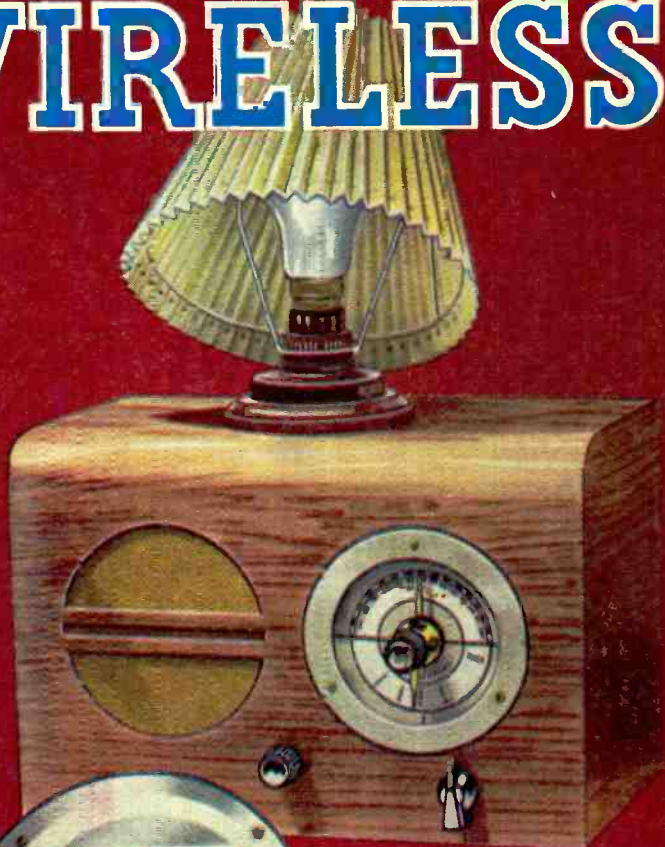


PRACTICAL ^{1/6} WIRELESS

JANUARY
1961

COMBINED
RADIO
AND
TABLE
LAMP



contents

REFLEXING TRANSISTORS
TRANSCRIPTION
RECORD PLAYER
CIRCUITS FOR ACORN VALVES
USING PORTABLES
IN THE CAR
S.W. LISTENERS LOG
ETC., ETC., ETC.

NEW! TRANSISTOR RADIOS



With **MINIATURE SPEAKER**. Simple instructions enable anyone to build this miniature radio. Gives reception over the entire broadcast band. Each kit is supplied with all latest miniature parts including

- ★ two transistors
- ★ ferrite pod
- ★ speaker
- ★ coloured plastic case
- ★ step by step instructions. Size 4 x 3 x 1in.

P. & P. 1/6.
Battery 1/- extra.

ONLY **27/6**

MINIATURE EARPHONES



CR-5 High imp. ... 12/6 Post
MR-4 Low imp. ... 10/6 1/-

WALKI/TALKI INTERCOM



Boys! They're terrific! Two coloured hand terrace units. 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.

Complete with 25 ft. of wire.
ONLY **17/6** per Set. P. & P. 1/-.



POCKET VOLT TEST METER
Two D.C. ranges: 0-250 v. and 0-25 v. Complete with test prods. and leather case. Very limited quantity. Only 12/6. P. & P. 1/6.

MICROPHONES. BRAND NEW. Throat magnetic 4/6; Throat carbon 3/6; No. 8 carbon with switch 6/8; No. 7 moving coil 7/6. Tannoy power mikes only 5/-. Crystal mike 22/6.

HI-FI HEADPHONES

These miniature HI-FI phones use high quality permanent magnetic speakers with regulated voice coil. The soft rubber ear moulds give correct spacing for optimum acoustic load. Each unit has a built-in miniature HI-FI transformer to ensure the finest music and voice reproduction. Supplied free is a small transformer unit which steps impedance up to 2000 ohms. Only 15/-. P. & P. 2/6.

HOOVER ROTARY TRANSFORMERS

12 v. input. 500 v. output at 65 mA. or 6 v. input. 250 output at 75 mA.
Only **10/6** EACH P. & P. 2/-.

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.



OSCILLOSCOPE MODEL 74

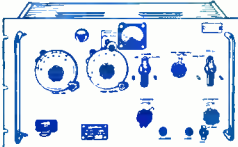
This basic scope represents one of the finest buys we have ever made! Contains Brilliance, Focus, Gain and 2 speed time base controls. Separate X plate terminals. Signal Generator modulated at 2 frequencies over 150-255 Mc/s. Complete with 12 valves, VCR 139A tube, internal A.C. power pack, and complete circuit and technical details.

ONLY **97/6** Carr. 12/6.

VHF RECEIVER 1392

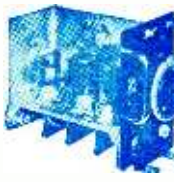
15 valve superhet covering 95-150 Mc/s which includes police, aircraft and amateur bands. Complete with slow motion tuning, tuning meter, circuit diagram, etc. Here is your opportunity to explore the VHF bands on a really sensitive receiver offered at a fraction of original cost.

ONLY **£6.5.0** Carr. 15/-.



R.F. CONVERTORS

Undoubtedly the most useful Govt. surplus units ever released. The R.F. units will extend the frequency range of your receiver to enable you to receive amateur, TV and V.H.F. stations.
R.F.24. 20-30 Mc/s. switched tuning 22/6.
R.F.25. 40-50 Mc/s. switched tuning 8/6.
R.F.37. 65-85 Mc/s. variable tuning 29/6.
Circuits supplied. P. & P. 3/6 on ea.



COMMUNICATION RECEIVER AR-8SD
340 kc/s—32 Mc/s

Universally recognised as the finest communication receiver ever produced for Amateur, Military and Laboratory use. Now our exclusive purchase enables you to obtain this "Rolls Royce" of Receivers at the lowest price ever! Supplied complete and ready for immediate use.

ONLY **£39.10.0** Carr. 50/-.

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 5/- each. P. & P. 1/6. Two for 8/-. P. & P. 2/6.



VARIABLE TRANSFORMERS

Input voltage 250 v. continuously variable output from 0-260 v. Supplied complete. Model B5 Current rating 5 amps. £9. Model B10 Current rating 10 amps. £13.5.0 Model B20 Current rating 20 amps. £32.10.0 ALL FULLY GUARANTEED.



SPARE VALVE KIT

Here's a gift for all 38 and 18 Set owners! Case containing 4 ARP12, 4 ATP4 valves. Only 10/- P. & P. 2/6.
A.C. CUMULATORS. 2 volts 18 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc Brand new. Original cartons. Size 4 1/2 in. x 7 in. x 2 1/2 in. 5/6 each. P. & P. 1/6, 3 for 15/-. P. & P. 3/6, 6 for 27/6. P. & P. 5/-.



WIDE RANGE SIGNAL GENERATOR

MODEL SWO-300 150 kc/s—300 Mc/s

Specification:

- Frequency Range: 150 kc/s-150 Mc/s on fundamentals (6 bands). 150 Mc/s-300 Mc/s on harmonics.
- Calibration Accuracy: within ± 1 per cent.
- Modulation: Internal and external.
- Attenuation: To -40db.
- Output: Facilities for high and low.
- Power Supply: Internal 230 v. A.C.
- Size 7 x 10 x 5 in.

ONLY **£14.19.6**
Carriage 5/6
FULLY GUARANTEED



Callers: 87 TOTTENHAM COURT ROAD, LONDON, W.1
Mail Orders: (DEPT. P), 32a COPTIC STREET, LONDON, W.C.1
Telephone: MUSEum 9607

Tel: Mitcham 6201
Open Daily to Callers



All Valves Brand New
and Fully Guaranteed

211 STREATHAM ROAD, MITCHAM, SURREY

Special 24 Hour Express Mail Order Service

OZ4	5/9	6CH6	12/-	10C2	27/10	32	13/6	CCH35	21/-	ECL83	12/6	H23DD		PCL82	11/6	U251	17/6
IA5	6/-	6ESGT	10/-	10F1	26/2	35A5	18/6	CL4	12/6	EF9	21/-	HL41	10/6	PCL83	12/6	U281	20/-
IA7	14/6	6F1	15/6	10F3	17/6	35L6GT	10/6	CL33	18/6	EF22	17/6	HL41	12/6	PENA4	17/6	U282	22/6
ID5	14/-	6F6	6/9	10F9	12/6	35W4	8/-	CY1	15/9	EF36	7/6	HL41DD		PENB4	17/6	U301	22/6
ID6	10/-	6F7	15/-	10LD3	12/6	35Z3	10/-	CY31	15/9	EF37	8/6			PEN4DD		U329	17/6
IH5	10/6	6F12	4/9	10LD11	15/-	35Z4	7/6	D41	12/6	EF37A	8/6	HL42DD				U339	19/6
IL4	6/-	6F13	17/6	10P13	21/-	35Z5	9/6	D42	12/6	EF39	4/-			PL33	18/6	U403	11/6
ILN5	14/6	6F14	17/6	10P14	20/-	40SUA	15/-	D63	3/6	EF40	15/-	HY90	13/6	PL38	23/9	U404	10/6
INS	10/6	6F15	14/9	11D3	17/6	41STH	23/6	D77	5/6	EF41	9/3	IW4/350	10/-	PL81	14/9	U801	25/6
IR5	9/-	6F17	12/-	11D5	17/6	43	15/-	D152	6/-	EF42	10/6	IW4/500	10/-	PL82	8/-	U4020	12/6
IS4	8/6	6F33	5/6	12A6	6/6	50C5	15/-	DAC32	10/6	EF50(E)	3/6	KBC32	9/6	PL83	10/6	UABC80	8/6
ISS	9/-	6H6	2/6	12AH8	10/-	50C6	15/-	DF91	7/6	EF50(A)	4/-	KF35	8/6	PLB20	21/-	UAF42	9/6
IT4	4/-	6J6	7/6	12AT7	8/-	50CD6G		DF33	10/6	EF80	6/-	KL32	10/6	PM2A	12/6	UB41	9/6
IU5	10/-	6J7GT	9/6	12AU7	9/-	501GGT	21/-	DF92	7/6	L185	6/6	KLL32	11/6	PM2HL	14/-	UBF41	9/6
2D21	8/6	6K7G	3/-	12AX7	9/6	61RT	17/6	DF96	9/6	EF86	11/-	KL35	9/6	PM22A	13/6	UBF80	9/6
2X2	5/-	6K7GT	10/6	12BA6	9/-	61SPT	17/6	DF97	9/6	EF89	10/-	KT2	10/6	PM24M	21/6	UBF89	9/6
3A5	12/6	6K8GT	12/6	12B8E	9/6	62BT	17/6	DF99	4/9	EF91	4/9	KT32	10/6	PM202	16/6	UC85	10/6
3D6	14/6	6K25	19/6	12E1	17/6	75	12/6	DH76	7/6	EF92	5/6	KT33C	10/6	PY31	16/6	UCH42	9/6
3Q4	8/-	6L1	15/6	12I7GT	9/6	77	12/6	DH77	8/3	EF93	5/6	KT36	28/6	PY32	15/6	UC81	9/6
3Q5	10/6	6L6	7/6	12K7GT	8/6	78	12/6	DH107	13/6	EF95	15/-	KT41	22/6	PY80	8/-	UC182	12/6
3J4	8/-	6L8	12/6	12K8GT	12/6	80	10/6	DH179	7/6	FL31	12/6	KT44	13/6	PY81	7/6	UC183	13/6
3V4	9/-	6L19	21/6	12Q7GT	8/6	85A	12/6	DK91	9/-	FL32	5/6	KT55	22/6	PY82	8/-	UF41	9/6
5R4GT	9/-	6L34	10/-	12SA7	8/-	150B2	12/6	DK92	9/6	EL33	12/6	KT63	8/6	PZ30	18/6	UF80	9/6
5U4G	9/-	6/30L2	10/-	12SC7	8/-	150B3	15/-	DK96	10/6	EL37	18/6	KT66	17/6	QP25	14/6	UF85	9/6
5Y4	8/-	6LD3	9/6	12SG7	8/6	185BT	32/-	DL33	9/-	EL38	23/9	KT71	9/-	QP210	17/6	UF89	8/6
5Y3GT	8/6	6LD20	15/6	12SH7	4/-	303	7/6	DL35	12/6	EL41	10/6	KT74	12/6	QP121	12/6	UL41	8/6
5Z3	10/-	6N7GT	7/6	12SJ7	4/-	304	7/6	DL92	8/6	EL42	10/6	KT76	12/6	R10	21/-	UL44	24/6
5Z4G	10/-	6M1	10/6	12SK7	8/-	305	7/6	DL94	9/6	EL81	14/9	KT101	25/-	R19	19/6	UL46	21/6
6A7	18/6	6M2	10/6	12SQ7	11/6	328	7/6	DL96	9/6	EL84	7/-	KTW62	7/6	SD6	8/6	UL84	9/6
6A8	10/-	6P1	17/6	12SN7	17/6	329	7/6	EAS0	2/-	EL85	10/6	KTW63	7/6	SP4	14/6	U06	20/11
6A8B	9/-	6P25	19/6	12Z3	15/-	807	7/6	EABC80	7/6	EL90	8/6	KTZ41	8/-	SP41	3/6	U07	15/6
6A18	9/6	6P28	26/-	13D3	12/6	955	4/-	EAC91	7/6	EL91	5/-	KTZ63	10/6	SP42	12/6	U08	26/6
6AK5	8/6	6Q7GT	10/6	14H7	12/6	5763	17/6	EAF42	10/-	EM80	10/-	L63	4/9	SP61	3/6	UY21	15/6
6AK8	7/6	6SA7GT	7/6	14R7	12/6	9002	7/6	EB41	7/6	EM81	10/-	LN309	15/9	T41	22/6	UY41	7/6
6ALS	6/-	6SG7	10/6	14S7	21/-	9003	7/6	EB91	5/-	EY81	10/6	LZ319	12/6	TDD4	17/6	UY85	7/6
6AMS	5/-	6SH7	6/6	15A2	17/6	AC4/PEN		EB33	4/-	EY84	10/6	MH4	8/6	TDD13C		VP28	17/6
6AM6	4/-	6S17	5/6	15D2	23/9	AC5/PEN		EB41	9/6	EY86	9/6	MHD4	17/6	TH41	23/9	VP48	17/6
6AN5	7/6	6SK7	7/6	19AQ5	10/6	AC6	2/6	EBF80	9/6	EY91	9/6	MHL	10/-	TP22	17/6	W17	8/6
6AQ5	8/3	6SL7GT	6/6	19BGG6		ACTP	32/-	EBF89	9/6	EZ35	7/6	MKT4 (S/7)		TP32	17/6	W76	7/6
6AQ8	9/3	6SN7GT	5/6			ACHL	12/6	EBL21	22/-	EZ40	7/6			TP35	17/6	W77	5/6
6AT6	8/3	6U4GT	11/6	20D1	24/6	AC2/PEN		EBL31	21/6	EZ40	7/6	MS48	17/6	U14	15/9	W81	6/-
6BA6	10/-	6U5	7/6	20D2	23/-	ACTH1	34/9	EC90	9/6	EZ41	7/6	MSP4	17/6	U16	10/-	W142	9/6
6B7	10/-	6U7	7/6	20F2	26/6	ACVP1	17/6	EC91	9/6	EZ80	7/6	MU14	9/6	UB18/20	10/-	W719	7/6
6B8	4/-	6V6G	5/-	20L1	26/6	ACV2	17/6	EC92	10/-	EZ81	7/6	MX40	17/6	U22	10/6	W727	7/6
6BA6	7/6	6V6GT	8/-	20P1	26/-	AC2/PEN	21/-	ECC32	10/-	EZ90	7/6	N18	8/-	U24	29/6	X18	11/6
6BE6	7/6	6X4	5/-	20P3	23/-			ECC33	5/-	FC2	21/-	N19	8/-	U25	14/6	X61M	21/9
6BG6G	21/6	6X5GT	5/-	20P5	22/6			ECC34	15/-	FC13	17/6	N37	18/6	U26	12/6	X65	23/9
6B96	7/6	7B7	8/-	25L6GT	9/6			ECC35	8/-	FC13C	21/-	N78	17/6	U31	9/6	X66	21/6
6BR7	15/-	7C5	8/-	25Y5	10/-			ECC40	21/-	FW4,500		N108	18/6	U33	21/-	X78	21/6
6BW6	8/6	7C6	8/-	25Z4	9/6			ECC81	8/-			N142	9/6	U35	21/-	X79	21/6
6BW7	6/6	7D5	15/-	25Z5	9/6	AC2/PEN	21/-	ECC82	9/6	FW4,800		N147	18/6	U37	25/-	Y61	10/6
6BX6	6/6	7D6	15/-	25Z6	10/6	AZ1	15/6	ECC83	9/6			N150	10/6	U45	21/-	Y63	9/6
6BY7	7/6	7D8	15/-	27SU	17/6	AZ31	10/6	ECC84	9/6	GZ30	10/6	N153	11/6	U47	21/-	Z21	12/6
6C4	6/6	7H7	8/-	30	13/6	B36	21/-	ECC85	9/6	GZ32	11/6	N309	11/6	U50	8/6	Z63	7/6
6CSGT	8/-	7K7	10/6	30C1	21/6	B65	8/6	ECC91	5/6	GZ34	13/6	N329	10/6	U52	7/6	Z66	19/6
6C6G	6/6	7Q7	11/6	30F5	11/6	B152	8/6	ECF80	12/6	H30	5/6	N727	7/6	U76	7/6	Z77	4/9
6C9	12/6	7R7	12/-	30FL1	10/6	B309	9/6	ECF82	12/6	H63	9/6	N729	8/6	U78	7/6	Z152	8/6
6C10	12/6	7S7	10/6	30L1	11/6	B329	9/6	ECH21	22/-	HBC90	9/6	P2	10/6	U142	8/-	Z719	7/6
6CD6G	27/6	7Y4	7/6	30P4	22/-	B339	9/6	ECH42	10/-	HL92	6/6	PCC84	9/6	U145	15/6	ZD152	9/6
6D1	8/-	8D3	4/-	30P12	11/6	B719	9/6	ECH81	9/-	HL133DD		PCC89	10/6	U147	7/-		
6D2	5/-	9BW6	14/9	30P16	10/-	C8L1	17/6	ECH83	12/6			PCF80	10/6	U153	9/6		
6D3	15/-	10C1	18/9	30PL1	15/-	C8L31	21/-	ECL80	9/-	HL23	12/6	PCF82	9/6	U191	20/-		

METAL RECTIFIERS

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

SPECIAL OFFER

IT4 4/-, 6K8 8/-, 6K7G 3/-, 6V6G 5/-,
EBC33 4/-, EF39 4/-, EF80 6/-, EF91 4/9
6X5G 5/-, 5U4G 4/6

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

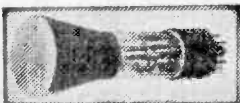
OBsolete VALVES A SPECIALITY.
QUOTATIONS GIVEN ON ANY TYPE
NOT LISTED.

A.C./D.C. Multimeter Kit

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



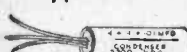
Building a Scope



3in. oscilloscope tube Americanmade Type No. 3FP7, Octal base 8.3 v. 0.8 amp heater, electrostatic deflection. Brand new and guaranteed, 15/- each, plus 1/6 post and insurance. Complete with circuit diagram.

Suppressor Condenser

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



Welding Transformer

Output 2 1/2 volts by high and low switch. Continuous rating 250 amps. Intermittent for spot welding exceeds 2,000 amps. Unused slightly soiled, but perfect working order. £3.10.0 plus 3/6 carriage.



TV Workshop Aids

E.H.T. SEALER. Apply with soldering iron. Stops corona discharge, etc. 2/6 per stick.
POLYTHENE TAPE. 2in. x 10 thou. for E.H.T. insulation up to 25 kv. 5/- per 12ft. roll.
SPONGE STRIP. 1/4in. x 1/4in. For sealing or cushioning. 9d. per foot.
ANTI-STATIC SCREEN CLEANER For TV tubes and screens. Perspex or glass. Delays accumulation of dust. 3/- per tube.
CELLULOSE CEMENT. Specially prepared for radio gluing of metal, glass, ceramic, wood, fabrics. 4/6 per tin.

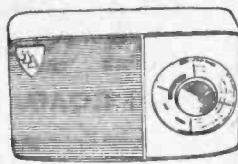
1960 ALL Mains Amplifier



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

TRANSISTOR LOUDSPEAKER RADIOS

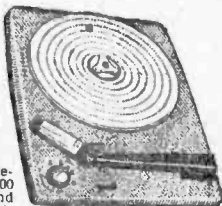
To build yourself—anyone can do it! Pocket 4 uses three transistors and a diode, complete cost 52/6 plus postage and insurance.



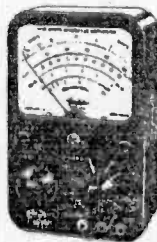
Pocket 5, much louder, uses four transistors and diode, complete cost 67/6, plus 2/6 postage and ins. Each complete to last out and bolt with proper cabinet, with proper tuning condenser and miniature loudspeaker. Batteries available (10d. extra) and solder (1/3) are definitely only other items needed. Our circuits are completely portable and do not need any aerial, also SERVICE AT MODERATE CHARGES IS AVAILABLE SHOULD YOU GET INTO DIFFICULTIES. Demonstrations gladly. Money back guaranteed. S.A.E. for additional details.

PHILIPS TRANSCRIPTION UNIT

Philips AG 2009 Record Player, 4 speed. Ideal for the enthusiast. Pick-up arm wired for stereo, fine adjustment on all four speeds. Continuously variable pick-up weight (2.12ms.). Supplied with Philips Hi-Fi crystal type AG3016 for micro-groove and 78 r.p.m. Frequency response 30-15,000 c/s. Pick-up lifting and lowering device. Individually balanced heavy turntable. Mutine switch. Can be used with any amplifier or radio set. Complete with monoaural pick-up £10.10.0, or 2 m/s. deposit and 20 fortnightly payments of 10/- Available also with stereo head, diamond or sapphire stylus. Prices on request.



The Taylor Meter Model 127A



A pocket size meter but with a big scale and a sensitivity of 20,000 Ohms per volt D.C., therefore an ideal unit for television servicing—robustly made and complete with leads and prods—20 ranges as follows: D.C. current 30 micro-amps. to 1 amp. D.C. voltages—0-1,000 volt in seven ranges (25 KV) with external probe, optional extra. A.C.—0-2,500 in six ranges. Ohms—0-20 meg. Ohm in three ranges (self-controlled). Volts 5K, 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg. Gang type 3/- each—values available: 5K+5K, 100K+100K, 1 meg. ± 1 meg., 2 meg. ± 2 meg.

THIS MONTH'S SNIP
 ★ Transistor Portable/Car Radio undoubtedly one of the best Superhet Transistor Sets being offered in component form with printed circuits
 ★ and very easy to follow instructions for alignment—service facilities should you get into difficulties with construction or alignment.
 ★ Uses 5 first grade Transistors giving a 500 MW push pull output, full tuning over medium and long waves from internal Ferrite aerial but with car aerial attachment. Slow motion and fine tuning, High flux elliptical speaker complete with fine 2 tone cabinet. Offered this month only! Special introductory price of 98.19.6 7/6 post and ins.

Connecting Wire

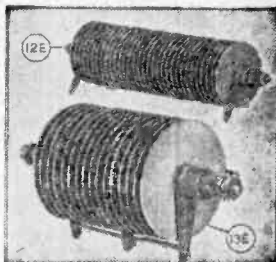


P.V.C. covered in 100ft. coils—2/9 a coil or four coils different colours. 10/- post free.

Yaxley Switches

1 Pole 3 Way	1/6
1 Pole 5 Way	3/-
1 Pole 12 Way	3/-
2 Pole 2 Way	2/6
2 Pole 4 Way	2/-
2 Pole 5 Way	2/6
2 Pole 6 Way	2/6
2 Pole 8 Way	3/6
2 Pole 12 Way	4/6
3 Pole 3 Way	1/6
3 Pole 8 Way	3/6
4 Pole 4 Way	3/-
6 Position Shorting	2/6
6 Pole 3 Way	2/-
6 Pole 3 Way	3/6
8 Pole 2 Way	2/-
9 Pole 3 Way	2/6
12 Pole 2 Way	2/-

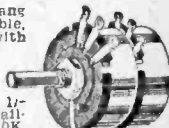
Rectifier Bargains



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

Morganite Potentiometers

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



Hi-Fi Snip infinite Wall Baffle

Nicely veneered and polished, corner fitting (attaches to picture rail). Takes up no floor space. Gives really fantastic results with only low-price 8 in. speaker fitting for tweeter. Only 45/- each carriage and insurance 3/6.

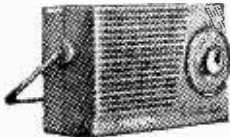


Crystal Mike by Acos



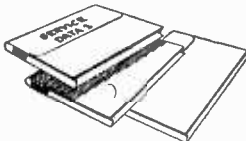
Model 39/1, this is ideal for tape or general amplifiers, complete with screened lead, 39/6, plus 1/- post.

Transistor Set Cabinet



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

TV Service Sheets



200 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Flye, etc. Giving circuit diagram, component values, I.F. frequencies, etc. £2, post free.

Miniature Microphone

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



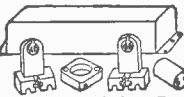
Speaker Bargain



12in. Hi-fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 33/6, plus 3/6 post and insurance.

"Dim and Full" Switch

Particularly useful for controlling photoflood lamps which have only a short life at full brilliance. This toggle switch has three positions, the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operation shots. Also useful for controlling night lights, heaters, etc. etc. Price 3/9 each, post 9d. Circuit diagram included.



Fluorescent Light Bargain

Kit of parts comprising: choke, two lampholders, starter holder and starter. 40 watt, 19/6, 90 watt, 23/6. Plus 2/- post and insurance.

Components for Transistor Sets

Parts for "Practical Wireless" Pocket Transistor Radios available. Send for lists. Sub-miniature Electrolytics, 1 mid 18V, 2.5 mid 8V, 4 mid 8V, 8 mid 8V, 5 mid 12V, 10 mid 8V, 25 mid 6V, 3 mid 3V, 50 mid 3V, 20k mid. All 1/9 each. Transistor Ferrite Rod Aerial with medium and long wave coils with circuit. Price 7/6. Oscillator Coil and set of 3 I.F. transformers for transistor set with circuit. Price 23/6. Midget 3in. P.M. Loudspeaker for transistor set. 3 ohm or 80 ohm coil. Price 18/6. Midget 20k pF + 17k pF two-gang Tuning Condenser with trimmers, 4 spindle drilled and tapped. Price 9/- plus 1/- post. Push-pull Output Transformers, for transistors OC78, etc. Sub-miniature. Price 8/6, plus 1/- post. Push-pull Input Transformer to match the above Output Transformer, 3/6. 0.0005 mid Single Tuning Condenser. Solid dielectric 1in. spindle for transistor or crystal set. 3/9; ditto with spindle tapped 6 BA, 4/- Fully Tested Transistors. Set of six for Superhet includes matched pair, Mullard 23.10.0, ditto unbranded, 45/-; suitable as mixers, 12/6 each. Suitable as I.F. amplifiers, 12/6, suitable for R.F. and Regen. circuits, 6/8; matched pairs for Push-pull Output, 16/- per pair. High gain for single ended output, 7/6. Ordinary white spot, 3/9; red spot, 3/6. Resistors, miniature quarter watt type for transistor sets. All popular values, 5d. each. Miniature ceramic condensers 6d. each. .04 Midgets 9d. each. .1 Midgets 1/- each.

Another Battery Charger Bargain
Components Would Cost More

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



Motor Snip

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



Component Storage Drawers

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



Band III Convertors

Suitable Wales, London, Midlands, North, Scotland, etc. etc. All the parts including 2 EP80 valves, coils, fine tuner, contrast control, condensers and resistors. (Metal case available as an extra.) Price only 19/6, plus 2/6 post and insurance. Data free.

INFRA-RED HEATERS

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



SPECIAL THIS MONTH

Twin Twisted Lighting Flex—equivalent 14/36. Rubber insulated, cotton covered, 12.6 per 100 yard coil.

Moving Coil Meters
0-500 microamp 2in. flush 17/6
250-0-250 microamp 2 1/2in. surface 27/6
750 microamp 2 1/2in. surface 17/6
5-0-5 milliamp 2 1/2in. flush 17/6
0-30 milliamp 2 1/2in. flush 17/6
0-100 milliamp 2 1/2in. flush 15/-
0-300 milliamp 2 1/2in. flush 15/-
0-500 milliamp 2 1/2in. flush 15/-

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 green p.v.c. covered. Normally costs 2/- per yard. Three 6in. leads for 2/-.

Filament Transformer, 6.3 v., 1 1/2 amp. 6/6.

6.3 Amp Dropper—tappings marked 200/220/250, 3/6.

Auto-Transformer, totally enclosed primary 200-250, secondary 110-120v., 200 w., normally 27/6. Price 19/6, plus 3/- post.

Output Transformer—standard pentode—4/6, multi ratio, 6/6.

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

Neon Lamp—midget wire ended, ideal mains tester, etc., 2/-, ex-Govt., 1/6.

5 amp. 12 v. full-wave Charger Rectifier, normal price 17/6. Price 10/-, plus 1/6 post and ins.

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 6/6.

Head Phones, DLR5. Ideal crystal sets, etc., 8/6, plus 2/- post.

STOP FREEZE UPS!

Wrap our heater wire around the pipes in your loft, to prevent freeze-ups. Complete heater wire suitable for up to 50ft. of pipe. 10/- post free. With instructions.

Cold Cathode Valve CV413. Voltage regulator or trigger switch—unused but ex-equipment, 2/6 each.

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

Belling Lee 2BA fully insulated terminals for mounting through metal panels, 1/6 each.

Terminal Heads, insulated 4BA, 2/- doz. 6 1/2 in. 350 v. Small tubular metal cased condensers made by Dubilier, 2/6 doz.

50 Assorted Resistors. Well mixed and useful values 1 and 1/2 watt, 5/- for 50. Ditto, but 1 watt. 6/6 for 50.

Mains Transformer. Standard 230 v. input 250-0-250 at 80 mA., 6.3 v. at 5 A., 12/6, post 1/6.

Toggle Switch. Standard metal body type with round d.c.v. 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.

ELECTRONIC PRECISION EQUIPMENT LTD.

★ Orders received by post are despatched from our warehouse Dept. 7, 66 Grove Road, Eastbourne, and to save time, please post your order to this address. Please include enough for postage. Callers, however, should use one of the following addresses:

Electronics (N.P.) Ltd.,
520 High Street North,
Manor Park, E.12
Phone: Ilford 1011
Half day Thursday

Electronics (Ruislip) Ltd.,
4-6 Windmill Hill,
Ruislip, Middx.
Phone: RU1SLIP 5780
Half day Wednesday

Electronics (Croydon) Ltd.,
266 London Road,
Croydon.
Phone: CRO 6558
Half day Wednesday

Electronics (Finbury Park) Ltd.,
29 Strand Green Rd.,
Finbury Park, N.4.
Phone: ARCHWAY 1049
Half day Thursday

RETURN-OF-POST

We offer a really efficient Mail Order Service on all items stocked. All cash orders are dealt with on the day of receipt. Hire purchase orders are subject to slight delay but this is kept to the absolute minimum.

JASON FM TUNER KITS

Three Jason F.M. Tuner kits with variable tuning are now available to the home constructor. Brief details are given here and our illustrated list is available free.
MOST IMPORTANT: We take great pains to see that every item needed is included in our kits and also that all items are entirely suitable in every way. This should be borne in mind when comparing prices.
 Hire Purchase Terms are available on any kit.
INSTRUCTION MANUALS. All our kits include the instruction manual, but this can be supplied separately if required. Data Publications booklet describing FMT1, 2, and 3, 2/10; J.T.V.2, 3/10; Mercury 2, 3/10. All post free.

STANDARD TUNERS

FMT1. Supplied complete with a chassis-panel assembly fitted with a gold hammer finished panel and glass dial. Four EF91 valves are used and an external power supply is required. Complete kit £8.19.6. Power Pack Kit £2.12.6.
FMT2. This is a new version of the FMT1 and is supplied with a complete cabinet-chassis assembly which can be mounted in a cabinet or stood on a shelf. The circuit employs four EF90 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply £8.9.6. Kit with power supply £10.9.6.

FRINGE TUNER

FMT3. This is a fringe tuner using the same cabinet assembly as the FMT2 described above. The tuner is fitted with variable AFC and uses five EF90 and one ECC81 valves. Kit less power supply £10.9.6. Kit with power supply £12.7.6.

F.M./TV SWITCHED TUNERS

Kits for two new Jason F.M./TV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turist Tuner which gives switch positions for the three BBC Programmes as well as BBC and ITA TV Sound. A.F.C. is fitted to ensure freedom from drift.
JTV2. This tuner is complete with power supply in a cabinet which can be used either for shelf or cabinet mounting. Complete kit £15.17.6.
MERCURY 2. This is similar to the JTV2 but has no provision for a power supply. It is mounted on a small chassis with printed front panel and is intended for cabinet fixing. Complete kit £11.7.6.
IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

GRAMOPHONE EQUIPMENT

ALL LATEST MODELS ALL POST FREE	Cash Price	Hire Purchase Deposit Mthly/Pmts.
RECORD CHANGERS		
COLLARO Conquest (Studio O PU)	£7.19. 6	£1.12. 0 12 of 12/3
GARRARD RC210 (GC8 PU)	£9.19. 6	£1.19. 6 12 of 15/-
B.S.R. U414 Monarch (TC8 PU)	£7.15. 0	£1.11. 0 12 of 12/-
B.S.R. U45 Monarch (TC8 PU)	£7. 5. 0	£1. 9. 0 12 of 11/4
B.S.R. U414 Monarch (TC8 Stereo/LLP/78)	£8.18. 0	£1.16. 0 12 of 13/6
SINGLE RECORD PLAYERS		
GARRARD TA GC8 PU	£8.10. 0	£1.14. 0 12 of 13/-
B.S.R. TU9 (TC2 PU)	£4.10. 0	£1. 5. 0 3 of £15.0
COLLARO RP594 (O P or T PU)	£9.18. 9	£1.18. 9 12 of 15/-
E.M.I. (Acos Stereo/Mono PU)	£6.15. 0	£1. 7. 0 12 of 10/8
TRANSCRIPTION UNITS		
COLLARO TRP 594 (TX88 PU)	£18.18. 3	£2.16. 3 12 of £1.0.4
COLLARO 4T/200 (TX88 PU)	£18.13. 0	£3.15. 0 12 of £1.7.4
COLLARO 4TR/200 Motor only	£18.18. 8	£2.15. 3 12 of £1.0.5
GARRARD 4HF (GC8 PU)	£18. 9. 9	£3.15. 9 12 of £1.7.0

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

NEW ILLUSTRATED LISTS

NOW READY

Illustrated lists are available on **LOUD-SPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT.** Any will be sent free on request.

BLANK CHASSIS

The very latest blank chassis for the home constructor. Packed flat for easy and safe posting. These are made in bright tin-plate and have the top plate and four side channels packed flat complete with nuts and bolts assembly. The top plate is completely flat for easy drilling before assembly. Earth connections can be made directly by soldering. Available in the following sizes: 7 x 5 x 2in., 4/9, post 1/3. 10 x 5 x 2in., 5/3, post 1/4. 10 x 7 x 2in., 6/-, post 1/6. 14 x 5 x 2in., 7/3, post 1/6. 14 x 10 x 2in., 8/9, post 1/4.

MULLARD CATHODE RAY TUBES

ALL AT NEW REDUCED PRICES

RADIANT SCREEN. The very finest picture tube available. **LUMENAR.** Built to the same high standards as the Radiant Screen tube, but using reclaimed glass bulbs. Every other tube is brand new.

FULL 12 MONTHS GUARANTEE ON EITHER TYPE
Hire Purchase

	Radiant Screen	Deposit	12 mthly. pmts. of
12" MW31/74	£9. 0. 0	£1.16. 0	13/8
14" MW36/24, MW36/44	£9. 0. 0	£1.18. 0	13/8
14" AW36/20, AW36/80	£9.10. 0	£1.18. 0	14/4
17" MW43/89, MW43/80	£10. 0. 0	£2. 0. 0	15/-
17" AW43/80	£10.10. 0	£2. 2. 0	15/8
Lumenar			
12" MW31/74	£8. 2. 8	£1.12. 6	12/6
14" MW36/24, MW36/44	£8. 2. 6	£1.12. 6	12/6
14" AW36/20, AW36/80	£8.10. 0	£1.14. 0	13/-
17" MW43/89, MW43/80	£9. 0. 0	£1.16. 0	13/8
17" AW43/80	£9.10. 0	£1.18. 0	14/4

ALL CARRIAGE AND INSURANCE FREE

STEREO COMPONENTS

Morganite ranged potentiometers as specified for the Mullard circuits. Lot/Anti-Log, 500k, 1 meg., 2 meg. Log/Log, 250k, 1meg., 2 meg. Lin/Lin, 500k, 1 meg. All 10/8 each.
Denso Chassis for the Mullard circuits. All drilled with printed front panel. Three Valve Stereo Amplifier Chassis, £21/-. Seven watt Stereo Amplifier Chassis, 24/6. Stereo Pre-Amplifier Chassis, 24/6. Set of switches for Pre-Amp, 34/8. Pick-up cartridges, B.S.R. TC8S £2-4.11. Ronette DC284, £3.19.6. Both are turn-over types for Stereo, LP and 78 records. List of all components for Mullard Stereo Designs is available.

LATEST TEST METERS

	Cash Price	Hire Purchase Deposit Mthly/Pmts.
AVO Model 8 with	£23.10. 0	£4.14. 0 12 of £1.14. 6
leather carryink case	£27. 9. 0	£5. 8. 0 12 of £2. 0. 4
AVO Model 7	£19.10. 0	£3.18. 0 12 of £1. 8. 8
AVO Model 7 with		
leather carryink case	£23. 8. 0	£4.12. 0 12 of £1.14. 6
AVO Multimeter	£9.10. 0	£1.18. 0 12 of 14/4
AVO Multimeter with		
leather carrying case	£11. 9. 0	£2. 5. 0 12 of 17/-
TAYLOR Model 127A	£10. 0. 0	£2. 0. 0 12 of 15/-
CARY A-10	£4.17. 6	£1. 7. 6 3 of £1. 6. 8
CARY B-20	£3.10. 0	£2. 0. 0 3 of £1.13. 4

Full details of any of the above supplied free on request.

TAPE DECKS

	Cash Price	Hire Purchase Deposit Mthly/Pmts.
B.S.R. HD2	£3.19. 6	£1.14. 6 12 of 13/7
COLLARO STUDIO	£12.19. 6	£2.12. 6 12 of 18/5

All components in stock for the Mullard Tape "C" Pre-Amplifier Kit. Fully detailed list available.

WATTS RADIO (MAIL ORDER) LTD

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

PLEASE NOTE: POSTAL BUSINESS ONLY FROM THIS ADDRESS

SERVICE

RECORDING TAPE

DOUBLE PLAY

B.A.S.F. 300ft (3'), 14/-; 600ft (4'), 25/-; 1200ft (5'), 45/-; 1800ft (5 1/2'), 58/-; 2400ft (7'), 77/6.

BRAND FIVE. 1200ft (5'), 37/6; 2400ft (7'), 60/-.

EMITAPE 100. 400ft (3'), 17/-; 1200ft (5'), 45/-; 2400ft (7'), 80/-.

SCOTCH BOY 200. 400ft (3'), 17/-; 1200ft (5'), 45/-; 2400ft (7'), 80/-.

TELEFUNKEN. 1200ft (5') in plastic container. 40/-; 1800ft (5 1/2') in plastic container. 50/-; 2400ft (7'). 75/-.

LONG PLAY

B.A.S.F. 210ft. (3'), 9/-; 850ft. (5'), 28/-; 1200ft. (5 1/2'), 35/-; 1800ft. (7'), 50/-.

BRAND FIVE. 900ft (5'), 18/6; 1200ft (5 1/2'), 23/6; 1800ft (7'), 35/-.

EMITAPE 99. 99/3 250ft (3'), 9/6; 99/3N 250ft (3 1/2'), 9/6; 99/9 950ft (5'), 28/-; 99/12 1200ft (5 1/2'), 35/-; 99/18 1800ft (7'), 50/-; 99/9. 99/12 and 99/18 available in Emitape. 2/6 extra.

SCOTCH BRAND 150. 300ft. (3 1/2'), 9/6; 900ft (5'), 28/-; 1275ft (5 1/2'), 35/-; 1800ft (7'), 50/-.

ALL TAPE POST FREE!

TAPE ACCESSORIES

BIB Tape Splicer. 18/6. Post 9d.

WEARITE De-fluxer. 50/-, Post 1/3.

Full tape list including special offers of standard tapes available free.

LOUDSPEAKERS

	Cash Price	Deposit	Hire Purchase Mthly/Pmnts.
GOODMANS			
Axiom 110. 10" ..	£5. 0. 0	£1.10. 0	3 of £1. 6. 8
Axiom 112. 10" ..	£8.10. 0	£1.14. 0	6 of £1. 6. 0
Axiette. 8" ..	£6.12. 1	£1. 7. 1	6 of £1. 0.10
Axiom 300. 12" ..	£11. 5. 9	£2. 5. 9	12 of 16/8
Axiom 400. 12" ..	£16. 1. 0	£3. 4. 0	12 of £1. 3. 7
Axiom 60 Bass. 12" ..	£9.12. 9	£1.18. 9	12 of 14/6
Trebax Tweeter ..	£6. 4. 0	£1. 5. 0	6 of 19/10
CX5000 Cross-over unit	£1.19. 0	—	—
WHITELEY			
HF1016. 10" ..	£7.12. 3	£1.11. 3	6 of £1. 3. 6
HF1013. 10" ..	£4.15. 0	£1.10. 0	3 of £1. 5. 0
HF16. 8" ..	£6.10. 6	£1. 6. 6	6 of £1. 0. 8
TS16. 8" ..	£6. 8. 9	£1. 3. 9	6 of £1. 0. 0
T10 Tweeter ..	£4. 4. 0	£1. 4. 0	3 of £1. 3. 4
T359 Tweeter ..	£1.13. 3	—	—
CX3000 Cross-over unit	£1.10. 0	—	—
CX1500 Cross-over unit	£1.18. 3	—	—

OUTPUT TRANSFORMERS

GILSON
W0696A, W0696B, 50/6, post 2/-, W0710, W0710/SK, 55/6, post 2/-, W0892, 82/3, post free; W0767, 27/-, post 1/6.

PARTRIDGE
P3667, 52/6, post 2/-; P4014, 98/6, post free; P4131, 60/-, post free; P3591A, 99/-, post free; P5202, P5203, 95/-, post free.

PARMEKO. P2641, 27/-, post 1/6. P2643, 41/3, post 2/-.

ELSTONE. OT3, 25/-, post 1/6; OT/ML, 45/-, post 2/-.

AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 2 and 3 valve Pre-Amplifiers, GEC 912 Plus. Fully detailed list on any of these sent upon request. Instruction Manuals. Mullard. All Mullard Audio Circuits in "Circuits for Audio Amplifiers", 9/5. GEC 912. 4/6. All post free.

HIRE PURCHASE TERMS

are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5 per cent but minimum charge of 10/-, Six and Twelve months: Deposit 4/- in the £. Service charge 10 per cent, but minimum charge 20/-.

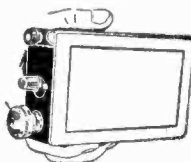
TERMS OF BUSINESS

Cash with order of C.O.D. We charge C.O.D. orders as follows: Up to £5, minimum 2/6. Over £5 and under £5. 1/6. Over £5 and under £10, 1/6. Over £10, no charge. Postage extra on CASH orders under £3 except where stated.

BE TRANSISTOR-WISE ! BE POCKET-WISE !

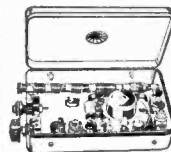
"RECO" TRANSONA-3 (3 transistors)

M/L waves. Ferrite rod aerial. Tuning condenser. Home, Light and Radio Luxembourg too. Complete kit with easy-build plans and "Sonotone" miniature earpiece. 55/-, With "Min. speaker." 49/6. Post etc. 2/6.



NEW! "RECO" PUSH-PULL SIX KIT

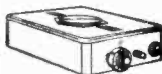
(6 Ediswan transistors and 2 diodes)



£6/19/6, post etc. 2/6. (Case 6 1/2 x 4 1/2 x 1 1/2 in. approx.)

"RECO" TRANSGEN-3

(3 Ediswan transistors)

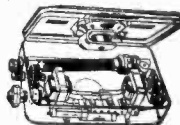


M/L waves and T.B. High-gain ferrite rod aerial. XA104 (Ediswan) RF stage. On test (50 miles London) tuned in Home, Light, Third, AFN, Radio Luxembourg and many others at good headphone strength. A really fine transistor kit complete with easy-build diagrams, and "Sonotone". min. earpiece 69/6. If reception conditions warrant a 3in. speaker may be fitted under speaker grille. (Case as P.P.S.)

"RECO" PUSH-PULL FOUR

(4 Ediswan transistors)

M/L waves with 2 S/W coils free upon request. 3in. HIGH-GRADE speaker affording fine tonal quality. Ferrite rod aerial. Bias sensitivity volume control. Complete kit with easy-build diagrams £5/19/6. Post etc. 2/6. Uses 4 1/2 v. flashlamp battery.



"RECO" PUSH-PULL FIVE

(5 Ediswan transistors)

M/L waves and T.B. Indoors or outdoors this brilliant radio brings Home and Continental stations to your finger tips. 3in. Golden - Tone Speaker. 6in. Ferrite Rod Aerial. EDISWAN XC101's (350 mw). Push-pull output stage. Gleaming pale blue styrene case with speaker grille in red. Complete kit with easy-build diagrams £5/19/6. Post etc. 2/6. Dorset customer writes:—"Makes fine car radio."

"RECO" SUPER TRANSGEN-4

(4 transistors)

As Transgen-3 but with 3in. speaker. Complete kit £4/19/6. Post etc. 2/6. (XA104, XB113, XC101, XC101).

"RECO" AMAZON-3

(3 transistors)

Medium waves with 2 S/W coils upon request. Tonal quality above average. Sensitive reflex circuit. Complete kit with super B.A. reproducer and attractive plastic case 45/-, post etc. 2/6. All transistors used in our kits are EDISWAN FIRST GRADE.

Overseas customers please add 3/6 extra for post. Circuits only and parts price list 2/6 for 6.

AFTER SALES SERVICE

Radio Exchange Company

27 HARPUR STREET, BEDFORD.

(Opposite Co-op). Phone 2367.

Closed Sat. 1 p.m.

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OZ4	5/-	6F6G	7/-	9D2	4/-	30PL1	10/6	DF96	8/6	EF39	5/6	HN309	24/7	PL83	9/-	U404	8/6	X109	17/3
IA3	3/-	6F11	17/3	10C1	13/-	30PL13	12/6	DF97	9/-	EF40	15/-	HVR2	20/-	PL84	12/8	UB80	29/10	XCR1.5	6/6
IA5	6/-	6F12	4/6	10D2	26/6	35A5	2/3	DH63	6/6	EF41	9/-	HVR2A	6/-	PL80	18/7	U4020	16/7	XF1	18/6
IA5GT	12/-	6F14	11/6	10D2	26/6	35L6GT	9/6	DH76	5/-	EF42	10/6	KF35	8/6	PM28	12/6	UAB80	9/6	XF12	1/6
ID6	10/6	6F15	15/3	10F9	11/6	35Z3	10/6	DH101	28/6	EF50(E)	5/-	LK35	8/6	PM12	6/6	UAF42	9/6	XF34	17/6
IG6	17/6	6F16	9/6	10LD3	8/6	35Z4GT	6/6	DH107	13/11	EF54	5/-	KT2	5/-	PM24M	21/3	UBC41	8/6	XSG(1.5)	6/6
IHS5GT	10/6	6F17	12/6	10LD11		35Z5GT	9/6	DK32	12/-	EF73	10/6	KT33C	10/0	PX4	10/6	UBF81	11/4	Y63	7/6
IL4	3/6	6F23	10/6		15/11	43	10/-	DK40	21/3	EF90	6/-	KT36	29/10	PX25	5/9B	UBF80	9/6	Z63	7/6
ILD5	5/-	6F32	10/6	10P13	15/-	50CS	10/-	DK91	6/6	EF85	6/-	KT41	12/6	PY31	16/7	UBF89	9/6	Z66	17/6
ILN5	5/-	6F33	7/6	10P14	19/3	50C06DG		DK92	9/6	EF86	10/6	KT44	12/6	PY32	11/6	UBL21	23/3	Z77	4/6
INS5GT	10/6	6G6	6/6	12A6	5/-		36/6	DK96	8/6	EF89	9/6	KT61	12/6	PY80	7/6	UCC84	14/7	Transistors and diodes	
IR5	6/6	6H6GT	3/-	12AC6	15/3	50L6GT	9/6	DL33	9/6	EF91	4/6	KT63	7/6	PY81	8/6	UCC85	9/-	GD3	4, 5,
IS4	9/-	6J5G	5/-	12AC6	17/3	53KU	19/11	DL66	17/6	EF92	4/6	KT66	15/-	PY82	7/6	UCF80	16/7	GD3	4, 5,
IS5	6/-	6J6	5/6	12A6G	13/11	72	4/6	DL68	15/-	EF97	13/3	KT88	24/6	PY83	8/6	UCH21	23/3	6, 8	4, 5,
IT4	3/6	6J7G	6/-	12AH7	8/-	77	8/-	DL82	46/5	EF98	13/3	KT'W61	6/6	PZ30	19/11	UCH42	9/6	OA70	4/-
IU5	6/-	6J7GT	10/6	12AH8	12/6	78	6/6	DL92	7/1	EF183	18/7	KT'W62	6/6	QP21	7/1	UCH81	9/6	OA73	4/-
2P	26/6	6K7G	5/-	12AT6	7/6	83	9/-	DL94	7/6	EF184	18/7	KT'W63	6/6	QP25	14/6	UCL82	11/6	OA79	4/-
2X2	4/6	6K7GT	6/-	12AT7	6/-	83	9/-	DL96	7/6	EK32	8/6	KTZ41	8/6	QS150/15		UCL83	19/3	OA81	4/-
3A4	6/-	6K8GT	10/6	12AU6	23/3	35A2	15/-	DM70	7/6	EL32	5/-	KTZ63	7/6		10/6	UF41	9/6	OA86	6/-
3A5	10/6	6K8G	6/6	12AU7	6/6	150B2	15/-	EB03	20/-	EL33	12/6	L63	6/6	R12	9/6	UF42	12/6	OA93	5/-
3B7	12/6	6K25	19/11	12AV6	17/6	161	10/6	EAS0	2/-	EL34	15/-	MH4C	7/6	R18	14/6	UF80	10/6	OA95	5/-
3D6	5/-	6L1	23/3	12AX7	7/6	185BT	33/2	EBC80	9/6	EL41	9/6	MH4	7/6	R19	19/11	UF85	9/6	OA110	25/-
3Q4	7/6	6L6G	8/-	12BA6	8/-	185BTA	33/2	SAC91	4/6	EL41	9/6	MHLD6	12/6	RK34	7/6	UF86	17/11	OA121	40/-
3Q5GT	9/6	6L6M	9/6	12BE6	9/-	304	10/6	EAF42	9/6	EL42	10/6	ML4	8/6	S130	15/-	UF89	9/6	OC16	54/-
3S4	7/6	6L7GT	7/6	12BH7	21/3	305	10/6	EB34	2/6	EL81	12/6	MS48	23/3	SP4(7)	14/6	UB1	9/6	OC19	54/-
3V4	7/6	6L8	13/-	12E1	30/-	807	7/6	EB41	8/6	EL83	19/11	MU1/214	8/-	SP41	3/6	UL44	26/6	OC2	87/-
5R4GY	17/6	6L19	23/3	12J5GT	4/6	956	3/6	EB91	4/-	EL84	7/6	N37	23/3	SP42	12/6	UL46	14/6	OC26	44/-
5U4G	6/6	6LD3	8/6	12K7G	9/6	1821	16/6	EBC3	23/3	EL85	13/11	N78	19/11	SP61	3/6	UL84	8/6	OC28	25/-
5V4G	10/6	6LD20	15/11	12G5	17/11	5763	12/6	EBC33	5/6	EL86	17/3	N108	23/3	SU25	26/6	UM4	17/3	OC35	48/-
5Y3GT	6/6	6N7	8/-	12K7GT	5/6	7475	7/6	EBC41	8/6	EL91	5/-	N308	20/7	SU61	9/6	UM8	15/3	OC44	26/-
5Z3	12/6	6P25	12/6	12K8GT	14/-	9002	5/6	EBC81	8/6	EL95	10/6	N339	15/7	T41	23/3	URIC	9/6	OC45	23/-
5Z4G	9/-	6P28	26/6	12Q7GT	5/-	AC/PEN		EBF80	9/6	EM34	9/6	P61	3/6	TDD4	12/6	U06	19/11	OC65	22/6
6A7	10/6	6Q7G	6/6	12SA7	8/6	S-pin	23/3	EM71	23/3	TH41	23/3	PBC80		TH41	26/6	U07	16/7	OC66	25/-
6A8G	9/-	6Q7GT	11/-	12SC7	8/6	7-pin	15/-	EBF89	9/6	EM80	9/-		13/11	TH233	33/2	U08	26/6	OC70	14/-
6A8B	9/-	6R7G	10/-	12SG7	7/6	AC2PEN/		EBL21	23/3	EM81	9/-	PCC84	8/-	TH232	20/-	U09	7/6	OC71	14/-
6AC7	4/-	6SA7GT	8/6	12SH7	8/6	DD	12/6	EBL31	23/3	EM84	10/6	PCC85	2/6	TP22	15/-	UY21	18/7	OC72	17/-
6AG5	5/6	6SC7	7/6	12S17	8/6	AC6PEN	7/6	EC52	5/6	EN31	37/-	PCC88	10/6	TP25	15/-	UY29	13/11	OC73	20/-
6AK5	8/-	6SG7GT	8/-	12SK7	6/-	AC7P	33/2	EC54	6/-	EY51	9/-	PCC89	11/6	TP2620	33/2	UY41	7/6	OC75	15/-
6AL5	4/-	6SH7GT	8/-	12S7G	11/6	ATP4	8/6	EC70	12/6	EY83	16/7	YB6F	13/3	TY85	7/6	UC76	15/-	OC76	15/-
6AM6	4/6	6S17GT	8/-	12SR7	8/6	AZ1	18/7	EC92	13/3	EY84	14/4	PCF82	10/6	UJ2/14	8/6	VMS4B	15/-	OC77	21/-
6AQ5	7/6	6S7GT	6/6	12TA6	10/6	AZ31	10/-	EC93	5/6	EY86	9/6	PCF86	15/6	U16	10/6	VP(7)	12/6	OC78	17/6
6A7G	7/6	6S7GT	6/6	12V7	27/10	13/11	11/6	ECC33	8/6	EZ35	6/-	PCL82	10/6	U18/20	8/6	VP4	15/-	OC78D	17/6
6AU6	10/-	6SN7GT	5/6	18	23/3	B36	15/-	ECC34	24/7	EZ40	7/6	PCL83	10/6	U22	8/-	VP2B	14/6	OC81	18/-
6AV6	12/6	6SQ7GT	9/-	19AQ5	10/6	BL63	7/6	ECC35	8/6	EZ41	7/6	PCL84	12/6	U24	29/10	VP4B	23/3	OC170	35/-
6B8GT	5/-	6SS7GT	8/-	19H1	10/6	C1	12/6	ECC40	23/3	EZ80	7/6	PCL85	16/7	U25	17/11	VP13C	7/6	OC200	54/-
6BA6	7/6	6U4GT	12/6	20D1	15/3	C1C	12/6	ECC81	6/-	EZ81	7/6	PEN4A	2/6	U26	10/6	VP23	6/6	OC203	58/-
6BE6	6/-	6U5G	7/6	20F2	26/6	CBLL	26/6	ECC82	6/6	FC2A	24/7	PEN4B	26/6	U31	9/6	VP41	6/6	TJ1	40/-
6BEG6	23/3	6U7G	8/6	20L1	26/6	CBLL31	23/3	ECC83	7/6	FC4	15/-	PEN4DD		U33	26/6	VR105	8/6	TJ2	45/-
6BH6	8/-	6V6G	7/6	20P1	26/6	CKH35	23/3	ECC94	9/6	FC13	26/6	PEN25	4/6	U35	26/6	VR150	7/6	TJ3	50/-
6B16	6/-	6V6GTG	8/-	20P3	23/3	CX506	6/6	ECC85	8/6	FC13C	26/6	PEN25	4/6	U37	26/6	VT61A	5/6	TP1	40/-
6BQ7A	15/-	6X4	5/-	20P4	26/6	CL33	19/3	ECC88	18/-	FW4/500		PEN40DD		U43	9/6	VT501	5/6	TP2	40/-
6BR7	15/-	6X5GT	6/-	20P5	23/3	CV63	10/6	ECC91	5/6					U45	25/-	W61M	26/6	TS1	10/-
6B57	25/-	6,30L2	10/-	25A6G	10/6	CY1	18/7	ECF80	10/6	FW4/800		PEN44	26/6	U50	6/6	W76	5/6	TS2	12/6
6BW6	6/-	7A7	12/6	25L6GT	10/6	CY31	18/7	ECF82	10/6			PEN45	26/6	U52	6/6	W81M	6/6	TS3	15/-
6BWX	6/-	7B6	21/3	25Y5	10/-	D1	3/-	ECH3	26/6	GZ30	9/-	PEN45DD		U54	19/11	W107	18/7	TS4	24/-
6B6E	6/-	7B7	8/6	25Y5G	10/-	D1S	10/6	ECH21	23/3	GZ32	10/-			U76	6/-	W729	19/11		
6C4	5/-	7C5	8/-	25Z4G	9/6	D63	5/-	FCH35	6/6	GZ33	19/11	PEN46	7/6	U78	5/-	X24M	24/7		
6C5G	6/6	7C6	8/-	25Z5	9/6	D77	7/6	FCH42	9/6	GZ34	14/-	PEN383	23/3	U107	16/7	X41	13/-		
6C6	6/6	7D6	10/6	25Z6G	10/-	DAC32	10/6	ECH81	9/6	H63	12/6	PEN45DD		U191	16/7	X61C	12/6		
6C9	13/6	7H7	8/-	25T5G	19/11	DAF91	6/6	ECH83	13/11	HABCO				U201	16/7	X61M	26/6		
6C10	9/6	7H7	12/6	25T6G	19/11	DA96	6/6	ECL80	9/6					U251	15/6	X61P	9/6		
6C16G	36/6	757	9/6	30C1	8/-	DDA	13/11	ECL82	10/6	HL2	7/6	PEN1DD		U281	19/11	X65	12/6		
6CH6	9/-	7V7	9/6	30F5	6/-	EDT25	7/6	ECL83	19/3	HL23DD	7/6	PL33	3/3	U282	22/7	X66	12/6		
6D3	19/11	7Y4	7/6	30FL1	10/-	DF33	10/6	EF9	23/3	HL41DD		PL36	12/-	U301	23/3	X76M	14/-		
6D6	6/6	8D2	3/6	30L1	3/-	DF66	15/6	EF22	14/-	HL42DD	19/3	PL38	26/6	U329	14/-	X78	2/3		
6E5	12/6	8D3	4/6	30L15	11/6	DF70	15/-	EF36	4/-			PL81	10/6	U339	16/7	X75	23/3		
6F1	26/6	9B8V6	15/3	30P12	7/6	DF91	3/6	EF37A	9/-			PL87	7/6	U401	16/7	X101	13/2		

ALL ITEMS OFFERED ARE NEW FULLY GUARANTEED, AND PRODUCTS OF ONLY THE BEST MANUFACTURERS WHO DO NOT STOCK JAPANESE GOODS, NOR ANY DISMANTLED FROM USED SETS.

VOLUME CONTROLS | **METAL RECTIFIERS** Full List with ratings free for S.A.E.

All with Long spindle and Double-pole Switch 4/6 each	DRM18 13/-	RM-1	5/3	1A486 17/6	14B130	35/-	14RA 1-2-8-3 21/-
10 K 25 K 50 K 100 K	DRM28 15/6	RM-2	7/6	1A497 25/-	14B261	11/6	(FC31)
	DRM38 15/6	RM-3	7/5	1A4100 27/-	14RA 1-2-8-2 17/6		16R2 2-2-8-1 12/-
	LW7	RM-4	14/-	14A124 23/-	(FC101)		16RE 2-1-8-1 8/6
± mg. ½ mg. 1 meg. 2 meg.							

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JASON F.M. TUNER KITS

We are the Authorised Jason Dealer and the whole kit is as supplied by them. You can therefore safely return to Jason for alignment without them rejecting it for non-standard components.

We can also align for the standard charge, to our kits only.

- FMT1** is the standard variable tuner for cabinet mounting, unpowered. Supplied complete with four EF91 valves £7.10. 0
Hire purchase Deposit £1.10.0 and 6 monthly
Instruction book, 2/6 extra.
- FMT1** Power pack kit with ready drilled chassis ... £2.14. 0
- FMT2** is a new tuner in a modern case, green, which can be used for shelf or cabinet mounting, and has space for power supplies if required. Supplied complete with four EF80 valves ... £8.12. 6
Hire purchase Deposit £1.14.6 and 6 monthly
- FMT2** With power. Complete kit £10.14. 0
Hire purchase Deposit £2.4.0 and 8 monthly
Instruction book 2/6 extra.
- FMT3** is the fringe version and should be used when farther than 70 miles from the transmitter. Supplied complete with 6 valves £10.12. 6
Hire purchase Deposit £2.6.6 and 8 monthly
- FMT3** With power. Complete kit £12.13. 0
Hire purchase Deposit £2.13.0 and 8 monthly
Instruction book 2/6 extra.

NEW JASON SWITCHED TUNERS

The **JTV/2** and **Mercury 2** are both of the pre-set station type with the addition of BBC and ITA sound. They use the latest "Fireball" turret and the A.F.C. ensures freedom from drift. The **Mercury 2** is for cabinet mounting with external power supplies. The **JTV/2** has the same tuning heart, with power supplies mounted in a case. This again can be used for shelf or cabinet mounting. The **JTV/2** cannot be supplied less power.

- JTV/2** Complete with valves and book £16.14. 9
Hire purchase Deposit £3.14.9 and 12 monthly £1. 3.10
- Mercury 2** Complete with valves and book... .. £12. 0. 0
Hire purchase Deposit £2.8.0 and 8 monthly £1. 6. 6
- Power pack Kit for Mercury 2** with drilled chassis £2. 14.0
Instruction book for all switched tuners, 3/6.

REQUIRED CHANNELS MUST BE SPECIFIED FOR SWITCHED TUNERS

All Jason kits can be supplied less valves. To find the cash price deduct 7/6 for each valve.

A more detailed list can be sent upon request.

ALL JASON TUNERS ARE ON DEMONSTRATION

GRAMOPHONE EQUIPMENT

All these units are brand new and boxed

	Cash	Deposit	Mthly	pmts.
B.S.R. Monarch TC8H, cartridge, UA14 ...	£7. 5. 0	£1. 9. 0	6	£12.8
COLLARO Conquest O cartridge	£7.15.0	£1.11.0	6	£14.0
GARRARD TA/Mk.2, GC8, cartridge ...	£8.10.0	£1.14.0	6	£16.0
GARRARD 4HF, GC8, cartridge	£18. 9. 9	£3.19.9	12	£16.7
PHILIPS AG2009, AG3016 cartridge	£10.10.0	£2. 2. 0	8	£13.6

For further information please write for manufacturers' list.

★ POST FREE ★

COLLARO STUDIO DECK. 3 speed, 3 motors, 7in. spools. Pause control, space for third head, piano keys, counter. **OUR PRICE** £13.10. 0
List price £17.10.0
Hire purchase Deposit £3.0.0 and 12 monthly 19. 3

TAPE AMPLIFIER for Studio deck, with two printed circuit boards, control and input panels, mains and output transformers, complete with knobs and plans, EF86, ECC83, EM84, EZ80, OA81 and two EL84, 4 watts output. Magic eye, Radio and Mic inputs, Mixing and Superimposing facilities, EX L.S. socket, low level output, tone control. Can be used as amplifier. **CASH PRICE** £11.12. 6
Hire purchase Deposit £2.6.6 and 8 monthly £1. 5. 9

TAPE RECORDER CASE to house the above deck and amplifier. Two-tone Grey... .. £5. 5. 0

E.M.I. Speaker to fit case 10 x 5in. £1. 5. 0

1200ft. Brand Five tape 25/-; Crystal Mic Stan Kelly Screened Jack Plugs, 4/6 each. Spare 7in. tape spool 4. 6

The above recorder complete to **PERSONAL SHOPPERS ONLY** for £35. 0. 0
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This machine is a first-class job and normally sells for £41. 0. 0

SEND FOR MAKER'S ILLUSTRATED LEAFLET

B.S.R. Monardeck TD2 3 1/2 i/s, 5 1/2in. spools. **OUR PRICE** £7. 9. 6
List price £12.12.0.

FERRODYNAMICS "BRAND FIVE"

Magnetic Recording Tape. Made in U.S.A. Fully guaranteed. High Grade Acetate base and boxed.

600ft. 5in. Standard	16/-	1200ft. 7in. Standard	25/-
900ft. 5in. L. play	18/6	1800ft. 7in. L. play	35/-
1200ft. 5 1/2in. L. play	23/6		

SEND FOR MANUFACTURERS' LEAFLET

Also stocked **SCOTCH BOY, EMITAPE** and **BASF.** LIST ON REQUEST.

TRANSISTORS

OC44 Mixer	List price 26/-	OUR PRICE 12/-
OC45 I.F.	List price 23/-	OUR PRICE 12/-
OC71 Audio	List price 14/-	OUR PRICE 8/6
OC72 Audio	List price 17/-	OUR PRICE 8/6
OC78 Audio	17/-	OC78D Driver 17/-
OC75 Audio	15/-	OC71 ... 25/-

The above transistors, which are offered below the list price, are all as supplied to set makers, and are not sub-standard. The last four types are at Mullard list price. Matched pairs of OC71 and OC72 can be supplied at no extra cost.

"PRACTICAL WIRELESS" POCKET SUPERHET

OSMOR set of Ferrite rod, IFTs and Osc. Coil, 32/6; REPANCO TT9, 12/6; TT10, 12/6; J.B. Gang, 11/-; ARDENTE volume control, 10/6; Wavechange, S.W.V., 3/9; CELESTION 2 1/2in. L.S., 26/9; OA81 diode, 4/-.

"TRANS TONIC"

TRANSISTOR KIT by BRAYHEAD

A new educational kit to build four radio receivers. M. and L. wave, and three short-range transmitters. Comprehensive instructions. **NO SOLDERING REQUIRED.** Send for BRAYHEAD leaflet. Complete kit ... £5.4.8.

WE PAY ALL POSTAGE AND INSURANCE ALL ORDERS DESPATCHED SAME DAY MONEY WILL BE REFUNDED IF REQUESTED

SURBITON PARK RADIO

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48 SURBITON ROAD

KINGSTON UPON THAMES, SURREY

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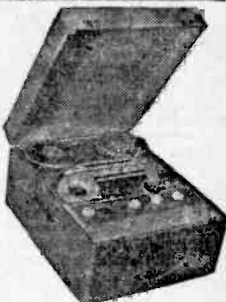
Hours: 9 a. m. to 6 p. m. 1 pm. Wed.

We do not close for lunch

Open all day Saturday

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

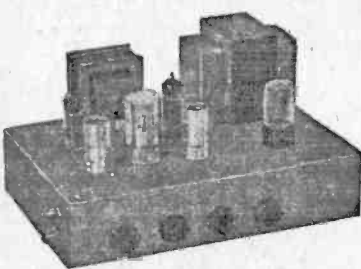
REALISM AT INCREDIBLY LOW COST, CAN BE ASSEMBLED IN HALF AN HOUR. The Recorder incorporates the Latest Collaro Studio Tape Transcriber. The Linear LT452 High Quality Tape Amplifier listed 12/20. High Flux P.M. Speaker listed 307. empty Tape Spool a Best of Best Quality Tape listed 22/8, and a Handsome Portable carrying Cabinet with latest attractive two-tone polychrome finish, size 18 x 13 x 9 in. high, listed 44/10.0, and circuit. Total cost if purchased individually approximately 240. Performance equal to units in the 260-280 class. S.A.E. for leaflet.



HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

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

Two input sockets with associated controls allow mixing of "mike" and gram, as in A10. High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, 5Y3. High Quality sectionally wound output transformer specially designed for Ultra Linear operation, and reliable small condensers of cutpoint manufacture. **DIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut."** Frequency response ± 3 D.B. 30-30,000 c/s. Six negative feedback loops. Hum level 80 D.B. down. **ONLY 23 millivolts INPUT required for FULL OUTPUT.** Suitable for use with all makes and types of pick-ups and microphones. Compare with the very best designs. For **STANDARD OR LONG PLAYING RECORDS FOR MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS, etc.** OUTPUT SOCKET with plug provides 300 v. 30 mA. and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-250 v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis if fully punched. Full instructions and point-to-point wiring diagrams supplied. **Only 8 Gns. 10/-** (Or factory built 45/- extra).



25 1/2

GNS.
Carr. 17/6

H.F. TERMS. Deposit 25.7.6 and 12 monthly payments of 2 gns. Cash price if settled in 3 months.

TELEVISION RECTIFIERS. 250 v. 200 mA. small size. Only 6/9 each. **RE-ENTRANT SPEAKERS.** Tannoy, 8 watt, 7.5 ohms. Only 22/8 each. **Parmeko Horn Type.** 10 watt, 15 and 200 ohm matching. 59/6. B.C.A. 20 watt, 15 ohms or 200 ohms. 8 gns.

COLLARO RC457 4 SPEED MIXER AUTO-CHANGERS. Turnover Studio Pick-up head, for 200-250 v. A.C. 27/18.6 Carr. 4/8.

THE SKYFOUR T.R.F. RECEIVER. A design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion detector. Power pentode output. Valve line-up 6K7, 5F61, 6Y80. Selectivity and quality excellent. Simple to construct. Point-to-Point wiring diagrams, instructions and parts list, 1/9. maximum building costs 24/18.6, inc. attractive Walnut veneered wood cabinet 12 x 8 1/2 x 5 1/2 in.

D.C. SUPPLY KIT. 12 v. 1 a. consisting of a partially drilled metal case, mains trans. F.W. Bridge Rectifier, 2 fuseholders and fuses. Change Direction switch, variable speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains. Limited number available at 33/6.

If required louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS.** DEPOSIT 24/3, and 9 monthly payments of 24/3. Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.

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

A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts, suitable for all crystal stereo heads. Ganged Bass and Treble Controls give equal variation of "left" and "cut". Provision is made for use as straight (monaural) 10 watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, E281. Outputs for 2-3 ohm speakers. Point-to-point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. Full constructional details and price list 2/8. **8 Gns. Carr. 10/-**

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6 v. or 12 v. 3 amps. with ammeter. 59/9
Above ready for use. With mains and output leads. Carr. 3/6.

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6/12 v. 6 amps. variable output. Consisting of Mains Transformer 0-230-250 v. F.W. Bridge Selenium Rectifier; Ammeter, Multi-Position Switch with Knob; Panels, Plugs, Fuses, Fuseholder and circuit. 59/9. Carr. 4/6.



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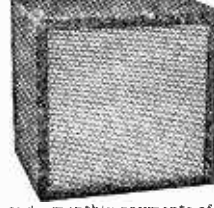
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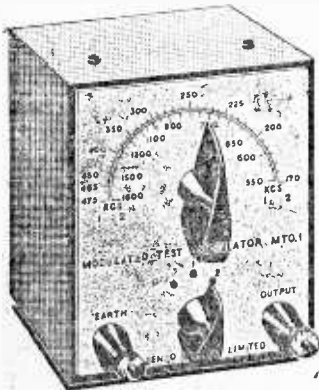
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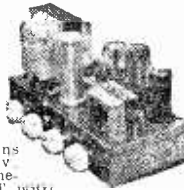


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Have you tried the famous American Ferrodynamics "BRAND FIVE" Recording Tape. An enthusiast's must!

High Quality Acetate Base: 5'-600ft., 16/-; 5'-900ft., 18/6; 5'-1,200ft., 23/6; 7'-1,200ft., 25/-; 7'-1,800ft., 35/-; 5'-1,200ft., 23/6; 7'-1,200ft., 25/-; 7'-1,800ft., 35/-; Extra Quality Mylar Dupont: 3'-300ft., 13/-; 5'-1,200ft., 37/6; 7'-1,800ft., 44/-; 7'-2,400ft., 60/- Each on plastic spool. All post free.

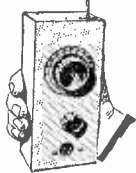


BRAND NEW—NOT SUB-STANDARD

"PRACTICAL WIRELESS" POCKET SUPERHET All required components for the Pocket Superhet as described in November issue now available at special inclusive price of £9.15.6 complete, including Printed Circuit. All items available separately. send stamp for list.

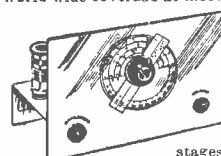
SUPER PERSONAL PORTABLE

A wonderful little set that you can take anywhere. Ideal for camping, picnics, etc. Detachable aerial rod supplied. Covers Medium waveband 200-500 metres. Can be built in approx. 1 hour. All necessary components available at the following SPECIAL INCLUSIVE PRICES: 1-valve version ONLY 35/- plus 2/- P. & P. Super 2-valve version ONLY 41/- plus 2/- P. & P. Send for point-to-point wiring diagram and parts price list 2/- post free. Extra for use with the above D.H.5 balanced armature headphones. 7/6 pair.



1 VALVE SHORT-WAVE RADIO

World-wide coverage at most reasonable cost. Covers 40-100 metres with the coil supplied. Can be extended to cover 10-100 metres. Provision is also made for the addition of two extra valve stages. Employs the famous Acorn-type 954 valve. All necessary components can be supplied complete with full assembly instructions at **ONLY 35/-** plus 2/- p. & p. Send 2/- for point-to-point wiring diagram and price list.



PRINTED CIRCUIT CAR RADIO

(for Home Construction)

We are proud to be able to offer this New type car radio employing up-to-the-minute circuitry special 12 volt valves and transistorised output stage. The highest degree of sensitivity is assured by the incorporation of Permeability Tuning and a tuned R.F. Stage. Covers Medium and Long Wavebands. NO VIBRATOR PACK IS REQUIRED. This is a really comprehensive receiver that will fit any car. Comprehensive assembly instructions are provided with all necessary components, including valves and transistor at a Special New Low Inclusive Price of **ONLY £11.19.6** plus 3/6 P. & P. Instruction booklet with itemised price list, full description dimensions, etc., available separately at 3/6 post free.



TO BUILD YOURSELF

We are the experts in this field and have no less than 45 different items for the home constructor including Portable Radios, Jason Tuners, Test equipment etc., etc., even an electronic organ. Send stamp for comprehensive list of equipment to build yourself also our current competitively priced valve list.

"FAMILY FOUR"

Our supersensitive T.R.F. Receiver for home construction. Covers Long and Medium Wavebands, is housed in very smart, plastic table cabinet in Brown or Black. For A.C. mains 200/250 v. Comprehensive assembly instructions provided, including practical and theoretical diagrams, which are easy to follow and will enable you to complete this receiver which will be the envy of your friends. ALL NECESSARY COMPONENTS ARE BEING OFFERED FOR LIMITED PERIOD ONLY at the REMARKABLE PRICE OF **ONLY 79/6**, plus 2/6 P. & P. Instruction book available separately if you wish to study before purchase at 1/6 post free.



RADIO JACK

Covers local medium wave stations variably tuned. Compact self contained unit requiring only connection to aerial (no power supplies req'd.) for 1st class reception when used in conjunction with your tape recorder or high gain amplifier. All necessary parts available at a special inclusive price of **ONLY 19/6**, P. & P. 1/6.

Full range at usual competitive prices. Interesting H.P. facilities. COLLARO JUNIOR 4-speed turntable and pick-up complete with crystal cartridge and sapphire styl. SPECIAL OFFER at only **75/-** plus 2/6 P. & P.



JUST ARRIVED!

LATEST GARRARD MODEL 310. Four-speed manual or automatic. 10in. and 12in. records of same speed can be mixed in any order. wired for stereo. attractive white colour scheme. Price 10/- plus 3/6 P. & P. L.A.TON H.S.K. 414. 4-speed. Attractive appearance. Wired for stereo. Fully g/teed £7.19.6. 3/6 P. & P. B.S.R. U.A.S STEREO/MONOCURAL. Free only at £7.19.6. plus 3/6 P. & P. Brand new. Guaranteed. COLLARO CONQUEST. 4-speed, wired for stereo. Brand new. £7.19.6. P. & P. 3/6.

A CONSTRUCTOR'S MUST

The latest "Plico" Instrument Bit Soldering Iron With Infrared Stand and built-in Spot-light for illuminating work. 200/250 v. ONLY 22/6. P. & P. 1/6. LOUIS SPEAKERS. EX. CHASSIS. As new guaranteed perfect, by leading manufacturers. 5in. 9/6; 6in. 10/6; 8in. 13/6; also 10in. with O.P. transformer (5,000 ohms). 17/6. All 3 ohm speech coil, also 8in. available in attractive cloth covered cabinet, ideal for extension speaker. 22/6. Each item plus 1/6 p. & p. Complete list of new speakers on request.

Brand new, individually checked and guaranteed VALVES

AC1/DD 2/6	DL96 8/-	EL85 10/-	PCF80 8/-	U52 5/-	3V4 7/3	6N7G 6/6	15D2 6/-	954 2/-
AC1/P 4/6	EL1232 5/6	EL91 7/6	PFN25 4/6	ULB4 8/6	4A1 4/6	6N7GT 7/-	15R 7/6	956 2/-
AC1/P1 2/6	EL1233 25/-	ESU208 8/-	PEN46 5/6	UL85 7/-	4D1 2/6	6Q7G 6/3	30 5/-	957 2/-
AC5/PENDD 4/-	EL124 6/6	EY51 8/3	PEN45 6/6	UJ9 5/6	5U4G 5/-	6R7G 7/6	35T 30/-	1619 5/-
AC6/PEN 5/-	EAS0 1/6	FY91 3/6	PEN220A 3/-	V226 5/-	5Y3GT 6/9	6R7GT 8/-	3524 5/-	1625 6/-
AC1/SP3 4/6	EAC91 4/6	EZ40 7/-	PENDD1 1360 9/6	V248A 4/-	SZ3 6/6	6S4 6/-	3524GT 7/-	1626 4/6
AL60 6/-	EB34 1/6	EZ80 7/6	PL81 11/-	V2D33B 8/-	5Z4G 8/-	6S7G 5/6	39-44 6/-	1629 4 6
AR8 5/-	EB91 3/7	FW4/500 6/6	PL83 9/-	VMP4G 6/-	6A6 5/-	6S7CGT 6/-	53A 3/-	4120 4 6
ARDD5 2/-	ECB33 6/6	H33 5/-	PM24A 4/-	VP23 3/6	6AB7 5/-	6S87 5/-	58 6/-	7193 1/9
ARP3 3/-	EC52 3/-	HL23 6/-	PM4DX 3/-	VR78 4/-	6AC7 4/3	6SH 5/-	59 6/-	6475 5/-
ARP4 3/6	ECC32 4/6	KBC32 5/-	PT25H 7/6	VR99 8/-	6AG5 4/6	6S17 6/9	71A 4/6	8010AR 22/6
ARPI2 2/9	ECC81 6 6	KF35 5/-	PM4DX 3/-	VR105/30716 6/-	6AG7 5/-	6S17G 6/6	7 6/-	8013A 10/-
ARP24 3/6	ECC82 6/9	KT2 4/-	PT25H 7/6	VR105/30713 6/-	6AJ7 4/3	6SK7 5/6	78 7/-	8020 6/-
ARP21 5/6	ECC83 7/9	KT31 8/-	PX4 19/-	VS110 4/-	6AK5 6/9	6SL7GT 6/9	80 6/3	9001 5/-
ARP34 4/6	ECC84 7/9	KT32 8/-	PY81 7/-	VT25 8/-	6AK6 7/6	6SN7GT 4/6	82 8/-	9003 5/6
ARHT2 7/-	ECC91 4/6	KT33C 7/-	QY2 8/-	VU111 3/3	6AK7 8/-	6SQ7 6/6	83V 12/-	9004 5/6
ATP4 2/9	ECL80 9/6	KT44 7/-	QP25 5/3	VU120 3/-	6AM6 6/3	6SR7 6/6	84 8/-	9006 4/-
ATP7 5/6	EF22 7/6	KT63 6/-	QP25 5/3	VU133A 3/-	6AT6 7/-	6S57 5/-	85A1 12/-	
AU1 5/-	EF32 5/6	KT66 11/-	QQV06-40 45/-	W21 4 pin 7/-	6B8 5/6	6S65 8/-	89 6/-	
AU4 5/-	EF36 3/6	KT241 9/-	QS75/20 6/9	W31 7/-	6B8G 2/6	6V6G 5/6	210LF 3/-	
AW3 4/-	EF37A 8/-	KTW62 7/6	QS95/10 6/9	Y63 5/-	6C4 4/-	6V6GT 6/-	210VPT 7 pin 2/6	
BL63 6/-	EF39 4/6	KTW63 6/6	QS108/45 6/9	Y66 8/-	6C6G 4/6	6X4 5/6	217C 17/6	
BT45 6/-	EF50 2/6	L30 4/-	QS150/15 6/9	Z31 6/-	6C8G 5/-	6X5GT 6/6	217G 17/6	
BT98 40/-	EF52 5/-	L30 4/-	R10 12/6	IA3 3/6	6E5 5/-	6Z4 8/-	446A 14/-	
D41 3/3	EF54 3/6	LP2 3/6	REL21 25/-	IASGT 5/-	6F6 7/-	7Q7 7/-	705A 17/6	
D42 4/-	EF55 6/-	MH4 3/6	RL37 3/6	ICSGT 7/6	6F8G 6/6	8D2 2/6	715B 97/6	
D77 4/3	EF70 4/-	ML4 4/-	RK34 2/6	IE7GT 7/6	6F12 4/6	9D2 3/-	717A 8/6	
DA30 12/6	EF80 6/9	ML6 6/-	SP48 4/6	ILD5 3/6	6G6G 3/9	10A6 8/6	723A/B 45/-	
DAF86 8/-	EF85 6/10	MPT42 5/3	SPI3C 4/6	IR5 5/6	6H6GT 1/9	12AH7 7/-	801 6/-	
DETS 15/-	EF86 9/-	M3/PEN 6/-	SP21O 4/-	IS5 6/-	6H6M 2/-	12A7T 6/6	805 30/6	
DET19 2/6	EF89 8/9	N34 6/-	SP41 2/6	IT4 4/-	6HA7 4/3	12AU7 6/9	807AMER 7/-	
DET20 2/6	EF91 4/10	NR15A 3/-	SP61 2/-	2A3 8/-	6J5 3/6	12C8 7/6	807B 5/-	
DF70 9/-	EF92 5/-	NT37 10/-	STV280/40 12/-	2A6 7/-	6J6 4/6	12E1 22/6	808 8/-	
DF72 7/6	EF95 7/6	(4033A) 10/-	SU2150A 4/9	2C4 2/6	6J7 7/6	12H6 3/6	813 67/6	
DF96 8/-	EL32 3/9	OD33 5/-	T41 7/-	2D4A 4/-	6K6GT 2/3	12J5GT 3/6	815 80/-	
DK76 4/9	EL35 9/-	P2 4/-	TP25 15/-	2X2 4/-	6K7GT 5/3	12K8GT 9/-	816 30/-	
DH96 8/-	EL41 8/3	P61 2/6	TT11 3/-	3A4 6/-	6K8G 6/6	12S27 4/9	829A 30/-	
DL71 8/-	EL42 9/-	PCC84 8/-	U17 5/-	3E29 9/-	6L6 9/-	12S7 6/-	832 15/-	
DL72 7/6	EL84 8/3	PCC85 8/-	U18 6/6	3Q5GT 9/-	6L6G 6/-	12SK7 5/-	866A 10/-	
			U27 8/-		(829B) 60/-	12SL7 7/-	872A 35/-	
						12SR7 6/-	930 8/-	

Cathode Ray Tubes
 3BP1 25/-
 5BP1 35/-
 5CP1 42/6
 5FP7 45/-
 VCRX258 (with scanning coil) 45/-

Photo Tubes
 GL16 12/6

Special Valves
 2J31 45/-
 3A/1481 45/-
 3J/170E £35
 3J/192E 80/-
 £37.10

723AB 45/-
 726A 27/6
 ACT25 40/-
 CV691 60/-
 KR3 45/-
 VX7110 15/-
 WL417A 15/-

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

Cosor Double Beam Oscilloscope 339A. Fully tested and working £15. Carr. 10/- **T.C.S. Receivers.** Made by Collins of U.S.A. In fully guaranteed working condition. 1.5-12 mc. Line up. 12SA7 (1), 12SQ7 (1), 12A6 (2), 12SK7 (3). Power requirements 12 v. L.T., 225 v. H.T. £11.10.0. Carriage 12/6.

Specially Built Power Pack for the above. 230 v. A.C. mains, including 6X5GT valve, £3.10.0. Carriage 5/-.

Transmitter/Receiver No. 22. 2 mc. to 8 mc. Built almost exactly as No. 19 set but much more economical in battery consumption. Complete in fully working condition with power pack for 12 v., Headgear and Microphone assembly and Key, £9.19.6. Carriage 15/-.

Brand new original spare parts for AR88 Receivers.

Please write your requirements.

Low Resistance Headphones, brand new. Balanced Armature DLR, 7/6. P. & P. 1/-.

Telephone Handset. Standard G.P.O. type, new, 12/-, P. & P. 1/6.

S.C.R. 522 Receivers BC624 100-156 Mc/s. including all valves. 25/-, P. & P. 5/-.

H.T. Chokes made by Bendix Radio (U.S.A.). 3 Henrys 0.600A D.C. 25 ohms D.C. resistance 18,000 v. R.M.S. 60 cycle test £1.12.6. P. & P. 6/-.

Ditto 10 Henrys 250 A. D.C. 90 ohms resistance 1,500 v. R.M.S. 60 cycle test 16/6. P. & P. 3/6.

Throat Microphones T 30 (U.S.A.), 3/6, P. & P. 1/6.

Carbon inset Microphone. G.P.O. Type 2/6, P. & P. 1/-.

Transmitter Cabinet with door at back. 7 1/2 in. high, 2 1/2 in. wide, rack fitting type. £17.10.0. Carriage £1.

Variometer for W/S No. 19 Fully tested and working 12/6. P. & P. 2/6.

Filament Transformers. Primary 0-190-210-230-250 v 50 C. Sec. 1 2.5 v

NEW PRODUCT OF TAYLOR

Model 127A
 Pocket size meter. Sensitivity 1 v. 2.0, 0.0 0.0 o.p.v. D.C. 1.00 o.p.v. A.C. 2.0 ranges. D.C. current 50µA to 1 amp. D.C. volt 0.3 v. - 1,000 v. (2.5 kV by probe). A.C. volt 1.0 v. - 1,000 v. 3 resistance ranges from 0-20 megohms (self contained). Meter 40µA 3 1/2 in. arc. Accuracy D.C. 3% A.C. 4%, ohms 5%. Dimensions 5 1/2 in. x 3 1/2 in. x 1 1/2 in. weight 14 ozs. Price £10 complete with instruction manual test clips and clips. Leather case £1.12.0 extra.

C.T. at 10 amps. 2.25 v. C.T. at 10 amps; 3 10.5 v. C.T. at 11 amps., 4,000 v. insulation. Price £2.19.0. P. & P. 5/-.

Primary 0-190-210-230-250 v., 50 C. Sec. 1 10 v. C.T. at 4.5 amps.; 2 10 v. C.T. at 4.5 amps., 4,000 v. insulation £1.16.0. P. & P. 5/-.

Primary 230 v. 50/60 c. 67 v. amp. Sec. 1 6.3 v. 1-6 amps.; 2 6.3 v. C.T. 3 amps.; 3 6.3 v. C.T. 3 amps.; 4 6.3 v. C.T. 3 amps £1.12.0. P. & P. 5/-.

Ferranti Transformer. Oil cooled. 20/19.5 K.V.A., 3 phase, 50 cycles. Primary 360/380/400/420/440 v. Secondary 2,700/2,900/3,100/3,300/3,500 v., 2.1 amp. Voltage regulation by simple switches on primary and secondary. Weight 1,150 lbs Price £125.0.0. Carriage at cost.

Driven Transformers. Primary 500 ohms imp. Sec. to match two 805 in push-pull. £1.7.6. P. & P. 5/-.

Rotary Transformer. 171 W 12 v. input, 1,600 v. 100 mA output, 30/-, P. & P. 7/6.

Insulation Test Meter. Testing voltage adjustable up to 6,000 v. D.C. Mains supply 180/250 v. In wooden case £25. Carriage 10/-.

Vibrator Unit. 12 v./160 v 35 mA. Exceedingly well filtered and smoothed, excellent for car radios. New including 6X5G valve and vibrator, 17/6. P. & P. 5/-.

Moving Coil Round Hand Microphone No. 13. 2 1/2 in. dia. with press switch, 12/6. P. & P. 1/-.

Complete Set of Strong Aerial Rods (American). Screw-in type MP49, 50, 51, 52, 53 total length 15ft. 10in. top diameter 0.615in. bottom diameter 0.185in. together with matched aerial base. MP37 with ceramic insulator, ideal for far or roof insulator £2.10.0, post free.

HRO Mains ower pack, input 115/250 v. A.C.; output 250 v. 0.75 mA and 6.3 v. 3.5 amps. £3. inc. arr

B.C.659 Transmitter Receiver. Frequency range 27-38.9 Mc/s. crystal controlled. 2 pre-set channels, together with power unit for 6, 12, or 24 v. D.C. Good condition £5.10.0. Carriage 15/-.

Output Transformer in screening can give 9 different ratios 10:1 up to 120:1 for battery receivers or any high resistance pentodes used as output valves, 6/6. P. & P. 1/6.

P. C. RADIO LTD.
 170 GOLDHAWK RD., W.12
 Shepherd's Bush 4946

DE LUXE TAPE RECORDER CABINET



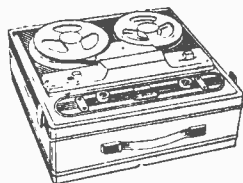
Beautifully made Tape Recorder Cabinet. Size: 13 x 10½ x 7in. Covered in two-tone coloured rexine cloth. Stylish design. Carrying handle and detachable lid. Easily adapted to Record Player Cabinet.. P. & P. 4/6.

29/9

TAPE RECORDER

29 gns. NOW 18 gns.

FAMOUS MANUFACTURER UNREPEATABLE VALUE



Huge purchase allows us to offer at this amazing price. Beautifully styled rexine covered cabinets. Colours: Red. Grey Black. Storage space for 4 tapes, mike and lead, incorporating latest B.S.R. deck. LOOK AT THESE EXPENSIVE FEATURES: Record playback switch and rewind with interlocking device to prevent accidental erasure. Tone and volume controls. Superimpose and electronic eye. Small overall size 14½ x 14½ x 7½in. Lightweight, 21 lbs. 5½in. standard tape. Fully guaranteed. Terms: Carr. and Ins. 12/6. Mike 27/6 extra. Tapes 19/9.

The "STUDIO TWIN"

40 GNS. NOW ONLY **29** GNS.

Quality Twin Speaker Tape Recorder at amazing low price. 7in. Standard reels. Latest Studio 3-speed Deck. 1½, 3½, 7½ I.P.S. Includes Twin Track reverse counter. Pause control and magic eye recording indicator. Volume and tone control, superimpose switch. Two matched speakers. 3 watts output. Attractive cabinet in Beige. Size: 19 x 13 x 8in. Fully guaranteed. Ins. and Carr. 12/6. Mike 27/6 extra. Tapes 25/-.



DE LUXE TAPE RECORDER

31 gns. OUR PRICE **22** gns.



Beautifully styled rexine covered cabinet in Red/Beige, with carrying handle. Size: 14½ x 13 x 9½in. Storage space in lid for tapes and mike. Speed 3½in. per second. Compact set using latest 5-valve amplifier with 4 stage amplification, and separate valve for Bias osc. 2 controls. Contains 7 x 4in. elliptical speaker, and incorporating B.S.R. Tape Deck. 5½in. standard tape. Fully guaranteed. Ins. and Carr. 12/6. Terms.

TAPE RECORDER AMPLIFIER

Compact, well designed 5-valve amplifier. Output 3.5 watts. Valve line up, ECC83. Double triode first audio amplifiers. ECL82 triode pentode further audio amplifier and output valve. 6BW6 bias and erase oscillator. EMB4 record level indicator. EZ80 H.T. rectifier. Input for mike, radio and gram. Controls: record, playback volume and on/off playback tone. Dia: 8½ x 3 x 4½in. Ins. and Carr. 4/6. Terms. Extras: Knobs 2/6 per set. Beautiful Perspex dial plate. Complete with sockets for mike, radio and superimposed switch. 3/6.

£7.19.6

RECORD PLAYER CABINET R.P.9 19/6

Exceptional offer. A lightweight portable player Cabinet in two-tone Rust and Cream. Famous manufacturer. Size: 14½ x 11½ x 6in. Complete with moulded deck board of attractive design. Takes B.S.R. TU9 single player; 2 control amplifier; 5in. round speaker. P. & P. 4/6.

EXTENSION SPEAKERS 19/9

5in. P.M. Speakers fitted into polished cabinets. Standard matching to any receiver. (Complete). Switch and Flex included. P. & P. 3/9.



17" TV's

ONLY **17½** gns.

MODERN CHASSIS, MODIFIED

Complete 17in. tube. VALVES — SPEAKER — KNOBS. Tuned ITV/ BBC. Ready to use. Fully guaranteed tubes 12 months, valves three months. Cabinet to fit, £1.11.6 if ordered with set. Salvage Set, tube, cabinet, despatched separately. Carr and ins. on set, £1.5.0; on cabinet, 8/6.

RECORD PLAYER CABINET R.P.2.

Made by famous manufacturer. In polka dot cloth with clipped lid and carrying handle. Size 16 x 14½ x 8½in. deep Carr and Ins. 4/6 Takes B.S.R. Monarch Auto-changer £6.19.6; 7 x 4in. Elliptical speaker 15/9. Our M.D2 portable amplifier 79/6.



only **59/6**

VALVES SALVAGED. Over 100 types to be CLEARED at 9d. each.

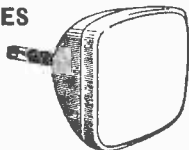
REPLACEMENT, REBUILT TV TUBES

12 MONTHS' GUARANTEE

Terms available over 10 weeks

Carr. and Ins. 15/-

21" TUBE	£8.10.0	£2 ALLOWED ON OLD TUBE
17" TUBE	£7.10.0	
12" 14" 15" TUBES	£5.10.0	£1 ALLOWED ON OLD TUBE



BAKELITE CABINETS 2/9

Brand new. Colour brown. Attractive design. Size: 12 x 7 x 5½in. Ideal small receivers, converters, etc. P. & P. 3/9.

TELEPHONE SETS 7/9

Ex W.D. Wireless remote control unit. E.M.K.11 (ZA11954). Including morse tapper, switches, jack plugs, etc. Less phone. Ins. and Carr. 3/6.

DUKE & CO. (LONDON) 621/3 Romford Rd. Manor Park, E.12. LTD. ILF 6001/3.

SEND FOR FREE CATALOGUE



Stern's "fidelity" TAPE RECORDERS

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

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

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

MODEL CR3/S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-speed Deck H.P. Terms: Deposit £7.18.0 and 12 months of £39.10.0

MODEL CR3/T Incorporates the very popular 3-speed COLLARO MK. IV "TRANSCRIPTOR" Deck which has both upper and lower tape tracks. H.P. Terms: Deposit £9.10.0 and 12 months of £39.9.8.

MODEL TR3/MK. VI Incorporates the New £49.10.0 TRUVOX MK. VI TWIN TRACK 3-speed Tape Deck H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.

All prices quoted provide for the COMPLETE RECORDER including CRYSTAL MICROPHONE and 120 ft. Spool of Tape.

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

TAPE AMPLIFIERS and PRE-AMPLIFIERS PRESENTED FROM MULLARD DESIGNS

MODEL HF/G2A-D

A complete self-contained Tape Recorder chassis incorporating Loudspeaker and comprising the Model HF/G2A Amplifier connected to the Garrard Tape Deck. Operates at 3 1/2 in./sec. speed and supplied fully tested and ready for immediate operation, designed for easy fixing into a portable case or cabinet only four fixing screws being required.

PRICE £25.0.0 (Including a 4in. spool of Long Play Tape.) Terms, Dep. £5.00.0, 12 months £1.18.8.

Alternatively we offer Complete Kit of Parts to build the HF/G2A Amplifier with the ASSEMBLED AND TESTED GARRARD TAPE DECK for **£22.0.0** Terms, Deposit £4.8.0, 12 months £1.12.3.

The model HF/G2A is available separately for
(a) COMPLETE KIT OF PARTS £11.0.0
(b) ASSEMBLED £12.15.0



MODEL HF/G2P-D

THE IDEAL "LINK" TO ADD FULL TAPE RECORDING FACILITIES TO HIGH QUALITY HOME INSTALLATIONS. RADIOGRAMS, etc. Comprises the HF/G2P Tape Pre-amplifier fitted to the Garrard Tape Deck, operates at 3 1/2 in./sec. speed, connects into the tape input channel or pick-up sockets of existing Amplifier or Radio Chassis. COMPLETE WORKING UNIT, containing 4in. spool of Long Play Tape.

PRICE £23.15.0 Terms, Dep. £4.15.0, 12 months £1.14.10.

Alternatively we offer Complete Kit of Parts to build the HF/G2P Pre-amplifier with the ASSEMBLED AND TESTED GARRARD DECK for **£20.15.0** Terms, Dep. £4.3.0, 12 months £1.10.5.



Model HF/G2P-D Contains the Model HF/G2A-D Unit (described opposite). A small robust recorder with outstanding performance. Truly portable, weighs only 22 lbs. Twin Track operates on 3 1/2 in./sec. speed.

PRICE £29.15.0

H.P. Terms, Deposit £8.0.0, and 12 months at £2.3.7.

The Pre-amplifier Model HF/G2P is available separately for
(a) Complete Kit of Parts £9.10.0
(b) Assembled £11.5.0.

MODEL HF/TR3 TAPE AMPLIFIER

(Mullard Type "A" design) A very high quality Amplifier incorporating 3-speed treble equalisation, using the latest FEROXUCUBE POT CORE INDUCTOR. FOR COLLARO-TRUVOX-BRENELL-WEARITE or MOTEK TAPE DECKS, has GILSEN Output Transformer. Includes separate Power Supply Unit.

PRICE £12.15.0 OR **£16.10.0**
KITS OF PARTS ASSEMBLED
H.P. Deposit £3.6.6 and 12 months at £1.4.2.



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

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

PRICE £14.0.0 H.P. £3.8.0 Deposit and 12 months £1.4.11. OR ASSEMBLED **£17.0.0**



(Excluding power unit £11.15.0 and £14.10.0 respectively).
(a) COMPLETE KIT to build the HF/TR3 Amplifier, together with the COLLARO "STUDIO" DECK. As above but with HF/TR3 supplied ASSEMBLED AND TESTED **£25.10.0** **£29.0.0**

(c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK AND POWER UNIT **£30.15.0**

(d) extra II we are required to wire up Deck Switch Banks. As above but HF/TR3 supplied ASSEMBLED AND TESTED **£34.10.0**

(f) extra II we are required to wire up Deck Switch Banks. COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX MK. VI TAPE DECK... **£36.0.0**

(g) As above but HF/TR3 supplied ASSEMBLED AND TESTED **£39.10.0**

(h) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK... **£41.10.0**

(i) As above but HF/TR3 supplied ASSEMBLED AND TESTED **£45.0.0**

(j) THE WEARITE 4A DECK with assembled and tested HF/TR3 Amplifier including WEARITE Head Lift Transformer. **£55.0.0**

H.P. Deposit £11.0.0, and 12 months £4.0.8. Carriage and Insurance on each above is 10/- extra. Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA/CELESTION 10 x 8in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 120ft. SPOOL E.M.I. TAPE—ALL FOR £9.10.0. Carriage and Insurance 5/- extra.

FOR THE HOME CONSTRUCTOR SPECIAL "COMBINED ORDER" PRICES

- (a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PRE-AMPLIFIER and Power Unit Assembled and Tested. **£29.10.0**
H.P. Deposit £5.18.0 and 12 months £2.3.3.
- (b) As above but TYPE "C" PRE-AMPLIFIER supplied as complete KIT OF PARTS. **£26.10.0**
- (c) The COLLARO MK. IV TAPE DECK and the MULLARD TYPE "C" PRE-AMPLIFIER and Power Unit assembled, tested. **£35.0.0**
H.P. Deposit £7. and 12 months £2.11.4.
- (d) As (c) but Type "C" as COMPLETE KIT OF PARTS. **£32.0.0**
- (e) The TRUVOX MK. VI DECK and the assembled Type "C" Pre-amplifier and Power Unit. **£40.0.0**
H.P. Deposit £8.0.0, and 12 months £2.18.3.
- (f) As above but Type "C" as complete KIT OF PARTS. **£36.10.0**
- (g) The BRENELL MK. V DECK and the assembled Type "C" PRE-AMPLIFIER and POWER UNIT. **£46.0.0**
H.P. Deposit £9.4.0, and 12 months £3.7.6.
- (h) As (g) but Type "C" as complete KIT OF PARTS. **£43.0.0**
- (i) THE WEARITE 4A DECK with TYPE "C" assembled and tested. **£56.0.0**
H.P. Deposit £11.4.0, and 12 months £4.2.1.
(Carriage and Insurance on above quotes 10/- extra.)

EACH OF THE ABOVE CAN BE SUPPLIED IN A PORTABLE CASE THUS FORMING A COMPLETE PORTABLE PRE-AMPLIFIER. (FULL DETAILS ON REQUEST)

FULLY DESCRIPTIVE LEAFLETS ON ALL OF ABOVE ARE AVAILABLE—BUT PLEASE ENCLOSE S.A.E. AND STATE WHICH LEAFLET IS REQUIRED.

STERN RADIO LTD.

STERN'S MULLARD DESIGNS

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

COMPLETE KIT OF PARTS—

MULLARD "5-10" MAIN AMPLIFIER

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

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



MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

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

PRICE COMPLETE KITS OF PARTS £6.6.0 ASSEMBLED AND TESTED £8.0.0

Supplied strictly to MULLARD'S SPECIFICATION and incorporating:

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



COMPLETE MULLARD "5-10" AMPLIFIER

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

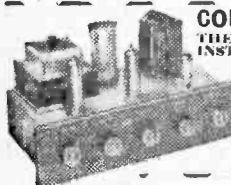
KIT OF PARTS £11.10.0 OR ASSEMBLED and TESTED £13.10.0

HIRE PURCHASE (Assembled Amp. only). DEPOSIT £2.14.0. 12 months at 15/10. ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. £1.6.0 extra



COMPLETE MULLARD "3-3"

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



STEREO "3-3" MAIN AMPLIFIER

Comprises two MULLARD 3-3 Main Amplifiers on one chassis. Operates with MULLARD STEREO PRE-AMPLIFIER. Output power 6 watts. Inputs for Crystal Pick-up and Radio Tuner. KIT OF PARTS £10.0.0 OR ASSEMBLED £11.15.0

COMPLETE STEREO AMPLIFIER

Meets the many requests for a low priced but good quality Stereophonic Amplifier. Output power is 4 watts and suitable for Crystal Pick-ups. KIT OF PARTS £8.10.0 OR ASSEMBLED £10.10.0

!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK, MANY AT REDUCED PRICES

SEND S.A.F. FOR ILLUSTRATED LEAFLET

- B.S.R. MONARCH UA8 4-speed mixer Autochanger with Crystal Pick-up. £6.19.6
- THE NEW COLLARO MODEL RP594 4-speed Single Record Player. Studio Cartridge. £9.18.9
- THE COLLARO "CONQUEST" 4-speed Autochanger Studio Pick-up. £7.10.0
- THE COLLARO 4-speed Single Record Player. Studio Pick-up. £6.9.6
- THE NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER. £8.7.6
- U.A.B. also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records. £10.10.0
- GARRARD MODEL TAMM.H 4-speed Player fitted high output Crystal Pick-up. £8.10.0
- GARRARD MODEL RC.240. Autochanger 4 speeds. High output. Crystal Pick-up. £10.10.0

Carriage and Insurance on each above. 5/- extra. H.P. TERMS AVAILABLE ON EQUIPMENT OVER £9. DESCRIPTIVE LEAFLETS AVAILABLE FOR ALL EQUIPMENT. PLEASE SEND S.A.F.

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Telephone: FLEET STREET 5812/1/4

PRICE REDUCTIONS

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

(b) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. £8.16.0 and 12 months at £1.7.5. £18.18.0

(c) THE KIT OF PARTS to build the DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT. £21.10.0

(d) THE DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED. H.P. Terms: Deposit £5 and 12 months at £1.6.8. £25.0.0

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

(f) ONE "5-10" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER both ASSEMBLED and TESTED. H.P. Terms: Deposit £5, 12 months at £1.6.8. £31.0.0

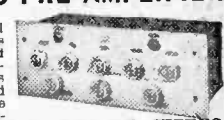
(g) KIT OF PARTS to build Two "5-10" MAIN AMPLIFIERS (incorporating Parmeko Output Transformers) and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT. £31.0.0

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

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

STEREO PRE-AMPLIFIER

This model incorporates two Mullard 2-valve Pre-Amplifiers combined into a single unit capable of being used for both STEREO PHONIC or MONAURAL operation. It is designed primarily to operate with our MULLARD MAIN AMPLIFIERS but will also operate with any make of Amplifiers requiring an input of 250 mvolts.



COMPLETE KIT £12.10.0 OR ASSEMBLED and TESTED £15.0.0

H.P. Dep. and 12 months at £1.2.0. MODEL 1.L. one microphone input matched for moving coil or Ribbon Mike. £1.17.0 extra.

MULLARD FOUR CHANNEL MIXER UNIT

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



Complete Kit of Parts £8.8.0 Assembled and Tested £10.0.0

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

Mk.11 "Fidelity" FM TUNING UNIT

An attractively presented Unit incorporating MULLARD PERMEABILITY TUNING HEART and corresponding Mullard valve line up. FOR THE £10.10.0 ASSEMBLED £14.5.0 CONSTRUCTOR

A SPECIAL CASH OFFER!!

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



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

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

WE ALSO SUPPLY SEPARATELY: AMPLIFIER £4.2.6

(a) The 2-stage (plus Rectifier) AMPLIFIER £3.17.6

(b) THE PORTABLE CARRYING CASE £3.17.6

(c) 6-in. P.M. SPEAKER 18/9 Carriage and Insurance 4/- extra

EASY AS A.B.C. TO BUILD

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

37/6



2/- extra. (Parts sold separately. Priced parts list 1/6.)



Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1 1/4 in. x 1 in. x 1 1/4 in. —"Feather-weight"—yet gives clear, crisp, personal-phone reception over all medium waves. Tiny battery inside lasts months—costs 6d. No snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only 29/6 (add 2/6 Post, etc.). C.O.D. 2/- extra. All parts sold separately. Priced parts list 1/6. Send Now!

Can Be Built for 47/6. Build this exceptionally sensitive high efficiency personal phone radio. Uses unique assembly system and can be built by anyone without any radio knowledge whatever in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6 1/4 in. x 5 1/4 in. x 3 1/4 in. Covers all medium and long waves. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holiday, etc. BUILD THE "SKY-ROMA" NOW! Total building cost—everything down to the last nut and bolt, 47/6 (Postage, etc., 2/-)—with full set of clear, easy-to-follow plans. (Parts sold separately. Priced parts list and plans 1/6.) C.O.D. 2/- extra.

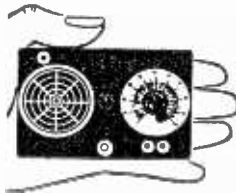


47/6



The sensational "Silver-tone" model! A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" building cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4 1/4 in. x 2 1/4 in. —a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, screws, wire, etc., for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately. Priced parts list 1/9.)

29/6



29/6



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

17/6

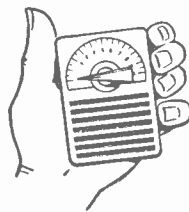
Choice of beautiful wainut veneered cabinetry or ivory bakelite. This is the

107/6



lowest possible price consistent with high quality. No radio knowledge whatever needed

can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves with razor-edge selectivity and exceptionally good tuning. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12 in. x 6 in. x 5 in. Build this long-range powerful midget NOW! TOTAL BUILDING COST INCLUDING PLANS, ETC., £5/7/6. (Post and Packing 3/6). Parts sold separately. Priced parts list and plans 1/8. C.O.D. 2/- extra.



45/-

Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step. Remarkably sensitive—covers all medium waves. Inc. Luxembourg, Home, Light. Size only 2 1/4 in. x 3 in. x 3 1/4 in.—Not a Toy! But a Real, Personal-phone Valve Radio with Detachable Aerial! IDEAL FOR BEDROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc., for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately. Priced parts list 1/9.) Send Today! Money refunded if parts not returned intact within 7 days.

39/6



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MINIATURE ROTARY TRANSFORMER. H.T. 11 volt. 11 volts input, 310 volts 30 m.a. Output. Will give approx. 120 volts at 30 m.a. from a 6 v. input. 4in. long x 2in. dia. Weight 14 lbs. Current consumption underload approx. 2 amps. 17/6 each.

ROTARY TRANSFORMERS
TYPE HT. 31
 Input: 11.5 volt.
 Output: 250 volt at 120 m.A. **TYPE HT. 32.** Input: 11.5 volt. Output: 100 volt at 65 m.A. **HT.31.** Ex-Units but tested, 35/- ea. **HT.32.** New in cartons. 20/- ea.



MINIATURE AMERICAN LEAD ACID ACCUMULATORS. 36 volts 20 m.A. 4 x 1 1/2 x 2 1/2 in. 3/6 each.

PANEL FUSEHOLDER ASSEMBLY
 ZA/US 1054 American pattern. Will take standard cartridge fuses. New 2/6 each or 8/- pkt. of 3



HYSTERESIS MOTORS. By Smith's Aircraft Instruments. Type: HM2/1/D. Drag Cup. 2 r. 400 cycles, 40/- ea. New. Type: HM/14/L. 115 v. 400 cycles, 50/- ea. New. Type: HM/12/10. 115 v. 400 cycles, 50/- ea. New.

TERMS: C.W.O. or 7 days approved accounts. All our goods are guaranteed new or in working order. Money refunded in full if not absolutely satisfied. Orders despatched same day. **NO POSTAL OR PACKING CHARGES.** C.O.D. 1/6 extra. Carriage extra Ireland and countries outside U.K.

AMERICAN SEALED RELAYS. Brand new and in Makers original packaging. Type A. SIGMA Type 5R-761 SPDT. 5,000 ohms. Solder Lug connections. size: 2 1/4 x 1 1/4 x 1 1/4 in. 22/6, each. Type B. HUGHES Pt. No. ME-5002. DPDT. 10,000 ohms. Solder Lug Connections. Size: 2 x 1 1/4 x 1 1/4 in. 21/-. Type C. R.C.A. MHX-110. 250 ohms. 4 pole D.T. 1 1/4 x 1 1/4 in. dia. 26.5 v. D.C. 10/6. R.C.A. MHX-84. 300 ohms. 4 pole D.T. 1 1/4 x 1 1/4 in. dia. 26.5 v. D.C. 10/6, each. COMAR C-3519. 400 ohms. 25.5 v. D.C. SPDT. 3 amps. Size: 2 x 1 1/4 x 1 1/4 in. Solder Lug connections. 15/- each.

SENSITIVE RELAY. Miniature type. 250 ohms. DPDT. 12 v. D.C. 2 oz. Overall size 1 x 1 1/4 x 1 in. Has adjustable armature tension spring. Will operate on less than 1 m/a. Suitable for all model Radio control. Brand New. 15/6 each.



MINIATURE DYNAMIC SPEAKERS
 A must for all Build-it-yourself. Hams. As supplied with all current transistor Kite. Can also be adapted for home phones or Intercom. 3in. diameter. Resistance 70 ohms. ONLY 5/- each.

8 FOOT WHIP AERIALS. Supplied in two sections. No. 1 and 2. ZA/26800 and 26286. Each section collapsible down to 1ft., with retaining wire through each section. Ideal also for radio control, fishing rod or pennant mast. 7/6 complete. New.

PLESSEY E.H.T. CONCENTRIC CONNECTORS

Type available. Plugs: CZ
 64662/64654/64646. Sockets: CZ
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AMPLIFIER FIELD TELEPHONE No. 1. Single stage amplifier designed to extend the working range of Telephone Trues 'F' and 'L'. Complete with working instructions, spare valve and Canvas carrying case. New. 27/6 each.

OPERATORS or INSPECTION LAMPS

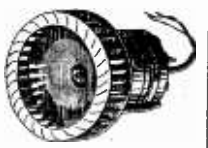


Type No. 6A. ZA 12645. Takes M.E.S. bulb. Ideal for Aircraft. Car dash, Map or T/X inspection. 3/8 each. New and unused.



CAMERA MOTORS
 Fractional Horse Power. 24 volts. Beautifully constructed throughout and fully governed. Ratio 2 1/2 in. to 1 in. Size: 3 x 1 1/4 x 1 1/4 in. Brand New and in New original sealed cartons. ONLY 12/6 each.

DRAYTON COMPACT CAPACITOR START AND RUN MOTOR. Type RQG. Beautifully constructed to stringent Ministry spec. Fully reversible and made to operate on 200/250 v. A.C. 50 cycles. 1.75lb. oz. Torque at 2,250 r.p.m. Condenser req.: 8 mfd., 350 v. A.C. Size: 2 1/2 in. dia., 2 1/4 in. width, 1 x 1 in. spindle. Only 35/-



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MONAURAL AMPLIFIER

This amplifier is made by a leading manufacturer. Mullard valves—ECC83, EL84 x EL84, EZ80. Bass, treble and volume on remote panel. Elegant knobs. OUR PRICE £4.16.6 P & P 3/6.

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Miniature amplifier, size 3 1/2 x 2 1/2 x 4 1/2. Ideal for record player, etc. Controls, volume/on-off, bass and treble. Supplied ready built, less valves (UY85, UF89, UL84), and mains transformer, at the give away price of 14/- P. & P. 2/6.

MIDGET GRAM AMPLIFIER READY-BUILT with Speaker

A 2 1/2 watt gram amplifier, fitted with bass, treble, and vol./on-off controls. Supplied complete with 6 x 4in. 3 1/2 speaker, valves (UY85, UF89, UL84), knobs, etc. Wiring diagram supplied

49/- P. & P.

HARVERSON SUPERHET 4 KIT

A medium and long wave superhet, incorporating two I.F. stages. Modern B9 valves (UCH81, UF89, UCL83, UY85), built-in ferrite rod aerial. All new we supplied, from theoretical and point to point wiring diagrams, to last nut and bolt (main components ready mounted), including an attractive contemporary styled cream plastic cabinet with gold trimmings. Size 1 1/2 x 4 1/2 x 6 1/2. PRICE £6.12.6 Post 3/6

EMI ANGEL TRANSCRIPTION P.U. (MODEL 17A)

A Pick-up for the connoisseur originally priced at £17.10.0. £4.10.0. P. & P. 5/-
The last remaining few offered at

FOR ILLUSTRATIONS OF ABOVE ITEMS SEE DEC. ISSUE

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500-500 Twin gang condensers with geared slow motion drive. 3/6 each. 36/- per doz. P. & P. 6d.

WIRE WOUND POTS

12 Wire wound Colvern Pots—all different values. 10/6 P. & P. 9d.

RECTIFIERS FOR BATTERY CHARGERS

12 v. 1 A. 4/3 12 v. 4 A. 12/6
12 v. 2 A. 7/- 12 v. 5 A. 14/6
12 v. 3 A. 10/- P. & P. 6d. each.

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ALL MULLARD FIRST GRADE

OC71	8/-
OC72	12/-
OC72 Matched Pair	25/-
OC45 Green Spot	15/-
OC45 Blue Spot	15/6
OC44	15/6
SB305 Semi Conductor	10/6
OA41 Diode	3/6

* Postage on all above 6d.

SPECIAL OFFER

DON'T MISS THIS!

MULLARD OC.76 10/6

MATCHED PAIR

£1.00

Post and packing 6d.

THIS MONTH'S BARGAIN! SUPERHET CHASSIS

Complete and ready for your cabinet, 4 valve superhet chassis, complete with valves, ferrite aerial, dial and knobs. Valve line up—UCH81, UF89, UCL83, UY85. Long and Medium wave coverage.

PRICE £4.19.6 P. & P. 3/6.

COSSOR C.R.T. SNIP 108K 10-inch. New and boxed, 15/-, plus 6/- P. & P.
75K 10-inch. New and boxed, 15/-, plus 6/- P. & P.

ION TRAP MAGNETS To suit the above, 2/9 each. P. & P. 3d.

SPEAKER FRET

Super quality heavily woven fret, 54 inches wide. Usual price 50/- per yard. P. & P. 1/-
OUR PRICE 12/6 per yard.

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AZ31	11/2	EC85 9/0	EM94 8/9
B36	14/-	ECF50 11/2	EM80 8/9
CB131	22/0	ECF92 12/3	EM81 9/8
CC135	22/0	ECF93 12/3	EM81 9/8
CL4	11/0	ECF94 12/3	EM81 9/8
CL38	18/-	ECF95 12/3	EM81 9/8
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DL91	9/3	EF41 9/3	GTTC 25/0
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EAB30	8/6	EF65 9/8	HN39 2/6
EAF42	9/8	EF69 7/0	HN39 2/6
EB84	1/3	EF74 9/8	KF93 3/6
EB41	3/-	EF75 11/8	KF93 3/6
EB38	8/6	EF80 9/8	KK32 30/6
EL14	18/0	EF89 9/8	KK32 30/6
EL18	11/0	EF90 9/8	KK32 30/6
EL17	11/0	EF91 9/8	KK32 30/6
EL16	11/0	EF92 9/8	KK32 30/6
EL15	11/0	EF93 9/8	KK32 30/6
EL14	11/0	EF94 9/8	KK32 30/6
EL13	11/0	EF95 9/8	KK32 30/6
EL12	11/0	EF96 9/8	KK32 30/6
EL11	11/0	EF97 9/8	KK32 30/6
EL10	11/0	EF98 9/8	KK32 30/6
EL9	11/0	EF99 9/8	KK32 30/6
EL8	11/0	EF00 9/8	KK32 30/6
EL7	11/0	EF01 9/8	KK32 30/6
EL6	11/0	EF02 9/8	KK32 30/6
EL5	11/0	EF03 9/8	KK32 30/6
EL4	11/0	EF04 9/8	KK32 30/6
EL3	11/0	EF05 9/8	KK32 30/6
EL2	11/0	EF06 9/8	KK32 30/6
EL1	11/0	EF07 9/8	KK32 30/6
EL0	11/0	EF08 9/8	KK32 30/6
EL-1	11/0	EF09 9/8	KK32 30/6
EL-2	11/0	EF10 9/8	KK32 30/6
EL-3	11/0	EF11 9/8	KK32 30/6
EL-4	11/0	EF12 9/8	KK32 30/6
EL-5	11/0	EF13 9/8	KK32 30/6
EL-6	11/0	EF14 9/8	KK32 30/6
EL-7	11/0	EF15 9/8	KK32 30/6
EL-8	11/0	EF16 9/8	KK32 30/6
EL-9	11/0	EF17 9/8	KK32 30/6
EL-10	11/0	EF18 9/8	KK32 30/6
EL-11	11/0	EF19 9/8	KK32 30/6
EL-12	11/0	EF20 9/8	KK32 30/6
EL-13	11/0	EF21 9/8	KK32 30/6
EL-14	11/0	EF22 9/8	KK32 30/6
EL-15	11/0	EF23 9/8	KK32 30/6
EL-16	11/0	EF24 9/8	KK32 30/6
EL-17	11/0	EF25 9/8	KK32 30/6
EL-18	11/0	EF26 9/8	KK32 30/6
EL-19	11/0	EF27 9/8	KK32 30/6
EL-20	11/0	EF28 9/8	KK32 30/6
EL-21	11/0	EF29 9/8	KK32 30/6
EL-22	11/0	EF30 9/8	KK32 30/6
EL-23	11/0	EF31 9/8	KK32 30/6
EL-24	11/0	EF32 9/8	KK32 30/6
EL-25	11/0	EF33 9/8	KK32 30/6
EL-26	11/0	EF34 9/8	KK32 30/6
EL-27	11/0	EF35 9/8	KK32 30/6
EL-28	11/0	EF36 9/8	KK32 30/6
EL-29	11/0	EF37 9/8	KK32 30/6
EL-30	11/0	EF38 9/8	KK32 30/6
EL-31	11/0	EF39 9/8	KK32 30/6
EL-32	11/0	EF40 9/8	KK32 30/6
EL-33	11/0	EF41 9/8	KK32 30/6
EL-34	11/0	EF42 9/8	KK32 30/6
EL-35	11/0	EF43 9/8	KK32 30/6
EL-36	11/0	EF44 9/8	KK32 30/6
EL-37	11/0	EF45 9/8	KK32 30/6
EL-38	11/0	EF46 9/8	KK32 30/6
EL-39	11/0	EF47 9/8	KK32 30/6
EL-40	11/0	EF48 9/8	KK32 30/6
EL-41	11/0	EF49 9/8	KK32 30/6
EL-42	11/0	EF50 9/8	KK32 30/6
EL-43	11/0	EF51 9/8	KK32 30/6
EL-44	11/0	EF52 9/8	KK32 30/6
EL-45	11/0	EF53 9/8	KK32 30/6
EL-46	11/0	EF54 9/8	KK32 30/6
EL-47	11/0	EF55 9/8	KK32 30/6
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EL-55	11/0	EF63 9/8	KK32 30/6
EL-56	11/0	EF64 9/8	KK32 30/6
EL-57	11/0	EF65 9/8	KK32 30/6
EL-58	11/0	EF66 9/8	KK32 30/6
EL-59	11/0	EF67 9/8	KK32 30/6
EL-60	11/0	EF68 9/8	KK32 30/6
EL-61	11/0	EF69 9/8	KK32 30/6
EL-62	11/0	EF70 9/8	KK32 30/6
EL-63	11/0	EF71 9/8	KK32 30/6
EL-64	11/0	EF72 9/8	KK32 30/6
EL-65	11/0	EF73 9/8	KK32 30/6
EL-66	11/0	EF74 9/8	KK32 30/6
EL-67	11/0	EF75 9/8	KK32 30/6
EL-68	11/0	EF76 9/8	KK32 30/6
EL-69	11/0	EF77 9/8	KK32 30/6
EL-70	11/0	EF78 9/8	KK32 30/6
EL-71	11/0	EF79 9/8	KK32 30/6
EL-72	11/0	EF80 9/8	KK32 30/6
EL-73	11/0	EF81 9/8	KK32 30/6
EL-74	11/0	EF82 9/8	KK32 30/6
EL-75	11/0	EF83 9/8	KK32 30/6
EL-76	11/0	EF84 9/8	KK32 30/6
EL-77	11/0	EF85 9/8	KK32 30/6
EL-78	11/0	EF86 9/8	KK32 30/6
EL-79	11/0	EF87 9/8	KK32 30/6
EL-80	11/0	EF88 9/8	KK32 30/6
EL-81	11/0	EF89 9/8	KK32 30/6
EL-82	11/0	EF90 9/8	KK32 30/6
EL-83	11/0	EF91 9/8	KK32 30/6
EL-84	11/0	EF92 9/8	KK32 30/6
EL-85	11/0	EF93 9/8	KK32 30/6
EL-86	11/0	EF94 9/8	KK32 30/6
EL-87	11/0	EF95 9/8	KK32 30/6
EL-88	11/0	EF96 9/8	KK32 30/6
EL-89	11/0	EF97 9/8	KK32 30/6
EL-90	11/0	EF98 9/8	KK32 30/6
EL-91	11/0	EF99 9/8	KK32 30/6
EL-92	11/0	EF00 9/8	KK32 30/6
EL-93	11/0	EF01 9/8	KK32 30/6
EL-94	11/0	EF02 9/8	KK32 30/6
EL-95	11/0	EF03 9/8	KK32 30/6
EL-96	11/0	EF04 9/8	KK32 30/6
EL-97	11/0	EF05 9/8	KK32 30/6
EL-98	11/0	EF06 9/8	KK32 30/6
EL-99	11/0	EF07 9/8	KK32 30/6
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F.M. TUNER



S.33



S-38



DX-40



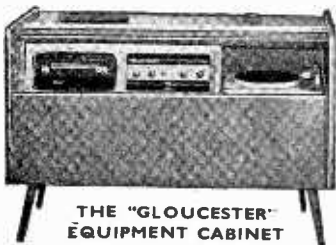
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Practical Wireless

VOL. XXXVI, No. 647, JANUARY, 1961

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THE REPORT OF THE BBC

THE report of the BBC for 1959-60 was published in October and caused much comment in the daily press. Naturally, most comment was on the future of television in this country, but the remarks concerning the plans for sound broadcasting are worthy of the same attention. The report states that "Reception conditions in the medium waveband have continued to be unsatisfactory. Listeners in many parts of the United Kingdom have experienced serious interference with reception caused by foreign stations. A meeting of the Administrations of the countries of the European area was held at Geneva to consider the position, but it was decided that it would be useless to attempt to re-plan the medium-wave band at present". The meeting came to the conclusion that no improvement could be achieved until more countries had developed V.H.F. services and V.H.F. receivers were in more general use by the listening public.

The problem of interference on the medium-wave band has been serious for a number of years and it is evident that little can be done to alleviate matters until all countries abide by the international agreements. As the report suggests, the solution so far as each country is concerned is to use V.H.F. networks for local broadcasting. At present, it is estimated that only one household in every five has a V.H.F. receiver. The V.H.F. sound broadcasting network in this country affords first-class reception of all the BBC programmes and about 97 per cent of the population of the U.K. is now within range of this service. The coverage of the service in certain "difficult" areas will be provided or improved by building low-power satellite stations.

In view of the large coverage of the V.H.F. service and of the quality reception which is possible, it seems strange that the present number of potential listeners is so small. The explanation must be that most listeners are not at all critical of the sound which they hear from their radio sets. Surely no one with a critical ear could fail to prefer the results from a V.H.F. receiver after a comparison with a medium-wave set. Although the most commonly quoted virtue of a V.H.F. receiver is the freedom from interference, there are several other advantages: a greater signal-to-noise ratio which enables a greater dynamic range to be employed, and the possibility of an increased frequency range—"possibility" because it seems that this factor is only rarely exploited to best advantage.

It seems to us that more education of the public is needed so that the advantages of radio on the V.H.F. services are made more widely known than they are at present. The BBC has continued, in co-operation with the radio industry and trade, to organise demonstrations and exhibitions in various parts of the country in order to make the public aware of the existence of the V.H.F. service and to demonstrate its advantages. The BBC report states that its demonstrations have made a significant contribution to the recent increases in the numbers of V.H.F. receivers in use—this number is now estimated to exceed 3½ millions. However, it is evident that before the service becomes as popular as it deserves to be, it will have to be "sold" to the public much more effectively than hitherto.

Our next issue, dated February, will be published on January 6th

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of September, 1960, 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	757,556
Home Counties	710,853
Midland	521,469
North Eastern	574,488
North Western	491,141
South Western	425,077
Wales and Border Counties	255,645
Total England and Wales	3,736,332
Scotland	431,588
Northern Ireland	138,323
Grand Total	4,296,246

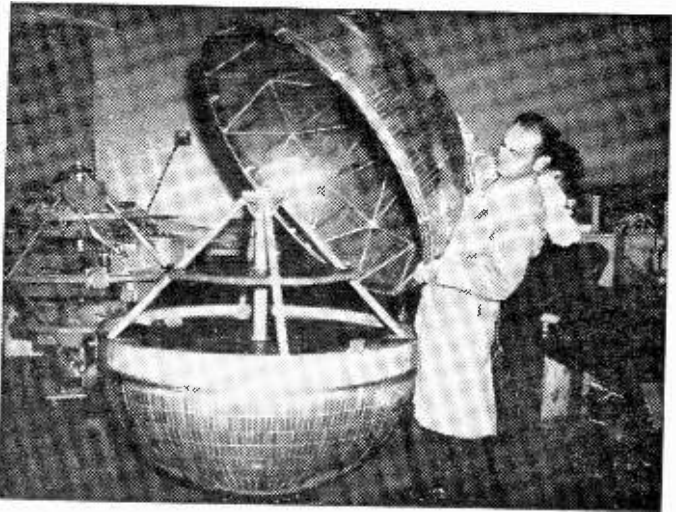
Contract

A SUBSIDIARY of the Solartron Electronic Group Ltd.—Solartron Laboratory Instruments Ltd.—has received contracts totalling £250,000 for the supply of oscilloscopes to the Admiralty and Ministry of Aviation. Before the contract was received, a number of this firm's oscilloscopes were, and still are, in service use under various arduous conditions.

Mobile Channels

RECOMMENDATIONS for increasing the number of V.H.F. channels for mobile radio users have again been made by the Mobile Radio Committee in its fourth Report recently approved by the Postmaster General. Last year the Committee drew up a programme for reducing the width of channels in the low band to 25kc/s; now the same channel width is to be adopted as standard for the high band during the 5-year changeover period specified in the Fourth Report. The Committee has also revised the distribution of high-band channels amongst the various categories of users, and a diagram showing the new allocations is included in the Report.

The Report was published by H.M. Stationery Office on 30th September.



Technicians of Philco Corporation, which built the Courier communications satellite now in orbit, are here seen trying out a dummy structure for size. They are checking the fit of parts mounted on the 500lb sphere to determine the exact location of the 38 "black boxes" making up the satellite's "payload". Using similar satellites it is hoped to establish world-wide communications systems.

National Hall, Lagos

THE complete sound reinforcement and simultaneous interpretation system for the National Hall, Lagos, Nigeria, has been supplied by a British firm—Standard Telephones and Cables Limited. The National Hall is the meeting place of the Legislative Assembly of the Federation of Nigeria, now an independent State within the British Commonwealth. The Hall has a ground floor and balcony and will ultimately seat 2,000 people. The design of the ground floor has been modified and resembles that of the British House of Commons. The whole assembly is divided into eight loudspeaker zones above which there are sixteen microphones. Mr. Speaker and the Clerks also have microphones and a local loudspeaker.

Radio Hobbies Exhibition

DISPLAYS and demonstrations of equipment of interest to all amateur radio enthusiasts were given at the 1960 International Radio Hobbies Exhibition which was held at the Royal Horticultural Society's Old Hall in London from 23rd to 26th November, 1960. The exhibition was opened by Mr.

Brian Rix and the special feature of this year's show was a number of rooms equipped as amateur radio stations. The station of the Radio Society of Great Britain, who sponsor the exhibition, was on the air continually throughout the show, keeping in touch with radio amateurs all over the world.

International Apprentice Competition

THE only second prize won by a British apprentice in the engineering section of the International Apprentice Competition at Barcelona recently was gained by P. Stacey of Marconi's. Mr. Stacey, who is 18 years old, won second place in the Junior Milling section of the competition. Another Marconi apprentice, R. A. Squirrel (19) took third place in the Senior Draughtsmanship competition. With three other Marconi entrants they competed against representatives from six other countries, using the continental metric system with which they were unfamiliar.

Radio Show Dates

THE National Radio and Television Exhibition is to be held at Earls Court, London, next year, from Wednesday, August 23rd to

Saturday, September 2nd, with a preview for overseas and other special visitors on Tuesday, August 22nd. It will mark the Silver Jubilee of television programmes which were first seen at "Radiolympia" in 1936.

The Exhibition is organised by Radio Industry Exhibitions Ltd., of which Mr. F. W. Perks remains chairman and also chairman of the organising committee. It will be the 28th National Radio Show.

Prize for Paper

THE first prize in the Student Apprenticeship Class of the Engineering Industries Association Group Apprenticeship Competition for 1960, for his paper on "A Random Observation Work Study" has been awarded to Mr. Allen J. Coleman, aged 22.

Hungarian "Hams"

THE organisation of Hungarian radio "hams" has celebrated its 10th anniversary with an exhibition of amateur radio equipment in the Budapest House of Technique. There are 50 amateur radio clubs in Hungary with approximately 400 short and ultra-short transmitter receivers and a total of nearly 3,000 members.

Bulgarian Bird-song

THE recent expedition to Bulgaria of the British Ornithologists' Union was an unusually difficult assignment for magnetic recording tape. One of the expedition's main objects was the recording of native bird-song. Among the special equipment designed and built for this expedition was a parabolic sound reflector, fitted with a gun-sight which could be aimed at a distant bird to pick up its cry and no other sound. The party used thousands of feet of tape for recording bird-song and Bulgarian folk music. Excellent recordings of a wide range of sounds were made, often in extremely difficult conditions of rain and mud.

New British Standard

SAFETY Requirements for Radio (including Television) Transmitting Apparatus. (British Standard 3192: 1959.)

This British Standard has been prepared under the authority of the Telecommunication Industry Standards Committee, and details the requirements for the design and construction of apparatus defined in Section I of the standard, for its installation and its electrical performance so far as it is necessary

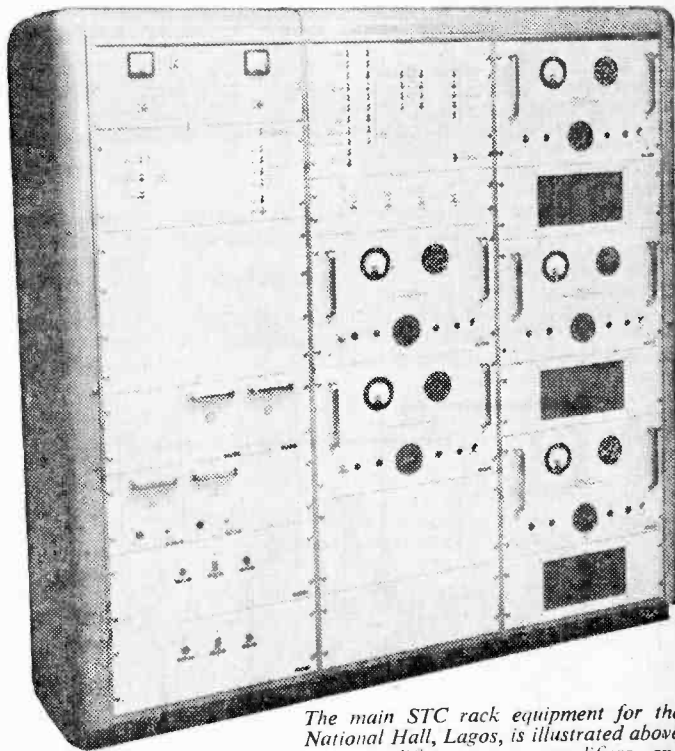
to provide the highest practicable degree of safety in operation. By safety is meant the personal safety of personnel against electric shock (including radio frequency burns) and other harmful effects, prevention of danger to personnel or to property through overheating or fire and, where apparatus includes a cathode-ray tube, protection from flying glass. Section 2 of the Standard lays down in broad outline the general principles of design, while Sections 4, 5, and 6 give the detailed requirements for safety from shock, fire risks and danger from flying glass respectively. Section 3 gives the general conditions of test under "normal" conditions and under "fault" conditions.

Dryden Hill

THE BBC has chosen a site at Dryden Hill, near Galashiels, for its new station in South-East Scotland. The site has been approved by the Postmaster General and legal negotiations for its acquisition are in progress.

The station will transmit BBC television, and also the Scottish Home Service, the Light Programme, and the Third Programme, with Network Three, on V.H.F. The station will be provided with a 750ft mast, and will serve an area with a population of nearly 100,000 people, some 70,000 of whom have not hitherto been within range of BBC television or of the V.H.F. sound services. This area will extend to Lauder, Duns, Selkirk, Hawick, Jedburgh, and Coldstream. The frequencies to be used for the V.H.F. sound services transmitters, which will be horizontally polarised, will be as follows: Light Programme 89.1Mc/s; Third Programme and Network Three 91.3Mc/s; Scottish Home Service 93.5Mc/s.

Work on the site will be started as soon as possible, but the construction of the building, the installation of plant, and the design and completion of the mast and aerials will necessarily take some time so that it is not yet possible to give a completion date.



The main STC rack equipment for the National Hall, Lagos, is illustrated above and incorporates microphone pre-amplifiers, power amplifiers and "patching" panels to enable the equipment to be connected up as required for particular occasions.

Radio Construction for the Beginner

No. 4—EMPLOYING A TRANSISTORISED CIRCUIT

By D. B. Kidd

THE receiver described in the last instalment introduced an amplifying device, the transistor, which produced a magnified image of the "programme" detected by the crystal diode. A valve, given a substantially higher voltage supply, could have performed the same job.

The Transistor

The transistor merely made the output much louder; it did not improve the receiver's performance in any other way. A crystal receiver, even if carefully designed, has very broad tuning, and although it may receive a fair number of stations at reasonable volume, especially after dark, it is rare that sufficient separation is obtained for much enjoyment.

Regeneration

The set described, therefore, was no more than an amplified crystal set with all its limitations retained.

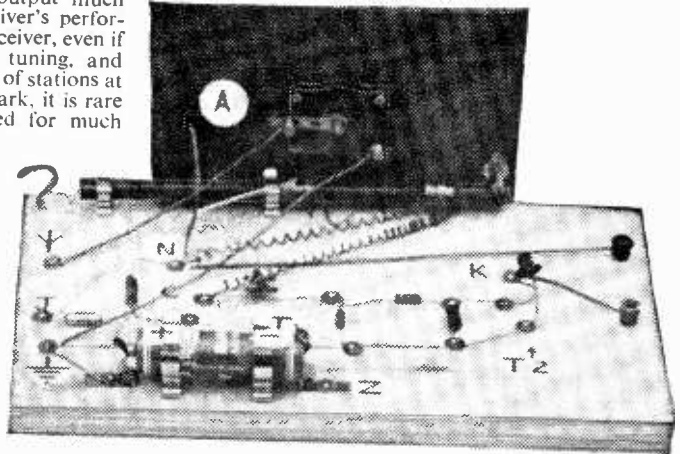
This receiver, the final one of the series, is superior in many ways. Firstly it employs two stages of amplification instead of one and therefore gives much louder output. Secondly, it employs *regeneration*, that is, "feed-back" of part of the signal output to the input, and this permits good separation of stations. Thirdly, as a result of regeneration, the set is sensitive. Loudspeaker reception may be expected on at least one station and headphone reception may be expected without an aerial or earth.

The way in which the set works may be understood by studying the theoretical circuit in Fig. 1.

The signal is picked up by the aerial and passed, as usual, to the tuning circuit which consists of the coil, L1, and the tuning condenser, C1.

As L1 is wound on a long piece of ferrite, there is additional pickup of signal magnetically and this normally adds to the amount derived electrically from the aerial.

The signal is applied via the fixed condenser, C2, to the base of the first transistor, T1. It is fed from the tapping, X, on the tuning coil. Notice that this



A rear view of the Receiver

tapping embraces fewer turns between itself and the earth line (positive) than the aerial terminal does. This is the reverse of the situation met in the previous two receivers and occurs because the electrical requirements of a transistor are much different from those of a diode. The purpose of C2 is simply to stop direct current from the battery flowing through the coil to the base of T1, and thus upsetting the biasing arrangements for it. A condenser used in this way is termed, aptly, a "blocking" condenser.

The transistor T1, which must be of a special type, amplifies the signal which then emerges at the collector terminal marked "Q" on the diagram. Part of this magnified signal passes through C3 (which also "blocks") and part passes along with the direct current of the battery to the upper (negative) line.

Reaction Coil

Notice that on its way it is caused to pass through coil L2 (called a "regeneration" or "reaction" coil) which is also wound on the ferrite rod and thus passes back, in magnetic form, part of its message to the starting point again. This "feed-back", as it is called, has the effect of "pushing the incoming signal from behind". The result is as

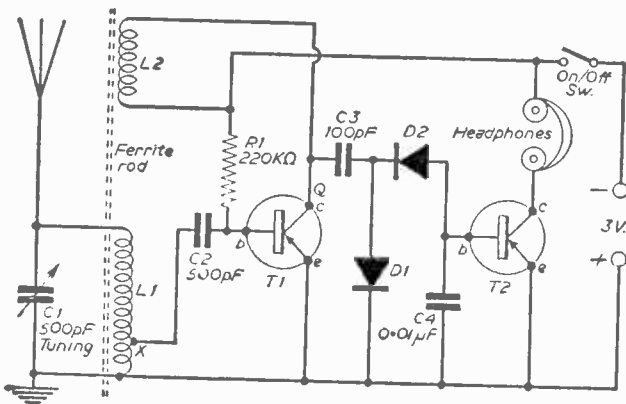


Fig. 1.—The transistor circuit.

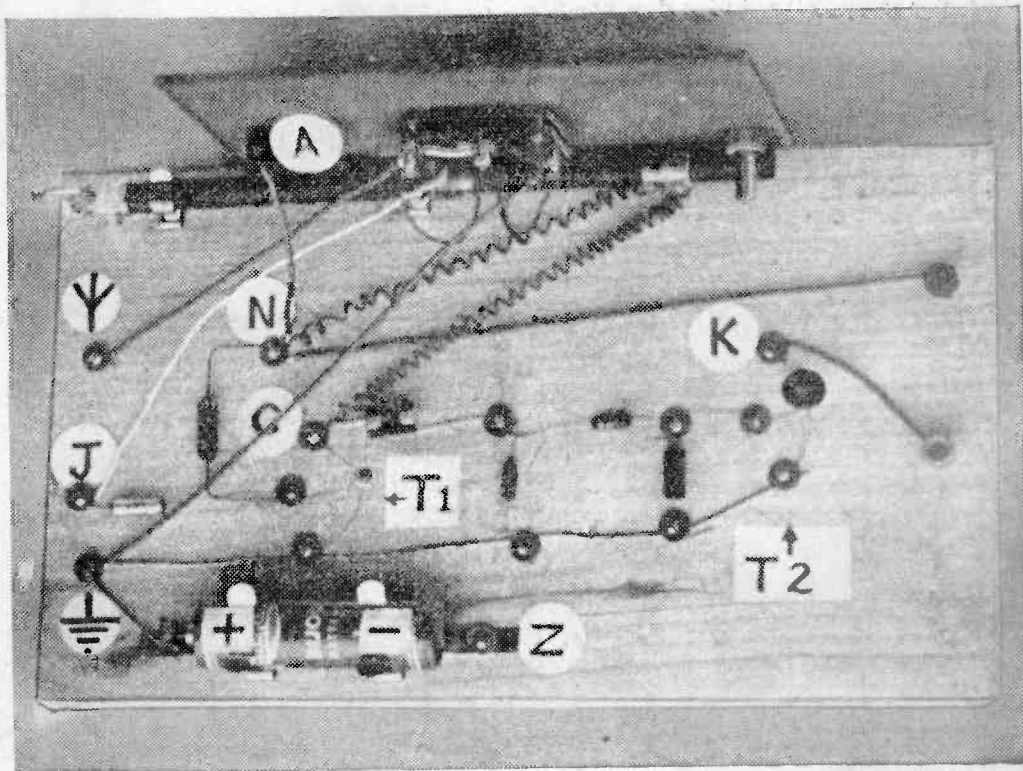


Fig. 2.—A view of the component board, showing the layout of parts.

though the signal voltage were much greater. It also creates the effect of the tuning circuit possessing much less "friction" and thus enables it to work more efficiently at its job of selecting one station from many.

The detecting is done by two crystal diodes (D1 and D2) instead of the single diode previously used. The arrangement C3+D1+D2 has been called an "electron pump". If the reader imagines the wires as tubes, C3 as a piston in a closed cylinder and D1 and D2 as inlet and outlet valves respectively, he will see the close similarity between this arrangement and the old-fashioned force-pump once used on fire-engines.

The remainder of the circuit functions as in the last receiver, using the same kind of transistor. Because T2 receives some direct current from the arrangement, no biasing is normally necessary. However, care must be taken to place the diodes in the directions shown, otherwise the set will refuse to work efficiently.

Components

The components required are as follows, a tuning condenser, a 3V battery, tool-clips, wire, audio-type transistor, 0.01 μ F fixed condenser, pointer knob, a crystal diode, socket-type wander-plugs, and an on/off switch, all as described in the last instalment. In addition, this receiver requires one fixed condenser of 0.0001 μ F (100pF), one fixed condenser of 0.0005 or 0.00047 μ F (500 or 470pF), another crystal diode similar to the first, one 220k resistor, one piece of ferrite rod at least 5in. in length, and one surface-

barrier transistor, type SB 305 or equivalent. This may be either new or "surplus".

The receiver as shown in the photograph also contains the following three items, but these may be improvised. The three extras are one small tuning knob, about 1½in. length of ¼in. diameter brass spindle, one brass bush, with a grub-screw—to fit into the spindle.

Construction

The reader should be able to follow the layout of the parts from the illustration. Because of the many components involved, one wire has been removed so as not to confuse the reader. This missing wire runs from the negative contact-spring of the battery (bottom-centre of the board) to the unoccupied terminal of the on/off switch (left side of the panel), passing over the first transistor on its way. (From "A" to "Z" in the illustrations.)

Having plugged all old holes in the board and repaired the surface as previously described, the battery-clips, contact springs, and 14 screws and washers may be arranged as shown. The two socket-type wander-plugs on the right of the board act, as before, as headphone terminals.

After the contact springs have been proved to press firmly on the battery tip and base, the battery should be laid aside until a later stage is reached.

It may be noticed that five of the wires (two of them twisted) run to the ferrite rod. These wires should be left until last as they will be described in detail.

The other components and wires should now be fitted, not forgetting the "missing" wire from battery to switch already referred to. The washers should be in the burnished state previously described and the screws really tightly turned down.

The layout follows roughly the theoretical diagram, but to help identify the parts, the following identification points are given.

The condenser connected to point "J" on the board, between aerial and earth terminals, is the $0.0005\mu\text{F}$. Its other end goes to the base of the SB305 transistor. The component between point "N" on the board and the base of the SB305 is the 220k resistor. The condenser to the right of point "C" on the board (collector of the SB305) is the $0.0001\mu\text{F}$. The two diodes are the next components to the right. The one

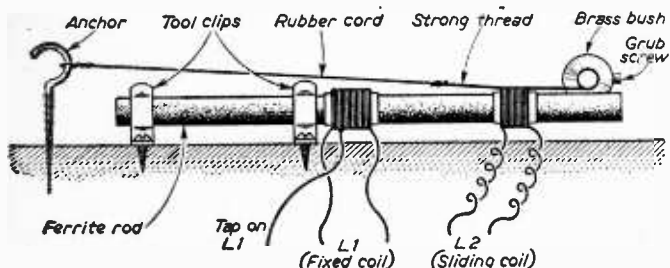


Fig. 3.—Details of the mechanism of the regeneration control.

shown vertical has its red (+) end downwards towards the positive line. The one shown horizontal has its red (+) end towards the left. The component further right and arranged vertically is the $0.01\mu\text{F}$ condenser. Point "K" marks the collector of the audio transistor (T2). Notice that a wire joins the positive (left hand) contact spring to the earth terminal. The aerial terminal is connected directly to one screw of the tuning condenser and the earth terminal directly to the other.

Connecting the First Transistor

The signal received is amplified twice, as previously explained, once before detection and once after. The signal after detection is at a comparatively low frequency and an ordinary transistor, such as was used in the last receiver, will suffice. Before detection, however, the frequency is that of the "carrier", not of the "message", and may be a thousand times greater (on the ordinary broadcasting band).

For such frequencies a special transistor called a radio-frequency (R.F.) transistor is required. This is usually more expensive but is connected into circuit in just the same way. The R.F. transistor used in this receiver is of a special sort called a "surface-barrier type", and is chosen because it will work effectively at a low voltage. Although a 3V battery is specified, the receiver will still function at half a volt or so. *More than 3V may destroy the transistor!*

The three wires which emerge from the base of a surface-barrier type transistor are arranged, not in a straight line, but in a curve. Looking upwards at the base with the wires towards the observer and with the middle wire turned uppermost, the emitter appears to the left, the base in the centre, and the collector to the right. The emitters of both transistors join the positive line on the board.

The Ferrite Rod

At the start of the series the writer promised that no component acquired for one receiver would be useless for a later one. This promise has been kept. When a long piece of ferrite rod has been obtained, the small piece acquired earlier may still be used by grinding or carefully filing one end of each till flat then gluing tightly end to end, using a strong pottery-glu or an epoxy-resin adhesive. The two pieces should be held in line under pressure until the adhesive is hard. Provided the layer of glue is thin, the combined rod works just as well as a normal long one.

The Coils

A layer of Sellotape is wrapped round the mid-point of the rod and thin enamelled coil-wire (approximately 34s.w.g.) is wrapped round in a "bunch" leaving a 6in. free length at the start. Eight turns are wound on, then a "tapping" loop is twisted in the wire (as previously described) and winding recommenced in the same direction. After a further forty turns have been wound, the coil is ready and the turns are anchored securely by a further layer of Sellotape, leaving 6in. free at the end. After cleaning the enamel from the tips of the two wires and the tapping-loop, the constructor should join up to the screws as described below.

The beginning of the coil to the tuning-condenser, on the same screw as the wire leading to the earth terminal. The end of the coil to the other tuning-condenser terminal, on the same screw as the one leading to the aerial terminal. The tapping loop to point "J" on the board.

The total number of turns (48) may be varied according to the reader's taste but the tapping loop should always be about $\frac{1}{4}$ of the total number from the beginning. This completes coil L1 shown in Fig. 1.

Coil L2 consists of five turns (provisionally) of the coil-wire wrapped round a sleeve of Sellotape. This sleeve is made by wrapping Sellotape round the end of the rod fairly tightly with the sticky side outwards.

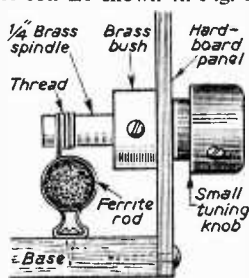


Fig. 4.—The fittings for the regeneration control knob

When the sleeve is five layers thick, each layer directly on top of the last one it is complete. The five turns of wire are anchored by a further layer of tape, sticky side inwards. The two free ends of the wire, after cleaning at the tips, go to points "N" and "C" on the board.

Adjusting

After aerial and earth leads and headphones have been connected and the battery placed in its clips, the set can be switched on with the ferrite rod held in the hand and coil L2 as far to one end of the rod as it will go. On pressing the switch a slight hiss

(Continued on page 790)

A 4-Watt Amplifier

FOR RECORDS OR RADIO

By K. F. Perry

THE instrument described here depicts a simply-made but highly efficient audio amplifier that comprises only two valves, excluding the rectifier, and which is capable of providing four watts with high-quality reproduction from a gramophone pick-up or radio source. Provided a suitable speaker (preferably housed separately) is used, a wide frequency range is available due to the use of adequate tone controls. With the bass control turned to "full bass" trouble from surface noise was experienced in the prototype on some L.P. recordings showing that a good low frequency response was obtainable. Consequently, care was taken to ensure adequate smoothing of the supplies and also to prevent A.C. currents circulating in the chassis, the latter point

being accomplished by employing a "negative bar" to which all chassis returns are made.

Alternative Uses

Whilst the amplifier may be constructed exactly as shown—as a separate unit—it can alternatively form the "back end" of a radio receiver, as a 2-valve T.R.F. or superhet tuner section will provide sufficient drive in most cases. Or again, where a receiver is in use which employs a simple L.F. valve feeding an output pentode, it might be possible to remove the L.F. valve completely, and to substitute V1 (Fig. 1) and the associated circuitry so improving the receiver. Similar reasoning applies in respect of audio amplifiers already in existence that do not perform so well as they might. Satisfactory results cannot be guaranteed, however, if this sort of thing is done and in any case a valve that is the same or direct equivalent as that specified for V1 is essential.

Generally speaking, however, the arrangement is a very flexible one and as only two valves are used, only a small chassis is needed, although the chassis layout (Fig. 3) shows the amplifier complete with the power pack section included. Where a separate power pack is envisaged the chassis could be reduced to approximately 7in. x 5in., when the front panel (see Fig. 4) also could be reduced in width so shortening the wiring to advantage. A point in favour of a separate power supply is of course that it is nearly always available for use with other equipment, thereby effecting considerable financial economy.

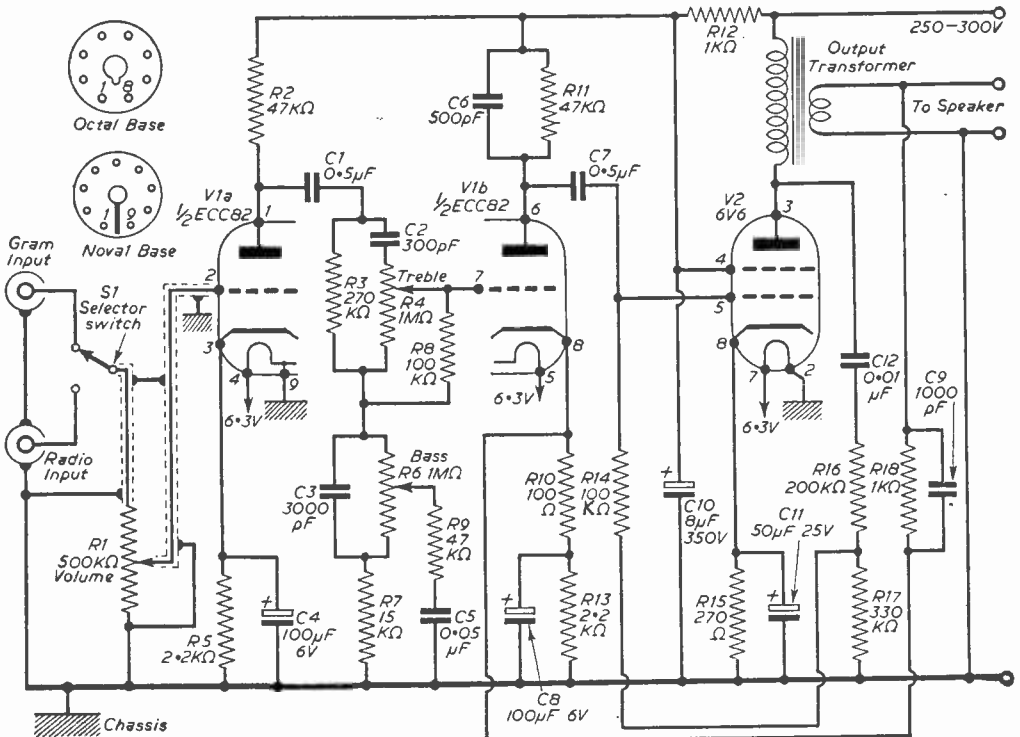


Fig. 1.—The circuit diagram of the amplifier stages.

COMPONENTS LIST

- | | |
|------------------------|----------|
| R1 500k Pot and Switch | R10 100Ω |
| R2 47k | R11 47k |
| R3 270k | R12 1k |
| R4 1M | R13 2.2k |
| R5 2.2k | R14 100k |
| R6 1M | R15 270Ω |
| R7 15k | R16 200k |
| R8 100k | R17 330k |
| R9 47k | R18 1k |
-
- | | |
|-----------------------------------|------------|
| C1 0.5μF | C6 500pF |
| C2 300pF | C7 0.5μF |
| C3 3000pF | C9 1000pF |
| C5 0.05μF | C12 0.01μF |
| C4 100μF, 6V electrolytic | |
| C8 100μF, 6V electrolytic | |
| C10 8μF, 350V electrolytic | |
| C11 50μF, 25V, electrolytic | |
| C13 } 32 x 32F, 350V electrolytic | |
| C14 } | |
-
- V1 - ECC82 V2 - 6V6 V3 - EZ80
 Mains transformer—Mains input Secondary 275-0-275V at 80mA, 6.3V at 2.5A
 L.F. Choke—10H, 100mA. One I.O. and Two noval valve bases,
 One rotary selector switch (or 2-pole, 2-way type).
 Four control knobs. Hardboard, wire, solder, etc.
 Output transformer 10k: speech coil impedance.
 Chassis (see text) 2in deep.
 Two flush mounting co-axial sockets.

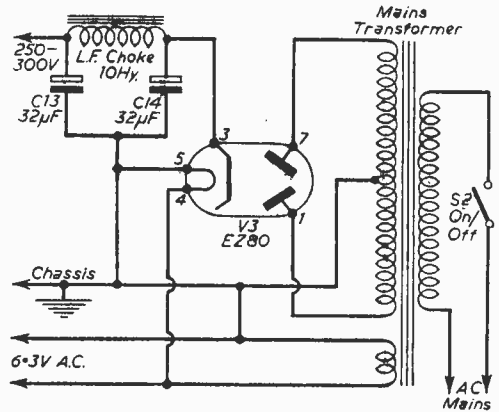


Fig. 2.—The circuit of the power-pack.

The Circuit

From Fig. 1 it will be seen that V1a—which is one half of a ECC82—takes the input from the volume control potentiometer, R1, and operates as a preamplifier feeding into a tone control network that couples into the grid circuit of V1b. The tone controls—R4 and R6—permit a wide range of control of “top” and “bass” respectively, the bass register being favoured somewhat in design. The amount of top however, can be arranged to suit individual taste by changing the value of R8 and, for example, should more top be required R8 should be

Mains Input and Speaker sockets are on rear flange of chassis

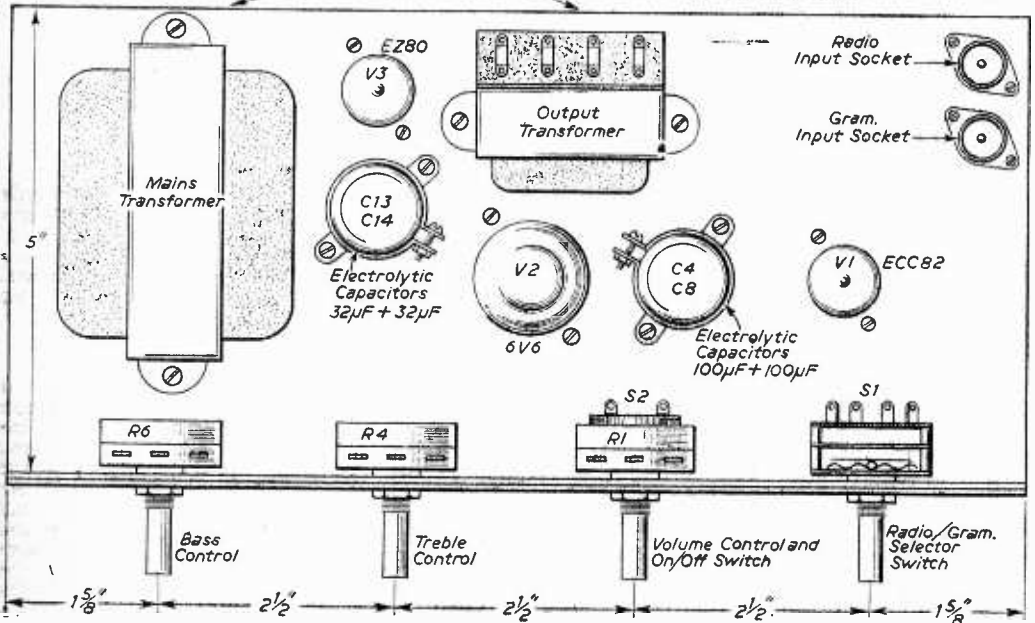


Fig. 3.—The above-chassis layout.

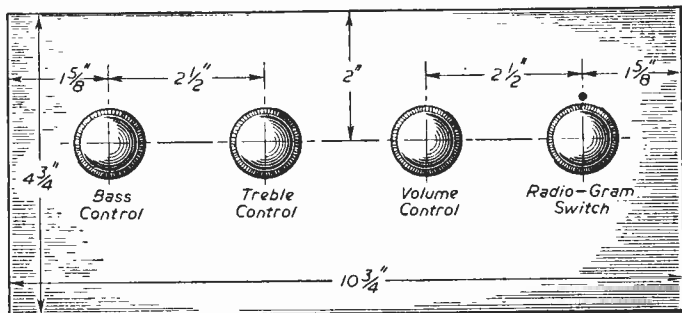


Fig. 4.—The front panel.

increase in value or even removed completely from circuit and vice versa.

Feedback is taken from the anode of the output pentode and also from the secondary of the output transformer, which should be a large and efficient component where possible. If desired R16 and R17 can be combined into a preset potentiometer, R14 being connected to the slider so that optimum operating conditions can be obtained.

The Power Supply

This is a full-wave rectified arrangement (see Fig. 2) and the valve specified will supply the amplifier with ease and will not be overloaded if a simple tuner is also fed from it. The mains transformer must be chosen to suit the case, however, and if no tuner is required to be used with the amplifier, then a transformer with a secondary current rating of 60mA will be sufficient, whilst with a tuner included a rating of 80mA is desirable. In either case the secondary voltage should be approximately 275–0–275V as too low an H.T. rail voltage will give poor results.

Constructional Notes

The positions of the larger components are shown in Fig. 3 which is the above chassis view. The L.F. choke can be mounted sub-chassis directly beneath the mains transformer (provided this is not one of the "drop through" variety) as can also the small electrolytics, C10 and C11 which should for preference be tag-ended items. The use of a 5-way tag strip will also be found beneficial although most of the smaller components, resistors, etc., can be suspended in the wiring with ease.

Construction is considerably simplified by employing a front panel upon which are mounted the various controls at a convenient height and this panel may be made of hardboard, plywood, etc.

When all the major components are in position a stiff copper wire should be run across the underside of the chassis from the input sockets and all chassis returns should be made to this "negative bar" during the subsequent wiring operation. Screened lead—television coaxial cable will do excellently—is essential in the grid circuit of V1a or there will be troublesome hum evident during usage.

If used in conjunction with a good quality speaker that is capable of reproducing the available range of frequencies and with high-grade ancillary equipment, this small amplifier will give a remarkably good account of itself and not until the volume control is turned to approximately three-quarters maximum travel will distortion be evident: before then, however, the output will be in excess of that needed in the average size room.

MAKING SMALL CASES FOR RECEIVERS

By E. J. Wotton

OBTAINABLE at many surplus stores is a form of plastic material often described as Waverite off-cuts, as opposed to the very hard type used for table tops. This is ideal to make the boxes required to house small radio sets and amplifiers. It is easy to cut and plane, and holes can be reamed and made with a square awl.

Cutting the Material

After deciding the size required, ensure that the top and bottom are true rectangles and that both are exactly the same size. This can easily be done by cutting the two pieces a little over size and pasting together face to face with a piece of tissue paper between, and leaving to dry overnight. After checking, soaking in warm water will separate them.

The best way of marking is by using a sharp pointed scribe and an ordinary set square. When gripping the material in the vice jaws it is necessary to use either fibre or wood faces on the jaws. These can be easily made.

The sides can now be prepared and again accuracy

is called for. The two longer sides must be exactly the length of the top and the bottom, while the two shorter sides are twice the thickness of material shorter than the short sides of the top and bottom. The ends must be square. Several suitable adhesives are available which will join the material being used.

Assembly

If the chassis is to be mounted in the box, it should now be fixed to the top with the controls protruding. Then apply a little adhesive to the underside edges of the top and also the edges and ends of the four sides. Place these in position and temporarily secure them with Sellotape. When the adhesive has set, attach the bottom with small pieces of Sellotape and carefully file the edges and corners flush, lightly rounding them at the same time. Short pieces of matchstick can be glued inside each corner for extra strength. The back can then be removed attaching when necessary with a Sellotape "hinge" and short piece as a catch.

CIRCUITS FOR ACORN VALVES

RECEIVERS, SIGNAL GENERATOR AND WAVEMETER

By L. V. Nixon

SURPLUS acorn valves may be obtained at exceedingly low cost, and give excellent results in short wave and ultra-short wave (V.H.F.) receivers. Though such valves are particularly intended for V.H.F. use, they operate equally well at lower frequencies. They can thus be employed in general coverage S.W. receivers, and even in receivers for the long and medium wave broadcast bands.

The 954 and 955 Valves

The 954 pentode and 955 triode will be found suitable for many circuits, and pin connections for these are shown in Fig. 1. The valve is viewed from the top, or longer end, in both cases. Both valves have 6.3V 0.15A heaters, and can thus be operated from a standard 6.3V transformer. Normally the anode voltage should not exceed 250V, and a maximum of 100V may be used on the 954 screen grid (G2). The valves operate well with much lower voltages.

If holders are used, the valves should be inserted and withdrawn with care, or the seal may be cracked. Leads may be soldered directly to the pins, and this is sometimes preferable. Excess heating of the pins near the seal may also cause it to crack, so ready tinned connections should be soldered to the ends of the pins. If the iron is at the correct temperature, it should not be necessary to hold it in contact with the pin more than a second or so. Heater leads may be of thin, twisted flex. For the other connections, 22s.w.g., or 20s.w.g. may be used. Very stout wires may impose strain on the pins, unless carefully shaped to avoid this.

954 Detector

The 954 will operate effectively as a detector from 10 to 2000m. using the circuit shown in Fig. 2. An H.T. line providing 200V will be sufficient. Any standard A.F. amplifier may follow the detector.

Reaction is controlled by adjusting the screen grid voltage, as this is very convenient from the point of view of S.W. working. The position of the cathode tap on the coil also influences reaction. This tap should be as near the earthed end of the coil as possible, providing sufficient reaction may be obtained. For most S.W. coils, a tapping point $\frac{1}{2}$ to 1 turn from the earthed end of the coil will do well. It is not difficult to try this tapping at various points, before finally soldering it.

Connections for typical coils are shown in Fig. 3. For the S.W. ranges, ribbed or tubular formers can be used. Leads are numbered to agree with Fig. 2.

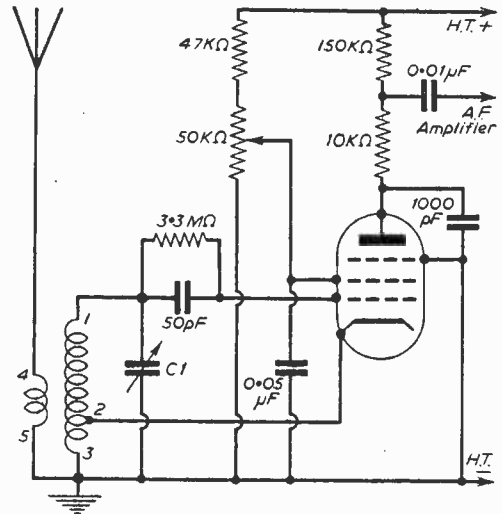


Fig. 2.—A detector circuit using a 954 acorn valve.

The tuned windings may be of 20s.w.g. or similar wire, with 28s.w.g. or similar wire for the aerial coupling windings. The number of turns on the latter can usually be about one-quarter to one-third the number on the tuned winding.

For V.H.F. use, the coils are best wound on ribbed ceramic formers, or can be self-supporting. Fairly stout wire is preferable—about 18s.w.g. To keep leads short, the ends of the tuned portion of the coil can be attached directly to the tuning condenser. Points 4 and 5 can be supported by terminals on an insulated strip, or by stand-off insulators.

In Fig. 2, a simple aerial is used, taken to point 4. In this case, point 5 is connected to the chassis or earth. If a dipole is available, its twin feeder is connected to 4 and 5, as shown in Fig. 3. Good results can be achieved with a simple short aerial, but a dipole does give better signal strength for the band for which it is cut.

Circuits for Short Wave Only

If the circuit is used for S.W. only, C1 can best be about 100pF or 150pF. For general coverage, inclu-

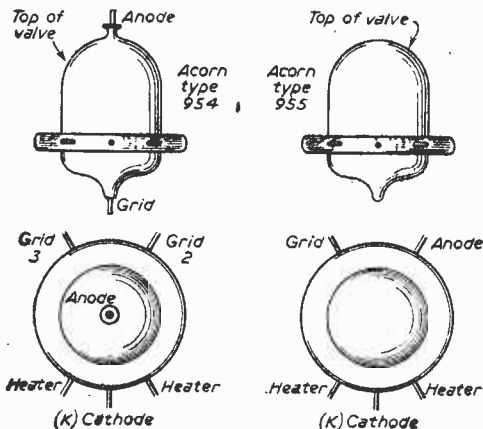


Fig. 1.—The 954 and 955 valves, showing pin connections.

ding long and medium waves, a larger condenser is preferable, and 300pF to 500pF can be used. For V.H.F. use, a smaller condenser is better, and it may be 25pF or 50pF.

Using 16s.w.g. wire, and winding self-supporting coils with an inside diameter of about $\frac{1}{2}$ in., 4 turns

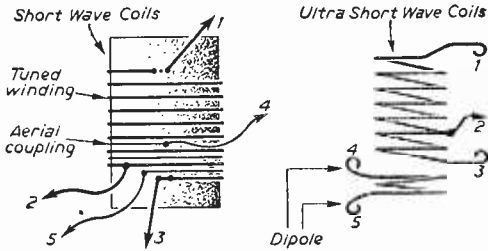


Fig. 3.—The coil windings for S.W. and ultra-S.W. tuning.

will permit 2m working, with 6 turns for about 2 to 4m, and 10 or 12 turns for 4 to 6m.

Using 20s.w.g. wire on 1in diameter formers for S.W. coils, about 6 turns will do for 10 to 20m. For 18 to 35m, about 14 turns may be used, and for about 34 to 60m, 28 turns of 24s.w.g. will suffice. These coils may be used with 100pF or 150pF tuning condenser.

The exact ranges covered will depend on layout, etc., but efficiency will in any case be maintained, as the circuit does not have to be aligned with a second tuned circuit, and therefore need not cover any particular waveband.

For S.W. purposes, plug-in coils are convenient. But a single fixed coil, or wavechange switching, may be used instead. The simplicity with which almost any waveband can be tuned is one of the great advantages of a circuit such as that in Fig. 2. The 50k potentiometer is carefully adjusted, as tuning proceeds, to keep the detector almost on the verge of oscillation.

V.H.F. Detector

A regenerative or super-regenerative detector which will work at very high frequencies is shown in Fig. 4.

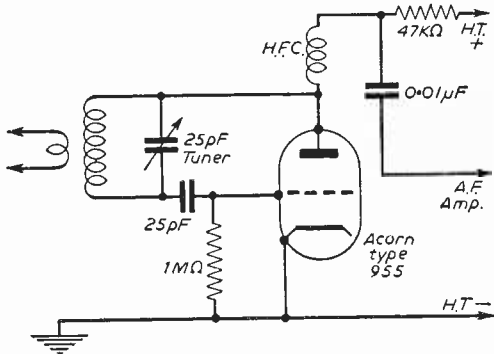


Fig. 4.—A V.H.F. regenerative detector circuit.

This type of circuit may be operated with controlled regeneration, by drawing H.T. current from a potentiometer. In these circumstances, it is very sensitive, and will not cause interference, if not allowed to oscillate.

For maximum sensitivity with such a circuit, however, super-regeneration is usually employed. For this method, the H.T. voltage is increased so that the valve oscillates, and rectified R.F. causes grid blocking, so that the valve is drawn in and out of oscillation. So that this arises at above audible frequency, the grid leak may be reduced to 100k or so, and other values may also be tried instead of the 25pF fixed condenser.

A super-regenerative detector is extremely sensitive, when working correctly, but must not be coupled directly to the aerial, as interference will be caused. A regenerative detector, kept just below oscillation point, is sensitive, but does not cause interference, and may be coupled to the aerial. With simple V.H.F. circuits of this type, the degree of aerial coupling will considerably influence results. With a self-supporting aerial winding, coupling can easily be adjusted.

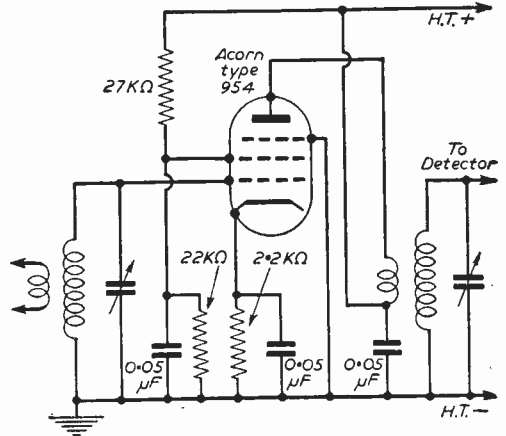


Fig. 5.—A 954 valve may be used as an H.F. stage.

H.F. Stage

A 954 valve as amplifier will isolate a regenerative or super-regenerative detector from the aerial, and may be wired as in the circuit shown in Fig. 5. The aerial coil and aerial tuning condenser should be the same as those in the detector stage. Ganged tuning may be arranged if the coils are carefully constructed. If separate tuning condensers are employed each circuit can be tuned independently, so that discrepancies due to the coils or layout and wiring are no longer of importance.

The aerial and detector circuits should be separated, or screened from each other, to avoid instability. This is usually easy to arrange.

The 954 may be used as an untuned amplifier by replacing the aerial tuned circuit with a suitable H.F. choke, or 100k resistor. This will still provide isolation of the detector from the aerial, but gain is less than with a tuned stage. A simple aerial may be coupled to the 954 grid through a very small fixed or pre-set condenser. A dipole cannot be coupled to the untuned stage.

The H.F. stage in Fig. 5 may be used with the detector in Fig. 2. If the circuit in Fig. 4 is used as a super-regenerative detector, the stage in Fig. 5 should be added, to avoid radiation of interference from the aerial, as explained.

Signal Generator

Acorn valves of the types mentioned can be usefully employed in other equipment, as well as receivers. A self-modulating signal generator, producing an A.F. output, and modulated or continuous wave R.F. outputs between 10 and 2000m, can be constructed from the circuit in Fig. 6.

Here, the radio frequency is determined by the coil and tuning condenser, and if the 0.5m control is set near zero value, an unmodulated, or C.W., output is obtained. As this control is adjusted towards its maximum value, grid blocking causes the valve to go in and out of oscillation at audio frequency. This

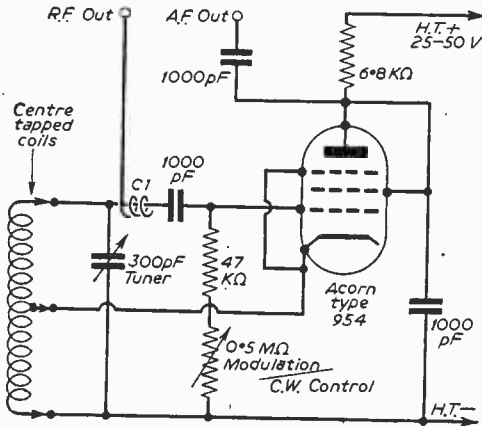


Fig. 6.—A self-modulated oscillator or signal generator.

provides a modulated radio frequency output, or a simple A.F. output, at the circuit points indicated.

C1 has a very small capacity, and can be made by looping insulated wire round the tuning condenser lead. A high voltage supply is not required, 25V to 50V or so being adequate.

With a 500pF tuning condenser, four air-cored coils will cover approximately 20 to 2000m. They may be wound as follows:

1. 7 turns of 20s.w.g. space wound on a 1½ in. diameter former.
2. 32 turns of 26s.w.g. enamel wire close wound on a 1 in. diameter former.
3. 120 turns of 32s.w.g. enamel wire close wound on a 1 in. diameter former.
4. 280 turns of 34s.w.g. silk covered occupying 1 in. on a 1½ in. diameter former.

If the generator is not required to work over long waves, the large coil is unnecessary. A 300pF tuning condenser will then be sufficient. The generator frequency can be checked, and its dial calibrated by tuning in known stations with a receiver, and tuning the generator to the same frequency. Tune the generator from a low wavelength (or high frequency) towards a higher wavelength (or lower frequency) until its note is heard, to avoid confusion from harmonics.

V.H.F. Wavemeter

A surplus 955 will conveniently act as a detector for a wavemeter operating up to 300Mc/s and higher frequencies. A circuit for this application is shown in Fig. 7. As the cathode current is very small, and long running will probably be unnecessary, a 4½V dry

battery may be used for the heater supply.

For average purposes near 10Mc/s to 100Mc/s, a 50pF or similar tuning condenser will be satisfactory. For regular use at frequencies above 100Mc/s, a smaller capacity is more convenient, though 50pF may be fitted.

The coils may be about 1 in. in diameter, and wound with 22s.w.g. or similar wire. With the 50pF condenser, 28 turns will cover about 6 to 12Mc/s. For about 12 to 24Mc/s, 12 turns may be used, with 5 turns for about 24 to 48Mc/s. The number of turns on the smallest coils will be much influenced by the layout, length of wiring, and minimum capacity of the tuning condenser. However, 1 turn about 1½ in. in diameter should do for about 50 to 100Mc/s. For about 100 to 200Mc/s, a ½ in. hairpin loop may be used.

The meter shown in Fig. 7 can be a 500µA or similar instrument. A more sensitive instrument will increase the sensitivity of the wavemeter.

The wavemeter can be calibrated from a signal generator, grid dip meter or receiver. When a R.F. signal is present (as in a generator or oscillator circuit) the wavemeter is tuned for maximum indication on the 500µA meter. With the simpler type of receiver, the 955 need not be operating, as the wavemeter will act as an absorption frequency meter, and pull the receiver detector out of oscillation. To avoid coupling in reactance, which would to some extent modify tuning, the coupling to the wavemeter should always be as loose as possible.

Power Supply

Detector and R.F. stages such as those shown can draw current from the amplifier or the broadcast receiver used to provide A.F. amplification. They may also be incorporated in complete S.W. or V.H.F. receivers. If this is so, it is only necessary to allow 2 to 3mA for the 954, and up to 7mA for the 955, according to circuit details, so even a small power pack will suffice.

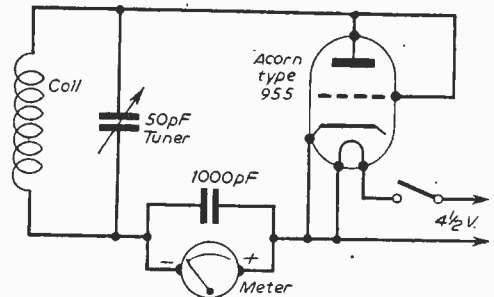
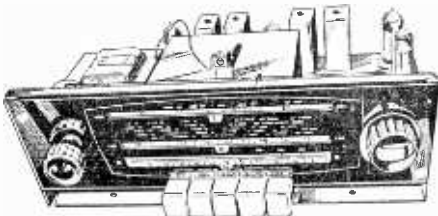


Fig. 7.—A wavemeter for use up to 300Mc/s.

The circuit in Fig. 6 is feasible for either mains or battery running. If a mains supply is chosen, the transformer will require a 6.3V winding for valve heater. If the H.T. winding provides a high voltage, such as 200V, this may be reduced by using two fixed resistors as a potential divider. For around 180V to 250V the divider may consist of 47k and 10k resistors in series, the 10k resistor being returned to H.T. negative, and H.T. being derived from the junction of the resistors.

If hum is introduced from the heater at some frequencies, a 0.05µF or similar condenser can be wired from each heater pin to the chassis

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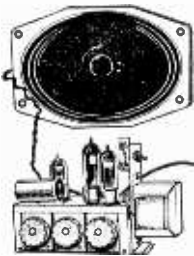
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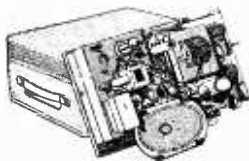
B.20—10K ohms/v. on 0.5 v. and 2.5 v.; 4K ohms/v. on 10, 50, 250, 500 and 1000 v.; A.C. and D.C. Resistance. 2K, 200K, 2M and 20M-ohms.; D.C. current, 100 microA, 2.5 mA, 25 mA, 250 mA. Size: 5 1/2 x 3 1/2 x 2 1/2 in. Weight, 24 ozs.



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See additional advertisement on page 812.

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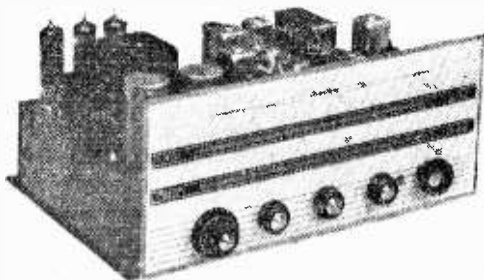
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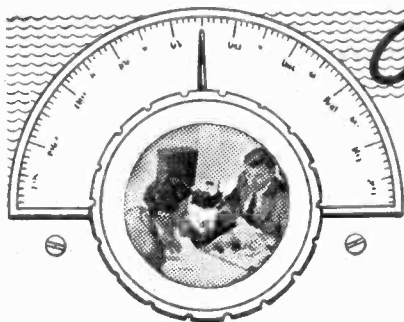


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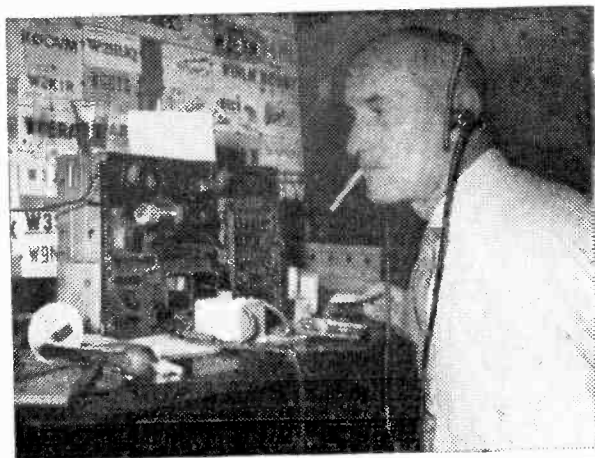
Mr. C. A. Bradley, seen here in his "shack", has been a radio enthusiast ever since the "good old days".

It is always interesting to me to see photographs of readers' dens, and I like to compare the equipment which is being used in the various dens. It is interesting to see how one reader will make do with a home-made receiver with a minimum of controls, whilst another will have a most elaborate converted ex-Government or American communications receiver.

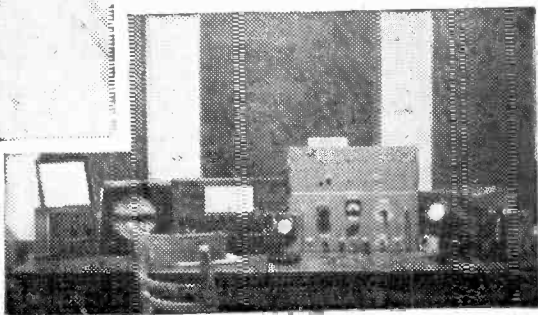
It reminds me of my early days, before I got my "ticket", when I used to spend many hours listening to the amateurs in order to gain experience in amateur techniques. There was a fully-fledged amateur a street away from me and I used to hear him call C.Q. every evening, and when he listened I tuned over the band and could hear dozens of amateurs all over the world calling in answer to his C.Q. call, but he never came back and worked any of them. I wondered what he could be listening on, or whether his aerial was no good. After a week I could stand it no longer so one evening I walked round to his house and introduced myself as a local listener and asked him if he had heard all the replies to his calls. He looked

astounded and said he had not heard one of them, and I was astonished to see a well-known American communications set and it was true that it gave such a crowded response over a narrow band that he was in fact unable to hear the many replies. My home-made set spread the band over a much wider scale, and I must confess that he sold his set and made the one I eventually described in these pages.

I am showing you this month some more dens and readers may like to compare the individual "stations".



This amateur station on Tobago (VP4WD), whose operating position is shown, is the first and only one on this island.



(Right) This illustration shows B. G. Taylor's station at Bathgate.

USING PORTABLES IN THE CAR

HOW TO USE A PORTABLE WITH AN EXTERNAL AERIAL

THE popularity of using an ordinary battery portable radio in a car is for ever increasing. Most of the latest portables with low-consumption valves and push-pull transistorised output stages, coupled with highly sensitive loudspeakers, give sufficient volume to mask the small ambient noise in the modern car. The modern portable is highly versatile, and as it does not represent a fixture in any particular place it is usually covered by the wireless licence taken out for the main receiver of the house. With a car radio, a separate licence is required, and as the set is fixed in the car it cannot easily be used for other purposes. Nevertheless, it must be understood that the modern car radio is comparable in terms of volume and quality to the household mains receiver, and this coupled with better selectivity and sensitivity will always put it well above the ordinary battery portable.

Car Radios Without an Additional Aerial

One of the disadvantages of the portable in a car is that of directivity of the internal aerial. The set can be orientated on the back window-ledge or under the dashboard for maximum pickup, but on turning a corner the signal fades. This is aggravated to a large extent by the screening of the car itself, for although a certain amount of signal passes through the metal shell, it is severely attenuated by the time it gets to the aerial. This means that the portable needs to be highly sensitive to receive the signal at any distance in excess of 40 to 50 miles from the transmitter.

In addition to this, the fact that the volume control has to be almost fully advanced to secure reasonable reception and sufficient volume makes the set highly responsive to interfering signals generated by the car itself. The signal-to-noise ratio is considerably impaired when any portable is subjected to these conditions. Vast improvement in the signal-to-noise ratio is possible, however, by operating the set on the rear window-ledge. The glass of the rear window allows unrestricted passage of signal, and the set is sufficiently removed from the engine to prevent most interference, unless, of course, the engine happens to be in the rear of the car, in which case the portable may well be directly over the sparking plugs!

Operation under the dashboard of a car with the engine in the front is virtually impossible, as the internal aerial picks up far more signal from the ignition system of the car than from the required station.

Using an External Aerial

Both the screening and directivity problems can be resolved by operating the portable from an

By Gordon J. King, Assoc. Brit., I.R.E.

ordinary car-type aerial. This, of course, also results in a marked improvement of signal-to-noise ratio. The car aerial can be coupled via a coaxial socket on the receiver, so that it is a simple matter to disconnect the aerial when the set is to be used under normal portable conditions.

Coupling the Aerial

The ease with which an external aerial can be coupled to a portable depends on the type of aerial to be used and the kind of aerial circuits employed in the set. The frame aerial or ferrite rod aerial contained in the portable represents not only the signal pick-up medium, but also the tuned circuits for the first stage. Thus, if an external

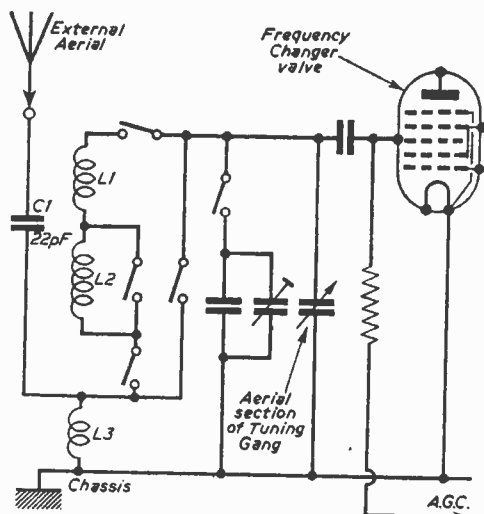


Fig. 1.—Method of coupling throw-out aerial to the portable radio.

aerial is simply connected direct to the tuned circuits, the capacitance and inductive loading introduced by the aerial is bound to detract from the available signal transfer owing to detuning of the aerial circuits themselves.

In this respect it often happens that the connection of an external aerial would appear not to improve the general reception over that of the internal aerial by any marked degree. Improved pick-up is possible, however, by retrimming the set's aerial circuits, provided the loading of the external aerial does not totally swamp the elements of the internal tuner circuits.

One method of coupling an external aerial to a portable with a frame aerial is shown in Fig. 1.

L1 is the L.W. frame aerial and L3 is the M.W. frame aerial, while L2 is a L.W. loading coil. The external aerial is coupled to the top of the M.W. aerial section through C1. It will be noted that C1 is a relatively low value capacitor, and the reason for this is that the loading due to the external aerial can never be greater than 22pF. even with a short-circuit between the external aerial socket and the receiver chassis. In practice, of course, the capacitive loading is considerably

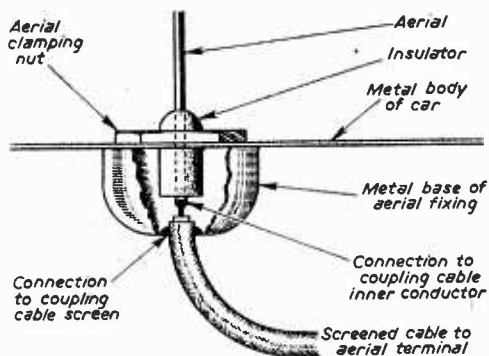


Fig. 2.—The car aerial connected to the portable via a screened cable.

less than this when a reasonably efficient aerial is used.

This type of coupling is most suitable for a long-wire type of aerial, since the impedance of the aerial circuits at the point of connection is relatively high and thus corresponds to its terminal impedance. It would be of little use for a car aerial to be coupled via a form of coaxial cable which itself is of low impedance. If a simple "throwout" aerial is used for car reception, then owing to the large pick-up which would occur throughout the whole of its length, considerable car interference would be injected into the set, and there would be little improvement of the signal-to-noise ratio.

Low Impedance Coupling

In order to obtain the best signal-to-noise ratio, the lead coupling the aerial to the set inside the car—right up to the point of connection to the aerial—should be "dead" so far as signal pick-up is concerned. This is accomplished by the use of a screened cable, such as coaxial (Fig. 2). The outer screen of the cable should make good connection with the metal body of the car, while the inner conductor should be adequately connected to the aerial element. Using this method of connecting, and provided a suitable coupling is available in the portable, the effect of unwanted interfering signals on the connecting cable will be very small indeed, and the only signals which will be injected into the set will be those actually picked up by the aerial. The frame or ferrite rod aerial in the set will also contribute to the general reception, but this should be small compared with the signal directed by way of the external aerial. Indeed, this is essential if the interference generated by the car itself is to be minimised.

Transistor Portables

Another method of aerial coupling in a transistor portable is shown in Fig. 3. Here connection is made direct to the transistor base, and being of relatively low impedance provides a fairly reasonable signal transfer via a screened lead.

Possibly one of the most successful methods of introducing an external signal is shown in Fig. 4. Although the circuit is based around a transistor set with a ferrite rod aerial, it is perfectly suitable for valve-type receivers with either a ferrite rod or frame aerial. The aerial signal is applied to L2 which is also wound on the ferrite rod along with the M.W. and L.W. coils, L1 and L3. The number of turns on L2 governs both the degree of signal transfer and the impedance of the aerial input circuit relative to the actual aerial circuits. The position of L2 on the ferrite rod can also be rather critical from the point of view of maximum signal transfer.

The aerial coupling coil is best wound on a former of suitable internal diameter for sliding on to the ferrite rod, giving a reasonably tight fit. The coil can be close-wound with approximately 20 turns of 24s.w.g. enamelled copper wire. The winding is then simply connected across a coaxial socket, the outside connector of which should also be connected to the chassis of the receiver, as shown in the diagram.

Optimum Signal Transfer

Adjustment of the position of the coupling coil on the ferrite rod to provide optimum signal

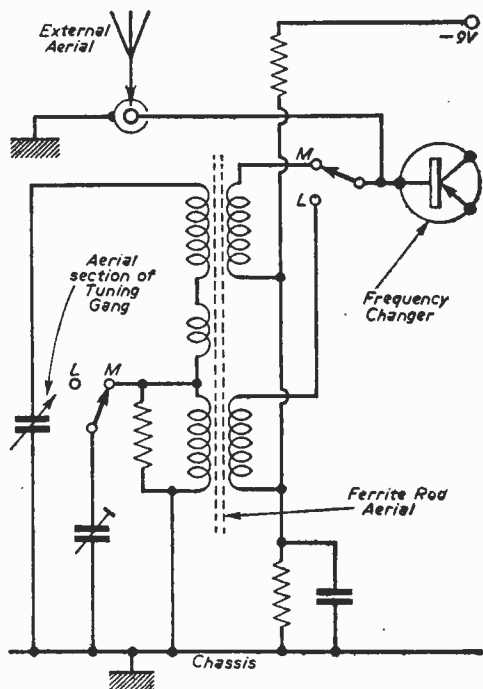


Fig. 3.—A low impedance input is obtained at the input circuit of the portable.

transfer is best accomplished by first turning the set to a very weak signal at the high-frequency end of the M.W. band without an external aerial. After

mise setting for the coil, giving the best overall results, will need to be obtained. Adjustment should be carried out on the actual aerial it is intended to use with the portable, preferably with the aerial in position on the car, and with the portable in the car, coupled to the aerial through screened cable.

It should also be noted that slight retrimming of the aerial circuits will give improved results after the coupling coil has been fixed. However, it is not advisable to retrim with the external aerial connected as this may result in impaired sensitivity when the aerial is removed and the set resumes its original role as a portable. Nevertheless, for extended use as a car radio it could pay to retrim on the external aerial provided one is prepared to retrim again when the set is no longer to be used in the car.

On some receivers more or less than 20 turns may be required on the aerial coil to secure maximum signal transfer. This is a matter for experiment, as no hard-and-fast rules can be given in this connection. Twenty turns represent the average required, though it may not be the optimum number for all receivers, and this may prove important if the set is to be used in areas of poor signal strength.

Frame Aerial Receivers

On frame aerial portables, the coupling coil should consist of three or four turns of similar wire wound round the existing aerial windings. If this is not possible, the coil can be wound, in slots, round the edge of a piece of stiff card of dimensions to match the frame aerial. The card should then be securely fixed so that the coil is as close as possible to the frame aerial. This arrangement is usually suitable for those portables in which the frame aerial is in the lid or rear cover of the set. Again, it may pay to experiment with the number of turns, as the optimum number is somewhat related to the size of the frame aerial.

Remember, it may well be necessary to fit the normal suppression devices on the car to avoid the pick-up of undue electrical interference from the ignition system, dynamo, windscreen wipers, etc.

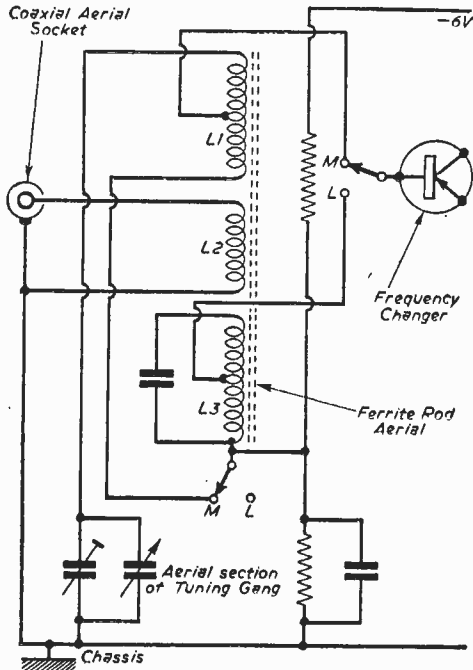


Fig. 4.—A coupling coil (e.g. L2) using either ferrite rod or frame aerial.

connecting an external aerial, the position of the coil should be adjusted for the best volume of the weak signal originally tuned. It may be found, however, that the position established for the M.W. signal will not correspond for all other signals on the M.W. and L.W. bands. In this case a compro-

RADIO CONSTRUCTION FOR THE BEGINNER

(Continued from page 778)

should be heard in the phones, indicating that the receiver is connected up correctly. When the sleeve of L2 is slid slowly along the rod towards the middle where L1 is fixed, a point should be reached where loud whistles are heard. If this does not happen, slip the sleeve off the end of the rod and replace it the other way round. This should bring success when the previous operation is repeated. If there is still no such effect, it indicates (everything else being in order) that the surface-barrier transistor has a low gain. Transistors vary greatly, especially if bought as "surplus". The number of turns on the movable sleeve must be increased and the experiment repeated.

When "whistling" is achieved, the tuning knob should be turned until the loudest local station is received. The turns of L2 can now be adjusted until this programme is still undistorted when L2 has travelled about one inch towards the middle of the rod.

(To be continued)

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A SIMPLE SIGNAL GENERATOR

A DUAL-VALVE CIRCUIT By P. R. Rodgers

THE signal generator to be described employs one 12AT7 (ECC 81) double triode and every effort has been made to economise on components without making a great sacrifice in performance. No separate audio oscillator has therefore been included as this would have necessitated the use of a further valve, but the R.F. signal can be modulated with an audio frequency signal derived from a neon bulb circuit. The modulating signal is not a sine wave, but this is not likely to limit the number of useful applications to which the instrument can be put. Circuits of the type shown in Fig. 1 have been operated satisfactorily at frequencies up to at least 200Mc/s with a small value of tuning condenser.

Feedback

The tuning condenser, C6, forms a resonant circuit with whichever coil is selected by the switch S2, feedback occurring through the cathode coupling to V1(a) and then through C5 to the grid of V1(b). If the grid of V1(b) becomes more positive at any time, both cathodes become more positive and therefore the anode current through V1(a) falls; the

anode of V1(a) becomes more positive and this positive pulse is fed to the grid of V1(b). The feedback is therefore positive.

The output voltage is taken from the variable resistor R3. The output impedance is quite low, as it is taken from the cathodes. The condensers C1 and C2 must be good quality components able to withstand the full mains voltage.

Audio Modulation

When S1 is closed, a small current flows from the H.T. line to charge C3. The large value of R1 keeps this current very small. When C3 is charged so that the voltage across it is about 130V, the neon strikes and the condenser loses some of its charge through the neon. The neon is extinguished when the voltage across it falls to about 100V, but it strikes again when the voltage rises. The voltage across the neon can therefore be made to alternate at any desired audio frequency by selecting suitable values for R1 and C3. Almost any small neon designed to work at about the voltages mentioned above is very suitable for the circuit. The audio frequency voltage across the neon is applied to the grid of V1(a) through the D.C. blocking condenser C4. The resistor R2 serves to provide a D.C. path between the grid and cathode and to keep the grid bias at its correct value. The audio voltage modulates the R.F. signal in V1(a). The modulation is approximately a triangular wave and with the values shown in Fig. 1 will have a frequency of about 1kc/s.

Frequency Coverage

Four coils (L1 to L4) are shown in Fig. 1, but more (or fewer) coils could be used to cover different ranges as desired. Any make of R.F. or aerial coils intended for radio receivers and designed to resonate with the 500pF condenser C6, can be used to cover the ranges required, but it is quite easy to construct suitable coils. If commercially made coils are used, any winding other than the tuned winding may be removed. It was found convenient to mount any high frequency self-supporting coils (16s.w.g. tinned copper wire) directly on to the ceramic switch, but the larger coils were mounted separately and as near to the switch as possible. All of the wiring

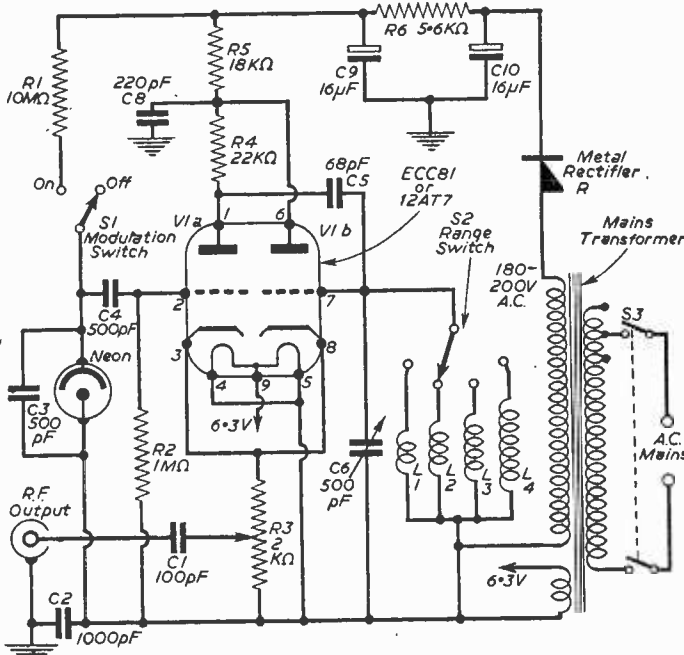


Fig. 1.—A circuit for operation at up to 200Mc/s. (There is no C7 in this circuit.)

connected to the coils should consist of fairly thick rigid wire (16s.w.g.).

If very high frequency coverage is required, a variable condenser with a maximum capacitance of 50pF or less should be used. Conversely if the constructor is mainly interested in very low radio frequencies, C6 may consist of a 1,500pF condenser. This value is most easily obtained by using a three gang 500pF component and connecting the three sections of the condenser in parallel.

The problem of coil design is very similar to that of radio receiver coil design, but is even simpler because only a single tuned winding is required.

Calibration

The variable condenser C6 was connected to a slow motion dial. The output voltage from the generator was fed into a communications receiver together with the output from a receiver crystal calibrator. The receiver was tuned until one of the harmonics of a 1Mc/s signal from the crystal calibrator could be heard; the particular harmonic being received could easily be identified from the receiver tuning. The signal generator was tuned to approximately the same frequency and the tuning was altered until a beat note was heard. The frequency of the zero beat then gave one calibration point on the generator. (As the generator is tuned, the beat note becomes lower and lower in frequency until it disappears altogether but returns on the other side of the zero beat. At zero beat the frequency of the generator and of the harmonic from the crystal calibrator are very accurately matched.)

The process is then repeated for the other harmonics of the 1Mc/s crystal which fall within the range of the signal generator. After this, the 100kc/s points on the generator scale may be marked by the use of the 100kc/s crystal (or the 1Mc/s crystal with the multi-vibrator) in the calibrator. The dial can thus be calibrated at every 100kc/s throughout all ranges.

The method of calibration described above is very accurate, but other methods are possible. Reasonable accuracy can be obtained by direct calibration against a good quality communications receiver. Alternatively a heterodyne frequency meter may be used.

If the constructor does not wish to go to the trouble of calibrating the dial of the instrument directly, it is probably best to use a calibration graph of frequency against the dial reading. The graph is prepared by one of the methods of calibration described above.

Calibration is much easier if C6 is one of the "straight line frequency" condensers. On any one range, equal amounts of dial rotation will then alter the frequency by the same amount. The calibration graph is a straight line if such a condenser is used.

Power Supplies

The 12AT7 valve requires a heater supply of either 6.3V at 0.3A or 12.6V at 0.15A. A metal rectifier is used so that no heater supply is required. Any metal rectifier which will handle 5m3 or more at 250V is suitable. At such small H.T. currents a smoothing choke is quite unnecessary and the resistor R6 is an adequate substitute for a much heavier and more expensive choke.

The Instrument Case

A small plastic or wooden case from an old radio receiver is an ideal container for the instrument, especially as it is probable that the tuning condenser could be utilised for C6—possibly with the same dial.

Although, for simplicity, no audio frequency output is provided, this should not usually matter when small receivers are being tested. A fault in the audio side of a receiver can usually be traced by using a 50c/s voltage from the heater line of the receiver. Alternatively touching the grid terminal of a receiver audio amplifier stage with a screwdriver will produce a click if, and only if that stage is functioning.

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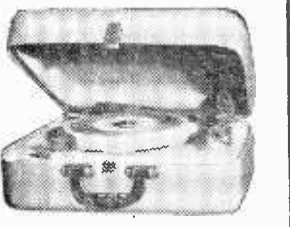
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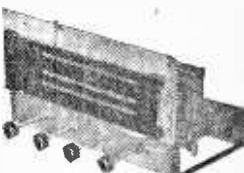
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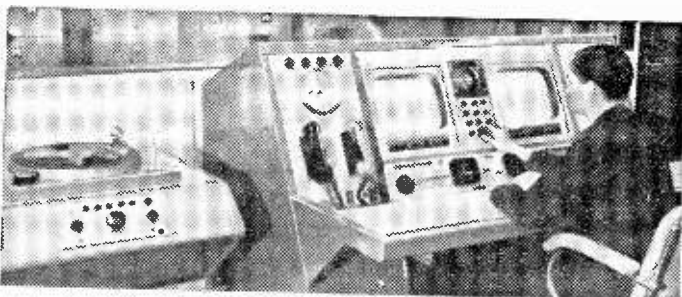
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1/61

ELECTRONIC SMOOTHING

A PRACTICAL CIRCUIT By J. B. Dance

If it is necessary to remove virtually all of the hum from a power supply, it is often easier to accomplish this by the use of a simple valve circuit than by means of a number of large smoothing chokes and condensers. It can be arranged that the valve circuit removes not only the hum but also any variations in the output voltage of the power pack owing to small changes in the mains voltage, providing that these variations do not last more than about a second. Such changes (usually a fraction of a volt), continually occur as the load taken from the power station alters. The amount of hum ripple can be made very much less than that which is present in the output of an ordinary power pack, but the circuit has the disadvantage that the regulation is not good owing to the resistor included in the power supply (R3 in Fig 1).

Electronically Smoothed Circuits

Electronically smoothed circuits are very useful for supplying oscillators, etc. which require a very smooth stable H.T. supply at a comparatively small current.

The circuit to be discussed is shown in Fig. 1. If the voltage from the power pack increases slightly, the increase will reach the grid of the smoothing valve via C1 and will increase the anode current in this valve. This increased current causes an increased voltage drop in R3 which, if the circuit values are chosen correctly, causes the output voltage to remain constant.

The resistor values are chosen so that the valve gain is unity. The phase of the voltage is changed by the valve, however, and can therefore be combined with the input voltage from the power pack to give a smooth output voltage. The two alternating components, which are 180 deg out of phase, completely cancel each other leaving smooth D.C. Alternatively it can be said that the whole of the alternating current from the power pack passes through the valve and none through the external load.

Variations in the voltage from the power pack are fed to the grid of the valve via the D.C. blocking condenser C1 and the resistor R2. It is important that C1 and R1 should be fairly large in order that the time constant C1.R1 shall be large enough to enable any comparatively slow variations of the supply voltage to be smoothed out. A good quality paper condenser should be used for C1; an electrolytic condenser is not suitable. R1 provides the D.C. path between the grid and cathode and cannot be increased much above the value shown.

A sudden increase in the value of the load current tends to produce a positive voltage on the grid of the valve for a short time; R2 prevents damage to the valve by limiting the value of the grid current during this time. It is almost essential to use a further smoothing condenser (C2) across the output of the circuit in order to reduce the output impedance of the circuit.

If desired, the amount of smoothing in the power pack, feeding the additional smoothing unit shown in Fig. 1, can be less than in a normal power pack. For instance, a single smoothing condenser without any choke is usually adequate.

Adjustment

The value of the resistor R4 is chosen to provide a suitable bias voltage for the valve. The value can be calculated from the recommended bias voltage and the normal anode current taken by the valve by means of Ohm's Law. If the best possible results are required, it is advisable to use a variable resistor for R3 which can then be adjusted to provide the smoothest output. Adjustment of R3 alters the amplification of the circuit and enables it to be made exactly unity so that the out of phase alternating currents in

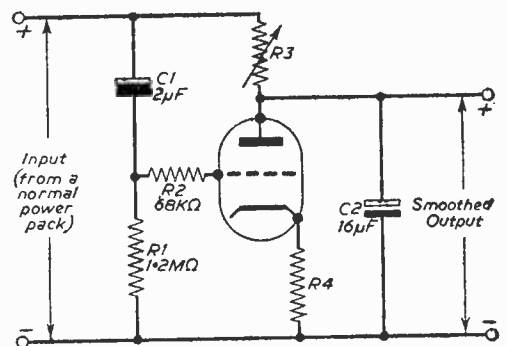


Fig. 1.—A circuit for electronic smoothing; the value of R3 and R4 depend on the valve chosen.

R3 and in the valve exactly cancel each other out.

The value of R3 can be calculated from the value of R4 together with the mutual conductance and amplification factor of the valve, but these quantities may not be known very accurately and better results can usually be obtained by adjustment of R3 experimentally to give the least possible hum in the output. The circuit does, of course, remove the harmonics of the hum as well as the fundamental mains frequency. It is convenient to use an oscilloscope for detecting the hum during the adjustment, but this is by no means essential; an audio amplifier is quite satisfactory.

The following equation gives the value of R3 fairly accurately, but it is not exact:—

$$R3 = 1/gm + R4$$

where gm is the mutual conductance of the valve used.

(Continued on page 830)

A Reliable Radiogram

AN ECONOMICAL AND EFFICIENT ARRANGEMENT

By A. Sydenham

(Continued from page 709 of the December issue)

IT is advisable to make all leads long enough to permit inter-chassis movement so that if necessary either unit may be removed and connected up outside of the main cabinet for repairs, testing, etc.

When the gram unit is in position, a tag strip will be found at the rear, and this is illustrated in Fig. 9. Four thin, coloured leads are already taken off into the pick-up arm but two of them will not be connected at the head, these being coloured yellow and blue. These are only used when a stereo cartridge is used. Check that the black and red leads do in fact connect to the turnover cartridge and, if so, solder the "outer" of one of the lengths of coaxial cable to tag (3) and the "inner" to tag (4). Fit a coaxial plug at the far end of this cable and plug it into the socket provided on the amplifier chassis.

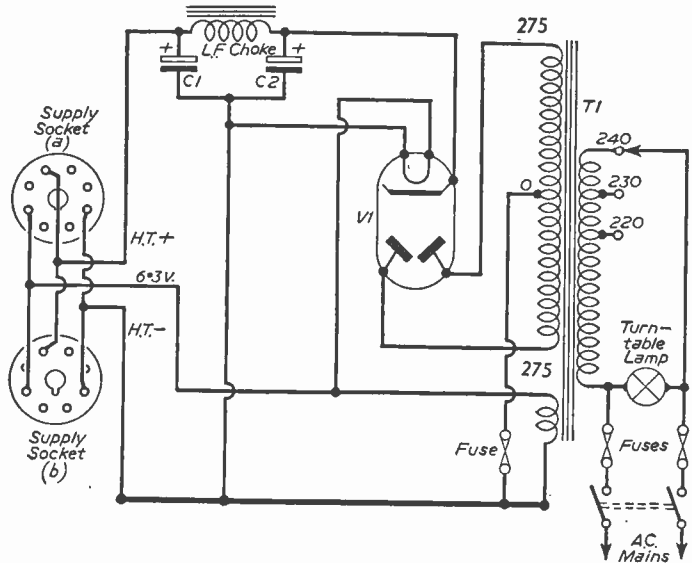


Fig. 6.—The power-pack.

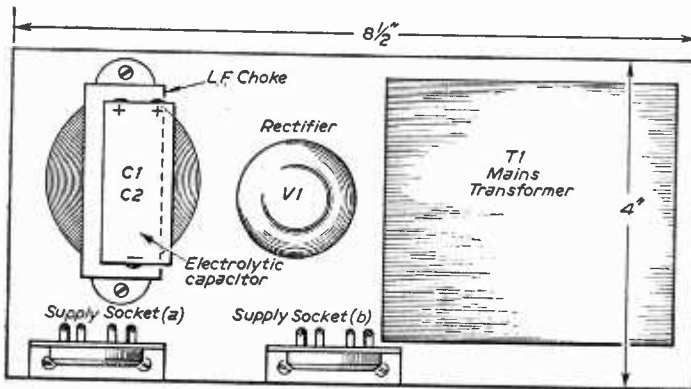


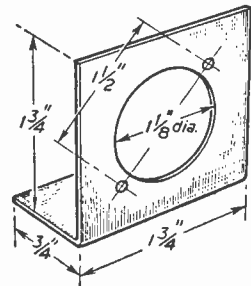
Fig. 7a.—Layout of the power-pack.

Setting Up the Tuner

This will present no difficulties if a signal generator is available, but without one the procedure is likely to be a little more tedious. In this case the best that can be done is to bring the various tuned circuits into line with each other although the precise value of I.F. is likely to be unknown.

However, this is not so important with a switch-tuned feeder as with one that tunes over a whole band. Before adjusting T1 or L5 an attempt should be made to obtain some sort of signal transmission upon which to work by adjusting the aerial and oscillator coil trimmers, the medium wave-band being chosen in preference to the long. The volume control should be well advanced, and once a signal is heard, even if only weakly, it should be

Fig. 7b (right).—Dimensions of the brackets for the supply sockets on the power-pack chassis.



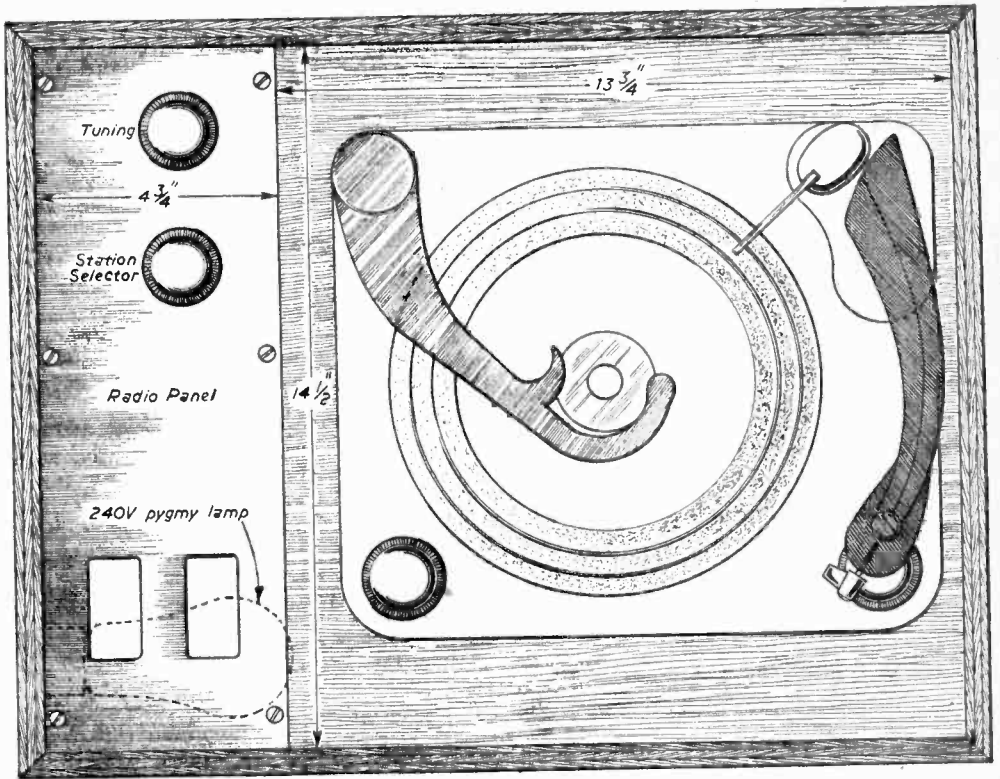


Fig. 8.—Layout of the gram unit.

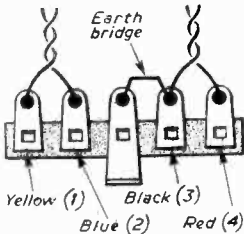


Fig. 9.—Pick-up connections for the UA8.

versa. The tuner is then switched to the other waveband and the desired transmission tuned in by means of the appropriate aerial and oscillator
(Continued on page 818)

"peaked up" by means of the cores of L5 and T1. As this is carried out, it will be found that the volume control has to be backed off considerably. The next step lies in identifying the transmission if possible from which one can soon learn which way to turn the trimmers for the transmission desired. For example, should the Welsh Home service be coming through and one wishes to receive the West Home service on 1,500kc/s for this band, then the trimmers across L1 and L3 must be unscrewed and vice

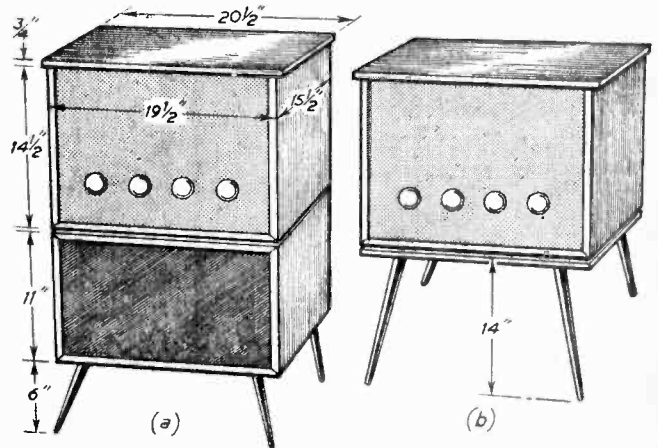


Fig. 10a (left).—The cabinet arrangement described in the text.

Fig. 10b (right).—An alternative cabinet arrangement.

detection, the audio signal is returned to the transistor base through the aerial coil winding, and the amplified audio signal passes through the H.F. choke, and is available across the 2.2k collector resistor.

With such circuits the transistor must, of course, be capable of acting as R.F. amplifier. An audio frequency transistor which will not operate at radio frequencies cannot be used. It may be necessary to modify the values of the 47k and 10k resistors, to suit the transistor, for maximum efficiency. Emitter bias may also be applied in the normal way, (as in Fig. 1) if small size and maximum economy are not essential.

In Fig. 3, the detector stage is not tuned. If space is available, efficiency may be increased by tuning this stage, as in Fig. 4. It may be feasible to use a ganged condenser (300pF to 500pF maximum

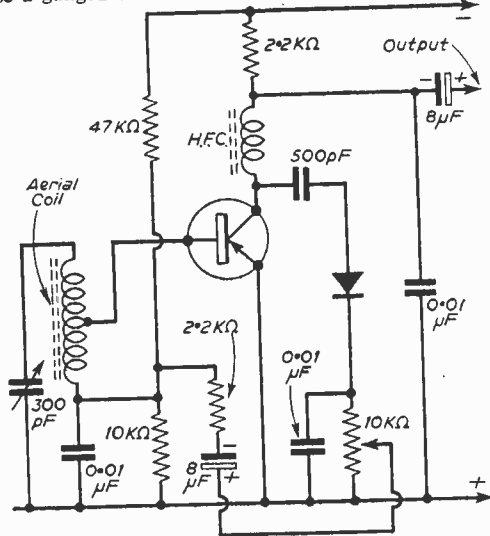


Fig. 3.—A simple T.R.F. receiver circuit reflexed to enable one transistor to act as R.F. and A.F. amplifier.

capacity each section), and a coil to match the aerial coil, or ferrite rod aerial. But in very small receivers this will be impossible. It is then either necessary to use an untuned stage, as in Fig. 3, or to employ small pre-sets, or core-tuned coils for the required stations.

Stability

If stray coupling exists at radio frequency or the receiver intermediate frequency, the reflexed stage may oscillate. To avoid this difficulty, a careful layout is necessary. In addition, the circuit should be adequately by-passed. In Fig. 2, the 0.05μF and second 0.01μF condensers serve to keep intermediate frequencies out of other parts of the circuit, while the 1k resistor wired to the 6μF condenser also helps prevent feedback of I.F. to the transistor base.

In Fig. 3, the 0.01μF condensers and 2.2k resistor in the volume control circuit perform a similar function in maintaining stability.

Other reflex circuits work in a similar manner, though various methods of coupling may be used. Normally, any R.F. type transistors may be used with success in the circuits in Figs. 2 and 3. Should it be necessary to adjust the base voltage, to obtain

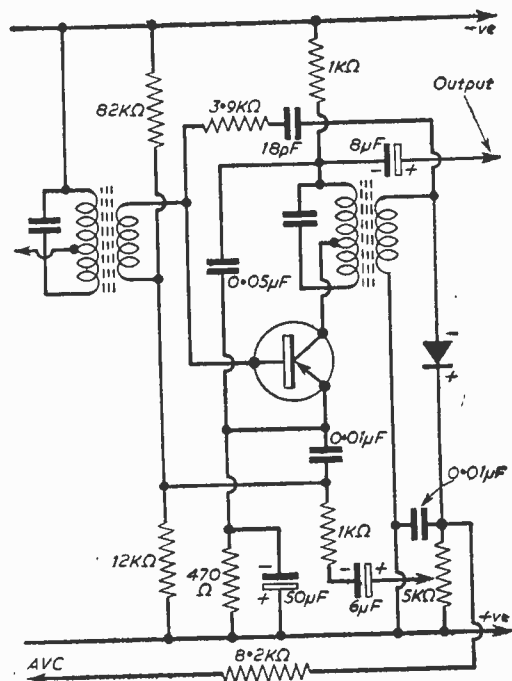


Fig. 2.—The I.F. stage reflexed to provide A.F. amplification.

best results, then it will usually be sufficient to change the value of one of the resistors only (e.g., 47k or 10k in Fig. 3).

With T.R.F. designs, care is necessary to avoid stray coupling between the aerial coil (or ferrite rod winding) and the H.F. choke or detector coil. Such

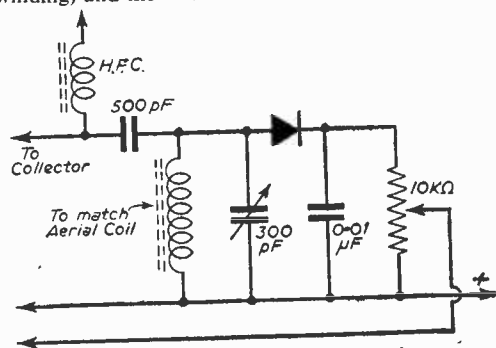


Fig. 4.—The tuned detector circuit.

coupling will cause ordinary R.F. instability. This can be checked by temporarily disconnecting the reflex circuit, and using phones to listen to the signal available across the volume control. If oscillation is present, this is due to a bad layout of the R.F. components—not to the reflex circuit. But oscillation only begins when the reflexing is introduced, this shows that insufficient by-passing has been employed, or that a bad layout is providing feedback of R.F. here. This simple test is thus worth making if the circuit gives trouble when first tested.

COMBINED RADIO AND TABLE LAMP

USING A 40W LIGHT BULB INSTEAD OF A MAINS DROPPER

By M. J. Dunn

THIS receiver is of the A.C./D.C. variety—the chassis is “live” and the valve heaters are wired in series. However, an electric lamp is used in series with the heaters instead of the usual “mains dropper” and the power which is normally wasted in this component is made to serve a useful purpose. The lamp may, if required, be used without the radio but when the radio is working, the lamp must, of necessity, be in circuit.

Choice of Bulb

During the design of the receiver, several bulbs of different ratings were examined but it was found that, for varying reasons, only 75W and 40W bulbs could be considered. The 75W lamp was thought to be too bright for general use and the 40W was therefore chosen. A lamp of this rating passes a current of about 0.16A which is near to the current taken by certain octal-based valves—0.15A.

The valves chosen were the 12SK7, 12SL7, 6G6 (or 12A6), all of which are readily available—as are suitable alternatives which will be mentioned later—and which have heater ratings of 0.15A.

The calculations may now be more closely examined, but without going into the minute details of working out as these were done by the simple application of Ohm’s Law to resistances operating in

series. It is required to supply a current of 0.15A through the heater chain of the three valves specified, and the total voltage across them will be 31.5. Assuming for the moment a mains supply of 245/250V, the situation is as follows: resistance of heaters 210Ω, resistance of 40W bulb (rated at 240V), 1440Ω, giving a total resistance of 1650Ω. With 245/250V mains, this will pass between 0.148–0.151A which is precisely what is required. For those on a lower mains supply voltage the use of a 40W bulb rated at 210V and on a supply of that value, in series with the same heater chain, will pass 0.159A. Now the tolerance allowed for running heaters is ± 7 per cent and this figure is within this tolerance. However, the current could be reduced by either using a 12A6 as the output valve or purchasing a 40W bulb with a slightly higher voltage rating. In practice this means that the constructor can go ahead with the 40W bulb of his district and always be within the tolerance limits for supplies between 210 to 250V.

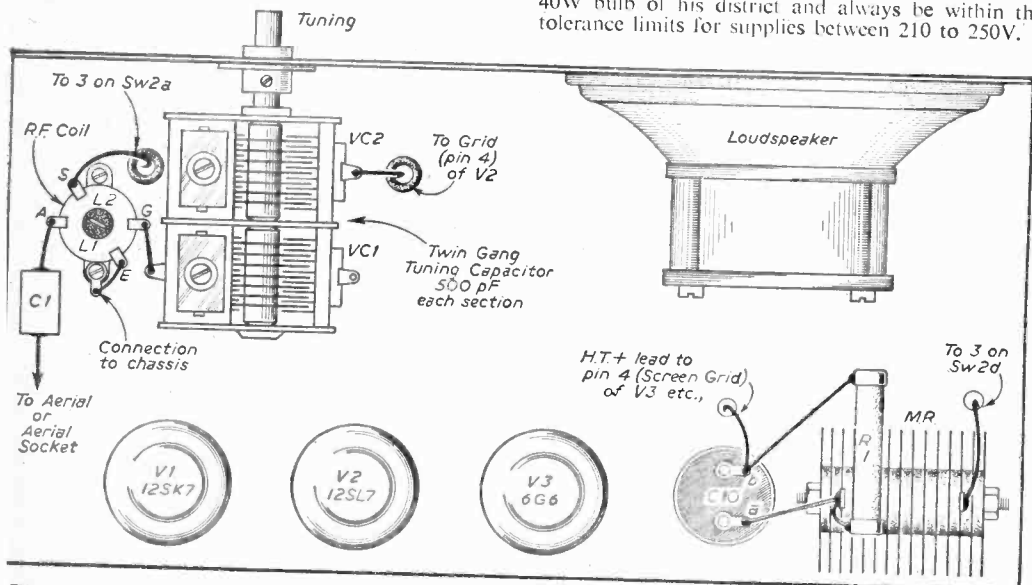
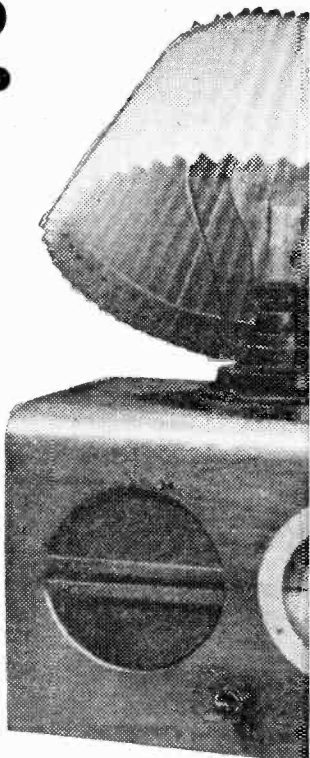
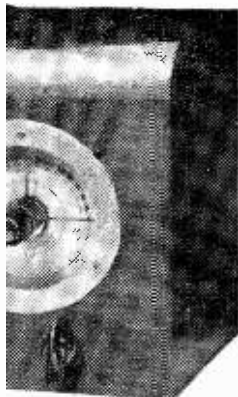
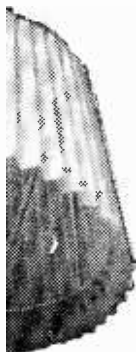


Fig. 1.—The above-chassis layout of components. (The theoretical circuit will be given next month.)

Alternative Valves

Having now disposed of the problem of describing the heater supply, a few words may be said about choice of alternative valves. For the first stage a 12SK7 has been specified, but a 12K7 would also be entirely satisfactory and being double ended would facilitate the grid connection to the coil as this is above chassis, the other one being below. It is not necessary to use a variable- μ R.F. pentode in the first stage and valves having a sharp cut-off characteristic are quite suitable so that one can also use a 12SJ7 (single-ended) or 12J7 (double-ended). These latter

two valves will afford some economy in H.T. current for the double triode, V2, a 12SL7 is more or less essential because the 12SN7 requires double the heater current and therefore cannot be used. A 6G6 was chosen for the output valve because of its low H.T. current consumption (15mA) and very cheap price at three shillings, but a 12A6 is perfectly suitable; having twice the heater resistance of the 6G6, there



The completed receiver.

is a very slight reduction of heater current. Because of the low power requirements of this set, it would be quite in order to use a general purpose triode such as the 12J5 as an output valve.

Conventional T.R.F. Circuit

A more or less conventional T.R.F. arrangement is used with one half of a double triode as an infinite impedance (cathode follower) detector, the other half giving a stage of A.F. amplification. The first stage of the receiver is a simple R.F. amplifier connecting an earth to the aerial terminal and will probably give excellent results in most cases and obviates erecting an aerial proper. It is important to regard the aerial coupling capacitor C1 as absolutely essential in an A.C./D.C. set and it should be exonerated from leakage. The signal appearing at the anode of V1 is passed to the grid of V2a via the R.F. transformer L3-4 and here it was found that anode decoupling by R4C4 was absolutely necessary to maintain R.F. stability. The wavechange switch of the two tuning coils will be explained separately under the description of the switch as a whole. The value of Rk at 100 Ω for V1 is nominal and can be altered to adjust

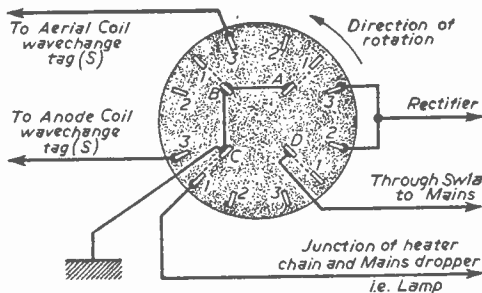


Fig. 2.—The wavechange switch and its connections.

the sensitivity of the set (providing the valve chosen for this position has variable characteristics); some constructors may wish to include a variable component between the lower end of R3 and chassis, especially in areas of very high signal strength.

The second stage employs an infinite impedance (cathode follower) detector with the output load in the cathode circuit. The anode is nominally connected direct to H.T.+, but some constructors may prefer to decouple and this can be effected with R6C6. C5 is an R.F. by-pass capacitor and shunts the rectified carrier present in the detector output, the audio component part of the signal going to the grid of V2a via the coupling capacitor C8. Infinite impedance detection is an excellent system as it imposes no load on the relevant tuned circuit and therefore preserves the high Q of the coil and gives excellent selectivity. Some might consider it a disadvantage that this kind of detector gives a stage gain less than unity, but this

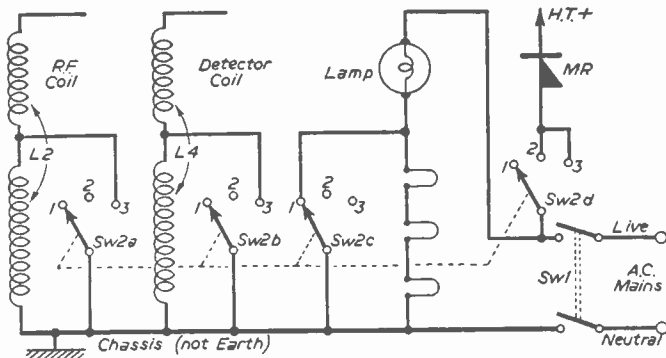


Fig. 3.—Coil and mains switching of the receiver.

is easily outweighed by the quality of the results. In the circuit under consideration, the 12SL7 is a high- μ triode and V2b gives a very satisfactory degree of audio amplification. Coupling from the anode of V2b to the grid of the output valve (V3) via C9 and the volume control Rv, is quite orthodox and requires no comment.

It was found that providing the layout of hot leads was sensibly carried out, the anode decoupling of both halves of V2 was not required in practice so that R6C6 and R7C7 can be omitted; their inclusion in the circuit is an academic requirement and a guide to anyone who wishes to include them for any reason.

(Continued on page 805)

~~~~~A TRANSCRIPTION~~~~~ QUALITY RECORD PLAYER

AN EASILY CONSTRUCTED UNIT WITH
SEPARATE LOUDSPEAKERS

By C. J. Lee

THIS record player is of modern design and of high quality. The first items to deal with are the two independent loudspeaker cabinets, the main cabinet being left until later. The reason for having two small independent loudspeaker cabinets is because it means that the constructor can at any time add another amplifier, thus making it a stereophonic player. The mounting of the motor and amplifier will be dealt with last of all. The constructor has a wide choice of suitable building materials, but the original was built of oak faced block board as this can be obtained in large sheets and cut to the required size. The two small loudspeaker cabinets, however, were built of mahogany.

Constructing the Loudspeaker Cabinets

The two small loudspeaker cabinets are constructed of $\frac{1}{2}$ in. thick mahogany wood. The original pair were 8in. units, but 10in. x 6in. elliptical speakers could be fitted if this is desired.

The construction can clearly be seen from Fig. 1. The cabinet is 15in. high (not including the small rubber feet), and 15 $\frac{1}{2}$ in. at its widest point. At the two points marked 'A' in Fig. 1, one edge of both of the side pieces, and both sides of the front panel, are planed to an angle of 67 $\frac{1}{2}$ deg. They are then fixed to the front panel, as in Fig. 1, with two pieces of batten screwed and glued in position to ensure a good strong joint.

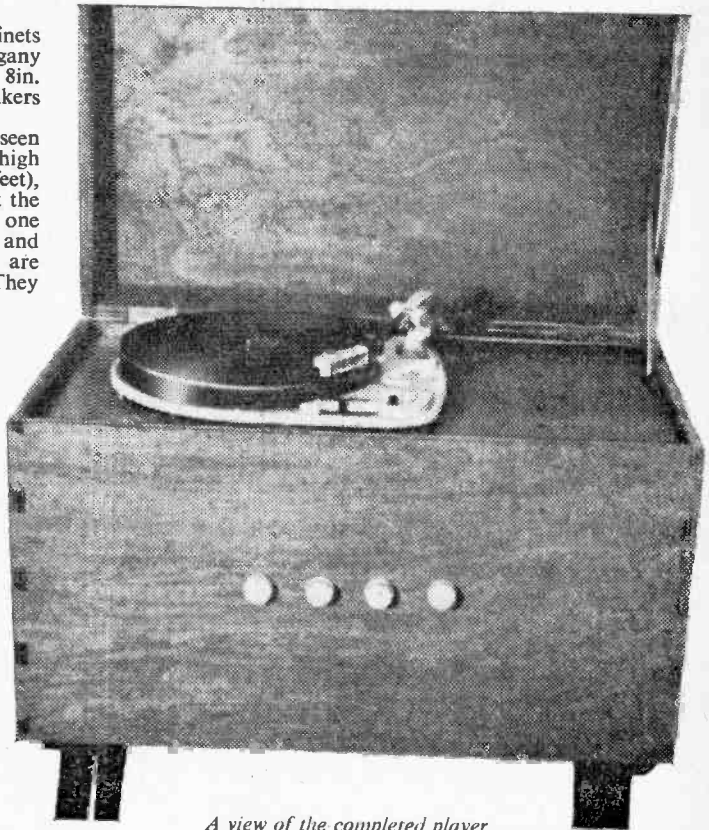
When this first stage of construction has been completed, proceed by cutting out the two back pieces, which are both a little over 14in. in length (leaving a little for planing). When cutting these, it should be remembered that side 'A', as indicated in Fig. 1, is 10in. wide, and side 'B' should only be 9 $\frac{1}{2}$ in. wide, thus allowing for the thickness of the wood when joining these two pieces together (Fig. 1). If this point is overlooked, the cabinet will not line up correctly. The two back pieces join at 90deg and are strengthened with a piece of batten which is 14in. long and an inch or so square, the size not being critical. This piece of batten is screwed and glued in position

and serves the same purpose as the batten used for the two side and the front at points 'A'.

A hole is now cut in the front panel, 6 $\frac{1}{2}$ in. in diameter for the loudspeaker. Any great increase in its size will cause much undue vibration when playing records.

The two loudspeakers can now be screwed into position as shown in Fig. 2 with a small piece of speaker fret placed in front of the loudspeaker first. When the loudspeakers have been mounted, the two back pieces which have been joined together can be fixed to the two side pieces which have been glued to the front panel, thus making one complete unit.

The top piece is now to be cut out. It is also $\frac{1}{2}$ in. mahogany and the same shape as the cabinet. When it is glued on to the top of the cabinet, it should be planed smooth so that it forms a good fit. It should fit flush with the two back pieces but a $\frac{1}{4}$ in. overlap is left over the front and the two side pieces to give the finished cabinet a professional appearance (Fig. 3).



A view of the completed player.

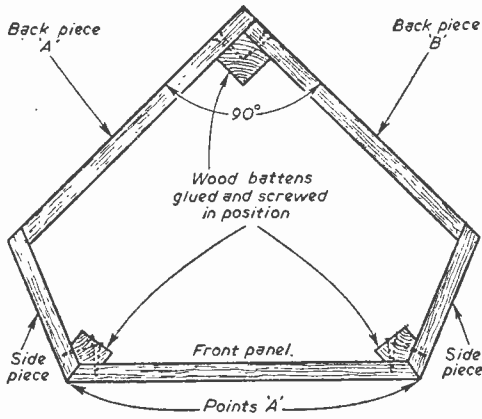


Fig. 1.—Details of the loudspeaker cabinet construction.

A piece of $\frac{1}{2}$ in. plywood is cut and planed to a smooth surface so that it fits tightly inside the cabinet. This piece of plywood is pushed up inside the cabinet for about 4 in. at which point it should be secured in position with small angle brackets, its position being shown in Fig. 2. This piece of plywood completely seals off the loudspeaker. It will now be seen that there is a compartment between this piece of plywood and the bottom of the cabinet. This compartment is now to be filled with sand as indicated in Fig 2.

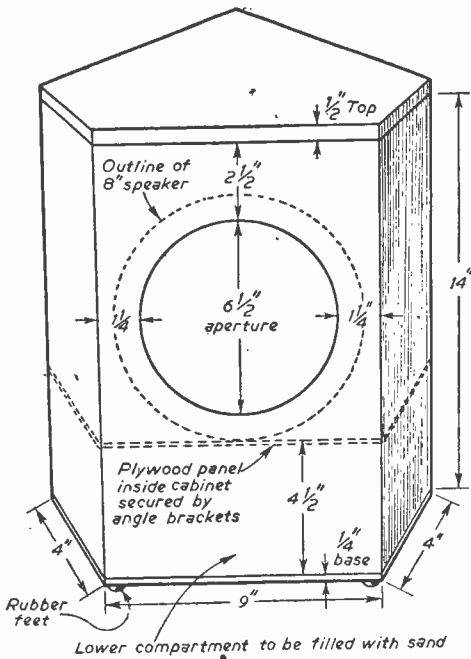
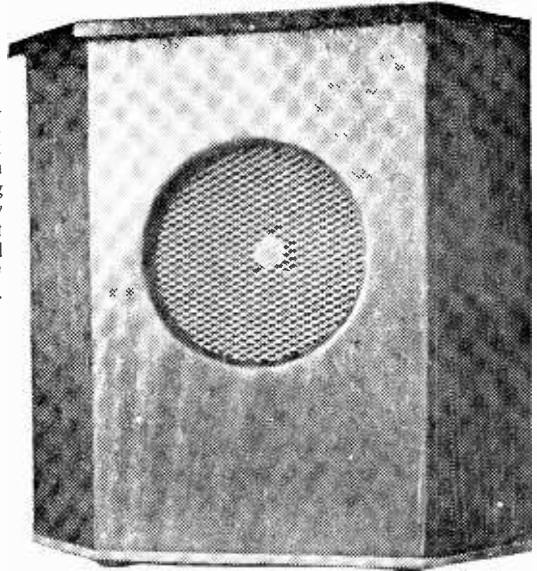


Fig. 2.—The position of the speaker in its cabinet.

Another piece of $\frac{1}{2}$ in. plywood has to be cut, the same shape as the top but without the $\frac{1}{4}$ in. overlap. This piece now forms the bottom of the cabinet and should be secured with screws. Assuming that the constructor has connected a lead to the loudspeaker, the cabinets have only to be stained or french polished to complete them.

Constructing the Main Cabinet

The front is first cut from $\frac{3}{4}$ in. oak faced block board, the size being clearly seen from Fig. 4. It should be noted that the lid is constructed with the main cabinet and is sawn off later. This ensures a perfect fit and also simplifies the construction for amateurs. Dovetail joints are marked and cut along both ends of the front panel, (Fig. 4) the size of the dovetails being left to the constructor, smaller dovetails are recommended on the lid than those to be cut on the main body. When the dovetails



The additional loudspeaker.

have been cut on both ends of the front panel, the sockets can be marked and cut out on the two side pieces which are both 18 in. x 18 in. in size.

Next comes the back piece which measures the same size as the front, 30 in. x 18 in. The first thing to do is to gauge off 3 in. for the lid, and then from the same end, a further 3 in. as indicated in Fig. 6. This time, from the bottom edge another 3 in. is to be gauged off. It can now clearly be seen that there is a strip in the middle which is 9 in. wide. This 9 in. strip can be cut out and a piece of hardboard is substituted for it. (Fig. 6).

This piece of hardboard is substituted because it can easily be removed since it is only screwed on to two strips of wood, which are screwed to the sides of the cabinet. Dovetails are now cut on both ends of the back piece and they should be the same size as those cut on the front: the corresponding sockets should then be cut on the side pieces. When the joints have all been cut and cleaned out with a chisel

COMPONENTS LIST

One Garrard 4HF transcription motor. A suitable amplifier. Six small rubber feet (three for each cabinet). Two loudspeakers, 8in. or 10in. x 6in. units and two small pieces of fret to fit inside of the two small speaker cabinets. One piano hinge, about 2ft long, and two stays for the main cabinet.

Timber for Speaker Cabinets

Two pieces, 14in. x 10in. (back peices). Two peices 14in. x 6in. (side peices). One piece, 14in. x 10in. (front piece). One piece, 12in. x 12in. (top piece). All the wood is 1/2in. mahogany.

Two pieces of 1/4in. plywood, 12in. x 12in., cut as required, one piece for the bottom, the other to fit tightly inside the cabinet.

French polish, screws and glue, etc.

Timber for the Main Cabinet:

Five pieces of oak-faced block board of 3/4in. thickness, cut as required for the front, back, two sides, top of lid, motor board and the bottom board.

One piece of 1/2in. hardboard to screw into the back of the cabinet.

Four pieces of teak, 18in. x 2in. x 2in. for the legs, and two pieces of beech size 17in. x 3in. x 1/2in. thick.

Eight pieces of batten, as required for the motor board and bottom board mounting runners. Screws, glue, polish and four metal tips to fit on to the end of each leg.

The bottom board of the cabinet, is also 3/4in. oak faced block board. The reason for this thickness is because this board has to withstand the weight of the

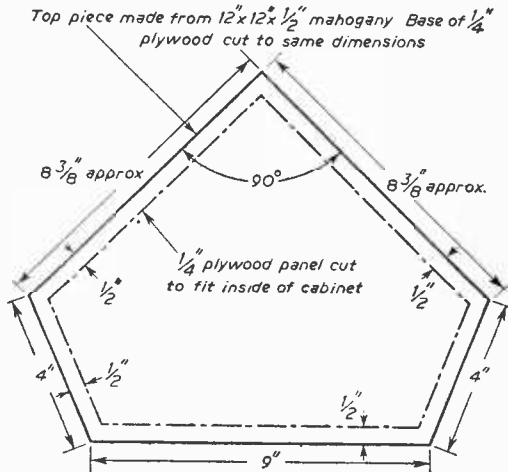
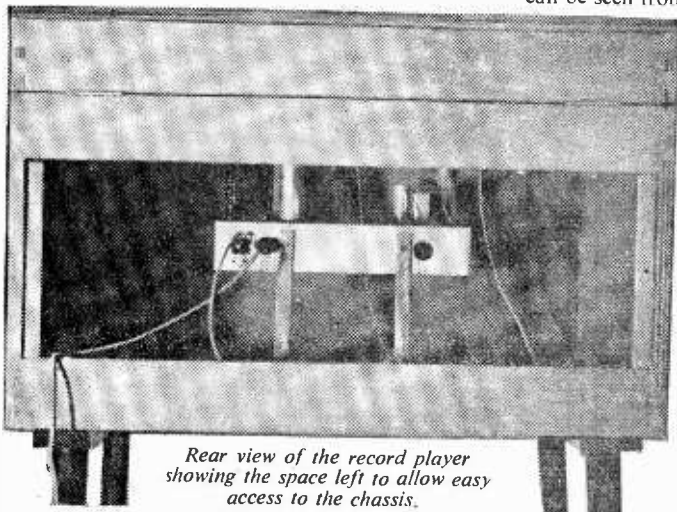


Fig. 3.—The top of the cabinet is made to overlap 1/4in. on all sides.

cabinet when it is finished. Referring back to Fig. 4, the bottom board may be seen as a dotted line. As can be seen from Fig. 6, the bottom board is secured by a rebate which is cut on all four sides of the bottom board, and also all the way round the actual cabinet. This rebate is cut so that when the bottom board is fixed in position, it draws level with the bottom of the cabinet. The motor board rests on runners which are 1in. square and are screwed and glued right the way round the cabinet. The motor board in the original was 1 1/2in. below the level of the top edge (Fig. 6).

The Legs

The four legs are the last of the parts required to construct the main cabinet. The originals were machined on a lathe and tapered from 1 1/2in. to 1 1/4in. They are glued into a piece of beech which measures 17in. x 3in. x 1/2in. Two such pieces of beech are needed, one for each end of the cabinet.

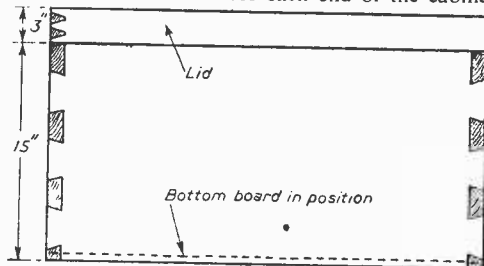


Rear view of the record player showing the space left to allow easy access to the chassis.

the five pieces can be glued together, that is the front, two sides and the two back pieces, making sure that the corners are right angles.

When the glue has set, the joints must be planed smooth and the lid can be sawn off, taking care to make sure that the saw does not cut "rigidly", or a bad fit will result. A suitable top of 3/4in. block board can then be glued on to the four sides of the lid and later planed down to obtain a good fit, but the lid however, should not be screwed on at this stage.

Fig. 4 (Right).—This shows the dovetail joints employed in the main cabinet.



When the legs have been turned, measure an inch down from the thickest end. From the top to this line, the leg should be reduced until it is only 1 in. in diameter (Fig. 7). This is repeated for all four legs. A hole is drilled at each end of both pieces of beech just under an inch in diameter to ensure a good fit (Fig. 7). The four legs are then glued into these holes and the piece of beech planed to the required angle which is illustrated in (Fig. 7). The two pieces of beech are then glued and screwed to the bottom of the cabinet, one at either end. A secure joint is essential here. Black oak stain and a coat of french polish completed the legs on the original model.

The lid can now be screwed in to position taking care to align it correctly and a suitable lid stay screwed on to one side of the cabinet. The cabinet can now be stained or french polished and the inside of the lid could be covered with baize so that the lid

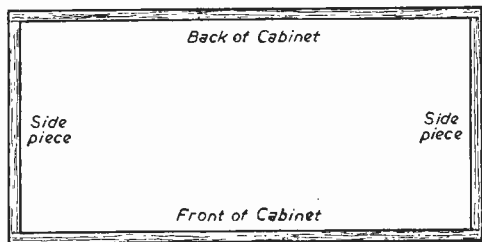


Fig. 5.—A plan view of the main cabinet.

does not produce any vibration if it is dropped accidentally. When the cabinet has been polished, the oak facing gives a pleasing appearance to the finished model.

Mounting the Motor and Amplifier

The player in the illustration is a transcription motor. Although a monaural amplifier was used, a stereophonic amplifier could be used instead, thus the reason for making two loudspeaker cabinets. The two loudspeakers would then be connected to their appropriate channel and placed about eight feet

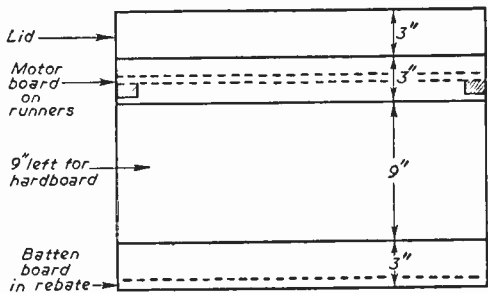


Fig. 6.—The motor board is supported by wooden runners.

The amplifier was mounted with the controls at the front, and with a well ventilated cabinet, the amplifier should not overheat. Incidentally the piece of hardboard that screws on to the rear should have a few holes drilled in it to help ventilation. Two strong brackets were used to support the amplifier as it was rather heavy because of the two trans-

formers. The amplifier was mounted so that a space to the right of the player was saved so that a VHF tuner could at any time be added.

Mounting the Player

The player is not difficult to mount. A suitably sized hole is cut out of the motor board and the player lowered on to its springs and with the aid of a

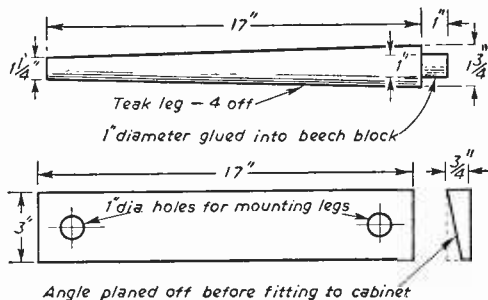


Fig. 7.—Details of the legs and their mounting board.

spirit level, the three screws are adjusted until the player is in a horizontal position. A word of warning would not be out of place here. When the author acquired his transcription motor a fault was apparent. The motor was mounted in the proper manner as directed in the instructions with the unit, but when the player was started, there was a noise coming from the motor instead of running silently as it should. The motor was examined and the fault traced. The three core lead taking the power to the motor was touching the motor board, but as soon as this lead was separated from the motor board, the noise disappeared.

The motor has only to be connected to the power supply and the pick-up to the amplifier, and the loudspeaker(s) to the amplifier(s) and the player is ready for use.

Combined Radio and Table Lamp

(Continued from page 801)

Constructional Notes

The final form of this set can be so very varied to suit individual requirements, existing chassis, cabinets and so forth, that comments on constructional details will be of a general rather than specific nature and mainly as a guide for the less experienced constructor. Neither need strict instructions be given about actual wiring-up. The important thing is to prepare a plan before starting so that nothing is omitted and of course it must be carried out so that connections left until the end are not inaccessibly buried beneath earlier wiring and components. The following plan is good advice for anyone requiring some guidance:

1. Mount all large and fixed components which require bolting to the chassis, including valve sockets, tag strips, etc.
2. Start wiring with all the routine connections, the "pipe-lines" of supply, starting with the heaters, continuing with chassis and H.T. connections, etc.
3. Leave the "signal path" until near the end.

(To be continued)

Club News

REPORTS OF CURRENT ACTIVITIES

BRITISH INSTITUTION OF RADIO ENGINEERS

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

Meetings for December:

London—At the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1.

December 7th at 6.30 p.m.—“Flight Evaluation of Airborne Electronic Equipment”, H. G. Hinckley.

December 13th at 6.30 p.m.—“Objective and Subjective Requirements for Loudspeakers” F. H. Brittain.

Liverpool—Merseyside Section.—At the Adelphi Hotel.

December 14th at 7 p.m.—“V.H.F. Sound Broadcasting”, L. G. Dive (Associate Member).

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

December 7th at 6 p.m.—“Human Engineering”, S. C. Ramsay, B.Sc.

Southampton—Southern Section.—At Lanchester Building, University of Southampton.

December 14th at 7 p.m.—“Some New Piezo-electric Devices”, A. E. Crawford (Member).

Wolverhampton—West Midlands Section.—At the College of Technology, Wulfrune Street.

December 14th at 6.15 p.m.—Programme of Technical Films.

BRITISH SOUND RECORDING ASSOCIATION

Hon. Sec.: S. W. Stevens Stratton, 40 Gairfield Way, Ewell, Surrey.

All meetings, unless otherwise stated, are held at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2. A lending library service of technical books and periodicals is available to all current members of the Association who are residing in the U.K. Full list of books and publications is available on request to the Association office. A library of tape recordings of talks on varied subjects is also available.

Future Events:

December 16th—“Magnetic recording in the Home Cinema” by D. O’C. Roe.

1961:

January 20th—“Modern Electrostatic Microphones” by F. W. O. Bauch.

February 17th—To be announced.

March 17th—“The Artist on the Record” by Roger Threlfall.

April 21st—“Recording Vision Signals on Tape” by P. E. Axon, O.B.E., M.Sc., Ph.D., M.I.E.E.

CHILDREN AMATEUR RADIO CLUB

Hon. Sec.: C. Simpson, 2 Mead Street, High Wycombe, Bucks.

Club meetings are held on the last Thursday of each month at the British Legion, High Wycombe, at 8 p.m. The R.A.E. course which commenced at the High Wycombe College of Further Education recently has a class of 10 under the instruction of G3INZ.

Future Event:

December 29th.—“This or That.”

CLIFTON AMATEUR RADIO SOCIETY

Hon. Sec.: C. Bullivant, G3DIC, 25 St. Fillans Road, London S.E.6.

The club meets every Friday at 8 p.m. at 225 New Cross Road, London S.E.14. Although attendances have been around the 30 mark recently there is still room for new members, and licensed amateurs, short-wave listeners and audio enthusiasts are welcome.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: r. C. Ward, 5 Up-and-ans Avenue, Littleover, Derby.

All meetings are held in Room No. 4, 119 Green Lane, Derby, commencing at 7.30 p.m. unless otherwise stated.

Future Events:

December 7th—Surplus Sale.

December 9th—Annual Christmas Party

December 14th—Film Show.

December 21st—Open Evening.

1961.

January 4th—Surplus Sale.

January 11th—Open Evening.

January 18th—Film Show.

January 25th—Constructor’s Night. The third of these annual exhibitions. There are three classes: 1—Home Constructed; 2—Kit assembled; 3—Junior entries.

February 1st—Annual General Meeting.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

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

On December 6th, G3JGW entertained the club with “Where, When and What to Look For”.

Future Event:

December 20th—An Informal Evening.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

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

On November 15th a Junk Sale was held and November 22nd was an Open Night. On November 29th, G3LRB and G3KYX gave talks on “Safety in the Shack”, G3LRB conforming with regulations and G3KYX dealing with the medical aspect.

MITCHAM AND DISTRICT RADIO SOCIETY

Hon. Sec.: M. Pharoah, G3LCH, 1 Madeira Road, Mitcham.

The Club Contest was held on November 12/13th and 19/20th. The station was at 216 St. Helier Avenue, Morden, and the equipment was provided by G3LCH (transmitter) and G3OCA (receiver). Operators were G3KKQ, G3LSP, G3OCA and G3OFF. On December 2nd K. Frankcom, G3OCA, gave an interesting talk entitled “Round and about with a Camera”.

Future Event:

January 13th—“Life Boat Radio Equipment” by W. D. Pye.

PETERBOROUGH AMATEUR RADIO SOCIETY

Hon. Sec.: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.

All future meetings will be held at the Technical College on the first Friday in each month.

The mysteries of “Single Sideband” were explained by Mr. K. Pugh, G3HES, at the November meeting, held at Peterborough Technical College. Members took a keen interest in his recently-constructed all-band S.S.B. rig, and Mr. Pugh pointed out how he had built it on separate sub-chassis which were later bolted together.

Future Event:

January 5th—“Short-wave Receivers”.

REIGATE AMATEUR TRANSMITTING SOCIETY

Hon. Sec.: F. D. Thom, G3NKT, 12 Willow Road, Redhill, Surrey.

Recent activities have included a talk by G3VK on “R.A.E.N.”, a tour of Gatwick Airport, a Junk Sale, a visit to the BBC Studios at Maida Vale and a discussion on aerials for the S.W. listeners. The clubroom is at The Tower, High Street, Redhill.

Future Events:

December 10th, at 7.30 p.m.—Demonstration of members’ equipment.

1961:

January 21st—The Annual General Meeting.

February 11th—Annual Dinner to be held at Laker’s Hotel, Redhill.

THE SLADE RADIO SOCIETY

Hon. Sec.: C. Smart, 110 Woolmore Road, Erdington, Birmingham 23.

The Club Station G3JBN at the headquarters, The Church House, High Street, Erdington, Birmingham 23, is available for the use of members for constructional purposes. Thursday evening meetings include informal discussions, operation of the club transmitter, and instructional Morse classes. A licences operator of G3JBN is always in attendance on Thursday evenings. Slow Morse transmissions are radiated on the air each Monday evening from station G3AYJ on 1.9Mc/s from 8 p.m. to 8.30 p.m.

Future Events:

December 16th—“Fun and Games”, organised by Mr. L. H. Blackwell and Mr. G. L. Turner (Members).

December 30th—“The Human Machine as a Radio Operator” a recorded lecture, illustrated with lantern slides by Mr. F. G. H. Charman, B.E.N. (G6CJ).

WANSTEAD AND WOODFORD RADIO SOCIETY

Hon. Sec.: J. R. Seaman, 67 Beattville Gardens, Ilford, Essex.

Owing to the fact that many junior members have now joined the club a junior section is to be held every Thursday. Morse practice and lectures on fundamental radio principles, and a receiving session are the main features. No definite plans have yet been made for the future although a two or three page news-sheet is being started and a field day is being discussed.

COURSE OF INSTRUCTION

MIDDLESEX COUNTY COUNCIL

Head of Institute: E. N. Fennell, B.Sc., Wesley Institute, Wesley Road, London N.W.10.

A Radio and Television course will be held on Mondays and Wednesdays between 7 and 9 p.m., recommencing January 9th 1961. Mr. Barnes will again be in charge and due prominence will be given to television topics in the classes. The course covers theory and some practical work. It is mainly intended for amateurs. Fees: 20/- per two terms, one evening; 25/- per two terms, two evenings. You may enrol by post to “Jeanville”, Brighton Road, Addlestone, Weybridge Surrey.

(Continued on page 810)

ANNOUNCING . . .

THE OFFER OF THE YEAR

HARVERSON'S SUPER STEREO

The product of a world-renowned manufacturer, this stereo amplifier is composed of a number of compact "ready-built" units, only requiring interconnection. This system has the big advantage of being easily adaptable to fit any cabinet. Each unit is extremely well made from first-grade components, and all valves employed (ECL82, EZ80 range) are genuine Mullard. The comprehensive instructions supplied with each kit make the simple interconnection of units easy even for the novice.

THE KIT COMPRISES . . .

TWO MIDGET AMPLIFIERS each capable of 3W output. The reproduction is good, enabling you to get the best from both your stereo or monaural recordings. Both amplifiers are complete with well-designed output transformers providing perfect matching to standard 3-7Ω loudspeakers, and have remote bass, treble and volume controls. Size 5" x 2½" x 3" high (each amplifier).

CONTROL UNIT, this is a flying panel fitted with three 2-gang potentiometers, enabling the bass, treble and volume controls of each amplifier to be positioned in the most convenient place in your layout. These dual controls are equipped with attractive cream and gold knobs and an escutcheon is provided for the complete panel.

SEPARATE POWER PACK complete with valve rectifier, although of midget size (5" x 2" x 3½" high), provides power for complete amplifier equipment.

ISOLATED MAINS TRANSFORMER of robust construction is a separate unit and may be mounted independently.

VOLTAGE SELECTION PANEL. Consisting of a panel fitted with the "valve base" type of mains input selector and a channel output socket.

ONE LOUDSPEAKER, a good quality 5-inch speaker, specially selected for this equipment. (Note: The second speaker may be purchased for us for an additional 14/6.)

CREAM DOUBLE PUSH BUTTON SWITCH of attractive design gives positive on/off switching action.

INDICATOR LIGHT. This pilot light provides visual indication that the equipment is operating, and is complete with an attractive gold-finished escutcheon.

This kit, which is complete in every way, is exclusive to HARVERSON'S, who are proud to present it at the amazing price of

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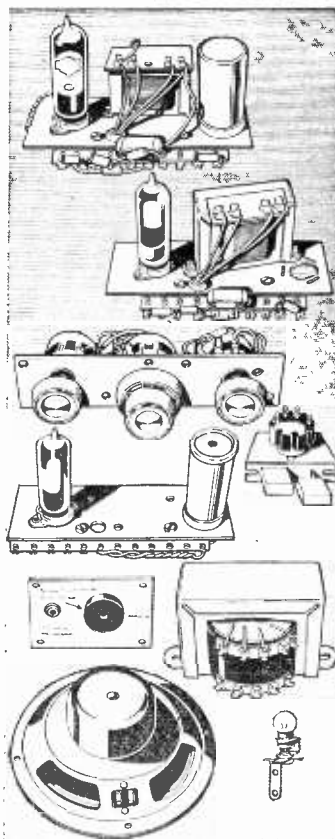
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FOR MORE BARGAINS SEE OUR OTHER ADVERTISEMENT
On PAGE 771

HARVERSON SURPLUS CO. LTD.

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**"MINITEST"
Model 127A**

,000 o.p.v. POCKET SIZE!

Performance equal to a high priced instrument

OUTSTANDING FEATURES:

- ★ Sensitivity 20,000 o.p.v. D.C. 1,000 o.p.v. A.C.
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- ★ A.C. Volts 10 v. to 1,000 v.
- ★ 3 Resistance Ranges from 0-20 megohms (self-contained).
- ★ Meter 40µA 3½" arc.
- ★ Accuracy D.C. 3%, A.C. 4%.
- ★ Dimensions 5½" x 3½" x 1½".

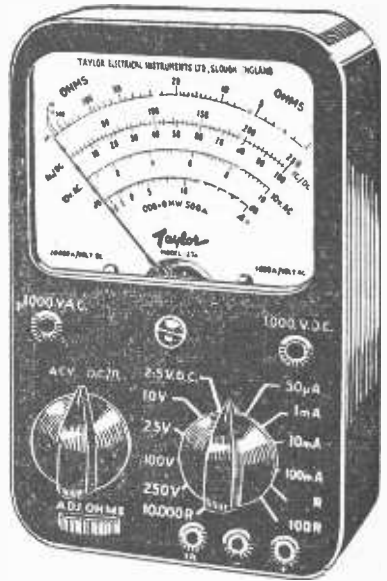
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Complete with instruction Manual and interchangeable test prods and clips. High quality leather case, if required, £1.12.0.
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DAF96, DF96, DK96, DL96, SET of 4, 26/-.

1D5	7/-	DL92	5/11	PCF82	7/6
1R5	5/-	DL94	6/9	PCL82	7/6
1S5	4/6	DL96	6/9	PCL83	10/6
1T4	3/9	EB91	3/-	ECL84	7/6
3S4	5/11	EB94	7/6	PL38	10/9
3V4	6/9	EBF80	7/9	PL81	8/-
5U4G	4/3	EBL21	12/6	PL82	7/-
5Y3GT	5/8	ECC81	4/9	PL83	7/-
5Z4G	7/3	ECC82	5/9	PL84	9/6
6AM5	2/9	ECC83	6/3	PY32	10/3
6K7G	1/9	ECC84	8/-	PY80	7/-
6K8G	4/9	ECC85	7/9	PY81	6/3
6Q7G	5/6	ECC86	8/3	PY82	6/3
6V8G	4/9	ECC87	8/3	PY83	7/3
8V8GT	6/-	ECL21	12/6	U25	12/-
8X5GT	4/9	ECH42	7/9	U26	10/-
12K7GT	4/9	ECL80	7/-	UABC80	7/6
12K9GT	11/-	EF41	7/6	UAF42	8/6
12Z7GT	4/6	EF90	4/9	UBC41	7/-
36L3GT	8/6	EF95	5/6	UBF80	8/6
35Z4GT	5/3	EF96	5/6	UCC85	7/-
AZ81	8/9	EF98	6/9	UCH21	12/6
CL33	11/9	EF91	1/9	UCH42	7/6
DAC32	9/8	EL41	7/-	UCH81	8/-
DAF91	4/6	EL84	6/3	UCL82	10/-
DAF96	6/9	EY51	6/9	UCL83	13/-
DF33	9/8	EY98	7/6	UF41	7/9
DF91	3/9	EZ40	6/-	UF85	8/-
DF96	6/9	EZ41	6/9	UF99	6/6
DE77	6/-	EZ80	5/9	UL41	7/-
DK32	11/-	EZ81	6/6	UL84	7/-
DK91	5/-	EZ30	8/-	UY21	11/-
DK92	7/3	MU14	7/-	UY41	5/9
DK96	6/9	PCC84	7/3	UY85	6/3
DL83	8/6	PCC89	10/-	VP4B	8/9
DL85	8/6	PCF80	7/3	Z77	3/9

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TELEPHONE HUNter 0755

A Mains Capacity Tester

CHECKING DIELECTRIC INSULATION

By R. R. Staney

THIS unit was designed to fulfil the need for a simple and effective means of testing most types of capacitor found in radio equipment. All components are obtainable on the surplus market and the total cost of the unit should not be much more than ten shillings.

Uses of the Tester

Electrolytic and non-electrolytic capacitors of 150VW and above can be tested on the unit. Apart from indicating the two main faults likely to be found in old or surplus capacitors, the unit will enable the user, with a little experience, to assess the condition of capacitors.

If the neon is purchased without a series resistor the following simple test will determine the value required. The neon should be connected across the mains in series with a 0.5M resistor. If this value does not give a strong enough glow, lower values should be tried in steps of approximately 50k. If the neon glows too brightly with a bluish tinge, it should immediately be disconnected and a higher value tried.

Wiring the Switches

The switches used in the unit are of the single pole changeover push type obtainable on the surplus market. It is important that S1 and S2 should be wired so that tags A and B on S1 and tags C and D on S2 (Fig. 2) are joined when the switches are depressed. A non-reversible mains plug should be used on the supply lead to the unit, and the "live" side should be taken to tag A on S1. If the switches are wired in this manner, the test leads will not be at mains potential until S1 is depressed.

Housing the Unit

The layout of the components is not critical and individual constructors can build and house the unit to their own requirements. For those who would like to follow the author's layout, details are given below.

Fig. 2 shows the arrangement of components on the rear of the front panel, which measures 5½ in. x 2½ in. and is of ¾ in. plywood. The neon bulb is mounted in the position shown (in the prototype, a small home-made metal clip was used), and a hole cut or drilled in the panel so that the neon light can be clearly seen. If a wire-ended neon is used, these wires should be heat shunted when soldering to avoid cracking the glass seal. In the prototype, MR1 was mounted by means of small "L" brackets, and the smoothing capacitor is supported by its own wires, but a capacitor clip could just as easily be used.

Two wander plug sockets are mounted as shown for connecting test leads to the unit. Plastic panel mounting sockets are ideal as they must be well insulated from the wooden panel, otherwise the

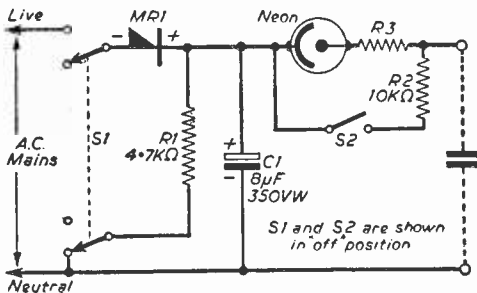


Fig. 1.—The circuit diagram (with S1 and S2 in the "off" position).

As will be seen from the circuit diagram (Fig. 1), the unit has a neon indicator in series with a source of D.C. supply and the capacitor under test. The D.C. supply is obtained through MR1, and smoothed by an 8μF electrolytic capacitor. This value is not critical, and if available a double electrolytic could be used with both halves connected in parallel to give 8μF or above. Experiments showed that a value as low as 4μF was quite satisfactory.

In the "off" position of S1, C1 is shorted through R1 thus discharging C1 and the capacitor under test through the neon indicator. In the "on" position, R1 is put out of circuit and the mains supply connected to the unit. By closing S2 the neon and its series resistor R3 are by-passed by R2. The object of this arrangement is to reduce the charging time required by high-value paper capacitors and most electrolytics under test.

The Neon Bulb

The neon used in the prototype is of the type found in "mains testing" screwdrivers and panel mounting indicators. However, a ¼ or ½W pygmy neon bulb will be found equally satisfactory.

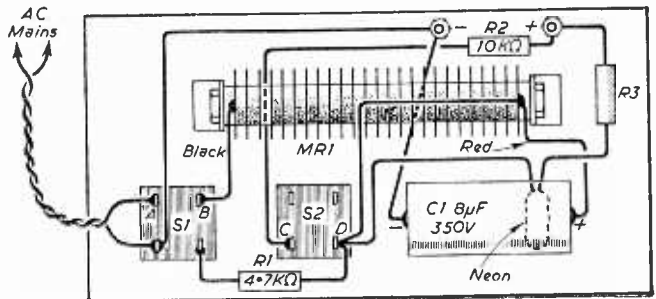


Fig. 2.—The component layout.

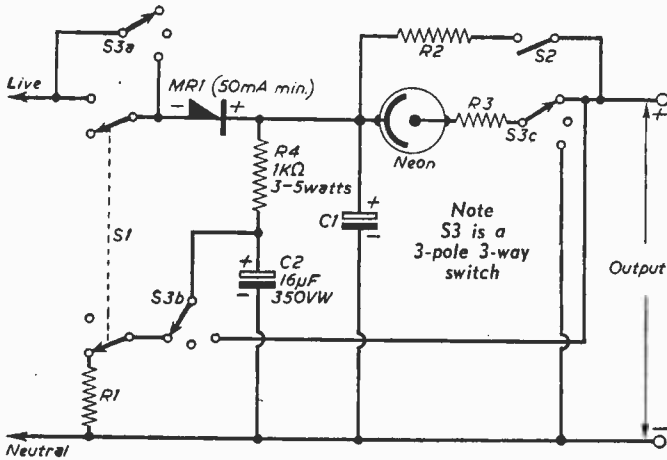


Fig. 3.—The circuit modified for a D.C. supply.

COMPONENTS LIST

R1 4.7k $\frac{1}{2}$ W

R2 10k $\frac{1}{2}$ W

R3 See text. $\frac{1}{2}$ W

C1 8 μ F 350VW

S1 } See text.

S2 } See text.

MRI Metal rectifier, 250V, 30mA.

Neon See text.

Two wander plugs and sockets.

Two bulldog clips.

smallest leakage through the panel will give an indication on the sensitive neon.

Two insulated test leads will be required, fitted with wander plug at one end, and bulldog clips at the other. The clips should be covered with large diameter plastic sleeving. In the prototype, the component panel was housed in a simple plywood box 2½ in. deep. This could be shallower if required as the actual depth of the mounted components is less than 1½ in.

Using the Unit (Non-electrolytics)

When S1 is depressed, with a good capacitor connected, there should be a flash from the neon as it charges and then no further indication until S1 is released, when a flash will occur as the capacitor under test discharges.

If a capacitor is short circuited the neon will glow continuously. If it is leaky, the neon will flash with a frequency depending on the amount of leakage. Reliable indications are given by the unit with capacitor values down to 500pF. (Short circuits, of course, are indicated whatever the value.)

Using the Unit (Electrolytics)

The procedure here is somewhat different, and although it may appear to be lengthy, in practice it is simple and quick. For convenience and ease of reference the procedure is given in a table. It

should be noted that with electrolytics, polarity should be observed when testing them on the unit. On the prototype, capacitors up to 300 μ F have been tested. Capacitors should be fully discharged before handling by depressing S2 while still connected to the unit. It is beneficial to electrolytics not in use to fully charge and discharge them several times in succession on the unit, as this helps to "form" them.

The tests should be carried out consecutively and in the order shown.

Action	Indication	Remarks
Depress S1.	(a) Neon lights. (May dim or go out after short period with low values.) (b) Neon does not light.	Not open circuited. Open circuited.
Depress S2. (Still keeping S1 depressed.)	(a) Neon goes out after a few seconds. (b) Neon does not go out. (c) Neon dims.	Good capacitor becomes charged. Capacitor short circuited. Capacitor leaky. (Degree of leakage indicated by amount of dimming.)
Remove one test lead and then release S1 and S2.	— — —	With a good capacitor fully charged this test determines whether it will hold charge
Reconnect test lead after approximately two minutes.	Neon lights for several seconds depending on capacity (e.g. 32 μ F—45 sec).	Shows that the capacitor has held its charge.

CLUB NEWS (continued from page 806.)

LEEDS AMATEUR RADIO SOCIETY

Hon. Sec.: D. Dinsdale, 69 Spen Lane, Leeds 16.

Meetings are held at 4 Woodhouse Square, Leeds 3.

An interesting lecture on aerials was held on November 30th with Mr. A. R. Bailey, G3IBN as the speaker.

Future Events:

- December 7th—Visit to Kirkstall Power Station at 7.30 p.m.
- December 14th—Christmas Rag Chew, 1961.
- January 4th—To be arranged.
- January 11th—Junk Sale.
- January 18th—Visit to G.P.O. Parcels Office at 7.30 p.m.
- January 25th—Film Show.
- February 1st—Transmitting Evening.
- February 8th—Open Night.
- February 15th—"Amateur T.V.," by D. Watson.
- February 19th—Visit to Odeon Theatre at 10 a.m.
- February 21st—Mullard Film Show at the Hotel Metropole.

LLANELLY AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec.: H. J. Hughes, G3ITW, 20 Ethel Street, Northampton.

The Chairman of the club, Mr. Arthur Jenkins, GW3HIR, announces the opening of its headquarters at Bynea Steelworks, Llanelly. All interested radio amateurs and short-wave listeners should contact the Hon. Sec. for information on membership and club activities.

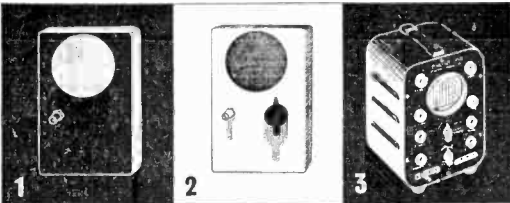
NORTHAMPTON SHORT-WAVE RADIO CLUB

Hon. Sec.: S. F. Berridge, G3ITW, 20 Ethel Street, Northampton.

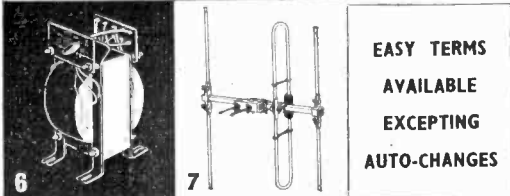
Meetings are held every Thursday at Allen's Pram Works, 8 Duke Street, Northampton. Meetings are held at 7 p.m. and the annual subscription is 7/6 and 3/9 for those under 18 years of age. At the recent Annual General Meeting the following officers were elected. President: B. Sykes, G2HCG; Chairman: P. L. Hunt, G3FWB; Vice-Chairman: M. A. Perry, G2ANS. Hon. Sec.: S. F. Berridge, G3ITW; Hon. Treasurer: S. Haddon (re-elected). Committee Members: R. F. Perrett, G3HWE and C. F. Robinson, G3HZF. Junior Committee Members: A. J. Hazelwood and P. Crane.

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- DOUBLE BEAM "SCOPE" for D.C. and A.C. APPLICATIONS.** A high gain, extremely stable differential Y-ampifier (30 mV/C.M.). Provide ample sensitivity with A.C. or D.C. inputs. Especially suitable for measurements of transient operating conditions where maintenance of D.C. levels is of paramount importance. Push-pull X amplifier; Fly-back suppression; Internal Time-base Scan Waveform available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external—1/P and CRT Brightness Modulation. A.C. mains 200/250 v. £19.19.0, P. & P. 7/6 or 50/- deposit plus P. & P. 7/6 and 12 monthly payments of 33/4. FULL 12 MONTHS GUARANTEE INCLUDING VALVES and TUBS.
- A.C. D.C. POCKET MULTI-METER KIT.** 2in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0-30, 0-100, 0-250, 0-600. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wirewound pot. (for ohms zero setting), toggle switch, resistor and rectifier. 19/6, P. & P. 1/6. Wiring diagram 1/-, free with kit.
- CHANNEL TUNER.** Will tune to all Band I and Band III stations. Complete with P.C.C.84 and P.C.F.80 valves (in series) 1.P. 16-19 or 33-35. Can be modified as an aerial converter (instructions supplied). 32/6, plus 3/6 P. & P.
- HEATER TRANSFORMER** to suit above, 200-250 v., 6/-, plus 1/6 P. & P.
- MAINS TRANSFORMERS.** All with tapped primaries, 200-250 volts, 0-160, 180, 200 v., 60 ma, 6.3 v., 2 amps, 10/6. 280-0-280 80 ma, 6.3 v., 2 amp, 6.3 v., 1 amp, 10/6. 350-0-350 v., 70 ma, 6.3 v., 1 amp, 6.3 v., 2 amp, 10/6. 250-250 v., 70 ma, 6.3 v., 2 amp, 10/6. P. & P. 3/-.
- WOLSEY 3-ELEMENT FOLDED DIPOLE.** 1.P.V. Aerial less mounting bracket for external use, complete with 12 yds. of coaxial cable, 15/-; P. & P. 3/6.
- CYLDON TURRET TELE-TUNERS 1 F 34/38 Mc/s.** Brand new complete with biscuit for channels 2, 4, 8 and 9. Less valves, 10/-; P. & P. 2/6. Pair of knobs to suit, 3/6. (Valves required P.C.C. 84 & P.C.F. 80).
- SIGNAL GENERATORS.** Cash £8.19.8 or 25/- deposit and 6 monthly payments of 21/6, P. & P. 5/-. Coverage 100 kc/s to 100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Case 10 x 6 1/2 x 4 1/2 in.

Three miniature valves and Metal Rectifier. A.C. mains 200/250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy ± 2 per cent.

10. SIGNAL GENERATORS. Cash £4.19.8 or 25/- deposit and 4 monthly payments of 21/6, P. & P. 5/-. Coverage 120 kc/s to 84 Mc/s. Case 10 x 6 1/2 x 4 1/2 in. Size of scale 6 1/2 x 3 1/2 in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Accuracy ± 2 per cent.

11. BATTERY RECORD PLAYER AND AMPLIFIER. 45 r.p.m. "Starr" motor. "Acos" crystal pick-up, 3 transistors push-pull amplifier, complete with transistors. Output 500 milliwatts, 49/6, P. & P. 3/6.

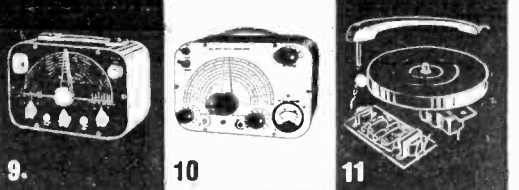
12. 8-WATT PUSH-PULL AMPLIFIER COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER. A.C. mains 200-250 v. Size 10 1/2 x 6 1/2 x 2 1/2 in. 4 valves, H.F. pent., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feed back. Two inputs, mike and gram, and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s, ± 4 db; 4 db down to 20 kc/s. Output 8 watts at 5 per cent total distortion. Noise level 40 db down all burn. Output transformer tapped for 3 and 15 ohms speech coils. For use with 8in. or 1.P. records, musical instruments such as guitars, etc. £4.19.8, P. & P. 7/6 or 20/- deposit plus P. & P. 7/6 and 4 monthly payments of 23/-.

13. B.S.R. MONARCH UAS WITH FUL-FI HEAD. 4-speed, plays 10 records, 12in., 10in., or 7in. at 16, 33, 45 or 78 r.p.m. Internixes 7in., 10in. and 12in. records of the same speed. Has manual play position; colour, brown. Dimensions: 12 1/2 x 10 1/2 in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Ful-Fi turnover crystal head. £6.19.8, P. & P. 5/- With Stereo Head £7.19.8, P. & P. 5/-.

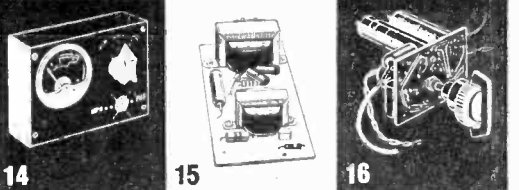
14. TRANSISTOR TESTER. For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case, size 4 1/2 x 3 1/2 x 1 1/2 in. Scale marked in gain and leakage. 19/6, P. & P. 2/6.

15. PUSH-PULL OUTPUT STAGE inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the POCKET RADIO. Kit of parts, including transistors. 19/6, P. & P. 1/6. Wiring diagram 1/6, free with kit.

16. PORTABLE AMPLIFIER. On printed circuit for A.C. Mains 200/250 v. Size 4 x 3 in. with tone and volume control. Valves: ECL82 and EZ80. 39/6, P. & P. 2/6.



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RADIO & T.V. COMPONENTS (Acton) LTD.

IS HALF YOUR TAPE RECORDER



WASTED?

The performance of a portable tape recorder is severely limited by the space available for its internal loudspeaker.

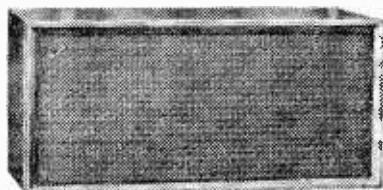
The connection of a high quality external speaker will reveal hidden detail in your recordings, and the Wharfedale PST/8 is an ideal choice.

This unique, patented enclosure design gives optimum results with Wharfedale 8in. foam surround units which are available in a range of impedances to suit all machines.

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WHARFEDALE PST/8

PRICE cabinet only
£10.10.0 finished in
walnut, oak or
mahogany veneers.
£7.10.0 in whitewood.



Recommended units 8in. Bronze/FS/AL £4.6.7
inc. P.T. Super 8/FS/AL £6.19.11 inc. P.T.

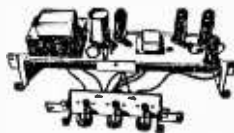
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WIRELESS WORKS LTD
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Gladstone Radio

PUSH-PULL AMPLIFIER £4.15.0 (3/- P. & P.)

Brand new 200-240 A.C. mains. Bass, treble and vol. controls on flying panel. Valves EZ80, ECC83 and 2-EL84 giving full 8 w. Chassis 12 x 3½ x 3½in. With 6p. trans. for 2-3 ohm speaker. Suitable for Crystal Mike input.



TWO-TONE BROWN RECORD PLAYER CABINET
(With Motor Board for Autochanger) and Gramophone Amplifier to fit Cabinet for £5.5.0 (5/- carr.). Size 17 x 15 x 8½in. Brand New.

State which Board—B.S.R. or COLLARO.

COMPLETE TAPE RE- RECORDER for only £19.19.0



B.S.R. deck. Two-tone leatherette case. Acos crystal mike. 850ft. tape, extra spool. On/Off Tone and Vol. 7 x 4in. Speaker. 1½ hrs. playing time. Single speed 3½in./sec., fast forward and reverse, mike and radio inputs, ext. speaker socket; cannot be accidentally erased, 13½ x 12 x 8in. Weight 20 lbs. 12 months guarantee. Carr. 7/6 extra. Terms: £6 down and 6 monthly payments of 50/-.

B.S.R. "MONARDECK" FOR TAPE SINGLE SPEED.
Our price only £8.10.0 including 850 ft. 1st grade tape, carr. pd.

**COLLARO STUDIO TAPE TRANSCRIPTOR 3
MOTORS. 3 SPEED. Push Button Controls. £12.10.0**
(10/- carr.)

AMPLIFIER FOR STEREO WORK



Beautifully finished wood cabinet with "gold" and brown dividing strip and "gold" finished fabric front. Size 13 x 7½in. front to back 4½in. 5in. P.M. speaker. ECL82 valve with metal rectifier. Vol. tone, on-off. 82/6 (3/- p. & p.).

**AMAZING OFFER!! BRAND NEW 6-12 VOLT D.C.
REVERSIBLE MINIATURE MOTORS AT A FRACTION
OF MAKER'S PRICE.**

Weight 2.1 ozs. Motor dimensions 1½in. long. 1½in. dia. Spindle 0.4in. long. .077in. dia. Consumption 0.72 watts off load. 7.68 watts on load. Speed 7,000 r.p.m. Switch. Centre off reverse by switching either side. General specification. These motors have a tremendous power-weight ratio, are extremely efficient. Can be used on 6 volts without great loss in power. Precision built in polythene housing. Self lubricating. With sintered bronze bearings. Easily mounted. Supplied Brand New and Guaranteed, 15/6, p.p. 1/6. Special price for quantities over 50.

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FOR GLADSTONE RADIO ON PAGE 785

transformer mounted on top. This will then leave space beneath the chassis for mounting a 100mA smoothing choke, to replace the first stage of resistance smoothing (2k wire-wound) in the original "Coronet." This will both improve the standard of smoothing, and minimise the voltage drop occasioned by the increased demand for H.T.; in actual fact, the H.T. voltage output to the anode and screen circuits of V1, V2 and V3 will be slightly increased, but this was found to have no harmful effects. The smoothing choke should be mounted so that its axis is at right angles to the laminations of the mains transformer mounted above the chassis, in order to obviate any danger of hum induction.

Increased Power Supply

The existing GZ32 rectifier valve is well able to cope with the increased power supply, demands and, as can be seen from Fig. 8, the existing 30 μ F electrolytics are retained. H.T. for the new pre-amp and output stages is drawn from the junction of the smoothing choke and the 33k resistor, i.e., after the first stage of smoothing. It will be observed from the theoretical circuit (Fig. 8) that slight modifications have been made to the circuitry of the EBL31 valve. The original 0.25M potentiometer (volume control) has been removed, and a 220k fixed resistor wired in its place, between "bottom" of the diode filter and the cathode of the valve; thus this resistor now becomes the "load" across which audio voltages are set up. The 0.02 μ F capacitor, formerly wired between slider of volume control and 470k grid leak resistor, is now re-wired between the diode load resistor and the "Radio" position on the radio/gram changeover switch.

Volume Control

A double section ganged volume control, of 0.5M, is mounted in the position vacated by the original "Coronet" volume control, and is wired between the rotor of the radio/gram switch and earth, while its slider is connected to the grid of the EBL31. The volume control thus acts as grid leak resistor for this valve, and the former 470k fixed resistor is no longer required. It is suggested that the section of the dual volume control nearest the chassis front panel be used for the feed to the EBL31 (i.e., Channel A). As dual volume controls with a combined on/off switch are in somewhat short supply, and also deeper in size than can be conveniently accommodated in the space available, it is assumed that a component without on/off switching will be used. This necessitates the provision and wiring in of a separate on/off switch, mounted either at some convenient point on the radiogram control panel, or actually in the mains lead of the receiver.

Stereo Balance

The reason for the circuit modifications is that it will enable the circuit of the Channel B amplifier to be made identical; in particular, it ensures that the signals from each channel pass through an identical number of capacitors between input and output. Lack of attention to this point would result in undesirable phase discrepancies between the two channels, making proper stereo balance impossible.

The pre-amplifier stage must now provide separate amplification and bass-boost for the two channels, and so the 6J5 of the previous design is replaced by a 6SN7 valve, which is virtually two 6J5 valves in one envelope; each section being identical in circuit and component values to the single channel pre-amp previously referred to, with the exception of the fact that means are provided of altering the "gain" of Channel B in respect of Channel A, so that correct stereo balance can be obtained. For this purpose, the 100k resistor wired between input socket and grid of the first valve stage in Channel A, is replaced in Channel B by a 250k potentiometer, which may

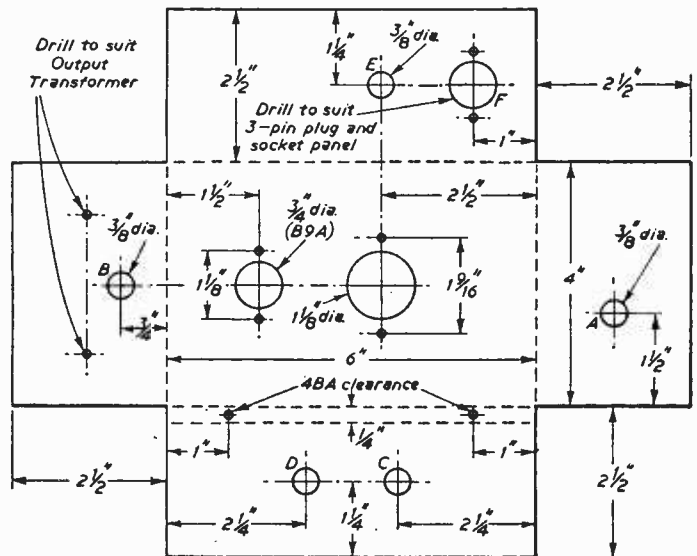


Fig. 9.—The drilling details for the additional stereo chassis.

be of the pre-set type. Once adjusted, it should not need further attention unless valves in the two channels age unevenly.

The outputs from the two sections of the 6SN7 are fed to the radio/gram changeover switch—this time, of course, both "poles" are utilised—when switched to "gram", the Channel A signal passes via the front section of the dual volume control to the EBL31 output stage of the "Coronet" chassis. The Channel B signal is fed through the rear section of the volume control, to the EL84 output stage, mounted on the pre-amp chassis. When switched to Radio a signal is fed only to Channel A for monaural reproduction.

BUILD IT YOURSELF!



THE FAMOUS COSSOR
(Traveller's Friend) Transistorised

£7.19.6 **POCKET RECEIVER**
P. & P. 2/-
in leatherette case

This set can be built for £7.19.6. Size 6 x 3½ x 1½ in. Weight 17 oz. This set covers medium waveband 190/500 metres intermediate frequency, 470 kc/s using 4 transistors (Ediswan) and 2 diodes on a printed circuit board, plus a 2½ in. moving coil speaker. Instruction book with point to point wiring diagram, 2/6 each. Batteries, PP4 (Ever Ready) 2/- each.



"SUPER-THREE"

Transistor Pocket Radio

Printed circuit technique using 2 Surface Barrier type transistors, one A.F. Trans and one Diode. Ferrite aerial, fully tunable on LW and MW. Uses 2 U16 1½ volt batteries. And easily assembled by the beginner.

Kit of Parts Complete

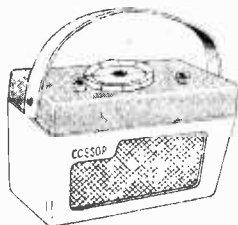
39/6

P. & P. 1/6

COSSOR BATTERY PORTABLE SPECIAL

£6.19.6

P. & P. 3/6



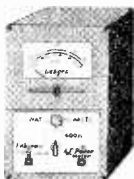
LIST PRICE 12½ gns

A printed circuit, 5in. speakers are features of this battery portable. An internal ferrite rod aerial for L and M Bands. A polythene wrapper provided to protect receiver. Width 10in., height 6½in., depth 5½in.

LABGEAR OUTPUT METER

£2.19.6

Complete Kit P. & P. 2/-



At last a Meter at the right price for the home constructor. An accurate Audio Power Output Meter. Two ranges 25mW to 1W and 1W to 10W. Accuracy 5% matched for 3. 15 600 ohms with inst. and tech. data. New 3-in. 0-1mA meter.

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TAPE RECORDERS THE "MAGNAPHONE"

A first class tape recorder at a reasonable price. Separate Treble and Bass controls for replay, facilities for monitoring and mixing, 3-speed Collaro Studio deck, and many other refinements. Output 4 watts.

£32.0.0

Complete with crystal microphone with lead and jack plug, 5½in. reel of tape and spare reel and spare lead for recording from radio.

21/- P. & P. & ins.

THE "VOGUE"

Another fine recorder fantastically cheap. It also uses the famous Collaro Studio 3-speed tape deck. Separate inputs for microphone and gram. recording, tone control for replay. Output 3 watts.

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Complete with microphone, reel of tape and spare spool.

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RECORDING TAPE OFFER

FAMOUS MAKE P.V.C. BASE ON PLASTIC SPOOL
1800ft on 7in. spool .. 32/6 1200ft on 7in spool .. 21/-
1200ft on 5½in. spool .. 22/6 850 ft on 5½in. spool .. 16/6

YOUR EXISTING RADIOGRAM OR RECORD PLAYER CHANGED TO STEREO BY OUR STEREO ADAPTOR

Tech. Data 2 valves EF80 and EL84. Switch control for Stereo and Mono Dual volume and tone control. Output 3 ohms, suitable for use with Acos GC/71, GP/73 and Garrard GC/10. Complete with wiring diagram.

Greatly Reduced

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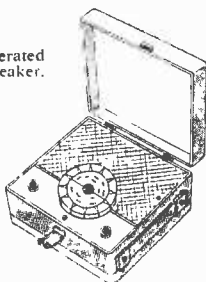
COSSOR BATTERY PORTABLE

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P. & P. 3/6

This extremely sensitive battery-operated set has a primed circuit and 5in. speaker. A frame aerial fitted in the lid gives high quality listening on L and M Bands.

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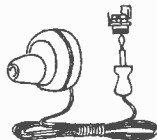
SPEAKERS

- 3½in. SPEAKER .. 17/6
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THE LATEST MINIATURE EARPHONE FOR TRANSISTOR RADIOS

This lightweight superbly made instrument enables you to listen in to your radio wherever you are. Ideal for all forms of travel, etc. Provides excellent reproduction and can be worn without any discomfort, complete with transparent earpiece, 3in. of fine flex, plug and socket.



Crystal earpiece as illus. High Imp. 10/- Usual price £1.1.0
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We can now supply all sub-miniature parts for the home constructor—transformers, coils, condensers, resistors—from our large stock of component parts.

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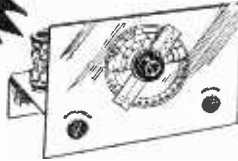
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ENSURE SUCCESS WITH R.C.S.

CONSTRUCTORS CORNER

Explore the world on short-wave radio (10-100m)

FOR ONLY **35/-**



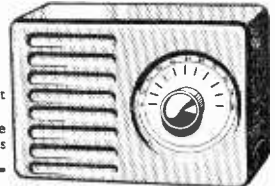
Construction price includes valve and one coil covering 40-100 m.
 ● Can be converted to 2v. or 3v.
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 Send 2/- for diagram and price list.

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EASY TO BUILD TWO STAGE TRANSISTOR SET
 The set that looks like a Radio Set.

- Attractive Case
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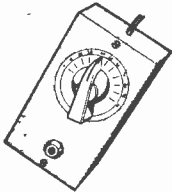
You can't go wrong. We guarantee good results
 Total Building Costs. P.P. 1/6 **25/-**



Components Price List. Layout Plans 1/6 free with order.

YOU CAN NOW BUILD THE R.C.S. TAPE TUNER

Will operate on all types of Recorder. Size 3 1/2 x 1 1/2 x 1 in. High impedance output, variable med. wave tuning. Triple wound Super-Hi-Q coil. Easily constructed from full instruction data and Layout Diagrams. Chassis and components colour coded.



All parts to Build. Post 1/6.

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CRYSTAL RECEIVER

Covers M/W Band

All components including case for **12/6**
 Ideal for the beginner

Post and packing: Under 10/- add 9d.; under 40/- add 1/6; over POST FREE

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POWERFUL PERSONAL PORTABLE

- ★ Sturdy metal case.
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FOR ONLY **35/-**

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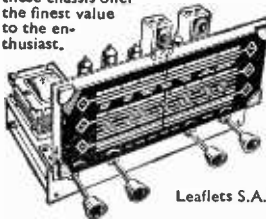
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TERMS: Remit with Order or C.O.D. Cash refund guarantee!

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ECH81, EF89, EBC81, EL84, EZ80
 Brand new and guar. A.C. 200/250v. Short - Medium - Long Gram. P.U. High Q dust core coils. Latest circuit technique. AVC and neg. feedback. 4 watts. Chassis size 13 1/2 x 6 x 7 in. Aligned and calibrated ready for use. Quality at Low Cost. Chassis isolated. H.P. Dep. £5 and five monthly of £1.

OUR PRICE **£9.9.0**

Matched Speakers, 5in., 6 1/2in., 8in., 17/6 ea. 10in. 25/- 12in. 30/-



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GARRARD 4-SPEED HIGH FIDELITY UNITS
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12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6
35L6	9/6
35Z4	6/6
807	5/-
954	1/6
956	2/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	9/6

Two Channel Tone Control

Simultaneously tone control of the two channels is also required, and as the author was unable to find an advertiser offering dual section potentiometers of the desired 50k, a 2-pole, 3-way switch was fitted to the same dimensioned extension panel as described for monaural gram modification, and arranged so that three fixed settings of the top-cut could be switched into circuit as desired. With the switch fully anticlockwise, the 10k and 33k resistors are placed in series between the 0.02 μ F capacitor and chassis, thus giving minimum top-cut; when turned to the central position, the 33k resistor is cut out of circuit, giving medium top-cut, and in the fully clockwise position, the 0.02 μ F capacitor is wired direct to chassis, giving maximum cut. It is desirable that the resistors are of at least 10% tolerance, or better still 5%, otherwise serious discrepancies might arise between the effect of the tone control on the two channels.

By careful planning, both the 6SN7 and the EL84 stages can be easily accommodated on the same chassis size (6in. x 4in. x 2½in.) as the previous design; indeed it is a simple matter to modify the chassis of design A to conform to that for design B, and it may well be that some constructors will carry out modification A as a first step, before proceeding to the more ambitious design, and this procedure can be followed without difficulty. The drilling details are shown in Fig. 9, from which it will be seen that, apart from the necessary provision of a hole ¼in. in diameter, to accommodate the EL84 valveholder, hole B is now re-positioned somewhat nearer the chassis bend and, instead of carrying the gram input socket, is now a grommeted hole giving access for wires to the primary of the Channel B output transformer. Further holes are drilled in the rear chassis runner for fixing the output transformer, which is mounted horizontally on the outside of the chassis. A new input socket, of the three-pin type, is mounted behind hole F, which should be drilled to suit, and hole E is to accommodate the pre-set balance control.

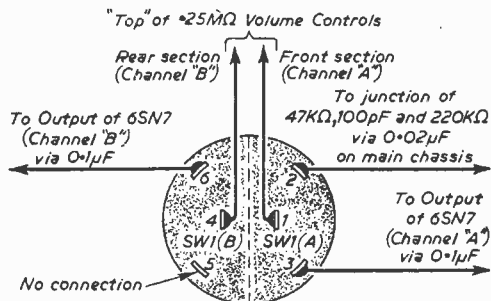


Fig. 10.—The radio/gram switch for the stereo unit. (Channel "B" is out of circuit when switch is on "radio".)

Wiring Instructions

As it is probable that only the more experienced constructors will undertake this modification, it is not proposed to give detailed point-to-point wiring instructions. The circuit diagram, read in conjunction with Figs. 10 and 11 should provide all

necessary information. Warning is again given to guard against possible short circuits when making connections in the single screened cable between the volume control, radio/gram switch, etc.

Testing

When the wiring has been completed and checked, and a loudspeaker connected to the output transformers of each channel, the "hum" test with a screwdriver blade can be carried out. This time, when the blade is presented to the live input

Component List for "Stereo" Modification

- Chassis (6in. x 4in. x 2½in.).
- 16s.w.g. Aluminium panel (5in. x 2½in.).
- International octal valveholder.
- B9A Valveholder.
- 3-pin chassis mounting plug and socket, with screening cover.
- 2-pole 2-way switch.
- 2-pole 3-way switch.
- Control knobs, to match existing "Coronet" type—2.
- 5-way tagstrip (centre tag earth).
- 2-way tagstrip (one end earth).
- 6B.A. solder tags—2.
- 18in. Twin twisted PVC flex (heater wiring).
- 12in. Single PVC flex, red (H.T. lead from "Coronet" to pre-amp).
- 18in. Single screened wire.
- ¼in. Rubber grommets—3.
- 8 μ F 350VW electrolytic capacitors—2.
- 25 μ F 25VW electrolytic capacitors—3.
- 0.05 μ F 450VW tubular capacitors—2.
- 0.02 μ F 450VW tubular capacitors—2.
- 0.1 μ F 450VW tubular capacitors—2.
- 6SN7 Valve.
- EL84 Valve.
- Output transformer (matching EL84 to 3 Ω speaker).
- 3 Ω P.M. loudspeaker (of size and type for reasonable match to existing "Coronet" receiver speaker unit).
- Dual pattern 0.5M potentiometer (volume control).
- 250k Linear potentiometer (balance control).
- Smoothing choke, rated to carry 100mA.
- Mains transformer, 250-0-250, 100mA, 6.3V, 4A, 5V, 3A.
- On/off switch (panel mounting "Toggle", or "Push Button" for insertion in mains lead).
- Nuts and bolts, connecting wire and sleeving as required.
- Resistors:
 - 1k ¼W—2.
 - 22k ¼W—2.
 - 68k ¼W—2.
 - 100k ¼W—1.
 - 220k ¼W—1.
 - 470k ¼W—2.
 - 10k (5-10 per cent tolerance) ¼W—2.
 - 33k (5-10 per cent tolerance) ¼W—2.
 - 10k ¼W—2.
 - 47k ¼W—2.

sockets, first one speaker and then the other should respond. If all is well, fit the 3-pin plug to the stereo pickup lead (live wires to the outer prongs, screen to the remaining prong), wire the mains supply to the gram motor, and all is ready for a trial run. It is recommended that an ordinary monaural L.P. record be first played. Turn up the volume control to a comfortable listening level, and carefully adjust the balance control until the sound appears to come from a point midway between the two speakers, which should be placed not less than four feet apart, facing into the centre of the room. If this effect cannot be obtained from a normal listening position, it is probably because the two speakers are out of phase. To correct this, switch off, and reverse the connections of one of the speakers to its relative output transformer, and repeat the test; it should now be possible to centralise the sound source. Now play a stereo record, and verify that left and right channels are being reproduced by their correct speakers; one of the demonstration records is ideal, as the spoken commentary will quickly establish the identity of the two channels. If the output is reversed, change over the pickup leads to the live input sockets.

For reasonable results, the speaker chosen for the additional channel should be as similar as possible to the original. If the "Coronet" was formerly operated with a small 5in. or 6½in. speaker it will be well worthwhile obtaining two new 8in. speakers.

Housing Cabinets

It is essential that the completed equipment be housed in suitable cabinet, either in a single extra wide console housing both speakers, or, of course, the modified "Coronet" and Channel A speaker can be housed in the traditional type of radiogram cabinet, and the Channel B speaker in a separate

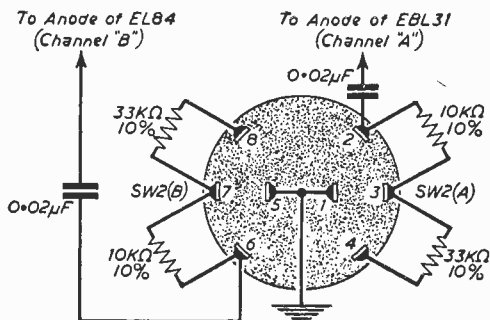


Fig. 11.—The three position top-cut tone control for simultaneous operation of channels "A" and "B".

cabinet, enabling the two to be placed at a convenient distance apart. Final adjustment of the balance control should be carried out with the equipment mounted in the cabinet.

The results obtained by the author have been very gratifying, and well up to the standard of commercially produced stereograms costing very much more than the overall cost of the "Coronet" and its modifications. Thus to anyone already possessing a "Coronet" receiver, the cost of an adventure into stereo will be quite reasonable. There is little doubt that many other receivers, both home constructed and commercially manufactured, could be adapted to stereo along similar lines; and the constructor of reasonable experience should have little difficulty in drawing up a design.

A list of components required for both modifications of the "Coronet" receiver is given; all components are easily obtained from advertisers in *Practical Wireless*.

RELIABLE RADIOGRAM

(Continued from page 797)

coil trimmers, the cores of L5 and T1 being left as they are. During the whole procedure C3 should be set to approximately half capacity as mentioned earlier. Final slight adjustments are permissible to ensure optimum operating conditions. It should be appreciated that this is only a "rough and ready" method of alignment.

The Speaker Enclosure

This was constructed from thick plywood and the dimensions can be ascertained from Fig. 10(a). Two ports approximately 6in square are cut in the top and bottom of this cabinet to permit air to circulate freely to the equipment in the main cabinet above. In the front of the cabinet an aperture is cut for the speaker after first positioning the retaining bolts. Gold fret slightly larger than that actually required is then stretched taut over the whole front where ¾in quadrant is placed to retain it. The edges of the fret are trimmed away once the quadrant is fixed firmly, thus leaving a neat finish.

The necessary legs are easily obtainable at handicraft stores etc., either polished or plain and with or without brass ferrules, thus making possible a modern styling. The cabinet is comparatively simple to construct, and since only the wood at the sides and the quadrant is visible, finishing is soon accomplished.

Where a speaker is already available and separately housed the arrangement depicted in Fig. 10(b) can be adopted or, alternatively, a speaker may be built into the main cabinet as mentioned earlier.

GENERAL COMPONENTS LIST

One 4-speed Autochanger (BSR Monarch). One 240V pygmy bulb and holder.
One equipment cabinet (The "Nordyck," by Record Housing Ltd.).
One 10in. speaker unit (see text). Set of four legs. Cable, connecting wire, solder, tags, nuts and bolts, etc.

Note:—The coils in the receiver are Osmor type: L1 QA8; L2 QA9; L3 QA5; L4 QO6; and L5 QA12.

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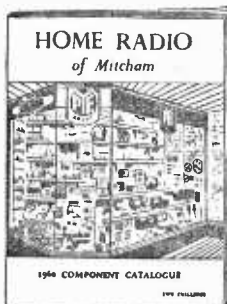
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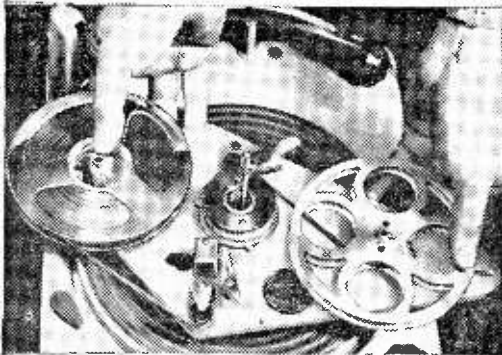
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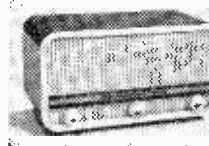
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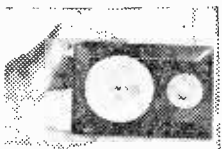
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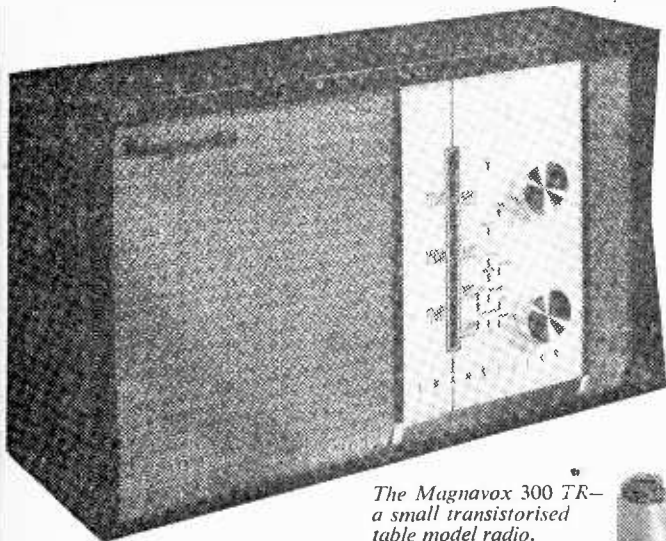
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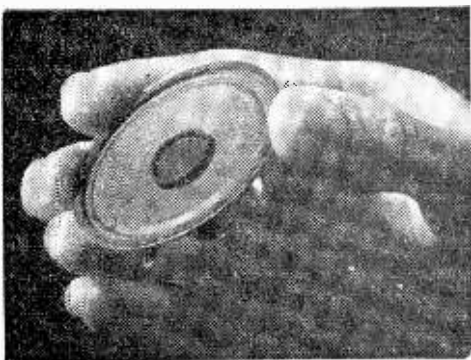
A well-known American company—Magnavox—has now entered the British market. Magnavox, who control the Collaro company, have begun distribution of radiograms, tape-recorders, record



*The Magnavox 300 TR—
a small transistorised
table model radio.*

players, transistor radios, and, in 1961, television sets. The policy of the company will be to select a limited number of dealers for their products, thus ensuring "steady stocks, stable prices and a high degree of dealer identity, associating with the public mind the quality dealer and the quality products".

The transistorised table model illustrated is battery-operated with long battery life and high output power. The cabinet is veneered with polished mahogany. *Magnavox Electronics Ltd., Ripple Works, By-pass Road, Barking, Essex.*



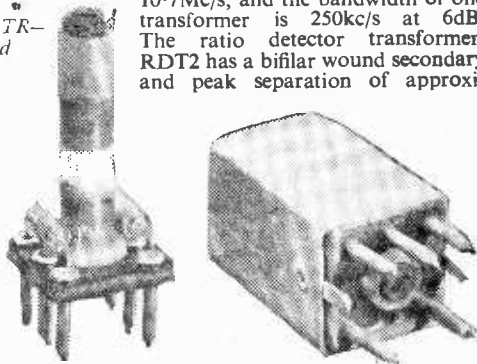
The Plessey 2 1/2 in. loudspeaker.

2 1/2 in. LOUDSPEAKER

A new miniature loudspeaker for use in modern transistorised receivers has been introduced by the Plessey Company Limited. The magnetic circuit uses a new constructional technique to enable the overall depth to be reduced to a minimum—a rod magnet is inserted into a split aluminium ring which is fitted into an accurately machined yoke. This design arrangement gives a compact, robust, unit without the use of magnet assembly bolts. The loudspeaker is available with a low impedance voice coil (8 to 10Ω) for use with a matching transformer or alternatively with high impedance coils for direct connection into transistor circuits. *The Plessey Co., Ltd., Ilford, Essex.*

MINIATURE I.F. TRANSFORMERS

Miniature I.F. transformers and ratio detector transformers for 10.7Mc/s are announced by Denco. The I.F. transformer IFT15 is double-tuned with tapped primary and secondary. The unloaded Q of the windings is approximately 70 at 10.7Mc/s, and the bandwidth of one transformer is 250kc/s at 6dB. The ratio detector transformer, RDT2 has a bifilar wound secondary and peak separation of approxi-



The Denco miniature components for 10.7Mc/s.

ately 220kc/s. Both transformers are of miniature construction with polystyrene formers and polystyrene foil capacitors. *Denco (Clacton) Ltd., 357-9 Old Road, Clacton-on-Sea, Essex.*

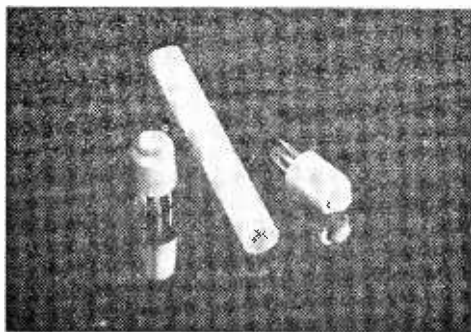
LOW VOLTAGE TRANSFORMERS

To meet the increasing demand for safe working voltages in commerce and industry as recommended by the Factory Acts, Gresham Transformers Ltd., have developed a range of low voltage transformers complying with B.S. 794 of advanced design and yet economical in price. These transformers reduce the dangerous mains voltage to a safe value for use with such applications as electric drills, grinders, sanders, inspection lamps, soldering irons, etc. The

transformers are totally enclosed in a robust hot-tinned sheet steel case and can be adapted for floor mounting, wall fixing, or for indoor use as a portable unit. They can also be supplied "weatherproofed". *The Gresham Transformer Group, Twickenham Road, Hanworth, Middlesex.*

I.F. TRANSFORMER

A new subminiature I.F. transformer—the "Fidis"—has been produced by the French company Orega. The unit is particularly well suited for use in pocket-sized, printed-circuit, transistorised receivers, but



Miniature I.F. transformers by Orega of France.

may also be used in all receivers where space is at a premium. It measures $\frac{3}{8}$ in. high and $\frac{3}{16}$ in. in diameter. Soldering pins are fitted for conventional mounting methods on printed-circuits. The Q of the coils is high—about 150-160. *Orega, 106 rue de la Jarry, Vincennes (Seine), France.*

TAPE RECORDING ACCESSORIES

A new Tape Accessories Kit has been introduced by Multicore Solders Ltd., for recording enthusiasts. This Bib kit contains the already well known Tape Splicer, a reel of Scotch Splicing Tape on a dispenser, an additional supply of cutters and the Bib Tape Data Card Calculator. The Data Card provides information of tape spools, playing times for all



The Bib Tape Accessories Kit.

types of tape at four different speeds and in addition contains the recording times of nearly 50 orchestral works. In a packet affixed to the lid of the kit, there are 24 Tape Reel Labels which are, like the Splicer, available separately. The labels are self-adhesive and provide an instant identification of all recorded reels of tape. The surface is suitable for typing, or for pencil or ink and allows the titles, composer, artist, reel number, date, speed and type of tape to be noted. The Bib kit containing the five items retails at 28s. 6d., whilst the Splicer at 18s. 6d., and the Labels at 2s. 6d. are available separately if required. *Multicore Solders Ltd., Maylands Avenue, Hemel Hempstead, Hertfordshire.*

MICROPHONES AND ACCESSORIES

The complete range of Shure microphones and accessories is now available in the U.K. The series is very comprehensive and includes models for broadcasting, Professional recording etc. Ribbon, dynamic, controlled-magnetic, crystal and carbon elements are employed. Transistorised controlled-magnetic units



The Shure model 43J "Commando" Series controlled-magnetic microphone.

are also available for direct replacement of carbon microphones. Full details and supplies are obtainable from the U.K. representative for Shure Brothers—*Mr. J. W. Maunder, 95 Hayes Lane, Beckenham, Kent. (BEC 7413).*

TAPES FOR CHRISTMAS

Magnetic tape is growing in popularity as a gift, and for some weeks before Christmas, the most popular sizes of Philips tapes will be contained in a special pack. The pack is in bright colours and there is a space for the name and address of the recipient. *Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.*

VALVE MANUAL

A completely revised Valve Manual for use with the Taylor Valve Tester, Model 45C and earlier versions of this instrument, Models 45A; 46A; 47A and 45B has been published. The Chart is priced at 10s. post free and includes over 5,000 characteristics and settings. *Taylor Electrical Instruments Ltd., Monrose Avenue, Slough, Buckinghamshire.*

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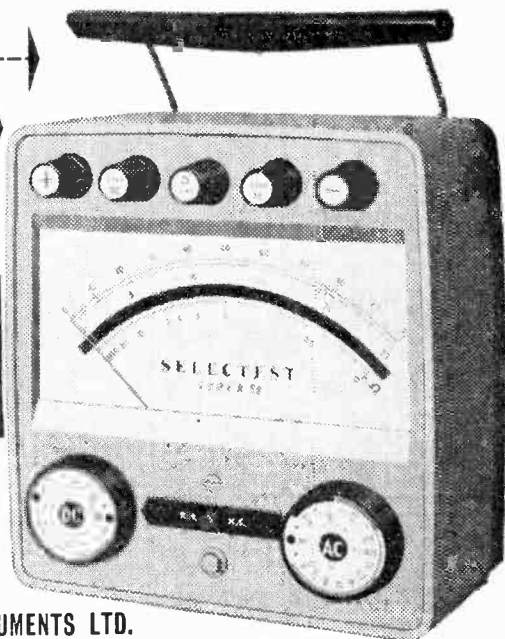
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TRANSISTOR TRANSFORMERS

BASIC DESIGN CONSIDERATIONS

By H. B. Dempsey

TRANSFORMER coupled transistor amplifiers are usually dismissed on account of the bulk and cost of the transformer. The transformers illustrated show that these need not be bulky, the smallest has a core size of $\frac{1}{8}$ in. x $\frac{1}{8}$ in. x $\frac{1}{8}$ in., while the others are $\frac{1}{4}$ in. x $\frac{1}{2}$ in. x $\frac{1}{8}$ in.

The Cost of Transformer

The cost of the transformer depends upon the cost of the core. For an output stage where a high impedance load is not required, the primary inductance can be low and expensive high mu-metals need not be used.

Experiments with normal size silicon iron cored transformers will often prove disappointing. This is due to the fact that the few milliwatts output are dissipated in magnetizing the core, the iron losses are of the same order as the transistor power. By using small laminations the core volume, and hence the iron losses, may be reduced. One source of such small laminations is to be found in high to low impedance headset adaptors.

For experimental work it is desirable to have a range of transformer ratios available and suggested ratios are:

Primary 20 tapped at 15.		
Secondary 5 tapped at 3.		
giving useful ratios of 10 : 1	5 : 1	
7.5 : 1	4 : 1	
6.6 : 1	3 : 1	

Transformer Windings

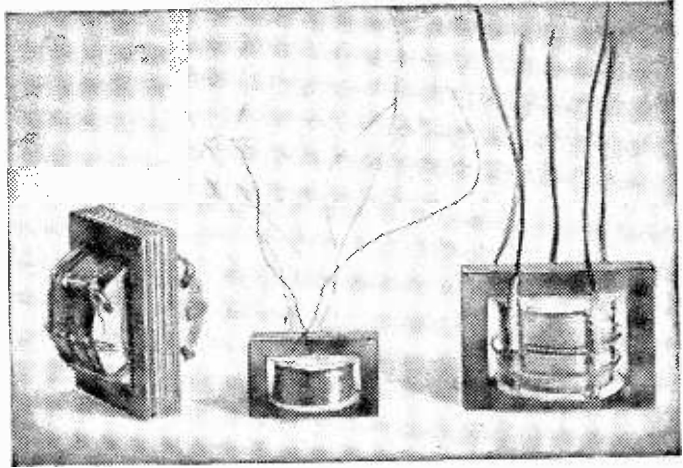
In the case of the larger transformers illustrated, a primary winding of 2000 turns tapped at 1500 with a 500 turn secondary is easily accommodated in the available winding space using 40 gauge wire. The smaller transformer has a 1250 turns primary and a 250 turns secondary, both wound with 46 gauge wire. 46s.w.g. enamelled copper wire proved to be the smallest size amenable to the method of winding used.

The bobbins were assembled on a mandrel of the same cross-section as the finished core, say $\frac{1}{16}$ in. square and 1 in. long.

Making the Bobbin

The stem of the bobbin was made by wrapping thin paper (0.002 in.) two or three times round the mandrel and applying an adhesive between each layer.

The cheeks were punched out of card (0.01 in. thick—cigarette packet) and the hole for the core chiselled out with a sharpened screwdriver blade, $\frac{1}{8}$ in. wide, to give a push fit on the stem. The cheeks were fitted to the stem, spaced to the core length and stuck with an adhesive and the surplus stem length trimmed off with a razor blade. The finished bobbin was made a sliding fit on the mandrel.



Winding was speeded by mounting the mandrel in the chuck of a wheelbrace held horizontally in a vice, and having checked the gear ratio, a check was kept of the number of turns of the driving wheel.

At the appropriate points taps were made by looping the wire and pulling it through slits in the cheeks. Care must be taken to keep the flying leads so formed clear of the subsequent position of the core. The ends of the wires were strengthened by doubling a couple of times and twisting for an inch or so to provide a stouter connection.

The primary was wound first, random fashion, followed by the secondary. As the voltages encountered are low there is no advantage in insulating the two layers with paper.

Driver and Output Transformers

Push-pull driver and output transformers have been wound bifilar fashion by the above method, winding the centre tapped secondary or primary from separate spools of the same wire, and laying them side by side. The start and finish of the windings in this case was carefully noted as the centre tap is formed by connecting the start of one to the end of the other.

The laminations were interleaved in the core. At the low direct current levels there is nothing gained by gapping it.

Radio-metal and mu-metal laminations are expensive. 50 pairs of E's and I's for the smaller transformer in radio metal cost 25s., providing enough for four transformers. A cheaper core could be made by using strip metal, about 18 in. long by $\frac{1}{4}$ in. wide, by 0.01 in. thick, and winding it into the core space copying C-core practice, without the joint. The transformers described are in use as interstage coupling and output transformer to a 3 in. moving-coil loudspeaker in a three transistor T.R.F. reflex-receiver. Correct matching by means of transformers effectively doubles the stage gain compared with R-C coupling. In the case mentioned, the frequency range is adequate for the speaker in use, and the set gives a fair volume for a battery drain of 5mA at 4½V.

Letters to the Editor

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

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

CRYSTAL SET RECEPTION

SIR,—With reference to D. J. Connolly's letter (PRACTICAL WIRELESS, October issue), I should like to say that, although not a common occurrence, to pick up Moscow and Prague on a crystal set is not too out of the ordinary, provided, of course, that conditions are favourable.

I have heard Radio Moscow several times in the last year, chiefly, however, either early in the morning, when the local station has not commenced its broadcasting, or between eight and ten in the evening, when it would naturally be easier to receive stations at that distance.

However, with respect to Mr. Connolly's situation in Britain, it would appear from a map that I, in London, am better placed than he is for reception of Prague Radió, but I have never heard it, although we are about equidistant from Moscow. The latter station seems to be somewhere between 210 and 225m.—A. LEA (London, W.C.2).

SIR,—With reference to Mr. Connolly's letter in the October issue, it is not unusual for long range reception on a crystal set.

He does not say, however, whether he was using a medium or short-wave coil, a crystal proper, or a crystal diode.

Beginners may not be aware that they can get good results with a short wave coil and crystal diode and interesting experiments may be easily made.

I have often experimented with crystal circuits and have received at good strength Finland, Sweden, France, Germany, Belgium, Prague Radio and, of course, Moscow, which, unfortunately, is sometimes difficult not to receive such is the power (distorted) of the signal!—A. RADMORE (Wakefield, Yorkshire).

A.C. OR A.C./D.C.

SIR,—In answer to F. R. Aldis's (September issue) attack on A.C./D.C. equipment, I would like to point out that although there are four areas in the UK with D.C. mains supply there are very few ships with A.C. mains. Many people join ships and have their own tape recorders, record players and receivers. Though some of the receivers are A.C./D.C. and can be used with the 220V D.C. supply, the other equipment cannot. The only solution is a rotary valve or vibrator converter which is very expensive and I have repaired too many for my liking.

There is only one ship's broadcast A.C./D.C. receiver with a good S.W. coverage and the only record player out in any number that is A.C./D.C. costs £12 more than the same model with A.C. only. Why this big difference for three valves and a couple of dozen components.

My opinion is that there is insufficient A.C./D.C. equipment, especially tape recorders (gramophones cannot be played in a rolling ship). There is not a single A.C./D.C. tape recorder reasonably priced.

The only danger with A.C./D.C. equipment is when people play with the "innards" when the set is switched on!—H. JORDAN (Bluff, New Zealand).

MODULATION

SIR,—On studying the circuits of various transmitters, I find anode and screen modulation is most popular. This method of modulation requires a reasonably high power of audio. To avoid using up extra space, more money, power, etc., surely it is possible to modulate the R.F. from the V.F.O. or crystal at a low power stage and then feed this modulated C.W. to the succeeding stages? This system would appear to be much simpler than an entire A.F. amplifier and would generally be a highly efficient way of effecting modulation. It is not, as far as I can see, ever used, so would someone be good enough to point out the snag, which unfortunately I am unable to see?

Returning to anode and screen grid modulation, could anybody give me a rough idea of the audio power required to modulate to 100 per cent, 150W of R.F., also the maximum power obtainable from a pair of 807's in any push-pull, and the values of the three gangs of the tuning condenser of an ex-Government 38 Mk.II Walkie-Talkie?—J. R. MILLER (Crewkerne School, Crewkerne, Somerset).

ONE VALVER

SIR,—Looking through the November edition of PRACTICAL WIRELESS I noticed Mr. K. Hamley's letter about the oddity of his valves running on 2V H.T. and 2V L.T. I also have had the same odd experience.

My radio, too, is a one valver, using 22.5V H.T. and 1½V L.T., with earphones, bringing in M.W. and L.W. stations very clear and loud. I was listening to the radio when I thought I would check the batteries, although the set was pulling in the stations at full power. When I tested the H.T. battery the voltmeter showed 2V. I was shocked when I found I was running the radio off 2V H.T. and 1½V L.T.—D. ILLINGWORTH (Leeds).

TRANSISTORS v. VALVES

SIR,—I have been following, with great interest, your many letters on Transistors v. Valves. My own opinion is that for performance the valve is far ahead.

C.R.T. ISOLATION TRANSFORMERS

TYPE A: OPTIONAL 25% and 50% BOOST. 2 V. OR 4 V. OR 6.3 V. OR 10.5 V. OR 18.3 V. MAINS INPUT. 12/6

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WIRE-WOUND RESISTORS 1/3
10 watt } 25 ohms-10,000 ohms 1/6
15 watt } 2/-

12.5K to 50K 10 w 3/3

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Long Play 7in. reel, 1,800ft	35/-	Spare
5in. reel, 1,200ft	23/8	Plastic Reels
5in. reel, 900ft	18/6	3/- ea.
Standard 7in. reel, 1,200ft	25/-	Metal
5in. reel, 600ft	18/-	7" Reels
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"Instant" Bulk Tape Eraser and Head Deflexer, 200/250 v. A.C., 27/6. Leaflet, S.A.E.

O.P. TRANSFORMERS: Heavy Duty 50 mA, 4/6 Miniature, 384, etc., 4/8. Multiratio push-pull, 7/6. Push-Pull 10 w. 15/6. 20 w. 6K or 8K, 30/-.

L.F. CHOKES 15/10 H. 60/65 mA, 5/-; 10 H. 85 mA, 10/6; 10 H. 120 mA, 12/6; 10 H. 150 mA, 14/-.

MAINS TRANSFORMERS: 200/250 v. A.C. STANDARD, 250-0-250, 80 mA, 6.3 v. 3.5 a. tapped 4 v. 4 a. Rectifier 6.3 v. 1 a. 5 v. 2 a. or 4 v. 2 a. ditto, 350-0-350... 22/6
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SMALL, 220-0-220, 50 mA, 6.3 v. 3.5 a. 17/8
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HEATER TRANS. 2.5 v. 14 amp. 7/6
Ditto, tapped sec. 2, 4, 6.3 v., 14 amp. 6/-
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ALADDIN FORMERS and core, 1in. 8d., 1in., 10d. 0.3in. FORMERS 5937/8 and Cans TV12, 1in. sq. x 2 1/2in. and 1in. sq. x 1 1/2in. 2/- ea., with cores.

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MAINS DROPPER 3in. 1 1/2in. Adj. Sliders. 0.3 amp., 1000 ohms, 4/3. 0.2 amp., 1000 ohms, 4/3.

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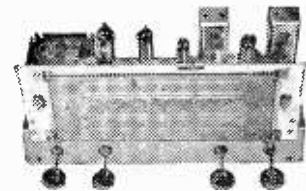
1R5	7/6	6K6G	7/6	6AC6	8/6	6Y8	10/-
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WIRE-WOUND 4 WATT Pots. Long Spindles. Values, 100 ohms to 50 K., 6/6; 100 K., 7/6.

ALUMINIUM CHASSIS 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2 1/2in. sides, 7 x 4in., 4/6; 9 x 7in., 5/9; 11 x 7in., 6/8; 13 x 9in., 5/8; 14 x 1 1/2in., 10/8; 15 x 14in., 12/6; 18 x 16 x 3in., 16/6.

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CONDENSERS. New Stock. 0.001 mrd. 7 kv. T.C.C., 5/6, Ditto, 20 kv., 9/6, 0.1 mfd. 7 kv., 9/6. Tubular 500 v. 0.001 to 0.05 mfd. Rd. 0.1, 1/-; 0.25, 1/6; 0.5/350 v., 1/8; 0.1/50 v. 32/41/1000 v., 1/8; 0.01/2,000 v., 1/8; 0.1 mfd., 2,000 volts, 3/6. **CERAMIC COND.** 500 v., 0.3 pF. to 0.01 mfd., 9d. **SILVER MICA CONDENSERS.** 10% 5 pF to 500 pF, 1/-; 600 pF to 3,000 pF, 1/8. Close tolerance (+1 pF) 1.5 pF to 47 pF, 1/8. Ditto 1.5 pF 50 pF to 81 pF, 1/8; 1,000 pF to 5,000 pF, 2/-.

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TUBULAR	TUBULAR	CAN TYPES
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2/250v. 2/3	100/350v. 3/-	16/500v. 4/4
4/450v. 2/3	250/25v. 3/-	32/350v. 4/4
8/450v. 2/3	500/12v. 3/-	100/270v. 5/8
8/500v. 2/3	8+8/450v. 3/6	2,500/3v. 4/4
16/450v. 3/6	8+8/500v. 5/6	32+32/350v. 5/6
16/500v. 3/6	8+16/450v. 5/6	32+32/450v. 6/6
32/450v. 3/6	8+16/500v. 5/6	50+50/350v. 7/6
25/25v. 1/9	16+16/450v. 4/3	64+120/275v. 7/8
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50/50v. 2/-	32+34/350v. 4/6	100+120/275v. 12/6

SELENIUM RECTIFIER. 300 v. 85 mA, 7/6. **CONTACT COOLED.** 250 v. 50 mA, 7/6; 60 mA, 8/6; 85 mA, 9/6; 300 mA, 21/-; 300 mA, 27/6. **COILS** Weatlex, "Q" type 2/- each. Osmor Midget "Q" type adj. dust core from 4/- All ranges. **TELETRON.** L. & M. T.R.F., with reaction, 3/6. **FERRITE ROD AERIALS.** M.W., 8/9; M. & L. 12/8. **T.R.F. COILS.** A/HF. 7/- pair. H.F. CHOKES, 2/6. **FERRITE ROD.** 8in. x 1/2in. dia., 2/6.

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3 p. 4-way 2 water long spindle... 6/6
2 p. 2-way, or 3 p. 2-way short spindle... 2/6
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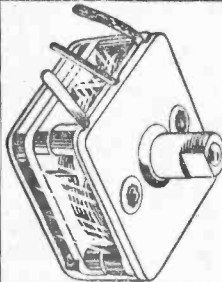
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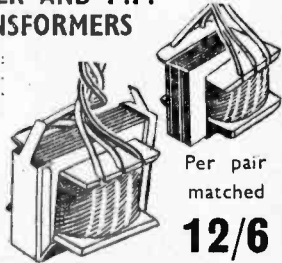


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Set of 3 I.F.s and coil. Can size $\frac{1}{2}$ " high x $\frac{3}{8}$ " sq. Individually checked before leaving factory. Very high Q, better than 125. Complete set... **21/-**

MATCHED DRIVER AND P.P. OUTPUT TRANSFORMERS

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Output—size $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " in.
300in. mW. Coloured leads.



HIGH GAUSS MINIATURE LOUDSPEAKER
1 $\frac{1}{2}$ " in. diam. x $\frac{1}{2}$ " in. deep
M.C. speaker. 9,500 Gauss ensures remarkably good quality. **25/-**

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Transistors are small, compact, and light in weight, and are obviously highly suitable for use in portable receivers, where small size is important, but the quality of the sound obtained from them is by no means as good as that obtained from their valve counterparts.

Another strong point in favour of the valve is that it is now being considerably reduced in size and weight. Many receivers using modern "button base" valves are as small as the more familiar transistor portable and certainly give more pleasing results.

I have heard the performance of many midge transistor receivers and I must say that I am rather disappointed, to say the least.—A. H. CARTER (Manchester).

CORRESPONDENTS WANTED

SIR,—I am 16 years old and am very interested in radio in all its aspects, especially short wave. I would like to correspond with someone of my age.

Has anyone a design for a small transceiver for 6 to 8 miles.—F. LUGINBUHL (12 rue des Rossignols Sèvres, Seine-et-Oise, France).

SIR,—I am a regular reader of your PRACTICAL WIRELESS, and interested in radio technology. I have recently started a course of radio engineering and I would like to correspond with any beginner of experienced radio technician from anywhere and of any age.—U. DIN (c/o Shell Co. of E.A.L., P.O. Box 82, Kampala, Uganda, B.E. Africa).

COMPONENT

SIR,—Referring to Mr. Bullen's letter in the October issue, I also had difficulty in obtaining a switch of the type I required but overcame it in the following manner. I purchased a "surplus" rotary switch with five wafers and carefully stripped this down. The inner rotating disc will be found in most cases to have a metal section on each side, and this can be removed by twisting the small locating lugs. It may then be cut if required, whilst the small clips situated round the edge of the outer discs are simply eyeleted in position. These also may be carefully removed by opening the eyelets with a penknife and carefully pushing them out. They can be reassembled in any desired pattern, the slips being tapped lightly with a hammer to close the eyelets and any desired pattern assembled. It is best to buy those switches which have the maximum number of clips round the edge to cover wastage due to damage, etc.—G. HENDRY (Wembley).

LOUDSPEAKER DESIGN

SIR,—Mr. Pickering's remarks in the August issue are noted, and I must confess I had many thoughts on similar lines. Some time ago I bought a damaged speaker cheaply and used it as a source of experiment, my interest lying in better reproduction than one usually associates with the ordinary speaker. I did find that the material from which the cone is made played an important part, but was not the be-all and end-all of the problem. The method of attaching the cone to the speaker (usually a spider of paper) seemed to me to play a much greater part, whilst a free-edge cone was not so good—at least in my experiments. Could not some speaker manu-

facturer produce some data showing facts which have been collated during experiments to enable those of us who are interested to carry out our own lines of experiment.—A. BENTLEY (Bath).

SIMPLE A.M./F.M.

SIR,—My main listening interest is in Luxemburg and I have a set which is used only for this. I recently heard an F.M. set and was impressed by the quality, but on looking into the matter find that the set is a bit complicated. I have been trying to adapt the medium-wave A.M. set to pick up the F.M. signals, but am faced with considerable difficulty.

Has any reader found a simple method of combining these two arrangements so that one set will tune to either the F.M. or the medium waves without complicated switching and circuit changes? I am sure other readers would be glad of details of a set on these lines.—G. PORTER (Melton Mowbray).

MAINS DUAL-WAVE 2

SIR,—I have often found that simple methods generally function best, and this was recently borne out by the small mains two valve set in the October issue. I have a 4-valver which I thought was quite good and I used it in my den for general searching, etc. When I read the dual-wave set I thought it looked easy so I dug out the necessary parts from the spares box and quickly "lashed it together". Although it did not occupy much over an hour before I had it working, it seems to perform better than my 4-valver. Reaction is admittedly a little bit fussy, but no doubt use will overcome this, but it is remarkably sensitive and it is indeed hard to choose between the two sets. When the reaction is properly adjusted it is just as selective. Thanks for a really nice little job.—R. E. TURNBULL (Harrogate).

TRANSISTOR HINTS

SIR,—I have a few transistors, which I use for small experimental sets, and units. After use in two or three different situations I found to my disappointment that the leads broke off at the base. I therefore thought of the following idea, which I would like to pass on to other enthusiasts who have had the same trouble themselves.

I slid wire insulation over the outer two leads. Then I made three pin holes in a piece of thick insulation and pushed the leads through, so that they projected about $\frac{1}{16}$ in. To these I soldered three flying leads. The longer these leads are, the safer it is to solder, because the heat has further to travel to the transistor. — G. L. PATTERSON (Brighton).

PUSH-PULL AMPLIFIER

SIR,—Recently, I made a push-pull hi-fi amplifier whose output valves had a common cathode resistor. However, I was told that greater output could be achieved with separate cathode resistors on the valves (EL84's).

The present cathode resistor (common) is 100 Ω and by-pass a condenser of 50 μ F.

Could any of your readers give me the value of the separate cathode resistors that I require? I shall indeed be grateful.—J. HASKELL (Fort Bombay, India).

RADIO MOSCOW

SIR,—I read with interest the letter of R. W. L. Limebear (December issue) with reference to Radio Moscow on 217m.

I agree that the signal strength is very good and this is because the transmitting station is located at Kaunas, Lithuania, in the U.S.S.R. The output is 150kW.

Incidentally, the other medium-wave station of Radio Moscow currently in use in their Winter Schedule, 227m, is located at Leipzig, East Germany.

I believe the Kaunas transmitter broadcasts a home service programme during the day time.

The short-wave stations of Radio Moscow broadcast direct from Moscow.

As regard Radio Luxembourg, the programmes are broadcast direct from Luxembourg and the excellent quality is due mainly to the output of the transmitter, 350kW.—P. J. KENNETT (Harrow, Middx.).

SIR,—May I inform reader Limebear (December, 1960) that Radio Moscow broadcasts are direct and not relayed. Moscow transmitters are the most powerful in the world and programmes can be heard at strength throughout the whole day. Voice of America, however, does employ trailers to relay her broadcasts and regularly announces their location and call sign. Radio Peking likewise can often be picked up on a small crystal set. Radio Luxembourg and Radio Eirean are examples of popular stations employing hardly enough power to bridge the ether. Interested listeners should not hesitate to write to radio stations sending reports of programmes heard and their views. The result is that a wonderful new field is opened with opportunities of stamp exchange and regular mailings of literature and friendly letters in English. Every letter received from Prague, Czechoslovakia, contains a free lottery ticket and amusing literature and aerial data can be had from Eddy Startz, Radio Happy Station, which beams our way every Sunday.—E. HAINES.

CONSTRUCTOR'S GUIDE

SIR,—I have purchased the December issue of the PRACTICAL WIRELESS which contains the very useful "Constructor's Guide". I think, however, there is an error in line 5 page 15—"47 000pF—or—0.0047μF".

Should this not be 0.047μF?—P. L. PARKER (Ipswich).

(Mr. Parker is quite correct; 47,000pF=0.047μF—ED.)

DRAIN PIPE EFFECT

SIR,—Your correspondent, C. E. C. (Boreham Wood) in the December issue, is almost certainly experiencing something that the Post Office have named "drain pipe effect".

Corroded joints in lengths of pipe, electric conduit, telephone wiring, etc., act as diode mixers because of rectification properties, and then reradiate the signal. The set, however selective, cannot separate the programmes once modulated in this way, and it is most common for the Home Service to modulate the Light rather than the other way round. This effect most often shows up when indoor or loft aerials are used.

The solution of course is not to pull the drain pipes apart, but to fit an aerial as clear of the building as possible. A little experiment shows the best arrangement.—S. J. BRAGMAN, A.I.P.R.E. (Ilford).

GUITAR AMPLIFIER

SIR,—The following information is furnished in response to readers' queries:—

Mains transformer: secondary: 275V-0-275V at 100mA, 6.3V at 3A, and 5V at 2A. A standard H.T. secondary of 300V-0-300V is satisfactory.

Smoothing choke: The inductance of this is not too important, but the choke must be capable of carrying 50mA D.C. and its resistance should be about 250Ω. A discarded output transformer primary is ideal.

Output transformer: Push-pull 10-12W 6V6 to 3Ω or 15Ω.

Incidentally, if a mains transformer of 350V-0-350V H.T. secondary is used (this being a very common rating) it is suggested that a 500Ω 10W wire-wound resistor be inserted between the rectifier cathode and the H.T. and line, mounted above the power chassis on a small tag-strip for ventilation purposes.—B. L. PHILLIPS.

VALVE BASE TROUBLE

SIR,—I was interested to read of the problem of G. Rich (December PRACTICAL WIRELESS). I am a technical representative in the plastic industry and am sure the valve holders are "tracking". The problem is fundamental and inherent in all moulding materials based on phenolic or cresylic resins and no matter what fillers are used, once a path is formed across the surface, a conducting carbon track is carved in the plastic.

Fortunately there are materials which do not form this carbon track, among them urea and melamine formaldehyde plastics (not, regrettably, used very often for ordinary valve bases but mainly for domestic electrical plugs, sockets and switches, etc).

Also there are, of course, the alkyd plastics which will only track under very severe conditions (very high voltage 2000V— and dampness), but I think Mr. Rich should change to a thermoplastic insulator or even go back to ceramic.—J. N. ALLEN (Manchester).

ELECTRONIC SMOOTHING

(Continued from page 795)

An Example

If a 6C4 valve is used, R4 should be about 820Ω and R3 about 1.3k. A 2k potentiometer should therefore be used for R3. The heater of this valve requires 6.3V at 0.15A.

The power pack voltage should not exceed about 320V, or the ratings of the valve may be exceeded. The resistor, R3, reduces the output voltage. In order to keep this reduction as small as possible and to keep the regulation reasonable, the output current taken from the circuit should be kept as small as possible. It should therefore be used to supply only the particular parts of the equipment which really do require a well-smoothed supply. The power supply for any other parts of the equipment should therefore be taken directly from the power pack. The heater supply for the valve used in the smoothing circuit can normally be taken from the same transformer winding as that which is used to supply the other parts of the equipment.

It has been found that the circuit shown will easily reduce hum and other ripple to less than a few millivolts. The ripple in the output of a normal power pack may be a hundred or a thousand times greater than this.



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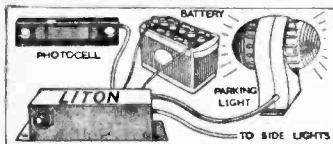
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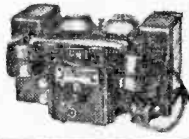
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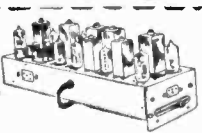
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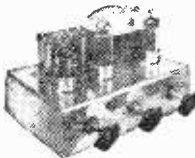
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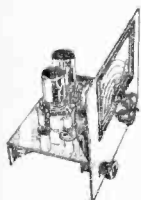
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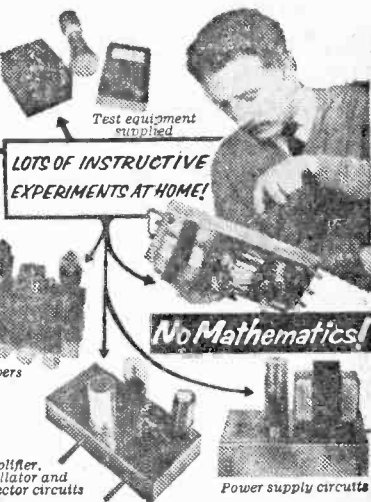
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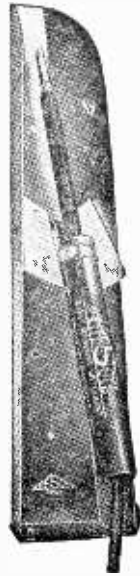
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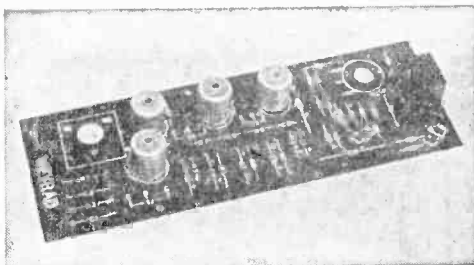
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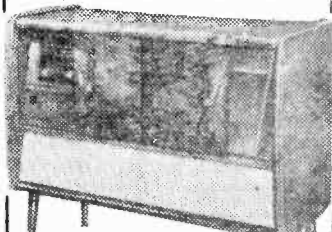
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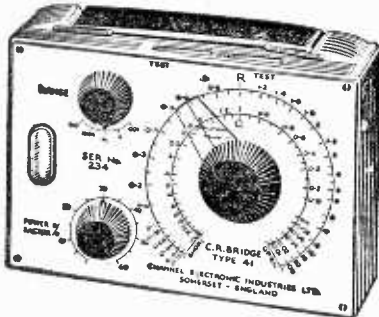
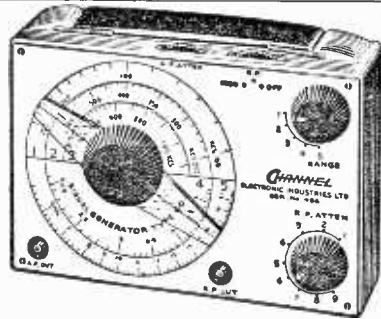
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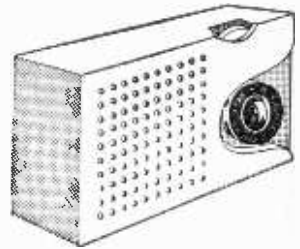
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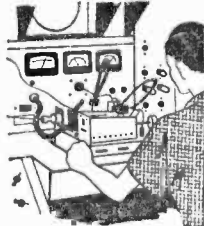
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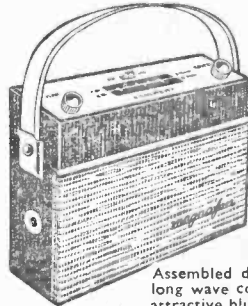


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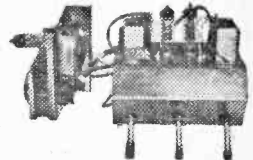
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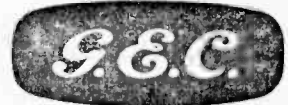
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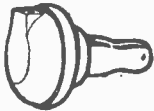


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Practical Wireless

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The index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to

PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2.

SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

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Junior Crystal Set	PW94*	2/-
Dual-wave Crystal Diode	PW95*	2/6

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The PT Band III converter	—*	1/6

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Experimenter's Short Wave	PW30a*	2/6
Midget Short Wave Two	PW38a*	2/6
Band-Spread Three (Battery)	PW68*	2/6
Crystal Receiver	PW71*	2/-
Signet Two (Battery)	PW76*	2/6
Simple S.W. One-valver	PW88*	2/6
Pyramid One-valver	PW93*	2/6

BBC Special One-valver	AW387*	2/6
Short-Wave Two	AW429*	2/6
Short-Wave World Beater	AW436*	3/6
Standard Four Valve S.W.	WM383*	3/6
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Standard Four Valve	WM391*	3/6
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PRACTICAL WIRELESS, JANUARY, 1961.

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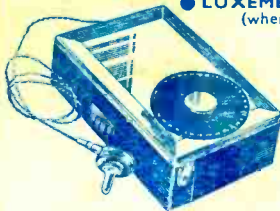
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