

A POCKET TRANSISTOR T.R.F.

PRACTICAL 16 WIRELESS

JULY
1960



CONTENTS

USING MODERN TRANSISTORS
TWO-VALVE CIRCUIT
ANALYSER
AN A.M. FEEDER UNIT
TRANSISTOR SUPERHET
CIRCUITS
CONVERTING THE P104
ETC. ETC. ETC.

PORTABLE RADIOPHONES MODEL MK II

We are proud to offer these Brand New British Army Portable Transmitter/Receivers. The improved model MK II (not to be confused with earlier models) is sold exclusively by us!



ONLY
60/- PER
SET
P. & P. 4/-
Batteries
20/- per Set.

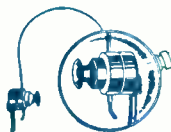
Consists of Transmitter/Receiver covering 7.4 to 9 Mc/s and designed for reliable voice inter-communication up to 10 miles depending upon obstructions and elevation. On test the Receiver astounded us, for we heard 65 Short Wave Stations—one as far away as Russia.

All controls are mounted on the front panel of the set and are clearly marked. Operates from standard 3v. L.T. and 120v H.T. dry batteries.

All sets are fully tested and supplied complete with all accessories, comprising: Dynamic Sound Powered Headphones, Electro Magnetic Super Sensitive Microphone, 4ft. Aerial, Junction box, battery connection details and full circuit diagram.

TWO FOR **£6** Post Free

LIGHT-WEIGHT HEAD-SET



These H.S. 30 phones are the smallest used by the U.S. Air Force. 250Ω imp. using soft rubber minothermal ear moulds for maximum music and voice reproduction of the finest quality. Supplied free is a small transformer unit with cord and plug which steps impedance up to 4,000Ω. ONLY 15/- P. & P. 2/6

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

U.S.A. WHIP AERIALS. 12ft. 12/6. P. & P. 2/6.
MICROPHONE BARGAIN. Acos crystal stick mike. Complete with cable. List price 5 gns. Offered at only 49/6. P. & P. 1/6.

1 mA METER, 2in. round. 17/6. P. & P. 1/6.
PRECISION 1% RESISTORS. Manufactured by Electrothermal. We offer the following values: 100K, 400K, 500K, all ±1% 1 watt, 1/9 each; 20/- per dozen.

POCKET RADIO. The new, exciting De Luxe "Gold Star" in beautiful moulded plastic case, a highly sensitive, self-contained set covering all medium waves. Uses modern miniature valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans. Size only 4 1/2in. x 2 1/2in. x 1 1/2in. Batteries fit inside. Only 37/6. 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/-.

WIRELESS SET NO. 19 MK. II



Incorporates "A" Set -TXRX covering 2-8 Mc/s (37.5-150 metres). "B" Set-V.H.F. TXRX covering 230-240 Mc/s. (1.2-1.3 metres) and intercom amplifier. Complete with 15 valves. 500 microamp check and tuning meter, circuit and instruction book.

In used condition. 65/-, Carr. 10/-.

POCKET MULTIMETER BRAND NEW

2,500 o.p.v. Multi range 6/30/120/300/1,200 v. A.C., ditto D.C. 0-1K. 0-1 megohm. 400 Micro-A., 12 mA., 300 mA. -00 to -64 db 5 ranges; 3in. x 4 1/2in. x 1 1/2in. Large clear dial. Leads supplied.

Our Price 70/- P. & P. 2/6



PORTABLE TRANS RECEIVER No. 18



A self-contained Trans/Receiver for Telephone and C.W. Range approx. 10 miles. Freq.: 6-9 Mc/s. (50-33.3 metres). Valve line-up: 3 ARP-12, 2 AR-8, 1 ATP4. Complete with aerial, H.T. and L.T. meter and all accessories. Weight 20 lbs. Size 8 x 10 x 1 1/2in. Only 80/-, Carr. 10/-.

TWO TRANSISTOR POCKET RADIO With Miniature Speaker

Reception on the full medium and long wavebands. Complete with all parts including plastic case, 2 transistors, germanium diode, medium and long wave coil, speaker, wiring diagram and full instructions. Size 3 1/2 x 4 1/2 in. Batteries 10d. per set.

ONLY **22/6** P. & P. 1/6



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



TELEPHONE SETS. Brand new, fully portable—hand generator, bell, hand set, morse key, lamps, instructions. Only 60/- a pair. Carr. 10/-.

HIGH RESISTANCE HEADPHONES. Brand New. 18/- P. & P. 1/6.

PRINTED CIRCUIT KIT. Easily and quickly you can make miniature professional printed circuits. Complete with illustrated manual, 19/6. P. & P. 1/6

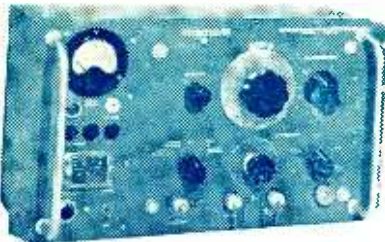
ARRS RECEIVER, 540 Kc/s—32 Mc/s. Complete in working order. £40. Carr. 30/-

CONVERT TO V.H.F. Within minutes you can extend the frequency of your receiver to cover V.H.F. by using our brand new V.H.F. Converter. R.F. 35 covers 40-45 Mc/s. Switched tuning, 8/6. Circuit supplied. P. & P. 3/6.

EAGLE VALVE FILAMENT TESTER MODEL VT41. Gives instant test of valves, fuses, continuity, etc. (as described in May issue, page 70). Supplied complete. 30/- P. & P. 2/6.

D.M.34. America's finest little dynamometer offering 12 v. in with 220 v out of 80 mA. With suppression and smooth mounting base. Size 4 1/2 x 2 1/2in. Original packing ONLY 35/- P. & P. 3/6

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



SIGNAL GENERATOR TYPE CT53

Manufactured to laboratory standard. Covering the complete frequency range of 8.9-300 Mc/s in 6 bands. Complete with internal 110-250 v. A.C. Power pack. Incorporates 110 μV R.F. meter with variable carrier control. Five position switched attenuator giving 1 μV to 10 MV and 10 db to 20 db. Variable Multiplier 1 to 10 and calibrated 0-20 db. Outputs: C.W., square wave and sine wave. Provisions for external sine wave or pulse. Complete with 7 valves and calibration charts. Here is your opportunity to own a Laboratory Signal Generator, covering the widest frequency range ever offered at a fraction of the original cost. We anticipate an overwhelming demand therefore send your order now to avoid disappointment.

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This amplifier as illustrated, made by a leading manufacturer. Mullard valves—ECC83, EL84 x EL84, EZ80. Bass, Treble and Volume on remote panel. Elegant Knobs. OUR PRICE **£5.0.0** plus P. & P. 3/6.

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An attractive cabinet 8 x 6 x 2in. fitted with 3 ohm 5in. speaker complete with lead, a few only. **19/6** P. & P. 2/6.

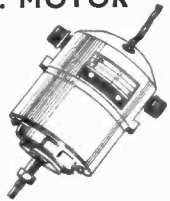


WHY NOT VISIT US?

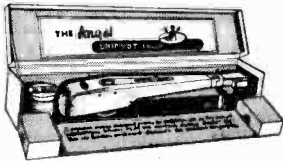
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1/6 H.P. MOTOR

140 Watt (Approx. 1/6 H.P.). Series wound. 220/250 volt 50 cycle motor. Off load 14,000 rev/min. on load 8,500 rev/min. Ideal small saw, sewing machine, etc. **30/-** post free

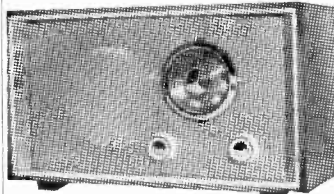


THE WORLD FAMOUS E.M.I. ANGEL TRANSCRIPTION P.U. (Model 17A)



A Pick-up for the connoisseur originally priced at £17.10.0. The last remaining few offered at **£4.19.6.** Plus P. & P. 5/-

HARVERSON T.R.F. EASY FOUR KIT



All parts and theoretical wiring diagram only.

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STUDIO P ...	17/6
ACOS HIGH G. ...	17/6
E.U. POWER POINT	12/6
RONETTE ...	18/6
G.C.Z. ...	16/6

TRANSISTOR

TRANSISTOR by leading manufacturer. First Grade Equivalent OC44. For one month only, the first 100 customers **8/6** post free. 6 for **50/-**.

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- ★ CONTEMPORARY Red and White Tygan Cabinet. Size 13½ x 14½ x 9½ inches.
- ★ B.S.R. DECK.
- ★ MAGIC EYE tuning.
- ★ INPUTS for RADIO and MIKE.
- ★ VOLUME and TONE Controls.

This instrument has to be seen and heard to be believed. Complete with ACOS Xtal Mike. **ONLY 18 gns.**

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- ★ Valves, ECH81, EF89, EABC80, EL84, ECC85 & EZ80.

50 Only at ridiculous price of **10 gns.**, plus 8/6 P. & P

DO YOU WANT STEREOPHONIC SOUND?

We have much pleasure in offering you a stupendous bargain, a complete Stereophonic Amplifier, inclusive of Valves (ECL82 x ECL82), panel, knobs, etc., and even two loudspeakers. This is in fact a complete installation, ready for your cabinet. We only have a few, and this offer cannot be repeated at the amazing price of

£6

Plus 4/6 P. & P.

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Plessey 6 x 4in. 3Ω Loudspeaker, 14/- each. 7 x 4 inch Goodmans 16/6. 25 amp 2½in. flush mounting meters, new 7/6.

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60 Milliamp Chokes at per 2/6 each.

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Twin Padded, Grey, Maroon Tracer Mains Lead. Usually 10d. per yard. Our price 15/- per 100-yard coil.

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Write (enclosing S.A.E. please) for our list of small parts and accessories for the Constructor. Trade willingly supplied.

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ID5	9/-	6F6	7/6	7Z4	18/7	30FL1	10/-	D77	4/-	ECL82	10/6	HN309	PM28	12/6	UB41	12/-	XS(1.5)		
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IHSGT	10/6	6F11	17/3	8D3	4/6	30L15	11/6	DAF91	6/-	EP9	6/-	HVR2A	PM12M	6/6	UBC81	11/4	Y63	7/6	
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ILD5	5/-	6F13	4/6	9D2	4/6	30P16	7/6	DD41	13/11	EF36	6/-	KK32	PK4	10/6	UBF89	9/6	Z66	17/6	
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IS4	9/-	6F17	12/6	10F1	26/6	30/-		DF91	4/6	EF41	9/-	KT33C	PY80	11/6	UCF80	16/7			
ISS	6/-	6F32	10/6	10F9	10/6	35A5	21/3	DF96	5/6	EF42	10/6	KT36	PY81	8/6	UCH23	23/3	Transistors and diodes		
IT4	4/6	6F33	7/6	10LD3	8/6	35L6GT	9/6	DF97	9/-	EF50(A)	7/-	KT41	PY82	7/6	UCH42	9/6			
IU5	6/-	6G6	6/6	10LD11		35W4	7/6	DH63	6/6	EF50(E)	5/-	KT44	PY83	8/6	UCH81	9/6	CGIC	4/-	
2A3	26/6	6H6GT	3/-		15/11	35Z3	10/6	DH76	5/-	EF54	5/-	KT61	PK20	19/11	UCL82	11/6	CG4E	4/-	
2A7	10/6	6J5G	5/-	10P13	15/-	35Z4	6/-	DH77	8/6	EF73	10/6	KT63	PK21	7/-	UCL83	19/3	CG6E	4/-	
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3A4	6/-	6J6	5/6	12A6	5/-	43		DH107	13/11	EF86	10/6	KT88	22/6	10/6	UF80	10/6	GEX103	12/6	
3A5	10/6	6J7G	6/-	12AC6	5/3	50C5	12/6	DK32	12/-	EF89	9/-	KTW61	6/6	R12	9/-	UF85	9/-	GEX35	4/-
3B7	12/6	6J7GT	10/6	12AD6	17/3	50CD6G		DK40	21/3	EF91	4/6	KTW62	6/6	R18	14/-	UF86	17/11	GEX34	4/-
3D6	8/-	6K7GT	8/-	12AE6	13/11		36/6	DK91	6/6	EF92	4/6	KTW63	6/6	R19	19/11	UF89	9/-	GEX35	4/-
3Q4	7/6	6K7G	5/-	12AH7	8/-	50L6GT	9/6	DK92	9/-	EF97	13/3	KTZ41	8/-	S130	15/-	UL41	9/-	GEX36	10/6
3Q5GT	9/6	6K7GT	6/-	12AH8	12/6	53K9	19/11	DK96	8/6	EF98	13/3	KTZ63	7/6	SD6	12/6	UL44	26/6	GEX45	16/6
354	7/6	6K8GT	10/6	12AT6	7/6	72	4/6	DL33	9/6	EK32	8/6	M63	6/-	SP471	14/6	UL46	14/6	GEX64	11/6
3V4	7/6	6K8G	6/6	12AT7	6/6	75	24/7	DL68	15/-	EL32	5/6	MH4(C)	7/6	SP4	13/6	UL84	8/6	GEX66	13/6
5R4YG	17/6	6K25	19/11	12AU6	23/7	77	6/6	DL68	12/6	EL33	12/6	MHL4	7/6	SP42	12/6	UM4	17/3	OA2	4/-
5U4G	6/6	6L1	23/3	12AU7	6/6	78	6/6	DL82	46/5	EL34	15/-	MHL6	12/6	SP45	3/6	UM80	15/3	OA5	4/-
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6A87	8/-	6P1	19/3	12K5	17/11	104	10/6	E834	2/6	EM34	9/6	P61	3/6	TP22	15/-	UY85	7/6	OC19	54/-
6A88	9/-	6P2	10/6	12K7GT	5/6	305	10/6	E841	8/6	EM71	23/3	PABC80	TP25	15/-	VMS4B	15/-	OC26	44/-	
6AC7	4/6	6P25	12/6	12K8GT	14/-	807	7/6	E891	4/6	EM80	9/6	P61	3/6	TP22	15/-	UY85	7/6	OC19	54/-
6AG5	5/6	6P28	26/6	12Q7GT	9/-	956	3/-	EBC3	23/3	EM81	9/6	PCC84	8/-	TY86F	13/3	VP4	15/-	OC35	20/-
6AK5	8/-	6Q7G	6/6	12SA7	8/6	1821	16/7	EBC33	5/-	EM84	10/6	PCC85	9/6	U12/4	8/6	VP2B	14/6	OC44	26/-
6AL5	4/6	6Q7GT	11/-	12SC7	8/6	5763	12/6	EBC41	8/6	EN31	37/-	PCC88	23/11	U16	10/6	VP4B	23/3	OC45	23/-
6AM6	4/6	6R7G	10/-	12SG7	7/-	7475	7/6	EBC81	8/6	EY51	9/-	PCC89	11/6	U18/20	8/6	VP13C	7/6	OC65	22/6
6AQ5	7/6	6SA7GT	8/6	12SH7	8/6	9002	5/6	E8F80	9/-	EY83	16/7	PCF80	8/-	U22	8/-	VP23	6/6	OC66	25/-
6AT6	7/6	6S7GT	7/6	12SJ7	8/6	AC/PEN		EFB83	13/11	EY84	14/-	PCF82	10/6	U24	29/10	VP41	6/6	OC70	14/-
6AU6	10/6	6S7GT	8/6	12SK7	6/6	5-pin	23/3	EFB99	9/6	EY86	9/-	PCL82	10/6	U25	17/11	VR105	8/-	OC71	14/-
6AV6	12/6	6S7GT	8/6	12SO7	11/6	AC/PEN		E8L31	23/3	EZ40	7/-	PCL83	11/6	U26	10/6	VR150	7/6	OC72	17/-
6B7	10/6	6S7GT	8/6	12SR7	8/6	AC/PEN		ECS2	5/6	EZ41	7/-	PCL84	12/6	U31	9/6	VT61A	5/-	OC73	20/-
6BBG	4/6	6S7GT	6/6	12Y4	10/6	DD	12/6	ECS5	5/6	EZ41	7/-	PEN4A	12/6	U33	26/6	VT501	5/-	OC75	20/-
6B8G	5/6	6S7GT	6/6	1457	27/10	AC/SPEN		ECS4	6/-	EZ80	7/-	PEN84	26/6	U35	26/6	W7M	26/6	OC75	20/-
6BA6	7/6	6SN7GT	9/6	18	23/3		23/3	EC90	12/6	EZ81	7/-	PEN4DD	U37	26/6	W76	5/6	OC77	20/-	
6BE6	6/-	6SQ7GT	9/6	19AQ5	10/6	AC6PEN	7/6	EC72	13/3	FC2A	24/7		U50	6/6	W81M	6/-	OC78	17/-	
6BG6G	23/3	6SS7GT	8/-	19B6G6		AC/SG	23/3	EC33	5/6	FC4	15/-	PEN25	19/11	U45	9/-	W107	15/3	OC81	18/-
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6B16	6/-	6U5G	7/6	19H1	10/-	ATP4	5/-	EC34	24/7	FC13C	26/6		U52	6/6	X2AM	24/7	OC170	35/-	
6BQ7A	15/-	6U7G	8/6	20D1	15/3	AZ1	18/7	EC35	8/6	FW4/500		PEN44	26/6	U54	19/11	X31	26/6	OC200	54/-
6BR7	15/-	6V6G	7/-	20F2	26/6	AZ31	10/6	EC40	23/3			PEN45	19/6	U76	6/-	X41	13/6	OC203	58/-
6B57	25/-	6V6GTG	8/-	20L1	26/6	AZ41	13/11	EC41	6/-	FW4/800	8/6	PEN45DD	U78	5/-	X61(C)	12/6	XAI01	23/-	
6BW6	8/6	6X4	5/-	20P1	26/6	B36	15/-	EC82	6/6				U107	16/7	X61M	26/6	XAI02	26/-	
6BW7	7/-	6X5GT	6/-	20P3	23/3	BL63	7/6	EC83	7/6	GZ30	9/-	PEN46	7/6	U191	16/7	X63	9/-	XAI03	26/-
6BX6	7/-	630L2	10/6	20P5	23/3	CI	12/6	EC84	9/-	GZ32	10/6	PEN483	23/3	U201	16/7	X65	12/6	XAI04	18/-
6C4	5/-	7A7	12/6	25A6G	10/6	CIC	12/6	EC85	8/6	GZ34	14/-	PEN45DD	U251	14/6	X66	12/6	XBI02	10/6	
6C5G	6/6	786	21/3	25L6GT	10/6	CBL1	26/6	EC88	23/11				U281	19/11	X76M	14/-	XBI02	10/6	
6C6	6/6	787	8/6	25U4	16/7	CBL31	23/3	EC91	5/6	H63	12/6	PEN/DD	U282	22/7	X78	21/3	XB(LF)		
6C8	12/6	7C5	8/-	25Y5	10/-	CH35	23/3	ECF80	10/6	HABC80			4020	33/2	X31	23/3	X79	21/3	
6C9	12/6	7C6	8/-	26Y5G	10/-	CK56	6/6	ECF82	10/6				PL33	19/3	U329	14/-	X81	46/5	

NEW MULLARD AMPLIFIER BOOK. HOW TO BUILD THE LATEST DESIGNS, 9/3d. post free.

Stern's "fidelity" TAPE EQUIPMENT

A SELECTION OF HIGH FIDELITY PORTABLE TAPE PREAMPLIFIERS

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

IN ALL MODELS WE INCORPORATE THE TYPE "C" PREAMPLIFIER AND OFFER IT COMPLETE IN CASE WITH . . .



- (a) The new COLLARO "STUDIO" 3 Speed Deck H.P. Deposit £7.6.0, 12 months £213.6.0 **£36.10.0**
- (b) The COLLARO Mk. IV "Transcriptor" 3 Speed Deck H.P. Deposit £26.6.0, 12 months £30.11.0 **£41.10.0**
- (c) The New TRUVOX Mk VI Tape Deck H.P. Deposit. £8.14.0, 12 months £33.10.0 **£43.10.0**
- (d) The BRENNEL Mk. 3 Speed Deck H.P. Deposit £10.6.0, 12 months £315.7.0 **£51.10.0**
- (e) The WEARITE MODEL 4A, Tape Deck. Deposit, £12.4.0, 12 months £49.5.0 **£61.0.0**

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

INCORPORATING THE NEW FERROXCUBE POT CORE PUSH-PULL OSCILLATOR AND 3 SPEED TREBLE EQUALISATION by means of the latest FERROXCUBE POT CORE INDUCTOR. PRICES INCLUDING SEPARATE SMALL POWER SUPPLY COMPLETE KIT OF PARTS. **£14.0.0** ASSEMBLED AND TESTED **£17.0.0** Dep. £3.8.0 and 12 of £14.1.11



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

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

- (a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PREAMPLIFIER and Power Unit Assembled and Tested. H.P. Deposit £8.10.0 and 12 months £27.7.8. **£32.10.0**
- (b) As above but TYPE "C" PREAMPLIFIER supplied as complete KIT OF PARTS. **£29.0.0**
- (c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PREAMPLIFIER & Power Unit assembled, tested. H.P. Deposit £7. and 12 months £21.1.4. **£35.0.0**
- (d) As (c) but Type "C" as COMPLETE KIT OF PARTS. **£32.0.0**
- (e) The TRUVOX Mk. VI DECK and the assembled Type "C" Preamplifier and Power Unit. H.P. Deposit £8.0.0, and 12 months £218.3. **£40.0.0**
- (f) As above but Type "C" as complete KIT OF PARTS. **£36.10.0**
- (g) The BRENNEL Mk. V DECK and the assembled Type "C" PREAMPLIFIER and POWER UNIT H.P. Deposit £9.4.0, and 12 months £37.6. **£46.0.0**
- (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. H.P. Deposit £11.4.0, and 12 months £42.1.1. **£56.0.0**

(Carriage and Insurance on above quotes 10/- extra.) PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE

YOU CAN BUILD A COMPLETE TAPE RECORDER

for **£36.0.0**



H.P. TERMS Deposit £7.4.0, 12 months £212.10.0. FOR THIS WE SUPPLY: ★ COMPLETE KIT OF PARTS TO BUILD THE HF/TR3 TAPE AMPLIFIER. ★ THE NEW COLLARO "STUDIO" TAPE DECK. ★ PORTABLE CARRYING CASE (as illustrated). ★ ROLA/CELESTION 10in. x 6in. P.M. LOUDSPEAKER. ★ ACOS CRYSTAL MICROPHONE. 1,200ft. SPOOL E.M.I. TAPE.

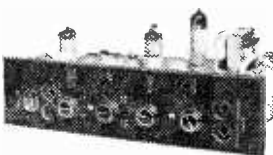
For those who prefer another type of TAPE DECK we will supply precisely as above—but IN PLACE of the COLLARO "STUDIO" DECK—WE INCLUDE: (a) The Mk. IV COLLARO "TRANSCRIPTOR" DECK H.P. Deposit £8.0.0 and 12 months £218.2. **£39.15.0** (£1 extra to wire up the Transcriptor Switch Banks.) (b) The New TRUVOX Mk. VI DECK. H.P. Deposit £9.0.0 and 12 months £36.0. (Carriage and Insurance on all above is 12/6 extra.) **£45.0.0**

- For Constructors with their own Cabinet WE OFFER
- (a) COMPLETE KIT to build the HF/TR3 together with the COLLARO "STUDIO" DECK. **£28.0.0**
 - (b) As above but with HF/TR3 supplied ASSEMBLED and TESTED. H.P. Deposit £6.6.0 and 12 months £24.2. **£31.10.0**
 - (c) COMPLETE KIT to build the HF/TR3 together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK. H.P. Deposit £7.0.0 and 12 months £210.5. **£30.15.0** (£1 extra if we are required to wire up Deck Switch Banks.) (d) As above but HF/TR3 supplied ASSEMBLED and TESTED. H.P. Deposit £7.18.0 and 12 months £210.5. **£34.10.0** (£1 extra if we are to wire up Deck Switch Banks.) (e) COMPLETE KIT to build the HF/TR3 together with the NEW TRUVOX Mk. VI TAPE DECK. H.P. Deposit £7.18.0 and 12 months £217.11. **£36.0.0** (f) As above but HF/TR3 supplied ASSEMBLED and TESTED. H.P. Deposit £7.18.0 and 12 months £217.11. **£39.10.0** (g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENNEL Mk. V TAPE DECK. H.P. Deposit £9.0.0 and 12 months £38.0. **£41.10.0** (h) As above but HF/TR3 supplied ASSEMBLED and TESTED. H.P. Deposit £9.0.0 and 12 months £38.0. **£45.0.0**
- 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 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1,200ft. SPOOL E.M.I. TAPE—ALL FOR £9.0.0 Carriage and Insurance 5/- extra.

WE HAVE THE NEW 2-SPEED TWIN TRACK TRUVOX Mk VI TAPE DECK IN STOCK £26.5.0
DEPOSIT: £5.5.0 and 12 MONTHS £118.8.

THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING 3-SPEED TREBLE EQUALISATION by means of the latest FERROXCUBE POT CORE INDUCTOR. PRICE FOR COMPLETE KIT OF PARTS **£12.15.0** PRICE FULLY ASSEMBLED & TESTED **£16.10.0**



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

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

STERN'S MULLARD DESIGNS

Designed by MULLARD—presented by STERNS strictly to specification

COMPLETE KIT OF PARTS—

MULLARD "5-10" MAIN AMPLIFIER

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

Alternatively we supply ASSEMBLED and TESTED. **£11.10.0**

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 ASSEMBLED AND TESTED **£8.0.0**

KITS OF PARTS 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"

The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Specified Components and new MULLARD VALVES are supplied including PARMERKO MAINS TRANSFORMERS and choice of the latest PARMERKO 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 19/10.

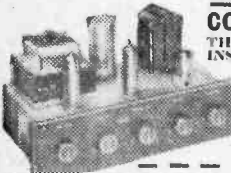
ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. **£1.6.0** extra.

COMPLETE MULLARD "3-3"

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT

COMPLETE KIT **£7.10.0** AND TESTED **£8.19.6**

(plus 6/6 coverage and insurance) H.P. Terms: Deposit **£2.0.0** and 8 months at **£1.0.0**. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMERKO OUTPUT TRANSFORMER.



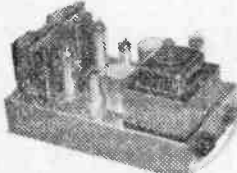
STEREO "3-3" MAIN AMPLIFIER

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

PRICE COMPLETE KIT **£10.0.0**

Alternatively ASSEMBLED AND TESTED **£11.15.0**

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



SPECIAL PRICE REDUCTIONS

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

(d) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED AND TESTED H.P. Dep. **£3.18.0** and 12 months of **£1.7.8** **£18.18.0**

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

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

H.P. Terms: Deposit **£5** and 12 months of **£1.16.8**.

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

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

H.P. Terms: Deposit **£5**. 12 months of **£1.16.8**.

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

(j) TWO "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0**

H.P. Terms: Deposit **£7.4.0**. 12 months **£2.12.0**.

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

STEREO DUAL CHANNEL PRE-AMPLIFIER

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

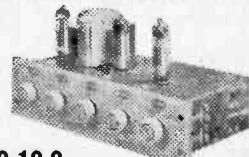
COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0**

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

COMPLETE STEREO AMPLIFIER

A thoroughly recommended Mullard design that very effectively meets the many requests for a low-priced but good quality DUAL CHANNEL STEREOPHONIC AMPLIFIER. Output power is 4 watts from STEREO or MONAURAL gram inputs **£8.10.0**

PRICE COMPLETE KIT OF PARTS **£10.10.0** ALTERNATIVELY ASSEMBLED AND TESTED



!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET

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

£6.19.6

The NEW COLLARO MODEL RU594 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

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L10 and 78 Records.

£10.10.0

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

£8.10.0

GARRARD MODEL RC210. Autochanger 4-Speeds, High output, Crystal Pick-up.

£10.10.0

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



! RADIOGRAM CHASSIS ! and V.H.F. RADIO TUNING UNITS

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

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

STERN RADIO LTD.



Stern's "fidelity" TAPE RECORDERS

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

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

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

MODEL CR3/S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-Speed Deck **£41.00**
H.P. Terms: Deposit **£8.4.0** and 12 months of **£3.0.2**.

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

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

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

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

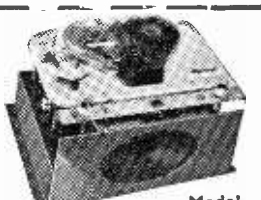
Model HF/G2R



and NOW WE INTRODUCE

two units meticulously matched to correctly operate
THE NEW GARRARD "MAGAZINE" TAPE DECK

- **MODEL HF/G2P TAPE PRE-AMPLIFIER**
- **MODEL HF/G2A TAPE AMPLIFIER**



Based on the very successful MULLARD tape DESIGNS, incorporating only HIGH GRADE COMPONENTS and MULLARD VALVES.

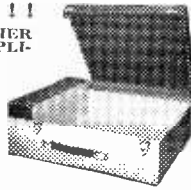
Both Units form an entirely new "Easy to handle" presentation, each is completely self contained with Power Supply (Loudspeaker Amplifier HF/G2A only), and all INPUT and OUTPUT sockets incorporated on the chassis, which itself is constructed to allow for direct attachment to the tape deck. Thus the tape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

BOTH UNITS CARRY MESSRS. GARRARD'S FULL RECOMMENDATION

Model HF/G2A-D
WE OFFER AS FOLLOWS:
(a) Model HF/G2R Portable TAPE RECORDER. **£33.0.0**
Includes spool of L.P. Tape and Crystal Micro. H.P. Terms: Deposit **£6.12.0**, 12 monthly payments **£2.8.5**
(b) Model HF/G2A-D, comp. AMPLIFIER and **£27.10.0**
TAPE DECK, Inc. spool of L.P. Tape and L/S. H.P. Terms: Deposit **£5.10.0**, 12 monthly payments **£2.0.4**
(c) ASSEMBLED AND TESTED AMPLIFIER **£15.0.0**
Model HF/G2A..... H.P. Terms: Deposit **£3.0.0**, 12 monthly payments **£1.2.0**
(d) Model HF/G2PP PORTABLE PREAMPLIFIER. Complete in Portable Case (like HF/G2R) **£30.0.0**
H.P. Terms: Deposit **£6.0.0**, 12 monthly payments **£2.4.0**
(e) Model HF/G2P-D, comp. PREAMPLIFIER and TAPE DECK. Includes spool of L.P. Tape. **£26.0.0**
H.P. Terms: Deposit **£5.4.0**, 12 monthly payments **£1.18.2**
(f) ASSEMBLED AND TESTED PREAMPLIFIER Model HF/G2P **£14.0.0**
H.P. Terms: Deposit **£2.16.0**, 12 monthly payments **£1.0.6**

A SPECIAL CASH ONLY OFFER !!

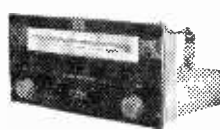
This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER.
ALL for ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)



The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS. The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Rexine. WE ALSO SUPPLY SEPARATELY—

- (a) The 2-stage (plus Rectifier) AMPLIFIER **£4.2.6**
- (b) THE PORTABLE CARRYING CASE **£3.17.6**
- (c) 8" P.M. SPEAKER 18/9 Carriage and Insurance 4/- extra.

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



PRICE **£14.5.0** (Plus 5/- Carr. and Ins.)
HIRE PURCHASE: Deposit **£2.17.0** and 12 Monthly Payments of **£1.0.11**.
Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps at 6.3 volts and 25 ma at 250 volts.

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

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

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

THE "ADD-A-DECK" incorporating the NEW B.S.R. "MONARDECK" and Matched Pre-amplifier

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



Designed to operate through the Pick-up Sockets of the standard RADIO RECEIVER through which first-class results are obtained. It consists of a Twin Track Tape Deck incorporating matched Pre-amplifier, and operates at 3 1/2 in./sec. speed.

Supplied fully tested and completely assembled on an attractive wood plinth, and only requires connections to the mains supply and the Pick-up Sockets, for which purposes "floating" leads are incorporated.

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

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

TUBES

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

	6 MONTHS REVACUUMED	12 MONTHS REGUINED	12 MONTHS NEW TYPES
CRM92, MW22-7, MW22-14, MW22-14C, MW22-17, MW22-18	£2	£3-10	
19KPA, 121K, C12B, CRM121, CRM121A, CRM121B, CRM122, CRM123, MW31-14C, MW31-16, MW31-18, MW31 74	£2-10	£4-10	MW81/74 £4-10
141K, 7201A, C14FM, CRM141, CRM142, CRM143, MW36-24, MW36-44	£3-5	£5-5	MW36/24 £7-15
17ASP4, 171K, AW36/21, C17FM, CRM171, CRM172, MW43-64, MW43-69	£3-15	£5-15	MW43/64 £8-10
7401A, AW43-90, C14BM, C17BM, CRM151, CRM152A, CRM152B, CRM153, CRM173, MW43-80, MW41-1 AW53-80, CRM21E, MW53-20, MW53-80	£4-15	£6-15	

NEW 108K (EQUIV.) TUBES SPECIAL OFFER: 39/-
PLEASE NOTE: Many other types not listed available. S.A.E. enquiries.

13 CHANNEL TV'S

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

AMAZINGLY POPULAR-IDEAL SECOND SETS

12" -	£3.19. (p. & p. 12/6)
14" -	£6.19. (p. & p. 15/-)
17" -	£9.19. (p. & p. 17/6)
12" 5 CHANNEL TV'S 45/-	(p. & p. 12/6)
14" 5 CHANNEL TV'S 85/-	(p. & p. 12/6)

CHASSIS BARGAINS

Top quality, undrilled, lowest possible prices due to the large quantities handled.

PACK FLAT CHASSIS

Consisting of flat top plates with separate sides and ends, in stout "easy to solder" tin plate.
7in x 6in. x 2in. 4/2; 10in x 7in. x 2in. 5/-; 10in. x 6in. x 2in. 4/6; 14in. x 5in. x 2in. 6/2; 14in. x 10in. x 2in. 7/8.

TIN PLATE-BOX FORM

Complete with sides and ends in "easy solder" tin plate.
4in. x 2in. x 1 1/2in. 2/2; 6in. x 4in. x 2in. 3/2; 8in. x 6in. x 2in. 4/-.

ALUMINIUM BOX FORM

OPEN ENDED. In heavy gauge bright sheet.
6in. x 4in. x 2in. 3/5; 8in. x 6in. x 2in. 4/8; 10in. x 7in. x 2in. 5/2; 12in. x 6in. x 2in. 5/8; 12in. x 8in. x 2in. 6/-; 16in. x 8in. x 2in. 7/8.

ALUMINIUM BOX FORM

Heavy gauge sides and ends.
6in. x 4in. x 2in. 4/-; 8in. x 6in. x 2in. 5/2; 10in. x 7in. x 2in. 5/8; 12in. x 6in. x 2in. 6/2; 14in. x 8in. x 2in. 6/8; 14in. x 10in. x 2in. 9/8.

TRANSISTORS

RED SPOT. 4/8. 1P.F., L.F. and Output up to 800 k.c/s. (48/- dozen). WHITE SPOT R.F. and L.F. 2.5 Mc/s. 6/8 (69/- per dozen). XA103, 15/-; XA104, 17/6; XB104, 8/-; GET15, 19/-; V1610P: "Golfput" power transistor, up to 10 watts dissipation, maximum collector current 3 amp, minimum collector voltage 15 volts. 19/- ea.

DIODES General purpose, famous make, 9d. 8/- doz. GEX44 type, 3/9.

4 TRANSISTOR AMPLIFIERS

ONE WATT—From a single 6v. all-dry battery. Latest GET15 Power Transistors. In PUSH-PULL Two-Transistor High Gain pre-amplifier stages. Output 3 ohms. **£3.19.0**

1 WATT TRANSISTOR STAGE

To the purchaser of each manufacturer matched pair of GET15 Power 1 watt Power Transistors (listed 25/-) we give the correct PUSH-PULL INPUT and OUTPUT TRANSFORMERS of High Grade construction and a complete 4 Transistor Amplifier circuit. Will transform your existing receiver or amplifier into a truly "Main Volume" outfit for a total price of ONLY 45/-.

RECTIFIERS

For Chargers, selenium, full wave bridge, 12 volt 3-4 amps., 9/6. (Carr. 1/-) 25 per doz. 250 v. 80 mA. 5/- RMI, 8/6; RME, 8/-; RMD, 9/-; RMA, 15/6; RMB, 21/-; 14A88, 17/-; 14A97, 23/-; 14A100, 25/-; 16RC1-110-1, 7/9; 18RA1-110-1, 7/8; 18RD2-2-8-1, 14/-; 14RA1-2-8-2, 17/-; 14RA1-2-8-3, 20/-.

LOUDSPEAKERS

TOP MAKES—MANUFACTURER FRESH

2 1/2in., 18/-; 3in., 18/-; 3 1/2in., 19/-; 5in., 18/-; 6in., 19/-; 8in., 19/-; 10in., 22/6; 12in., 25/6; 7 x 4in. elliptical, 18/-; 8 x 6in. elliptical, 22/6; 10 x 6in. elliptical, 25/6; 8in. Stentorian 15 ohms HPS10, 20/-; 10in. Stentorian 3-7.5-15ohms HPS10, 22/6; 12in. Closed Field, 27/6; 12in. 17 ohms, 40/-
STOP PRESS—Just out! 8 x 13in. HI-PI speakers, built-in tweeters, 48/-.

SPECIAL OFFERS

ALL DRY PORTABLES

A fortunate purchase enables us to offer you these Brand New Stella, shoulder strap, lightweight models, in makers' sealed cartons, with guarantees and instructions. Economy valves. Superior finish. Listed at £13.2.6, amazing value **£7.15.0** Carr. 4/-.

4-SPD. RECORD PLAYERS

Latest B.S.R. TU9 Turntable, together with lightweight Star Galaxy dual sapphire crystal turnover pick-up head. Truly amazing value **£3.10.0** Carr. 3/-.

VIBRATOR PACKS

6 volt, complete 220 volt, 60 mA output. Limited number. **12/6**

CO-AXIAL CABLE

Semi-Air-Spaced low loss. 1-19 yds., 7d. per yd., p. & p. 1/3. 20-39 yds., 6d. per yd., p. & p. 1/9. 50 YD. DRUMS, 24/-.

VALVES ALL GUARANTEED 3 MONTHS.

PL81 SOLED, AMAZING VALUE AT ONLY **4/6**

EY51 SHORT ENDS **4/6** U25 SHORT 8/6 ENDS

100 CONDENSERS 10/-

Due to huge purchase we can offer a wide, well balanced range of mainly the latest miniature Ceramic and Silver Mica Condensers, 3 pF to 10,000 pF. LIST VALUE OVER 25. A must for your spares box. Only 10/-.

PM SPEAKERS Surplus 3 ohm

Tested, top makes, performance guaranteed. 6 1/2in. 7/- 6in. 11/- 7 1/2in. 13/- 8in. 13/-

STEREO

Special Offer. matched pairs of speakers. 6 1/2in. or 8in. 14/- pr. 7 x 3 22/- pr. Special quotations for quantities of the above speakers or any other goods listed.

12in. TV's 5 channel table models including speaker, line trans. cabinet. Top makes requiring only valves and tube to complete your choice if available (carr. 4/-). (Or £8 per dozen, carr. free.) **15/-**

14in. TV's 5 channel as above **35/-** (carr. 4/-)

100 RESISTORS assortment **7/6** 1-2 watt.

TAPE DECKS

B.S.R. "MONARDEC". Latest type, 3 1/2 i.p.s., takes 9 1/2in. spools. Simple controls. **£9.15.0**
LATEST COLLARO STUDIO TAPE TRANS-CRIPTOR. Three motors, three speed, 15 9/32 i.p.s., takes 7in. spools, super quality finish. Push button controls. **£14.10.0**

TAPE RECORDERS

LATEST ALBA. Using the B.S.R. Monardec 3 1/2 i.p.s. takes 5 1/2in. spools, and is absolutely complete in attractive carrying case.

ELPICO tape recorder, similar to above using B.S.R. tape deck. **28 gns.**

FIDELITY tape recorder. An excellent machine, also incorporating the B.S.R. tape deck, but also with facilities for "superimposing". **29 gns.** (All tape recorders carriage free).

PORTABLE RECORD PLAYERS

COLLARO 4-speed auto-changer, 2 1/2 watt high gain amplifier. Super two-tone case. **13 gns.**
Or case only 69/-, 2 1/2-watt Amplifier complete on battle with Speaker, **£3.10.0.**

RECORD PLAYERS

COLLARO 4-speed 4/546 ... **£5 19 0**
EMI 4-speed stereo ... **£2 19 0**
GARRARD 4-speed 4HF ... **£17 15 0**
B.S.R. (Ua8) AUTOCHANGERS ... **£6 15 0**
GARRARD RC120D MKII ... **£9 7 8**
Carriage 4/-.

STARR GALAXY SPARES

We hold the most comprehensive range of spares in the country, send 6d. stamp for Service Sheet and Spares Price List.

PICK-UP ARMS

The well-known Starr "Galaxy" lightweight pickup arm, dual sapphire turnover single hole fixing, adjustable metal pressure, can be used with any 3 and 4 speed turntable. Supplied complete with famous cartridges above listed at **19/6** approximately 22.

RECEIVERS R109. 2-12 Mc/s. Takes only 6 volt, 1 1/2 amp. **£3.15.0.**

TIME SWITCHES. Clockwork mechanism, Mercury operated, 2 circuit, 14 day, 20 amp contacts, 25/-, carr. 4/-.

L.F. CHOKES. 20 H, 80 mA, 5/-; 5 H, 260 mA, 4/8 10 H, 250 mA, 6/-.

SUPER GOLD METAL FRETS. 10 x 2 1/2in., 1/-; 5in. round, 1/-; 11 x 5in., 2/-; 13 x 6in., 3/-.

IVORY/GOLD KNOBS. 1/2 sp. grub screw, 1in. diam., half price, 1/- each, 4 for 3/6. Ditto 1 1/2in. diam. 1/6 each, 4 for 5/-, 2 1/2in. instrument knobs 1/6 each.

SOLDERING IRONS. 50 watts, 45/- pencil bit, 16/9.

AM/FM KIT. Gorka: Consisting of Tuning Heart, assembled, with lat L.F. Transformers. Second FM, AM and Discriminator Transformers, complete kit. Comprehensive instruction booklet supplied. Booklet only 2/-; Kit, with EC035 valve, **£3.18.6;** Kit, less EC035 valve, **£3.5.0**

TECHNICAL TRADING CO.

Postage must be added unless otherwise stated

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 Colloredo Studio Tape Transcriber. The Linear LT45 High Quality Tape Amplifier listed £12.10. High Flux P.M. Speaker listed 30/- empty Tape Spool, a reel of Best Quality Tape listed £2.68 and a Handsome Portable carrying Cabinet finished in Two-tone covering, size 18 x 13 x 9in. high, listed £41.00. and circuit. Total cost if purchased individually approximately £40. Performance equal

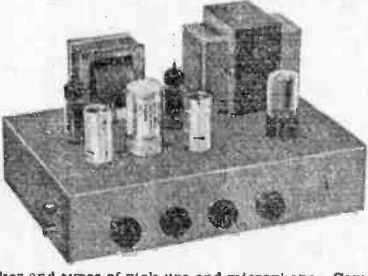
to units in the £60-£80 class. Send S.A.E. for leaflet. **25** 1 GNS. Carr. 1/76

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

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 current manufacture. **INDIVIDUAL CONTROLS FOR BASS AND TREBLE** "Lift" and "Cut." Frequency response ± 3 D.B. 30-30,000 ccs. Six negative feedback loops. Hum level 60 D.B. down; **ONLY 23 millivolts INPUT** required for **FULL OUTPUT.** Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs. For **STANDARD or LONG PLAYING RECORDS.** For **MUSICAL INSTRUMENTS** such as **STEELING BASS, GUITARS, etc.** **OUTPUT SOCKET** with plus provides 300 v. 30 mA. and 6.3 v. 1.5A. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9" in. For A.C. mains 200-250 v. 60 c/s. Output for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. **Only 8 Gns. Carr. 10/-** (Or factory built 45/- extra). If required lowered metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED KIT. DEPOSIT 18/9, and 12 monthly payments of 18/9.** Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.



STAAR GALAXY 4-SPEED MIXER AUTO-CHANGERS
Brand new, cartoned. Turnover sapphire styl. Many exclusive features. Unique design motor virtually free from rumble. For 200-250 v. A.C. mains. Only **£5-19.6**.

SPECIAL OFFER. Two tone Portable cabinet. Gram amplifier. Staar Changer and 7 x 4in. P.M. Speaker. 10 gns. Carr. 10/- or with B.S.R. U48 or Conquest, 12 gns.

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, 5P61, 6WG. Selectivity and quality excellent. Simple construction. Point-to-Point wiring diagrams, instructions and parts list. 1/9. maximum building costs **£4-19.6**. Inc. attractive Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

WAYNE KIRJ SIGNAL GENERATOR. Type CT53. 3.9 to 300 megacycles. Suitable for calibrating V.H.F. Radio or TV receivers. Output 1 microvolt to 10 millivolts. Worth approx. £100. Limited number at 19 gns. with charts.

MICRO-AMMETERS. 2in. diam. 250-0-250 micro-amps. 15/9. 3in. diam. 0-50 micro-amps. 39/6. 3in. diam. 0-500 micro-amps. 69/6.

EX. GOVT. MAINS TRANSFORMERS
Primaries 200-250 v. 50 c.p.s. A.C.
250 v. 60 mA. 6.3 v. 2 a. 10/11
270-0-275 v. 100 mA. 6.3 v. 7 a. 5 v. 2 a. 21/9
300-0-300 v. 60 mA. 6.3 v. 2 a. 11/9
300-0-300 v. 100 mA. 6.3 v. 2 a. 5 v. 2 a. 18/9
350-0-350 v. 160 mA. 6.3 v. 4 a. 5 v. 2 a. 27/6

F.W. BRIDGE		H.T. Types H.W.	
6/12 v. 1 a.	3/11	150 v. 40 mA.	3/9
6/12 v. 2 a.	6/11	250 v. 50 mA.	3/11
6/12 v. 3 a.	9/6	250 v. 60 mA.	4/11
6/12 v. 4 a.	12/3	250 v. 80 mA.	5/11
6/12 v. 6 a.	15/3	250 v. 250 mA.	12/9
6/12 v. 10 a.	25/9	CONTACTCOOLED	
6/12 v. 15 a.	35/9	250 v. 30 mA. H.W.	6/11
24 v. 2 a.	14/9	6/11. 250 v. 75 mA. H.W.	8/11
		F.W. (Bridge) 8/11.	

HI-FI 10 WATT AMPLIFIERS
Slightly store soiled but guaranteed unused and in perfect order. Fitted Mullard valves. Dual inputs for "mike" and gram. etc. Bass and Treble Controls. High sensitivity and quality. For 200-250 v. A.C. Carriage 7/6. **£5-19-9**

R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS
6 v. 1 amp. 19/9
6 v. or 12 v. 1 amp. 29/9
6 v. 2 amps. 29/9
6 v. or 12 v. 2 amps. 38/9
6 v. or 12 v. 3 amps. with ammeter 59/9
Above ready for use with mains and output leads. Carr. 3/6.



Assembled 6 v. or 12 v. 4 amps
Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finish. Fused **69/9** and ready for use with Carr. 5/- mains and output leads. **Terms:** Deposit 13/3, and 5 monthly payments 13/3.

BATTERY CHARGERS KIT
Consisting of Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses. Fuse-holders. Grommets, panels and circuit. Carr. 3/6 extra.
6 v. or 12 v. 1 amp. 24/9
As above, with Ammeter. 32/9
6 v. 2 amps. 25/9
6 v. or 12 v. 2 amps. 31/6
Carriage 3/6 extra.
6 v. or 12 v. 2 amps. including Ammeter. 42/9
6 v. or 12 v. 4 amps. 53/9
6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector. 59/9
CHARGER AMMETERS.
0-1.5 a. 0-3 a. 0-4 a. 0-7 a. 0-25 a. 0-60 a. 8/9.

HEAVY DUTY CHARGER KIT
6/12 v. 6 amps. variable output. Consisting of Mains Transformer 0-200-230-250 v.; F.W. (Bridge) Selenium Rectifier; Ammeter, Multi-Position Switch with Knob; Fuses, Plugs, Fuses, Fuseholder, and circuit 59/9. Carr. 4/6.

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

Interleaved and Impregnated. Primaries 200-250 v. 50 c/s. Screened TOP SHROUDED DROOP THRO. CH.
250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 a. 17/9
350-0-350 v. 80 mA. 6.3 v. 2 a. 5 v. 2 a. 18/9
250-0-250 v. 100 mA. 6.3 v. 3.5 a. C.T. 22/9
250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 4 a. C.T. 0-4-5 v. 3 a. 25/9
0-4-5 v. 3 a. 25/9
250-0-250 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 29/9

FULLY SHROUDED UPRIGHT
250-0-250 v. 60 mA. 6.3 v. 2 a. 5 v. 2 a. 17/9
Midret type 2/1-3/1in. 17/9
250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
for Mullard 510 Amplifier 35/0
350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 35/9
425-0-425 v. 200 mA. 6.3 v. 4 a. C.T. 6.3 v. 4 a. C.T. 5 v. 3 a. 49/9

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

OUTPUT TRANSFORMERS
Midret Battery Pentode 66:1 for 354, etc. 3/9
Small Pentode. 5000 Ω to 3 Ω 3/9
Small Pentode 7/8,000 Ω to 3 Ω 3/9
Push-Pull EL84 to 3 Ω or 15 Ω 19/9
Standard Pentode 5,000 Ω to 3 Ω 5/6
Standard Pentode 7/8,000 Ω to 3 Ω 5/6
10,000 Ω to 3 Ω 6/6
Push-Pull 10-12 watts 6V8 to 3 Ω or 15 Ω 18/9
Push-Pull 10-12 watts to match 6V8 to 3-5-8 or 15 Ω 19/9
Push-Pull EL84 to 3 Ω or 15 Ω 19/9
Push-Pull 15-18 watts. 6L6. KT66 22/9
Push-Pull for Mullard 510 Ultra Linear 29/9
Push-Pull 20 watts, sectionally wound 6L6. KT66, etc. to 3 to 15 Ω 47/9

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

SMOOTHING CHOKES
150 mA. 7-10 H 250 ohms. 11/9
100 mA. 10 H 200 ohms 8/9
80 mA. 10 H 350 ohms 5/9
60 mA. 10 H 400 ohms 4/11

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

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

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, etc. Limited number available at 33/9.

R.S.C. A12 STEREOPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and point-to-point wiring diagrams supplied. Only good quality Carr. and pkg. 5/- components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

4 Gns.

STEREO EQUIPMENT OFFER.
Comprising A12 Kit, 2 matched 8in. L/Speakers, £6-19-6 and Acos T10 Stereo head Carr. 7/7 with diamond stylus suitable most pick-ups.

PICK-UP ARMS complete with Hi-Fi turnover crystal head. Acos IGP54. Limited number brand new, perfect. At approx. half price. Only 29/11.

ACOS CRYSTAL MICROPHONES. Mic40 stand or desk. Listed 45/-, Only 27/9. 39-1 Stick types, listed 5 gns. Only 39/6.

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

A highly sensitive Push-Full high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response -3 db. 30-30000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF86, ECC83, 807, 807, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3, and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. Full instructions in a separate cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built with 12 months' guarantee, for £18.19.6. TERMS: DEPOSIT 24/9 and 12 monthly payments of 24/9.

11 gns.

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BMI. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 v. and 90 v. This includes latest low consumption types. Complete kit with diagrams. -39/9, or ready to use. 46/9.



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

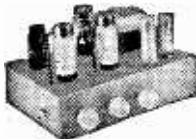
R.S.C. J4 WATT A7 HIGH-GAIN AMPLIFIER

For 200/250 v. 50 c/s. Mains input. Appearance as in Specification, with exception of output wattage, as A5 amplifier. Complete Kit with diagrams. £3.15.0; Carr. 3/6.

R.S.C. BRADFORD, MANCHESTER and LEEDS

(Leeds) Ltd.

LINEAR L45 MINIATURE 45 WATT QUALITY AMPLIFIER. Suitable for use with any record playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/s. Output for 3 ohm speaker. Three miniature Mullard valves used. Size of unit only 7-5-5 1/2 in. high. Guaranteed for 12 months. Only £5/19/6. Send S.A.E. for illustrated leaflet. Terms. Deposit 22/6 and 5 monthly payments of 22/6.



R.S.C. 45 WATT A5 HIGH-GAIN AMPLIFIER
A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalization. Hum level is negligible being 70db. down. 15 db. of negative feedback is used. H.T. of 200 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. Mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with instructions. Exceptional value at only £4/15/0, or assembled ready for use 25/- extra, plus 3/6 carr.; or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

R.S.C. PORTABLE GUITAR AMPLIFIERS

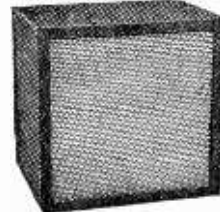
Junior 5 watts High Quality output. Separate Bass and Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v. Twin inputs. High Flux 8in. Loudspeaker built-in. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carrying handle. H.P. Terms. Deposit 21/- and 9 monthly payments Carr. 7/6 of £1.

£8-19-6

Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated. 7 x 4 m. elliptical for Bass notes and a 7 x 4 m. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit 26/9 and 9 monthly payments of 26/9. Both models for 200-250 v Carr. 10/- A.C. mains. **15 gns.**

SPECIAL TRANSISTOR OFFER. T51 Brimar. Brand new. Perfect. 3 for 10/9

12in. 10 WATT HIGH QUALITY LOUD-SPEAKER



IN POLISHED WALNUT FINISHED CABINET

Gauss 12.000 lines. Speech coil 3 ohms or 15 ohms. Only £4.19.6 Carr. 5/-. Terms: Deposit 11/- and 9 monthly payments of 11/-. 12 in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 8in. Finish as above. Terms: Deposit 13/10 and 12 monthly payments of 13/10. Only £7.19.6. Carr. 8/6.

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

HI-FI CRYSTAL PICK-UP HEADS. (Turnover type with sapphire stylus). HGF59. Standard replacement for Garrard and B.S.R. B.S.R. Ful-8, Garrard GC2. 10/9.

BUILD A BATTERY OPERATED PORTABLE RECORD PLAYER For Consisting of Garrard 45 **£6.19.6** r.p.m. motor and turntable. Two-tone case, speaker, parts for transistor, amplifier, and circuit. All parts sold separately.

F.M. SPEAKERS. 2-3 ohm. 2in. Perdio 21.9. 5in. 17/9. 6in. 16/9. 8in. 19/9. 8 x 5in. 25/9. 10in. 23/9. 10 x 6in. 29/9. 12in. 29/11. 10in. W.B. 'Stentorian' 3 or 15 ohms type HF1012 10 watts, high fidelity type. Recommended for use with our A8 Amplifier. £4.10.9. 12in. Plessey 3 ohms 10 watts (12,000 lines). 59/6.

TWEETERS. Plessey 3 in 19/9. 15 in 25/9. GL3A MINIATURE 3-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Over-all size 1 1/2 in. x 2 1/2 in. x 2 1/2 in. Vol. and Tone with switch. Guaranteed 12 months. Only 59/6.

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

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. For 200-250 v. 50 c.p.s. A.C. mains. Our price £8.19.6. Carr. 5/6.

EX-GOVT. CASES. Size 14-10-8in. high. Well ventilated, black crackle finished, undrilled cover. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE, OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage.

TERMS: C.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2. 2/9 extra under £5. Open 9 to 8, Wed. until 12. Trade supplied. S.A.E. with all enquiries. Mail Orders to 29-31 Moorfield Rd., Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1, and 8-10 Brown St. (Market St.), Manchester 2, or 56 Morley Street, (next to Majestic Ballroom) Bradford.

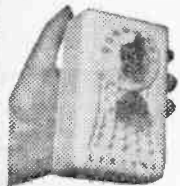
EASY AS A.B.C. TO BUILD

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" x

37/6

2 1/2" x 1 1/4" — 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. 2/- extra. (Parts sold separately, priced parts list 1/8.)



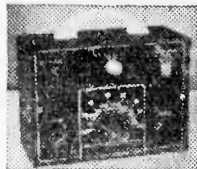
2/- extra. (Parts sold separately, priced parts list 1/8.)



29/6

Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1 1/2" x 1 1/2" x 1 1/2" — "Feather-weight" — yet gives clear, crisp, personal-phone reception over all medium waves. Its battery inside lasts months—costs 5d. No snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only 29/6 (add 2/6 Post, etc.). C.O.D. 2/- extra. (All parts sold separately, priced parts list 1/8.) 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



47/6

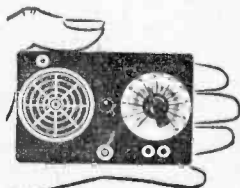
knowledge whatever in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6 1/2" x 5 1/2" x 3 1/2". Covers all medium and long waves. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holiday, etc. BUILD THE "SKY-ROMA" 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 1/8.) C.O.D. 2/- extra.



**THE SENSATIONAL
POCKET RADIO!**

29/6

The sensational "Silvertone" model! A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" building cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4 1/4" x 2 1/4" x 1 1/4" — a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, wire, screws, etc., for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/8.)



29/6

THIS TRANSISTOR SET Can Be Built For Only 29/6. The "Sky-Scout" Pocket two-stage transistor set, size only 1 1/2" x 3 1/2" x 4 1/4". Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- Post and Packing. INCLUDING CASE, TRANSISTOR, STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS, nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list and Plans 1/8. VERY SIMPLE TO BUILD.



**MATCHBOX
SIZE
RADIO!**

17/6

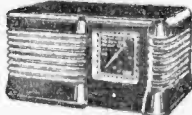
This amazing "Tiny-Tim" model—no larger than a match box—costs nothing to run—ever! No batteries! No Valves! No electricity! Will never run down or burn out. Uses the latest TRANSISTOR TYPE GERMANIUM DIODE, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can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



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!

39/6

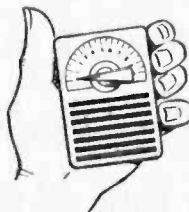
Remarkably sensitive—covers all medium waves, inc. Luxembourg, Home, Light. Size only 2 1/2" x 3 1/2" x 5 1/2" — Not a Toy! But a Real Personal-Phone Valve Radio with Detachable Aerial! IDEAL FOR BEDROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc., for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately, priced parts list 1/8.) Send Today! Money refunded if parts returned intact within 7 days.



Choice of beautiful walnut veneered cabinet 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, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12 1/2" x 6 1/2" x 5 1/2". Build this long-range powerful! midget NOW. TOTAL BUILDING COST INCLUDING PLANS, ETC., 107/6. (Post and Packing 3/6.) Parts sold separately. Priced parts list and plans 1/8. C.O.D. 2/- extra.



45/-

TWO-TRANSISTOR SET. Can Be Built for 45/- BUILD THE "SKY-ROMA" NOW! VEST-POCKET TWO TRANSISTOR RADIO which gives a superb performance and is highly sensitive. Weight under 7 ozs.—yet it is a THREE-STAGE receiver covering all medium waves, working entirely off a "penlight" battery. Every part tested before despatch! SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS. Total building cost including case, transistors, etc.—everything down to the last nut and bolt—ONLY 45/- with plans. Postage, etc., 2/- (C.O.D. 2/- extra.) (Parts sold separately. Priced parts list and plans 1/8.) RUSH YOUR ORDER TODAY!

CONCORD ELECTRONICS

210, Church Road, Hove, Sussex

Dept.
PW20

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

LOOK—ONLY £6-17-6!



BRAND NEW—NOT SURPLUS! In maker's sealed cartons. Latest UAS "Monarch" 4-speed record-player complete with High-fidelity "turnover" head. Type HGP 37-1 Capacity of 10 Records, plays 12in., 10in. and 7in. Intermixed in any order, 78, 45, 33 1/2 and 16 r.p.m. For A.C. mains 100 to 250 volts. Exclusive "magdisk" selector gives quickest and quietest change over. With full instructions and fixing parts. Limited Quantity at £6.17.6 plus 4/6 Post, Packing, etc. **WHY PAY MORE?**

LIMITED QUANTITY "CABY" TESTMETERS! Never before such amazing value! A high grade universal testmeter. Large scale (3 1/2 in.), highly sensitive movement (500 Micro Amps) Measures A.C. Volts, D.C. Volts, D.C. Current, Ohms, Decibels, Inductance and Capacitance! Range: D.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v., A.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v., D.C. Current—0-500 Micro-Amps, 25 Milliamps, 250 Milliamps. Resistance—0-10 K ohms and 1 Megohm. Decibels—-20 dB. to +22 dB. and -20 dB. to +36 dB. Capacitance—100 pfd. to 0.1 mfd. Inductance—10 to 1,000 Henries (also with external D.C. voltage will measure to 100,000,000 ohms). A beautiful, strongly-made instrument. Brand New, not a kit, at only 87/6, incl. test prods, instruction book and internal batteries (replacements cost only 6d. ea.). Plus 2/6 P. & P. (C.O.D. 2/- extra)

LOOK AT THESE "CONCORD" BARGAINS

Build this
MAINS "FRYING PAN" RADIO
for only **67/6!**

Build this **MAINS "FRYING-PAN" SPECIAL**, uses highly sensitive twin-diodes valve circuit and normal size speaker. Covers all Medium and Long Waves giving amazing performance and tone. Costs only 1/1. for about 75 hours' use! Excellent for KITCHEN, bedroom, garden hut, etc., etc. Robust design. **NO EXPERIENCE WHATEVER REQUIRED—YOU CAN BUILD ANY CONCORD DESIGN AND GET PROFESSIONAL RESULTS!** For A.C. Mains 200 to 250 Volts. **LOADS OF FUN TO BUILD—INSTRUCTIONS ANY-ONE CAN FOLLOW.** Can be built for 87/6 including valves, speaker, step-by-step plans, etc. Postage and packing 2/6 (C.O.D. 2/-). **PARTS SOLD SEPARATELY—shopping list, etc., 1/8. WILL PAY FOR ITSELF AGAIN AND AGAIN!—RUSH YOUR ORDER TODAY.**



Look—
only
77/6!

NEW in maker's sealed cartons!—limited quantity of "COLLARO" JUNIOR 4-speed record player unit, exceptionally easy to fix, with lightweight pick-up, incorporating crystal turnover head and separate sapphire stylus for Standard and Long-Playing. With full instructions and fixing plans. Unbeatable price, 77/6, plus 3/6 Post, Packing, etc. C.O.D. 2/- extra. **RUSH YOUR ORDER NOW—BEFORE IT'S TOO LATE!**

CIGARETTE RADIO
Only 25/-



Amass your friends—the highly sensitive **TRANSISTOR "CIGARETTE RADIO"** receives all medium wave stations clear and crisp—boils tea, cigarettes—weighs less than 3 ozs. with cigarettes! Tiny battery inside costs 3d. and lasts over three months! This brilliant little novelty personal phone radio is ideal for Bedside, News, Sports, Office. Can be built by anyone from our simple, pictorial diagrams in an hour or two. All parts supplied for 25/- (add 1/6 P. & P.). C.O.D. 2/- extra (Parts sold separately, priced parts list 1-)

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(a) Full-time One Year Course in Radio and Television. College course in basic principles for prospective servicing engineers.

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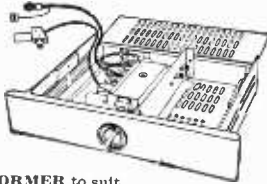
For details of the above, write to:

The Principal, PC/11,
**THE PEMBRIDGE COLLEGE
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34a Hereford Road, London, W.2

CHANNEL TUNER

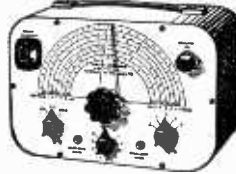
Will tune to all Band I and Band III stations. BRAND NEW by famous manufacturer. Complete with PCF34 and PCF30 valves (in series) I.F. 16-19 or 33-38. Also can be modified as an aerial converter (instructions supplied).



Complete with knobs.

22/6 Plus 3/6 P. & P.
HEATER TRANSFORMER to suit the above. 200-250 v., 6/. Plus 1/6 P. & P.

SIGNAL GENERATORS

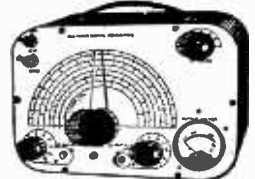


Cash **£6.19.6** or 25/- deposit and 6 monthly payments of 21/6. Post and Packing 5/- extra.

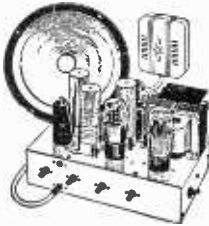
Coverage 100 Kc/s-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Metal case 10 1/2 in. x 6 1/2 in. x 4 1/2 in., grey hammer finish incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250 v. Internal Modulation of 400 c.p.s. to a depth of 30%; Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Incorporating magic eye as output indicator. Accuracy plus or minus 2%.

Cash **£4.19.6** or 25/- deposit and 4 monthly payments of 21/6. Plus Postage and Packing 5/-.

Coverage 120 Kc/s-84 Mc/s. Metal case 10 1/2 in. x 6 1/2 in. x 4 1/2 in. Size of scale, 6 1/2 in. 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%, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%



8-WATT PUSH-PULL AMPLIFIER COMPLETE WITH CRYSTAL MIKE AND 8in. LOUSPEAKER



A.C. mains 200-250 v. Size 10 1/2 in. x 6 1/2 in. x 2 1/2 in. Incorporating 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feedback. Two inputs, mike and gram, and controls for same. Separate controls for Bass and Treble Hft. Response flat from 40 cycles to 15 K/c.s., distortion 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as Guitars, etc.

± 2db; 4 db down to 20 K/c.s. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as Guitars, etc.

£4.19.6 Plus P. & P. 7/6. Or 20/- deposit Plus P. & P. 7/6, and 4 monthly payments of 23/-.

B.S.R. MONARCH UA8 WITH FUL-FI HEAD



4-speed plays 10 records 12in., 10in. or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position; colour brown. Dimensions: 12 1/2 in. x 10 1/2 in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Full-Fi turnover crystal head.

£6.19.6 Plus 5/- Postage & Packing. With Stereo Head, **£7.19.6**, plus 5/- P. & P.

TRANSISTOR TESTER

For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case size 4 1/2 in. x 3 1/2 in. x 1 1/2 in. Scale marked in gain and leakage.

19/6 Plus 2/6 P. & P.

MAINS TRANSFORMERS

All tapped with primaries 200-250 volts, 0-160, 180, 200 v., 60 ma., 6.3 v., 2 amps. 10/6, 320-0-320 v. 75 ma., 6.3 v., 2.5 amp., 5 v., 2 amp. 10/6, 280-0-280 v., 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, 250-0-250 v. 70 ma., 6.3 v., 2 a., 10/6. Postage and packing on the above 3/-.

PORTABLE AMPLIFIER

On printed circuit for A.C. Mains 200/250 v. Size 4 1/2 in. x 3 1/2 in. with tone and volume control. Valves: ECL82 and E280.

39/6 P. & P. 2/6

BUILT POWER SUPPLY UNIT

A.C. Mains 200-250 v. D.C. Output 250 v. at 75 ma. Also 6.3 v., 2 amp. heater winding.

21/- Plus 3/6 P. & P.

WOLSEY 3-ELEMENT FOLDED DIPOLE

L.T.V. Aerial less mounting bracket for External use, complete with 12 yds. of coaxial cable, 15/-; 4 element, 17/6; 5 element, 25/-; P. & P. on above, 3/6.

INTERCOM or BABY ALARM

In Wooden Cabinet with 8in. speaker and 3 valves. Transistorised input. Provision for talk back.

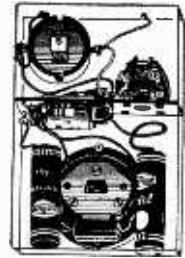
49/6 Plus 5/- P. & P.

2-TRANSISTOR POCKET RADIO

Plus Germanium diode, fully tuneable over medium and long waves. Size 3 1/2 in. x 4 1/2 in. Complete set of components including case, 2 transistors and earpiece (less batteries obtainable anywhere at 10d.)

19/6 Plus P. & P. 1/6.

Point to point wiring diagram 1/6, free with kit.



PUSH-PULL OUTPUT STAGE

Inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the above kit. Complete kit of parts including transistors.

19/6 Plus Post and Packing 1/6.

Point to point wiring diagram 1/6 free with kit.

3-TRANSISTOR POCKET RADIO

Plus Germanium Diode on PRINTED CIRCUIT Size 3 1/2 in. x 4 in. x 1 1/2 in. Incorporating Ferrite Rod Aerial. Tuneable over medium and long waves. **39/6** Plus 1/6 P. & P. Kit of parts Circuit diagram 1/6, free with kit.

A.C./D.C. POCKET MULTI-METER KIT

Comprising 2in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel range switch, wire-wound pot (for ohms zero setting), toggle switch, resistor and rectifier. In grey hammer finish case.

19/6 Plus P. & P. 1/6.

Point to point wiring diagram 1/-, free with kit.

F.M. TUNER UNIT

By famous German Manufacturer. Coverage 88-100 Mc/s. Complete with ECC85. **25/-** Plus Size 4 1/2 in. x 2 in. x 2 in. Circuit diagram 1/-, free with unit. 10.7 Mc/s I.F. and Discriminator Coil. 4/- pair.

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

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All enquiries S.A.E. Goods not dispatched outside U.K.

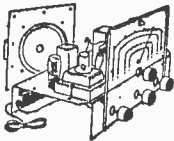
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E.12 (Dept. C.7). I.L.F. 6001/3

NO DEPOSIT INTEREST FREE
20 or 36 weeks to pay

SUPER CHASSIS

3/11 per week



Cash price **79/6**

On the initial payment of 5/1, plus carriage of 5/6, this chassis will be despatched. Balance at 3/11 for 19 weeks. 5-valve superhet chassis including 8in. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four wavebands with position for gram p.u. and extension speaker, A.C. ins. & Carr. 5/6.

TV CHASSIS FOR SPARES
all this **9/6**
for only

56 resistances including 7 variable controls. 54 condensers including electrolytics. Coils. 7 I.F. and R.F. transformers. 13 valve holders (8-88A, 2-87G and 3 octal). 4 transformers: Mains, Output, Line, Frame. Chokes 250 mA. Metal Rectifiers: 300 volts at 250 mA. Fuse panel, scanning coils, focus magnets. Plug sockets, switch, chassis screws, tag strips, etc. I.F. can be separated. Power pack can be used without dismantling. The chassis have been used but were working when stored. 6-page circuit and instructions showing position of each component. Carriage 7/6.

SUMMER SALE! BARGAIN!

17" TVs complete 19 gns.

Cash or terms over 20 weeks (no interest charged). Initial payment £1.0.7 and 19 weekly payments of 19/11. Carr. and Ins. 30/-.

ITV/BBC. Beautifully styled polished cabinets. These are table models with the option of contemporary legs fitted (2 gns. extra). 17in. rectangular tube guaranteed for 12 months. Valves & Chassis guaranteed for 3 months (chassis salvaged but reconditioned).

Where possible personal collection is advised.



79/9
OR
5/4
initial payment

RECORD PLAYER CABINET R.P.8.

Balance at 3/11 a week for 19 weeks

This contemporary cabinet in two-tone grey rexine is ideal for the modern home. Added attraction is the cream plastic speaker fret. Press button lid; lock. Fittings for screw-in legs. Internal measurements 14 1/2 x 18 x 8 1/2 in. deep. Takes a Garrard 121 Mk. 2, or B.S.R. UA12; 9 1/2 x 4 1/2 elliptical speaker at 19/6; our Mk. D2 portable amplifier at 79/6. Carr. and Ins. 5/6.

HOME RADIO



A.C. OR UNIVERSAL
mains 5 valve **79/6**
octal superhet 3
w/band receiver can be adapted to gram p.u. in attractive polished cabinet. Dimensions 9 1/2 x 18 1/2 x 11 1/2 in. Ins. & Carr. 4/6. Terms available.

SOLO SOLDERING TOOL 12/6

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

REPLACEMENT, REBUILT TV TUBES

12 MONTHS' GUARANTEE.



21in. TUBE £8.10.0 **£2** allowed on old Tube.
17in. TUBE £7.10.0
12, 14, 15in. TUBES **£1** allowed on old Tube
£5.10.0

TERMS AVAILABLE OVER 20 WEEKS

Send for a **FREE** Catalogue.

full details of goods and easy payments.

DE-LUXE TAPE RECORDER CABINET

ONLY 29/9



Beautifully made Tape Recording Cabinet. Size 13 x 10 1/2 x 7 in. Covered in two-tone rexine cloth. Stylish design. Carrying handle and detachable lid with lock and key. Easily adapted to Recorder Player Cabinet. Exceptional value at this very low price. Post and packing 4/6.

RECORD PLAYER CABINET R.P.9

Exceptional offer: A lightweight portable Record Player Cabinet by a famous manufacturer. Size 14 1/2 x 11 1/2 x 6 in. Colours cream and rust. Complete with moulded deck board of attractive design. Takes a B.S.R. TU9 Single Player, 2 control amplifier and a 5in. round speaker. P. & P. 4/6. **19/6**

B.S.R. Monarch, 4-speed Autochanger	£6.19.6
T.U.9 B.S.R., 4-speed single player	£4.9.6
Collaro Conquest, 4-speed Autochanger	£6.19.6
Collaro Conquest, Stereo Autochanger	£9.9.0
Portable Amplifier, Mk.D.2, 4 wts., 2 control	£3.19.6
Portable Amplifier, Mk.D.3, 4 wts., 3 control	£4.9.6

SALVAGED VALVES. 3 MONTHS' GUARANTEE. USEFUL TYPES

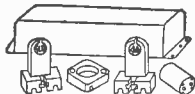
at 9d. 6AC7, 6SA7, 6SG7, 6SH7, 6SJ7, 12BE6, EF36, EF37, EF50, SP41, SP61, T41.
at 2/9. 6F1, 6F12, 6F13, 6F14, 6F15, 6K7, 6LD20, 10F1, PEN45, PEN46, U22, UF41.
at 7/9. 5U4, 5Y3, 6A8, 6K8, 6Q7, 6U6, EABC80, EBC33, ECC81, EL38, EZ40, KT36, EZ80.

Post, Packing and Ins. 1 valve 7d., 6 valves 1/6, 12 valves 2/6.

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.



Fluorescent Light Bargain

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

Avo Proclips

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

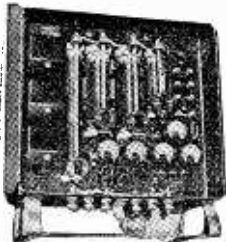


Cabinet Snip



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

Charging Switchboard



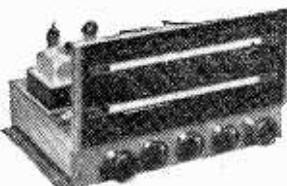
Offered at about one-twentieth of original cost. This is an ex-Government switchboard. It contains three reverse current relays, one voltmeter, one main ammeter, two secondary ammeters and three variable resistors for controlling circuits. These are original cases. Price £2.15.0, carr. 10/-.

Novelty Radio

Completely wired tunable medium wave, originally intended for B7G valves and external batteries but could easily be converted for transistors with internal batteries. Less valves and speaker, otherwise complete, 15/-, plus 1/6 postage.



Fine Chassis by Armstrong



The AF208 handbuilt to the traditional Armstrong standard is ideal for building into a new set-up or for bringing that old favourite up to date. PM 97-108 Mc.s. AM 187-570 mtrs. 5 watts output—15 db neg. feedback—separate base and treble—2 compensated inputs for pickup—frequency response 30-25 thousand C.P.S. Plus or minus 2 db. Tape record and playback facilities. Price 22 gns. or H.P. terms on request.

Re-gunned Tubes

We offer television tubes which have had new gun assemblies, new getters, new screens and have virtually been rebuilt as new.

12in.	£4.19.6
14in.	£5.9.6
17in.	£5.19.6

Non-callers please add 10/- carriage and insurance.



Transistor Set Cabinet

Very modern cream cabinet, size 5 1/2 x 3 x 1 1/2 in. with chrome handle, tuning knob and scale. Price 8/6, plus 1/6 postage and packing.

This Month's Snip Thermal Delay Switch

This is a bi-metal device which will delay switching on for a variable period depending upon voltage applied. Can be used to prevent full voltage appearing until valve heaters have warmed up or many other applications. Photographic tuner, liquid level indicator, etc. Snip price 3/6 includes book of circuits. Non-callers please add 1/6 postage.

Motor Snip

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



A Mobile Receiver Transmitter Station

Compactly built to be carried by one man. This has a range of approximately 10 miles and being crystal controlled tuning is avoided and operation is as accurate as a telephone. Complete stations comprising: receiver transmitter, rod aerial, headphones and microphone in canvas carrying bag and additional canvas carrying bag for batteries. Items 1-8 in the illustration but less the plug in crystal coil units (these are available for the specified frequencies as an extra). Price £4.10.0 per station. Frequency 3.6-9.1 Mc/s. Instruction book free with equipment or available separately. Price 2/6.



FOR ADDRESSES SEE OPPOSITE PAGE

Speaker Bargain



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

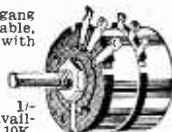
W.D. Circuit Details

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

A.134	R.109
BC.348	HRO Receiver
BC.312	R28/ARC5
R.103A	R1116/A
BC.342	RA-1B
RA-1B	AR88D
R-203	WV/WAPA-1
R-1155	78
R-1124A	76
R-1132A/R-1481	R.T.18
R-1147	CAV-46-AAM-
R-1124A	RADAR
R-1082	A.S.B.-3
R-1355	Indicator 62A
B.C. 1206-A/B	Indicator A.S.B.3
B-465-A (or-B)	Indicator 62
B-464-A (or-B)	Indicator 62K
B-465-M-A (or-B)	R.F. unit 24
Transmitter T1154	R.F. unit 25
Fifty-eight walkie talkie	R.F. unit 26
Frequency meter	R.F. unit 27
B.C. 221	Wireless set No. 16
	Demobbed valves

Morganite Potentiometers

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



Tube Tester and Reactivator

We can supply all the main components for making this unit which will not only test Cathode Ray Tubes but also will reactivate them, supplied complete with full instructions. Price £3, plus 2/6 post and ins.



Clock Numerals Etched on Metal

Clock numerals etched on metal, 2/6. Post 1/-.



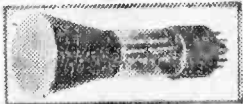
For Your Lab.

Resistance substitution boxes are great time savers and you really cannot have too many of them; here then, is an opportunity to acquire these at a very low rate. Our R.S. kit available for only 8/6, plus 1/6 postage comprises one 50 W. precision variable resistor 0-100 K., six 2-3 watt fixed resistors, one 6-position switch, one pointer knob and one ordinary knob and instructions. This unit when made up will give an infinite variability over the range 100 ohm to 2 meg.

"Dim and Full" Switch

Particularly useful for controlling photo-flood 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.

Building A Scope?



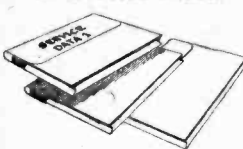
3in. oscilloscope tube American made Type No. 3FP7. Octal base 6.3 v. 0.6 amp heater, electrostatic deflection. Brand new and guaranteed 15/- each, plus 1/6 post and insurance. Complete with circuit diagram.

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.



TV Service Sheets



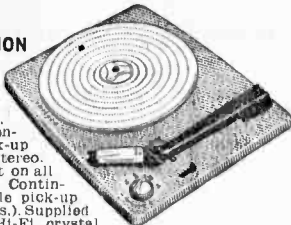
150 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc. Giving circuit diagram, component values, I.F. frequencies, etc. 2/-, post free.

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 20ft. roll.
SPONGE STRIP. 1in. x 1in. 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.

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 (212gms.). Supplied with Philips Hi-Fi crystal type AG3019 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. Muting switch. Can be used with any amplifier or radio set. Complete with monaural pick-up, £10.10.0. or 2 gns. deposit and 19 fortnightly payments of 10/-. Available also with stereo head, diamond or sapphire stylus. Prices on request.

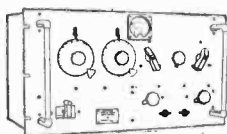


Unique Opportunity to build Fine Transistor Set

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



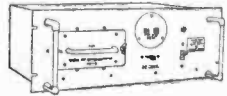
RI132—2 Metre Receiver



Price £6.10.6, plus 10/- carriage and insurance.

This is a 15 valve superheterodyne covering 95-150 mc/s (2-3 metres). Switchable A/G and AVC—variable b.f.o. We have a few only of these very fine receivers—complete and good condition but may need some attention.

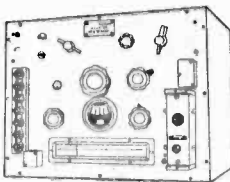
Power Unit 234A



Unused and in perfect order, £4.10.0, plus 7/6 carriage and insurance.

Built to operate the RI32 but on extremely fine power pack for any job—standard mains input, h.t. output, 100 mA at 240 v. fully smoothed L.T. 6.3 v. at 5 amps.

B.29 Receiver



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

Special This Month

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 millamp, 2 1/2in. flush	17/6
0-30 milliamm, 2 1/2in. flush	17/8
0-100 milliamm, 2 1/2in. flush	15/-
0-300 milliamm, 2 1/2in. flush	15/-
0-500 milliamm, 2 1/2in. flush	15/-

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

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

Metal Rectifier. Equivalent RM5. 12/6.

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

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

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

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

Philips Trimmers. 0-50pF, 1/- each, 9/- doz.

Set of 8 Allen Keys. 3/6.

Install these extra Points. 3,000 twin flat T.R.S. cable. Big purchase enables us to sell this at 45/- per 100 yds., carriage 3/6.

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

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

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

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

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

Relling Lee 2BA fully insulated terminals (for mounting through metal panels) 2/- each.

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

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

50 Assorted Resistors. Well mixed and useful values 1 and 4 watt, 5/- for 50.

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

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

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

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

ELECTRONIC PRECISION EQUIPMENT LTD.

Post orders are dealt with from Eastbourne, so for prompt attention please post your orders to 66 GROVE ROAD, EASTBOURNE, SUSSEX, marked Dept. 7.

Callers may use any one of the Companies below:

Electronics (M.P.) Ltd., 529 High Street North Marlow, Bucks. Ux4 2E Phone: H100 1111 Half day Thursday	Electronics (Rushlip) Ltd., 42-46 Windmill Hill, Rushlip, Mdx. Phone: RU1SLIP 5780 Half day Wednesday	Electronics (Croydon) Ltd., 266 London Road, Croydon, Phone: CRO 6558 Half day Wednesday	Electronics (Finsbury Park) Ltd., 29 Stroud Green Rd., Finsbury Park, N4 Phone: AR0Hway 1049 Half day Thursday
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Easy-to-build kit-sets of

Heathkit

DAYSTROM

highest quality at lower cost

HI-FI F.M. TUNER

Tuning range 88-108 Mc/s. For your convenience this is available in two units sold separately as follows: Tuner Unit (FMT-4U) with 10.7 Mc/s I.F. output (£3.2.0, inc. P.T.). I.F. Amplifier (FMA-4U) complete with cabinet and valves (£10.10.6).
Total £13.12.6



F.M. TUNER

HI-FI 16W. STEREO AMPLIFIER Model S-88
10mV. basic sensitivity (2 mV. available, £1 extra). Ganged controls. Stereo/Monaural gram. radio and tape recorder input. Push-button selection. Two-tone grey metal cabinet. £25.5.6



S.33

6-TRANSISTOR PORTABLE Model UXR-1

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



S-88

DUAL-WAVE TRANSISTOR RADIO UJR-1

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



DX-40

RES.-CAP. BRIDGE Model C-3U

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



DX-100U

AUDIO SIGNAL GENERATOR Model AG-9U
10c/s to 100 kc/s. switch selected. Distortion less than 0.1%. 10v. sine wave output metered in volts and dB's. £19.3.0

VALVE VOLTMETER Model V-7A

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



OS-1

Portable 2 3/4" SERVICE SCOPE Model OS-1

Compact portable scope ideal for servicing and general work. Y amplifier sensitivity 10 mV/cm; response ± 3 dB 10 c/s-2.5 Mc/s. Time base 15 c/s-150 kc/s. Printed circuit. Case 7 3/8 x 4 1/2 x 12 1/2 in. long. Wt. only 10 1/2 lb. £18.19.6



UXR-1

5 in. OSCILLOSCOPE Model O-12U

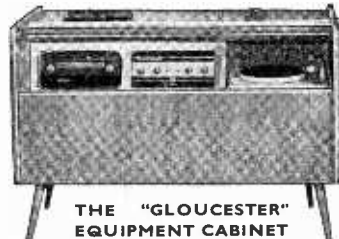
Has wide-band amplifiers, essential for TV servicing, F.M. alignment, etc. Vertical freq. response 3 c/s. to over 5 Mc/s. without extra switching. T/B covers 10 c/s. to 500 kc/s. in 5 ranges. £34.15.0

NEW MODELS include:

"Chepstow" Equipment Cabinet £10.10.0
Stereo Control Unit, Model USC-1 £17.19.6
Single Channel Amplifier Model MA-12 £9.19.6
and

'PACKAGED DEALS' of Hi-Fi
Equipment including TAPE DECKS (Collaro or Truvox), RECORD PLAYERS (Collaro or Connoisseur) and DECCA ffs PICK-UPS.

Write in to see how these deals save you further money.



THE "GLOUCESTER" EQUIPMENT CABINET

6-W STEREO AMPLIFIER Model S-33

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

TRANSCRIPTION RECORD PLAYER RP-1U

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

HI-FI SPEAKER SYSTEM Model SSU-1

Ducted-port bass reflex cabinet "in the white". Twin speakers. With legs £11.2.6 £10.5.6

"HAM" TRANSMITTER Model DX-40U

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

AMATEUR TRANSMITTER Model DX-100U

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

"GLOUCESTER" EQUIPMENT CABINET

46 1/2 x 30 x 21 in. deep. Mk. I houses Record Player, Stereo Amplifier, F.M. Tuner, records, etc. Mk. II will house a Tape Deck in addition. Left in the white for finish to personal taste.

Mk. I ... £15.18.6 Mk. II ... £17.8.6

"COTSWOLD" HI-FI SPEAKER SYSTEM KIT

Acoustically designed enclosure "in the white" 26 x 23 x 15 1/2 in., housing a 12 in. bass speaker with 2 in. speech coil, elliptical middle speaker and pressure unit to cover the full frequency range of 30-20,000 c/s. Complete with speakers, cross-over unit, £19.18.6 level control, etc.

COMPLETE MATCHED STEREO OUTPUT

Includes record player, amplifier and twin speaker systems (pedestal speaker legs optional, £4.14.0 extra). £42.10.0

AUDIO VALVE MILLIVOLTMETER AV-3U

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

AUDIO WATTMETER Model AW-1U

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

STEREO-HEAD BOOSTER USP-1

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

VAR. FREQ. OSCILLATOR VF-1U

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

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

Please send me FREE CATALOGUE (Yes/No).....

Full details of model(s).....

NAME

ADDRESS

PW7

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WORLD'S LARGEST-SELLING ELECTRONIC KITS

Practical Wireless

VOL. No. XXXVI, 641, JULY 1960

Editorial and Advertisement
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RADIO SHOW PLANS

IN recent years it has seemed to many visitors to Earls Court that the Radio Show has been developing into a routine event and gradually become less attractive to dealers and public alike. Many visitors to last year's exhibition were heard to express the view that some new approach was needed so that public interest in the exhibition could be maintained. Evidently the organisers have become aware of the situation since it has been announced by them that it is intended to make this year's show much more interesting to visitors and in fact a major increase has been made in the amount of money to be spent in promoting and advertising the Show.

The ground floor of the Earls Court building will be occupied this year as usual by the large stands and space will be found for 44 in the well of the hall—two more than in previous years. For the first time there will be an ITV feature exhibit on the ground floor staged by some of the programme companies including ATV and Southern Television. Spaces have also been reserved for feature exhibits, possibly on transistors and printed circuits.

There were some complaints last year that the various sections of the exhibition were difficult to locate and many improvements will be made to the signposting in the hall. Although the Audio Hall will occupy the same position as last year—on the Philbeach side—in order to make it easier to find, and to give a more open layout, it has been completely replanned. More audio stands and demonstration rooms, of the same type as before, will be provided and all will be clearly visible. There may possibly be a central feature exhibit which might be concerned with recording. The lighting of the stands will also be greatly increased and entrances and exits will be better sited.

The BBC's exhibit, in the usual position at the far end of the first floor, will this year be restricted to publications and static displays. It is hoped to reduce the congestion caused in this area. The main BBC exhibit, including a Gramstand presentation with visiting stars and a stage, will be located in the West Brompton Wing. Other exhibits still under consideration include an improved servicing and careers display incorporating small booths for firms making test equipments; no doubt this will be of particular interest to many of our readers visiting the exhibition.

We welcome these improvements to the exhibition and hope that they will make it more interesting, particularly to the lay visitor, who may only wish to make a choice of a new receiver. In view of these improvements to the exhibition, the announcement that there will be 20 stands in the Warwick Hall devoted solely to pianos was rather surprising. This exhibition within an exhibition has been organised in conjunction with the Piano Manufacturers' Association. We fail to see that there is any justification for including pianos in a radio show. True, they can be heard on the radio and television but so, for instance, can other musical instruments. It seems to us that the Radio Show is being used to provide visitors to a separate exhibition which might otherwise attract little attention.

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

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences
THERE are now over fifteen million broadcast receiving licences in force in Great Britain and Northern Ireland.

During March the number of combined television and sound licences increased by 101,430, bringing the total to 10,469,753. Sound only licences total 4,535,258, including 427,491 for sets fitted in cars.

Region	Total
London Postal	792,850
Home Counties	747,289
Midland	551,782
North Eastern	638,316
North Western	518,877
South Western	447,476
Wales and Border Counties	271,490
Total England and Wales	3,998,020
Scotland	462,098
Northern Ireland	135,150
Grand Total	4,535,258

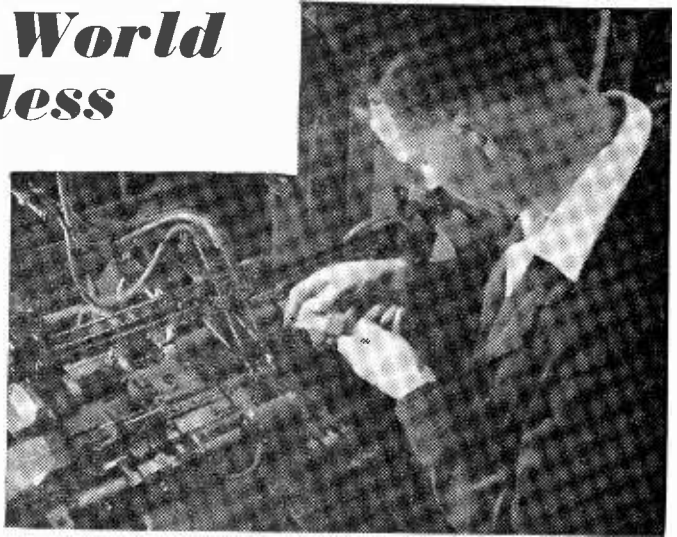
Anglo-American Agreement

AN agreement has been concluded between Ferranti Ltd. and the Bendix Aviation Corporation for the sale in the U.S.A. of the new Ferranti systems of machine tool control developed at Edinburgh.

The systems were first introduced at the 6th European Machine Tool Exhibition in Paris in September, 1959. They are the transistor/hydraulic continuous-path machine tool position control equipment, numerical position control equipment and inspection machines. Bendix, the leading manufacturers of machine tool control systems in the United States, will market and service the British built systems throughout the U.S.A. and will set up a computer centre initially in Detroit to supply magnetic tapes for this equipment.

Co-ordination

THE United Kingdom and the United States have begun co-ordination of their time and frequency transmissions. This was announced jointly in the United Kingdom by the Astronomer Royal, Royal Greenwich Observatory and the Director, National Physical



The above illustration shows the manufacture of receiving valves at the Mullard Blackburn plant. Machines of this type have been developed for welding together the component lengths of the tri-metal connecting wires, which comprise the stiff external connecting pins, a special type of wire to form a perfect seal with the glass base, and the connecting wire between this and the various electrodes. Gas jets heat the metals for welding.

Laboratory, and in Washington by Dr. James H. Wakelin, Jr., Assistant Secretary of the Navy (Research and Development) and Dr. Allen V. Astin, Director of the U.S. Bureau of Standards.

Co-ordination was begun early this year in order to help provide a uniform system of time and frequency transmissions, which is needed in the solution of many scientific and technical problems in such fields as radio communications, geodesy, and the tracking of artificial satellites. Participating in the project are the Royal Greenwich Observatory, the National Physical Laboratory, and the Post Office Engineering Department in the United Kingdom, and, in the United States, the U.S. Naval Observatory, the Naval research Laboratory, and the National Bureau of Standards.

Milan's Radio-Taxi Service

BRITISH radiotelephones went on the air recently in 250 Italian taxis. Milan began its first radio-taxi service on April 11th with equipment made by Pye Telecommunications Ltd. of Cambridge. The launching of the new service coincided with the opening of the Milan Fair, at which the achievements of the British electronics industry were

presented by the Board of Trade.

Effective over a ten mile radius from the centre of Milan—where a fixed station is installed on the fourteenth floor of a 300ft high office block—this full-scale taxi scheme follows the successful demonstration of Pye radiotelephones in the mini-taxis used at previous Fairs in Milan.

Visitors to the Fair were able to watch Milan's new taxi control room in operation—by television. Pictures were transmitted from the taxi control headquarters in the City to three monitor screens on the Pye stand via a microwave link mounted on the roof of the Palace of Nations which housed the Fair.

Tape Library

MORE than 70 district ministers of the Methodist Church are now using taped material, recorded on a Philips tape recorder, in their work. The tapes are supplied by a unique library service started last December by the Rev. John Davis, B.A., of Maple Avenue, Horwich, Bolton, Lancs.

The library provides recorded materials for classes and discussion meetings and for special groups such as local preachers and Sunday school teachers. Subject matter already includes

'Direct Giving,' 'St. Paul and the modern world' and 'Is the day of the Sunday school over?' and the extent of the library is continually being increased. Some of the recordings are in the form of talks and others are interviews.

Radar Over New York

VISITORS to the British Exhibition in New York, starting on 10th June 1960 will be able to see a large area of the city on the screen of an AEI escort marine radar equipment, the most advanced of its type used at sea today.

To make this possible scanning equipment will be set up on the roof of the Coliseum and will project a view of the Hudson and East rivers into the display stand.

This will be one of the features of the variety of electrical apparatus which will be seen on the stand taken by A.E.I., Britain's largest manufacturers of electrical equipment. Escort radar is made by Associated Electrical Industries (Rugby) Limited, formerly the British Thomson-Houston Company, Limited, one of the pioneers of centimetric radar.

Equipment for Turkey

TURKISH engineers are being trained at Marconi College, Chelmsford, to take over the operation and maintenance of HF radio telecommunications equipment being supplied to Turkey and Iran by Marconi's Wireless Telegraph Co. Ltd. The equipment is being provided under a £225,000 order placed by H.M. Government as part of its programme of technical assistance to member countries of the Central Treaty Organisation.

New British Standard Magnetic tape sound recording and reproduction (B.S. 1568 : 1960)

THIS 16-page publication incorporates two revised specifications: B.S.1568, 'Magnetic tape sound recording and reproduction', and B.S.2478 (the standard for tapes and spools for commercial and domestic magnetic tape sound recording and reproduction — issued in 1954, and now withdrawn).

The new standard deals with the essential features of recording on magnetic tape coated on one side only. It also specifies features of the tape itself and of the associated recording and re-

production equipment which are necessary to ensure satisfactory interchangeability. It applies to single-track and two-track recordings, the latter being either single-channel or stereophonic.

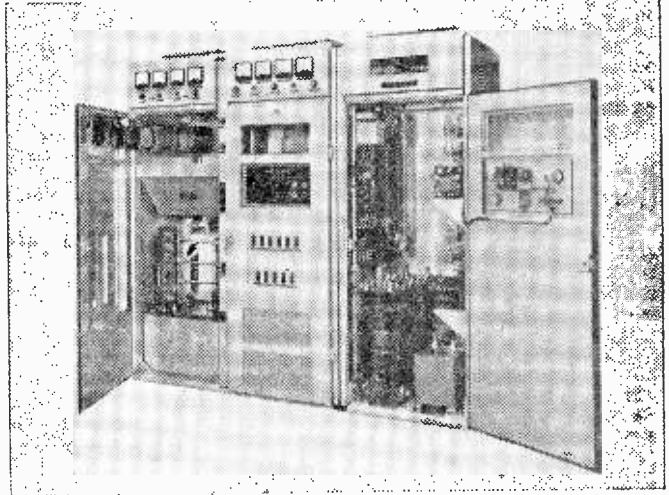
The specification clauses deal with: dimensions of tape; tape-windings identification of recorded side of tape and of recorded tapes; colour codes for leaders; tape speed; spools; position and dimensions of magnetic sound tracks, recording characteristic; tolerances on recorded levels; tolerances for reproducing equipment. There are four diagrams.

Copies of this publication may be obtained from the British Standards Institution, Sales Branch, 2 Park Street London, W.1. Price 4/6d. (Postage will be charged extra to non-subscribers.)

Lighting is a feature of the interior design and the main hall, occupying about 6,000sq ft of the first floor, is illuminated by three 90-lamp chandeliers suspended from a magnificent ceiling. The chandeliers commemorate the Three Towns, the coats of arms of which are incorporated in decorative designs.

Commercial Radio for Nigeria

NIGERIA'S first commercial radio broadcasting station, WNBS (Western Nigeria Broadcasting Service) was officially opened on May 1st by the Western Region Premier, Chief S. L. Akintola. Also present at the opening ceremony was J. E. Babatola, Minister of Home Affairs, whose ministry is responsible for broadcasting and television. The entire ceremony was telecast over WNTV—one



Tropospheric scatter link equipment of the kind shown in this picture is being supplied by Marconi's Wireless Telegraph Co. Ltd. to Cable and Wireless (W.I.) Ltd. to establish a quadruple diversity UHF tropospheric scatter link between the West Indies islands of Trinidad and Barbados.

Plymouth Guildhall

THE new Guildhall in Plymouth, opened last September by Field Marshal Viscount Montgomery, has been reconstructed within the shell of the original structure which was extensively damaged by incendiary bombs during the war. It is equipped with the most up-to-date and comprehensive electrical services, and contains some 30 miles of various cables supplied by British Insulated Callender's Cables Limited.

of the few occasions on which television has covered the opening of a radio station.

The broadcasting station is the sister service to WNTV, Africa's first television network, already in operation. Both form part of the Western Nigeria Radio Vision Service.

Premier Akintola read the first station identification of WNBS which is scheduled to broadcast sixteen hours daily. Programmes will feature 9 newscasts daily, including 3 relays of BBC news.

Electronic Photo Timer

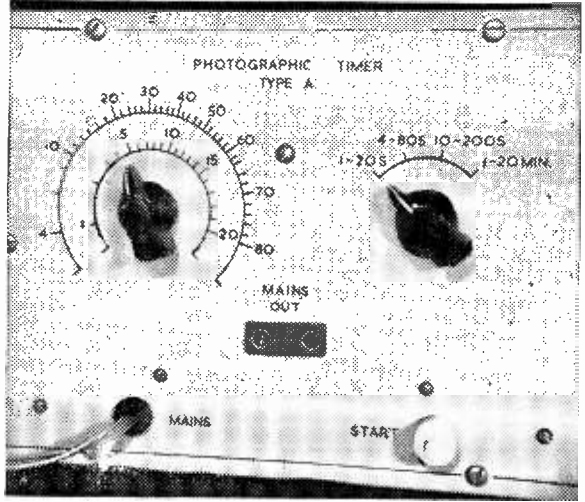
ACCURATE TIMING OF LONG INTERVALS

By H. D. Kitchen

(Continued from page 125 of the June issue)

THE difficulties mentioned last month in obtaining a fair degree of setting accuracy over a range of from a few seconds to about a quarter of an hour can be largely overcome by the use of two separate RC combinations (see Fig. 7). The first C1R1 provides a maximum period of about 30 seconds and is continuously variable, using a variable resistor of 1 or 2M and an electrolytic capacitor. As an example, we could use a 1M variable resistor and a 16 μ F capacitor, giving a maximum interval of 26 seconds when E_g is 80 per cent of E_1 . Present-day capacitors of good quality with a capacitance of 16 μ F have low enough leakages to avoid trouble when used with a 1M variable resistor. This capacitor charges up in the normal manner from the supply potential E_1 until V1 conducts sufficiently to energise relay RY1. One set of contacts on this relay RY1(1) short circuits C1 and quickly discharges it, which cuts V1 off again and de-energises RY1. During the short period when RY1 is energised a second set of contacts, RY1(2), connects the second time constant combination C2R2 to the supply voltage E_1 . However, when RY1 is de-energised C2R2 is disconnected from the supply and it can receive no further charge until V1 conducts again, energising RY1 again. This sequence of operation continues, with C2 only acquiring its charge for short periods during the discharge of C1, until the potential of C2 is sufficient to cause V2 to conduct and energise the second relay RY2. One set of contacts on this relay, RY2(2), operates the external circuit while another set, RY2(1) connects the grid of V through a resistor to the supply, maintaining both valves conductive. This terminates the timing period. The timing interval can be initiated again by momentarily pressing the button B, which short-circuits C2 and C1, cutting off V2 and V1 and opening contacts RY2(1) and RY1(2), thus permitting C1 to commence charging up again through R1 and starting the sequence of events over again.

The action described above is illustrated in Figs. 8 and 9, showing the principle of dividing the charging curve of the second time constant capacitor C2 into a number of parts and separating these



The front panel of the finished timer.

parts by the interval of the first time constant. By this means we can obtain a long timing interval without necessitating very high values of either C or R in either section. To reduce the number of valves and simplify the circuit, a neon tube can be used instead of a valve for V1. It is connected across C1 along with a low resistance relay in series with either its anode or cathode. When the voltage on C1 reaches the striking voltage of the neon it conducts and discharges C1, the flow of current through the neon energising the relay. The rest of the circuit, for C2R2 and V2, could be as in Fig. 7 with the number of "steps" required to cause V2 to conduct controlled by switching in different values of R2. However, it is important with this type of circuit that C2 should retain its charge without appreciable loss during the period when C1 is charging, otherwise the capacitor C2 may, on the average, lose more charge than it gains

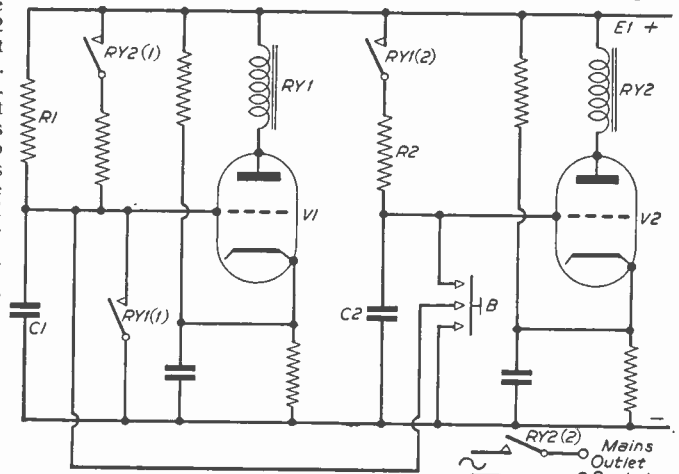


Fig. 7.—A timer circuit incorporating two time constant circuits.

and the second stage will never operate. The circuit of Fig. 7 also suffers from the following disadvantage: the external circuit is switched off at the end of the timing period by the anode current of V2 energising the relay RY2, this state being maintained so long as V2 passes sufficient current. The external circuit is, conversely, switched on when RY2 is de-energised, which will normally only occur when the button B is pressed, to initiate the timing period. However, if the anode current of V2 should cease for any other reason, such as the mains supply being momentarily interrupted, the timing cycle will be initiated and the external circuit switched on. This is obviously undesirable, as it could mean spoiling a, perhaps,

RY2(1) open the H.T. supply to RIC1 and prevent C1 charging up again, thus terminating the timing period. This situation will persist until the start button B is pressed, which short-circuits C2 and permits V2 to draw enough current to energise RY2. Contacts RY2(2) and RY2(1) close connecting the mains to the outlet socket and R1 to the H.T. supply. C1 charges up through R1 and the cycle described before is repeated. It should be remembered that the first timing interval when the timer is first connected to the mains supply is inaccurate because it includes the warm-up time of V2. To avoid any trouble due to this there is no mains switch fitted to the timer.

Housing

The timer is accommodated easily in a small box approximately 6in. x 8in. x 5in., which can be made out of sheet aluminium or tinfoil—20 or 18s.w.g. is suitable if aluminium is used, or 22s.w.g. if tinfoil is used. It is very important that there be no connection whatever between any part of the circuit and the metal box, as the circuit is directly connected to the mains. For this reason, some constructors may prefer to use a wooden box. For additional safety when a metal box is used, it is advisable to use a three-core mains lead and connect the box to the earth lead. Few of the parts specified are critical and almost any small triode, or pentode strapped as a triode, can be used for V2, providing that it is capable of passing sufficient current at zero bias to energise RY2. A type S130 neon tube is specified, but a VR105/30 or even a VR150/30 could be tried. It will be necessary to experiment with the resistor values if different valves to those specified are used, but in any case it is better to calibrate the controls and adjust the timing resistors for each particular instrument, as described later. The timing capacitors C1 and C2 should be of good quality; C1, being an electrolytic type, should preferably

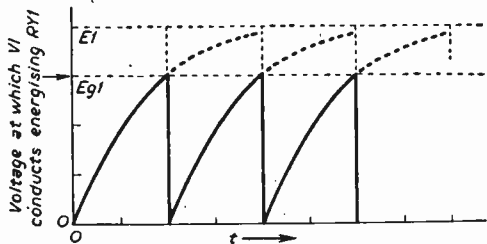


Fig. 8.—Curve of voltage on capacitor C1 in Fig. 7.

valuable print when enlarging. In the final design, about to be described, the mode of operation of V2 and RY2 has been reversed so that RY2 must be energised to switch on the external circuit.

Final Circuit

The complete circuit of the timer based on the foregoing principles and requiring a minimum number of contacts on the relays is shown in Fig. 10, and for which the following brief description of its operation should suffice. Assume that all the capacitors are initially discharged. On applying mains to the input, the H.T. rectifier "M" will establish a steady potential of about 280V on the reservoir capacitor C3. This voltage will fall somewhat as V2 warms up and draws anode current. As capacitor C2 is assumed discharged, the potential between grid and cathode of V2 will be zero and V2 will draw maximum current, energising RY2. This will close contacts RY2(1) and RY2(2) applying mains to the outlet socket and H.T. to the first time constant combination C1R1. C1 will charge up through R1 until it reaches the striking potential of V1. When V1 strikes (i.e., starts to conduct) C1 is rapidly discharged through V1 and RY1. The current passing through RY1 during the discharge of C1 closes the contacts RY1(1) and permits C2 to charge up slightly through R2, different values for which can be selected by the range switch, S. C2 is connected so that, as it charges, the grid is made negative with respect to the cathode reducing the current taken by V2. When the potential of C1, as it discharges, reaches the extinction potential of V1 the neon tube V1 ceases to conduct and C1 commences to charge up again through R1. This process of charging and discharging C1 continues until the grid potential of V2 becomes sufficiently negative relative to its cathode that the current passed by V2 is unable to energise the relay RY2. When RY2 is de-energised contacts RY2(2) open the mains supply to the outlet socket and contacts

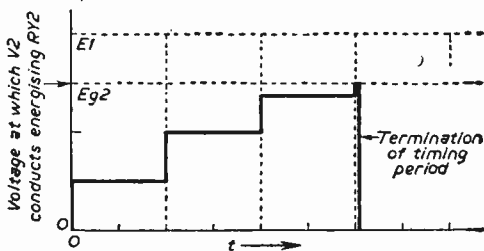


Fig. 9.—Curve of voltage on capacitor C2 in Fig. 7.

be either new stock or be formed before calibration is undertaken. It is essential that C2 be a paper capacitor, and that the insulation of the range switch, S, and the relay contacts RY1(1) be of good quality. The insulation of these parts may be checked by removing V1 and pressing the start button B momentarily. A lamp connected to the outlet socket will light and should remain lit for at least an hour if the insulation of S and RY1 contacts is satisfactory. The insulation of C2, V2 valveholder and the start button B is equally important and can be checked by disconnecting the lead from V2 grid to S, momentarily short-circuiting V2 grid to H.T. negative and noting the interval before a lamp connected to the outlet

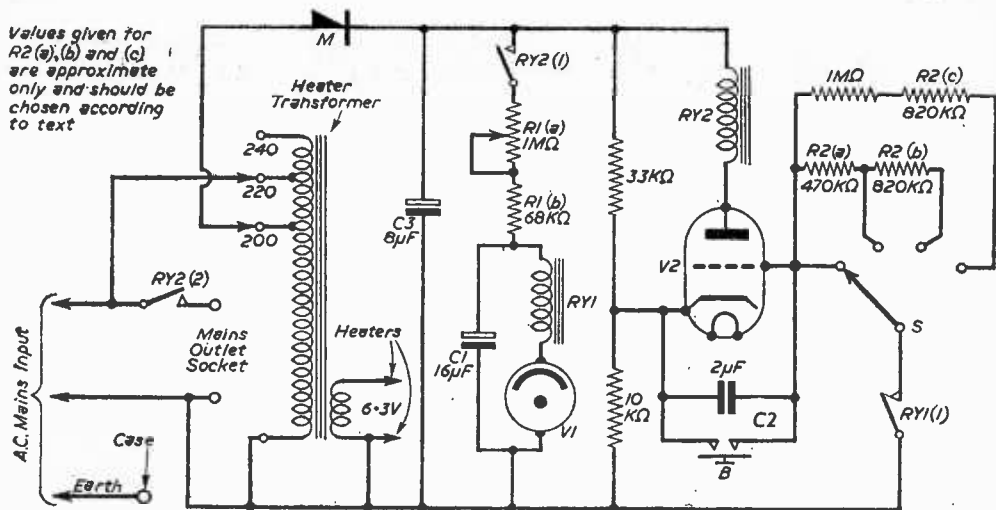
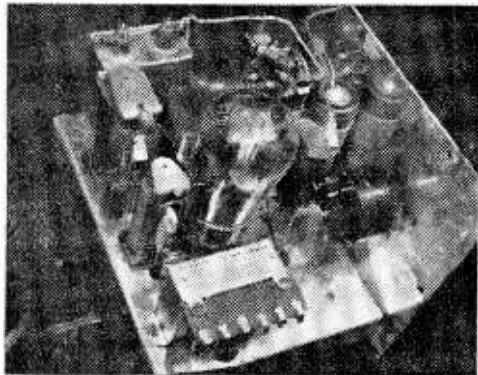


Fig. 10.—Circuit diagram of the complete timer. (Values given for R2 (a), (b) and (c) are approximate only and should be chosen according to the text.)

socket lights up. If their insulation is satisfactory the lamp should remain unlit for several hours.

Relays

The relay RY1 should be of fairly low resistance and be operated by not more than 30mA (any resistance value below 200ohms will be suitable). Only one set of contacts is required on this relay and must close when the relay is energised.



Rear view of the unit.

The relay RY2 should be operated by about 5mA current and will normally be a high resistance type. Two separate sets of contacts are required on this relay and must both be closed when the relay is energised. Suitable types of relay are available from many ex-Government stores.

Calibration

The calibration of the controls can be carried out as follows: Holding the start button closed, find the point on the variable control R1(a) at which the relay RY1 clicks once each second. The seconds can be marked by means of a "seconds" pendulum, which is easily made by fastening a small weight to a length of fine cotton

and suspending the cotton so as to swing freely. The distance between the point of suspension and the centre of the weight is adjusted to 32.6in. The time of a complete oscillation of such a pendulum is two seconds, that is, a swing in either direction takes one second. Alternatively, if a metronome is to hand it may be used to mark each second by setting to MM=60. A watch with a seconds hand may also be used by counting a number of clicks of the relay and noting the time taken, but is rather more time consuming than the use of something marking each second clearly. After the one second point has been found other points can be found for two seconds, three seconds etc., up to the maximum, which is about 20 seconds. The range of the control at the low resistance end can be adjusted by the resistor R1(b) and may be used to compensate for different values of C1.

When R1(a) has been calibrated, the range resistors R2(a), R2(b) and R2(c) are chosen to count the correct number of clicks of RY1 before RY2 is operated. The first position of the range switch S has no series resistance and the relay RY2 is operated on the first click of RY1, the timing interval being that of the first time constant network as indicated on R1(a). The next position of S puts in series a resistor, R2(a), which is chosen to operate RY2 on the fourth click of RY1, thereby multiplying the interval indicated on R1(a) by four and giving a range of about 4 to 80 seconds. Similarly R2(b) and R2(c) are chosen to operate RY2 on the tenth and sixth click of RY1 respectively, giving ranges of 10 to 200 seconds and 1 to 20 minutes.

Those who wish to elaborate the instrument and improve its stability may connect a voltage stabiliser across the H.T. rail. A suitable type is the VR150/30 and a resistor should be inserted in series with the rectifier M to limit the current through the voltage stabiliser to not more than 30mA. To make sure that V1 will always operate it is advisable to use a type VR75/30 for V1.

AN A.M. FEEDER UNIT

HIGH QUALITY M.W. RECEPTION

By G. Davey

MOST users of high-fidelity equipment nowadays employ a feeder which receives the three BBC VHF FM stations in view of the remarkably high standard of reproduction which such a unit possesses. Its usefulness is limited, however, by the fact that those three stations are all that it can receive and manufacturers of commercial receivers say that they cannot make receivers for VHF only in view of the large public demand for the reception of Radio Luxembourg on the medium waveband. Readers with teenage children who have tried to confine hi-fi reception to F.M. have probably come up against this difficulty so that this unit is offered to them as a possible solution. It consists of two valves of the 6K7 and 6Q7 variety arranged on a neat chassis in a conventional variable- μ R.F., diode detector and A.F. formation which takes its power from the hi-fi amplifier and which can be arranged either to switch, or plug, in place of the FM feeder.

provide for tuning of the three coils, two of which form a band-pass unit in the aerial grid circuit of the 6K7 which is a special feature of this design. The complete schematic diagram is given in figure 7 and is perfectly normal apart from the band-pass tuning. The two diodes of the 6Q7 are strapped together as AVC is not used. We are only aiming at receiving stations which come in at a steady useful strength and in such conditions AVC is not necessary. In my home locality Radio Luxembourg has periods of severe fading at times but when this occurs it is of the distorted type and even on a large superhet AVC provides no cure. In this feeder, therefore, it was felt that the small control which AVC could exercise on the 6K7 would not be of any value and so it was omitted.

Tuning

As originally designed, it was arranged for fixed tuning, by means of trimmers, to the Radio Luxembourg wavelength but, in course of trying it out in that form, it was discovered that there are a number of powerful worthwhile stations on the medium waves (such as Hilversum) and it was decided to arrange for full tuning by means of a three-gang condenser. This type is essential to

Construction

Construction of the unit should not present any difficulties. The original was built on a small chassis 7in. by 4in. which is about the smallest size which will accommodate the required components. With a midjet 3-gang condenser and using smaller valves such as EF89 and EBC81 no doubt a smaller version could be made up but the size shown seems adequate for most purposes. Of course the unit can be built on a larger size chassis if it is to match up with that of an associated amplifier or, indeed, can be made the "front-end" of a complete receiver should the constructor so desire, it

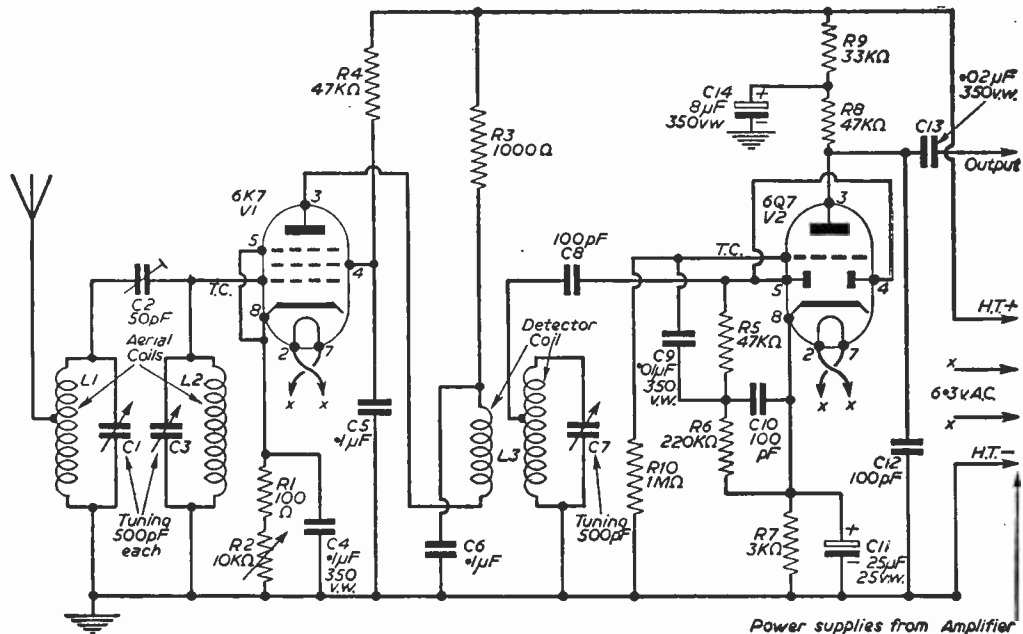


Fig. 1.—The circuit diagram.

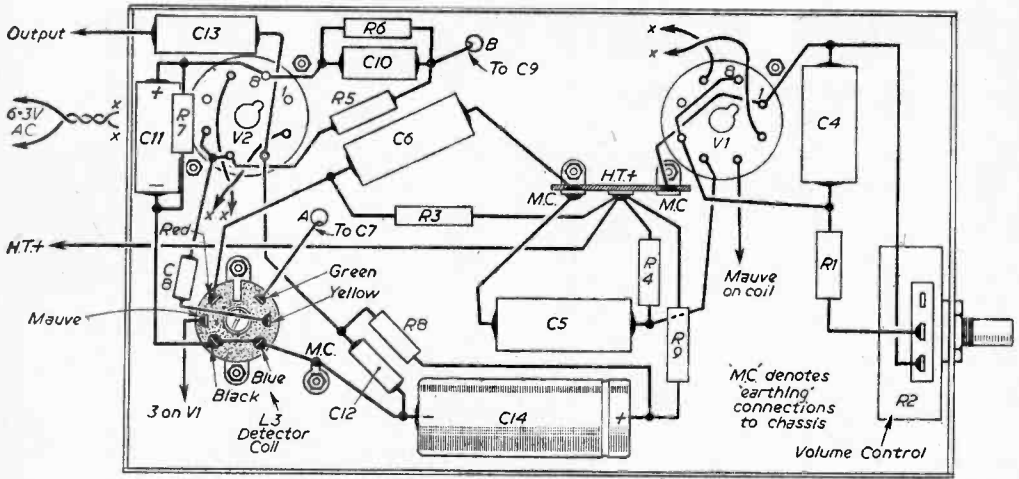


Fig. 2.—Underchassis wiring diagram.

is quite versatile in this way. Originally the band-pass coils were mounted side by side on the chassis but the coupling between them was a little too great for best selectivity. It was decided to separate them very completely and this was done by fixing the second coil to a small screen which is bolted to the top of the gang condenser between the first, or aerial, tuning section and the second section which tunes the coil mounted above it. This coil is fixed so that it is "lying down". (The coils used in this receiver are "Repanco" types.) A small trimmer (C2) effects the coupling between the two band-pass coils and their associated sections of the gang condenser and is, in fact, connected between the two top "fixed plate" connecting tags of that condenser. The ganged tuning condenser should have trimmers fitted to each section but if these are not already there trimmers will have to be wired across each coil or between "fixed" and "moving" plate tags of each section.

There is nothing unusual about any other features of the construction which involves perfectly normal wiring-up in the usual manner, components being suspended in the wiring without difficulty as they are quite few and light. The power supplies to the feeder unit will, no doubt, be taken from the main amplifier and some form of plug arrangement will have to be attached to the cable carrying them in order to pick them up. This will have to correspond to the outlet arrangements on the amplifier and cannot therefore be specified here. In my own case the amplifier has the feeder-unit supplies led to an old type four-pin valveholder and I have simply used an old base from a four-pin battery valve as termination of the unit supply cable. Each constructor must make his own arrangement here, as suitable. Similarly with the output: my amplifier has coax sockets for "input" and "LS output". From the feeder unit I use a

(Continued on page 242)

L2 Aerial Coil fixed on small screen secured to frame of gang condenser

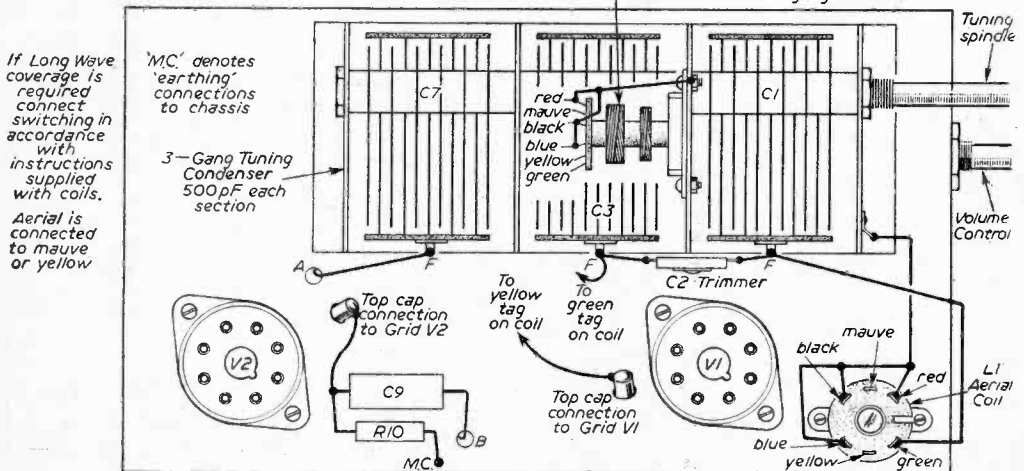


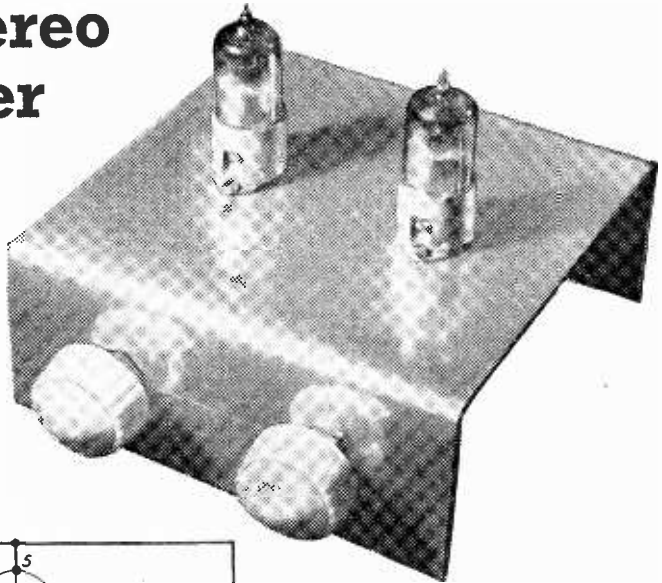
Fig. 3.—Layout of the parts on the chassis.

Simple Stereo Amplifier

INEXPENSIVE AND BATTERY OPERATED

By G. C. H. Lowndes

WITH the recent increase in popularity of stereophonic sound, and the large numbers of records now being produced in stereo as well as monaural versions, the author felt it was time to convert his gramophone to stereo, but was disturbed by the fact that it was necessary to buy a stereo cartridge, a stereo amplifier, two matched speakers as well as stereo records.



Front view of the unit.

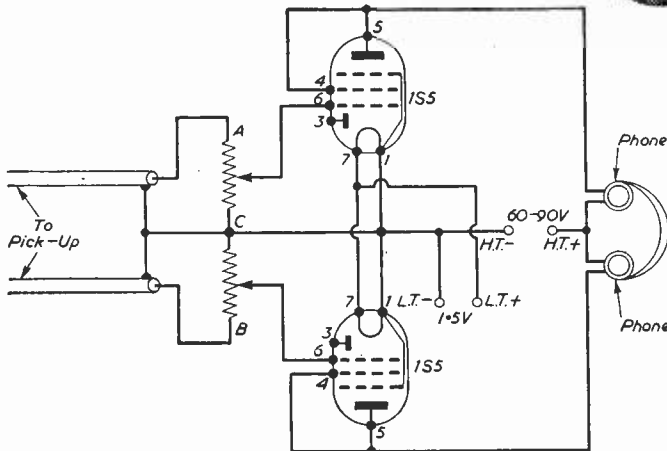


Fig. 1.—The circuit diagram.

Headphones

However, the difficulty was largely overcome by building this amplifier. Although it seems rather out of place these days to have to revert to headphones for serious listening, it should be remembered that this is one of the best ways of listening to stereo, since each ear hears only the sounds it is meant to hear, and none of what is meant for the other ear as with even the best loudspeakers. The amplifier to be described was designed with an eye to fidelity and cost. Transistors were rejected because of the cost of associated components i.e. electrolytics, the difficulty of finding two with similar characteristics and the fact that they are liable to introduce noise in the form of background hiss. The final circuit is extremely simple and gives full headphone volume with no perceptible distortion or noise.

Separate volume controls are used as this obviates the need for a balance control. The balance point

is easily found by setting one control to nearly full volume and then turning up the other until it is impossible to tell which ear is the loudest. At this point the sound becomes completely detached from the phones and seems to come from an area in front of the listener.

Construction

Construction is not at all critical, the author's prototype being made in a cigar box, but it is advisable to keep the two channels symmetrical and apart.

A word about stereo cartridges would not be out of place here.

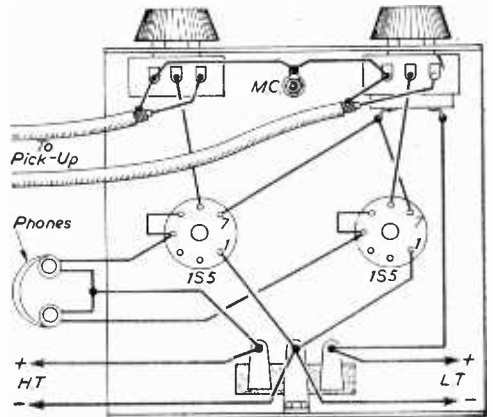


Fig. 2.—Underchassis wiring diagram.

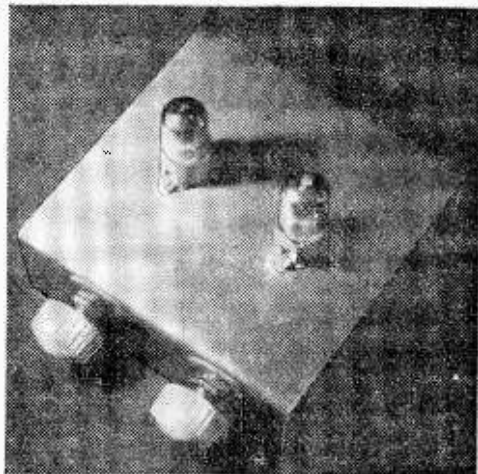
PARTS REQUIRED

- 2—1M volume controls (one with single pole switch).
- 2—B7G valveholders.
- 2—1S5 valves.
- Small chassis, wire, knobs, plugs for batteries.
- 1-5V and 60-90V batteries.

The connections to the cartridges may be made by two screened leads, the screening of which should be connected by a short ring on the cartridge. The screened leads should be taken to the earth connection C. on the amplifier. The two inner leads are taken to A and B. Alternatively, the cartridges may be wired by a screened wire with two inner wires, in which case the screened wire goes to C, and the two inner ones to A and B. Screened wire should be used between the gramophone and the amplifier, to prevent pick-up of hum.

It makes no difference to the stereo effect which earphone is used for which ear, but for those who like the orchestra correctly orientated, having found out the right way round to wear the phones, it is best to mark them "left" and "right".

Having the phones in or out of phase made little difference, but reversing the leads to one phone may make some improvement.



Another view of the unit.

With a good pair of phones (which should be of the high resistance type) results are most pleasing, and to those who have not yet experienced the thrill of stereo, this is an excellent way to start.

R.A.E. SCHOLARSHIPS

IN view of the widespread interest in the R.A.E., we think it is well worth while repeating the information which we gave last month on the R.A.E. Scholarships offered for radio amateurs by 404 Signal Squadron (Press Communications), Army Emergency Reserve. Twelve R.A.E. scholarships will be offered to men wishing to become radio amateurs. The scheme is open to fit men between the ages of 18 and 40 who are prepared to enlist in the Squadron for a period of three years. When these men attend annual camp in September 1960, they will be given an intensive course in basic radio and electrical theory, plus a basic morse course. On returning home, they will continue their theory studies by means of a free correspondence course, and at the April 1961 camp specifically designed for R.A.E. candidates, plus more advanced morse training. This will allow them to sit the 1961 R.A.E. and take the G.P.O. morse test shortly afterwards. On completion of training men will be granted the trade of Wireless Operator. Men with good technical aptitude may be given further training to qualify as radio technicians.

Pay, Allowances, Amenities

During training all volunteers are paid at Regular Army rates, plus a Bounty of either £9 or £19 depending upon re-call liability. Uniform, food, accommodation and travel are free. Typical recruit pay rates are:—

£9 Bounty. Single man, £18; married man, £24.

£19 Bounty. Single man, £28; married man, £34.

This is for a 15 day camp. The Bounty part of the payment is Tax Free.

There is a good social life at camp, plus opportunities for sport and shooting. The Squadron has an active radio club and operates GB3AWR at camp. Volunteers who make good progress will be given permission to operate a transmitter from their homes on Service frequencies **before** obtaining the G.P.O. licence.

Obligations

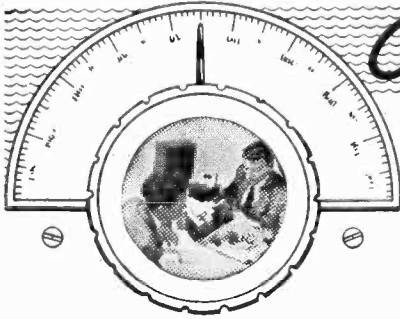
The only peace-time training obligation is to attend one 15 day camp each year. There are no compulsory week-end or evening drills, though voluntary training nets are run. All volunteers can be called for full-time service by Royal Proclamation in a national emergency. A certain number of men volunteer for re-call without proclamation. They receive the higher rate of Annual Bounty.

How to Apply

The number of candidates for these scholarships is likely to be high, so early application is essential. Write to:—Major J. A. Bladon, G3F DU, "Madresfield", Jack Lane, Davenham, Northwich, Cheshire.

Please give details of your age, civilian job, Service experience, radio experience, morse reading speed (if any), and whether or not you hold a driving licence. You will then be sent full details of the conditions of service and your name will go forward for a scholarship award.

Men who already hold an amateur licence or who are ex Royal Signals tradesmen will find an interesting and financially rewarding spare time occupation with the Squadron.



On Your Wavelength

BY THERMION

which are encountered when various records are compared. So far as I can see there is no excuse for noisy backgrounds on records unless they are long playing transcriptions of old, worn 78rev/min pressings. Of course if the recordings were made under difficult conditions for instance, if the ambient noise level were high, the noise on the recording would naturally be tolerated as part of the original sound.

The forms of distortion which I find particularly objectionable are those which occur during the

Readers' Radio Dens

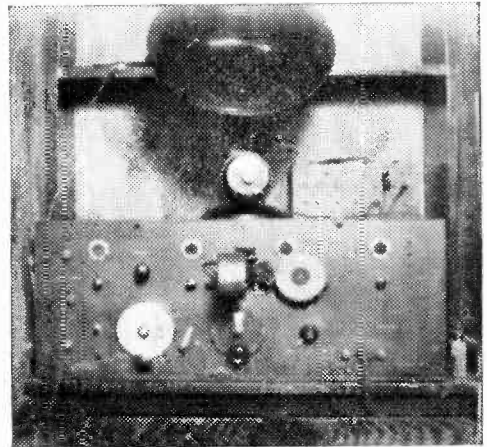
I AM still receiving a steady flow of pictures of readers' radio dens and I shall continue to publish these pictures when space permits.

The picture at the foot of the page was taken in 1959 in the Birmingham den of Mr. J. W. Wroth who has since moved to Ramsgate. Mr. Wroth (G2WT) has held a transmitting licence since 1927 and is at present operating on 40, 80, and 160m from 10W to 25W, morse and telephony.

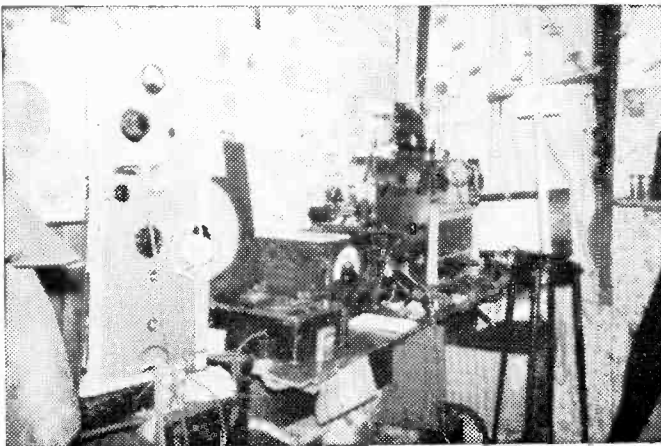
The second illustration is of an early receiver built by Mr. F. L. Parker of Eastbourne—detector and 3L.F., battery operated. Mr. Parker became a radio amateur in 1923 and was issued with an experimental licence. During the last war he kept up his studies (thanks to PRACTICAL WIRELESS) but later ill-health forced him to abandon the hobby for some years. Although Mr. Parker is now retired he still services his own sets and dabbles in radio.

Gramophone Records

IN the May issue I gave my views on gramophone records and my remarks have given rise to a great deal of correspondence on the subject. Many of those who have written agree with my views in some degree at least and all of them mention the great variations in quality



An early detector and 3L.F. receiver built by F. L. Parker.



The den of J. W. Wroth, formerly of Birmingham and now of Ramsgate.

actual recording process. Apart from harmonic distortion which can generally be tolerated, there is an increasing tendency for records to exhibit wow and flutter. In my experience flutter is more common than wow. It seems to take the form of a low frequency modulation of the background hiss or tape noise on the record.

In a letter arising from my article in the May issue Mr. A. F. Metcraft of Romford mentions what he terms "end of side distortion". In Mr. Metcraft's experience most records exhibit this fault although personally it has not been very evident to me. I find that with an exceptionally good recording which has a very good high frequency response then the drop in quality as the stylus nears the centre of the record is noticeable and seems to be inevitable.

Transistor Superhet Circuits

CIRCUITS OF VARYING SENSITIVITY

By J. Gray

BECAUSE of their small size and modest battery requirements, transistors are particularly suitable for portables. In T.R.F. circuits, regeneration is often employed, and adjustment is then somewhat critical. The superhet type of circuit avoids this difficulty, and enables a good degree of sensitivity to be achieved. As a result, superhet circuits are generally used. When simplicity and low cost are not important.

A 3-transistor circuit for medium waves only is shown in Fig. 1. These same stages may, of course, be employed with dual wave tuning, or additional A.F. amplifiers. Normally, long waves are only required in those localities where the Light Programme cannot be received at adequate volume on the medium wave band. When M.W. reception alone is considered sufficient, the aerial and associated circuits are much simplified, and the signal pick-up can also be slightly improved, compared with that of a dual-wave aerial.

The oscillator coil and I.F. transformer numbers given are those which will be correct for ready-made coils and transformers, the circuit being intended for use with a gang condenser having a 208pF aerial section and 176pF oscillator section. This is a standard condenser, readily available and of small size. By keeping circuit capacity low, tuning ranges of approximately 200 to 550m. and 1200 1800m are obtainable.

If a ferrite rod aerial is used, it can be wound for M.W. as shown in Fig. 2. The wire gauge is not critical. If a fairly long rod can be used, and this can be fitted some inches from the gang condenser, and other metal parts, reasonable signal

pick up is possible. The I.F. transformers are adjusted for maximum volume, in the usual way. The aerial circuit is then aligned by adjusting the 50pF trimmer at a fairly low wavelength, and sliding the coil along the rod at a fairly high wavelength, until no further increase in volume can be obtained.

A circuit such as that in Fig. 1 will make a sensitive and easily operated pocket set for head-phone reception. For this purpose, any small audio-frequency transistor will suffice. The operating voltage can be 6 to 9 according to volume required.

Types of Transistor

Best results will be obtained with manufacturers tested transistors, as would be expected, and the circuit in Fig. 1 is given component values for the Mullard OC44 and OC45. If cost is important,

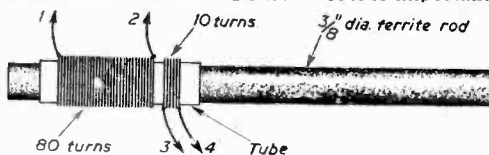


Fig. 2.—Ferrite rod aerial.

surplus and other low cost transistors can be used. The reduction in volume will then depend upon how far below normal standard these transistors are. In some cases it may also be necessary to modify resistor values, to suit.

(Continued on page 223)

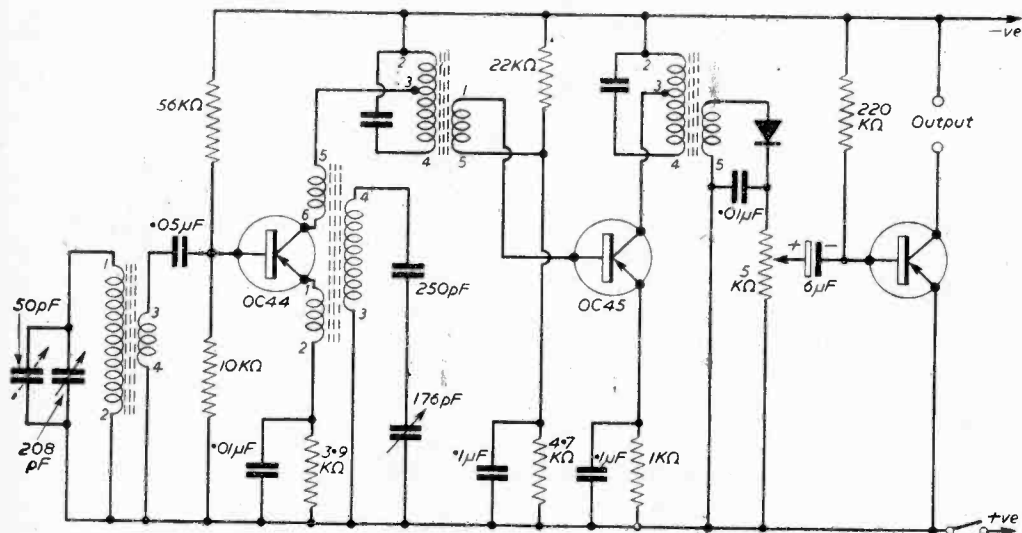
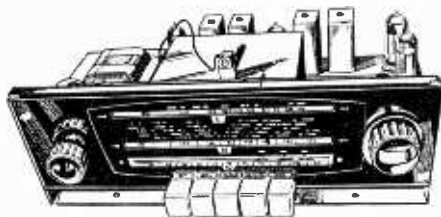
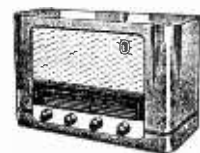


Fig. 1.—A three-transistor-circuit for medium waves only.

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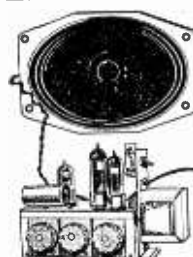
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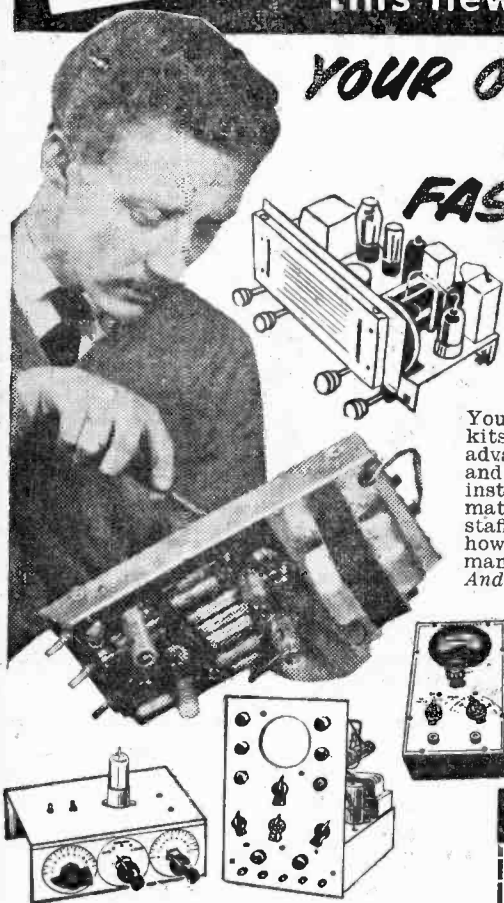
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(Continued from page 220)

The diode, used for detection, should be in good condition. If a surplus diode is fitted, it should be tested (a crystal set circuit, with phones, may be used to do this). A sub-standard diode will cause poor volume, and may easily be overlooked.

In the A.F. stages, the transistors are less critical, but poor transistors will again reduce volume. It is important to remember this, if results prove disappointing.

because no reception at all is possible if the transistor ceases to oscillate. In some circuits the base voltage is provided through the aerial windings, and this gives similar results.

I.F. Amplifier

A single stage I.F. amplifier is shown in Fig. 1, and is only adequate when the aerial provides a reasonably strong signal, and a modest output is required. Usually, two I.F. stages will be required, and a circuit recommended for the Mullard OC45 transistors is shown in Fig. 4.

To prevent oscillation, neutralisation is employed, the 1.2k and the 56pF forming one neutralisation loop, and the 3.9k resistor and 18pF condenser the second loop. These values are suitable for the transistors mentioned, components of two per cent tolerance being desirable. With surplus transistors, other values may be required to obtain neutralisation, and will have to be found by trial. If the stages do not oscillate, when aligned, the degree of neutralisation achieved can be considered sufficient.

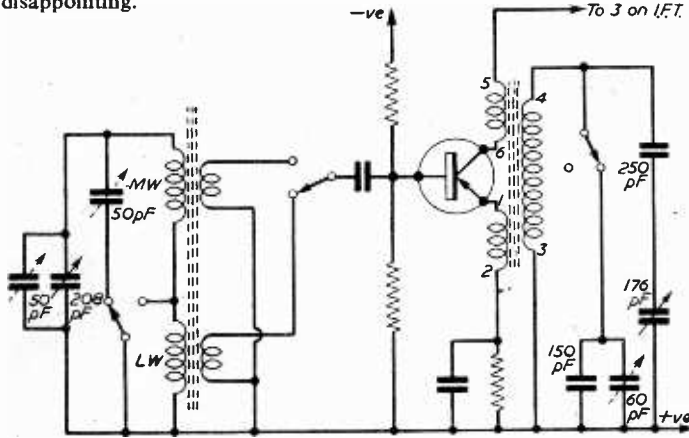


Fig. 3.—Modified frequency changer circuit for long waves.

Dual-Wave Tuning

When long waves are also required, the frequency changer may be modified as shown in Fig. 3. In the aerial circuit, the L.W. winding is shorted out, for M.W. reception, one 50pF condenser being used for trimming. This switch section introduces a further 50pF condenser for L.W. trimming. The M.W. trimmer should thus be adjusted first as its setting will modify L.W. trimming also.

A further switch section connects the transistor base circuit to either M.W. or L.W. coupling winding. The M.W. coupling winding can have approximately one-tenth the number of turns used on the tuned portion. For L.W., about 200 turns will be required, with about 40 turns for coupling. L.W. and M.W. sections should be well separated, to avoid interaction.

A further switch introduces additional capacity across the oscillator coil, so that the same windings suffice for L.W. reception. The 60pF pre-set condenser allows trimming of the oscillator circuit on long waves.

Either the M.W. or dual-wave frequency changer circuits in Figs. 1 and 3 may be used with any of the I.F. amplifiers or A.F. and output circuits described later. It is essential to use a good transistor of appropriate type in this stage,

A positive voltage is obtained from the diode, and used as automatic volume control bias to the first transistor. This gives some degree of AVC action to counteract fading, or the directional effects of the aerial.

A 9V supply will be best for the stages shown in Figs. 3 and 4, but a lower voltage may be used if desired. The 5k potentiometer in Fig. 4 is the usual volume control.

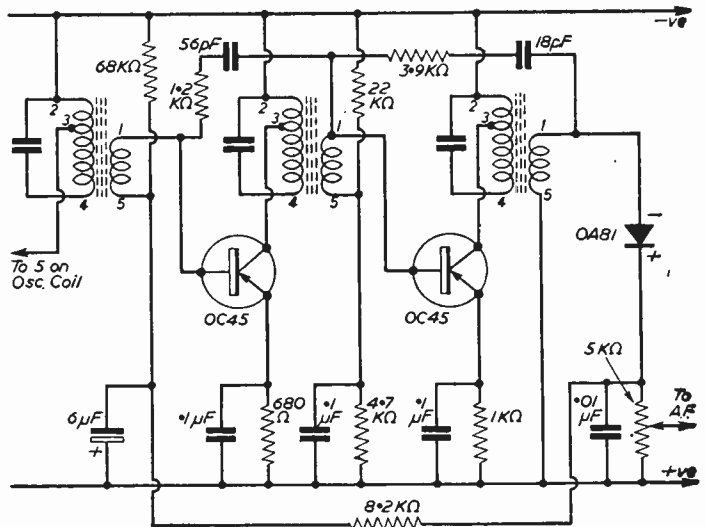


Fig. 4.—I.F. amplifier circuitry.

When employing grounded emitter circuits, as in Fig. 4, phase reversal arises between input and output circuits, and this method usually provides maximum gain from the stage. In a grounded base circuit, no phase reversal arises, and this allows an I.F. amplifier to be used without neutralisation. A circuit for this method of operation is shown in Fig. 5. Fewer components are required, due to the absence of neutralisation and emitter bias, but the stage gain is less than with the grounded emitter type of circuit. As a result, this circuit is most suitable when a good aerial signal is available, or sufficient A.F. amplification will follow the diode. The effect of modifying the value of one resistor in each base supply divider is worth while, with surplus transistors.

When constructing a receiver, the stages up to and including the diode can be checked by wiring phones across the volume control, or from diode to battery positive. Good phone volume should be obtained at this point.

The A.F. Amplifier

If moderate volume is sufficient, A.F. and output stages using a circuit such as that in Fig. 6 can be employed. Five transistors in all will then be sufficient. Yellow/green spot audio-frequency transistors may be used in this type of circuit. A 2 or 3Ω speaker, with matching transformer, can also replace the 35Ω speaker.

For reduced volume, the circuit may be simplified by using a first A.F. stage like that in Fig. 1, condenser coupled to the output stage. A coupling transformer is then unnecessary.

For operation under favourable conditions, one I.F. stage may be employed, and only four tran-

sistors will then be required in the completed receiver.

Push-Pull Output

To obtain a more powerful output, a push-pull circuit is used. The resting (no signal) current of this will be less than with a single output transistor, but increases with signal strength.

If two separate batteries, or a tapped supply, can be used, the circuit in Fig. 7 will be suitable. A driver stage, and transformer with separate secondary windings, gives a base input to the pair of transistors. It is preferable to purchase these as a matched pair, or their characteristics may not be sufficiently similar for best results.

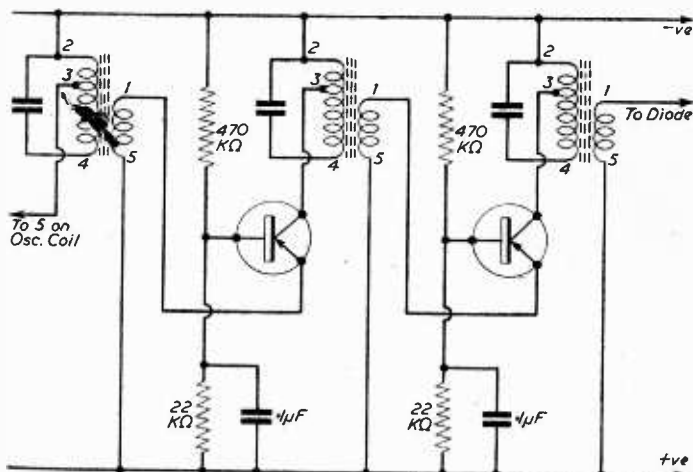


Fig. 5.—Alternative I.F. amplifier circuit.

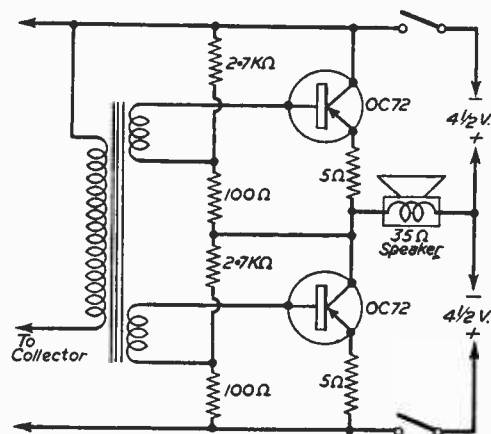


Fig. 7.—Push-Pull output for tapped battery.

A speaker of about 35Ω impedance is operated directly from the transistors, so that no output transformer is required. This is an important point when space is limited.

(To be continued)

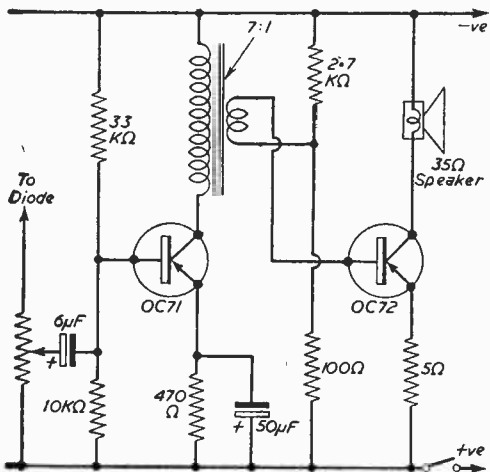
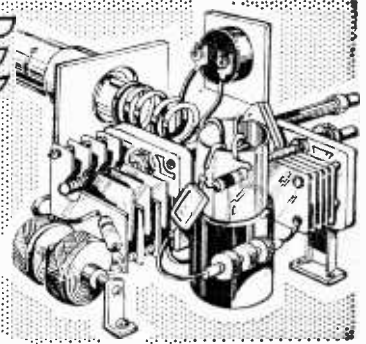


Fig. 6.—Two-transistor A.F. amplifier.

SHORT-WAVE SECTION



OBTAINING PEAK PERFORMANCE FROM THE R1116 AND R1116A

By A. W. Mann

DURING the early post-war years one of the most popular battery communication receivers available was the R1116 and the related R1116A. The reason for its popularity was in the first instance because of its wide tuning range and the use of a double superheterodyne circuit. Those who were fortunate enough to obtain a new model fitted with the original valves would find them to be high performance receivers.

New and unused models were, however, in limited supply, while used models varied as to condition and performance. Providing the receivers were in working order and mechanically sound, valve replacements were in many instances sufficient to assure a reasonably high standard of efficiency at the expense of variations from the original tuning dial calibrations and I.F. stages alignment.

Providing that one has to hand the necessary instruments, these receivers can be improved considerably in performance and in accuracy of calibration.

The purpose of this article is to discuss and explain the correct procedure to be followed. Before doing so some idea as to the general design of the R1116 is desirable.

General Design and Purpose

In the first instance, the R1116 was designed as a general purpose receiver for use in aircraft in conjunction with the T1115 transmitter, provision

being made for the reception of CW, I.C.W. and radio telephony, D.F. and intercom. While the 10m and 160m bands are not included, a wide range of frequencies are covered in seven bands. These extend from 142kc/s to 1600kc/s and from 2Mc/s to 20 Mc/s approximately.

The L.F. traffic and D.F. ranges are as follows:

- Range 1: 142kc/s to 315kc/s.
- Range 2: 315kc/s to 700kc/s.
- Range 3: 700kc/s to 1600kc/s.

The arrangement of the four H.F. ranges is:

- Range 4: 2.0Mc/s to 4.4Mc/s.
- Range 5: 4.2Mc/s to 7.3Mc/s.
- Range 6: 7.3Mc/s to 12.0Mc/s.
- Range 7: 12.0Mc/s to 20.0Mc/s.

All ranges are switched, the L.F. switching and tuning controls being on the right side of the front panel and coloured yellow, while the H.F. switching and tuning controls are on the left-hand side coloured green. In the centre at the bottom of the panel is the H.F./R.F. changeover switch. This enables the operator to set up one H.F. and one R.F. frequency as predetermined, and switch from one to the other as required.

Valve Line-up

Eight valves are used in the receiver and the line-up is:

- a protective diode VU33,
- first frequency changer VR82,

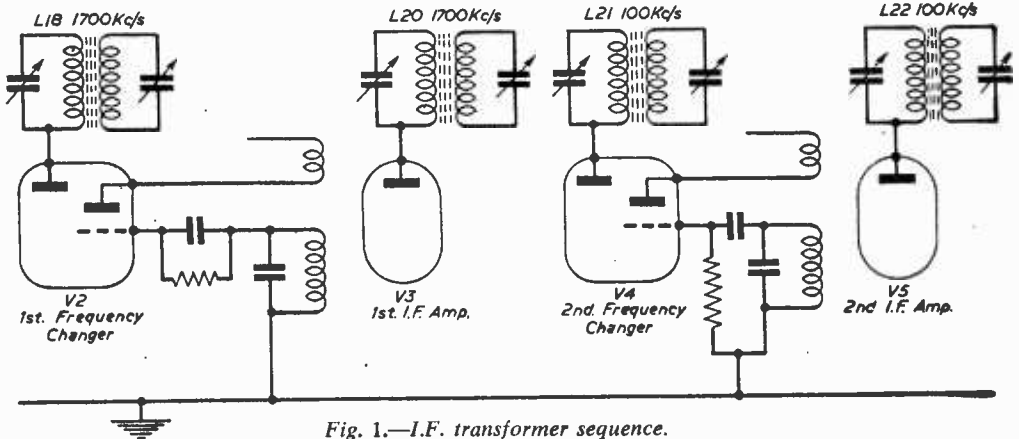


Fig. 1.—I.F. transformer sequence.

first I.F. amplifier VR83,
second frequency changer VR82,
second I.F. amplifier VR83,
double diode triode VR44,
QPP output VR35.

The beat oscillator is a VR21.

Two sets of I.F. transformers are used for double conversion, the first stage being 1700kc/s and the second 100kc/s. This combination assures a good image ratio and adequate channel selectivity with sufficient bandwidth for intelligible telephony.

Headphones and L.S.

The R1116 receiver was designed for headphone reception, and provides more than sufficient volume for that purpose, together with a high signal-to-noise ratio and most effective AVC.

So far as loudspeaker reception is concerned, the output is sufficient when used with a suitably matched loudspeaker and if fitted with a complete set of new valves, and realigned, leaves little to be desired. The speaker output is sufficient taking into consideration that the extremely low noise level is an asset which can be exploited to the full, especially on DX signals using both headphones and the loudspeaker.

Some models are prone to repeat points, but not all. The use of 1700kc/s I.F. is often blamed for that, and the fact that no R.F. stage is incorporated. This is not entirely true, as a little investigation will prove that the generation of spurious frequencies is the cause.

The inclusion of a series I.F. trap will not cure the trouble but an added R.F. tuned stage incorporating a series wave-trap parallel tuned will improve matters.

In spite of these defects the author regards the R1116 as a very good receiver and an attractive DX proposition. Incidentally, if used in conjunction with a No. 19 set variometer aerial tuner, the receiver's already good performance on the 7Mc/s and 3.5Mc/s bands is further improved.

Sliding iron cored oscillator coils are fitted and are tuned by means of the calibrated slow motion drive mechanism which has a 21:1 reduction drive, the gearing of which should be carefully oiled occasionally to reduce wear.

Realignment

There must be a considerable number of these receivers in use and among them some, which owing to valve replacements, require realignment and recalibration. In such instances, some loss in signal gain, sensitivity and selectivity is to be expected.

The following data and diagrams should be carefully studied and the outlined procedure followed in order to assure satisfactory results. The author cannot supply theoretical diagrams, which in this instance are unnecessary.

Unless the reader has a reliable calibrated signal generator and some form of output measuring device such as an output meter to hand, the work should be placed in the hands of some-

one known to specialize in the realignment of communications short-wave receivers. Any attempt to carry out the work without instruments will result in failure.

After the signal generator and output meter are coupled up to the receiver a warming-up period of at least half an hour should be allowed in order to avoid the possibility of frequency drift.

Alignment Procedure

In Fig. 1 is shown the frequency changers and I.F. transformer sequence; in Fig. 2 the above chassis layout of components; and in Fig. 3 the under-chassis arrangement of the few components with which we are concerned in aligning the receiver. Other components with which we are not concerned fill the section which are shown empty. Follow Fig. 2 to locate the components and valves mentioned in the following paragraphs.

Begin with the second, I.F. stage with the volume control fully open, and AVC switched out (switch in RT position). Inject a modulated 100kc/s signal from the signal generator to the signal grid of the

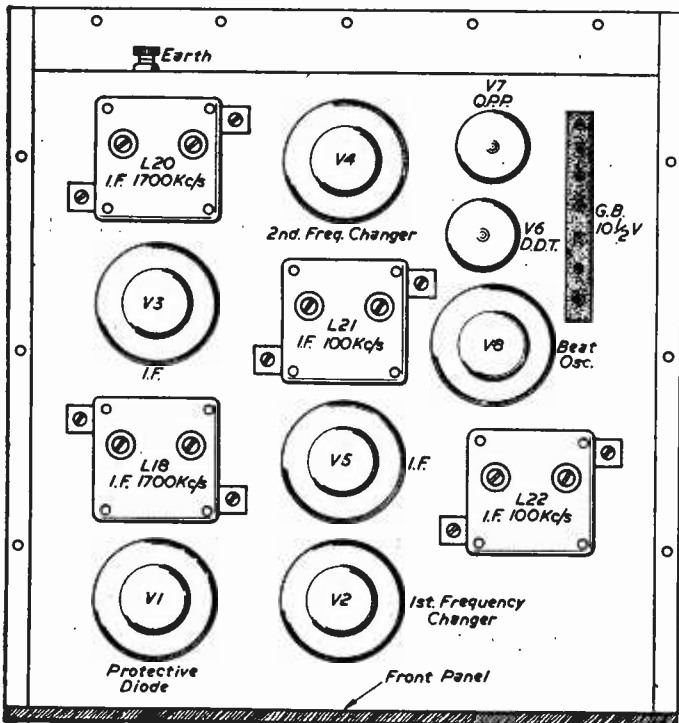


Fig. 2.—Above chassis view.

second frequency changer valve V4. The I.F. amplifier grid is inaccessible. The signal grid is the top cap. Tune the primary trimmer first (primary trimmer to earth shows H.T. voltage).

Trimming CW Oscillator

Switch to CW on receiver, and from modulated to unmodulated signal on signal generator of 101kc/s. The signal input at this frequency is to

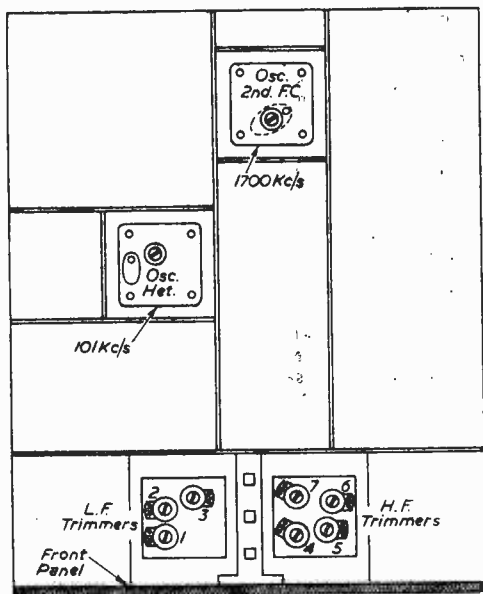


Fig. 3.—The underchassis layout.

the grid of the second frequency changer (see Fig. 3 for location of heterodyne transformer under chassis and alter the trimmer under the sliding cover). A note which is suitable to the ear should be the aim in this instance.

Trimming Second F.C. Oscillator

This transformer is also located under the chassis (see Fig. 3). Tune the signal generator to give an unmodulated signal of 1700kc/s and, leaving it coupled to the grid of the second oscillator transformer, trim the associated oscillator transformer. Inject the same 1700kc/s signal into the grid of the first frequency changer and trim I.F. transformers L18 and L20 (see Figs. 1 and 2).

Trimming First Oscillator

There are seven oscillator trimmers, one for each range. These are located under the chassis just behind the front panel, each being numbered according to the range.

Reference to Fig. 3 shows three on the L.F. side and four on the H.F. side. Set the calibrated oscillator dial to about the centre of the range to be trimmed, and the aerial tuning condenser to 45deg. Inject a signal between aerial and earth comparable with the reading on the calibrated dial, which will be in kc/s on the L.F. ranges and in Mc/s on the H.F. ranges, and alter the appropriate

trimmer until the signal is received at maximum volume using a modulated signal.

To check that the local oscillator is working at 1700kc/s above the required frequency inject between aerial and earth a signal at dial frequency plus twice the I.F. If the oscillator is working at 1700kc/s above R.F. the note will be heard.

Check Frequencies

L.F. band 1: Dial freq. 150kc/s; check freq. 3.55Mc/s.

L.F. band 2: 600kc/s; 4.0Mc/s.

L.F. band 3: 1000kc/s; 4.4Mc/s.

H.F. band 4: 2.2kc/s.; 6.6Mc/s.

H.F. band 5: 5.0Mc/s; 8.4Mc/s.

H.F. band 6: 7.5Mc/s; 10.9Mc/s.

H.F. band 7: 12.5Mc/s; 15.9Mc/s.

Current Consumption

Turn volume control full open. Current should not be less than 12m with the aerial disconnected. Test from pin 11 to earth should be 150k with battery plugs removed. Test between pin 10 and earth should show no continuity with battery connected. Where A.C. mains are available a QPP type H.T. battery eliminator is recommended.

Final Notes

The R1116 receiver can be used for the reception of FM reception on the amateur bands following the usual method of tuning to the centre point of the received signal and then switching in the beat oscillator and making the final adjustment on the oscillator dial to resolve the signal with fair intelligibility. When carrying out this procedure, however, the volume control should be gradually reduced so that the signal is at a comparatively low level. Once the speech is intelligible a slow increase in volume will result in clear speech. There is a knack in doing this which comes with practice.

So far as the author is aware the foregoing aligning data has never previously received publication and is not contained in the official publications issued with these receivers. It should, therefore, be filed for future reference.

One final point. It is important that in carrying out the various stages of alignment that the signal generator output be progressively reduced as amplification is increased.

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AN INEXPENSIVE UNIT USING SP6I VALVES

By J. Kemp

(Continued from page 170 of the June issue)

THE circuit of this V.F.O., as mentioned last month, consists essentially of a series tuned Colpitts, or Clapp, oscillator operating in the 3.5—3.8Mc/s band, this range being band spread over the full 180deg. of the dial. This oscillator is followed by an isolating cathode-follower stage and a tuned-anode voltage amplifier with variable screen control.

The tuned circuit is in the upper box of the unit, and the lower unit is connected to the tuned circuit with coaxial cable and plugs. These must be connected correctly for oscillation to occur. No special precautions need be taken in constructing the oscillator and cathode follower stages, except that care must be taken to see that the VR150 is lighting correctly. If during testing it does not strike, the 4.7k resistor must be reduced slightly in value. If the stabiliser heats even slightly the resistor must be increased in value. Incidentally the V.F.O. will work very well without stabilisation but its use prevents a change in frequency with mains variation. Disc ceramic condensers should be used where indicated to prevent R.F. leakage through supply leads.

Screening

An aluminium screen is attached both above and below the chassis between the cathode follower and output stage. The lead to the control grid of V3 is screened with coaxial cable, the screening being bonded to chassis. The 27k grid leak is mounted on the top cap. The output coil is the larger winding of a Denco range 3 blue chassis mounting coil. The core is adjustable from the front panel by placing a small length of hollow $\frac{1}{4}$ in. dia. aluminium tubing over the top of the adjusting screw and squeezing in with pliers to obtain a firm grip. The only capacity across the coil is that of the 3ft length of coaxial cable to the transmitter. If less drive is required the panel control may be omitted, the coil being made

pre-set and damped by a 15k $\frac{1}{4}$ W resistor in parallel with it. The drive control is 250k (or nearest value) wirewound potentiometer. No frequency shift should occur with adjustment of this because of the isolation afforded by the cathode follower stage and voltage stabilisation by V4.

Constructional Details

The best material for use is a 16 or 18 gauge aluminium which gives excellent screening and appearance, but since this material was not available the prototype used thin flat galvanised iron

(Continued on page 231)

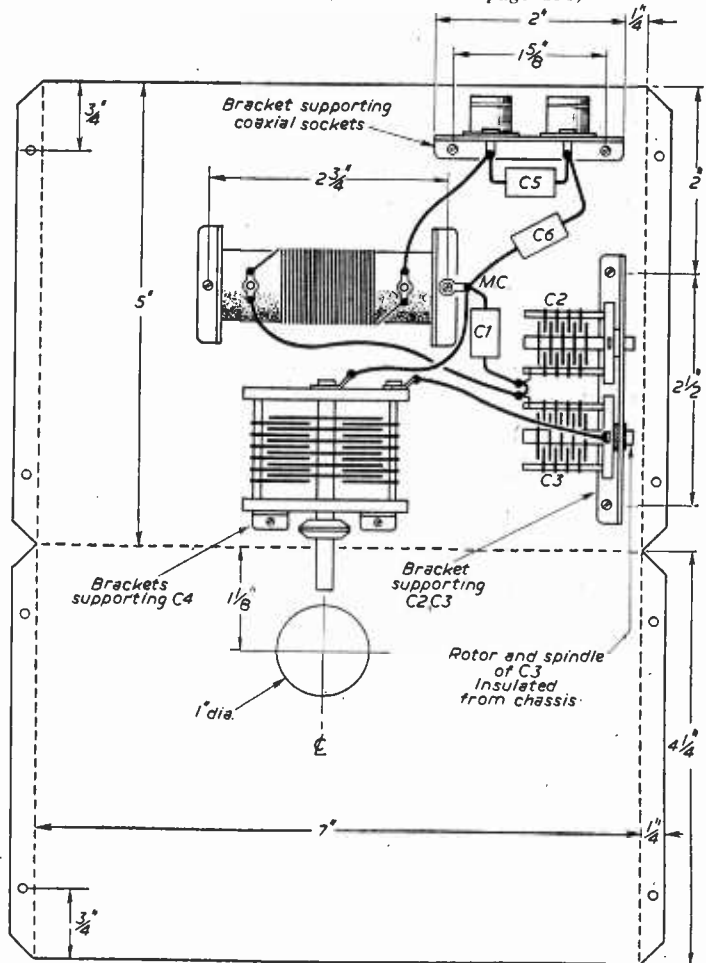


Fig. 6.—Front and base of the tuned circuit box.

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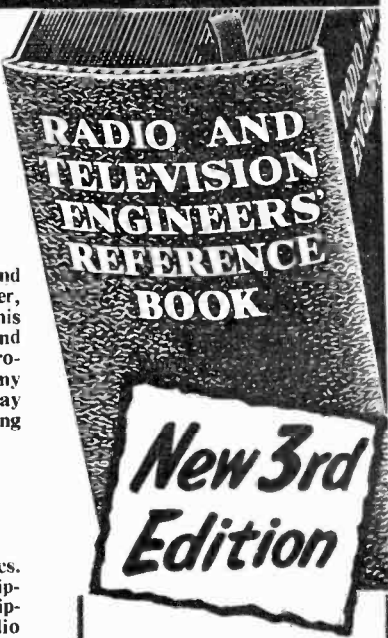
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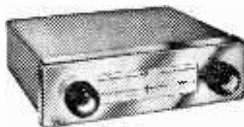
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(Continued from page 228). - which was afterwards painted to prevent corrosion. The cutting and drilling diagrams are given in Figs. 2, 3, 4, 6 and 9. Small self-tapping screws are used to hold the top, back and sides on to the bottom and front of each of the units. Before mounting any components the various sections should be fitted together to make sure that hole positions, etc. match one another.

As previously mentioned, rubber feet (grommets) should be fitted to the base to prevent vibration from reaching the tuned circuit which might cause F.M. The dial is of white cardboard covered with clear varnish and marked with frequencies in ink. An epicyclic 5:1 drive is fitted to the spindle of C4 and a larger diameter knob and short pointer fitted.

Alignment and Calibration

Alignment is very simple if a calibrated receiver or frequency meter is available. The prototype was aligned using a "19" set. The "19" set dial readings were adjusted using the netting control and M.S.F.

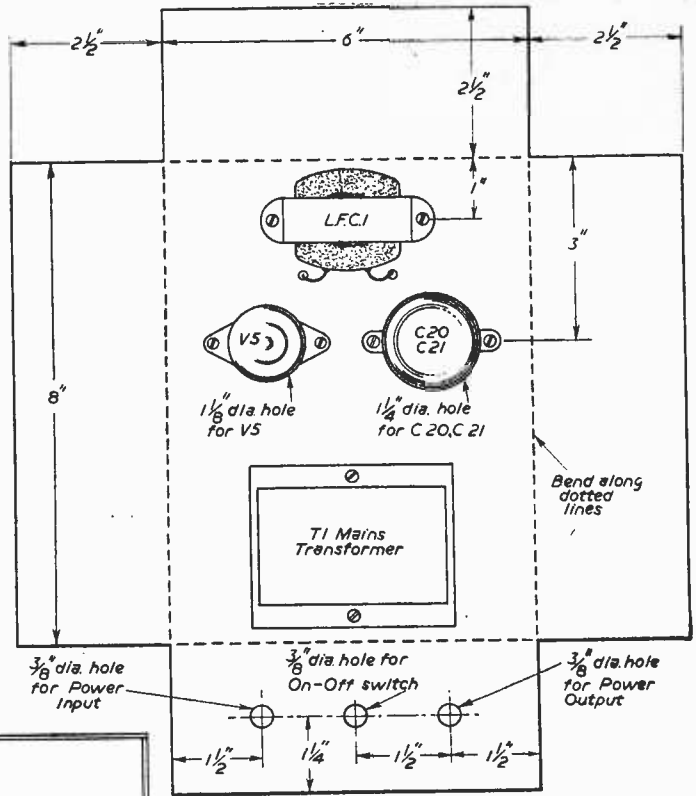


Fig. 8.—Layout of the power pack.

transmissions on 2.5Mc/s. The V.F.O. was then switched on, allowed to warm up for about one minute, the drive control turned fully clockwise and the frequency of oscillation traced using the "19" set. It should be between 3 and 4Mc/s. The V.F.O. dial is then turned fully clockwise "following" it with the receiver. The 19 set is then tuned as accurately as possible to

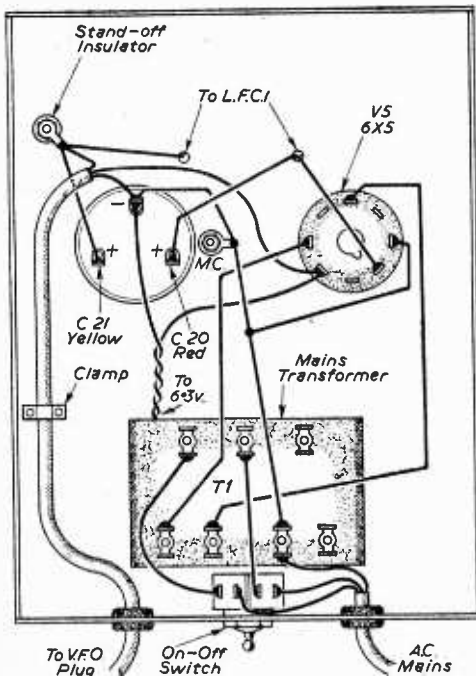


Fig. 7.—Wiring of the power pack.

REMAINING COMPONENTS REQUIRED

- 16 or 18s.w.g. aluminium wire.
- 3 Mazda octal moulded valveholders.
- 1 International octal valveholder or to suit Stabiliser.
- 1 epicyclic drive (5:1) with 28in. diameter knob and pointer.
- 3 coaxial sockets and matching plugs.
- About 1yd. of semi-airspaced coaxial cable.
- 1 power socket and plug (I.O. or M.O. valveholder and valve base suitable).
- 3in. of 1/4in. diameter copper or aluminium tubing.
- 1 3/4in. diameter, 2 1/2in. long former for L1 (preferably ceramic, or paxolin may be used).
- Small quantity of 22s.w.g. enamelled wire for L1.

3.5Mc/s, the netting control depressed and C3 set to maximum capacity. C2 is then adjusted for zero-beat. The V.F.O. dial is turned fully anticlockwise (minimum capacity) and the "19" set to 3.8Mc/s. C3 is then adjusted for zero-beat. Alignment on 3.5Mc/s is then repeated, and so on, since the two adjustments interact. After repeating adjustments two or three times, the range will be bandspread over the whole dial. The intermediate frequencies are marked over the scale simply by turning to zero-beat on the various frequencies. Adjustments have since been repeated with a BC 221, and the initial calibration proved to be almost exactly correct.

For use with a transmitter, the coaxial output is connected to the original crystal socket. If an R.F. choke is in series with the cathode of the crystal oscillator this is removed, the cathode then being earthed, as are also any condensers between the control grid and chassis. A grid leak of about 22k is most suitable. The anode tuning of the stage is adjusted as usual for a dip in anode current and the core of the output coil in the V.F.O. adjusted for the deepest dip, which usually indicates maximum drive. When either the ex-crystal oscillator stage or a following power amplifier is loaded into an aerial the drive control is adjusted for maximum output indicated by maximum

aerial current, or voltage if using a very long wire aerial.

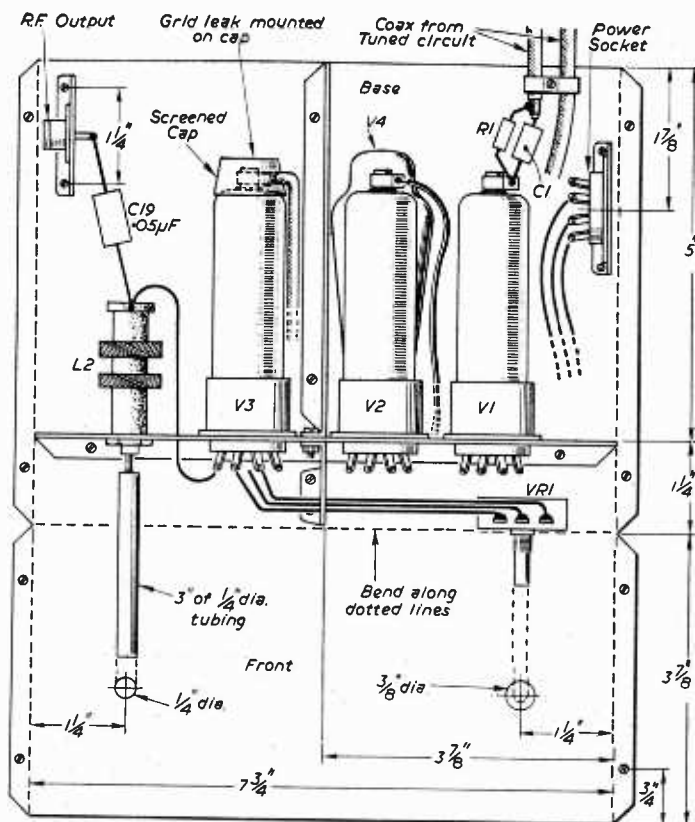


Fig. 9.—Front and base of the R.F. section.

NEW LONDON-BIRMINGHAM LINK

THE first long-distance trunk TV circuit in Britain to be built, installed and maintained by private enterprise was formally handed over to Associated Television in London recently. The circuit carries high quality vision and sound from the Alpha Studios at Aston Road, Birmingham to the A.T.V. London Headquarters at Marble Arch. It will enable A.T.V.'s London management to monitor programmes originating in Birmingham and to watch rehearsals and dry runs. It will also enable advertisers in London to see programmes radiated from Birmingham without having to travel to Birmingham as at present.

The new microwave scheme which has been manufactured and installed by Pye Telecommunications Limited has many entirely novel features. Apart from being the first long-distance trunk circuit of its kind to be operated by free enterprise, it is also the first 7,000Mc/s microwave permanent trunk circuit in Great Britain. It makes use of passive reflectors, which eliminates the expensive waveguides normally required by such

systems to carry the transmitter power to the aerials. The microwave link carries high quality TV sound in addition to the picture. Radiotelephone circuits for engineering maintenance have been put on a separate 450Mc/s channel. One of its features has been very low cost—probably a fraction of links previously supplied for the purpose.

The circuit, which is routed via automatic radio repeater stations at Meriden, Cold Ashby, Barkway and Highgate, is 135 miles long. The repeater stations are fully automatic and unattended. Apparatus faults occurring at any station are automatically indicated on the London control board by telemetry circuits operating over the 450Mc/s control link.

Authority to install and operate the system was granted by the general Post Office, who have recently made a band of microwave frequencies available for operations of this kind. The Birmingham to London Link is thought to be the first of many such applications.

Circuit Analyser

A USEFUL TWO-VALVE CIRCUIT

By L. Baker

MANY amateurs, while being the possessors of very fine test equipment such as meters, signal generators, valve testers, etc., are inclined to overlook the circuit analyser or signal tracer. For the repair man, either professional or amateur, this instrument is almost worth its weight in gold. It can cut short many tedious hours of poking and probing at a chassis in search of that obscure fault which is causing poor volume, cracking noises etc.

Principle

Most readers will be familiar with the principle of signal tracers by now. For the benefit of beginners, however, a short explanation would not be out of place. The "signal tracer" is an instrument with which the operator can trace the actual signal being received through the different circuits (frequency changer, I.F. amplifier, detector and low frequency stages) of a radio receiver or amplifier. Usually, it has its own loudspeaker or phones, and the speaker of the equipment under test is rendered inoperative at the beginning of the testing procedure. Then, by means of the R.F. and A.F. probes the operator can listen to the various signals in each stage of the equipment under test in turn. By checking the signal through each stage, the operator will quickly arrive at the stage where the signal is weak, noisy, or non-existent. By the isolation of the troublesome stage in this manner, the faulty component is now known

to be directly connected with this stage and its location is made much simpler.

An early example of the signal tracer which has been used by most Servicemen at one time or another is a crystal diode with blocking condenser in series with a pair of phones. This is a basic signal tracer and enables the operator to carry out the various tests in each stage of the defective equipment, with a reasonable amount of success.

Circuit

The equipment described here is more ambitious than the crystal diode/phones combination, and will enable the operator to carry out much more comprehensive and extensive tests on suspect equipment. Briefly, the circuit of the instrument to be described consists of an R.F. amplifier stage feeding into a 6E5 valve which acts as detector, audio amplifier, and indicator. Provision is made for various R.F. AF tests by means of the two input jacks. A third jack provides for the insertion of phones or for connection to an amplifier with speaker if desired. There is no complicated switching to go wrong, the only switch used in the instrument is the on/off mains switch. The unit is powered by a mains transformer of the "small" type operating in conjunction with a half-wave rectifier, the output of which is smoothed and filtered. Visual indication of the signal is given by the display of the 6E5, and aural indication by the phones.

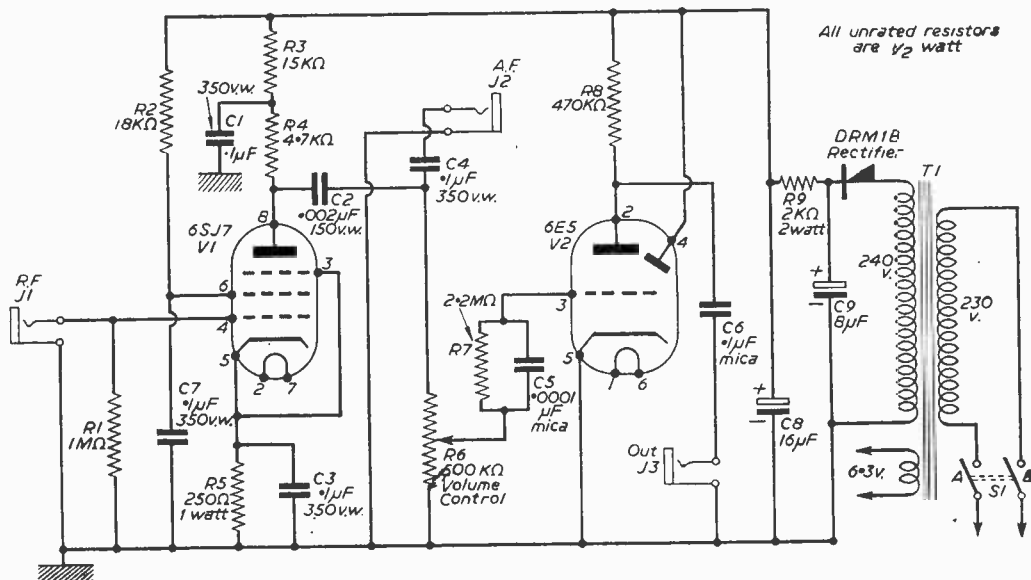


Fig. 1.—The circuit diagram.

All the components are mounted on the aluminium chassis and front panel. Screen decoupling for V1 (a type 6SJ7) is provided by R2/C7 and anode decoupling for the same valve by R3/C1. Audio gain control is provided for by R6 which is a 500k potentiometer which is also ganged with on/off switch S1 A-B. Automatic bias for the R.F. amplifier is provided by R5 and C3. Both valves are heated from a single L.T. winding on the mains transformer T1. The transformer T1 is of the small variety, which is adequate for this purpose. The H.T. secondary

fixing the front panel to a cabinet especially made to contain the finished instrument. A hole should be drilled in the front panel for the mounting of R6 which should be positioned so that it is barely clear of the top of the chassis. A further hole should be made on the right-hand side of the panel to take the escutcheon of the indicator V2. The jacks should be carefully positioned, and holes made for them in both the front panel and chassis. These will normally be sufficient, when tightened up, to hold the panel and chassis together. However, if desired, the panel can be held to the chassis by a further three 6B.A. nuts and bolts. A hole should be made in the chassis for the valveholder of V1 and for C8/9. The rectifier is positioned as shown in Fig. 4 on top of the chassis. It should be noted that if the type DRM1B is not to hand, two RM1 rectifiers may be used, wired in series. These are fixed to the chassis by their central mounting bolts, making sure that the rectifier has a reasonable amount of clear space immediately surrounding it for ventilation. A square aperture should be made in the chassis for the mounting of T1, the mains transformer. This aperture is, of course, only necessary for the "drop through" type of transformer. Any other type that may be used will need whatever fixing arrangements are necessary for the component. Small holes, fitted with rubber grommets, should be drilled as shown in Fig. 3 and Fig. 4. These are to facilitate leads from underneath the chassis to components on the chassis top and front panel and valve V2. It is then best to position all smaller parts such as tagstrips, etc., and drill fixing holes for these parts. A solder tag should be fixed to the chassis alongside T1, between it and the valveholder for V1 for earth connections. The valve V2 is held in its horizontal position by means of a simple metal bracket made from soft aluminium strip, the portion of the bracket passing around the glass envelope of the valve being fitted with a sleeve of

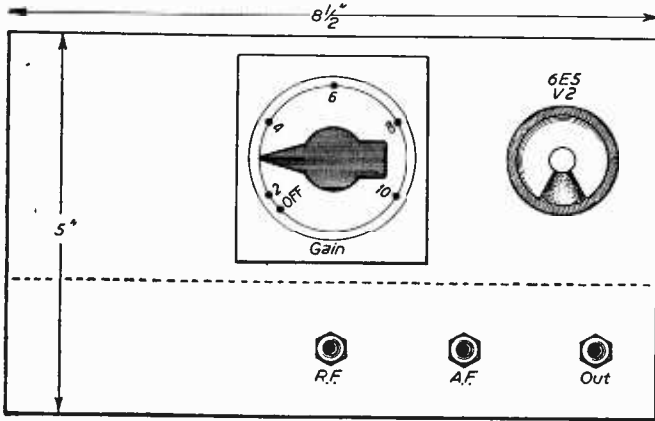


Fig. 2.—The front panel.

should give approximately 240V r.m.s. If the intending constructor has a small transformer on hand, but is of the "centre tap" type, it is quite permissible to use this, ignoring the centre tap, or by using the tapping together with one of the other "outer ends" if the voltage is too high.

The two electrolytic capacitors in the H.T. circuit are contained in one can, the can being the negative connection for both. The smoothing resistor is R9, which is a wirewound control (2W) and of value 2k. This was found to be quite adequate for the H.T. supply of the instrument, there being very little hum evident, even with the gain turned full up. All resistors are 10 per cent tolerance and all are 1/2W types except R5 and R9. All are carbon resistors except R9. It is advisable, although not essential, to use a metal type valve in V1 position.

Chassis

Construction of the unit is reasonably simple. First an aluminium chassis and front panel should be made to the approximate dimensions shown in Figs. 4 and 2. There is no need to adhere exactly to these dimensions, and the chassis and panel can be made to suit a cabinet that the intending constructor may already have to hand. It will be noted from the diagrams that the front panel dimensions are slightly larger than the chassis. This is to facilitate

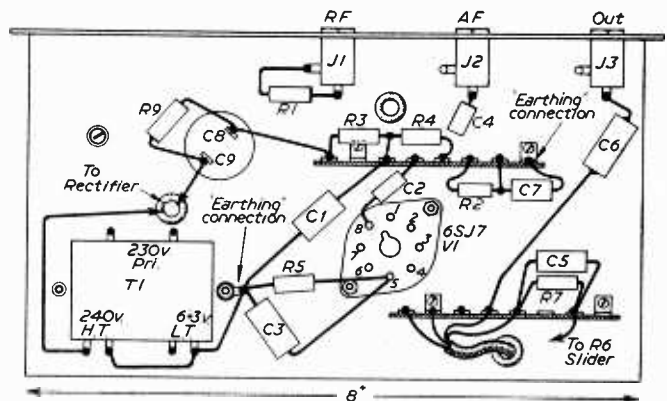


Fig. 3.—Underchassis wiring diagram.

sponge rubber so that the valve is held securely without overtightening the bracket on the envelope. The UX type connector for V2 carries the resistor R8 soldered directly between lugs 2 and 4. A short piece of 4 conductor cable (preferably but not essentially) screened takes the various connections from underneath the chassis to V2.

Mounting Components

With all preliminary drilling, etc., completed, the chassis and panel should first be fixed together. The mains transformer T1 and octal valveholder for V1 should then be installed on the chassis. Capacitor C8 can also be fixed in place with its clips so that the connections to this part protrude through to the underneath of the chassis. The tagstrips may then be fitted together with the bracket for V2. The valves, of course, should not be inserted until the wiring has been completed.

The wiring, together with the installation of the remaining small components, should then be completed, roughly following the layout shown in the underchassis view, Fig. 3. Leave the soldering of the cable to V2 until all other parts are wired in place. The wiring should be of good quality stranded wire, a heavier type being used for the filament circuit which should be of twisted flex, one wire to the tagstrip for connection to V2, also for the valveholder of V1. The other side of the filament circuit is taken to the chassis, near to the mains transformer. All connections should be securely soldered in place and connections should be short and direct where possible. The mains input lead to the switches SA1-B should be clipped to the chassis to prevent strain on the lugs of the switches. The resistor R9 should be fixed directly across the connection lugs of C8-9, all other wiring to this component having first been connected. The connecting cable for V2 (if screened) should have its screening braid securely soldered to the appropriate lug on the tagstrip. The cable should be just long enough to reach the connector for V2 in a slight curve. Having completed the wiring and installation of all components, all components should be checked against the circuit diagram to avoid mistakes which may, possibly, have crept in during construction.

Testing

Having made sure that all is in order, the plug of the instrument may be inserted into the mains socket and the instrument switched on with gain turned full up. After a few seconds warming-up time, a gentle hiss should be heard in the phones and the indicator valve should glow bright green with a clearly defined "V"-shaped shadow-free area. On touching the grid (only) of V2, a loud buzzing noise should be heard in the phones. A much louder noise will be heard on touching the grid connection of V1. The instrument is then ready for use with the exception of the constructing of two simple probes for R.F. and A.F. input jacks.

The probes are made from ordinary "hollow body" test prods. The cables for connection to

the probes is made from thin coaxial cable, leaving sufficient braid (say about 8-12m.) free for earth connection. The R.F. probe has a 100pF condenser installed in its body, one end of the condenser being fixed to the top of the probe, the other end soldered to the conductor of the inner core of the coaxial cable. The AF probe is of similar construction, the only difference being that a 100k resistor is used in the probe body in place of the condenser. The instrument end of both cables, which should be approximately 2-3 ft. long, should terminate in the appropriate jacks for the plugs on the instrument panel. A crocodile clip should be soldered to the braided earth connection side of the tip end to facilitate easy connection to the chassis under test.

Uses

Signal tracing can be commenced as outlined earlier. Any signal picked up with either probe will be heard in the phones and shown on the display of the indicator also. Comparative gain measurements can be made by means of the numbered scale on the front panel. The indicator

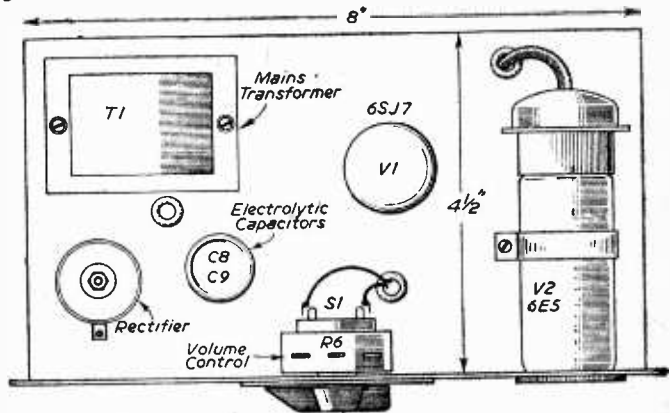


Fig. 4.—Layout above the chassis.

is extremely useful, for instance, in the R.F./I.F. alignment procedure of a radio receiver when it is connected to the signal diode of a receiver. The various R.F. and I.F. circuits can then be adjusted to give maximum indication on the 6E5 display. Another useful test with the instrument is checking the R.F. local oscillator section of the frequency-changer valve. By placing the R.F. probe tip on the oscillator anode of the f/c valve a clear indication that the valve is oscillating can be seen by observing the closing of the shadow of V2. If the shadow does not close, on this test, then the oscillator section of the f/c valve or its associated circuit is the cause of the trouble.

It is recommended that a cabinet of some type be made to house the finished instrument. The prototype had a metal cabinet, which was useful in the prevention of stray pick-up. However, the intending constructor can make a suitable cabinet from 5-ply wood, lining the inside of the cabinet with metal foil, which in turn is earthed to the chassis or front panel, which will be just as effective as a metal cabinet and will give freedom from any stray pick-up which would otherwise be evident.

Pocket Transistor T.R.F.

FOUR TRANSISTORS WITH GANGED INDUCTIVE TUNING

By W. Cleland

THIS receiver is of the T.R.F. type and was built with a view to trying out inductive tuning with transistors. Regenerative circuits tend to exaggerate all the variations that occur in transistors, and between transistors, and also have a high noise level, counteracted to some extent by the narrowing of the bandwidth. By avoiding regeneration it was intended to make the amplification very stable, and this made three R.F. stages necessary with four tuned circuits.

Aerial

A ferrite aerial is used as this can give reception almost anywhere, indoors or outside, picks up much less interference and radiates negligibly if oscillation should occur, and together with the omission of regeneration, makes the set free from hand-capacity and similar effects. The question of radiation is, of course, more important with a superheterodyne which contains an oscillating frequency-changer.

Ferrite aerials are normally tuned by variable capacitors, and it did not seem possible at first to gang the input with the other tuned circuits. Various ideas were tried, such as an aperiodic, or untuned input circuit which resulted in too great a loss of signal; a flatly fixed-tuned circuit—not much better; and a multiple-tuned input circuit, with a number of ferrite aerials tuned to different stations, feeding their outputs simultaneously to the first transistor.

Finally, it was found that a tuning inductor could be used at the input without having to abandon a ferrite aerial. Although this cannot gang accurately with the other three tuning inductors



The completed receiver.

(because the ferrite aerial winding in parallel with the coupling winding reduces the maximum inductance and the range of inductance variation), it serves the purpose of overcoming the reactance of the aerial, and can be brought into exact tune with the other coils at the top end of the medium waves.

Only four or five turns are required on the ferrite rod instead of the usual 50 turns or more, since it feeds direct to the emitter and low impedance coupling coil on the tuning inductor. It is, however, best to connect the aerial

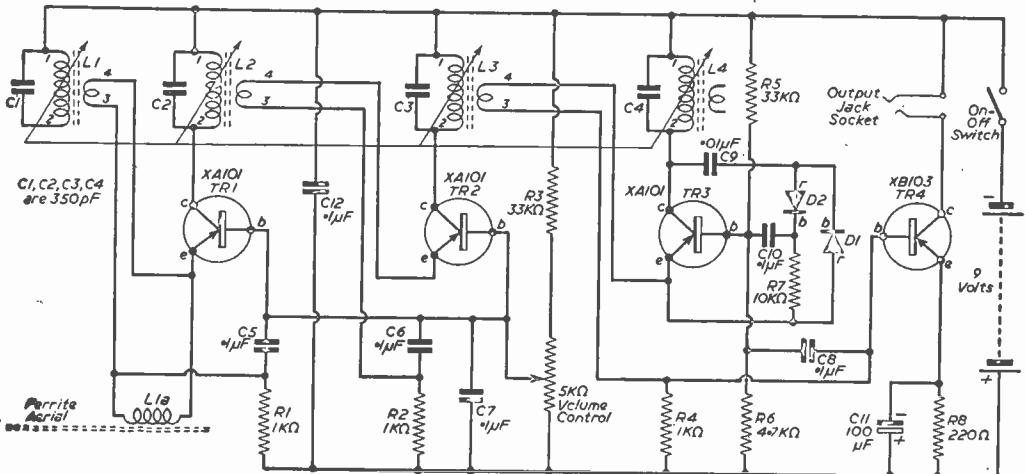


Fig. 1.—The circuit diagram.

and coils in the senses shown in the diagrams. Reversal of the aerial connections decreases the stability of the receiver.

The large values ($0.1\mu F$) of the capacitors in series with the coupling windings are necessary because of the low impedance level, and satisfactory results will not be obtained with smaller values. The arrangement of these components in the circuit is one of several tried out, and appears to give better stability than alternative arrangements.

The values required in neutralizing circuits cannot very well be checked without suitable equipment. However, with inductive tuning, it is possible to use fixed tuning capacitors high enough in value for most of the circulating current to flow through them, and very little through the internal capacitance of the transistors. Values as high as $1000pF$ are usable, but $350pF$ gave a better performance and were the highest values obtained as sub-miniature tubular polystyrene capacitors.

Replacing any of the tuned circuits by R.F. chokes yields a smaller output, although a $10mH$ choke replacing the circuit feeding the detector gives only a moderate reduction in output.

Inductors

Miniature variable inductors can be wound on the small pot core assemblies recently introduced. These utilize a high-grade ferrite which would yield unnecessarily high Q -values in larger coils. Despite their smallness, they can be wound with Litz wire to give Q -values at intermediate frequency as high as 180.

The inductance can be varied by screwing the core in and out. This is permeability tuning and does not involve any coil switching as in earlier forms of inductive tuning, nor any disturbance of the windings. A 2:1 variation is intended, but if one does not worry too much about the fall in Q -value a much larger variation in inductance can be obtained. The slot in the core extends right through and a narrow strip of metal can therefore

be inserted through several cores enabling a number to be tuned simultaneously. Because of its much lower permeability, the insertion of the metal strip does not affect the tuning to any appreciable extent.

Providing the polystyrene formers are protected from damage during construction, the screwing action of the cores in the formers is very smooth, and it is this that makes it possible to gang the four coils.

Construction

The construction of the receiver is a little complicated, but a number of ideas are incorporated that can usefully be employed in transistor receivers

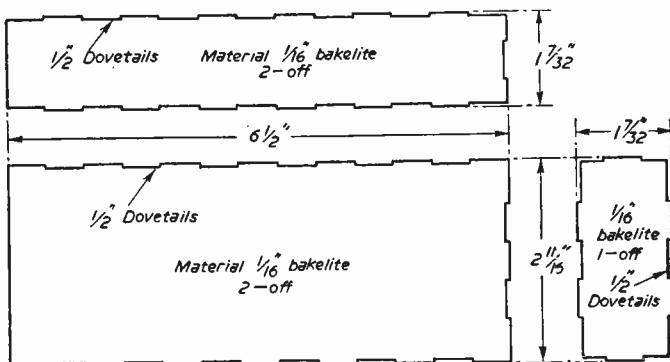


Fig. 2.—Making the case.

in general, and it is hoped that this information will prove useful to other constructors.

Case

Metal was avoided, to avoid screening the ferrite aerial, and all the parts required were cut from a $1/16in.$ bakelite sheet measuring $12in. \times 8in.$ The pieces forming the case were dovetailed and bonded together with Araldite. The corners and edges can then be rounded with a file, after which the case is covered with coloured plastic material. Tape around the open end, folded over the edge, will prevent the plastic from lifting.

Araldite for the purpose of jointing the bakelite

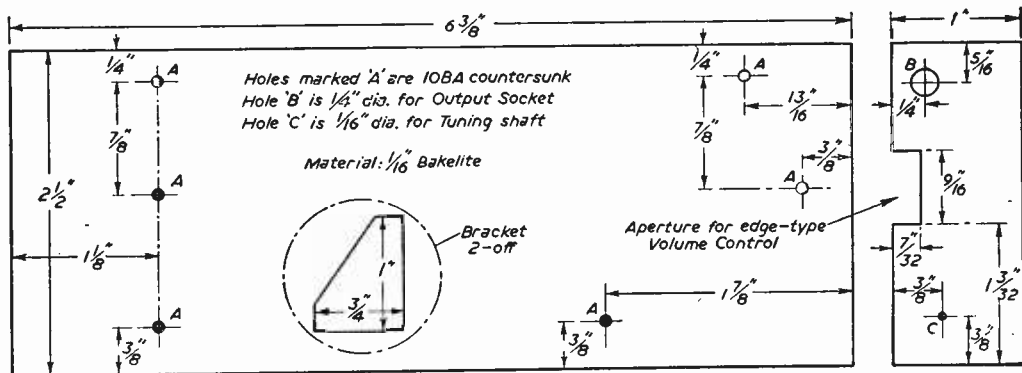


Fig. 3.—Bottom and front panels and (inset) dimensions of the brackets.

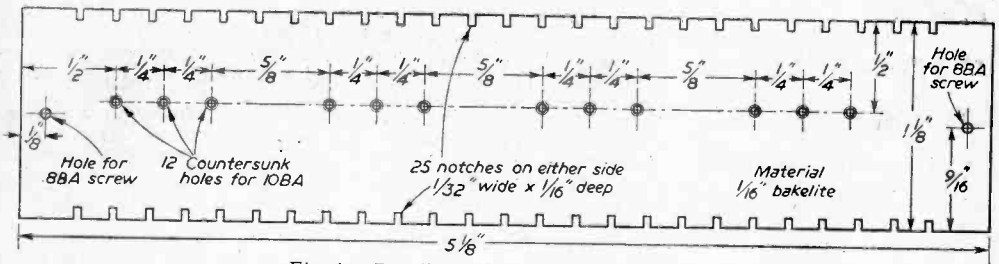


Fig. 4.—Details of the components strip.

is now easily obtainable from model engineers' stockists and yacht chandlers in the form of a pack containing a tube of the adhesive and a tube of hardener. Equal amounts are squeezed from each tube on to a clean surface and mixed together with a nail file or similar spatula. As the mixture remains usable for hours, a little of it goes far.

The pieces to be cemented are first smeared with the prepared Araldite, and then held together until it sets, with the aid of "Sellotape". Setting will take place overnight, but the joints should be treated with care for several days.

In addition to its use in making the case, Araldite is used to join the front and bottom panels and side brackets, all of bakelite, and an extra bearing, made by drilling a 1/16in. hole in the inner part of a size 2 snap fastener is affixed by it to the inside of the front panel, for the tuner shaft.

Tuner Details

The five spaced separators of 1/16in. bakelite, under the coil mounting are also stuck on to the mounting strip with Araldite, and the construction of the tuner knob was greatly facilitated by its use. The tuner knob was made by cutting down a toothpaste cap (see Fig. 5). A metal insert is then made from a size 2 snap fastener, the two parts soldered together round the edge, with a 1/16in. copper rivet through the centre, as a shaft, soldered into the snap fastener.

Araldite is applied to the interior of the knob, and the insert pushed into it. A hole is then drilled in a board for the rivet and the knob is clamped on to this board for 12 hours, after which the insert will remain firmly in the knob.

The coils tune to the upper frequency by screwing out the cores about a dozen turns, and since they are ganged, the cores must be positioned to the same side of the maximum positions, so that the inductances will increase and decrease together. This screwing range should be on the rear of the centres, i.e., towards the base plates of the coils and on the side furthest from the front panel of the set.

Coil Winding

The winding of the coils was the most difficult part of the construction of the receiver and it would be preferable to obtain them commercially, if an equivalent type could be obtained. When they are not wave-wound, the coils are not self-supporting and tend to come apart on removing the temporary cheeks, and especially if wax or polystyrene solution is applied. The coupling coil, if wound on the outside, tends to come between the ferrite cups when these are fitted, preventing them from meeting. It may thus be preferable to wind on the five-turn coupling coils before the 80 turns of the main windings.

(Continued on page 246)

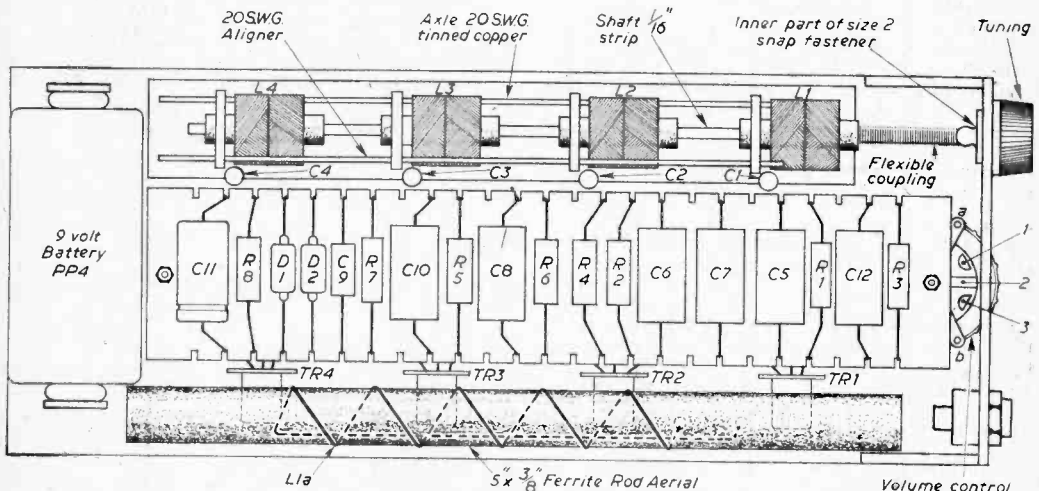


Fig. 5.—Wiring diagram of the receiver.

Audio Transformer Design

BASIC PRINCIPLES OF DESIGN AND CONSTRUCTION

By D. Saull

GOOD transformer design is the result of careful co-ordination of mechanical and electrical considerations. In industry these two considerations are separated into the design and winding departments, each specialising in their respective subjects.

Theory

Transformer design and construction is in itself a lifetime's study, and it would not be possible in this article to cover the subject comprehensively.

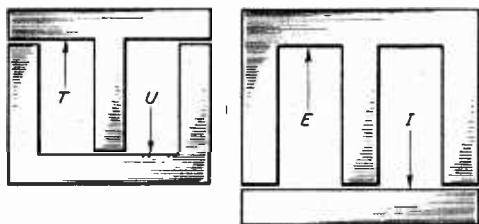


Fig. 1.—Two types of lamination.

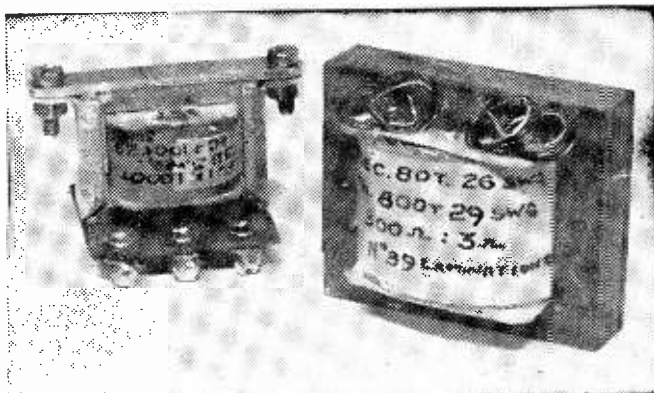
The purpose is to place more bias on the physical side with only a background in electrical theory, so as to enable the reader to make a choice of laminations, determine the wire gauge, the number of turns to wind on the bobbin, and the method of construction. The reader may thus select the laminations and purchase, or utilize laminations from an old transformer out of the spares box. Laminations may be removed more easily from old transformers which have been impregnated in varnish if the assembly is heated to approximately 130deg. C (this could be done in a domestic cooker as the varnish does not run but softens. As a safeguard, the transformer may be stood in a tin before placing it in the oven).

Laminations

The physical shape of laminations fall into two main types, "E" and "I" and "T" and "U" (Fig. 1).

There are other shapes which are not discussed here. One side of the laminations is coated with an insulant to reduce the eddy currents, and hence the iron losses, in the transformer. The laminations are assembled with the coated surfaces in the same direction. The laminated core of the transformer may be built up in one of three ways:

- (a) Interleaved.
- (b) Block Assembled.
- (c) Butt Assembled.



Two completed transformers.

(a) Interleaved Assembly

In this type of assembly like patterns are fed into the former from alternate ends (Fig. 2). A transformer assembly in this fashion has the highest inductance for a given coil, but the inductance will fall more quickly with the addition of a direct current in the windings (e.g. when carrying the steady D.C. component of an output transistor stage working single-ended).

(b) Block Assembly

In this type of assembly the complete stack of laminations is divided into two equal parts, and assembled from alternate ends of the former (Fig. 3). A transformer assembled in this fashion has a slightly lower value of inductance, for the

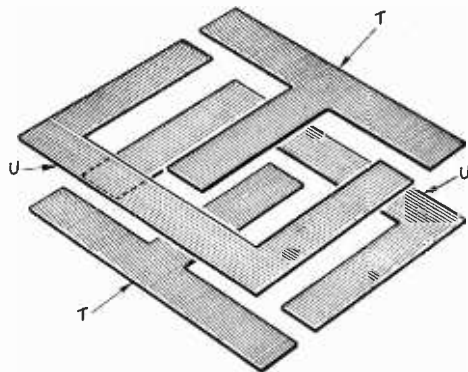


Fig. 2.—Interleaved assembly.

same coil as (a), but the inductance will fall off less steeply with superimposed D.C.

(c) Butt Assembly

In this type of assembly, like patterns are fed into the same end of the former (Fig. 4).

A transformer assembled in this fashion has a lower value of inductance than for the block assembled type, but the inductance will fall even less steeply with applied D.C.

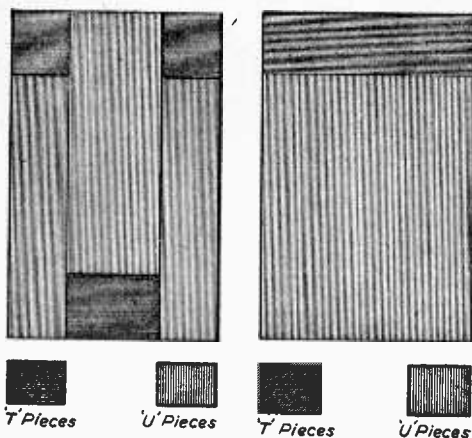


Fig. 3 (left).—Block assembly.
Fig. 4 (right).—Butt assembly.

In addition a 0.002in. or 0.005in. or even 0.01in. packing piece, (consisting of paper or thin cardboard) may be used to increase the air gap. The required thickness of the packing piece may best be found by trial and error. Some typical curves are shown (Figs. 5 and 6). For general use, for reasons of simplicity, interleaved assembly should be used, block and butt assembly being used as a way out of difficulty when the D.C. results in too low a value of inductance to be practical.

Grades of Iron

There are various grades of iron from which the lamination stampings are made, and a few of the main types are discussed.

Mumetal

This is a high grade of material, very pliable. It looks not unlike aluminium, and is bright and smooth in appearance. It is usually coloured light blue on one surface. High values of inductance may be obtained but it saturates at low values of D.C. through the windings. It is expensive to buy.

Radio Metal

This has similar characteristics to Mumetal (usually coloured red on one surface).

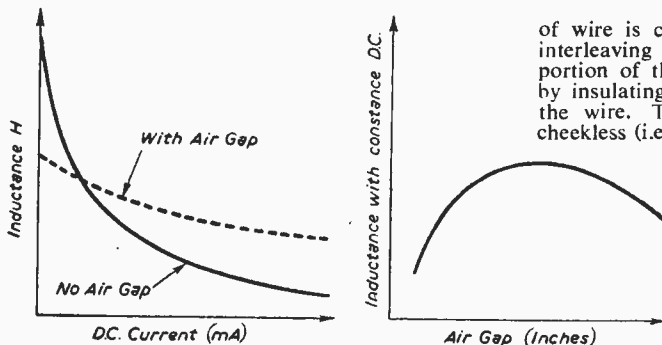


Fig. 5 (left) and Fig. 6 (right) curves relating inductance, air gap and D.C. flowing.

Silicon Irons

These are the cheaper grades of iron, and are supplied in two main grades, Silcor 25 and Silcor 107. The latter has the highest silicon content and can be distinguished from the former, in that it is more brittle (i.e. when bent a number of times it snaps). It is usually coloured green on one surface.

The Silcor 25 (low silicon content) grade is the more practical for general purpose use because it saturates at the highest D.C. values, and has the highest inductance value in the silicon iron group. It is the cheapest grade of lamination and is usually coloured medium grey on one surface.

Designing the Transformer

The design of an output transformer for use with an OC72 transistor working single-ended into a 3Ω speaker is now considered.

An M and EA No. 39 lamination (Silcor 25 grade) would do well in physical size and electrical characteristics.

There are two methods of winding:—

- Layer winding.
- Random winding.

(a) Layer Winding

With this type of winding, the wire is wound on in layers, with one turn of thin paper (0.002in.) between layers. When using fine wire the diameter

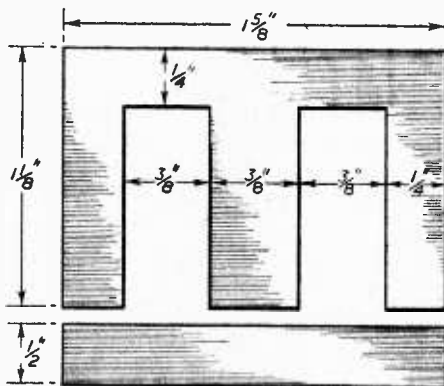


Fig. 7.—A No. 39 lamination with dimension.

of wire is comparable with the thickness of the interleaving paper and consequently a large proportion of the available winding area is occupied by insulating material, thus leaving less space for the wire. The former used for the winding is cheekless (i.e., it has no end pieces).

(b) Random Winding

In this case, the wire is wound on as evenly as possible but no interleaving paper is used between layers of wire. This method lends itself well to small, low voltage transformers because a greater number of turns of wire may be accommodated for a given area of winding space. The former

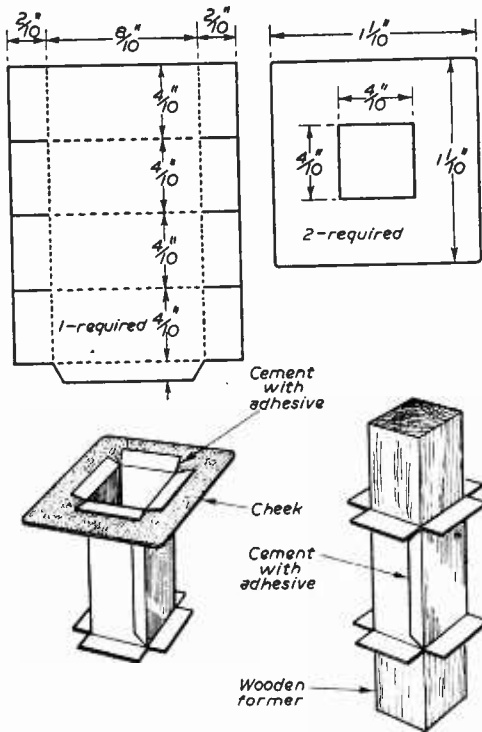


Fig. 8.—Making the coil former.

used for this method has cheeks (i.e. end pieces to keep the shape of the winding).

Construction of the Former

A No. 39 Lamination is shown with dimensions indicated in Fig. 7. The former is made from ordinary post-card—cheap and readily obtainable. It is marked out and assembled as shown (Fig. 8).

A wooden winding block is made from a piece of soft wood, size 3/4 in. x 3/4 in x 3 in. This serves usefully to bend the cardboard bobbin round during its construction. Adhesive is used to cement the cardboard.

The completed bobbin may be coated with varnish to give added strength. Before forming the bobbin to shape the dotted lines should be scored with a sharp hard pencil several times. This will ensure a sharp, clean bend.

When the bobbin is completed the wooden winding block is cut to the exact length of the

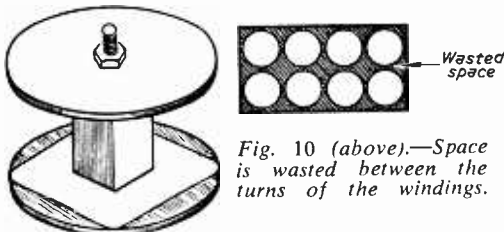


Fig. 10 (above).—Space is wasted between the turns of the windings.

Fig. 9 (left).—Mounting the coil former in wooden cheeks for winding.

bobbin and drilled through its length to take a 4B.A. bolt. Two supporting end pieces are cut from 1/4 in. ply and likewise drilled to take a 4B.A. bolt. The bobbin is assembled on the wooden winding block and is then ready for putting on the windings (Fig. 10). The bobbin may be rotated in a hand brace.

Winding the Bobbin

The bobbin completed, the next stage is to determine the number of turns of wire necessary to obtain the required inductance of the primary, and the turns ratio required to match the transistor to the 3Ω speaker.

The primary winding must carry 14mA D.C. (the steady operating condition of an OC72 transistor), which will reduce the initial inductance of the winding. The required number of turns for a given inductance with D.C. may be calculated but the calculations are inclined to be involved, and the ultimate results may be obtained by a trial and error method. Wind on about 200 turns of wire and measure the inductance (with the instrument described in the article "An Inductance Measuring Instrument" on page 933 of the March issue. The inductance is proportional to the square of the number of turns. If the measured inductance with 200 turns and 14mA D.C. is say 16mH, and the required inductance is 250mH then we require 16 times more inductance (i.e. 250mH). Therefore,

$$\frac{250\text{mH}}{16\text{mH}}$$

$\sqrt{16}=4$ times the number of turns are required and $200 \times 4=800$ turns. Make the primary inductance approximately correct before considering the

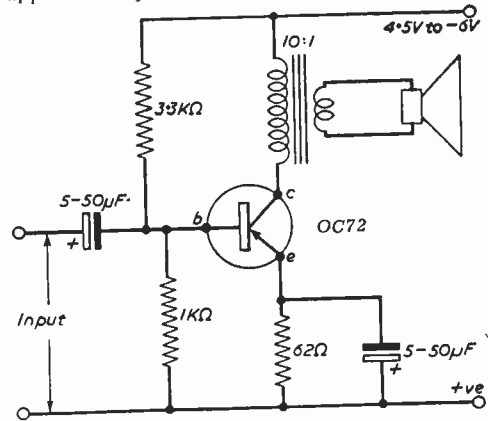


Fig. 11.—Circuit of the transistor amplifier.

secondary, because this value will affect the low frequency response of the transformer.

Having achieved the number of turns necessary for the primary, the turns ratio is next considered. The OC72 transistor requires a 300Ω load which is required to be matched to 3Ω, the turns ratio is therefore:—

$$\text{Turns Ratio} = \sqrt{\frac{300}{3}} = \sqrt{100} \text{ or } 10:1.$$

We require 800 turns on the primary, and $800/10=80$ turns on the secondary.

Choice of Wire Gauge

There is only one gauge of wire which will

occupy the given winding area. The term window area is given to the area of space between the centre core and the outside limb of the laminations. When making the choice of wire gauge we consider the cross-sectional area of the wire. The window area in our case is $\frac{7}{8} \times \frac{3}{8} = 21 = 0.328\text{sq. in.}$

Windings, even laid perfectly do not completely fill the area, and the bobbin, too, occupies some space, so there will be a wastage of space. Fig. 10 illustrates the wasted space (shown shaded). This wasted space is termed "space factor" and a good overall figure for a small sized lamination is 35 per cent. In our case (100—35=65 per cent winding area) the available winding space will be:— $\frac{0.328 \times 65}{100} = 0.214\text{sq. in.}$

The transformer ratio is 10:1 so the secondary winding will carry 10 times more current than the primary, and so should be of thicker wire. The primary will take up most of the space (an output transformer is an inductive, rather than power rating, consideration). Allow say, 0.18sq. in. for the primary area and 0.02sq. in. for the secondary area.

From the wire tables $\frac{\text{No. of turns required}}{\text{space available}} =$ turns per sq. in. of wire suitable (i.e. wire gauge).

Primary Winding

$$\frac{800}{0.18} = 4450\text{t/sq. in.} = 29 \text{ gauge (from the tables).}$$

$$\frac{800 \text{ (turns)}}{4380\text{t/sq. in.}} = 0.183\text{sq. in. (space occupied).}$$

$$\text{Available space} = 0.214\text{sq. in. (Total).}$$

$$\text{Primary space} = \frac{0.183}{0.031\text{sq. in.}}$$

Secondary Winding

$$\frac{80 \text{ (turns)}}{0.031\text{sq. in.}} = 2580\text{t/sq. in. Therefore, 26s.w.g.}$$

(from wire tables) must be used.

Therefore, we require for the secondary 80 turns of 26s.w.g. enamelled copper wire, which is wound on first, and 800 turns of 29s.w.g. enamelled copper wire for the primary, which is wound on last.

Winding on the wire is straightforward. Make a small hole in the cheek of the bobbin through which to bring the lead and wind on the secondary, keeping the wire as even as possible. If a black line is painted on one of the plywood check supports of the winding assembly it will be easier to count the turns. Cover the secondary windings with two layers of thin paper cut into strips, and then wind on the primary. Cover the complete winding with two layers of thin paper.

The transformer is now ready to be laminated and inserted into the circuit shown in Fig. 11. A clamp may be made to finish the transformer in a professional way from thin aluminium (Fig. 12). If the reader so wishes, Mumetal laminations may be tried which produce a smaller sized transformer. In this case the laminations should be block assembled. Smaller transformers have smaller bobbins which are more tedious to manufacture. Also the winding space is smaller, calling for thin wire which is not always easy to wind on without the aid of a coil winding machine.

Table

Turns /sq. in.	Current at 1000A/sq. in.	s.w.g.
1770	380mA	24
2120	314mA	25
2570	255mA	26
3120	211mA	27
3760	172mA	28
4380	145mA	29
5400	121mA	30
6100	106mA	31
6940	92mA	32
7960	79mA	33
9600	67mA	34
13500	45mA	36
20400	28mA	38
33100	18mA	40
44900	13mA	42
65500	8mA	44
118300	4½mA	46

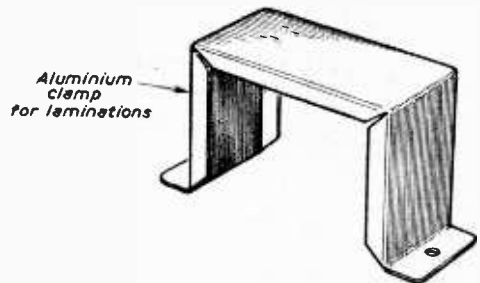


Fig. 12.—An aluminium clamp for the laminations.

AN A.M. FEEDER UNIT

(Continued from page 216)

length of coax with a suitable plug at the end. Others using this unit as an adjunct to a FM unit, as suggested earlier, will probably make up some form of switching device for quick change-over between them.

Tuning

To tune the feeder is merely a matter of adjusting the various trimmers associated with the gang condenser and that for coupling (C2). This latter must be adjusted to provide just sufficient coupling between the two band-pass coils to avoid "double-hump" tuning which can usually be detected, without the use of instruments, by the fact that the signal can be tuned-in at two fairly adjacent places on the dial. A similar effect will sometimes arise if the trimming of first and second sections of the gang condenser are incorrect. Sometimes difficulty arises in finding the signal at first and to do this the aerial may be placed directly on the grid of V1, that is at the "fixed plate" connection of C3. Here something is usually tuned in without trouble and the aerial can then be transferred back to its correct terminal and alignment carried out. As selectivity is so good quite a long aerial can be used without difficulty.

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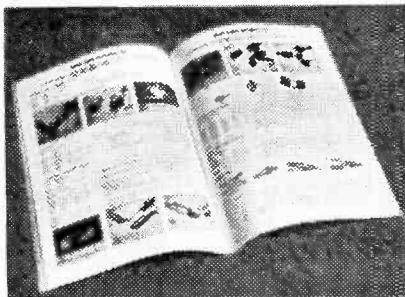
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By D. D. Smith

THERE are now, on the surplus market, many P.104 VHF receivers. These may be bought new for about £5 or for as little as 39s. 6d., fully valved. The range covered is from 95-150Mc/s, but as bought, the set cannot be tuned over this range, as it is for crystal control. By a simple modification, however, variable tuning over the band may be obtained. The modification used is that of changing the oscillator circuit to that of the similar R.1392 receiver. This is a simple alteration and uses only six new components.

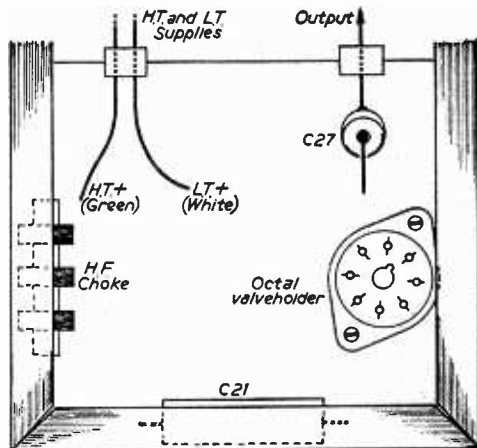


Fig. 1.—Underside of the oscillator section showing the components not removed but with int. Octal valveholder fitted.

proper. After removing the crystal sockets, the set may be put aside as the rest of the work involves only the deck removed at this stage.

The oscillator stage to be changed is in the front section of the deck and uses an EF39 (VR53) valve. All the components in this compartment are removed with the exception of the H.F. choke, the condenser bolted to the front panel (C21), and the condenser (C27) soldered to the feed-through insulator at the right-hand side of the rear panel. The green and white wires (H.T. and L.T. respectively) coming through the grommet on the left-hand side of the rear panel are left for later connection (Fig. 2).

Replacement Valve

The international octal valveholder is removed and replaced by a Mazda octal type for the SP61 valve which replaces the EF39. Although the compartment space is rather cramped, all the components may be housed adequately. A little care is needed when soldering components to the valveholder as this is partly shrouded by the fixing turnover of the deck. After completing the wiring of the new circuit and this has been checked, the deck may be fixed back into its original position and the three wires removed initially soldered back to the original points.

The original aerial socket is best removed and replaced by a blanking panel to which may be fitted a coaxial socket. Until the trimmers are adjusted the original epicyclic drive and dial are best replaced, making sure that the dial is fitted in its former position and not at 180deg. to it.

Power Supply

A conventional power supply unit giving 250V at 100mA and 6.3V at 4A is connected to the Jones plug via a suitable socket connector. The connections are as shown in Fig. 4.

With power supply connected, aerial fitted and low resistance headphones plugged in the "monitor" socket, the set may be tested. Set R.F. gain control and audio gain control to

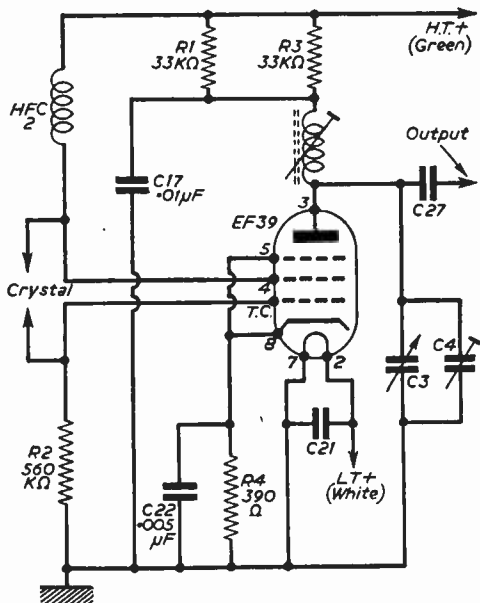


Fig. 2.—The oscillator circuit of the P104.

Procedure

Firstly, remove the "Tune Oscillator" dial after marking its position on the spindle, and also the epicyclic drive. Invert the receiver and drop methylated spirit on to the heads of the eight 6B.A. screws holding the oscillator/multiplier deck to the main chassis. While the shellac is softening, the three connecting wires to this deck, at the rear, may be unsoldered and noted for future replacement. The wires to the crystal holder may be removed also. On removing the eight holding screws, the deck may be removed from the chassis

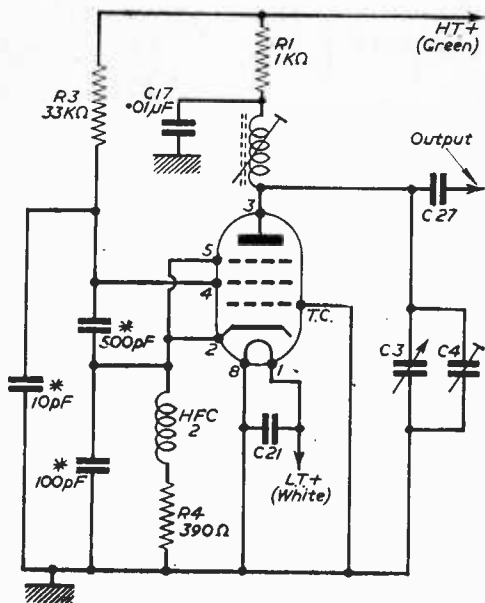


Fig. 3.—The new oscillator circuit (components marked with an asterisk are new—silvermica condensers).

maximum, meter switch to "oscillator" and "Tune oscillator" dial to approximately 130Mc/s. Tune around this frequency on the "Tune Signal" control, when a hiss should be heard above the background noise. If this is missing or is weak, the trimmers over the last three of the ganged condensers should be adjusted. Final adjustments should be made to tune the meter for maximum dip.

Operation

It should now be possible to tune in a signal. This may be found almost anywhere in the frequency range and will most probably be from an aircraft or airport. It is very easy to tune over, and thereby miss, a signal with the drive fitted to the oscillator section and, of course, in this range, signals are not being transmitted continuously. It is advisable to tune for a carrier, with the beat frequency oscillator switched on. On hearing a signal the R.F. stages may be peaked up by the associated trimmers and the aerial tuner also adjusted.

It will be found that if the H.F. end of the band is peaked up the L.F. end will be out and vice-versa. As most

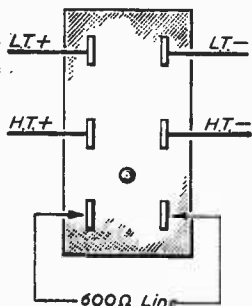


Fig. 4.—Jones plug connections.

amateurs will probably use the receiver as an introduction to the 144Mc/s Amateur Band, this will be of little consequence however.

A good slow-motion drive, preferably of the geared kind, is a necessity and may be fitted on a stand-off panel as there is little space behind the front panel. A suitable aerial is a vertical dipole having each arm 1ft. 8½in. long and connected with 75Ω coax (for 144Mc/s).

If shielding is used, it is possible to fit a simple amplifier under the chassis and there is also room to mount a small speaker where the crystal sockets were originally mounted.

POCKET TRANSISTOR T.R.F.

(Continued from page 238)

The coils are wound with 5/47 Litz wire, and the winding process was greatly facilitated by using a simple winder which uses the wire of a straightened-out paper clip for a crank handle, and as bearings. These take the form of clips soldered to nails driven into a board. The shaft is a fully-screwed 6B.A. bolt, and the polystyrene coil former is secured by a 6B.A. nut and washer. The nut should not be tightened too much as the former may crack and this would cause binding of the core.

One half of the pot core is left on the former and the other fitted on completion of the coil. The two temporary cheeks, made from 1/16in. material, are a push fit on the formers from the side, and should not be so tight as to be difficult to remove.

Assembly

The inner end of the Litz wire is passed through a soldering spill at the corner of the base plate, projecting about 1in. beyond, and then is bent in to avoid contact with the nail as the handle is turned. After the correct number of turns has been counted on to the former, the wire is cut and passed through the adjacent spill. The second winding is then put on in the same way, the inner end of the wire being passed through the spill diagonally opposite the one first utilized.

A scratch can be made on the base plate to mark the two spills belonging to the 80-turn winding. The two remaining spills, diagonally opposite, are reserved for the purpose of mounting and mechanical alignment, and no solder is used on them.

Each ferrite cup has two notches, giving a total of four openings, one for each lead. Fitted over the coil, the two ferrite cups can be fixed together with "Sellotape" round the join. The pot core with the coil inside can then be pushed to the bottom of the former, near the base-plate, to make its position the same for each coil.

Soldering

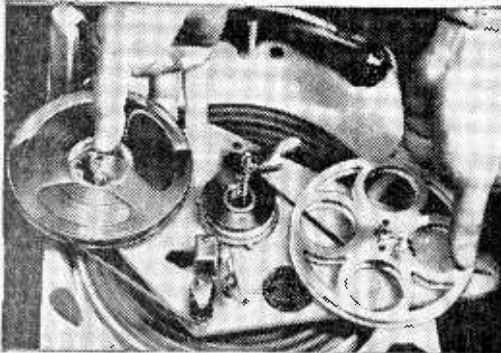
The cross-section of the Litz wire consists of insulated strands to produce a more uniform current distribution and so reduce the R.F. resistance and increase the Q-value of a coil. Its successful use depends upon having an efficient means of removing the enamel from the strands at the ends where it is to be soldered.

(To be continued)

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Club News

REPORTS OF CURRENT ACTIVITIES

BLACKBURN AMATEUR RADIO CLUB

Hon. Sec.: K. Heap (G3NCZ), 138 New Bank Road, Blackburn.
The club has recently acquired a new clubroom at the West View Hotel, Revidge Road, Blackburn, and meetings are held every Tuesday night at 8 p.m. It is hoped to hold a Hamfest in conjunction with the Bury Amateur Radio Society in the autumn provided sufficient interest can be aroused in the area.

BRADFORD AMATEUR RADIO SOCIETY

Hon. Sec.: M. T. Powell (G3NNO), 28 Gledhow Avenue, Roundhay, Leeds 8.
Meetings are held at Cambridge House, 66 Little Horton Lane, Bradford 5, every other Tuesday at 7.30 p.m.

The Annual General Meeting was held on March 22nd when the following officers were elected: President, D. Binns (G3MG1), Vice-President, L. A. F. Stockley (G3EKE), Secretary, M. T. Powell (G3NNO), Treasurer, F. J. Davies (G3KSS), Public Relations Officer, P. A. Dennison (G3NOE). The meeting on April 5th was devoted to the discussion on Field Day Arrangements and on April 26th, D. G. Enoch gave an interesting lecture on the "Development of Television". A competition, "Top Score", was held on May 10th and on May 24th a lecture was given by E. C. Bell on transistors. The club will visit the Holme Moss Television Station on June 14th.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: F. C. Ward, 5 Uplands Avenue, Littleover, Derby.
Meetings are held at the College of Art, Green Lane, Derby. A surplus sale was held on May 4th which was well attended. On May 11th a direction finding practice run was held in the nearby countryside when members were able to test their skill as driver, map reader, navigator or D.F. operator. Mr. W. H. Jones gave a talk on crystal filters on May 25th and another surplus sale was held on June 1st.

Future Events:

June 11th and 12th.—National Field Day. G3ERD and G3EEO will run two stations from "Glebe Farm", Blagreaves Lane, Littleover.

June 22nd.—Open Night in the Sub Basement Club Rooms.

August 14th.—Third annual mobile rally at Rykneld School.

FLINTSHIRE RADIO SOCIETY

Hon. Sec.: J. Thornton Lawrence, Perran Porth, East Avenue Prestatyn.

Meetings are held at the Railway Hotel, Prestatyn at 7.30 p.m. Mr. H. Syngé gave a talk on May 2nd entitled "Two Metres". Arrangements for National Field Day were discussed at the meeting on May 23rd and on June 6th Mr. J. T. Lawrence gave a lecture on "Audio Amplifiers".

Future Event:

July 4th at 7.30 p.m.—"Subscriber Trunk Dialling" by a G.P.O. official.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

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

On April 9th the members paid an interesting visit to a Manchester television studio. A lecture was given on April 12th at the Sportsman Inn, Ogdén on "Fire Prevention" and the Annual General Meeting was held on May 24th.

Future Event:

June 14th.—Workshop Practice.

LEEDS AMATEUR RADIO SOCIETY

4 Woodhouse Square, Leeds.

Hon. Sec.: D. Dinsdale.

The Hon. Sec., Mr. D. Dinsdale, has changed his address to 69 Spen Lane, Leeds 16.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

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

Meetings are held every Tuesday night at Gladstone Hall, Queens Drive, Liverpool. As the club is now becoming well known through previous exhibition stations it has been found that the programme for this year had to be extended and justified a sub-committee being formed so that the station might be properly organised and presented to the public in an efficient manner. The first of these exhibitions was held on May 28th at the Newton-le-Willows Garden Fete, this being a combined organisation to show what the younger generation do with their spare time. A top band contest was held on Sunday, April 24th as in previous years.

THE MEDWAY AMATEUR RECEIVING AND TRANSMITTING SOCIETY

Hon. Sec.: E. N. Gunnee, 5 Saxton Street, Gillingham, Kent.

The club meets on alternate Mondays at 8 p.m. at Riverside Buildings, Gun Wharfe Gardens, Chatham. The club has no transmitter at the moment but is hoping to acquire one soon. The following officers have been elected: President, W. Nutton (G6NU), Chairman, V. Davies (G3MSK), Treasurer, S. Baker (G3HWS), Secretary, E. Gunnee.

MITCHAM AND DISTRICT RADIO SOCIETY

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

The club meets every Friday at "The Canons", Madeira Road, Mitcham, and has recently been issued with its own call sign, G3OCT. On May 8th the First 144Mc/s Field Day of the year was held. G3LAR/P operated from a site in Buckinghamshire and G3LCH/P was at the usual site at Hindhead. On club night the club station is on the air until tea break using 'phone. After the break Morse Instruction Classes are held until 10 p.m. During this time the Club Station must use only Telegraphy and headphones are worn by both the station operators and those taking part in the Morse Classes. The Morse Oscillator is available for Morse practice throughout the meeting but headphones must be worn. On Friday, May 20th, G3BCM gave a talk on TVI-BCL and the Radio Amateur. On Sunday, May 29th, a dummy run was held for National Field Day and on June 3rd this was the topic for discussion at the club meeting.

Future Event:

June 11th.—National Field Day Assembly in King George VI Avenue, off Madeira Road, Mitcham.

PETERBOROUGH AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: D. Byrne (G3KPO), Jersey House, Eya, Peterborough.

The club meets at Peterborough Technical College.

Future Events:

June 10th.—Equipment Demonstration.

July 1st.—Mobile Operation.

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Using Modern Transistors

THEORETICAL AND PRACTICAL INFORMATION

By R. Leyland

TRANSISTORS are certainly among the smallest of radio components and, as substitutes for thermionic valves, make possible amplifiers and radio sets smaller than ever before. Their smallness and low power consumption have stimulated the miniaturisation of other components, and the reduction of the bulk and weight of equipment.

Nevertheless, the transistors that have so far reached large-scale production are not entirely adequate as substitutes for thermionic valves. Not only is their stage gain lower, and noise-level higher, but also special circuit design is required to counteract their sensitivity to changes in temperature, and the wide production spreads of nominal types.

The main disadvantages of transistors, however, appear to be their low and non-linear input resistance, and high frequency limitations, which in some types are particularly severe.

Input Resistance

The input characteristic for a transistor is essentially that of a rectifier—the base-emitter diode. A thermionic valve by comparison has input conditions that are ideal—merely a high resistance

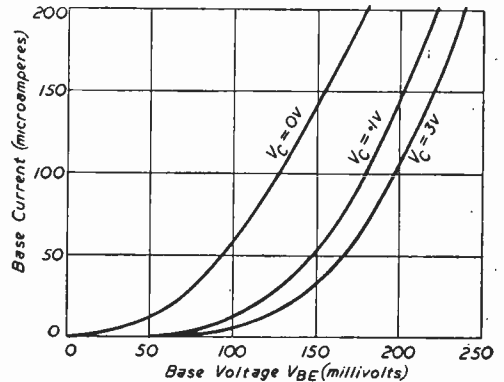


Fig. 1.—Typical transistor input characteristics.

A load in the collector circuit reduces the feedback current to the base, and this can decrease the input resistance in the grounded-emitter arrangement by as much as 25 per cent.

The input resistance thus depends to a considerable extent upon the value of the collector load, as well as upon the working point chosen, and upon the signal amplitude.

One consequence of the low input resistance of a transistor is that much larger coupling capacitors are required than in valve circuits, and these are usually electrolytic capacitors of several microfarads. Another point is that in a multi-stage amplifier the real values of collector loads are set by the low input resistance of transistors, rather than by the values of actual resistors, as in a valve circuit.

In low-level stages, there is little distortion of the signal, but at larger amplitudes, the curvature of the input characteristic prevents the waveforms of the input current and voltage from being identical. As the output current (and the output voltage across an unvarying load resistance) is more nearly linear in relation to the input current, it is the signal current that should be kept undistorted. It is therefore necessary to supply the signal from a source of several times the input resistance of the transistor to swamp the variations of the input resistance. As this source will probably be the collector of a preceding stage, the collector resistor will be several times the input resistance, the latter setting the real value of the load.

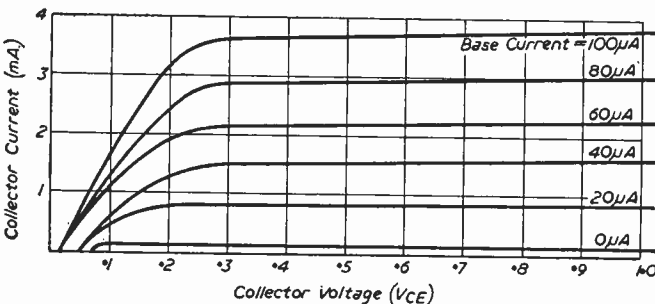


Fig. 2.—Typical transistor output characteristics.

grid leak in parallel with a few pF of interelectrode capacitance. It is true that capacitive feedback occurs in triode valves as well as in transistors, but it can be more easily surmounted when necessary, as in a grounded-grid circuit, or by adding the screen grid as in a pentode; and transit-time effects in valves make their appearance only at very high frequencies.

The A.C. input resistance is measured by the slope of the input characteristic, and may vary from about 30k with abnormally low base currents to 1k or less above the bend in the characteristic.

Output Stages

An undistorted input voltage, from a low resistance source, would therefore produce distortion in the output waveforms, and in class B stages, where each transistor handles only half of the wave, the effect would show at the cross-over points between the half-waves, as in Fig. 4, giving severe distortion in the sound output.

Thus it is particularly necessary to minimise distortion in output stages, arising from variations of input resistance with signal swing, both by

(Continued on page 253)

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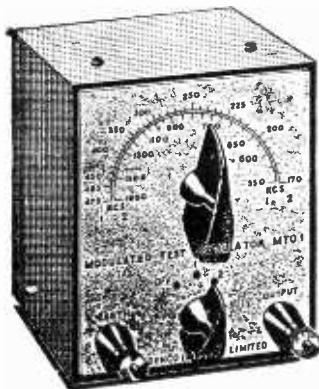
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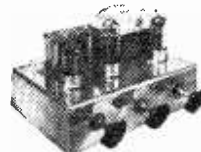
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(Continued from page 250)

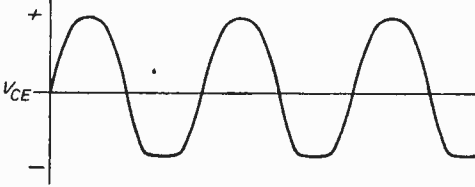


Fig. 3.—Distorted output waveform of a Class A p-n-p transistor output stage, owing to a sinusoidal signal voltage being applied from a source of too low a resistance.

suitable choice of bias current, and by making the source resistance of the driver stage sufficiently high.

Larger output transistors have become available which are capable of delivering several watts with higher efficiencies than valves, providing that the cooling arrangements are sufficient. The gm of these output transistors (as much as 10A/V) is surprising as compared with the few mA per volt of a radio valve, but elation is somewhat damped on noticing that the input resistance is extremely low. The voltage amplification that can be realised is limited by the output resistance of the transistor, two or three hundred ohms, and usually does not

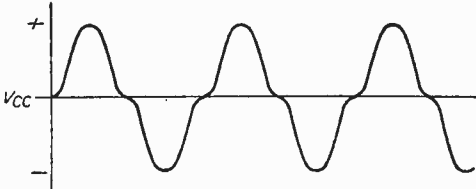


Fig. 4.—Distorted output waveform in a Class B stage (cross-over distortion), owing to the signal source having too low a resistance.

exceed a few hundred times. With a 25Ω load, the voltage amplification may easily be 100, but the input resistance is only a few ohms, so the drive is usually supplied through a transformer. The effective source resistance must of course be large enough to avoid distortion.

Output Characteristics

The relatively high output A.C. resistance of a transistor is a closer approach to similarity with a valve. In the grounded-emitter arrangement, it is raised on reducing the resistance of the signal source, because this increases the negative feedback current to the base.

Biasing

Superficially transistors resemble triode valves, with the base taking the place of the grid, the collector the place of the anode, and the emitter of the cathode. The phase relationships between electrodes are the same, but there are biasing differences (Fig. 5). When a single battery is used, the stabilising arrangements that have to be employed tend to obscure these differences of polarity.

High-frequency Limitations

Transit-time in a transistor sets an upper limit to the frequency range over which the transistor can be used. In surface-barrier transistors, reduction of the base layer to about one five-thousandth of an inch in the thickness, by a special electrolytic etching process, enables this upper frequency limit to be extended considerably.

Another factor affecting the high frequency performance is the collector junction capacitance. This capacitance is in most cases larger than the grid-anode capacitance of a triode valve, but in surface-barrier transistors it can be less than 2pF.

Feedback in the transistor becomes governed at high frequencies by this internal capacitance, and is negative or positive according to the reactance connected at the input. Usually this is the reactance of a parallel tuned circuit in the base circuit, and changes from an inductive reactance below resonance, to a capacitive reactance above resonance. Feedback is thus positive below resonance and negative above, resulting in an asymmetrical response curve.

The effects of the internal capacitance can only be eliminated by introducing an equal amount of feedback in the external circuit in the sense opposite to that occurring inside the transistor. Perfect unilateralisation may be difficult to maintain since the internal capacitance varies to some

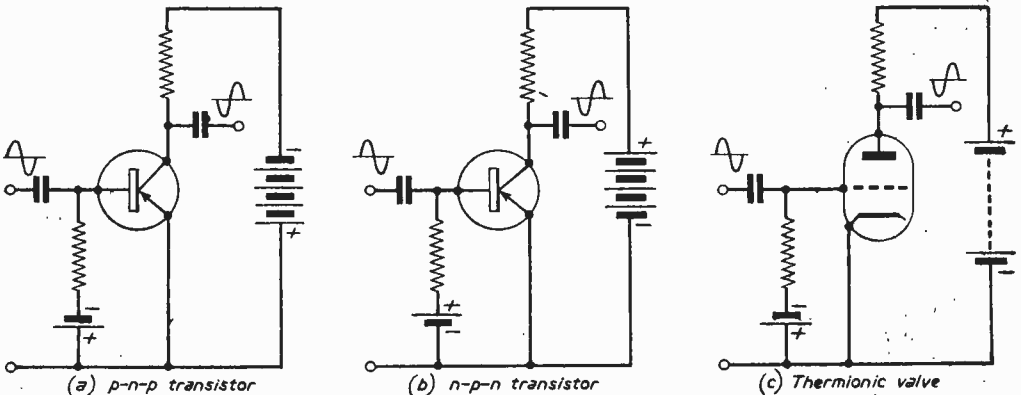


Fig. 5.—Biasing differences and relative phases of input and output voltages.

extent with collector voltage, but it is standard practice to apply neutralising in transistor I.F. stages enabling a high amplification to be secured without instability. Further advantages are that the interaction between the tuning adjustments of individual stages is greatly reduced, and a symmetrical response curve can be obtained.

A neutralising circuit takes the form of a bridge circuit with one arm consisting of the internal collector capacitance. Its balance should be maintained over a range of frequencies and will not be affected by the phase shift due to transit-time effect in the transistor.

In the I.F. amplifier, Fig. 6, there is a chain of neutralising components, the neutralising feedback in each stage being derived from the secondary of the I.F. transformer. The values of the neutralising components depend upon the step-down ratios of the I.F. transformers.

There is a step-down ratio from the collector of 6:1 in T2, and of 2:1 in T3 (which feeds the detector). Thus Rn2 is given a value three times that of Rn1, while Cn1 has a value three times Cn2, so making the feedback currents the same for each stage, despite the difference in the I.F. transformer ratios. Since the stepdown in T2 is 6:1, Cn1 requires to be about six times the internal collector capacitance of about 10pF, and would therefore be in the region of 60pF, while Cn2 would be 20pF. The series resistances (Rn1 about 1K Ω , Rn2 about 3K Ω) are to balance the collector A.C. resistance, and are more convenient than high resistances (several 100k Ω 's) shunted across the neutralising capacitors. The balance can only be maintained over a small frequency range, but this suffices in I.F. stages.

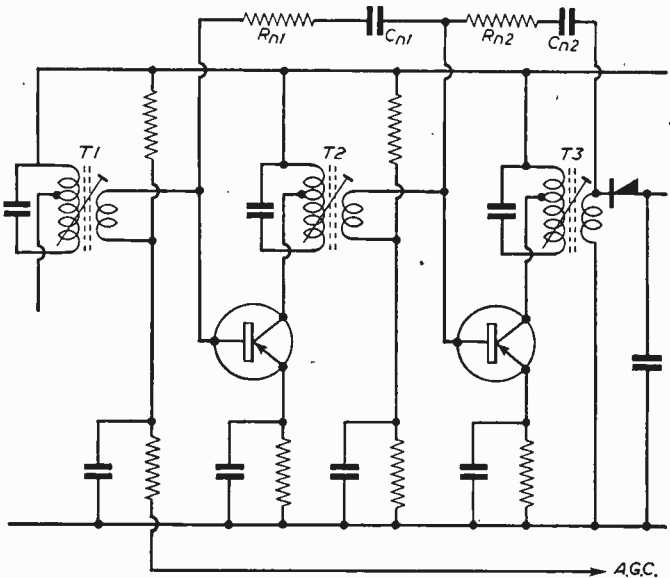


Fig. 6.—Transistor I.F. amplifier with neutralising applied in each stage.

Transistorisation

To sum up, we can say that transistors have become rivals to thermionic valves because of their smallness and low power consumption, but it is not always easy to transistorise equipment because transistors differ radically from valves in their characteristics.

Thermionic valves are usually preferred where low-noise levels, high input impedances, wide frequency responses, high quality or large pulse voltages are required.

Much depends upon the types of transistor available, and we shall probably have to await the more advanced types of semiconductor devices before the thermionic valve is seriously challenged.

INFRA-RED SCANNING SYSTEM

IN Philadelphia, scientists of Philco Corporation's Research Division have perfected a method of electronically reproducing an image of heat emissive targets detected by cells sensitive to the invisible infra-red portion of the light spectrum.

Called "Filterscan", the system offers good picture quality with a television-type image presented in a pattern of 150 lines per inch. The standard raster in television is a predetermined pattern of scanning-lines at 525 lines per inch. According to Philco's IR specialists, the "Filterscan" image could be scanned at TV rates should particular applications call for higher definition.

Electronic scanning, according to physicists, is some 30 times faster than mechanical systems which use a moving mirror scanning an image at the rate of one frame per second. Rapid changes in direction or heat-intensity of a target can thus be monitored more closely.

Development effort in the IR field has been

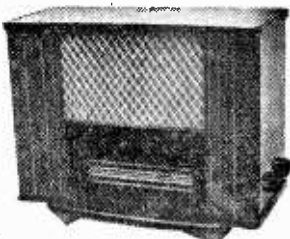
extensive in recent years because of the medium's "passive" nature. Active detection and tracking systems such as radar necessarily use directional radio waves which are reflected from a target back to the transmitter site. Because such microwave beams may be detected, they are subject to jamming and interference. It is even conceivable that an enemy missile might "home" toward a radar transmitter-receiver.

Passive Infra-red Systems, on the other hand, are immune to jamming counter-measures, and no missile could direct itself (home) toward a system which merely collects information without the need of it first transmitting a radio beam.

Industry has found uses for IR detection, with monitoring of equipment which might develop damaging hot spots, for inspection of components rolling off an assembly line where excessive heat could indicate trouble. Closely packaged electronic systems can be observed automatically for early warning of tube-destroying heat.

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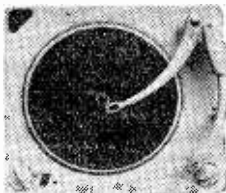
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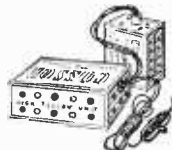
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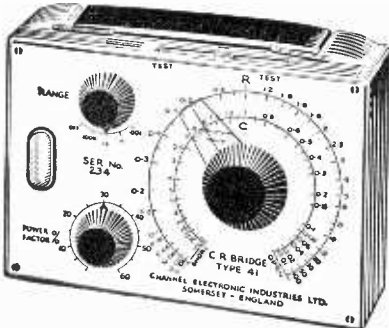
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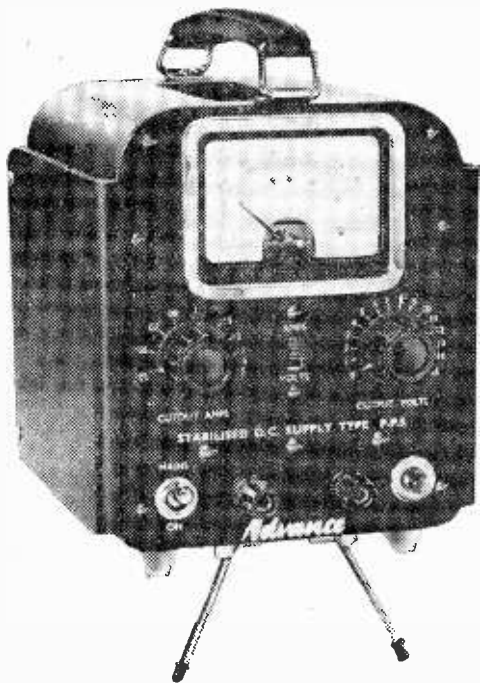
NEW PRODUCTS AND DEVELOPMENTS

ALL TRANSISTOR PORTABLE RADIO

A NEW portable table radio called the Linnet has recently been introduced by Dynatron Radio Ltd. This a battery-operated transistorised receiver housed in an attractive cabinet "picture framed" in beechwood and finished in high quality walnut veneer. This is a transistorised receiver incorporating a specially matched pair of transistors in the output stage, connected in push-pull to provide a power output of 500mW. It is economical and safe to use utilising 9V long-life batteries which provide the 18V H.T. supply required to operate the receiver. The Linnet is provided with two wavebands, medium and long, covering 190-550 and 1050-1800m. The retail price is £25 14s. 6d. and the set is made by Dynatron Radio Ltd., Maidenhead, Berks.

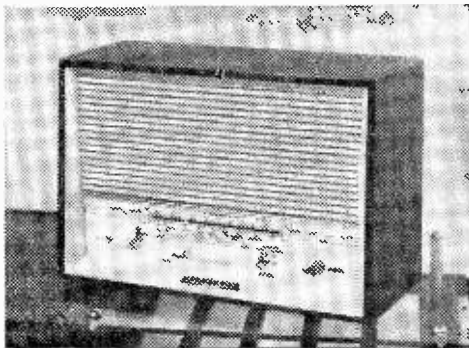
TRANSISTORISED LABORATORY POWER SUPPLY

IDEAL for use both in the developing and testing of transistor circuits, the Advance Components Ltd. model PP5 has been designed specifically to satisfy the demand for a compact laboratory power supply at low cost. The



The Advance PP5 stabilised power supply.

instrument is completely transistorised and provides a stabilised D.C. supply continuously variable in one calibrated range from 0 to 15V at a maximum current of 500mA. An adjustable electronic cut-out provides full protection against progressive current overloads and short circuits. The operating point of the cut-out is adjustable from 50 to 500mA and can therefore be set to provide protection from the load circuit as well as for the instrument. A grade-one dual range meter is incorporated and can be switched to monitor both the output current and voltage. The unit measures 5½in. x 7½in. x 6½in. and weighs 8lb. (Advance Components Ltd., Roebuck Road, Hainault, Essex.)



The Linnet transistor portable radio.

NEW FREQUENCY STANDARDS

A NEW electronic "tape measure" has now been introduced by Standard Telephone and Cables Ltd. This is 40,000 miles long and never varies in length by more than an inch. It is a high frequency source which has a short term stability of ± 4 parts in 10^{10} . The new STC sources are both inexpensive and mobile, they are being applied to the driving and checking of single sideband communications systems; the excitation of nuclear magnetic resonances; navigational aids and the provision of laboratory reference frequencies in scientific, industrial and education establishments. The units are of rugged, compact construction and suitable for individual use or for incorporation in large equipment. (Standard Telephones and Cables Ltd., Connaught House, Aldwych, London, W.C.2.)

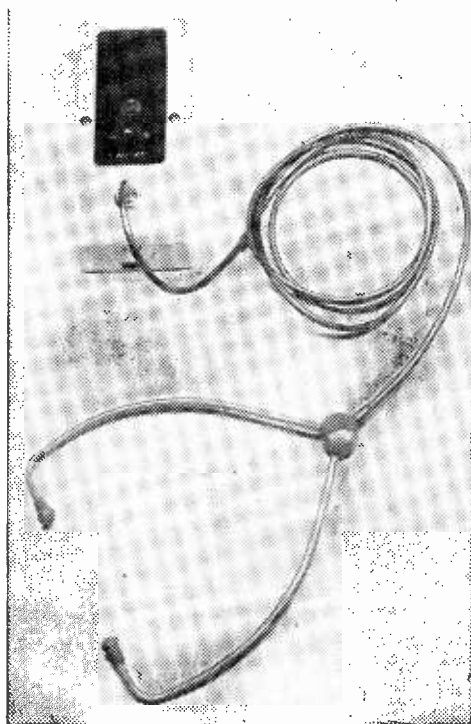
COMMUNICATIONS RECEIVER

A COMMUNICATIONS receiver, known as Type HR120, incorporating a decade system of tuning has been announced by Marconi's Wireless Telegraph Co. Ltd. Four decade dials enable the selection of any frequency within the H.F. range with a maximum error of 200c/s. This is

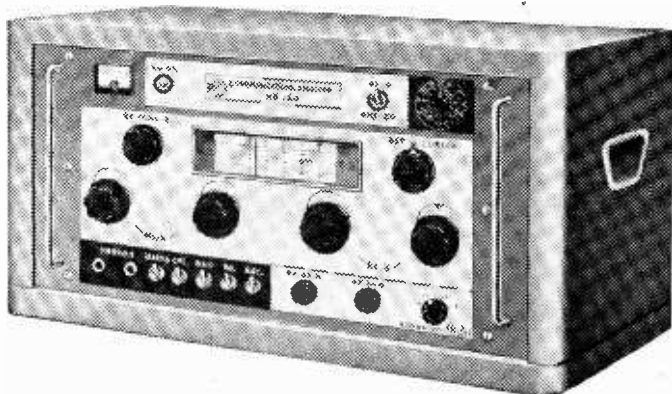
obtained by a crystal-controlled first oscillator operating at 1Mc/s intervals and a second oscillator with a continuous variation of 1Mc/s. Switch-selection of bandwidth is provided among the controls on the front panel, all of which are grouped for maximum ease of operation. The receiver output can be fed either to a loudspeaker, headphones or 600Ω lines. Preferred valve types are used throughout and have American and "reliable" CV equivalents. The receiver has the following dimensions: height 10½ in., width 1ft 7½ in., depth 1ft 4 in. and weight 70lb. (*Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex.*)

LIGHTWEIGHT RADIO HEADPHONE

A NEW type of lightweight radio headphone, designed primarily for use in hospitals, has been introduced by Hadley Telephone and Sound Systems Ltd. The new headpiece closely resembles a doctor's stethoscope in appearance and weighs only 1½oz compared with 9oz of the traditional



The Hadley radio headphone.



The Marconi HR 120 communications receiver.

type headset. Adaption to any standard jack socket in existing bedhead control units is simple, involving only the fitting of a miniature driving unit mounted within the control box in place of the jack socket. A complete unit for use with the stethoscope headphone consists of the Hadley standard five-way control unit giving the choice of four programmes with a central "Off" position and fully variable volume control, adapted as described. Further details can be obtained from the manufacturers, *Hadley Telephone and Sound Systems Ltd., Smethwick, Staffs.*

DOMESTIC TAPE RECORDER

TWO new domestic recorders have been announced by Cossor. They are CR.1601 and CR.1602 selling at 59 guineas and 37 guineas respectively. The main feature of both is that they are for four-track operation. Model CR.1601 is a three-speed instrument 1½, 3½ and 7½ in./sec. With four-track recording it gives a total of 16 hours playing time when double-play tape is used at 1½ in./sec. It is housed in an attractively styled portable cabinet, covered in plastic cloth, with a detachable lid.

Model CR.1602 is a single speed instrument (3½ in./sec) with an improved tape-desk layout. One of its features is push-button operation. The recorder, which takes reels up to 7 in., has a wooden cabinet covered in two-tone washable plastic, with moulded lid. Further information is available from *Cossor Radio and Television Ltd., 71, Endell Street, London, W.C.2.*

STEADFAST PAD SAW

A MULTI-PURPOSE pocket tool with two pad saw blades and a knife edge cutter, all contained in a translucent amber plastic handle, has now been placed on the market by J. Stead Ltd. The tool is supplied in a plastic wallet and may be purchased from most tool dealers and ironmongers. The coarse tooth pad saw blade is for cutting soft materials, the fine tooth blade for hard materials. The retail price is 6s. and replacement blades are available at 3s. a set of three. The pad saw is made by *J. Stead and Co. Ltd., Manor Works, Cricket Inn Road, Sheffield 2.*

RETURN-OF-POST SERVICE

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 **£6.19.6.** Power Pack Kit **£2.1.0.**

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 EF91 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply **£7.17.6.** Kit with power supply **£9.16.0.**

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 EF80 and one EC81 valves. Kit less power supply **£9.19.6.** Kit with power supply **£11.18.0.**

F.M./TV SWITCHED TUNERS

Kits for two new Jason F.M./TV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turret 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 **£14.14.0.**

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 **£10.10.0.**

IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

RECORDING TAPE

DOUBLE PLAY

BASEF. 300ft. (3in.), 14/-; 600ft. (4in.), 25/-; 1,200ft (5in.), 42/-; 1,800ft. (5 1/2in.), 52/6; 2,400ft. (7in.), 77/6.
SCOTCH BOE 200, 400ft. (3 1/2in.), 17/-; 1,200ft. (5in.), 45/-; 2,400ft. (7in.), 80/-.
TELEFUNKEN. 1,200ft. (5in.). In plastic container, 40/-; 1,800ft. (5 1/2in.). In plastic container, 50/-; 2,400ft. (7in.), 75/-.
SPECIAL OFFER. 1,200ft. Standard Tape. Brand new. Famous maker. Fully guaranteed, 25/-. Four for 95/-. Full range of standard and L.P. tape and accessories also stocked. Send for list. All tape post free.

CATHODE-RAY TUBES

BRAND NEW STOCK. NOT REBUILDS
12 MONTHS' GUARANTEE
 We can supply all BVA branded tubes at the new reduced prices. This includes Brimar, Cossor, Emiscope, Emitron, Ferranti, G.E.C., Mazda and Mullard. Full list of all available types sent on request.

ILLUSTRATED LISTS

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TRST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT. Any will be sent free upon request.

HIRE PURCHASE TERMS are available on any time. 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 or C.O.D. We charge C.O.D. orders as follows. Up to £3, minimum 2/6. Over £3 and under 25, 1/6. Over 25 no charge. Postage extra on CASH orders under £3.

WATTS RADIO
 (MAIL ORDER) LTD.

54 CHURCH STREET, WEYBRIDGE, SURREY

Telephone: Weybridge 4556

Please note: Postal business only from this address

CLOSED FOR ANNUAL HOLIDAYS AUGUST 6th TO 20th

LATEST TEST METERS

AVOMETER MODEL 8. The finest multi-range meter available. 20,000 ohms per volt on D.C. ranges. Eight D.C. Voltage ranges 2.5 v. to 2,500 v. Seven D.C. current ranges 50 microamps. to 10 amps. Seven A.C. Voltage ranges 2.5 v. to 2,500 v. Four Current ranges 100 mA to 10 amps. Three resistance ranges. Price £23.10.0. H.P. Deposit £4.14.0 and 12 monthly payments of £1.14.6. Price with leather carrying case. £27.8.0. H.P. Deposit £5.8.0 and 12 payments of £2.0.4.

AVO MULTIMETER. A pocket size 10,000 ohms per volt meter (1,000 ohms per volt on A.C.). Six D.C. voltage ranges 2.5 to 1,000 volts. Five A.C. voltage ranges 10 to 1,000 volts. Five D.C. current ranges 100 microa. to 1 amp. Two resistance ranges. Price £9.10.0. H.P. deposit £1.18.0 and 12 monthly payments of 14/4. With leather case £11.9.0. Deposit £2.5.0 and 12 monthly payments of 17/-.

AVOMETER MODEL 7. also available. Price £19.10.0. H.P. Deposit £3.18.0 and 12 payments of £1.8.8. With leather case £23.8.0. H.P. deposit £4.12.0 and 12 payments of £1.14.6.

CABY SUPREME MULTI-RANGE METERS. Made abroad. We can confidently recommend these meters as being accurate, well made and very good value for money.

MODEL A-10. Sensitivity 2,000 ohms per volt A.C. and D.C. Five voltage ranges 10-1,000 volts A.C. and D.C. Three D.C. current ranges 0.5-250 mA. Two resistance ranges. Size 5 1/2 x 3 1/2 x 1 1/2 in. Price £4.17.6. H.P. Deposit £1.7.6 and three monthly payments of £1.6.8.

MODEL B-30. Sensitivity 4,000 ohms per volt A.C. and D.C. Voltage ranges. Five D.C. 10-1,000 volts. Four A.C. 10-1,000 volts. Four D.C. current ranges. 0.5-250 mA. Four resistance ranges. Price £6.10.0. H.P. Deposit £2 and three monthly payments of £1.13.4.

Leaflets giving full details of any of the above meters are available free upon request.

GRAMOPHONE EQUIPMENT

ALL LATEST MODELS

Cash Price Deposit Mthly/Pmts. Hire Purchase

RECORD CHANGERS

COLLARO Conquest (Studio O PU)	£7.19. 6	£12. 0	6 of £14.7
GARRARD RC20 (GC8 PU)	£9.19. 6	£11.9. 8	12 of 15/-
GARRARD RC88 (GC8 PU)	£16. 8. 0	£3. 6. 0	12 of £14.0
GARRARD RC98 (GC8 PU)	£18.12. 8	£3.15. 8	12 of £17.3
B.S.R. UA8 Monarch (TC8 PU)	£7. 5. 0	£1. 9. 0	6 of £12.8
B.S.R. UA14 Monarch (TC8 PU)	£8.18. 0	£1.15. 0	12 of 13/7
B.S.R. UA14 Monarch (TC8S Stereo/LP/78) ..	£9.18. 0	£1.18. 0	12 of 15/-

SINGLE RECORD PLAYERS

GARRARD TA (GC8 PU)	£8.10. 0	£1.14. 0	12 of 13/-
B.S.R. TU9 (TC8 PU)	£4.10. 0	£1. 5. 0	3 of £15.0
COLLARO RP54 (O, P or T PU)	£8.18.11	£1.15.11	12 of 13/7
B.S.R. UA14 RP54 (O, P or T PU)	£9.18. 9	£1.18. 9	12 of 15/-
E.M.I. (Acos Stereo PU)	£6.15. 0	£1. 7. 0	12 of 10/8

TRANSCRIPTION UNITS

COLLARO 4T/200 (TX88 PU)	£18.13. 0	£3.15. 0	12 of £17.4
COLLARO 4TR/200 Motor only	£13.18. 3	£2.15. 3	12 of £10.5
GARRARD 4HP (GC8 PU)	£18. 9. 9	£3.15. 9	12 of £17.0

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

AMPLIFIER BARGAINS

LEAK POINT ONE PLUS PRE-AMP. Brand new in maker's carton. List £12.12.0. OUR PRICE **£10.0.0.**
QUAD MAIN AMPLIFIER WITH PRE-AMPLIFIER. Brand new in maker's cartons. List £42.0.0. OUR PRICE **£32.0.0.**
 Only one each of the above available. Any can be supplied on H.P. Terms.

AMPLIFIER KITS

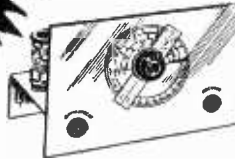
We have full stocks of all components for the Mullard 510, Mullard 2 and 3 valve Pre-Amplifiers, GEC 912 Plus, Jason Jupter and JSA 2 Stereo Amplifiers. Fully detailed list on any of these sent upon request.
 Instruction Manuals, Mullard, All Mullard Audio Circuits in "Circuits for Audio Amplifiers", 9/5. GEC 912, 4/6. Jason Jupter, 2/10. JSA 2, 2/4. All post free.

CONSTRUCTORS CORNER

Construction price includes valve and one coil covering 40-100 m.
 ● Can be converted to 2v. or 3v.
 ● Receives speech and music clearly from all over the world.
 Send 2/- for diagram and price list.

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

FOR ONLY **35/-**



SENSATIONAL RESULTS WITH 2 TRANSISTORS

- ★ No aerial or earth
- ★ Dial tuning with mini .0005.
- ★ Drilled chassis, colour coded, components, simple layout for beginners.
- ★ Special small case fits shirt pocket.
- ★ Soldering iron and pliers are only tools needed.



Finest results ever obtained with 2 transistors and diode layout. The ideal radio to carry with you everywhere. PARTS PRICE LIST & EASY LAYOUT PLANS, 2/-. Total building cost, including transistors, wire, etc. **62/6**

TRANSISTOR POCKET RADIO

Two-stage circuit using variloopstick coil.

- Ideal for the beginner.
- Can be built in 30 minutes.
- Works for months off 7d. battery.
- Fits into palm of your hand.



The ideal low-cost transistor pocket radio for the beginner.
 Send 2/- for data and list of components.

ONLY **30/-**

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

BUILD THIS AMAZING RADIO

POWERFUL! PERSONAL! PORTABLE!

- ★ Sturdy metal case.
 - ★ No holes to drill.
 - ★ Detachable rod aerial.
 - ★ All batteries self contained.
 - ★ Can be built in 1 hour.
 - ★ Covers medium waves.
 - ★ Loud clear tone.
 - ★ Selective tuning.
 - ★ All parts are sold separately.
- This delightful set is designed to give you a completely personal portable radio.
 Bronze-finished case. Ideal for the beach, the bedroom, the office—in fact, anywhere.
 Send 2/- for wiring diagram and component price list.



FOR ONLY **35/-**

Trade Enquiries Welcomed

R.C.S. PRODUCTS (RADIO) LTD. 11 OLIVER RD., LONDON, E.17

Mail Order Only

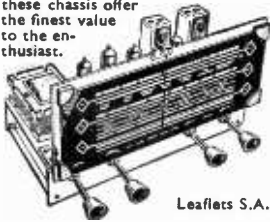
KINGSMERE SUPPLIES LIMITED

Insured Post 1/-, over £2 Free. (Export extra.)
 Single valves, post 6d.

MAIL ORDER HOUSE

TERMS: Remit with Order or C.O.D.

Built to the highest specifications, these chassis offer the finest value to the enthusiast.



Leaflets S.A.E.

ALL BRITISH RADIOGRAM CHASSIS. 3 WAVEBANDS 5 MULLARD VALVES
 ECH81, EF89, EBC81, EL84, EZ80
 Brand new and guar. A.C. 200/250 v. 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. high. 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, Sin., 6 1/2 in., 8 in., 17/6 ea. 10 in., 25/-.



The Brimandy Successful

Monarch

BRAND NEW AND BOXED

OUR PRICE POST FREE

£6.15.0

4 SPEED MODEL UA8

GARRARD 4-SPEED HIGH FIDELITY UNITS

Autochanger 121 Mk.11 **£9.19.6**
 Single Player TA Mk.11 **8 gns.**
 Transcription 4 HF **17 gns.**

Price inc. plug-in, normal heads. Stereo hds. £2 ex.

BRAND NEW

OZ4	6/-
IR5	7/6
IS5	7/-
IT4	6/-
2X2	3/6
3Q5	9/-
3S4	7/6
3V4	7/6
SU4	7/6
5Y3G	7/6
5Z4G	9/6
6AC7	5/-
6AG5	5/-
6AL5	5/6
6AM6	5/-
6AT6	7/6
6BBG	5/-

VALVES

6S17M	6/6
6SN7GT	6/6
6U5G	7/6
6V6G	6/6
6X5G	6/-
12A7	7/6
12A7	7/6
12A7	7/6
12K7GT	6/6
12Q7GT	6/6
25Y5G	6/6
35L6	9/6
35Z4	7/6
807	5/6
954	1/6
956	2/6
DAF96	8/6

ALL GUARANTEED

EL41	9/-
EL84	8/6
EM81	9/6
EY51	9/6
EY86	10/-
EZ40	7/6
EZ80	7/-
E1148	1/6
HABC80	12/6
HVR2A	6/-
KT33C	10/-
MU14	9/-
P61	3/6
PCC84	9/6
PCF80	9/6

FAMOUS MAKE

Long Play 7in. reel, 1,700ft.	...	...	32/6
5 1/2 in. reel, 1,200ft.	...	...	22/6
5in. reel, 850ft.	...	...	19/6
3in. reel, 225ft.	...	...	7/6
Standard 7in. reel, 1,200ft.	...	...	21/-
5in. reel, 600ft.	...	...	15/-
Spare Plastic reels all sizes	...	...	3/-
"Instant" Bulk Tape Eraser and Head De-fluxer, 200/250 v. A.C., 27/6.	Leaflet, S.A.E.		

BAKERS SELHURST

12in. Stairwart, 15WV	...	...	90/-
12in. Foam Suspension	...	...	120/-

25 FOAMCOURT WAY, FERRING, WORTHING, SUSSEX

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.

OLD DAYS

SIR.—I agree entirely with Mr. Trowbridge's remarks on early equipment. True, equipment has improved in design, and components have become smaller. However, the workmanship of these has generally deteriorated. Transformers, particularly audio types, while being miniaturised somewhat, are never as good as the early ones, which are classified as "monstrosities." No, when miniaturisation takes place, something must be forfeited. In this case, that something is the quality of reproduction.—J. R. MALLISON (Nottingham).

HI-FI SYSTEMS

SIR.—I realise there are a lot of readers to cater for, and I understand your difficulty in selecting varied articles aimed at pleasing the majority; but could we not have one or two short articles on installing a Hi-fi system from scratch. I am sure many readers welcomed the article in the April issue describing a record player. I appreciate the fact that other magazines cater for such installations, but many are too technical for the man who has little radio knowledge.—A. A. JENNINGS (Morden, Surrey).

[We will certainly bear in mind your suggestion.—ED.]

REPETITIVE TIMER

SIR.—I would like to say that I made a slight error in describing the action of the timer. It should have read as follows.

"V2 conducts and a negative voltage is applied to the control grid of V1 cutting it off. As C1 discharges through VR1 the control grid of V1 becomes less negative until after a given time depending upon the time constant of C1 and VR1 and other factors in the circuit V1 conducts. This action now cuts off V2 because its grid now has a negative voltage applied to it and will remain in this state until C2 has discharged through VR2 when V2 will conduct once again and the whole operation is repeated."

I would also like to mention that the on and off periods can be roughly estimated by using the simple expression $C=CR$ seconds. An example being 1 μ F and 1M which would have a time constant of 1 second as shown $1 \times 10^6 \times 1 \times 10^6 = 1$. In the case of a balanced arrangement the following would be used $C=C1 R1 + C2 R2$ being an approximation of one complete cycle and may

readily be in error by as much as 50 per cent. Final values should be arrived at by experiment unless one is capable of applying the mathematics necessary when designing multivibrator circuits, applied H.T. voltage, Ra of the valves and load resistors all being involved. In conclusion I would like to say that it is preferable to increase the capacity when a longer time constant is required and attempt to keep the resistance within one or two megohms. This avoids excessive grid current. I hope at least that this information has helped any constructor who wishes to experiment with these interesting circuits.—E. LEATHERLAND (Nottingham).

S.W. TWO

SIR.—I have constructed the "Mains Short-wave Two" described in the last (May) issue, and it works very well. I made a few modifications to the circuit, and I thought perhaps other readers might be interested. They are as follows:

A 300pF variable condenser was used, with a 15pF variable condenser across it. This gives more coverage, with one coil and the bandspread condenser gives adequate selectivity.

For a coil-holder, I used one of the old B4 valve-holders, which, in addition to the sockets and solder-tags, has screw-terminals. I connected the coil to the screw terminals and the other connections were made to the solder tags. I found that by placing the aerial plug into each of the four sockets in turn, different stations could be tuned without varying the tuning condenser at all. At the moment I am listening to the Light Programme on the M.W., using the 90m coil!

I hope the above modifications will be of use to other readers.—M. FEREDAY (Cheadle).

MORSE CODE

SIR.—I write in reply to Mr. R. C. Woodall, who asked for details of the morse code in the May issue. My advice for him is not to worry about the "Q" code, or any other code. These will develop when he is operating in the future. The Post Office only requires a knowledge of the alphabet and numerals. The punctuation is left out. My advice for anyone learning the morse code is to listen to the slow morse on the radio for practice, and also that they should not play around with a key until they can read about seven w.p.m. Morse is very easily mastered if the pupil will concentrate. There is no reason why he should not be able to read at 18 w.p.m. after a period of three months if he has about an hour a day in practice.

Also, "ch" is not used as stated. These are only used in foreign languages.—G3NGD (Stratford).

OVERSEAS VIEWPOINT

SIR,—I am a regular subscriber to your interesting magazine. Wireless, the receiving side, caught my fascination some two years ago, and since then has been my hobby. I am a fairly busy attorney but do find time to read technical books on the subject and to dabble around at night with an old chassis, radio parts and a soldering iron.

I find your magazine most helpful and educating. I have already constructed a few sets, mostly 220V and mostly superhets. May I suggest a few points?

I would very much like to have an article on the construction of a grid dip meter and especially the construction of an amateur's receiver and not too expensive transmitter. Could not one of your readers lend me a diagram of a simple ham receiver incorporating an S-meter, B.F.O. and V.F.O.? An article, or series of articles on the construction of a reliable transmitter would be welcome.

In my country, to become an amateur, one must be able to send and receive twelve words of morse per minute. This test is taken down by our local Postmaster. After that, one must stay on morse for twelve months after which one is allowed to transmit modulated signals.

Radio parts are fairly expensive here and one feels envious to see how cheap parts are in England. Obviously the difference is due mainly to import control and taxes.—G. J. IMMELMAN (S. Africa).

[We plan to publish an article on a 75W transmitter in the near future.—ED.]

TRANSISTORS v. VALVES

SIR,—I have been very interested in the letters which you have published on the subject of "Transistors v. Valves," and feel certain that much of the objection to them is due to one of two things:

1 There is not nearly enough information available to make transistors really interesting.

2 The designs so far published are for the wrong class of reader, i.e. not the class which in my opinion will make transistors really popular.

So far as information is concerned how does one design a L.F. amplifier to give a worthwhile controlled output? Perhaps I have not looked in the right place but I have never seen a tone control circuit for a transistor. True the ordinary circuits will do the job but presumably we must use very large condensers and low resistance, but how large and how low? One can spend a lot of time with a trial and error method. How good are transistors? Do they amplify the top more than the bass, or is it the badly designed circuits? Can we design a set which will give good quality whether we call it Hi-fi or anything else? Heat will spoil them as does coldness affect them (it appears to me that if a transistor set is in a cold room it is not nearly so good as in a warm room), I have never read about this.

How about a transistor amplifier for a tape recorder, with the necessary compensating network? There is no reason why this should not be done. Something on those lines would interest the class of constructor who is more likely to help to popularise the transistor.

Small miniature sets will never teach constructors to use transistors, they are wonderful things but we are living in an age of noise and power. To listen to 250mW (all top) after switching off a mains set is just silly. If transistors are treated as toys they will remain toys!—D. J. L. (Kenton).

INFORMATION WANTED

SIR,—Can any reader assist with information on the conversion of the BC624/C receiver for use on the 2m band. All replies will be acknowledged and postage refunded.—P. A. FOSTER ("Severn Vale," Bristol Road, Hempsted, Gloucester).

SIR,—I operate a CR100 receiver and wish to add a Tuning Indicator using a moving coil meter. Can any reader supply information on this modification giving wiring connections, etc.—A. MILHAM (9a Warrior Gardens, St. Leonards-on-Sea, Sussex).

SIR,—I am 19 years old and interested in all aspects of amateur electronics (design, construction and reception of AM/CW/SSB teletype and amateur television signals) and I would like to correspond with anyone with similar interests.

Also I wish to beg, buy, or borrow the circuit of an amateur television receiver. I am following your articles on the modification of the 19 set with great interest as I am on army wireless operation and did my basic training on the 19 set. The secondary receiver at my station (home QTH) is a Mk II with a 250 volt power supply otherwise unmodified.—23685340 J. QUIGLEY (S.M.C.) Banda, H.Q. B.A.O.R., BFP040.

NO. 19 SET

SIR,—I wish to correct a mistake which I made in my drawing of Fig. 8 on page 46 of the May issue in the third part of my article, "Improving the No. 19 set." The connection of the centre tap of the secondary of T2 to the 6V6 cathodes would result in these valves operating without bias. The centre tap should, of course, be earthed. The cathode switching circuit is also incorrect, and although this fault would cause no damage to any components, the speaker would not be muted by insertion of the headphone jack when operating on 'phone. The lead from a section of phone/C.W. switching to the lower end of the paralleled 250Ω resistor and 25μF condenser is disconnected, and instead connected to the "T" position of the transmit/receive switch slightly to the right of and above the phone/C.W. switch mentioned.—D. W. DILLON (Ballycastle).

SIR,—I believe considerable confusion exists as regards the 19 set. I have a 19 Mk II and it has been at one time water-proofed and is in a water-tight case. It has three switches under the PA tuner and an improved drive on the 4 gang cond. The Mk II appears to have two switches under the PA tuner and no R.F. gain in the top right hand corner of the front panel. Could you please include conversion details in with the Mk II conversion for the Mk III you are now doing.—D. M. JACKSON (Dalton).

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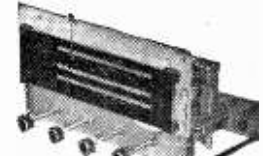
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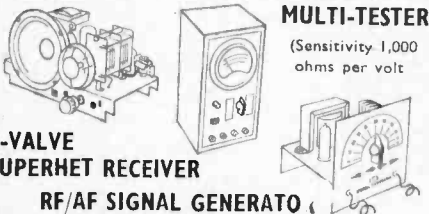
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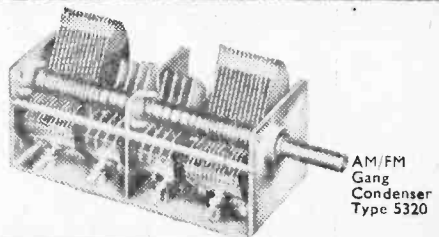
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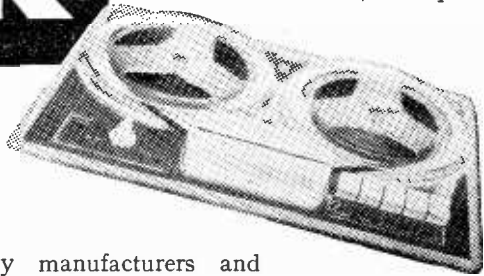
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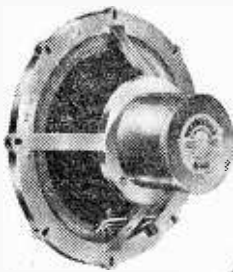
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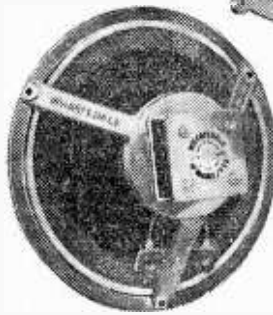
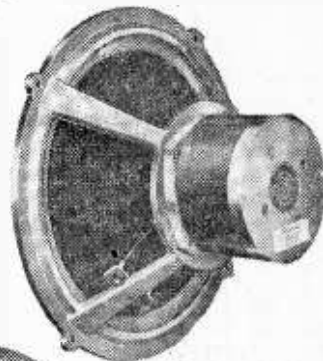
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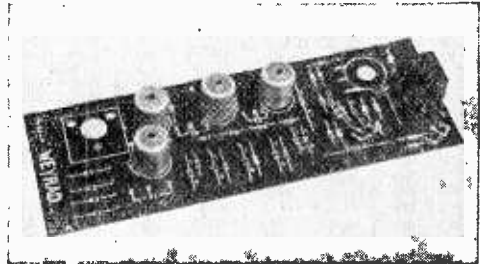
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Practical Wireless

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SERVICE

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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, Strand, W.C.2.

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Junior Crystal Set	PW94*	2/-
Dual-wave Crystal Diode	PW95*	2/6

STRAIGHT SETS		
Battery Operated		
Modern One-valver	PW96*	2/6
All-dry Three	PW97*	3/6
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SUPERHETS		
Mains Operated		
A.C. Band-pass Three	PW99*	4/-
A.C. Coronet-4	PW100*	4/-
A.C./D.C. Coronet	PW101*	4/-

MISCELLANEOUS		
The PW 3-speed Autogram	—*	8/-
The PW Monophonic Electronic Organ	—	8/-

TELEVISION		
The PT Band III Converter	—*	1/6

Title	Number	Price
A.C. Fury Four	PW20*	2/6
Experimenter's Short Wave	PW30a*	2/6
Midget Short Wave Two	PW38a*	2/6
Band-Spread Three (Battery)	PW68*	2/6
Crystal Receiver	PW71*	2/-
Signet Two (Battery)	PW76*	2/6
Simple S.W. One-valver	PW88*	2/6
Pyramid One-valver	PW93*	2/6

BBC Special One-valver	AW387*	2/6
Short-Wave Two	AW429*	2/6
Short-Wave World Beater	AW436*	3/6

TELEVISION		
Argus Television Receiver	—*	3/-
Simplex Television Receiver	—*	3/6

QUERY COUPON

This coupon is available until 7th July, 1960 and must accompany all queries in accordance with the notice on our "Open to Discussion" page.

PRACTICAL WIRELESS, JULY, 1960

COMBINED PORTABLE/CAR RADIO

Medium and Long Wave Full Tuning

- ★ Plessey Printed Circuit
- ★ 6 "TOP GRADE" EDISWAN TRANSISTORS
- ★ 5in. High Fidelity Speaker
- ★ 400mW Push-Pull Output
- ★ Internal Ferrite Aerial
- ★ Slow Motion Tuning
- ★ Full Instructions
- ★ Printed Circuit marked out
- ★ Car Radio aerial socket and A.V.C.
- ★ ALL COMPONENTS GUARANTEED
- ★ Double Tuned IFs
- ★ Size 9½ x 7 x 3½ins Weight 4lb

Just right for a day's outing "CONTINENTAL-6"

Total Cost of all Components

£11.10.0

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A highly sensitive and selective portable fully tunable on medium and long waves. Performs equally well as a car radio. Low running costs, good looks and ease of construction combine to produce a radio equal to any commercial receiver in the 20 gns. class.

ALL COMPONENTS AVAILABLE SEPARATELY

OUR CUSTOMERS SAY:

- "more than satisfied with performance"
- "worth the money in every way"
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- "delighted with performance"
- "very impressed—no difficulties"
- "excellent design and performance"
- "first-class in every way"

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CALL FOR DEMONSTRATION

★★ NO EXTERNAL AERIAL OR EARTH — NO REACTION CONTROLS ★★

—EASY AS ABC TO BUILD AND USE—

MAJOR — 2 (Two-Transistor Pocket Radio)



- ★ 4-stage reflex
- ★ Medium wave, tunable
- ★ Very sensitive
- ★ No aerial or earth
- ★ Complete lay-out
- ★ Over 6 months on one battery
- ★ 4½ x 3 x 1½in
- ★ Weight only 4oz.
- ★ Personal phone included

TOTAL COST **69/6** P.P. 1/6

NEW BOOKLET FREE: All components sold separately. Ideal for beginner.

REPAIRS GUARANTEED ANYWHERE!

MAJOR — 3 (Three-Transistor Pocket Radio)



(As described in R.C., Sept. '59)

- ★ 5-stage Reflex Circuit
- ★ No Aerial or Earth
- ★ Miniature Volume Control
- ★ 3 Ediswan Transistors
- ★ Medium Wave Tuning
- ★ Size 4½ x 3 x 1½in
- ★ Personal Phone included

TOTAL COST **87/6** P.P. 1/6 NEW BOOKLET FREE

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RED-SPOT TRANSISTORS

5/- each

WHITE SPOT TRANSISTORS

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NEW FREE LIST
ON REQUEST

Fully Guaranteed

PRACTICAL TRANSISTOR CIRCUITS

14 circuits for the Home Constructor with data and prices. 2/- post free.

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Direct Equivalent OC45 ... 12/6

BRAND NEW GUARANTEED
LIMITED QUANTITY ONLY

Crystal Microphones

ACOS 39-1 Stick Microphone with Stand (List 5 gns.) 39/6. P.P. 1/6
ACOS 40 Desk Microphone with built-in stand (List 50/-) 25/-, P.P. 1/6

Special Offer of MERCURY BATTERIES

1.3 volts, 500 mA.H
Size ½in. diam. x ¾in. length
ONLY 1/3 ea. P.P. 3d. ea.
or 12/- dozen P.P. 9d.

IDEAL FOR ALL TRANSISTOR
WORK

Telesopic Chrome Aerial

7-Sections, 3ft 6in. open; 6in. closed.
Ideal for Portable Receivers. Walkie-talkies. Radio Control, etc.
12/- P.P. 1/-

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Latest ACOS 19-4, 2in. round Hi-Fi Insert. 14/-, P.P. 6d.

ALSO:
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A selection of other DO-IT-YOURSELF equipment:— FULL LIST ON REQUEST

3-TRANSISTOR HEARING AID

High-gain circuit with built-in crystal microphone and battery. Includes miniature earphone. Size 3 x 2 x ¼in. All components. 89/6. P.P. 1/-.

2 WATT OUTPUT TRANSISTOR AMPLIFIER

For connection to any battery portable to give up to 2W output. Works from 12V battery. Ideal for car radio use. Size 4½ x 3 x 2½in. uses power transistor. All components (less speaker), 52/6. P.P. 2/-.

TRANSISTOR TRANSMITTER

1.8 to 2 Mc/s coverage. 3 transistors unit size 4½ x 3 x 1½in. Range of 3-section rod aerial up to 300 yards. Includes built-in microphone, battery and 3-section rod aerial. All components. 57/6. P.P. 1/6.

RF, IF AND AUDIO SIGNAL TRACER

Ideal signal peaker or quick fault-finder for receivers, amplifiers, etc. Size 4½ x 3 x 1½in. All components, with phones, 37/6. P.P. 1/6. Less phones, 32/6. P.P. 1/6.

250mW PUSH-PULL OUTPUT AMPLIFIER

For use with any 2, 3 or 4 transistor, earpiece or headphone radio to give room-filling volume on 3in. speaker. All components including 2 Ediswan transistors, speaker, battery, special input socket to take earpiece plug, cabinet, etc., 59/6. P.P. 1/6. Ideal for use with Major-2 or Major-3.

27 Mc/s RADIO CONTROL RECEIVER

3-Transistor regen. circuit. Size 2 x 1½ x 1½in. Weight with batteries, 1½ oz. Uses SB305 transistor. Multi-channel reed operated. All components (less reed), 50/-, P.P. 1/-.

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ADVT. INSIDE

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