although this is not dangerous if the mains are properly connected, you may feel a tingling sensation. As already mentioned, a wooden cabinet and an insulated panel—either paxolin, three-ply wood or similar material—will make the receiver shock-proof, but if you have to carry out any servicing adjustments, remember that the chassis is "live" to part of the mains supply.

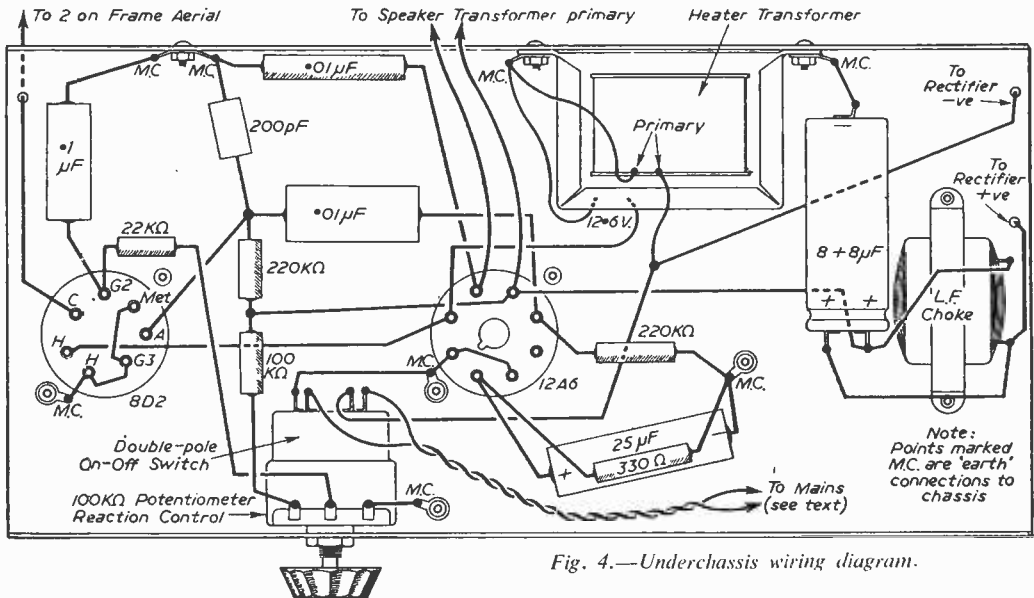
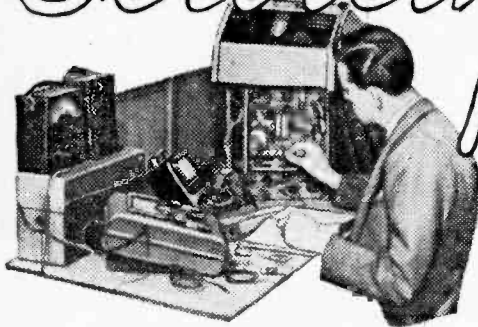


Fig. 4.—Underchassis wiring diagram.

Servicing Radio Receivers



THIS MONTH G.E.C. MODEL BC5645 IS CONSIDERED

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

(Continued from page 137 April issue)

CONTINUING our servicing notes on the G.E.C. range of receivers, we deal this month with Model BC5645. In the April issue we dealt with Model 5842 (and its associated models) and it should be noted that the circuits and other data given in the April issue relate to Model 5645, whilst those included in this issue are of the 5842 model. It will be interesting to compare the two essential circuit diagrams in order to see what differences the makers have made. Model 5842 was first released in August, 1955, and Model 5645 was released in August, 1956.

Model BC5645 is a table receiver covering the V.H.F.-F.M. band as well as the ordinary L.W. and M.W. bands. The V.H.F. section is tuneable over the range 87.5-100 Mc/s, the M.W. over 0.55-1.6 Mc/s (545-187 metres) and the L.W. over 160-270 Kc/s (1,900-1,100 metres). The receiver is for use on A.C.-only mains supplies from 40 to 100 c/s, and has a power consumption of approximately 50 watts when working correctly.

Aerials

Internal aerials are featured for both A.M. and F.M. services, but are recommended only in areas of strong signal. In locations removed from a powerful transmitter, it is advisable to employ outside aerials and an efficient earth. The aerial for M.W. and L.W. reception is of the "frame" variety, while the F.M. aerial is in the form of tinfoil on the back panel.

A low-impedance (three-ohm) permanent magnet loudspeaker of the elliptical kind measuring 8in. X 5in. is utilised and is capable of very good quality reproduction. Terminals are also available on the rear of the chassis for the connection of an extension loudspeaker of similar impedance.

Model BC7445

This is a table radiogram which uses the BC5645 chassis. In addition, two 5in. diameter treble loudspeakers are connected in parallel with the elliptical unit through four 1 μ F capacitors

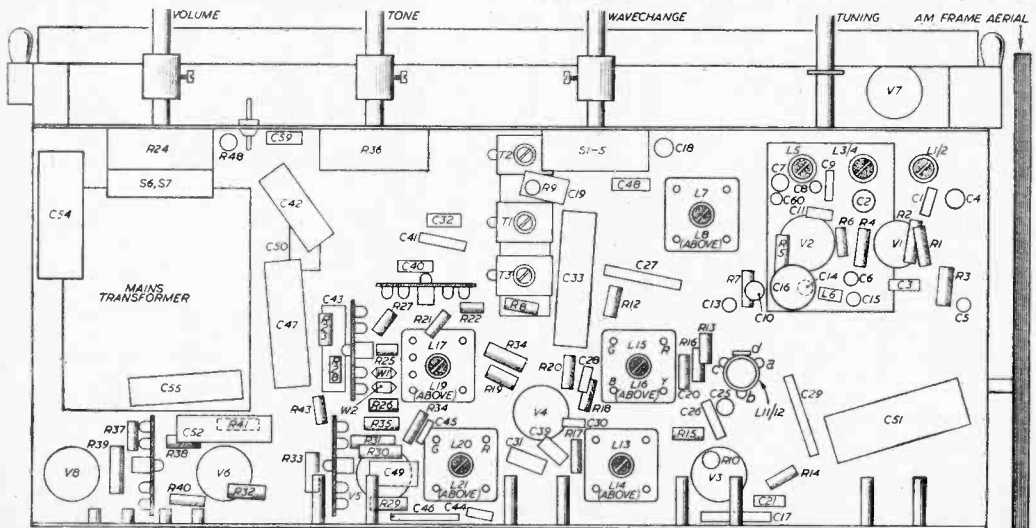


Fig. 1.—Underside view of the chassis of Model BC5842.

wired in parallel which serve as a high-pass filter.

A Collaro Type 4/564 four-speed record player is incorporated, and this is fitted with a type "O" crystal insert with a type 5304/L long playing stylus and a type 5304/N stylus for "standard" 78 r.p.m. records. The styli are easily taken out by removing the small screws which secure them to either side of the cartridge, this being of the "turnover" variety. The motor unit has a power consumption of approximately 14 wats.

The Circuit

The complete circuit of both models is given in Figs. 1(a) and 1(b) (April issue). Valves V1 and V2 are switched in only on F.M. and then serve as R.F. amplifier and frequency changer respectively. Valve V3 is the frequency changer on A.M. only, but is converted to an I.F. amplifier when the set is switched to F.M. V4 is the I.F. amplifier common to both A.M. and F.M., the anode circuit being loaded with the A.M. and F.M. I.F. transformers in series. V5 triode section serves as a common A.F. voltage amplifier, while the two diodes act as A.M. detector and A.G.C. rectifier. V6 is the output valve and V7 the H.T. rectifier valve.

Ratio Detector

The F.M. demodulator is a ratio detector and uses two type GEX34 germanium crystal diodes. It will be recalled that this method is not always utilised, as in the majority of A.M./F.M. receivers a triple-diode-triode valve invariably performs as A.M. detector and F.M. ratio detector as well as providing an A.G.C. bias and A.F. voltage amplification. However, the germanium diode arrangement results in a less complex circuit.

The V.H.F. and A.M. tuning capacitors are ganged to a common spindle and drive. When the receiver is switched to F.M. the A.M. oscillator is muted by R7 being connected in series with C15 across the oscillator circuit.

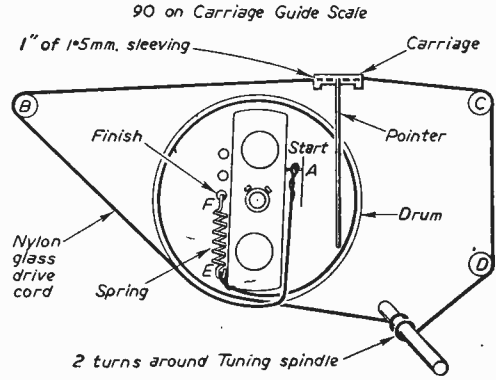


Fig. 2.—Tuning drive data for Model 5842.

Switch section S3 caters for this action. Switch section S5 energises the V.H.F. tuner section, while switch section S1 connects the V.H.F. I.F. signal to the signal grid of V3. Switch section S4 selects either the ratio detector or A.M. detector output. In the former case, de-emphasis is given by R18 and C36.

A.M. Operation

When the receiver is switched to the A.M. bands the load is removed from the A.M. oscillator circuit; power is removed from the V.H.F. tuner section, the A.M. detector is introduced and the circuits operate much after the style of an ordinary A.M. set. A.G.C. bias is

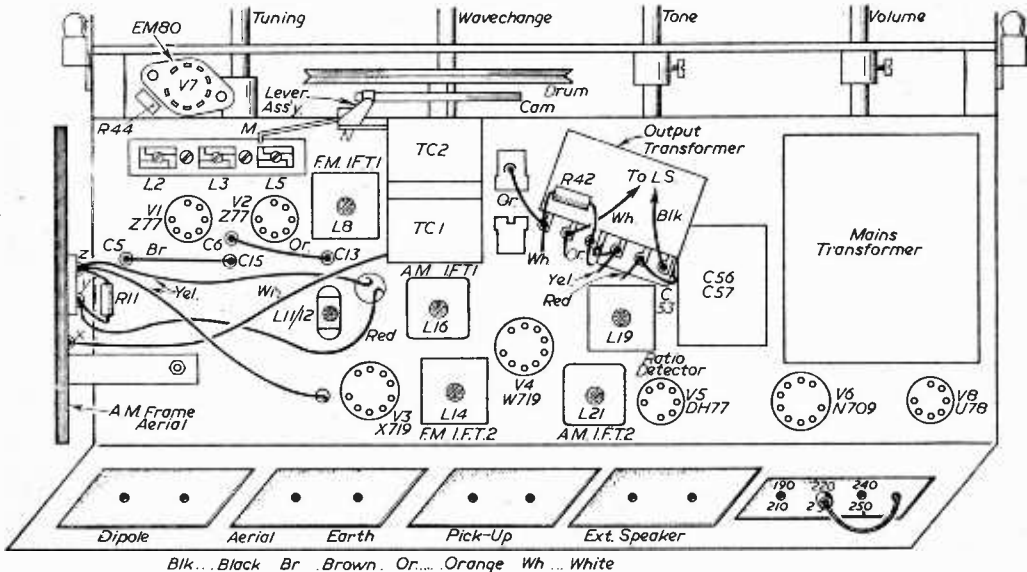


Fig. 3.—Top view of chassis of Model 5842.

provided by the diode connected to pin 5 on V5, this being coupled from the I.F. aspect through C43, and R29 acting as the diode load. The A.G.C. bias is conveyed through R30 and R9 and is decoupled (filtered) by C28.

On both services, and also on gram, a simple top-cut tone control system is utilised. The tone control R31 is also combined with the on/off switch S6/7. The control of volume is accomplished in the usual manner, the volume control R20 being connected across the audio supply from either the ratio detector or A.M. detector through the coupling capacitors. The required level of audio is picked up from the volume control and coupled to the grid of V5 triode through C39.

Servicing Notes

The table model is easily dismantled by first removing the four screws which hold the back

panel, removing the control knobs, which are spring fitted (they simply pull off) removing the two chassis fixing screws and spacers at the chassis rear and then withdrawing the chassis from the cabinet. Complete removal of the chassis will require the disconnection of the speaker leads. It should also be noticed that a felt washer is employed between the tuning and wavechange knobs.

With the table gram, dismantling is a little more involved. The back panel should first be removed by extracting the three retaining screws. Next, the control knobs should be pulled off and then the two chassis fixing screws and spacer bars should be removed. The two treble speakers are secured by four wing-nuts and brass spacers, and these should be released so that the speakers can be placed face-down behind the cabinet as far as the leads permit. Finally, the chassis should be withdrawn from the cabinet with the

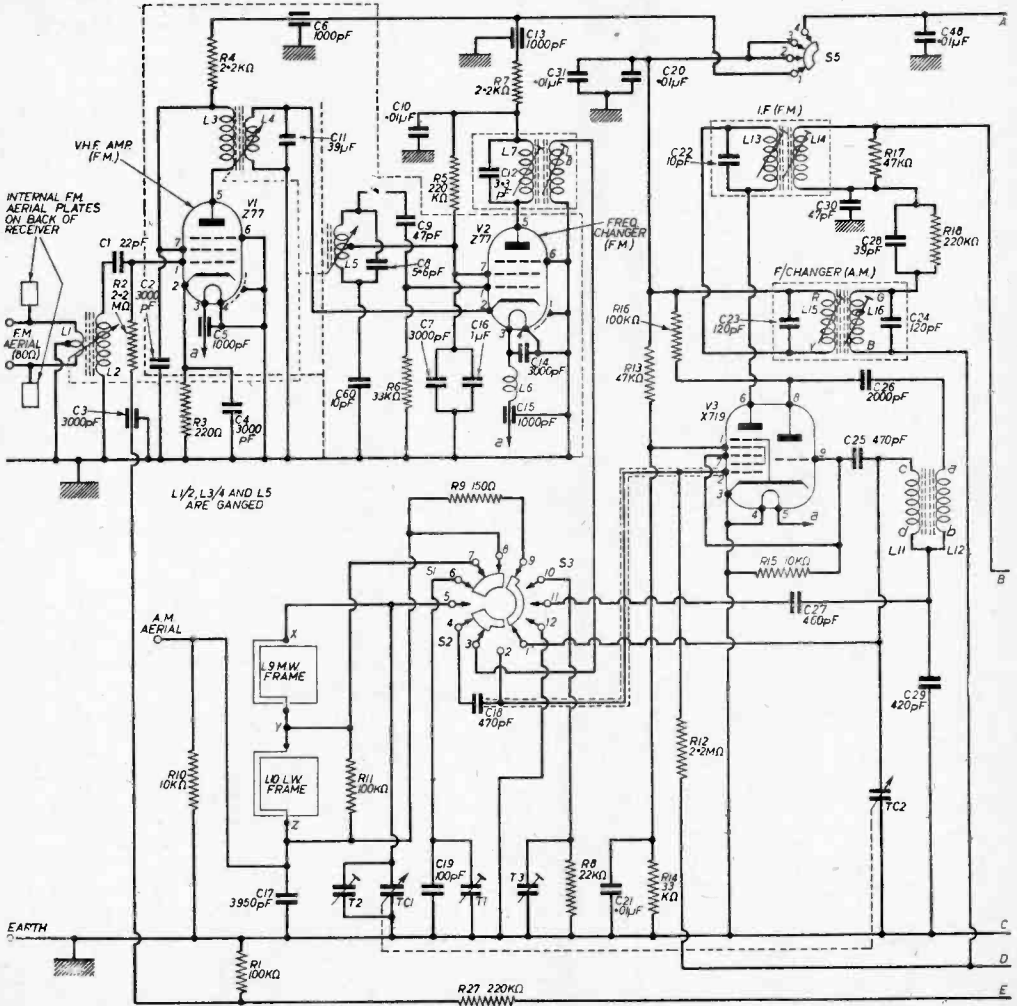


Fig. 4(a).—A.M. and F.M. frequency changer stages of Model 5842.

utmost caution, taking care to avoid damaging the frame aerial on the speaker fixing bolts protruding from the inside left of the cabinet. While the chassis is being withdrawn, the two speakers should be manoeuvred over the chassis so that they can be placed face down on the floor of the cabinet with the chassis outside.

Disconnecting

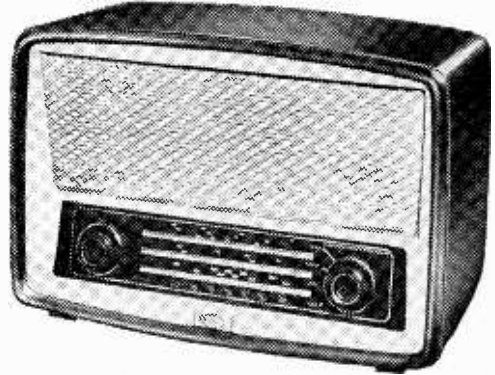
The auto-change unit is removed first by disconnecting the mains supply lead from the mains transformer, the pick-up leads from the pick-up terminals and the earth lead from the tag on the top of the 32 + 32 + 32 μ F electrolytic capacitor unit. The turntable should next be removed and then the three pairs of nuts below the motor board can be undone so as to release the player, which may then be withdrawn from the cabinet. It will be observed that the heavy copper springs are positioned above the motor board, while the plated springs are positioned below the motor board. This sequence must be followed when replacing.

Dial Drive

Full details for replacing the dial drive are given in Fig. 4 (April). It should be noted that in some early versions, damage may result to the drive cord on removing the tuning control knob. This is due to the tuning control sleeve being free to move, but is avoided on later versions by means of a special bracket being fitted over the collar of the sleeve and the control securing

locknut. This bracket can be obtained from the makers (part No. RP124889) for fitting to the early versions if required.

The dial lamps are rated at 6.3 v. 0.3 A and have an M.E.S. fitting. These should be of the



G.E.C. Model BC5645.

Osram type OS75 so as to ensure adequate illumination and optimum life. The stipulated G.E.C. or Osram valves should also be used to ensure the best performance.

Instability

Instability sometimes occurs in early versions (Continued on page 304)

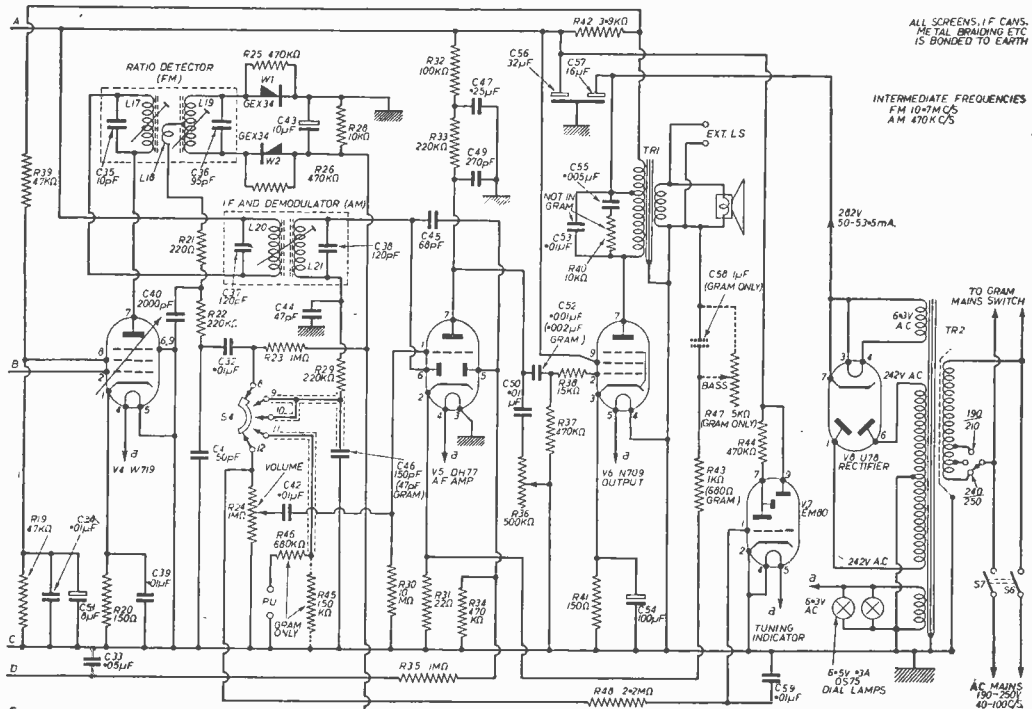


Fig. 4(b).—I.F., audio and output stages of Model 5842.

A Record Player Auto-stop

A SIMPLE ADAPTATION FOR SWITCHING THE MOTOR
By T. C. Smith

THERE are at the present time a great number of record player units on the market. Very few of these incorporate an auto-stop mechanism for turning the motor off at the end of each record. The author recently purchased a four-speed Collaro unit with Acos pick-up, and little difficulty was experienced in converting it to automatic action. The underlying principle is that the rotation of the pick-up arm as it traverses the record and reaches the run-off groove operates a switch which turns the motor off. It is restarted by moving the pick-up backwards past the pick-up rest. The switching is entirely independent of the size and speed of the record.

Switch

It will be realised that little pressure is available from the pick-up to operate the switch. The type employed in this design was from the Bulgin micro-switch range (Type 530/L) with leaf-blade operator. The switch is a single-pole double-throw type and so it may be used either as an on/off or as an off/on (i.e., it may be either "on" or "off" when depressed). In this unit the switch is required to be in the "on" position when it is depressed and "off" when the pressure is released. The correct tags may be found by using a torch battery and bulb. The switch is rated at 250 v. 1.5 amp. and so is adequate for the job.

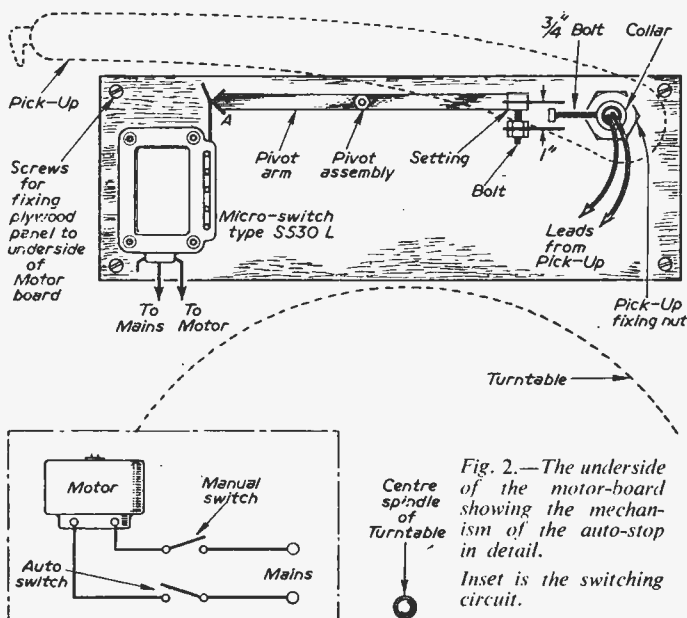


Fig. 2.—The underside of the motor-board showing the mechanism of the auto-stop in detail. Inset is the switching circuit.

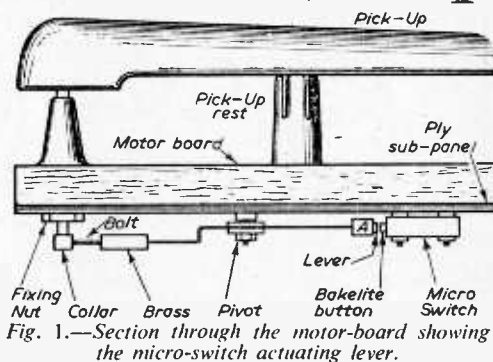


Fig. 1.—Section through the motor-board showing the micro-switch actuating lever.

Construction and Layout

Obtain a collar of $\frac{1}{4}$ in. inner diameter. A spindle coupler could be used or the brass insert from a control knob, provided it has both ends open. The reason for this is that the pick-up leads must be threaded through it. The prototype was built on a small piece of ply, which was then screwed down to the baseboard, but there is no reason why it should not be built direct on to the board. The pivot arm was made from brass and this material was found to be very easy to work. Aluminium or steel may be used instead of brass, but then nuts and bolts will have to be used instead of solder. The mechanism which determines the stopping and restarting of the motor consists of two pieces of brass joined together by a $\frac{1}{4}$ in. bolt. The distance between the two pieces of brass can be varied by moving the bolt.

One of these pieces of brass is soldered to the pivot arm. The pivot itself is made up from a small bolt, nuts and washers. At the other end the pivot is arrow shaped. The arm must move freely, as any stiffness in its action will result in the pick-up being pushed back over the record. The position of the micro-switch is critical and care must be taken to ensure that when it is in the "on" (depressed) position the arm is perpendicular to the blade operator. This has the effect of locking the switch in the "on" position.

Setting Up

When the mechanism has been completed the setting up may be undertaken. First the $\frac{1}{4}$ in. bolt and collar are moved round the pick-up spindle until the pivot arm moves the micro-switch into the "on" position when the pick-up arm is 1-1 $\frac{1}{2}$ in. past the pick-up rest. Now place a record on the turntable, move pick-up back to

(Continued on page 302)

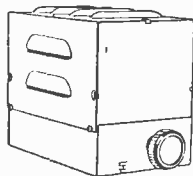
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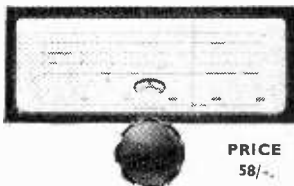
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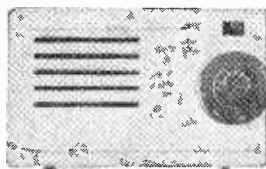
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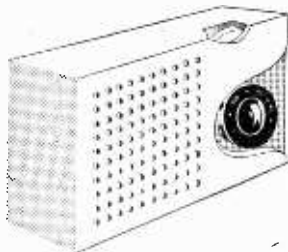
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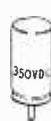
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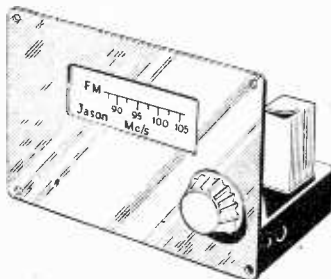
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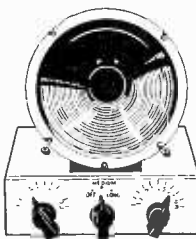
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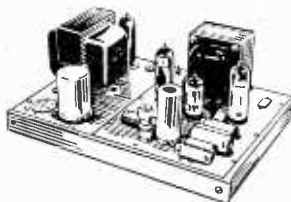


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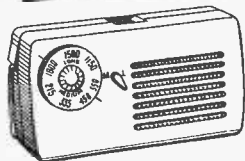
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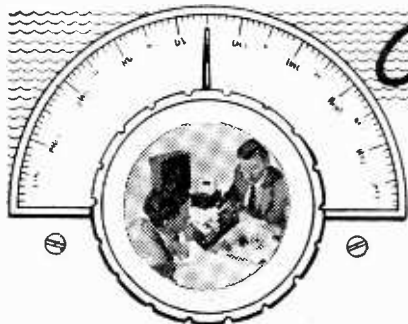
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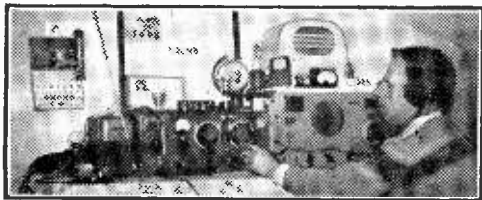
BY THERMION

Bygone Days

A LETTER from Mr. H. Constable, of Shepherds Bush, saddened me. Mr. Constable winds his own coils for the receivers he builds and recently he went into a radio components shop to buy a coil former 1in. in diameter and 2in. long. The superior-looking assistant looked blank and said, "I think you mean a 2 to 1 step-down transformer, sir." Mr. Constable tried to explain, but the assistant had not the slightest idea of what was wanted. Years ago, pride was taken in building as much as possible of a receiver oneself. Nowadays, it seems that one is expected to buy all the parts ready-made or be classed as an old-fashioned eccentric.

Constructional Kits

THERE are now many manufacturers and dealers who offer for sale kits of parts for home construction. Included in the range are



S. D. Wright (G7985), of Sheffield, operating his R.208 set.

crystal receivers, oscilloscopes, multimeters, valve voltmeters, V.H.F./F.M. receivers and audio amplifiers. By buying a kit of parts rather than the completed article, it is possible to save an appreciable sum. Therefore, it is not surprising that the sales of kits are rapidly increasing and more and more traders are entering the market.

Many of those who buy kits know very little indeed about radio or electronics but, since the kits are supplied with "comprehensive instructions", these people have no hesitation in spending their money. It was with this thought in mind that I recently visited several dealers and bought some half-dozen kits. Of course, I went on my spending spree quite anonymously.

During the following few weeks I spent much of my leisure time in building and assessing the performance of these kits, following the instructions carefully just as would someone with

little or no technical knowledge. In almost every instance, I found that the instructions enclosed with the kit were far from "comprehensive". All assumed that the builder was familiar with the soldering of components to tags, etc. Is this assumption valid? I think not. Many "technical" people cannot solder well, let alone those who are making a first attempt.

Another very annoying assumption was that all would know the resistor and capacitor colour codes. The resistor code is more well known than the capacitor codes (there are several) as is evidenced by the fact that only one of some twenty of my technical acquaintances could tell me the capacity of a small tubular ceramic condenser which I produced and even he could not read the temperature co-efficient marking.



R. Ablett repairing a "38" transceiver.

A really detailed order of assembly was another omission. How annoying it is to find that in order to complete the assembly of the chassis, front panel, etc., it will be necessary to start almost at the beginning again just because part Z was fitted before part X in error.

I suggest to those who produce kits of any kind that they make a careful revision of their assembly instructions.

Should I Be Sacked?

THE other day the Editor passed over to me a letter from a Mr. Cleaton, of Stamford Brook. Mr. Cleaton suggests that the Editor is shirking his duties in allowing me space. He (Mr. Cleaton) likes neither my writings nor my views and thinks that my efforts to preserve the correct pronunciation of our language are wasted.

Mr. Cleaton ends his letter with the inference that I am old, doddering and on my last legs. Whilst I am not so young as I used to be, I refuse to consider the idea that I am showing signs of old age.

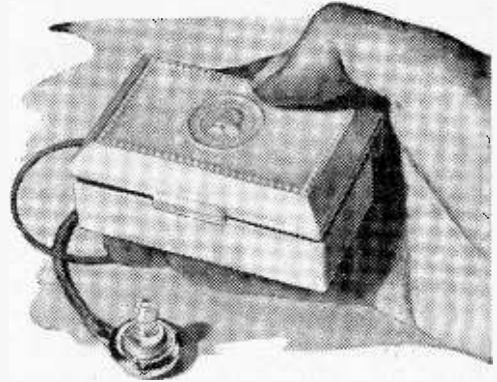
How hard is the task of a contributor! If he is outspoken he is too forthright. If he dons the velvet glove he is not sufficiently outspoken. The views I have are not formed lightly and I shall continue to express them with the same vigour as hitherto. I do not expect all to agree with me.

IF resistors R7 and R8 are replaced by a 20 KΩ potentiometer while testing, as suggested last month, the potentiometer should be adjusted so that the current taken by the receiver is in the region of 1 mA.

Tuning Components

The aerial winding is on a ferrite slab 2½ in. long, which was broken off a longer piece. The material is brittle, but it was found possible to form a groove around it by using an old hacksaw blade. It was then inserted in a vice and snapped at the groove by pressing a flat-iron against it. The part remaining in the vice broke in two, but the other piece was obtained intact.

Transparent tape is used to hold the end turns



A Direct-Coupled Transistor Receiver

THE CONSTRUCTION, WIRING AND OPERATION OF THIS COMPACT SET WHICH USES STANDARD COMPONENTS

By W. Cleland

(Continued from page 228 of the May issue)

in place, and also to fasten the aerial to the panel, the tape being passed through a slot in the panel.

The winding begins ¼ in. from the end of the ferrite slab, which is first wrapped with trans-

parent tape. The screw adjustment is gradual, especially at the low capacitance end where most required. For tuning, a maximum value of 500 pF is used, and this gives coverage of the medium waves between end frequencies in the ratio of 2:1—not as wide a range as with standard air-spaced condensers, but sufficient in some areas to enable the Home, Light and Third Programmes to be heard on the medium waves.

The trimmers are modified by replacing the fitted screws by 6 B.A. bolts ¼ in. long. Plastic caps from toothpaste tubes are drilled and fitted on the bolts as miniature knobs.

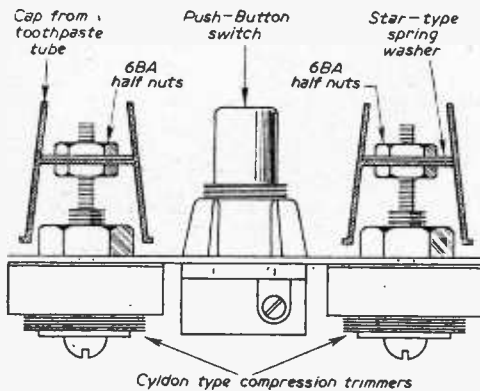


Fig. 4.—Section through the trimmers.

parent tape, and consists of 50 turns close-wound of 28 s.w.g. enamelled wire. A tapping is taken out at 10 turns by the usual method of making a twisted loop.

Condenser

The difficulty of procuring a really small tuning condenser was overcome by adapting mica compression trimmers. These are entirely satisfactory as sub-miniature variable condensers

Blobs of solder applied when bent and rivetted in position

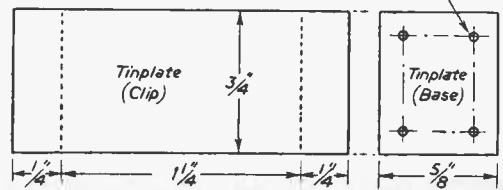
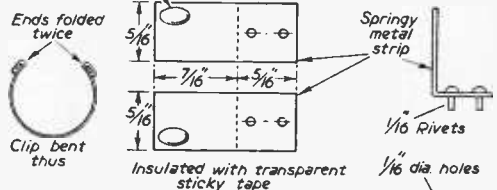


Fig. 5.—Details of the fittings for the 1.5 v. cell.

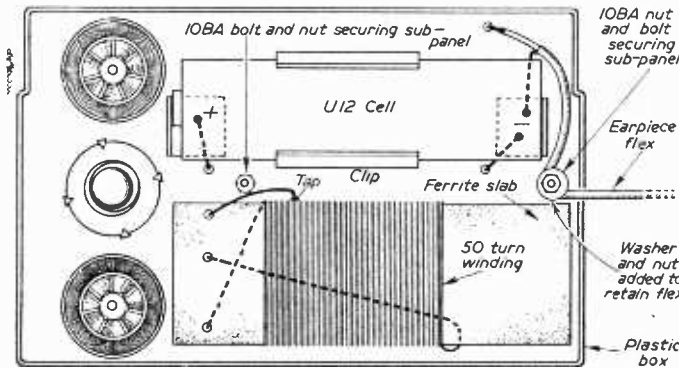


Fig. 6.—Top view of the receiver.

half-nut is first positioned on the bolt to give the required minimum setting. The knob is then put on, and secured by another half-nut with a spring washer. If possible, the latter should be of the star-shaped type, as these grip very firmly.

Battery

Although the current required by the set is only about 1 mA, it was thought worth while to use a U12 battery rather than a smaller one, to give a long period of use before replacement becomes necessary. The battery is held in a tinfole clip, and makes contact with spring strips at the end. These are so insulated that if the battery should by mistake be inserted the wrong way round, no contact will be made, thus avoiding damage to the transistors.

The battery clip is soldered to another piece of tinfole, riveted to the panel. Carrying out this process may blister the panel, but with care it will usually turn out successfully. The contact strips are each fastened with a couple of rivets. The rivets used are round-headed copper ones 1/16in. in diameter and 1/4in. long. A flat-iron held in a vice makes a suitable anvil, and it is only necessary to take care that every blow of the hammer lands solidly on the rivet and nowhere else. Hammering, of course, should stop once the rivet is firm, in order to avoid cracking the panel.

The projections of the rivets on the underside of the panel can be filed down slightly and pieces of transparent sticky tape then applied for insulation.

Contacts

Springy metal for the contact strips was obtained by dismantling a Jones socket. After cutting and drilling the two pieces required, these were bent and riveted in place, and then insulated by wrapping three turns of tape around each of them. A spot of this insulation was then flaked off with a razor blade and a blob of solder applied to form a raised contact area. The contact on one strip should be at the side opposite to that on the other, so that the one gives contact at the centre (for the carbon or positive electrode) and the other at the side. The contact strips are positioned somewhat off

the centre line of the 1.5-volt battery, to assist in this arrangement.

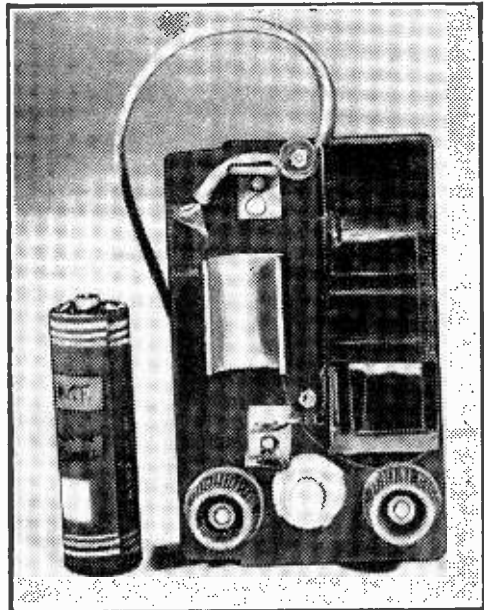
The work of making these fittings for the battery can be avoided if direct-soldered connections are used. It then takes longer to replace the battery, but the risk of faulty contact is avoided. Low-resistance contact is essential, otherwise a howl will occur, owing to common coupling through the supply impedance. The internal resistance of the battery plus the contact resistance must not rise above 20 ohms or so. Trouble from this cause can be eliminated by connecting a 25 μ F capacitor between the positive and

negative lines of the receiver, but it was decided that this could safely be omitted, as the contacts can be bent to make better contact if this should become necessary.

The same difficulty arises if it is desired to insert a 5 mA meter temporarily in series with the battery for current measurement, but it may be overcome by shunting the meter with a 25 μ F condenser.

Wiring

The receiver is constructed on a panel of 1/16in. insulating material measuring approximately 2 1/4in. \times 1 1/4in., filed a little to slip easily into the plastic box which houses the set. To the main panel a sub-panel is attached by two 10 B.A. bolts, on which the smaller components, including the transistors, are mounted. The connecting points on the sub-panel are counter-



The receiver and its battery.

sunk 10 B.A. brass bolts, $\frac{1}{4}$ in. long with nuts. These make neat soldering spills which can be spaced as little as $\frac{3}{16}$ in. apart where necessary. Preliminary tinning should be carried out rapidly to avoid loosening them.

There is no need to use stout connecting wire in a miniature receiver. Tinned copper fuse wire of a thin gauge is more suitable. The resistors used were of the ordinary $\frac{1}{4}$ watt type, but advantage could be taken of the smaller resistors that are available, although some of these have rather thick leads for their size and are easily broken. Similarly, a sub-miniature 25 μ F capacitor may be used in place of the miniature one. A small ceramic by-pass capacitor of a type used in television is required for C4. Actually the receiver will work with this condenser omitted, but the performance is impaired at the top end of the medium waveband.

Aerial Connections

The leads from the aerial winding and from the battery pass through $\frac{1}{16}$ in. holes in the panels. So also does one lead from the earpiece flex. For convenience of wiring, the miniature press on-off switch was put in the positive line. The last components to be soldered in are the transistors. Their leads should be insulated with thin sleeving, and need not be shortened, as they

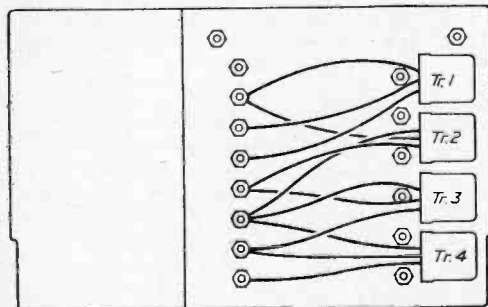


Fig. 8.—Wiring in the transistors. Sleeving is required on all of the leads.

can be wound around the bolts several times if necessary.

Care taken to keep the heat of the soldering iron away from the transistors is very necessary. A transistor damaged from this cause will show a large increase in leakage current and a decrease of current gain. An R.F. transistor which previously gave good results can easily be made quite useless. Miniature electrolytic condensers are also easily damaged by the soldering iron. To avoid this, the soldering iron should be sufficiently hot and well-tinned, and soldering should be done efficiently and rapidly.

An earpiece flex with plugs at the ends is easy to replace, but a yard of fine-screened cable was used instead, with the screening as one conductor. The inner conductor is led through a hole in the panels to a soldering spill underneath. The flex is retained between a 10 B.A. securing bolt and the ferrite aerial, with a $\frac{1}{4}$ in. dia. washer on top. A notch is required in the plastic case to enable the flex to pass through.

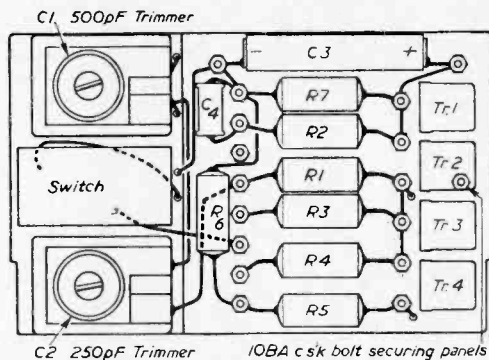


Fig. 7.—Underside view of the receiver. The transistor leads are omitted for clarity.

The Case

The receiver was fitted into a small plastic box which was obtained as a hairgrip box from a large store. The receiver can, of course, work without a container, but it needs some protection if it is to be carried about.

After completing and checking the wiring, the battery can be inserted, the carbon electrode towards the end of the set with the controls. On switching on, with the reaction control at minimum, background noise should be heard. Reaction is then increased until on turning the tuning knob the local stations become audible. It is necessary to turn the receiver so that the ferrite slab is roughly perpendicular to the direction of the station.

As with the majority of regenerative circuits, it will be found that the reaction and tuning controls are to some extent dependent on each other. However, with a little patience in adjusting the controls, it should be possible to obtain adequate volume without excessive distortion, and reception will be possible under many varied conditions.

A RECORD PLAYER AUTO-STOP

(Continued from page 296)

start the motor and place the pick-up on the edge of the record. Most probably the motor will stop in the middle of the record. If this happens adjust the setting nut (see diagram), increasing the distance between the two arms. If the motor fails to stop before the pick-up reaches the end of the record the distance will have to be decreased. The motor should cut off at the beginning of the run-off groove. One final fault is that the pick-up refuses to turn the motor off, and slides back over the record. In this case the pivot arm is not acting freely and this can be remedied by loosening the pivot nut.

If the pivot arm tends to spring back too far when the micro switch is actuated it may be found necessary to position two bolts or screws in the ply sub-panel to limit its travel.

In conclusion the unit has been found to operate well and the only indication that the motor has been switched off is a slight click.

A NOVEL VOLT/OHM METER

By W. R. Masfield

AN UNUSUAL METHOD OF MAKING MEASUREMENTS WHICH USES A NEON SAWTOOTH GENERATOR

A DIFFICULTY frequently met when measuring anode and screen voltages, or, indeed, any high voltage at the end of a large value resistor is that the meter draws so much current that the voltage across the resistor reduces the voltage across the meter, and so gives a false reading. An inexpensive way of overcoming this difficulty, without resorting to a sensitive

the neon until its PD falls to the extinguishing voltage. The charge and discharge continues at a rate depending on the time constant of R1 and C1, and on the H.T., as shown in Fig. 2(a) and (b).

Values for R1 and C1 can be obtained from the equation for charge of a capacitor through a resistor:

$$V_1 = V_2 \left[1 - \exp \left(-\frac{T}{RC} \right) \right]$$

where V_0 is the difference in potential between striking and extinguishing voltages; V_2 is the difference between the maximum D.C. voltage to be used and the extinguishing voltage; T is the period of one tooth in seconds (assuming the discharge time is very short compared with the charge time); C is the value of C1 in Farads and R is the value of R1 in ohms.

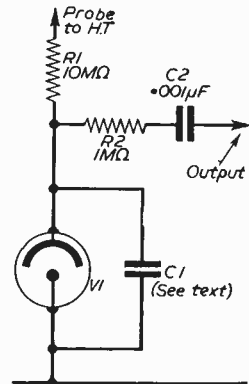


Fig. 1.—The circuit of a "Radio Pen."

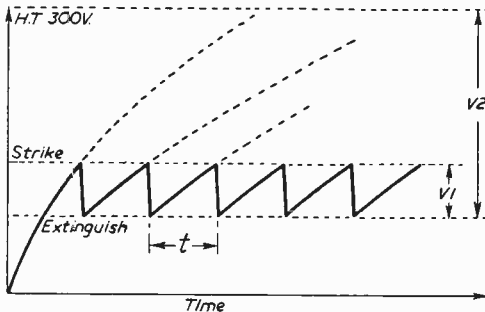


Fig. 2(a).—Output waveform of the sawtooth generator.

meter or a valve-voltmeter, is available to those who possess one of those neon testers which gives an audio output when connected to a D.C. potential between 90 and 300 volts. Such devices are available for a modest sum, and usually appear in the form of so-called "Radio Pens."

Sawtooth Generator

The "Radio Pen" is really a sawtooth generator, and it is not difficult to make one up, based on the circuit given in Fig. 1. V1 is a small neon indicator lamp, having a striking potential in the region of 110 v., and an extinguishing potential of about 90 v. When the probe is connected to a higher D.C. voltage, capacitor C1 begins to charge slowly through the high resistor R1, until the potential difference across it reaches the striking voltage of the neon. Then the capacitor discharges rapidly through the low resistance path of

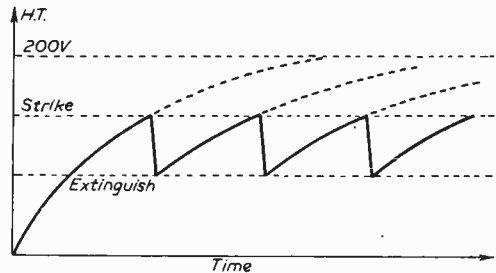


Fig. 2(b).—A lower value of H.T. voltage alters the frequency.

For a neon, striking at 110 v., extinguishing at 90 v., and assuming 300 v. to be the maximum. T to be 1/5,000 secs. (i.e., frequency is to be 5 kc/s), then the time constant CR will be 1/500 secs. It is best to make R1 large, say 10 meg-ohms; C1 will then be 200 pF.

Output

The output is taken via R2 and C2, these presenting a high impedance so as not to load the generator excessively.

The frequency of the audio signal varies from about 300 to 5,000 cycles per second as the voltage is raised from the striking voltage up to about 300 v., and the makers of the pen say that with a little practice it is possible to judge the voltage by listening to the note. It occurred to me that one could be rather more precise and match the note heard with that produced across a variable

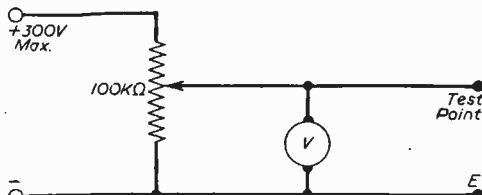


Fig. 3.—Circuit for obtaining the reference voltage.

supply whose voltage could be measured by an ordinary (inexpensive) meter. The basic circuit is simply that shown in Fig. 3.

Using the Meter

In use, all one has to do is to put the probe of the neon tester to the unknown voltage point in the equipment under test, listen to the audio note, then to transfer the probe to the test point of Fig. 3 and adjust the potentiometer until the

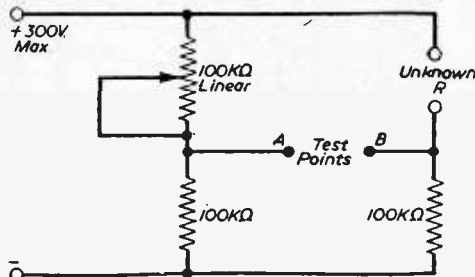


Fig. 4.—Circuit for resistance measurement.

same note is heard. The test point is then at the same potential as the unknown voltage, and the value is read off on the meter. It is not even necessary to have a separate supply for the tester; the potentiometer can be connected by clip leads to the supply of the equipment under test.

A slight addition to the circuit will enable the neon tester to be used for measuring an unknown

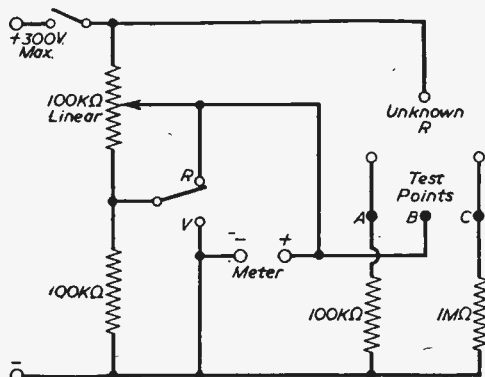


Fig. 5.—A composite circuit for measuring volts and ohms.

resistor with a reasonable degree of accuracy, even in the 10 megohm range. The basic circuit is shown in Fig. 4. The unknown resistor is connected across the terminals and the neon probe applied to point B. A note is heard, the pitch depending on the potential at B. The neon probe is then transferred to point A and the variable resistor is adjusted until the same note is heard. Point A is now at the same potential as B and therefore the value of the variable resistor must be the same as the value of the unknown resistor. Obviously, a calibrated resistor is required. This may be achieved by reference to borrowed equipment, or, more independently, by connecting several different but known resistors

across the terminals, adjusting the variable resistor for the same audio note and marking the positions on a dial attached to the variable resistor spindle.

Range

The range is easily extended, say, to 1 MΩ, by substituting a 1 MΩ resistor from point B to negative, and multiplying the variable resistor readings by 10. Or to 10 MΩ by a 10 MΩ resistor and multiplying by 100.

Fig. 5 shows a composite circuit on these lines, allowing voltages or resistors to be measured. The changeover switch chooses the facility, and two test points (A and C) provide for two ranges of resistance measurement.

SERVICING RADIO RECEIVERS

(Continued from page 295)

when the internal plate aerial is utilised on V.H.F. This can be remedied by connecting a lead from pin 6 of V2 to chassis at a point immediately below the tag. Attention should also be directed to the white lead from TC3 section of the tuning gang, ensuring that it is kept as far as possible away from the gang tags. The yellow H.T. lead to V1, pin 1 should also be routed so that it is in close proximity to the chassis, while the lead from C8 (47 pF) to pin 2 of V2 should be cut as short as is possible.

Distortion

Excessive distortion should lead to a check of C46 insulation, especially if the distortion is present on all services. R28 going high in value is another cause of the trouble, as also is low emission of V5 and/or V6. Low H.T. voltage, owing to low emission of V7, will also result in distortion at high volume, but will also be evidenced as a reduction in sensitivity.

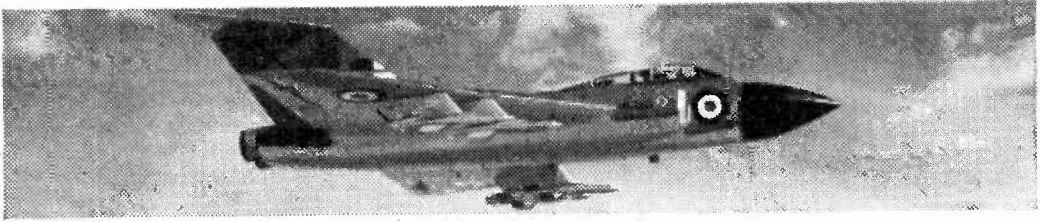
Distortion on F.M. only may well be caused by failure of one of the GEX34 ratio detector diodes, and this possible cause should be suspected if the F.M. section appears not to tune cleanly between two points either side of the station.

Multipath distortion is another factor which is not always given due consideration. This is the result of the F.M. aerial picking up several signals, the direct signal and additional signals, slightly displaced in time from the direct signal, as the result of reflections. This effect gives rise to ghosting on TV and distortion on F.M.

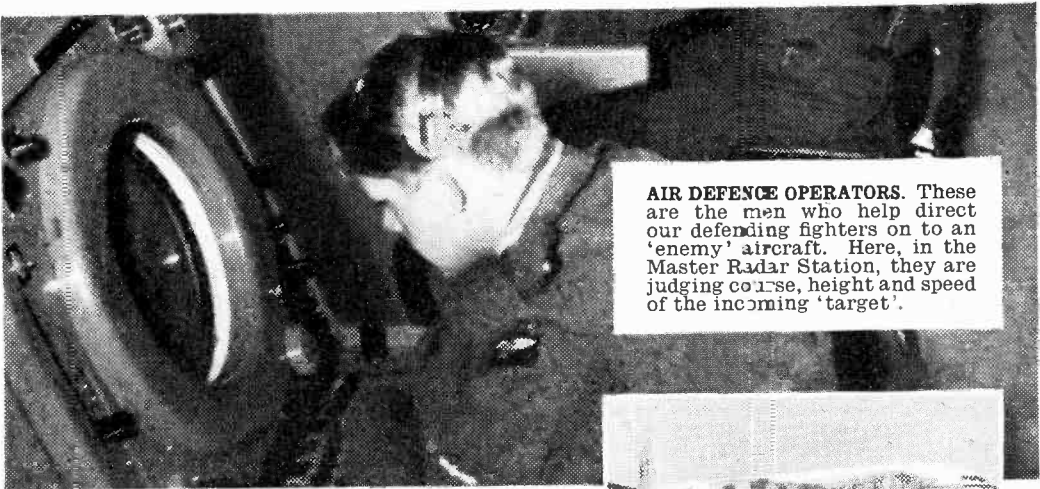
Remedy

When this trouble is serious, the only real remedy lies in adjusting the orientation of the aerial to give the smallest pick-up of the unwanted reflected signals. When present with the internal plate aerial, moving the receiver to different positions may assist, but in most cases a directional outside aerial is necessary.

Figs. 2 and 3 on page 136 of the April issue show the upper and underside views of the chassis of Model 5645.



‘...target-angels four zero’

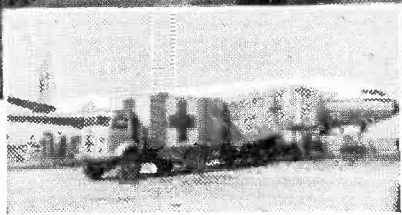


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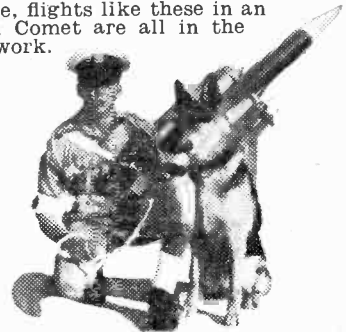
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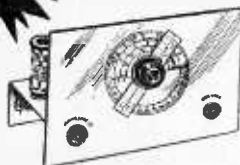
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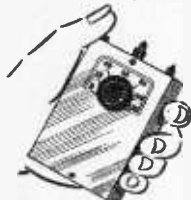
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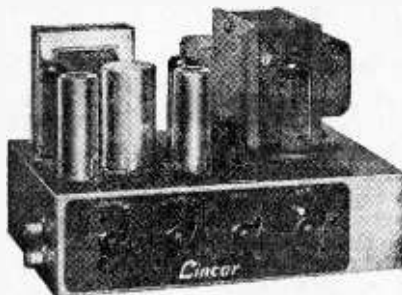
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Weight 12 1/2 lbs. Power consumption 90 watts. For 200-230-250 v. 50 c.p.s. A.C. mains. Outputs for 3- and 15-ohm speakers. Chassis finish stoved Blue-Grey hammer.

HIGHEST QUALITY! Retail price
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 ±2 d.b. 30-20,000 c.p.s.

MAXIMUM POWER OUTPUT

In excess of 14 watts.
 RATED OUTPUT 10 WATTS.

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Volume (1) 22 millivolts for rated output.
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TREBLE LIFT CONTROL
 Continuously variable + 6 d.b. to -13 d.b. at 12,000 c.p.s.

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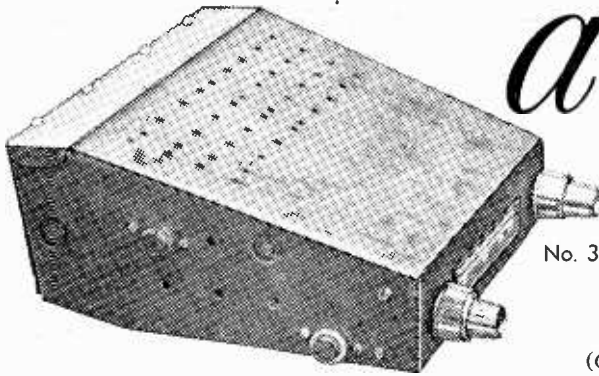
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 0.19% measured at 6 watts.

NEGATIVE FEEDBACK
 Total 32 d.b. including 24 d.b. in main loop.

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A Six Valve Car Radio

No. 3.—ALIGNMENT AND THE CONSTRUCTION OF THE POWER PACK

By T. Murphy

(Continued from page 122 of the April issue)

THE alignment is simple and straightforward. The I.F.T.'s are not touched until the set is assembled and switched to M.W. when adjustment of the oscillator trimmer and padder should bring in the more powerful stations. Only then should the I.F.T.'s be peaked, commencing with No. 2 I.F.T. If No. 1 I.F.T. has a flying grid lead, it should be removed from the can and the grid lead cut-off close to the base, leaving all connections to come from the bottom of the can. (This is done before fitting it to the chassis.) Once the medium wave has been satisfactorily aligned, the set can be switched to long wave and peaked on the BBC Light Programme. Final aerial peaking is done at about 300 metres with the set in the car.

The Power Pack

The power supply was constructed from components available on the general market, adver-

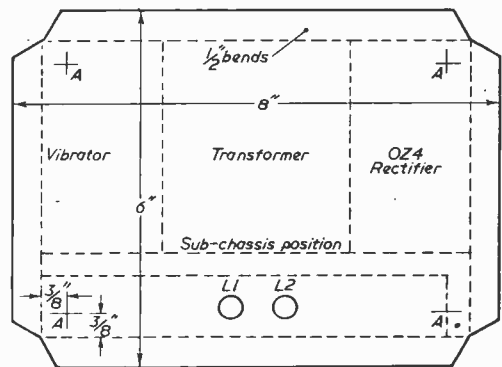


Fig. 14.—The chassis of the power-pack.

tised freely in PRACTICAL WIRELESS. The main object was to keep the physical size as small as possible, consistent with good smoothing, H.T. and L.T.

The case is made up of 22 s.w.g. tinned steel. Required arc: one piece 8in. X 6in. (base-chassis), one piece 12in. X 5½in. (top and sides), one piece

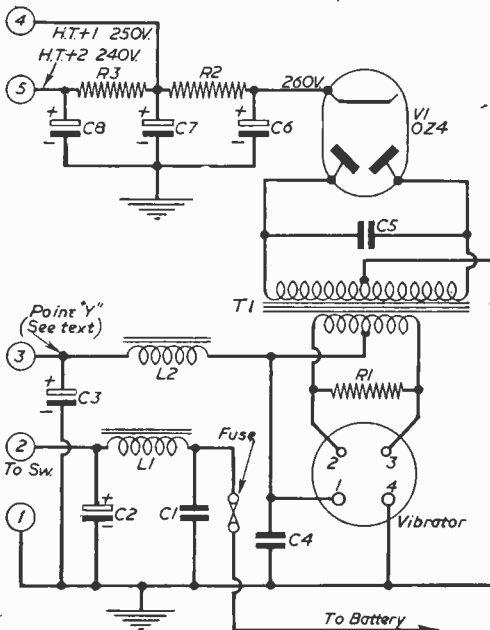


Fig. 13.—Circuit of the vibrator power-pack.

POWER-PACK COMPONENTS LIST

- 12 v. to 270 v. vibrator transformer
- 12 v. non-sync vibrator : Mallory G629C
- Vibrator base and spring retainer
- Octal base for OZ4 or OZ4A
- 5-pin socket, type M.5

Condensers :

- C1—1 μ F 150 v.w., electrolytic
- C2—4 μ F 150 v.w., electrolytic
- C3—4 μ F 150 v.w., electrolytic
- C4—100 μ F 12 v.w., electrolytic
- C5—.005 μ F 800 v. A.C. working
- C6—4 μ F 350 v. D.C. working
- C7—8 μ F 350 v. D.C. working
- C8—8 μ F 350 v. D.C. working

(T.C.C. or similar midget type)

Resistors :

- R1—680 Ω 1 watt.
- R2—220 Ω 5 watts.
- R3—1 K Ω 2 watts.

Smoothing Chokes :

- L1—Air cored L.T. choke
- L2—Air cored L.T. choke

8½ in. × 2½ in. (sub-chassis), and two pieces 7 in. × 2½ in. (back and front).

First, the 8 in. × 6 in. piece is bent up ¼ in. all around giving a finished size of 7 in. × 5 in. This forms the base-chassis. Next the 8½ in. × 2½ in. is bent as shown and bolted (using 4 B.A. nuts and bolts) to the base-chassis at 90 deg. Next, the four points marked "A" are drilled out ¼ in., then four bolts ¼ in. × 1½ in. B.S.F. are fitted. They are bolted tightly to the chassis with heads inside the upturned edges and the nuts locked with another nut. These four bolts now become

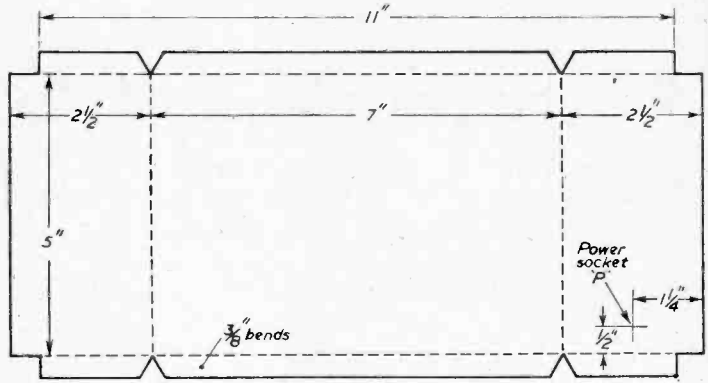


Fig. 15.—Measurements of the top and sides.

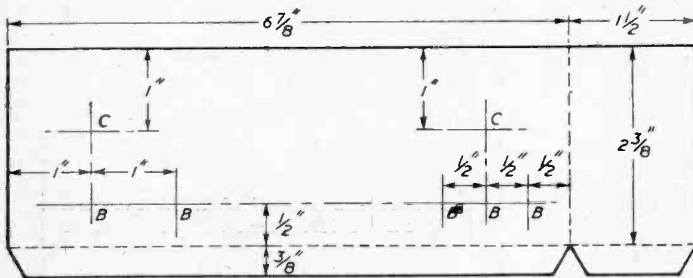


Fig. 16.—The sub-chassis measurements.

the anchorage to which any shape or size of fixing bracket may be clamped by a further nut at almost any angle.

Leave these bolts in position and proceed to drill the sub-chassis, for the vibrator base, rectifier base and grommets.

The vibrator and rectifier are mounted parallel to the base-chassis, with the transformer between them. The three electrolytics (H.T. smoothing) are mounted on the base-chassis underneath the OZ4, their positive connections coming through the upright sub-chassis wall, well sleeved and grommeted. The two L.T. smoothing chokes, capacitors and H.T. resistors, etc., are all mounted behind the upright sub-chassis.

The top and sides of the case are all bent from one piece, 12 in. × 5½ in., giving two 2½ in. side walls plus 7 in. cover, with ¼ in. lips to which the back and front may be secured.

The top and sides cover is slid over the base chassis and fixed with four 6 B.A. size, P.K. self tapping screws. Having fixed this in position, drill at point "P" in Fig. 3, straight through the outer and inner walls. Next remove the outer cover and drill out the point "P" to B9A size:

then drill the inner wall of the upright sub-chassis with B7G size. Fit the 5 pin, M5 socket. Next replace the outer cover with the P.K. screws, add two more centrally, then fit back and front covers squarely, also with P.K. screws. It now remains to ventilate the case; this is done by boring four rows of ¼ in. holes at 1 in. intervals along the top and front side. This power unit remains remarkably cool even after several hours of continuous running. The inside may now be finished

(Continued on page 310)

(Below)—A view of the receiver, which shows the tuning drive.

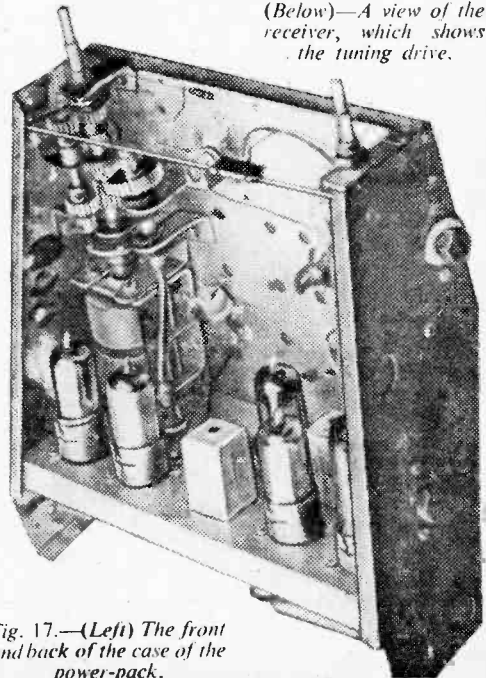
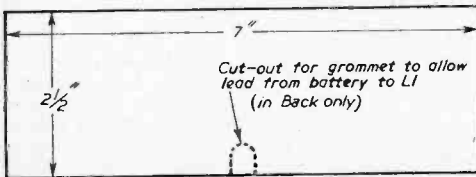


Fig. 17.—(Left) The front and back of the case of the power-pack.



Shipping Band Four-Valver

FINAL DETAILS OF THE BATTERY-MAINS RECEIVER DESCRIBED IN THE TWO PREVIOUS ISSUES

By R. Morgan

(Concluded from page 206 of the May issue)

Mains Operation

WHEN using the receiver on mains supplies, the following important points should be noted.

The mains transformer should be adjusted to the correct voltage. When provision for the exact mains voltage is not available it is usual to employ the tapping on the transformer of next higher value; for example, the 230 v. tapping for 220 v. mains.

With the receiver plugged in, and the pack connected to the mains and switched on, 6.3 v. A.C. should be read at the valve heaters at once. Some half minute or so must elapse before the H.T. voltage rises to a stable figure, however, and the valve heaters should then have visibly reached operating temperature, and local stations should be heard, as explained in the alignment instructions.

Accumulator Operation

A circuit suitable for a rotary converter is shown in Fig. 7, and this may be employed with input voltages other than those given. It is, of course, necessary to use a converter intended for the required battery voltage, as it will be satisfactory with this only. The H.T. output needs to be about 70 mA at some 200 v. to 250 v. This can be provided by a relatively small unit. A very large converter, with unnecessarily high output, should not be used, otherwise the load imposed on the accumulator will be heavy.

The Rotary Converter

The rotary converter used here provides a reduced L.T. voltage for the valve heaters. This

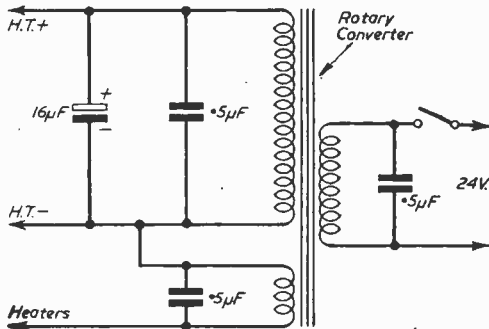
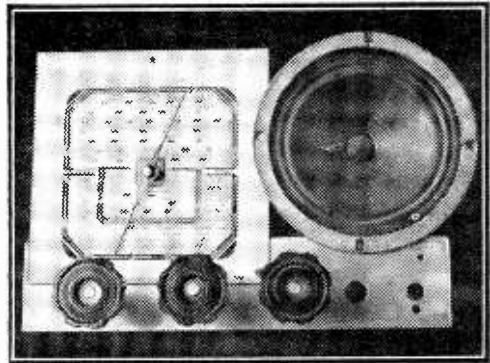


Fig. 7.—Circuit of the 24-volt power pack.

is useful with a fairly high accumulator voltage but is not justified with a 12 v. supply. With the latter, the heaters may be used in pairs in series-parallel, as explained. Alternatively, for interchangeable operation with a 6.3 v. transformer, a dropping resistor may be included in one heater lead, as described.

In Fig. 7, .5 μ F paper condensers are wired in parallel with each pair of brushes, to reduce interference and sparking. The value of these condensers is in no way critical. This also applies to the 16 μ F condenser fitted for H.T. smoothing. Should an even more silent back-



Front view of the receiver.

ground be required, a choke and further condenser can be added, exactly as for the A.C. power pack.

Details of the Wiring

Wiring is shown in Fig. 8, and it will be appreciated that a rotary converter delivering H.T. only will have two pairs of brushes instead of three pairs. The position of these brushes also depends upon the particular rotary fitted, and markings should be followed. Note that on most rotary converters there is an arrow or other marking to indicate the correct direction of rotation of the armature.

It is important that the correct polarity be employed in wiring input and H.T. output circuit brushes, or the 16 μ F condenser will be damaged, and possibly the converter. Any trouble from this cause may be avoided by connecting a meter to the H.T. output circuit and switching the rotary off immediately if polarity is incorrect.

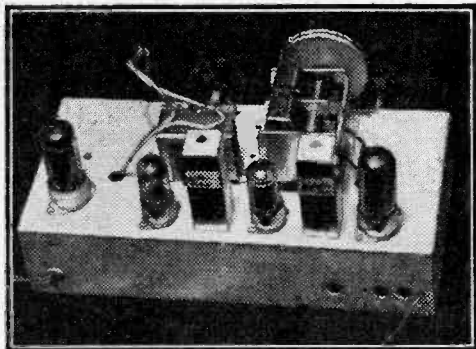
When comparing Fig. 8 with the wiring plan

of the A.C. pack, it should be observed that the latter (Fig. 6) shows the underside of the chassis. With the chassis in its usual position, negative, heater and H.T. positive sockets come in the same relative positions as those in Fig. 8.

Protective Case

The converter will require a case, both to reduce noise and to protect it. This can be made from stout plywood. A lining of thick felt or similar material will be found to diminish the sound made by the unit when running. The box should be entirely enclosed, and direct conduction between baseboard and case will be much reduced if the unit rests upon a thickness of felt or rubber.

It is also helpful to keep the converter away from the receiver, possibly locating it near the accumulator supply, with a long three-core cable to carry H.T. and heater current. The brushes



A rear view of the finished receiver.

and commutators should also be clean, and free from oil, etc., which may cause sparking, or noisy running. If long periods of continuous running are expected, some ventilation holes will be necessary in the containing case. Some converters have a small fan, to help maintain air circulation.

Other Methods of Supply

A vibrator unit can provide a satisfactory H.T. supply, and is especially economical with a 6 v. accumulator, as rotary converters are intended for higher voltages. As mentioned, the unit must provide 200-250 v. at 70 mA, and this is similar to the requirements of many car radio receivers. Heater current is drawn directly from the accumulator.

Though a converter may be used with 12 v., a vibrator unit would be more economical. The saving in current would be worth while with small accumulators, and in circumstances where a generator is not present to maintain the accumulators in good condition.

Typical power units available as surplus include

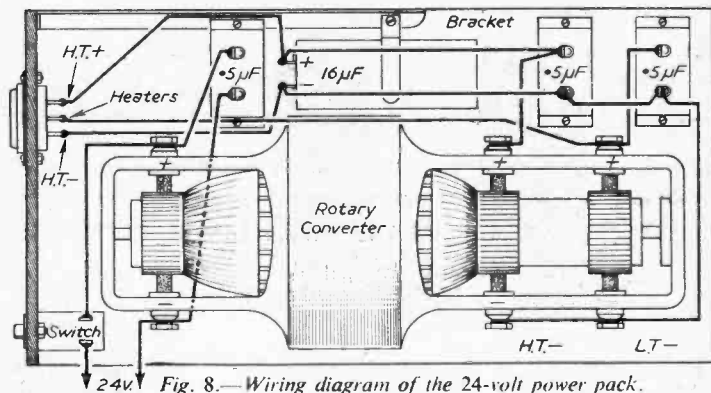


Fig. 8.—Wiring diagram of the 24-volt power pack.

the Type 457, with 24 v. input and 250 v. 65 mA and 6.5 v. 2.5 A outputs. The power unit Type 743 will provide 250 v. at 50 mA, with 6 v. input. The output valve bias resistor may be increased to 330 ohms, for 65 mA supply or to 600 ohms, for 50 mA supply, to avoid overloading the power pack. Rotaries for 12 v. are available from numerous suppliers.

A SIX VALVE CAR RADIO

(Continued from page 308)

with matt black paint and the outside with black crackle.

Wiring

Wiring up of the components may now commence and there are no pitfalls, provided that the L.T. electrolytics are of the insulated type and that they are wired with the correct polarity for the car in which the power pack will be used.

In the circuit diagram, C4 is shown as a paper capacitor. This has since been changed to 100 μ F 12 V.W. in order to obtain extra smoothing on long waves.

Should the constructor be troubled with vibrator noise, a pair of headphones will soon track it down, via a capacitor, of course. A low pitched weak buzz is permissible on the heater chain. The same test applies to the H.T.

A Warning

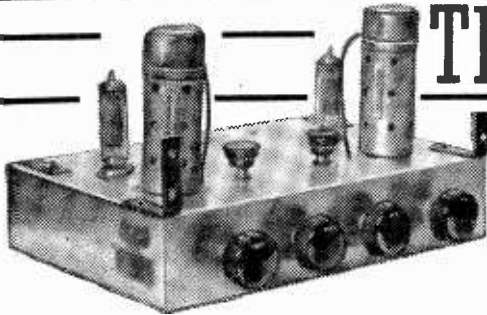
A final word of warning. Do not run the OZ4 without a load, should you wish to construct the power pack first. Having completed wiring, checked for shorts, etc., connect a 250 v. 15 watt lamp to H.T.1 before switching on.

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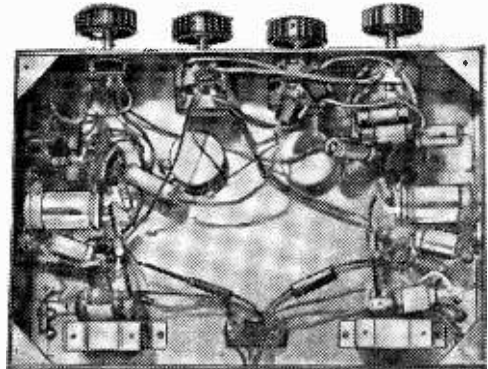
INFORMATION ON OPERATING THE UNIT AND THE FINAL CONSTRUCTIONAL DETAILS

By J. B. Willmott, A.I.P.R.E.

(Continued from page 225 of the May issue)

CONNECT an aerial (and earth if provided) to the aerial and earth sockets, and endeavour to tune in the local medium-wave BBC station, utilising the gain control VR1. Make sure that the amplifier is switched to "radio," and that the volume control is turned "up" sufficiently. Roughly adjust the trimmers on top of the two-gang tuning condenser, then tune to a station at the low wavelength end of the medium-waveband (Radio Luxembourg for example), and now accurately adjust the trimmers for maximum volume. Check that stations are now received at correct settings of the dial, and switch over to the long waveband. The coils are so designed that no further adjustment should be necessary to obtain good results (e.g., from the BBC Light Programme on 1,500 m.).

With the receiver tuned to a reliable signal from the local station, the two amplifier channels can now be roughly balanced for equality of output. Place the speakers 8 to 12ft. apart and when volume levels are correctly set, using VR2 and VR3, the sound should appear to come from mid-way between them. If this effect cannot be obtained, it is because the speakers are out of phase. To correct this, switch off and reverse the connections to one of the speakers when no further difficulties should be experienced. It is a good plan to mark the speaker plugs and sockets in some way (e.g., by the use of red and black plugs and suitably marked sockets) to



Underchassis view.

ensure that, if disconnected at any time, they can be reconnected in phase without difficulty.

Operation on "Gram"

Turn the switch to "Gram," and for a first trial, use an ordinary L.P. record, when once again the sound should appear to emanate from a point

(Concluded on page 318)

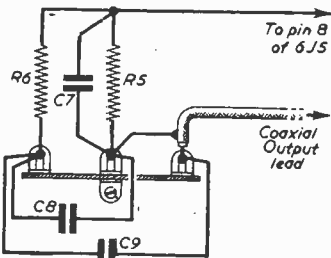
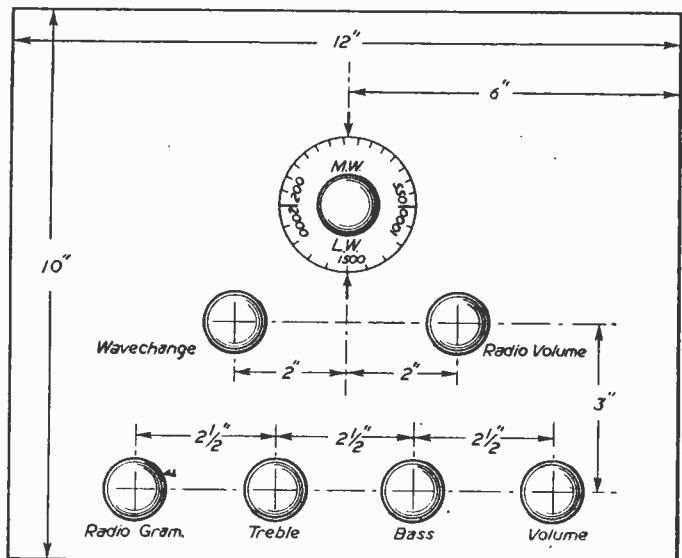
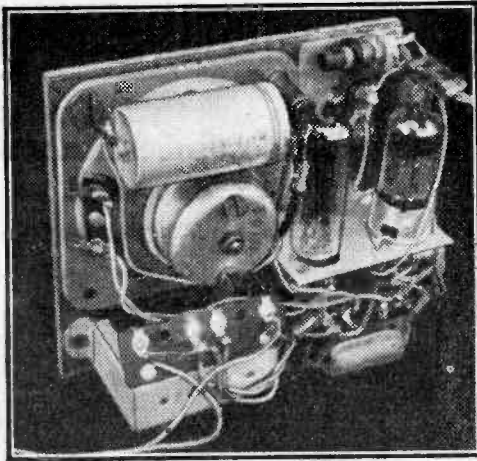


Fig. 12 (Above).—Using a three-way tag-strip for the detector filter circuits.

Fig. 13 (Right).—A suggested layout of the control panel.





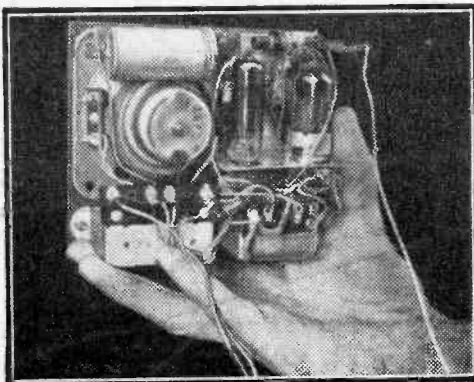
Rear view of the receiver.

MINIATURE receivers are popular, but when extremely small in size it is only possible to accommodate special midget components which may not always be readily obtainable. There is the added difficulty that wiring can become rather awkward owing to the lack of space. In the receiver described here, no special midget parts are used, but dimensions have been kept down so that the complete set, without cabinet, is only 5½ in. × 4½ in. × 2 in.

Miniature Components

If some small parts, such as a midget mains or output transformer, are available, the size of the receiver can be reduced to suit. A reduction in size will also be possible if a smaller speaker unit is fitted. That specified has a 3 in. diameter cone, thereby allowing better results than can be expected from an extremely small unit.

When other components are to be used, a check for dimensions should be made by arranging them in accordance with the layout shown. Overall dimensions can then be measured, and about ¼ in. added each way for clearance. As the speaker and trans-



This view shows the compact size of the receiver.

A Miniatur

A MEDIUM-WAVE 2-VALVER USING

By P.

formers occupy so much space, a smaller set can easily be made if required, with the same circuit. However, the set is already so small that any further reduction is scarcely worth while in a mains receiver. As the total weight of the set is only very slightly over 2 lb. it can readily be taken anywhere, for use where current is available.

Circuit and Components

The circuit is shown in Fig. 1, and is a detector-output combination, with valve rectifier. When regeneration is applied, as is so here, a pentode detector of this kind can be highly sensitive. Only a short length of thin insulated flex need be used as a throw-out aerial, as a result. To save space, a

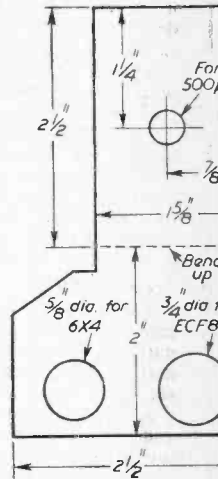


Fig. 2.—Metal chassis

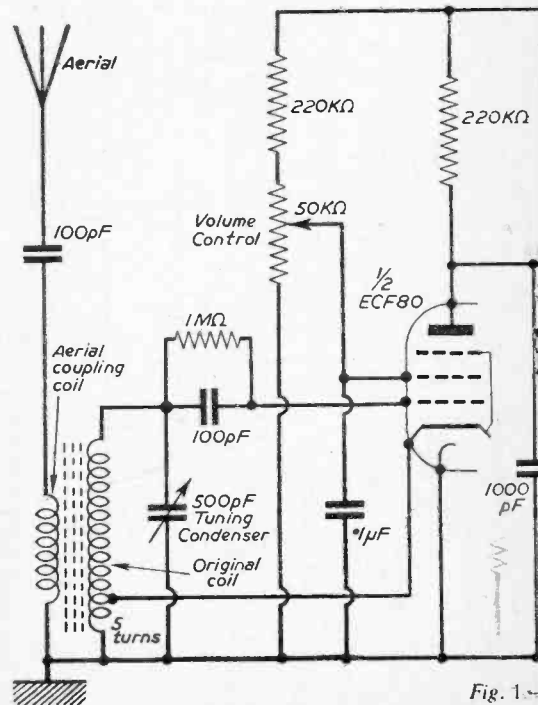


Fig. 1.—

Mains Set

RECTIFIER AND A TRIODE-PENTODE

Rayer

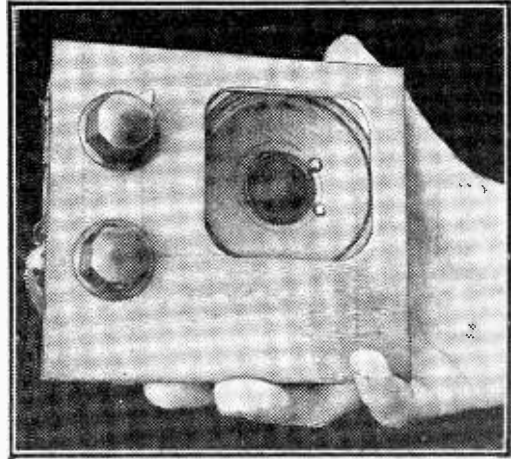
Triode-pentode is used, and the ECF80 gives a high degree of amplification. The triode section gives a similar output to that obtained from all-dry battery receiver output valves, and this gives good volume with a speaker of the kind fitted in battery portables.

Hum is not noticeable with a 5 k resistor instead of a smoothing choke, and this avoids the need for one rather bulky component. It is necessary to use the small type of electrolytic condenser in bias and smoothing positions. Separate smoothing condensers can be accommodated if required, one in the position shown, and the other between mains transformer and speaker.

Heater Current

The valves consume 1.03 A, and a 1 A transformer can easily withstand this very slight overload. Alternatively, a 1½ A transformer may be employed, if a dial or indicator bulb is to be added later, and that shown is of such a rating.

A small 50 k potentiometer must also be used and it may have an integral on/off switch, if this is preferred to the lead-through switch outside the receiver. It is also worth noting that a 250 v., 25 mA or similar metal rectifier can be substituted for the



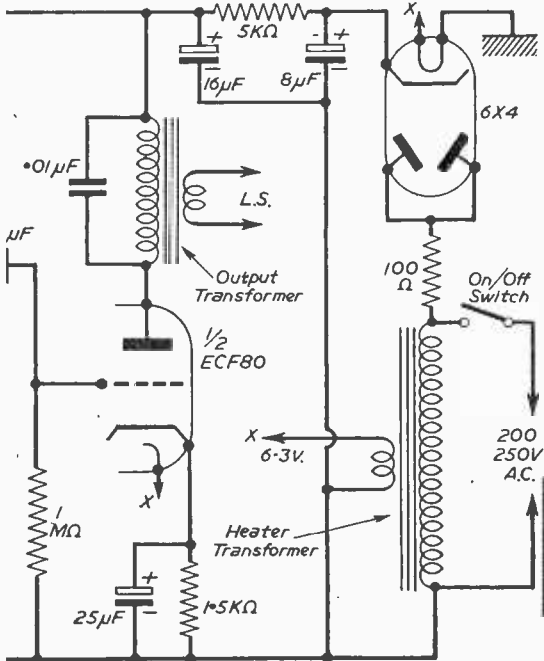
Front view of the receiver.

6X4, in which case a 6.3 v. ½-amp heater transformer will suffice.

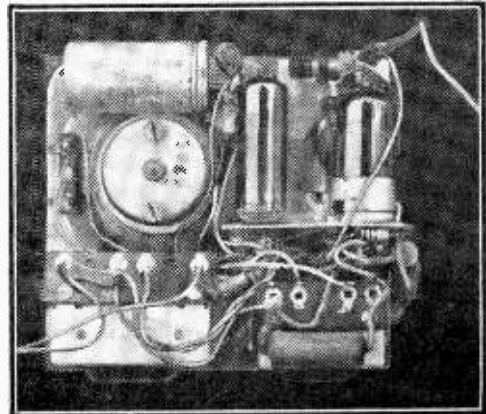
Coil Cathode Tap

A tapping is most easily provided by adding some extra turns, as in Fig. 4. With the values specified, five turns will be satisfactory, but they must be wound in the correct direction. If the coil is examined, the outer end of the original winding can be seen. A short piece of 36 s.w.g. or similar wire is then soldered to this tag, and the five extra turns are put on so that they form a continuation of the original winding, as indicated. This tag, formerly for earth connection, then becomes the cathode tap, while the end of the five turn winding is taken to the moving plates of the tuning condenser, and chassis.

Touches of wax will hold the extra turns secure. If no regeneration is obtained when the set is tested, these extra turns are probably wound in the wrong direction. No change is made to the aerial coupling



Circuit of the receiver.



Another view of the rear showing the compact layout.

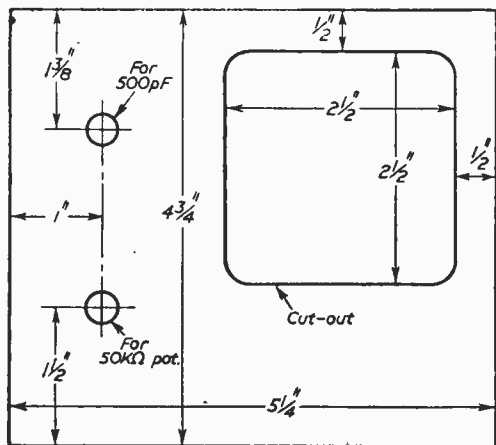


Fig. 3.—Panel dimensions.

winding, one tag being taken to chassis, and the other to the 100 pF aerial condenser. The "grid" tag of the coil is soldered to the fixed plates of the tuning condenser.

Panel and Chassis

Panel dimensions are shown in Fig. 2, but these can be modified as already explained, if necessary. Very thin wood is best avoided or difficulty will arise in screwing the speaker and transformers in place. A small piece of silk may be glued over the speaker cut-out before mounting the speaker.

The chassis is shown in Fig. 2, and is cut from aluminium, with clearance holes for the 6X4 and ECF80 holder. A little height is saved by bolting the 6X4 holder below the chassis, but the ECF80 holder is on top of the chassis, to leave a little extra space for components near the potentiometer.

The flange is bent at right-angles, and clamped to the panel by means of the 500 pF tuning condenser. This avoids hand capacity effects by providing screening between the user's hand, and coil and associated parts, including the tuning condenser.

A single tag is bolted to the chassis, and forms the "M.C." connection in Fig. 5. A further tag is placed under one screw holding the output transformer, and similarly used as an earth return. It is, however, necessary to leave this transformer off until other wiring has been completed.

Layout of Components

The positions of the large components are shown in Fig. 5. The chassis, 6X4, and mains transformer overlap the speaker. When wiring the transformers correct connections are essential. The mains transformer

COMPONENTS LIST

6.3 v, 1 1/2 A transformer for required mains voltage. Small 2/3 ohm output transformer. Elac speaker. Small 50 k potentiometer. Two knobs. Fixed condensers: two 100 pF, 1,000 pF, two 0.01 μF, 0.1 μF, 25 μF, 25 v, small tubular, and 16 μF plus 8 μF, 350 v, or similar small tubular. Resistors: 100 ohm, 1/2 w, 1.5 k, 1/2 w, 5 k, 1/2 w, two 220 k, 1/2 w, two 1 MΩ 1/2 w. 6X4 and B7G holder. ECF80 and B9A holder. 500 pF variable condenser. Medium wave aerial coil. Lead-through switch.

primary goes to mains, via the switch. The 6.3 v. secondary is wired to the valveholder heater tags. With the output transformer, the primary goes to triode anode and 16 μF condenser. The secondary is connected to the speaker. Some makers place tags or leads in different positions, and this must not be

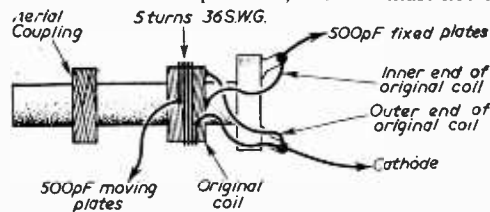


Fig. 4.—Tuning coil modification.

overlooked. The negative tag of the 8-plus 16 μF condenser is soldered to a brass bracket which is in turn secured by one of the screws holding the speaker.

A general idea of the positions of the various parts

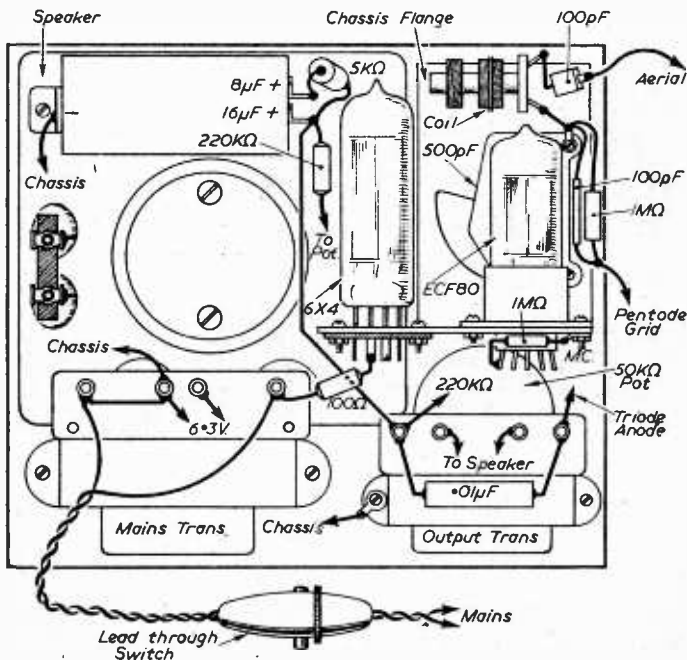


Fig. 5.—Back view showing component layout.

can be gained from Fig. 5, and all connections are shown in Fig. 6. When following the latter, it should be realised that only the approximate location of components is indicated, and that the valveholders will be fitted to the chassis.

Wiring

In view of the limited space, thin insulated flex may be used for wiring up, so that leads can be moved aside without coming adrift or breaking. The potentiometer should be wired up first, followed by those valveholder tags which lie near the panel. The other small condensers and resistors can then be added as the more accessible tags on the valveholders are dealt with. All joints should be well made, without excess solder, and insulation should not be removed farther from leads than is necessary.

A twisted pair of leads can be used for heaters, and also for speaker connections. Care is necessary to position joints so that no short circuits can arise. As mentioned, the output transformer is screwed in place only when the potentiometer and other wiring has been completed.

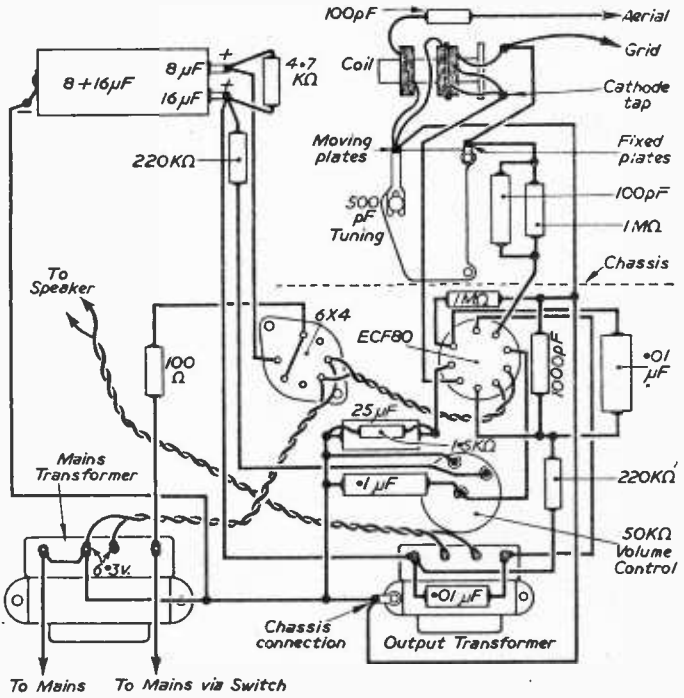
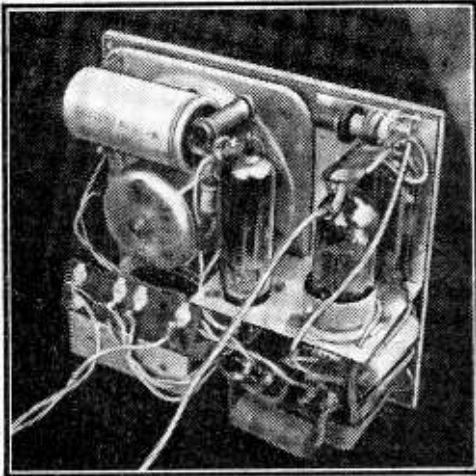


Fig. 6 (Above).—Complete wiring diagram.

The 50 k potentiometer acts as volume control, but regeneration should not be so far advanced that oscillation commences. The setting of this control considerably influences sensitivity.



Another view which will assist in wiring the receiver.

Aerial

For the aerial, some 6ft. to 10ft. or so of thin flex is soldered to the 100 pF condenser. The latter should not be omitted, as it is necessary to keep mains voltages out of the aerial. If a very short aerial is used, or other circumstances cause poor signal strength, the 100 pF condenser can with advantage be taken to the fixed plates of the tuning condenser, instead of to the aerial coupling winding tag on the coil.

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PRINTED CIRCUITS

No. 5.—PROCESSING THE COMPLETE CIRCUIT

By W. G. F. Roberts

THE printed circuit board, the development of which was seen in previous articles, must now be cut to size, the holes drilled or pierced, the components mounted, and all the connections soldered. It is here that the manufacturer achieves his savings in cost, by the use of equipment far beyond the reach of any amateur. For prototype work, however, he proceeds exactly as does the amateur. Let us first,

are otherwise occupied, a saving over drilling by sight location is obtained by use of a drill jig where quantities of 100 or so are involved. To save the costly business of marking out, the negative of the circuit is used to print a positive image on the actual surface of the drill jig. The toolmaker then drills it by sight from this image.

Mounting Components

Next, the boards are taken to a machine which inserts the components. The machine cuts component leads to the correct length, bends them at right angles, pushes these through the board, and bends the leads over along the line of the copper conductors. In Fig. 20, an engineer is seen using a single head machine, which is used for small quantity production, but Fig. 21 shows a complete multiple assembly line as used by radio manufacturers.

All components having been mounted, the circuit is then soldered. This is done by fluxing the board, and applying it to the clean surface of molten solder. Fig. 22 shows one type of machine. Other machines work on the conveyor principle, and some use a wave of solder to ensure the absence of dross on the soldering surface. Fig. 23 shows such a machine.

Procedure

The amateur, of course, proceeds in a very different manner. First, the panel must be drilled

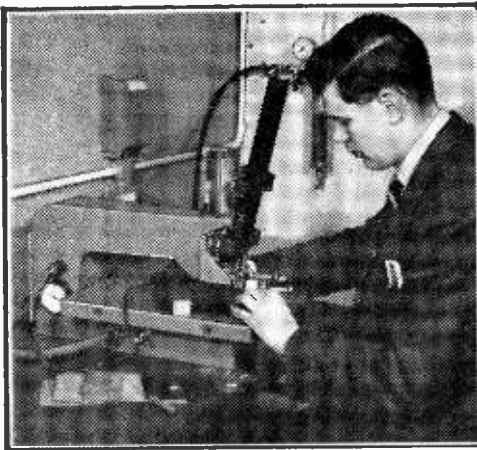


Fig. 20 (Above).—Single head component insertion machine.
Fig. 21 (Right).—Multiple head machine.

therefore, take a brief look at manufacturing methods.

Connection Holes

The circuit is blanked out to size and the holes pierced by standard press tools. The standard connection hole of 0.051in. diameter can easily be punched in 1/16in. material. All details of the circuit must be settled before the tools are made, as the complete press tool will cost about £500 to make, and, once hardened, it can only be modified with great difficulty. For intermediate quantities, tooling is saved, at the expense of time, by punching the holes one at a time, locating by a pantograph action to a master. The circuit may also be processed according to information punched on a paper tape. In this case, the machine is set running, and punches a complete set of holes without further attention. To punch a different pattern, it is only necessary to change the tape.

Where these machines do not exist, or

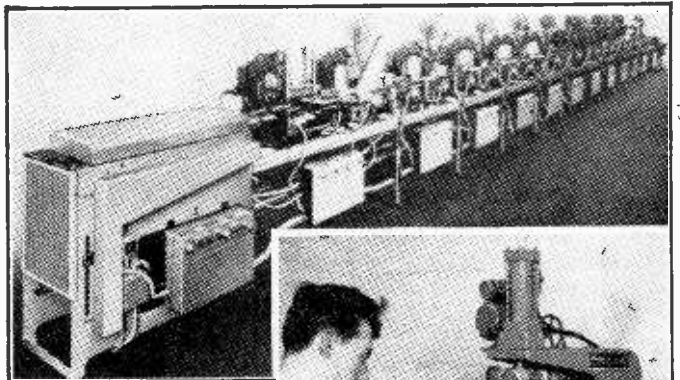
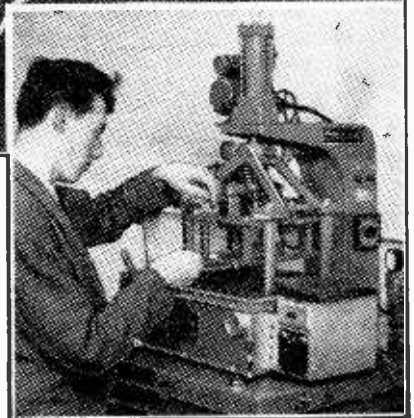


Fig. 22.—Forced selective dip soldering machine.



and cut. Cutting is best done with a fine-tooth hacksaw. If the circuit has a line of copper round the edge solely as a boundary marker, as distinct from a common earth, all copper must be removed from the edge, otherwise inductive pick-up may occur. To drill the panel, it is essential to avoid tearing the copper. This can be done by grinding a 1/64 in. flat on the cutting edges of the drill. The highest available drill speed should be chosen, but the ordinary hand drill will do quite well. Relieving the cutting edge as suggested not only avoids tearing the copper, but stops the drill chattering in the hole. In Fig. 24, we see

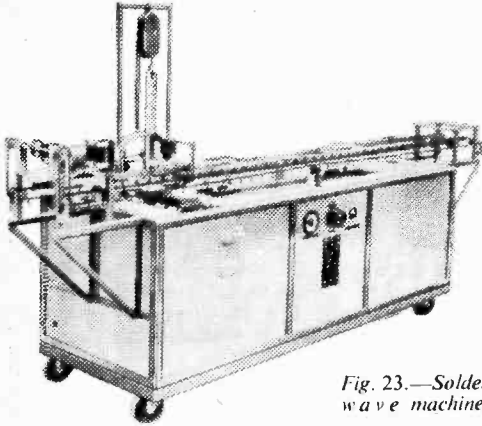


Fig. 23.—Solder wave machine.

the amplifier printed circuit, as discussed through this series, so processed.

Cleaning

Next, the printed circuit must be cleaned. A dip in 3 per cent. nitric acid or a special cleaner is a commercial method, but often the circuit has been treated after removal of resist with a flux varnish, or a millionth of an inch of gold has been deposited chemically to avoid further cleaning. The amateur, however, can retire to the kitchen, find a clean scrubbing brush and a cleaning powder and scrub the circuit clean. The circuit is then washed under the tap and dried naturally, assisted as necessary by a clean

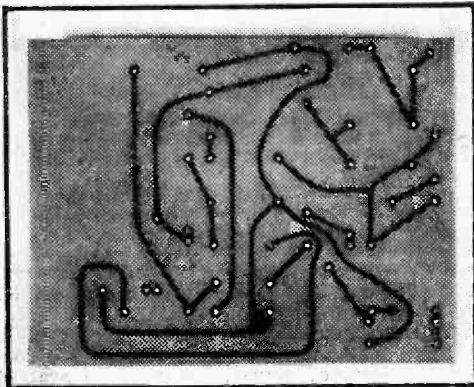


Fig. 24.—Amplifier circuit cut, and drilled.

towel, or blotting paper. After this, the copper must not be touched with the fingers where it is to be soldered.

In the meantime, the components will have been prepared. Resistors, etc., will have their leads cut to length and bent ready for insertion. All connections must be clean, of course. The components are then mounted. Wire leads are

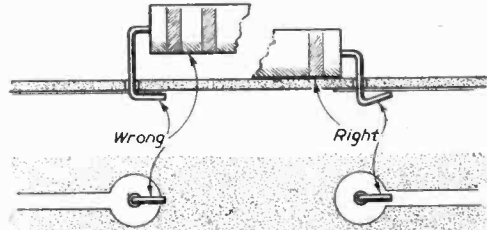


Fig. 25.—Right and wrong way of mounting components.

bent over along the line of the printed circuit "wires." As an example, Fig. 25 shows the right and wrong way of mounting a resistor. The connections can be soldered as each component is inserted (this is necessary where the component might otherwise fall out). Otherwise, the joints can be made in one operation. It is necessary to heat-shunt the leads of transistors and diodes by any of the usual methods.

Soldering

Careful soldering is important. Ordinary resin-cored solder, 60/40 alloy, can be used, and the correct method is to apply the solder between the iron and the work. The iron must have a clean, well-tinned bit, free from pitting. Those skilled in soldering can make a joint with any iron, but it must be remembered that the average small iron, left lying hot, has a bit temperature of 450 deg. C. The printed circuit has little heat capacity, and, if such an iron is laid on the copper foil, the bond may be destroyed causing the copper to lift. As it is only 1½ thousandths of an inch thick, the copper may even be dissolved. Therefore, keep the solder between the iron and the work, and remove the iron as soon as the

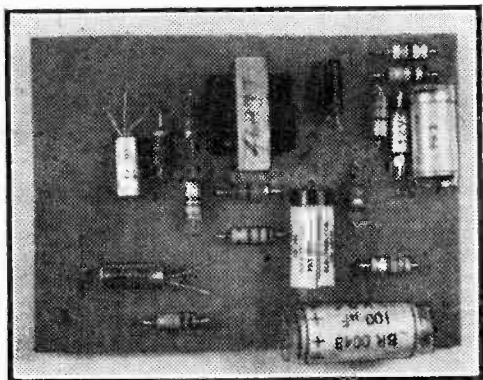


Fig. 26.—Components on amplifier circuit.

solder is properly melted. It should not take more than about four seconds to solder each joint. It is as well, when soldering a printed circuit for the first time, to try a joint or two on earth

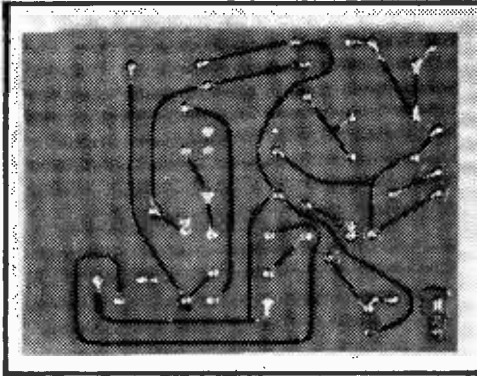


Fig. 27.—Soldered side of amplifier circuit.

areas or on the pieces which were cut off when shaping the circuit.

Servicing

The circuit is now complete. Figs. 26 and 27 show both sides of the selected transistor

amplifier. Two big questions will probably remain in the reader's mind, how can the wiring be altered and how can a component be replaced?

If a component has to be put in another position, fresh holes are drilled and, if available, the component's leads used to make connection.

Replacing Components

However, it may be necessary to replace a component. If it is wire-ended, the soldering iron is placed on the joint, a small screwdriver

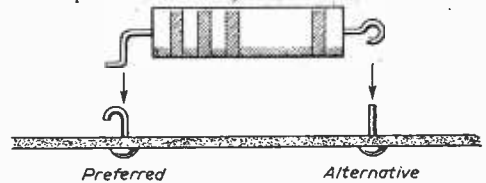


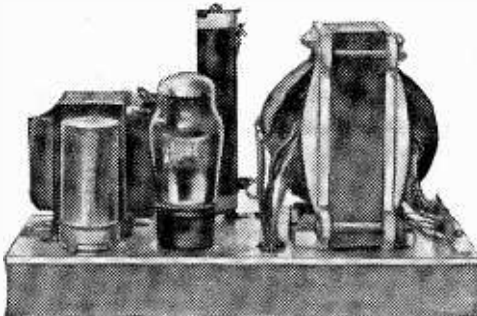
Fig. 28.—Replacing a resistor.

placed under the end to straighten the component wire, and then the end of the component is withdrawn. Another method, safer for radio repair, is to snip off the component lead close to its body, clean it, and turn the end over to make a little loop, as in Fig. 28. The lead of the new component is threaded through this loop and soldered.

THE STEREO SEVEN

(Continued from page 311)

midway between the two speakers. Now try a stereo-record (the Decca test record "Journey Into Stereo" is particularly recommended). Ascertain that the "left" and "right" hand speakers are being fed with the correct sound channel (as indicated by the commentary on the



The power pack.

record). If they are transposed, switch off, and either exchange the speaker connections, or change over the connections on the pick-up cartridge. A word of warning here, when connecting the three-way lead to the pick-up cartridge, never apply the soldering iron to the cartridge tags, as the heat will ruin the crystal. First remove the small soldering tags (which are a push-on fit) before soldering to them. In the prototype a standard "Monarch" autochanger unit by B.S.R. Ltd., was fitted with this firm's special

POWER SUPPLY UNIT : COMPONENTS

- 1 chassis 11in. x 5in. x 2½in.
- 1 Octal type plug.
- 1 Octal valveholder.
- 1 Brit. 4-pin valveholder (or Int. Octal if 5Z4 valve used).
- 1 mains lead, length as required.
- 1 yd. red/black twin flex.
- 1 yd. plain twisted flex.
- 1 toggle switch, on-off.
- 1 red indicator light and bulb.
- 1 mains transformer, 350-0-350 at 150 mA., 6.3 v. at 4 amp., 5 v. (tapped 4 v. at 2.5 amp.).
- 1 smoothing choke (rated at not less than 120 mA., approx. 10 H.).
- 1 .2 amp. mains dropper resistor, adjustable type.
- 1 32 μ F, 350 v.w. electrolytic, C20.
- 1 16 x 16 μ F, 450 v.w., electrolytic, C.21/22.
- 1 fixing clip for above.
- 2 .01 μ F 1 kV. working mica or tubular condensers (to prevent modulation hum, may not be required in some districts), C23, C24.

AUXILIARY EQUIPMENT

- 2 10in. diameter P.M. speakers, 3 ohm type.
- 1 B.S.R. "Monarch" 3-speed autochanger, fitted with stereo cartridge, or any other suitable auto or single player unit.
- 1 yd. twin screened lightweight pick-up cable.
- 1 cabinet to house radio tuner, amplifier, record player and power supply units.
- 1 cabinet to hold second loudspeaker.

turnover stereo cartridge, a very simple matter, and found to give first-class results.

If all tests are satisfactory, it now only remains to fit the units into a suitable cabinet, the second speaker being, of course, housed in a separate cabinet. A suggested layout of the control panel is shown in Fig. 13.

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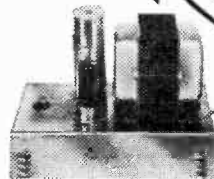
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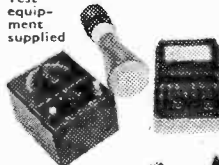
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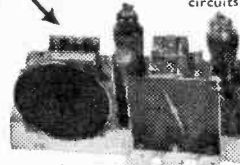
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1.2 V	120 V	60 mA	120 mA
6 V	240 V	120 mA	600 mA
12 V	480 V	600 mA	1.2 A
60 V	600 V	1.2 A	6 A
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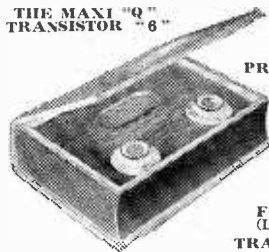


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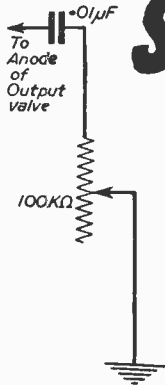


Fig. 1.—Simple treble-cut circuit.

TONE controls are used to alter the treble and bass responses of amplifiers to achieve the desired quality of sound reproduction. Most tone controls introduce losses and therefore, for effective working, we must start with a reasonable audio power. It is useless to build a small amplifier and introduce elaborate

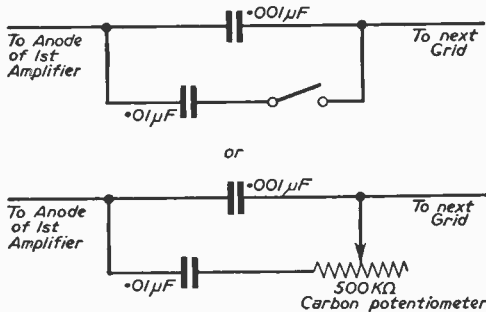


Fig. 3.—Two circuits for bass-cut; one switched and one variable.

tone control systems, as this may reduce the available output to too low a level, but we can, even with the simple circuits given, introduce a range of control which gives pleasing results.

Circuits

In the circuits given, only the actual tone control circuit is shown. The connections are marked for introduction into other circuits, e.g., anode and grid where applicable. Fig. 1 shows the most-used type of control; this gives nothing more than a treble cut Fig. 2 is a modification

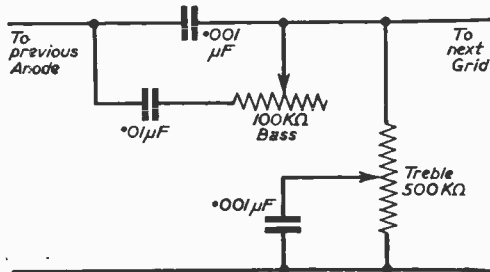


Fig. 5.—Bass- and treble-cut circuit.

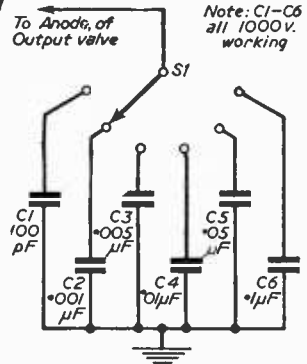


Fig. 2.—Switched treble-cut control.

of Fig. 1. Here, other values of condenser can be switched in, thus increasing the amount of treble cut. This works excellently in a grid circuit, i.e., the switch side going to a grid, the effect of the control then being more noticeable. Possibly, as the larger values are introduced, the volume of audio output will suffer, unless there is reserve power.

Another simple circuit is shown in Fig. 3, in which we switch one condenser in parallel with

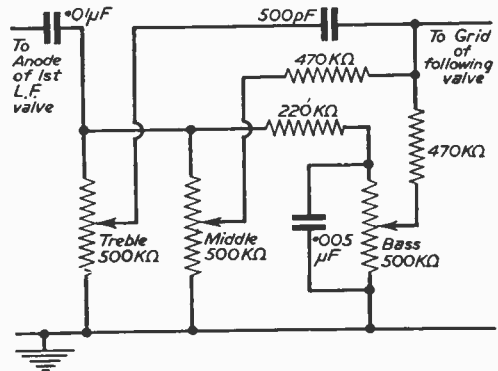


Fig. 4.—Circuit for control of bass, middle and treble.

another, thus increasing the coupling. It is a simple and effective circuit. If we remove the switch and use a potentiometer, we can adjust the coupling. By varying the potentiometer setting we can increase the value of the coupling condenser from C1 to C1 plus C2. Fit the usual grid resistor.

Comprehensive Controls

Fig. 4 is a more complex system. With this we can control the bass, middle and treble. In small amplifiers, this circuit may reduce the output power too much, but when used with high power amplifiers, e.g., 10-20 watts, it will be found to be excellent. Fig. 5 shows a simple control system which has been used with high-power amplifiers and modulators where a great variation is not needed, and where the aim is simply to make the reproduction acceptable. It

will work effectively with the smallest amplifier. With this circuit use a grid leak of about 250 k Ω . Fig. 6 gives independent control over the treble and bass, and has been found excellent in tape recorder playback amplifiers. As in the circuit given in Fig. 4, there is no need for a grid resistor here, as we have sufficient in the circuit. The minimum resistance is R5, which is 22 k Ω .

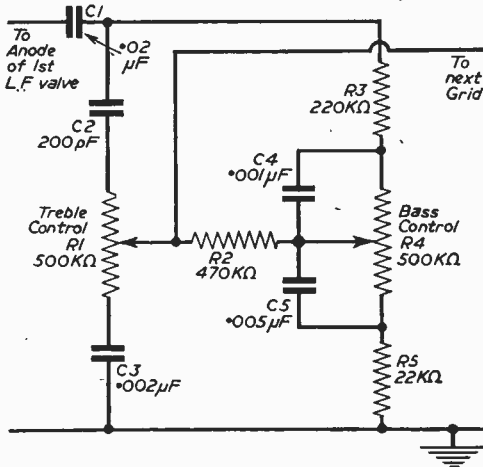


Fig. 6.—Circuit for independent control of treble and bass.

Fig. 7 is a system for use with a pick-up of the crystal variety. The Acos GP20 gives excellent performance with this circuit, which also incorporates the volume control, the output of which must be fed to a grid circuit. With this circuit,

too, remember that no grid resistor is needed, as all the points are isolated from each other. No matter what the positions of the potentiometers, there is sufficient resistance.

Components

In conclusion, the reproduction is only as good as the weakest link in the chain, but it is possible with simple tone control circuitry to improve results considerably at small cost. All condensers should be 1,000 V.W. The potentiometers are normal carbon types, and the resistors are $\frac{1}{2}$ watt rating. The smaller valued condensers may be either mica or ceramic types. Keep all grid leads as short as possible. If they have to be long, screen them, otherwise hum will be introduced. It is also important to keep all leads away from heater wiring.

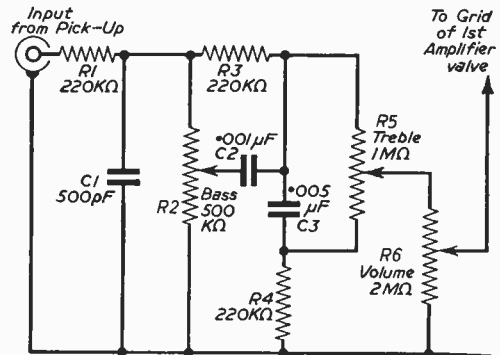


Fig. 7.—Control circuit suitable for use with a crystal pick-up.

Books Received

HIGH FIDELITY SOUND REPRODUCTION. Second edition. General editor: E. Molloy. Published by Geo. Newnes Ltd., price 20s., or 21s. 3d. by post. 208 pages.

This book covers high fidelity sound reproduction in all its aspects and each chapter is written by a specialist in his particular field. The introduction is by H. J. Leak, M.Brit.I.R.E., and sections are included dealing with Acoustics, Loudspeaker Enclosures, Electrostatic Loudspeakers, Radio Reproduction, etc. In this, the second edition, a chapter on Stereophonic Disc Records has been added.

An outstanding feature is the clarity of expression which makes the book appeal to the professional or amateur engineer and the layman alike.

MOBILE RADIO TELEPHONES. By H. N. Gant. Published by Chapman and Hall, 37, Essex Street, London, W.C.2, at 21s. 125 pages.

The author deals with the uses of mobile radio telephones from the commercial, rather than the technical, point of view. There are four chapters: "Uses and Limitations of Mobile Radio Telephones"; "Performance Requirements of the Equipment"; "Installation" and "Maintenance

and Testing." The author has had ten years' experience in the design and development of mobile equipment and is therefore well qualified to express authoritative views on this subject.

"PRINCIPLES OF TRANSISTOR CIRCUITS: Introduction to the Design of Amplifiers, Receivers and other Circuits." By S. W. Amos, B.Sc. (Hons.), A.M.I.E.E. Published for "Wireless World" on March 26, 1959, by Iliffe and Sons Limited. Size 8 $\frac{1}{2}$ in. \times 5 $\frac{1}{2}$ in. 167 pages including 105 diagrams in the text. Price 21s. net (postage 11d.).

THE PRACTICAL DICTIONARY OF ELECTRICITY AND ELECTRONICS. By R. L. Oldfield. Published by The Technical Press Ltd., 1, Justice Walk, Chelsea, S.W.3. 216 pp. Fully illustrated. Price 52s.

In this handy dictionary illustrations are employed where a definition would not be clear without it, and apart from forming a handy memory refresher for engineers and technicians, it will form a most valuable reference book. The writer is a former instructor of the American Television Laboratories of California and therefore has presented the book in an ideal form for the student. Following the dictionary, which occupies 178 pages, is a handbook presenting formulæ, tables, symbols, and six pages of diagrams and other figures.

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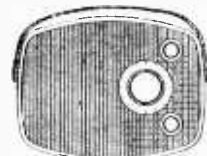
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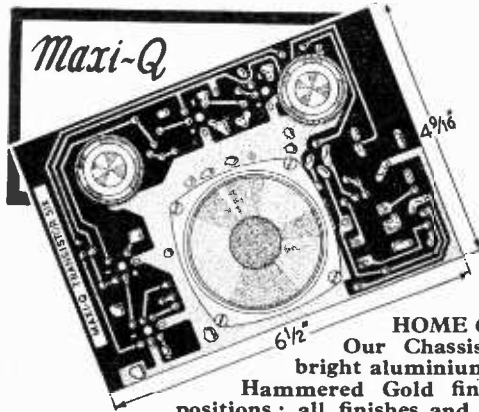
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TRANSMITTING TOPICS

THE MEANING OF THE TERM "STANDING WAVE RATIO (SWR)"

By O. J. Russell, B.Sc.(Hons.), G3BHJ

(Concluded from page 230 of the May issue)



LAST month we showed how the transmission line could be adjusted with an SWR of two. If the SWR were three, we could produce any value of resistance between $33\frac{1}{3}$ ohms and 300 at the transmitter by varying the length of the line.

A quarter wave alteration in length of line suffices to change from the highest to the lowest value. If we have designed our transmitter to operate efficiently into a 100 ohm line when correctly tuned up, we may have trouble if a high SWR exists. If fact if the SWR is too high, we may damage components in the transmitter tank circuit (for example, the load capacitor) by having too high voltages appear. Such injurious effects are often reported, particularly where the transmitter tank circuit components are adequate for their designed output impedance, but have not been made to handle wide variations from the designed values. The usual trouble reported on some commercial transmitters (not made in this country) has been burning out of mica load condensers owing to excessive currents caused by SWR on the coaxial feeder.

Varying Impedance

Fig. 5 illustrates the impedance changes at quarter-wave intervals for the two cases of a 100 ohm line operating with an SWR of two. Owing to the fact that the impedance varies between 50 ohms and 200 ohms at quarter-wave intervals along the line, it might be asked whether at some intermediate point the line would present an exact 100 ohms resistance to the transmitter. This is in fact the case, and midway between the two extremes, i.e., an eighth wavelength of cable from a maximum or a minimum current position, the resistance presented is precisely that of the cable—100 ohms. There is a slight snag, however, as apart from the resistive component, the impedance presented is also either capacitive or inductive depending on line length. That is to say the effect is that of a 100 ohm resistor together with either an inductance or a capacity. However, the tuning adjustment of the transmitter can be arranged to "tune out" the inductive or capacitive part of the impedance presented, so that the transmitter is then matched into the correct value of load resistance.

It should be noted that this procedure of adjusting line length so that a good match is presented to the transmitter does not affect the SWR in any way. It is sometimes found that an operator who has obtained satisfactory loading by "pruning" his feeder in this way imagines that this has reduced his SWR. Of course this is not so, and the existence of a high SWR necessitates this "pruning." Incidentally, this procedure may have drawbacks, particularly if a long feeder is used. Thus the "pruning" at one frequency will be upset if the transmitter is tuned to another frequency. With a very long length of feeder such effects may be very appreciable, although under average amateur conditions are not likely to be troublesome.

Higher Losses

Although pruning the feeder may enable the load presented to the transmitter to be adjusted so that power may be effectively fed into the line, other disadvantages of a high SWR are not removed. Thus if the line has losses, a high SWR results in higher losses. At the high current point, for example, losses owing to the resistance of the line will be increased. Similarly, dielectric losses will be increased at the high voltage positions. It should be noted that coaxial cable may have appreciable losses. In a 100 foot run, some types have nearly 2dB loss even when correctly terminated. An amateur transmitter would not choose such a cable, for with various other losses, nearly half his generated power would be lost. There are quite a number of cables available on the market, and also from "surplus"

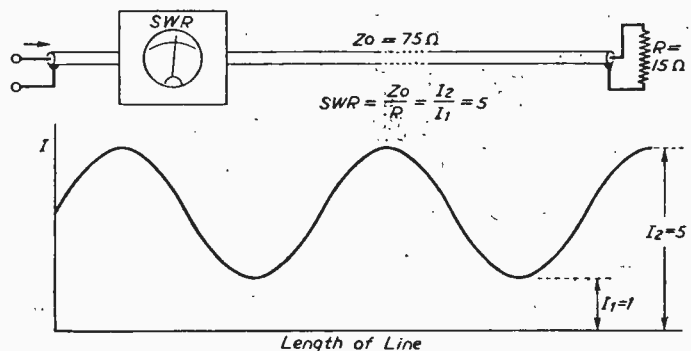


Fig. 4.—If a transmission line is not terminated in the correct value of load resistance, standing waves exist. The ratio of maximum and minimum currents (or voltage) along the line is the standing-wave ratio. This ratio is also given by the ratio of line impedance and load resistor.

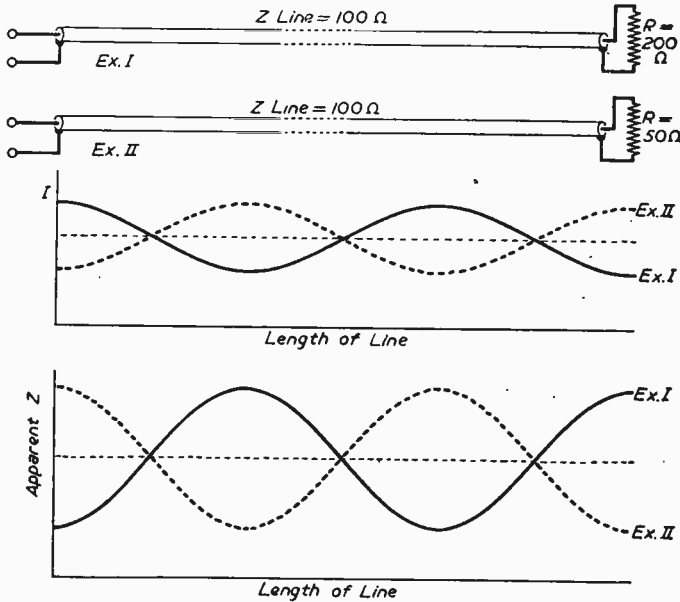


Fig. 5.—As the SWR is always reckoned as greater than one, the two cases above illustrate a 100 ohm line with an SWR of two. Not only the current but also the apparent impedance of the line varies with length.

sources. Unless care is taken, losses from most cables will exceed 1dB.

Line Losses

It should be noted that with line losses, the SWR of a long line as measured by the usual "SWR meter", will be somewhat less than the true figure. The forward power will be measured correctly, but the "reflected" power has to travel down the line, be reflected and travel back to the SWR meter. Thus with 100 feet of line with 2dB attenuation, the reflected power would suffer this attenuation twice in travelling down the line and back again. This would appreciably reduce the SWR reading of the meter. In fact if the line at the far end were shorted or open circuit—a complete mismatch representing an SWR of infinity—the SWR meter would only register an SWR of between four and five. With a long run of coax of this type, almost any degree of mismatch could exist at the far end, and the meter with a mere hundred yards of such coax attached would never indicate higher than about two no matter what load was applied to the far end.

False Readings

For many reasons, then, the indications of an SWR meter may be misleading. An unbalance in the coaxial feeder for example might make the meter give spurious readings, while appreciable harmonic output by the transmitter could also be misleading through the SWR meter indicating a higher SWR than actually exists and so on.

The amateur who has not previously considered the importance of standing-wave ratios, may now

see that while they are a matter of considerable importance in some cases, they are not necessarily greatly important in others. Thus the common "tuned feeder" operates with the usual 500 ohm spaced feeder with an SWR that seldom exceeds around ten or so even with the usual resonant feeder systems. However, some aerial systems of the resonant type if fed with 50 ohm coax might run up to an SWR of 50 or even 100. This is the case when one attempts to run a coax-fed dipole on its second harmonic for example. These figures follow because, with the usual aerial systems, the feed impedance may vary from, say, 50 ohms up to 5,000 ohms. The 500 ohm feeder is the geometric mean of these values, so is not too drastically mismatched—say, an SWR of ten—whatever it feeds. With the very low losses of open wire airspaced feeder, even with a high SWR the total losses are not great. Coaxial cable inherently has a fairly high attenuation unless a wide spaced type with air insulation is used. Such feeders are used, but are necessarily rigid and used in fixed runs.

Melting Dielectric

The more usual flexible coaxial cable having appreciable solid dielectric has considerable losses. This shows up with the actual melting of the dielectric under high powers at voltage points when standing waves exist. The usual effect found by the writer with powers of many kilowatts (not on his amateur rig), is that at bends the dielectric softens, allowing the inner wire to creep through the insulation and short to the outer shielding. In the U.S.A., amateurs running high power have found the coax shorted internally at quarter-wave intervals when attempting to feed dipoles on their harmonic frequencies, thus causing heavy mismatch and high SWR.

SWR becomes of importance when using Pi tank transmitters, or similar systems designed to operate on fairly well defined output loads; when coaxial cable is used and when feeding aerial systems involving matching. There are many beam matching devices to match the coaxial feeder, which are adjusted at the aerial until the SWR meter reading is reduced to an acceptable value. Usually the target figure is unity, but with many beams, it is only possible to achieve this at one frequency. Thus a low SWR is obtained only around the frequency to which the aerial has been adjusted.

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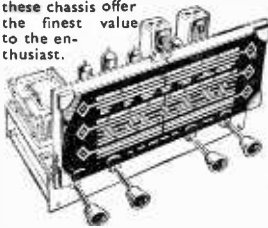
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INCREASED RELIABILITY WAS THE MAIN FEATURE OF THE LONDON EXHIBITION
HELD FROM APRIL 6th TO 9th

IMPROVED radio components which will lead to increased reliability of all electronic equipment, from television and radio sets to missile guidance systems, were to be seen at the exhibition of the Radio and Electronic Component Manufacturers' Federation at Grosvenor House and Park Lane House, London, from April 6th to 9th. There were 179 firms exhibiting.

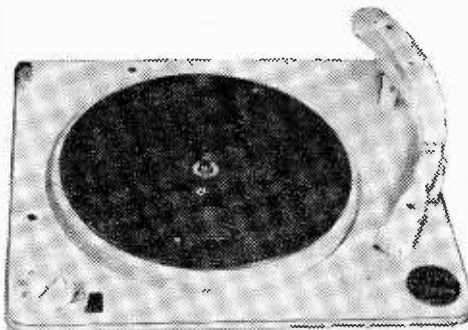
This was the last show of the series to be held at Grosvenor House. Next year there will be no components show, and commencing in 1961 the exhibition will be staged every two years at Olympia. It will then take place in the third week in May.

Component Sizes

There were interesting developments in loudspeaker design. One triple-speaker assembly by Richard Allan gives virtually flat response from 23 to 17,000 cycles per second. The popularity of small transistor portable receivers has given the loudspeaker makers problems in maintaining good sound response while further reducing

speaker sizes. One loudspeaker shown by Whiteley Electrical Radio Co. measures only 1½ in.

Reduction in component sizes was a general feature. A twin-gang variable condenser measuring less than one inch in any direction was shown by Wingrove and Rogers. Another firm (Forti-phone Ltd.) showed what is claimed to be the smallest knob-operated volume control and switch



The Collaro RP594 Gramophone Unit.

ever manufactured commercially. It is specially designed for "headborne" hearing aids and measures less than one-third inch in diameter and little more than one-eighth inch in depth.

Tape Recorders

The expansion of the tape recorder market was reflected in the introduction of several new pieces of equipment. One of the well-known record player manufacturers introduced a new simple tape deck designed for the mass market. (B.S.R.) Manufacturers have improved the quality of recording tape. By using an extremely thin, yet strong, plastic base, a "double play" tape has been produced by the makers of Scotch Brand, which doubles the playing time for a spool of given size.

Improvements in the record/playback heads, coupled with more uniform tape quality, enable recordings to be made at slower tape speeds without undue sacrifice of quality. With well-designed amplifying equipment, "better than radio" response can be obtained now at 3½ in. per second tape speed, doubling the length of playing time that is available at the standard 7½ in. per second speed.

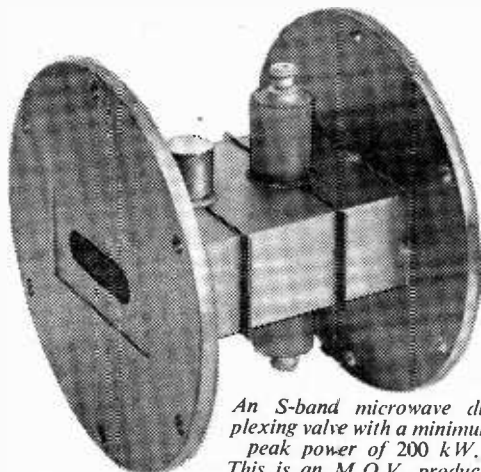
Stereophonic Equipment

Stereophonic recording and reproducing equipment was featured by several manufacturers. New tape decks and record players for this purpose were shown. There were also some improved stereo pickups.



A non-destructive Flash Tester by Labgear.

There was an interesting new microphone for stereophonic recording. To all intents and purposes it looks like a single instrument, but it is in fact two tubular directional microphones



An S-band microwave duplexing valve with a minimum peak power of 200 kW. This is an M.O.V. product.

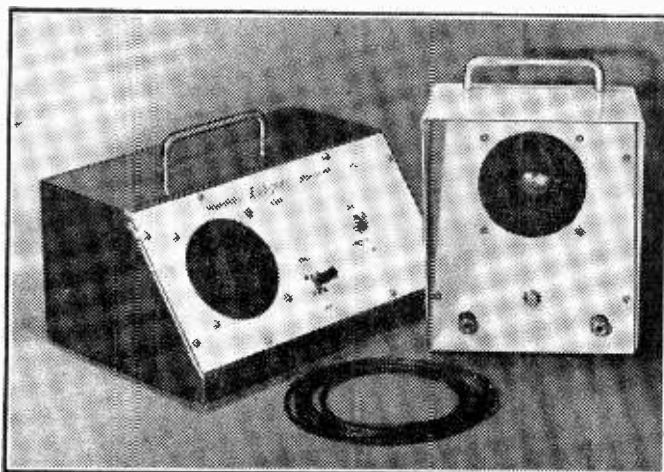
mounted one above the other and capable of being turned to the required angle to accept "left" and "right" sound channels. This was shown by Lustraphone.

Miniaturisation was to be seen everywhere. Transformers have been developed by Gresham Transformers and others for aircraft and guided missile work that are not only of reduced size and weight but are able to operate over even wider temperature ranges.

Condenser and resistances of extremely close tolerances, designed to withstand difficult conditions of humidity and temperature, have been made even smaller than a year ago, yet are built to strict specification.

New Test Gear

New test gear was exhibited. Taylor Electrical



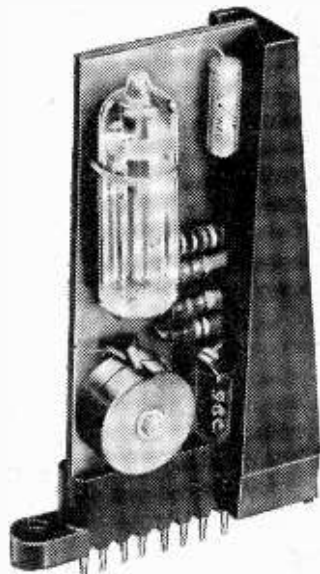
An inter-com unit by Labgear—also using a transistor circuit.

Instruments and British Physical Laboratories were showing highly sensitive multi-meters. Sufficiently rugged for everyday work on bench or in the field, one has a sensitivity of 1 megohm per volt while the other, using an 8 microamp f.s.d. meter movement, is rated at 100,000 ohms per volt.

Service manufacturers are stressing the increasing use of plastics, not only in the production of cabinets and containers but for insulation and as dielectric materials in condensers. Wiring and cables which are unharmed at temperatures between *minus* 65 degrees and *plus* 250 degrees centigrade are now quite general. New low-loss coaxial cable was also shown.

Mobile Radio

Much of the equipment which was seen related to mobile radio. As more channels come into use, stricter frequency control is necessary in both transmitters and receivers. Cathodeon exhibited a crystal oven for maintaining the control crystal at an even temperature—plus or minus 2.5 degrees centigrade—yet it measures little more than 2in. in height and weighs only 1½ ounces.



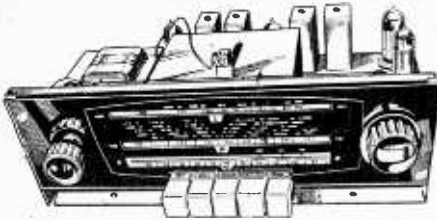
The new transistor oscillator by S.E.I.

The same firm also showed a small I.F. crystal filter unit for narrowing the response band of a V.H.F. receiver.

A system of controlling alternating current without switching was demonstrated by Haddon Transformers Ltd. Known as stepless control, it uses a small D.C. supply to control large A.C. powers such as those used in electric furnaces and various automation systems. The D.C. is employed to vary the A.C. permeability of a transformer core.

Transistors are now invading the V.H.F. wavebands. Several firms are introducing transistors using germanium or silicon which are capable of operating at frequencies of 100 to 200 Mc/s. At least one firm is hopeful of putting on to the market a 400 Mc/s transistor soon.

WONDERFUL OFFER OF A.M.-F.M. CHASSIS AT £13.68. (P. & P. 10/-)



Why buy a F.M. Tuner at the same price? Tapped input 220-225 v. and 226-250 v. A.C. ONLY. Chassis size 15" x 6 1/2" x 5 1/2" high. New manufacture. Dial 14 1/2" x 4" in gold, red and deep brown. Pick-up, Extension Speaker, Ac., E. and Dipole sockets. Five "piano" push buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. With all valves & O.P. Transformer. Covers 1,000-1,900 M.; 200-500 M.; 88-99 Mc/s. Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85. Speaker & Cabinet to fit, polished, with back, 67/6. 10" x 6" ELLIPTICAL SPEAKER, 20/-. Tone Control fitted.

TERMS:—(Chassis) £4.16.8 down + 10/- carr. and 6 Monthly Payments of 30/-, or with Cabinet & Speaker £59.2 down + 10/- carr. and 7 Monthly Payments of 35/-.

"READY TO USE" I.T.A. CONVERTER

I.T.A. high gain converter. ALL CHANNELS—ALL AREAS—ALL SETS. Direct switching (I.T.A. to B.B.C.): internal power pack; valves PCF80 and PCC84; moulded cabinet 8 1/2" x 4" x 6". No alteration to your set; fitted in 10 mins. 12 months' guarantee. For Philips' sets using Twin Feeder Specify "Twin Feeder."

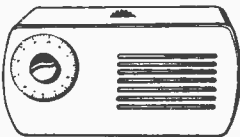


£5.5.0 P. & P. 3/-

AUTOMATIC RECORD CHANGERS COLLARO CONQUEST with manual play also. Turnover crystal pick-up, 4-speed, A.C. mains 200-250 v., see illus. Buy for your friends as well. Box of 4 B.S.R. Monarch for only £26 (carr. £1).



£7.17.6 (5/- p. & p.)



10 GUINEAS (Reg. Post 2/6 extra)

Fully transistorized completely built printed circuit Radio, M.W. only. Originally nearly twice the price. Uses Ever Ready 9 v. PP4 battery.

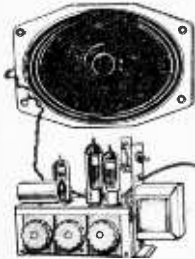
Weights only 16 ozs. Unbreakable plastic case, cream, red or blue. 6" x 3 1/2" x 1 1/2". We have received more than 20 Stations at loudspeaker strength.

SIX TRANSISTOR SUPERHET KIT £9.19.6 Med. and L.W.; Printed Circuit; Instruction Book. Internal aerial. Details as for 10 Gn. Set above. All items supplied separately. Write for price list.

1-AMP BATTERY CHARGER KIT (with instructions). 6 v. and 12 v. 21/- (p. & p. 3/-). Fully assembled 26/6 (p. & p. 3/-).

50 DIFFERENT NEW RESISTORS. 1/1 w., 5/-, post paid.

AERIALS. F.M. Aerials single dipole room mtg., 17/6; ditto loft mtg., 20/-; "H" with chimney lashings, 65/-. Co-axial low loss cable 8d. yard or 20 yds. 12/6, all these items carriage paid.



3-VALVE AMPLIFIER (INCL. RECT.). Capable of giving 6 watts. 8" x 5" Speaker wired-in. Mains and output transformers. Valves ECC81, EL84 and Rect. 3 Controls, volume, bass and treble. On/Off switch. Fully guaranteed. Chassis size 6 1/2" x 3" x 2 1/2".

67/- (3/- p. & p.)

GRAMOPHONE AMPLIFIER with 5in. SPEAKER. On Fabric covered Baffle 12 1/2" x 5". Mains and Output Transformers. Metal Rectifier. ECL82 Valve. Tone and Volume Controls. On/Off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. ONLY 57/- (post 3/-). Useful for Stereo.

BEREC "PIONEER" RADIO IN MAKER'S CARTON. Valves DK96, DF96, DAF96, DL96. Berec Ever-Ready Battery B103, 20/- extra. Two Short Wavebands 2.5 to 7 Mc/s and 6.5 to 17 Mc/s. Cabinet, 12" x 7 1/2" x 6". In kit form with instructions and fully wired coil pack. Two Short Wavebands £3.10.0. One M.W. and S.W. £3.17.6. Plus 2/6 p. & p. Separate items supplied.

BATTERY ELIMINATOR. Converts your Battery Set to Mains. For 4 Low Consumption Valves (DK96 range). 90 v. 15 ma. and 1.4 v. 125 ma., 42/6 (2/6 post). 200-250 v. A.C. Size 5 1/2" x 3 1/2" x 2". Also for 250 ma. 1.4 v. and 90 v. 15 ma. at same price. Specify which.

LOUDSPEAKERS—Rola 10,000 line (2-3 ohm). 3 1/2" square, 15/- (1/-); 8" x 5" Celestion elliptical 20/- (1/6); 6 1/2" circ. 14/6 (1/6); all 2-3 ohm. (p. & p. in brackets)

50 SILVERED MICA AND CERAMIC CONDENSERS. 10/-, post paid.

Send 6d. (stamps will do) for our illustrated catalogue of the above items and others. All New Goods. Posted Orders to Worthing, please. Delivery by return. Terms:—One-third down and balance plus 7/6 in four equal monthly payments. Postage with down payment. (C.O.D. 2/- extra.)

SEE SPECIAL TERMS FOR A.M./F.M. CHASSIS.

Large selection of complete Radiograms, ready built in cabinets, with 4-speed Autochanger. Write for details. giving approximate size required. Price from £25 for A.M. only, or £30 for A.M./F.M.

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WEYRAD

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

LONG AND MEDIUM WAVE AERIAL—RA2W

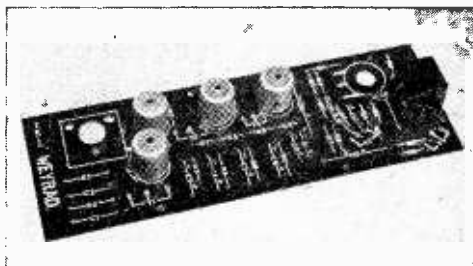
On 6in. rod, 7/16in. diameter, flying lead connections, 208 pF tuning 12/6

OSCILLATOR COIL—P50/1AC
Medium wave in screening can. For 176 pF tuning condenser 5/4

1st AND 2nd I.F. TRANSFORMERS—P50/2CC
470 Kc/s operation with 250 pF tuning in cans. 11/16in. diameter by 3/4in. high 5/7

3rd I.F. TRANSFORMER—P50/3CC
Last stage transformer to feed diode detector. Size as P50/2 6/-

DRIVER TRANSFORMER—LFD7I
Fully enclosed with six connecting tags—case 11/16in. square by 1 1/8in. high 17/6



PRINTED CIRCUIT—PCAI

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

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

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

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

SOUTHERN RADIO'S WIRELESS BARGAINS

QUARTZ CRYSTALS. Types F.T.241 and F.T.243, 2-pin, 1/2" Spacing. Frequencies between 5.675 Kc/s and 8.650 Kc/s. (F.T.243) 20 Mc/s. and 38.8 Mc/s. (F.T.24), 54th Harmonic, 4/- each. ALL BRAND NEW. TWELVE ASSORTED CRYSTALS, 45/- . Holders for both types, 1/- each. Customers ordering 12 crystals can be supplied with lists of frequencies available for their choice.

TRANSPARENT MAP CASES, Plastic. 14" x 10 1/2". Ideal for Maps, Display, etc. 5/6

STAR IDENTIFIERS. Type I A-N Covers both Hemispheres. 5/6

CONTACTOR TIME SWITCHES. 2 Impulses per sec. in case 11/6

REMOTE CONTACTOR. For use with above. 7/6

TRANSRECEIVERS. Type "38" (Walkie-Talkie) complete with 5 valves, etc. New condition, untested by us, but serviceable no guarantee. 22/6 each.

ATTACHMENTS for Type "38" Transreceivers. ALL BRAND NEW. PHONES, 15/6; THROAT MICROPHONES, 4/6; JUNCTION BOXES, 2/6; AERIALS, No. 1, 2/6; No. 2, 5/-; WEBBING, 4/-; HAVERSACKS, 5/-; VALVES, A.R.P.12, 4/6; A.T.P.4, 3/6. Set of FIVE VALVES, 19/- the set.

RESISTANCES. 100 Assorted useful values. New wire end, 12/6

CONDENSERS. 100 Assorted. Mica, Tubular, etc. NEW. 15/-

LUBBRA HOLE CUTTERS. Adjustable 1/8" to 3/8". For Metal, Plastic, etc. 7/-

MORSE TAPPERS. Midget Type, 2/9. Standard, 3/6. Heavy Type on Base, 5/6. ALL BRAND NEW.

MORSE PRACTICE SET. TAPPER with BUZZER on Base. Complete with Battery. BRAND NEW. 12/6

MAGNETS. Strong Bar Type. 2" x 1/2". 1/6 each.

TRANSRECEIVERS. Type "18" Mark III. Two Units (Receiver and Sender). Six Valves, Micrometer, etc. Metal Case, Un-tested. No guarantee, but COMPLETE. £2 18s. 6d.

ATTACHMENTS for "18" Transreceivers. ALL BRAND NEW. HEADPHONES, 15/6; HAND MICROPHONE, 12/6; AERIALS, 5/-; SET OF 6 VALVES, 30/-.

PACKARD-BELL AMPLIFIERS. Complete BRAND NEW with Valves; Relay, etc. etc. 17/6 each.

SPECIAL OFFER. 12 ASSORTED METERS. Slightly damaged. Mainly broken cases (perfect movements). Including 3 Brand New Aircraft Instruments. 12 for 45/-.

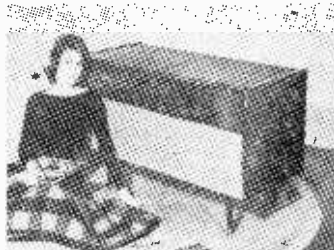
POST OR CARRIAGE EXTRA. FULL LIST OF RADIO BOOKS, ETC., 3d.

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RADIOSTRUCTOR
BRITAIN'S LEADING RADIO TRAINING ORGANISATION

International Transistor Convention

TO BE HELD AT EARLS COURT, FROM THE 21st TO 27th MAY, 1959

THE transistor was invented in 1948 by three Americans: Dr. W. B. Shockley, now head of Beckman Semiconductor Laboratories; Professor John Bardeen, now Physics and Electrical Engineering Professor at the University of Illinois; and Dr. Walter H. Brattain of the Bell Telephone Laboratories.

Each is a Nobel prize winner in physics, and they will be giving the opening lectures at the convention, which is already exciting world-wide interest among scientists and engineers. Delegates (some 2,000 are expected) will be coming from almost every country in the world, including Russia, East Germany and Poland.

Scope of Convention

The convention will range over the whole field of transistors and semiconductors, including basic theory, transistor materials, characteristics and their measurements, transistors as a circuit element, technology, design manufacture, applications, and world technical trends.

During its 23 sessions (11 specialist, 12 general), over 30 lectures will be given and some 200 papers are expected to be presented, the texts of which, together with the convention discussions, will be published in a special supplement of the "Proceedings of The Institution of Electrical Engineers."

Need for Exchange of International Knowledge

Transistors—"three bits of wire leading from a germanium crystal enclosed in a vacuum inside an aluminium tube protected by silicone grease"—represents one of the most outstanding scientific and technical achievements of the post-war period, and they have had an enormous influence on many branches of electrical engineering.

The need now is for an exchange of international knowledge on the transistor and its applications. That the International Convention and Exhibition on Transistors and Associated Semiconductor Devices (to give it the official title), will meet this need is made apparent by the very large number of delegates who have already expressed their intention of attending the event, and by the clear indications of a large attendance by scientists and engineers desiring to see the exhibits.

It is fitting that London, one of the main electronics centres to which people from all over the world come to teach or to be taught electronics, should be the place chosen for this unique scientific convention and exhibition.

Nature of Exhibits

The exhibits will come from firms manufacturing transistors and other semiconductor devices, and from those making transistor materials, equipment incorporating transistors, or specialised components for use in transistorised equipment.

Many of the numerous applications of transistors and other semiconductor devices will be demonstrated, and a section of the exhibition will be devoted to research and development, with exhibits from government, industrial and university research laboratories.

V.I.P. Treatment for School Parties

The exhibition, organised for the I.E.E. by Industrial and Trade Fairs Ltd., will be open to scientists, engineers, numerous categories of technical experts, and students. Admission will be by ticket. Parties from schools will also be welcomed. Applications for tickets should be made to Industrial and Trade Fairs Ltd., Drury House, Russell Street, London, W.C.2.

LIST OF PRINCIPAL EXHIBITORS

- | | | |
|---------------------------------------|-------------------------------------|--------------------------------------|
| Ardent Acoustic Laboratories Ltd. | G.P.O. (Research Section) | Semiconductors Ltd. |
| Associated Electrical Industries Ltd. | Hathfield Instruments Ltd. | Shockley Transistor Corporation |
| Atomic Energy Research Estab. | Heraeus Quarzschmelze G.m.b.H. | Siemens Edison Swan Ltd.; also |
| Belling & Lee Ltd. | Imperial Chemical Industries Ltd. | Research Section |
| Birlec Ltd. | Institution of Electrical Engineers | Siemens & Halske A.G. |
| Brandhurst Co. Ltd. | Johnson, Matthey & Co. Ltd. | Societa Generale Semiconduttori |
| British Thomson-Houston Co. Ltd.: | Livingston Laboratories Ltd. | S.p.A. |
| also Research Section | Mallory Batteries Ltd. | Solartron Electronic Group Ltd. |
| Brush Crystal Co. Ltd. | Mansol (G.B.) Ltd. | South London Electrical Equipment |
| Compagnie Francaise Thomson- | Mining & Chemical Products Ltd. | Co. Ltd. |
| Houston | Mullard Ltd.; also Research Section | Standard Telephones & Cables Ltd. |
| Compagnie Generale de T.S.F. | Newmarket Transistor Co. Ltd. | TEKADE |
| Dawe Instruments Ltd. | Plessey Co. Ltd. | Telefunken G.m.b.H. |
| Edwards High Vacuum Ltd. | Pye Ltd. | Texas Instruments Ltd. |
| Electrovac Hecht & Huber O.M.G. | Rank Cintel Ltd. | Transitron Electronics Corporation |
| Elga Products Ltd. | Ratheyon Manufacturing Co. | Ultra Electric Ltd. |
| Elliott Brothers (London) Ltd. | R.C.A. (Great Britain) Ltd. | University of Birmingham |
| English Electric Valve Co. Ltd. | Rivlin Instruments Ltd. | Venner Electronics Ltd. |
| Ever Ready Co. (Gt. Britain) Ltd. | Roband Electronics Ltd. | Wayne Kerr Laboratories Ltd. |
| Ferguson Radio Corporation Ltd. | A. V. Roe & Co. Ltd. | Westinghouse Brake & Signal Co. Ltd. |
| Ferranti Ltd. | S.C.I. Ltd. | Wirepots Ltd. |
| General Electric Co. Ltd. | | Wire Products & Machine Design Ltd. |

NEWS FROM THE CLUBS

BRIGHTON AND DISTRICT RADIO CLUB

Hon. Sec. : Mr. E. M. Large, School House, Frant Road, Hove, 4.

The headquarters of the above are The Club Room, "The Eagle Inn," Gloucester Road, Brighton 1, and meetings are held on Wednesdays 8 to 10.30 p.m.

The Spring Programme for 1959 is as follows :

Wednesday, May 13th.—Junior Members' Evening No. 2. Wiring a Circuit, by D. Hemsley.

Wednesday, May 20th.—The Short Wave Bands and What Can be Heard on Them, by C. T. Fairchild (G3YY).

Wednesday, May 27th.—Film Show.

Wednesday, June 3rd.—Final arrangements for the National Field Day.

Saturday and Sunday, June 6th and 7th.—National Field Day Morse Classes will be held where possible to fit in with existing programme.

Notice to Members.—There has been an increase in the rent of the Club Room. The Committee do not wish to increase subscriptions, so the only way to keep the Club going is by more regular attendance.

The Club welcome to their meetings all interested in radio.

THE BRITISH INSTITUTION OF RADIO ENGINEERS

The following are the May Institution meetings.

Tuesday, May 5th, 6.30 p.m. (London Section). "An Experimental Diode Parametric Amplifier and its Properties," by I. M. Ross, C. P. Lea-Wilson, A. J. Monk and A. F. H. Thomson, at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1.

Wednesday, May 13th, 6.30 p.m. "Improving Communication Techniques—what have engineers to learn from theory?" by Professor D. Gabor, F.R.S., at the London School of Hygiene and Tropical Medicine, address as above.

BRITISH TIMKEN AMATEUR RADIO CLUB

Hon. Sec. : D. G. Chatfield (G3JXU), 55, Bush Hill, Weston Favell, Northampton.

This newly-formed club, which has been in existence about three months, is now "on the air" under the flag G3N1B. They will gladly welcome contacts on 80 and 160 metres, as at present they are limited to these two bands. The club night is every Thursday.

The equipment in use at present is a ZCI transmitter and National H.R.O. receiver. A Type 36 set is up for modification and they hope to build a higher power rig for the 1.6 bands, aerial is 300ft. long, wire 80ft. up.

The club has already visited the BBC transmitting station at Daventry and have in line a lecture on "Interference," by Mr. C. Homer, of the G.P.O.; a film night, and a visit to the local brewery!

The shack at British Timken is situated on the sports field and they have been granted permission to erect an aerial between two of the four 80ft. floodlight towers, which are spaced at a 300ft. by 400ft. rectangle.

BURY RADIO SOCIETY

Hon. Sec. : Mrs. Jean Hodgkins (G3JZP), 24, Beryl Avenue, Tottington, nr. Bury, Lancs.

MEETINGS on the second Tuesday of every month at 8 p.m. at the George Hotel, Kay Gardens, Bury. All hams and S.W.L.s welcome.

The next meeting is on May 12th, and Mr. J. Crowther, G3KMM, will give a talk and make final preparations for NFD. The meeting on June 9th will be a Junk Sale.

CHESTER AND DISTRICT RADIO SOCIETY

Hon. Press Sec. : A. Bagley, Astbury Cottages, Parkgate Road, Saughall, nr. Chester.

At an Extraordinary General Meeting of the Chester and District Amateur Radio Society, held at the Y.M.C.A., Chester, on February 24th last, it was decided to rename the club The Chester and District Radio Society.

H. Morris (G3JATZ), of 24, Kingsley Road, Boughton Heath, Chester, was elected Hon. Secretary for the coming year.

CLIFTON AMATEUR RADIO SOCIETY

The following events were held during March and April :

March 6th.—A Junk Sale.
March 20th.—A lecture on the History, Development and Manufacturing Technique of the Avometer," by a representative of Avo, Ltd.

April 3rd.—A lecture and demonstration called "Aerials and the Amateur" by C. J. Leal, G3HSX. The talk was illustrated with scaled down aerials working at 300 mc/s and set out to prove that the theory in the technical books is correct. Visitors from the N.W. Kent Radio Society attended.

April 17th.—A lecture and demonstration called "Direction Finding," by C. Hatfull (G3HZI), assisted by other club members, when members of the Mitcham Radio Society were entertained.

On May 8th Mr. G. A. Bird (G4ZU) will give a talk on the subject of "Practical Transistor Circuits," and on May 29th a Junk Sale will be held.

The first D/F Contest of the year will be run on May 17th, the assembly point being Green Street Green, near Farnborough, Kent.

Meetings continue every Friday as usual at the clubroom, 225, New Cross Road, S.E.14, at 7.30 p.m. G3GHN, the club Tx, is on most of these evenings on 160 metres and welcomes contacts.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY (Incorporating Derby Wireless Club, 1911)

(Affiliated to Radio Society of Great Britain, Station G3ERD.)

Hon. Sec. : F. C. Ward (G2CVV), 5, Uplands Avenue, Littleover, Derby (Tel. 21931).

Calendar of events :

June 3rd.—Surplus Sale.

June 6th.—National Field Day.

June 10th.—Open Night : Proposed visit Oaklands Amateur Observatory.

June 17th.—Direction Finding Practice Run, 7.30 to 9.30 p.m.

June 24th.—Beginners' Demonstration.

July 1st.—Surplus Sale.

July 5th.—R.S.G.B. Second 144 m/c Field Day (Telephony)

July 8th.—The Derby Wireless Club.

July 15th.—Open Night.

July 26th.—Direction Finding Contest (President's Trophy).

July 29th.—Beginners' Demonstration.

August 16th.—Mobile Rally.

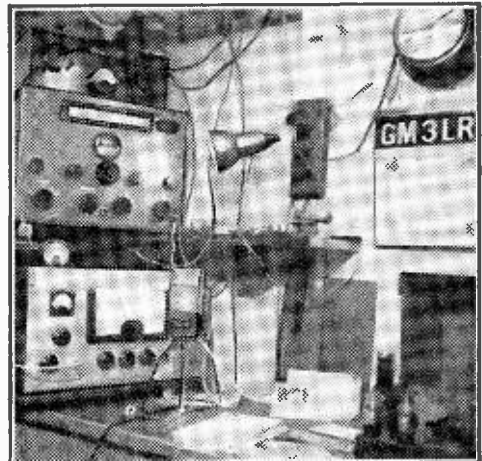
All meetings will be held in Room No. 4, 119, Green Lane, Derby, commencing at 7.30 p.m. Refreshments served 9 p.m.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

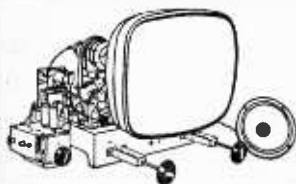
Hon. Sec. : A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax.

At the monthly meeting of the above Society, on March 3rd, 1959, held at the Sportsman Inn, Ogden, a good attendance of members listened to a lecture by Mr. Falkus and Mr. Newbold of Fane Acoustics, Ltd., and the subject was "Hi-Fi and Stereo Reproduction." The chairman, Mr. H. Malkin (G3FDC), presided and proposed a vote of thanks.

(Continued on page 337)



The illustration shows the den of Mr. James J. Gray (GM3LRG) of Greenock.



17" T/V CHASSIS, TUBE and SPEAKER 16 GNS.

17in. Rectangular Tube on modified chassis. Supplied as single channel chassis covering B.B.C. channels 1-5, or, incorporating Turret Tuner, which can be added as an extra, at our special price to chassis purchasers of 50/- giving choice of any 2 channels (B.B.C. & I.T.A.). Extra channels can be supplied at 7/6 each. Chassis size 12 x 14½ x 11in. less valves. Similar chassis are used by well-known companies because of their stability and reliability. With tube and speaker (less valves), 16 guineas. Complete and working with valves and Turret Tuner, 24 guineas. 12 months' guarantee on the Tubes. 3 months' guarantee on the valves and chassis. Ins., carr. (incl. Tube), 25/-.

R.P.2. RECORD PLAYER CABINET

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



69/6

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



- ★ COLLARO 4-SPEED AUTOCHANGER, £7.19.6.
- ★ B.S.R. MONARCH 4-SPEED STEREO AUTOCHANGER, £9.19.6.
- ★ COLLARO CONQUEST STEREO AUTOCHANGER, 11 GNS.
- ★ U.A.12. Latest B.S.R. MONARCH 4-SPEED MIXER, £8.9.6.
- ★ T.U.9. B.S.R. 4-SPEED SINGLE PLAYER, £4.9.6.

P. & P. on Autochangers, 5/6.

STEREOPHONIC AMPLIFIER, £7.19.6.

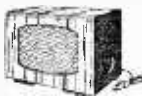
12 months' guarantee.
Beautifully made for portable stereophonic record players. Latest design with printed circuit. Dimensions 3 x 5½ x 9½in. A.C. only. Mains isolated. Twin amplifiers each side giving 3-4 watts output. Incorporating ECLB2 triode pentode valve. Full tone, volume and balance controls. Complete and ready to fit. Knobs 3/6 per set extra. P.P. & Ins., 4/6.

PORTABLE AMPLIFIER MARK D.2, 79/6

12 months' guarantee.
Printed circuit. Latest design. Dimensions 7 x 2½ x 5in. A.C. only. Mains isolated. 3-4 watts output. Incorporating the latest ECLB2 triode pentode output valve giving higher undistorted output. Volume and tone controls. Knobs, 2/6 extra. P. & P., 3/6.

EXTENSION SPEAKERS, 19/9

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



IDEAL FOR STEREOPHONIC SOUND
Bin. P.M. Speakers, 8/9. With O.P. transformer fitted, 10/-.
6½in. P.M. Speakers, 12/6. 4 x 7in. elliptical speakers, 19/6.
8 x 5in. elliptical speakers, 22/- P. & P., 2/9.



REGETTERED IMPROVED VACUUM T.V. TUBES

12 MONTHS' GUARANTEE

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

Our 12 months' guarantee (6 months full replacement, 6 months progressive) illustrates our wholehearted confidence in the Tubes we offer. Remember they also hold a 10 days' money back guarantee.

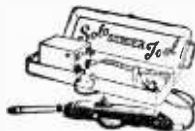
Pin., 10in., 14in., 15in. & 16in. Round Tubes. Our special offer of these sizes, £5. 12in. T.V. Tubes, £6. Three months' guarantee on round Tubes. Ins., carr., 15/6.

★ EXPRESS DESPATCH SERVICE ★

Please phone to confirm Tube in stock. Send Telegraph Money Order. Tube despatched Passenger Train same day. This service only available with remittance by a Telegraph Money Order.

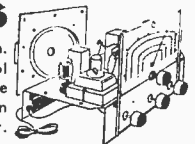
SOLO SOLDERING TOOL, 12/6

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



SUPER CHASSIS, 79/6

5 valve superhet chassis including Bin. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four w/bands with position for gram p.u. and extension speaker. A.C. Ins., carr., 5/6.



SOUND/VISION & I.F. STRIP, 5/9

Salvaged. Complete sound and vision strip. 8 valve holders. Less valves. I.F.s 16-19.5 Mc/s. Size 8½ x 4½ x 4½in. Drawings free with order. P. & P., 2/6.

TIMEBASE, 4/9

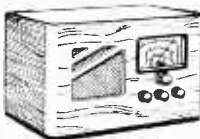
Containing scanning coils, focus unit, line transformer, etc. Less valves. Drawings free with order. P. & P., 2/6.

POWER PACK & AMPLIFIER, 9/9

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

CONTEMPORARY EXTENSION SPEAKERS, 32/6

18 x 7 x 15in. Dark veneered walnut cabinet. Attractive speaker fret. High quality Bin. P.M. Speaker. On and Off switch and volume control. P. & P., 3/6.



HOME RADIO, 79.6

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

DUKE & CO.

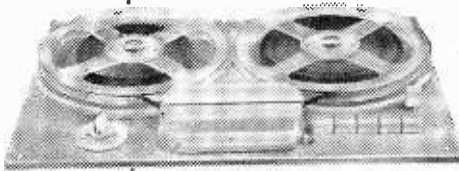
(Dept. D.6.), 621/3, ROMFORD ROAD, MANOR PARK, E.12.

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21
Gns

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POCKET SIZE!

Performance equal to a high priced instrument

OUTSTANDING FEATURES:

Sensitivity 20,000 o.p.v.

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20 Ranges.

D.C. Current 50µA, to 1 Amp.

D.C. Volts 0.3 v. to 1,000 v. (25kV. by probe).

A.C. Volts 10 v. to 1,000 v.

3 Resistance Ranges from 0-20 megohms (self-contained).

Meter 40µA 3 1/2" arc. Accuracy D.C. 3%, A.C. 4%, Ohms 5%.

Dimensions 5 3/8" x 3 3/8" x 1 1/2". Price: £10.0.0

Weight 14oz.

Hire Purchase or Credit Sale Terms available.

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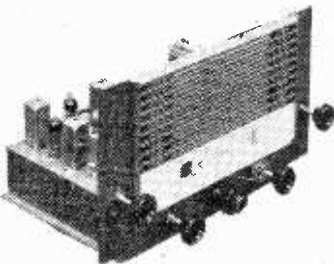
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AN *Armstrong* BANDSPREAD

SHORT-WAVE RECEIVER BS125R. £46.10.0 (Plus £10.2.0 P.T. in U.K.)



A reliable high performance semi-communications receiver with 6 bandspread ranges (11, 13, 16, 19, 25 and 31 metre bands) and 3 general coverage bands (15-43, 43-150, 190-550 metres). A tuned high gain R.F. stage and two I.F. stages ensure outstanding sensitivity and selectivity. The 10-watt push-pull output amplifier section, with independent bass and treble controls and high quality output transformer, gives a high standard of reproduction which, with the gram input provided, is available for record reproduction as well.

An ALL-WAVEBAND RECEIVER

WITH R.F. STAGE RF125R. £37.10.0 (Plus £7.4.4 P.T. in U.K.)

This version of the 125 receiver is identical to that described above, except that the coverage is continuous from 13 to 550 metres spread over 4 ranges and with the addition of the long waveband.

BANDSPREAD and R.F. STAGE TUNERS

Tuner-Control Unit versions of these models, incorporating bass and treble and gain controls, and audio pre-amplification, are available for use with existing power amplifiers.

BS125T. £31.10.0 (Plus Purchase Tax in the United Kingdom)
RF125T. £22.10.0

Post this coupon or write for descriptive literature and details of Home Trial facilities, Hire Purchase Terms and Guarantee or call at our Holloway Showroom for full, unhurried demonstration and professional advice on your installation. Open 9-6 Weekdays and 9-5 Sats.

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HARLOW AND DISTRICT RADIO SOCIETY

(Affiliated to the Radio Society of Great Britain)

Hon. Sec. : A. T. White, The Chestnuts, Fyefield, Ongar, Essex.
THE above club holds its meetings at 6, High Street, Harlow, Essex, on Tuesday evenings at 8 o'clock. They are endeavouring to arrange film shows, lectures, or visits, on alternate Tuesdays during the fine weather.

The club participates in the various amateur contests, and also in the R.S.G.B. annual "Field Day."

Each year, the club holds a mobile rally and this year it is proposed to hold it at Magdalen Laver village hall on June 21st (Sunday). Last year's rally which was held at the same venue was very successful in spite of disadvantageous weather. Refreshments are to be available and it is hoped to be able to arrange exhibitions and demonstrations. "Talk-in" stations will be operating on 160 and 2 metres.

Visitors to any event or meeting are always welcome and any enquiries can be made either to the Secretary or the Chairman at 6, High Street, Harlow, Essex.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec. : H. James (G3MCN), 448, East Prescott Road, Knotty Ash, Liverpool, 14.

MEETINGS are held every Tuesday at 8 p.m. at the Gladstone Mission Hall, Queen's Drive, Childwall, Liverpool and future events include :

May 12th—Lecture on TVI by G3LIS.

May 19th—Lecture on Relays.

May 26th—Lecture on Aerials by G3EWZ.

LOWESTOFT AND BECCLES AMATEUR RADIO CLUB

Hon. Sec. : P. Hayward, 60, Edgerton Road, Lowestoft, Suffolk.

THE Club in conjunction with the Lowestoft & District R.S.G.B. Group participated in the Careers and Hobbies Exhibition held by the Lowestoft Rotary Club at the Pier Pavilion, South Pier, Lowestoft, from April 29th to May 1st, 1959.

An amateur station was in operation during the exhibition using the call sign GB3RC and there was the usual display of amateur built equipment.

READING AMATEUR RADIO CLUB

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

Club meetings are held on the last Saturday in each month, at 7 p.m. for 7.30 p.m. at the Palmer Hall, West Street, Reading. On April 12th G5HZ arranged details of the clubs entering the R.S.G.B. Field Day. On May 30th G3GKH will be discussing gear for 2 metres and down. There is to be a talk shortly by G5TP on mobile equipment for top band.

New members and visitors are always welcome. Subscriptions are 12s. per year for adult members and 6s. per year for under 18's.

REIGATE AMATEUR TRANSMITTING SOCIETY

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

THIS Society has recently been formed by a small group of enthusiastic radio amateurs in the Reigate and Redhill areas with the aim of furthering the spirit and interests of amateur radio locally. The Chairman is P. D. Lucas (G3JDN), 14, Rusbets Road, Reigate, Surrey, and the Hon. Sec./Treas. is F. D. Thom, (Tel. : Reigate 5033), either of whom will be willing to supply further details to any interested licensed amateur or S.W.L.

Future activities include a demonstration of amateur radio at the Reigate Grammar School Fair to be held in the School Grounds on Saturday, May 30th, when the Society will be operating under the call-sign G3JDN/A, on all bands from 160 m. to 2 m. and for which occasion special QSL cards will be printed. The Society will be assisting the local R.S.G.B. members in the National Field Day and 2-metre Contests, and portable expeditions are also planned.

ROYAL AIR FORCE AMATEUR RADIO SOCIETY

THE first Amateur Radio Society to be formed in the R.A.F. was called the Cranwell Amateur Radio Transmitting Society and was formed in 1936. C.A.R.T.S. was allotted the call sign G8FC. Widening interest throughout the R.A.F. in this hobby, and the desire of members of C.A.R.T.S. to continue to maintain touch with Cranwell members after their dispersal on posting, gave birth to the formation of the R.A.F. Amateur Radio Society, April 1st, 1938.

The Society received Air Ministry support and has prospered. The Headquarters (G8FC) is now located at No. 1 Radio School, R.A.F. Locking, near Weston-super-Mare, and many stations at home and overseas have opened RAF-ARS Clubs. Corporate membership is open to all serving R.A.F. amateurs and retired R.A.F. personnel may continue membership as Associates. Both types of membership are open to Air Ministry civilian employees.

The Society has received very valuable financial help from the Nuffield Trust and has been able to supply many of its clubs with a transmitter kit of parts by virtue of this assistance.

Air Marshal Sir R. G. Harr (Rtd.) is the Patron of the Society, the position of President is vested in the Officer Commanding R.A.F. Locking, and the Vice-President is, at the moment, W/Cdr. A. R. Gilding (G3KSH) who represents the Society at Air Ministry level.

Many of the Society's members will be well known to experienced "Hams." W Cdr. W. E. Dunn (R.A.F. Rtd.), affectionately known as "Wally" (G2LR), has been responsible for RAF-ARS at Air Ministry level virtually since its inception in 1938 until he retired a year or two ago. Another member well known in "Ham" circles is F/Sgt. Frank Johnstone (G3JDC). This operator accompanied the Inspector of Radio Services to many stations on his IRIS flight and visited many R.A.F. Clubs overseas.

It will be of interest to note that another member, Sgt. Ellis (Tally) Williams (VP8BO), was a member of the Advance Party of the British Trans-Antarctic Expedition at Shackleton in 1956, where he operated under conditions of great difficulty in an official capacity for the Advance Party and also as an amateur.

The Society issues its own magazine entitled "QRV" to all members twice a year.

SPEN VALLEY AMATEUR RADIO SOCIETY

(Affiliated R.S.G.B.)

Hon. Sec. : J. J. Rose, 14, South View Terrace, Hill Head, Dewsbury, Yorkshire.

THE Northern Mobile Radio Rally will be held on May 24th, 1959 in the Park of Harewood House, situated on the A61 road between Leeds and Harrogate, 7 miles from Harrogate and 8 miles Leeds.

Talking-in stations will be operated on 160 and 80 metre bands. The park will be open from 12.30 to 6 p.m. The rally will be mainly a social event and the organising committee welcome old and new friends. A Bi-centenary exhibition will be open, "The Story of Harewood" and "Harewood Golden Vase." An "all-in" charge will be 3/-; children half price, or a 1/- additional charge to the park admission which is 1/6. Refreshments are available in the park at nominal charges. High Teas or Cold Luncheons can be booked in advance; for menu and prices, bookings, or any further details write to the Secretary.

STOKE-ON-TRENT AMATEUR RADIO SOCIETY (G3GBU)

(Affiliated to R.S.G.B.)

Hon. Sec. : Victor James Reynolds (G3COY), 90, Prince's Road, Stoke-on-Trent, Staffs.

ANNUAL General Meeting was held on March 26th, at the Club headquarters "The Cottage," London Road, Oakhill, Stoke-on-Trent.

New officers were elected. Plans were made for participation in all the inter-club contests.

The Midland Mobile Rally was held at the nearby Trentham Gardens on April 26th.

A demonstration of radio operating was given to the Newcastle-under-Lyne Conservatives on April 30th. This was on similar lines to a demonstration given to the Senior Scouts at Burslem on March 14th. For this event the local Fire Brigade assisted with the erection and dismantling of the aerials.

During the Easter weekend more work was carried out on building the Country Shack, G3GBU/A. Huge pieces of Derbyshire stone were lifted into position to complete the gable walls.

TORBAY AMATEUR RADIO SOCIETY

Hon. Sec. : G. Western (G3LFL), 118, Salisbury Avenue, Barton, Torquay.

SOME 40 members were present including an old friend G3HW. Mr. L. Dymond, and Mr. J. Seaton, a keen SWL of Teignmouth, together with the Exeter Society secretary Mr. P. Pavey, G3NFT, and his sister Miss V. Pavey, another SWL.

NFD arrangements are well under way with A site at Milber and B site at Barton, Torquay. Club call-sign issued is G3NJA. Arrangements at H.Q. are almost complete and aerials are being erected for multiband operation.

Members of the society installed and operated a station from the Newton Abbot Rotary Hobbies Exhibition on April 2nd, 3rd and 4th, using the club call sign for the first time. Over 130 stations were contacted on the 40 and 20 metre bands. E. Hayman (G3ABU) designed and built most of the equipment used and most of the operating was done by G. Western (G3LFL), D. Webber (G3LHJ) and L. Webber (G3GDW).

Another cup—the VUZEK one—is open to club members for best performance on 10 metres, March 1st, 1959 to February 28th, 1960.

WEST LANCS RADIO SOCIETY

Hon. Sec. : A. Treanor (G3F2G), 13, St. John's Road, Waterloo, Liverpool, 22.

AT the recent A.G.M. the following officers were elected : Chairman, G. McCracken (G3GST); Secretary, A. Treanor (G3F2G); Treasurer, K. Coates (G312T).

Morse and Theory classes are held on alternate Thursdays and Club meetings every Tuesday at 8.30 p.m. Junior members now comprise almost 50 per cent. of club membership. New members and visitors are always welcome.

Programme :

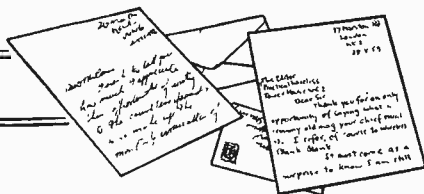
May 12th.—Open Night.

May 19th.—Junk Sale.

May 26th.—TVI Discussion.

June 2nd.—"Filters and Attenuators." by G3BBI.

Open to Discussion



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

The Radio Show

SIR,—Would it be possible at this early stage to suggest that the coming Radio Show opens its doors at the more reasonable hour of 10 a.m. instead of 11?

When one has to travel up to Town to visit the show it is not always possible to have an entirely free day, and on arriving at or about 11 a.m. one is usually faced with an enormous queue, thus involving about an hour before one gains admission to the hall.

I am well aware, of course, that the staff on the stands have to be considered but surely some sort of shift routine could be worked out to take care of the extra hour? One is hardly inside the place before Mr. X or Mr. Y is at lunch.—G. F. WARNER (Bourne End).

Super-sensitive Transistor Receiver

SIR,—I have recently constructed the "Super-sensitive Transistor Receiver" described in your March, 1958, issue.

In my previous experience, one, two and three transistor circuits (including those using the normal type reaction) have been unselective and insensitive. This set, however, has proved entirely different, being highly sensitive and having "razor-edged" selectivity, even on a short indoor aerial. I am very pleased with the set and it has completely restored my faith in transistors.—M. E. KINDER (Middlesbrough).

Service Data

SIR,—Why don't manufacturers of radio sets supply service sheets with every receiver they sell? There are many amateurs now who would be capable of servicing their radio sets if they had a service sheet. Many can, and do, manage without one, but it would be a great help if they were readily available. At present, if one has no connections with the "trade," it is well nigh impossible to obtain data. If you buy a car, you can easily get a service manual so why not the same thing with radios?—J. BRUNE (Molding).

Transistors v Valves

SIR,—I agree entirely with the views of G. Plachey (Chelmsford). May issue, "Open to Discussion." Many of the younger radio set (pardon the pun!) believe that valves are out of

date, old fashioned and useless to-day. I think this belief often stems from the fact that their fathers or grandfathers used valves in the days when radio was a real home construction hobby and not, as it is now, the assembly of ready-made parts. To many young people to-day, anything their fathers used to do is now out of date; hence the prejudice against valves. Transistors are, admittedly, wonderful little devices, but they have a long way to go before they oust the valve from its exalted position.—

R. S. JENKINS (Burton-on-Trent).

Unusual Effect

SIR,—I read with interest the letter from J. A. N. Semple concerning the unusual effect caused by connecting

throat microphones to a powerful amplifier. A similar occurrence happened to me about two years ago. On this occasion a crystal microphone was feeding a public address system. During an important presentation there was a lull in the use of the microphones and over the loudspeakers was heard quite clearly, "This is the BBC Home Service". It was concluded that the microphone leads formed a tuned circuit operating on one of the Home Service frequencies.—W. R. B. SPEAKE (Penylan, Cardiff).

SIR,—I also received sounds on a throat microphone in conjunction with a powerful amplifier. The voices, I discovered, were transmissions on V.H.F. They were very clear and loud. Also if I tuned in to Channel 2 on our television receiver I heard exactly the same things.—P. E. J. BEDFORD (11 yrs.) (Edinburgh).

Interference from TV Receivers

SIR.—Mr. A. Deverell (Rickmansworth), in the May issue, referring to my letter about the present country-wide TV interference with radios, draws my attention to the Wireless Telegraph Act, which I know very well indeed. But what the Act says should be done is one thing, and what the G.P.O. will do in cases of interference from TV sets is another. The engineer who visited me never made the slightest attempt to deal with the offending TV set. He called in my absence and suggested another outdoor aerial to replace my existing aerial and vanished. I complained again and he came back, again

(Continued on page 341)

TV CONVERTORS

INTERNAL FITTING. Tunable to any Band 1 station plus any 2 Band III stations—gain tuned, T.R.F. Band 1, superbet Band III, switch controls, instructions, PCF80, PC84 valves, easily adaptable to almost all sets. **£3/10/-**. Listed over 47. Carr. 3/.

EXTERNAL I.T.V. CONVERTORS WITH INTERNAL POWER PACK. Well-known make, at a very competitive price, completely enclosed. Finished in hammered gold. Very compact. Can be put inside practically all T.V.s. Gain and Tripping controls. Listed at **£3/19/6**. 47.7.0. Our Price, Carr. 2/6.

TURRET TUNERS. Compact 13 Channel, with all coils. PCF80, PC84 Valves. 28 Mc/s or 16 Mc/s if as fitted in Flye T.V. sets. **£2.15.0.**

I WATT TRANSISTOR

1 WATT TRANSISTOR AMPLIFIERS. From a single 6 v. all-dry battery. Latest GET15 Power Transistors. In PUNCH-PULL. Two Transistor High Gain Amplifiers Transformer coupled. Output transformer 3 ohms, 22.19.0. Post 2/.

1 WATT TRANSISTOR PUSH-PULL OUTPUT STAGE KIT. Can transform your existing Transistor Receiver or Amplifier into a really high volume set. Two GET15 Power Transistors, correct Push-Pull Input and 3 ohms output transformers. Instructions. 22.19.0. Post 2/.

BURWELL T.V. AERIALS. Complete Illustrated Price List of 1 to 12 element Band I and III aerials at amazing competitive prices. (incl. stamp).

CO-AX CABLE. Low loss High Grade 750 ohms. 6.49 yds., 7d. yds. over 30 yds. 6d. yds.

LATEST 2-TONE TYPE A8 AUTOCHANGERS. Gold and Fawn finish, 10 records all sizes, unrepeatable value at 22.19.0. Carr. 4/.

TWO-TONE REXINE PORTABLE AUTO-CHANGER CABINETS. Attach case type with lift-up lid and front speaker cut out complete with uncut motor board amplifier back, snap fasteners, carrying handle. 23.5.0. Carr. 3/.

B.S.E. 4-SPEED AUTOCHANGER PORTABLE RECORD PLAYERS. (Consisting of type A8 autochanger, 2.2 watt amplifier, speaker, assembled in a two-tone resin case. Truly amazing Value. (Listed over 22.0.) **£13.13.0.** Carr. 1/6.

4-SPEED SINGLE PLAYERS

- COLLARO 4-speed RCX554 **22.19.0**
 - GARRARD 4-speed 4SP **27. 7.0**
 - GARRARD 4-speed TA MKII **22.19.0**
(Carr. and pack, 3/).
- 10 RECORD AUTOCHANGERS**
- COLLARO RC511 3-spd. **23.19.6**
 - COLLARO 4-speed 4SP **22.19.6**
 - B.S.E. A78 4-spd. **22.19.0**
 - GARRARD RC75A Senior 10.0. **27.19.0**
 - GARRARD R9080 A.C./D.C. **210.19.0**
 - GARRARD RC5874 **213.15.0**
 - GARRARD RC1200 MKII **29. 7.6**
 - GARRARD RC1214 MKIII **29.19.0**
(Carr. and pack, 4/).

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6501, 6504, 6505, CRM91, CRM92, MW22/7, MW22/14, MW22/14C, MW22/17, MW22/18, **£2/15/-**

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TRADE (PWA/ER)

during my absence, rigged up a long aerial, moved my radio across the room to a most ridiculous position on the sideboard, ran earth wires upstairs to the bathroom taps, cut down the volume of the set three-quarters (naturally also reducing the whistle) and said nothing more could be done. I then wrote to the G.P.O. Radio Department in London and finally, after I had been without a radio for *three months*, a device was brought along (which I had to pay for) which reduced the whistle and made the set usable, although still with a background whistle. In all these cases *nothing* is done to deal with the offending TV set. The radio owner has all the inconvenience, annoyance and expense. As regards Mr. Deverell's assertion that TV manufacturers "conduct exhaustive tests before marketing their receivers" it is well known that their standards are low. It is admitted by the G.P.O. that had their interference standards been adhered to, none of this interference from TV sets would have come about, but the manufacturers insisted on the present low standards, the G.P.O. gave way and radio listeners everywhere suffer.—F. J. LORD (Stamford).

"Arrangements"

SIR,—I have been reading PRACTICAL WIRELESS for some years now, and this is far from being the first occasion on which I wish to take up cudgels with "Thermion." He lambasts modern band-leaders for performing their own arrangements, but has he really stopped to think? The habit of re-arranging old favourites is by no means a modern innovation, as seems to be the general opinion. Has no reader ever heard, and really enjoyed, any of Lizst's adaptations of Beethoven's symphonies? Or Dvořák's famous "New World Symphony"? I could cite many other examples of this, as I am sure, other readers could if they took the trouble.—W. J. NYE (Footscray).

Meter Shunts

SIR,—In the May issue "Open to Discussion" R. A. Berry points out a different method of calculating the values of shunts, which, while valid, seems to me more cumbersome than the original method outlined in the article "Meter Shunts and Multipliers" (April, 1959, issue, page 130).

I suggest the following additional step to the article be used.

The formula derived is:

$$R_s = \frac{I_1 R_m}{I_2 - I_1}$$

where R_s = shunt resistance
 I_1 = F.S.D. current for the meter
 R_m = Resistance of the meter
 I_2 = Current to be measured at F.S.D.

Now by dividing numerator and denominator by I_1

$$R_s = \frac{R_m}{\frac{I_2}{I_1} - 1}$$

or $R_s = \frac{R_m}{N-1}$ where N =ratio of the currents.

The use of this is obvious, for when extending the range of a meter one usually wants 2x, 5x, 10x, etc. of the original scale markings for ease of reading the current.

Also the formula for the multipliers can be extended. The article gives

$$R_p = \frac{V_2 - I_d R_m}{I_d}$$

where R_p = Resistance of multiplier
 I_d = Current for the meter at F.S.D.
 R_m = Resistance of meter.

Taking R_m out of the fraction.

$$R_p = \frac{R_m (V_2/R_m - I_d)}{I_d}$$

$$= R_m \left(\frac{V_2}{R_m I_d} - 1 \right)$$

Now $R_m I_d = V_1 =$ voltage across the meter for F.S.D.

$$\therefore R_p = R_m \left(\frac{V_2}{V_1} - 1 \right)$$

= $R_m (N-1)$ where N is ratio of voltages.

This also has the advantages outlined above for the shunt.—F. M. SALTER (Sheffield).

Commercial Radio

SIR,—The BBC has had a monopoly in sound broadcasting in this country for many years now. Its policy has mostly been one of giving the masses what they ought to have (in the opinion of the BBC) rather than what they want. In the days of Lord Reith's Director-Generalship, the programmes were noted for their cultural gloom and although matters have now improved, is it not time that the BBC was turned into a commercial radio network or that such a network was set up in competition with the BBC? After all, commercial television has been a success in this country to the detriment of radio, so perhaps commercial radio would provide the novelty which is necessary to increase radio listening figures. What do other readers think of this idea?—P. RAYNER (Liverpool).

Information Required

SIR,—Could any reader give me particulars of the Receiver 78 or tell me what the plug connections are, and the particulars of the Desyn trimmer?—K. ARMSTRONG (11, Woodville Gardens, Ruislip, Middlesex).

Correspondents Wanted

SIR,—I am 14 years old and I am interested in wireless as a hobby and profession. I would like to correspond with others around my age.—ANDREW HILL (93, Abbey Road, St. John's Wood, London, N.W.8).

SIR,—I am nearly 13 years of age and I am very interested in wireless. I would like to correspond with anybody of my own age, preferably with amateurs who are quite experienced in radio construction.—DAVID A. PICKETT (Holy Trinity Vicarage, Bury, Lancs).

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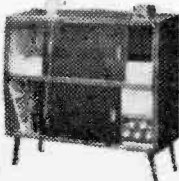
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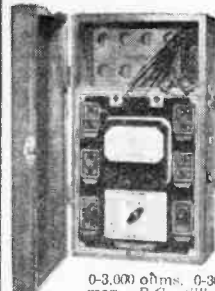
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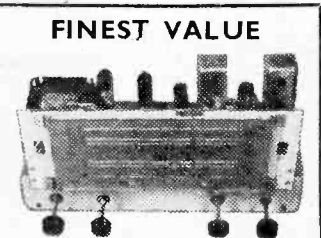
O.P. TRANSFORMERS, Heavy Duty 50 mA. 4.6 Multiratio, push-pull, 7/6. Miniature, 38/4, etc., 4.6. L.F. CHOKES 15 to 10 H. 90.65 mA. 5.-; 19 H. 85 mA. 10.6; 10 H. 130 mA., 14.-

MAINS TRANSFORMERS 200/250 v. A.C. STANDARD, 250/0-250, 80 mA., 6.3 v. 3.0 v. tapped 4 v. 4. Rectifier 6.3 v. 1.5 v. 5.0 v. or 1 v. 2.2. ditto, 300/0-300, 22.6. MINIATURE 200 v. 20 mA., 6.3 v. 1.5 v. 10.6. MIDGET, 250 v. 45 mA., 6.3 v. 2.4. 15.6. SMALL 250/0-250, 100 mA., 6.3 v. 3.5 v. 19.6. STANDARD, 250/0-250, 65 mA., 6.3 v. 17.6. HEATER TRANS. 6.3 v. 1 1/2 amp. 7.0. Ditto, tapped sec. 2, 4, 6.3 v., 1 1/2 amp. 8.6. Ditto, sec. 6.3 v. 3 amp., 10.-

ALADDIN FORMERS and core, 7in. 8d.; 3in. 10d. O.S.M. FORMERS 593/7.8 and Cans TV1, 2. 3in. sq. x 2 1/2in. and 3in. sq. x 4 1/2in., 2.- ea., with cores.
TYANA—Midget Soldering Iron, 40 w., 16.9.
REMPLOY Instrument Iron, 35 w., 17.6.
MAINS DROPPERS, 3in., 1 1/2in., 40d. Sliders, 4/3 amp., 7.50. ditto, 4.2, 4.2, 4.2, 1,000 ohms, 4/3.
LINE COIL, 3 amp., 60 ohms per foot, 3 amp., 100 ohms per foot, 2-way, 6d. per foot, 3-way, 7d. per ft.
LOUDSPEAKER P.M. 3 OHM, 2 1/2in. x 5in., 17.6. 8in. Pleseyer, 19.8. 8in. x 4in. Rolo, 18.-. 8in. R.A., 19.6. 8 x 5in., 21.-. 10 x 5in., 27.6. 10in. Rolo, 30.-. Hi-Fi Tweeter, 25.-. 12in. R.A., 30.-. 12in. 15 ohm 10 w., Pleseyer, 45.-.
STENTORIAN HF1012 10in. 3 to 15000 Hz. v., 99.6. 12in. Baker 15 watt 3 ohms, or 15 ohms 105.-.
CRYSTAL DIODE C.R.T. 2.-. GEK34, 4.-.
HIGH RESISTANCE PHONES, 4,000 ohms, 16.6 per pair.
MIKE TRANSF. 50:1, 8.9 ea.; 100:1, Potted, 10.6.
SWITCH CLEANER, Fluid spirit, about, 4/3 tin. **TWIN GANG TUNING CONDENSERS**, 365 pf. miniature 1in. x 1 1/2in., 2 1/2in., 10.-. 3000 Standard with trimmers, 9.-. less trimmers, 8.-; midget, 7.6. **SINGLE**, 50 pF., 2.6; 80 pF., 1.90 pF., 1.90 pF., 7.6. Soft dielectric 100, 300, 500 pF., 3.6.
SPEAKEE FRET, Expanded Metal Silver, 13 1/2in. x 9 1/2in., 2.- each. **GOLD CLOTH**, 17in. x 20in., 5.-; 25in. x 30in., 10. **TYRAN** 4 1/2in. wide, 10.-; 2 1/2in. wide, 5.-. Samples, 8/4.6.

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1K3	6/6K8	8/6EABC80	11ABC80
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2X2	3/6E07G	10/6E103	8/6E10T4 10/6
3A4	8/6E847	7/6E104	10/6E101 9/6
3F4	3/6E047M	10/6E108	10/6E108 12/6
6E4	3/6E847	8/6E108	12/6E108 11/6
5Y3	3/6E160	7/6E108	12/6E108 11/6
5Z4	10/6E14	7/6E108	12/6E108 11/6
6AM6	8/6E15	7/6E108	12/6E108 11/6
6BS6	5/6E12A7	9/6E108	7/6E108 10/6
6BE6	7/6E12A7	9/6E108	10/6E108 10/6
6BH6	10/6E12A7	9/6E108	5/6E108 10/6
6BW6	10/6E12A7	10/6E108	10/6E108 11/6
6D6	7/6E12K7	8/6E108	8/6E108 11/6
6F6G	7/6E1207	8/6E108	5/6E108 12/6
6H6	4/6E13A7	9/6E108	5/6E108 10/6
6J5	4/6E13A7	9/6E108	10/6E108 10/6
6L6	7/6E108	10/6E108	12/6E108 10/6
6G7	4/6E107	6/6E108	10/6E108 10/6
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THREE WAVEBANDS PIVE VALVES
S.W. 16 m.-50 m. LATEST MULLARD M.V. 280 m.-350 m. B.H.T. EP41, EP41, L.V. 800 m.-2,000 m. EL41, EZ40, 12-month guarantee.
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£9.10 Carr. & Ins. 4/6.
TERMS: Dep. £5.5.0 and five monthly of £1.
MATCHED SPEAKERS FOR ABOVE CHASSIS.
8in., 17/8; 10in., 25.-; 12in., 30.-



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OUR PRICE £6.19.6
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COLLARO LATEST MODEL HIGH-FIDELITY AUTOCHANGER 4-SPEEDS-10 RECORDS
With Studio "O" pick-up
BRAND NEW IN MAKER'S BOXES
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Ready for immediate assembly.
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AUDIO PERFECTION
Designed to play 16, 33, 45, 78 r.p.m. Records 7in., 10in., 12in. Lightweight Xtal pick-up. GC2 turnover gear, two separate sapphire styli.
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Long spindles. Guaranteed 1 year. Midget 5K ohms to 2 Meg. No Sw. 3.-. Linear or Log Tracks. 4/9. Semi-air spaced Potyees these insulated, 1in. dia. Stranded core, 9d. v.d. Fringe Quality, 1/6 yd.

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CONDENSERS, New Stock. .001 mfd. 7 kv. T.C. 5/8; Ditto, 20 kv., 6/6; 100 pf. to 500 pf. Mica, 6d. Tubular 500 v. 500 to 0.1 mfd., 9d., .05, 1.1/-, .25, 1/8; 5/350 v., 1/9; 1/350 v., 9d., 0.1/2,000 v., 1/9; 1 mfd., 2,000 volts, 8/8.
CERAMIC CONDS. 500 v., 3 pf. to .01 mfd., 9d. **SILVER MICA CONDENSERS**, 10% 5 pf. to 500 pf. 1.- to 600 pf. to 3,000 pf. 1.3. Close tolerance (±1 p.p.f.) 6 p.f. to 47 p.f., 1/8. Ditto 12, 50 pf. to 815 p.f., 1/8; 1,000 pf. to 5,000 pf., 2/-.

I.F. TRANSFORMERS 7/6 pair, 465 Kcs Silar Tuning Miniature Can. 2 1/2in. x 1in. x 1in. High Q and good bandwidth. By Fry Radio. Data sheet supplied.
Wearite M800 I.F. 465 Kcs. 12/6 per pair.
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8/500 v. 2/9	8/450 v. 4.-	2/300 v. 4.-
16/450 v. 6/8	8/500 v. 5.-	6,000/50 v. 7/6
16/500 v. 4.-	8/16/450 v. 5.-	32/32/350 v. 4/6
32/450 v. 5/8	8/16/500 v. 5/8	50/350/350 v. 7.-
32/250 v. 1/9	16/16/450 v. 5/6	64/120/270 v. 7/6
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50/50 v. 2.-	32/32/350 v. 7/6	100/200/270 v. 12/6

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CONTACT COOLED 250 v., 60 mA., 7/6; 60 mA., 8/6; 85 mA., 9/6; 200 mA., 21.-; 300 mA., 27/6.
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T.R.F. COILS A.H.F., 7/- pair. H.F. CHOKES 2/6.
FERRITE ROD, 7in. x 3/8in. dia., 2/6.

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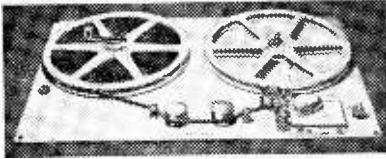
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WAVECHANGE SWITCHES
3.- 4-way 2 water long spindle 8/6
2.- 2-way, or 3.- 2-way short spindle 2/6
2 p.f. 6-way, 4 p.f. 2-way, 4 p.f. 3-way long spindle 3/6
3.- 4-way, or 3.- 2-way long spindle 3/6
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P. P. 6d. each or 2/- per dozen.

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RECTIFIER UNITS TYPE SE.8. Power Units designed for mains operation of such installations as the SCR522, TR1430, etc. Input 200/250 v. 50 cps. mains. Outputs: 300 v. at 200 mA. H.T., 150 v. at 20 mA. (grid-bias) and 13 v. at 5 A. L.T., all fully smoothed D.C. Very strongly made, fitted gate switch, starter relay, etc., and circuit diagram. Selenium rectifiers employed for rectification. Size 20 x 13 x 1 1/2 in., weight approx. 95 lbs. In good condition. **PRICE ONLY £5.17.6.** Carriage 19/6

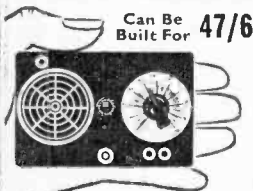
TRANSFORMER BARGAINS. Primary tapped 210 230 250 v. 50 cps. Secondary: 350/0/350 v. at 75 mA., 6.3 v. tapped at 4 v. at 2 A. and 6.3 v. at 1 A. Made by R.I. Ltd., a manufacturer's surplus stock in good unused condition. Can be mounted upright or sideways. Size 3 1/2 x 3 1/2 x 2 1/2 in. **PRICE ONLY 12/6.** post 1/6. **E.H.T. Type** Primary 230 v. 50 cps.; secondary 3,500 v. at 10 mA. Over size 8 1/2 in. high x 4 1/2 in. sq. Ex-Govt., as new. **PRICE ONLY 29/6.** post 2/6.

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Can Be Built For **107/6**



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PRINTED CIRCUIT POCKET SET

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

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BUILD THIS PROFESSIONAL-LOOKING, FIRST-CLASS 6 TRANSISTOR POCKET SUPERHET THE "TRANSIDYNE." Size only 6 1/2 in. x 3 1/2 in. x 1 1/2 in. Beautiful red and cream plastic case with engraved dial. Set weighs only 20oz. with batteries! Covers medium and long waves. Works off two No. 8 batteries. The second I.F. Stage is reflexed to give additional audio gain. In-built ferrite rod aerial and 2 1/2 in. O.M. speaker. This TIA New York is probably the best yet of its kind, it is simple to build and really sensitive. **ALL COMPONENTS INCLUDING CABINET, PRINTED CIRCUIT, TRANSISTORS IN FACT EVERYTHING CAN BE SUPPLIED FOR £11/16/-.** (Plus post and packing 2/6.) (All parts sold separately. Price list, circuit, etc., 9d.) C.O.D. 2/- extra.

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

47/6

READ WHAT OTHERS SAY!

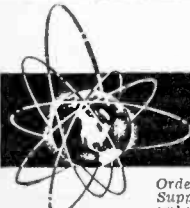
- "I WAS SURPRISED AT THE NUMBER OF STATIONS"—
L. D. C. of Worcester, writes, "—Just a few lines to let you know how pleased I am with the midset portable radio. I was surprised at the number of stations I could get, with a clear performance. The price was a real bargain. Have you lists of other bargains? If so, please send them—"
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J. W. S., of Scarborough, Yorks, writes, "—I feel I must say I am very pleased in the way you do business and if at any time I require anything, or can recommend you to anyone, I will not hesitate to help you—"
- "I'VE HEARD MUCH PRAISE OF THEM"—
J. E., of Eilton, Mr. Derby, writes, "—I would like one of your portable radio kits as I've heard much praise of them—"
- "THIRTY-TWO STATIONS RECEIVED"—
J. N., of Oxted, writes, "—Yesterday evening on the Medium Waveband, between 10 p.m. and 10.30 p.m., I counted 32 distinguishable stations! I am very pleased with the set, which is well worth the money—"
- "MY DEEPEST ADMIRATION"—
J. R., of North Shields, Northumberland, writes, "—The honest and direct dealing of your firm has earned from me my deepest admiration—"
- "ITS PERFORMANCE IS ALMOST UNBELIEVABLE"—
E. P., of Ipswich, writes, "—For so small a set I think it is a wonderful station getter with ample volume on all. Its performance is almost unbelievable, and it's a very convenient little set giving me stations I've never been able to get on a larger set—"

THIS TRANSISTOR SET

CAN BE BUILT FOR ONLY

29/6

VERY SPECIAL OFFER WHILE STOCK OF PARTS LASTS!—The "Sky-Scout" Pocket two-stage transistor set, size only 1 1/2 in. x 3 1/2 in. x 4 1/2 in. Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- post and packing, including case. Transistor, **STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS.** nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list & Plans, 1/6. **VERY SIMPLE TO BUILD.**



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POCKET TRANSISTOR SUPERHET RECEIVER



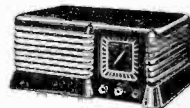
This Receiver incorporates 6 Selected Transistors and the latest type printed circuit, it is extremely sensitive on medium waveband only, incorporating an internal Ferrite Aerial and operates on a 9 volt type P.P.4 Battery. The

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612 v. 6 a.	15/3	250 v. 50 m.a.	3/11
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1A15 6/9	6F14 11/9	9D2 3/9	AC6PEN 5/9	EBF89 9/6	GZ34 13/9	PY82 8/9	UBC85 10/9
1FD9 6/9	6F15 11/9	954 1/9	AC HL 5/9	ECC81 7/9	GZ37 10/9	PY83 8/9	UCC42 10/6
1FD1 6/9	6J5 4/9	10C1 13/9	B36 8/9	ECC82 7/3	HL41DD 11/9	PZ30 16/9	UCL82 14/9
1F1 6/9	6J5A 4/6	10P1 17/9	B65 7/3	ECC83 9/9	IW4 350 9/9	R2 9/9	UF42 8/9
1F2 6/9	6J6 4/9	10LD3 7/9	B152 8/9	ECC84 9/9	IW4 500 9/9	R3 9/9	UF89 9/9
1F3 5/11	6J7G 5/9	10LD12 15/9	B39 8/9	ECC85 9/9	KT44 14/9	SP6 8/9	UL41 9/9
6P1 6/9	6K7G 4/9	10LD14 15/9	B329 8/9	ECC87 9/9	KT45 9/9	SP42 11/9	UL46 14/9
1P10 7/3	6K7MET 5/9	10P18 9/9	B339 8/9	ECC88 12/9	KT61 11/9	SP61 2/9	U03 9/9
1P11 8/9	6K8G 8/9	12A7 5/9	B719 9/9	ECC89 10/9	KT82 9/9	SP64 6/9	UT4 9/9
1R5 7/9	6K26 8/9	12A77 7/9	BT19 9/9	ECC90 11/9	KT86 9/9	SU61 11/9	UT5 9/9
1S5 7/9	6L3 8/9	12A06 7/9	CH35 7/9	EF32 11/9	KT83 9/9	T41 16/9	UY41 7/9
1T4 5/11	6L12 8/9	12A07 6/9	DI 2/3	EF39 5/9	KTWC 9/9	UL18 20 9/9	UY85 10/6
3A4 6/9	6LD20 8/9	12AX7 9/9	D77 5/11	EP41 8/11	KT63C 9/9	U22 7/9	VU120A 3/9
3C4 6/9	6L8 11/9	12SN7GT 6/9	D152 8/9	EP50 4/9	KTZ11 7/9	U24 7/9	WH7 5/11
3S4 7/3	6L8G 8/11	15A6 7/9	DAF91 7/9	EP54 5/11	L83 4/9	U25 7/9	WH17 5/11
3V4 4/9	6L9 11/9	16A5 6/9	DAF96 9/9	EP90 7/9	LN152 8/9	U31 9/9	W19 9/9
4D1 8/9	6M1 6/9	16A8 7/9	DB47 6/9	EP85 3/9	MU12 9/9	U43 11/9	W27 9/9
6U4G 6/9	6Q7G 8/9	17Z3 9/9	DF92 9/9	EP86 16/9	MU14 9/9	U46 9/9	W150 9/9
5Y3G 7/9	6P28 9/9	19Y3 9/9	DF96 9/9	EP89 9/9	N17 7/3	U50 8/9	WD709 9/9
5Z4C 9/9	6N8 8/9	19X3 9/9	DH63 6/9	EP91 5/9	N19 8/9	U52 6/9	WD142 8/9
6AC7 5/9	6SN7GT 7/3	20L1 9/9	DH77 7/9	EP93 9/9	N37 15/9	U54 10/9	W19 9/9
6AM5 4/9	6SG7MET 6/9	20D1 14/9	DH47 6/9	EP94 9/9	EL32 4/9	U35 9/9	X78 10/6
6AN5 6/9	6SK7MET 7/9	20P1 12/9	DI11 8/8	EL33 16/6	N152 9/9	U78 6/9	X142 9/9
6AL5 5/9	6SL7GT 7/9	20F2 8/9	DH719 8/9	EL38 19/9	N154 9/9	U151 9/9	X727 9/9
6AT6 7/9	6U6G 6/9	21A6 8/9	DH150 8/9	EL41 10/9	N329 9/9	U152 9/9	Y63 5/9
6AQ5 7/9	6U4GT 12/9	25L6 8/9	DH142 8/9	EL84 8/9	N727 9/9	U153 9/9	Z63 8/9
6AQ8 7/9	6U8 6/9	30L1 8/9	DK91 7/9	EL90 9/9	OW1 4/9	U139 9/9	Z66 8/9
6AK8 9/9	6V4 8/9	30P16 9/9	DK86 8/9	EL95 9/9	OC72 25/-	U142 9/9	Z77 7/6
6AB8 12/9	6V6GT 6/9	35Z4GT 6/9	DL92 7/3	EL91 4/9	OM4 9/9	U403 9/9	Z142 9/9
6BB 3/11	6V6G 6/9	41MH1 6/9	DL93 7/9	EM80 9/9	PG1 2/9	U154 9/9	Z152 5/9
6BG6G 15/9	6X4 6/9	43U1 9/9	DL96 8/9	EY51 11/9	PL33 9/9	U282 9/9	Z159 5/9
6BQ5 9/9	6X2 11/9	63KU 10/9	DL96 8/9	EY86 13/9	PL82 12/6	U381 9/9	Z129 16/9
6BY7 7/9	6X5 5/11	64K1 11/9	EA9 1/9	EZ35 9/9	PEN46 8/9	U281 9/9	ZD17 7/9
6BN6 3/6	7C5 8/9	82DDT 7/9	EA42 9/9	EZ80 8/9	PEN383 8/9	UABC0 10/6	ZD152 5/9
6C3 11/9	7C8 7/9	62V 7/9	EB34 2/3	EZ81 8/11			
6CD6G 7/9	7AN7 7/9	63ME 6/9	EB41 7/6				

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Takitessi! DO be careful on the roof. DON'T wear crêpe soles in wet weather. (Better still, wait for good weather.)
NOTE.—Efficiency and gain of aerials depends on number of elements, spacing, siting, etc., and hardly varies with PRICE which concerns finish, long-term durability and patent assembly methods. DO write us for aerial advice if in doubt.

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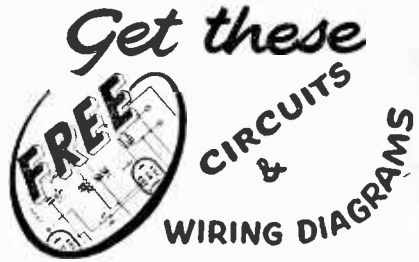
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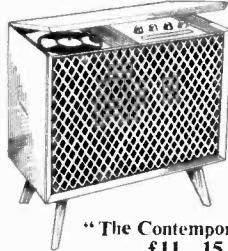
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AMATEUR WIRELESS AND WIRELESS MAGAZINE

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The index letters which precede the Blueprint Number indicate the periodical in which the description appears. Thus P.W. refers to PRACTICAL WIRELESS, A.W. to Amateur Wireless, W.M. to Wireless Magazine.

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- Four-valve : 3/6 each
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beater (HF, Pen, D, RC,
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- Standard Four-valver
Short-waver (SG, D,
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Mains Operated

- Four-valve : 3/6
Standard Four-valve A.C.
Short-waver (SG, D,
RC, Trans) ... WM391*

MISCELLANEOUS

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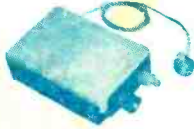
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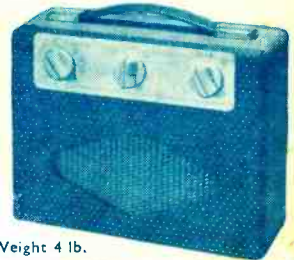
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