• A SWITCHED F.M. TUNER •

PRACTICAL WIRELESS

1/3

MAY 1958

EDITOR: F. J. CAMM

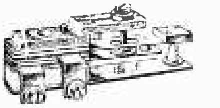
CONTENTS

W.D. CIRCUIT DETAILS

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

American Service. Sheets	R.109
A.1134	78 receiver
BC.348	76 receiver
BC.312	R28/ARC5
R.103A	R1116/A
BC.342	RA-1B
RA-1B	AR88D
R-208	AN/APA-1
R-1155	78
R-1124A	76
R-1132A R-1481	R.T.18
R-1147	CAY-46-AAM-RADAR
R-1224A	A.S.B.-3
R-1082	Indicator 62A
R-1355	Indicator A.S.B.3
B.C.1206-A/B	Indicator 62
B-455-A (or-B)	Indicator 6K
B-454-A (or-B)	R.F. unit 24
B-453-M-A (or-B)	R.F. unit 26
Transmitter T1154	R.F. unit 25
Fifty-eight walkie talkie	R.F. unit 27
Frequency meter B.C. 221	Wireless set No.19
	Demobbed valves

THERMOSTATS



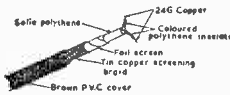
2½in. x 1in. x 1½in. high. Useful for the control of appliances such as convectors, gluepots, vulcanisers, hot plates, etc. Adjustable to operate over temperature range 50-550 deg. F., fitted with heavy silver contacts.

1½ amp., 3/6 ; 5 amp., 8/6 ; 2 amp. QMB, 5/6 ; 15 amp. QMB, 15/-. 15 amp. wall mounting type, 19/6.

SAPPHIRE NEEDLES

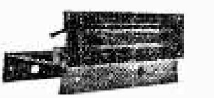
Unrepeatable bargain—new and perfect—two types available : miniature E.M.I. and Standard (trailer). Sale price 1/- each or 10/- doz.

TWIN FEEDER



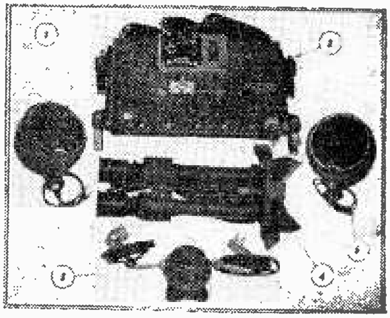
Ideal for FM down lead, as a twin microphone lead, etc. Sale price 6d. per yard. 80 ohm co-ax. low loss for Band III, 8d. per yard.

CHASSIS ASSEMBLY



Superhet Chassis, 3-waveband, coloured scale, scale pan, pulleys, driving head, springs, drum, etc. Scale size 14½in. x 3½in. Chassis size 15in. x 15in. x 2in. Price 15/- plus 1/6 post. Note : We can supply cabinet for this. Price 39/6 plus 5/- carr. and insurance.

CROCODILE CLIP for metering, etc. Has sharp point for piercing insulation without spoiling it. 8d. each or 7/- per dozen.
15 AMP. SLYDLOK panel mounting fuse and fuse carrier, 2/6.
DOUBLE POLE CONTACTOR on bakelite case, coil resistance 100 ohms, heavy duty silver contacts. 3/6.



TABBY EQUIPMENT COMPLETE

Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises : 2 Infra Red Radiators, adjustable binoculars, powerpack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—£10, plus 10/- carriage and insurance. Mains power pack £4 extra.

PUBLICATIONS FOR CONSTRUCTORS

Title	Short Description	Price of data
Car Starter Charger	A 6-12 volt 5 amp battery with overcharge position.	1/6
Chimelite	Door chimes and hall light combined.	2/-
I.T.A. Converter ...	A two valve unit suitable for converting any type of television.	1/6
Crispian	Four valve all dry battery portable.	1/6
Economy Amplifier	Cheapest possible 3 valve mains amplifier.	1/6
Skysearcher ...	Cheapest possible 2/3 valve mains receiver for medium wave.	1/6
Economy Three ...	Three valve battery version of the Skysearcher.	1/6
F.M. Tuner	Good unit quality tuner based on the original Radio Constructor circuit.	1/6
Mini Radio	Four valve mains T.R.F. medium and long wave.	1/6
A.C./D.C. Multimeter	15 range test meter for A.C. and D.C. volts, ohms and milliamps.	1/6
Simplex	The simple transistor receiver for headphones.	9d.
Transistor Timer ...	For photographic and process timing.	9d.
Easy to Build T.V.	A modern set suitable for wide angle 14" or 17" tubes which can be assembled in an evening (only 24 solder joints to make).	3/6
Condenser Tester ...	Tester for all types of condensers, can also be used for reforming electrolytics.	9d.
C.R.T. Tester ...	A device for testing and re-activating television picture tubes.	9d.
Beginners' Superhet	A 4 valve mains operated receiver, simple to make and align.	9d.
Two Way Switch ...	Describes how to control a light from two points.	9d.
Moisture Operated Switch	Describes a switch which is operated by moisture.	9d.
Electric Blanket ...	Describes how to make a foolproof, waterproof electric blanket.	9d.
Anti-burst	Describes how pipes in lofts can be prevented from freezing.	9d.
Thermal Delay Switch	Gives circuits of process timer, sequence switch, overload relay, smoke control, etc.	9d.
Solder Gun	Shows how to make a 7 second solder gun.	9d.

Special Offer : All the above booklets and pamphlets, 12/6 or any ten at half price.

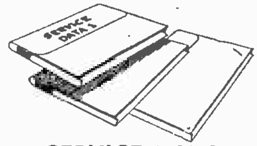
STOP PRESS ITEMS

R. & C. SUBSTITUTION BOX

As described in last month's issue—author describes this as second most used instrument on his bench. Kit of components with full instructions, £2.10.0. plus 2/6 post and insurance.

SIMPLETONE

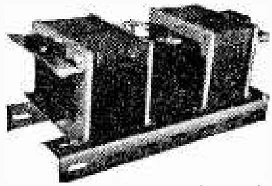
electronic organ described in February issue. Kit of components as specified complete with valves but not chassis or case. £4.10.0. plus 3/6 post and ins.



SERVICE DATA

100 service sheets, covering British receivers which have been sold in big quantities and which every service engineer is ultimately bound to meet. The following makers are included : Aerodyne, Alba, Bush, Cossor, Ekco, Ever-Ready, Ferguson, Ferranti, G.E.C., H.M.V., Kolster Brandes, Lissen, McMichael, Marconi, Mullard, Murphy, Philco, Philips, Pye, Ultra. Undoubtedly a mine of information invaluable to all who earn their living from radio servicing. Price £1 for the complete folder.

Mains Isolation Transformer



Makes servicing safe, also makes the adjustment for difference in mains voltage very simple. Input tapped 200-250 v., output tapped 200-250 v. Continuously rated at 500 watts, intermittent rating 2,000 watts. Cable entry by terminal blocks, two separate screens for suppressing mains interference. Size approximately 14in. x 6in. x 6in. weight approximately 40lbs. Price £5/12/6. Carriage and insurance 7/6 (up to 250 miles).

Sub-Miniature Electrolytics

These are extremely small—for instance 1 mfd is only approx. ½in. long by a little over ⅛in. diameter. Mainly developed for transistor receivers, price 2/9 each. Special quotes for quantities. The following values available but additional types are being added almost weekly. 1 mfd. 18 v., 1.5 mfd. 6 v., 2.5 mfd. 6 v., 6 mfd. 6v., 5 mfd. 12½ v., 8 mfd. 6 v., 10 mfd. 6 v. 16 mfd. 12 v., 25 mfd. 6 v., 25 mfd. 25 v., 32 mfd. 3 v.

Yaxley Switches

3-pole 2-way	1/3
12-pole, 2-way	1/6
3-pole, 3-way	1/6
9-pole, 3-way	2/-
2-pole, 4-way	2/-
6-pole, 4-way	2/6
4-pole, 5-way	2/6
2-pole, 6-way	2/6
1-pole, 7-way	2/6
1-pole, 12-way	2/6
6-position shorting switch ...	2/-
Double-pole mains switch for attaching to Yaxley switches...	1/6

Discount of 10% allowed where a dozen of one type ordered. Special quotes 144 or over.

R.S.C. BATTERY CHARGING EQUIPMENT

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

ASSEMBLED CHARGERS

6 v. 1 amp.	19/9
6 v. or 12 v. 1 amp.	27/9
6 v. 2 amps.	29/9
6 v. or 12 v. 2 amps.	38/9
6 v. or 12 v. 4 amps.	56/9

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

SELENIUM RECTIFIERS F.W. BRIDGE TYPES

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

L.T. Types H.W.
2-6 v. ½ a., 1/11
6-12 v. ½ a. H.W., 2/9

H.T. Types H.W.

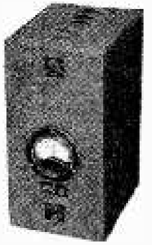
150 v. 40 mA.	3/9
250 v. 50 mA.	5/9
250 v. 80 mA.	7/9
250 v. 250 mA.	11/9

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

6 v. or 12 v. 1 amp.	22/9
6 v. 2 amps.	25/9
6 v. or 12 v. 2 amps.	31/6
6 v. or 12 v. 4 amps.	53/9

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

ASSEMBLED CHARGER
6 v. or 12 v. 2 amps. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case, finished attractive hammer blue. Ready for use. With mains and output leads. Double Fused. Only **49/9** Carr. 3/9.



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 and ready for use with mains and output leads. **75/-** Carr. 4/6. Credit Terms: Deposit 30/- and 4 monthly payments, 13/-.

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

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

TOP SHROUDED DROP THROUGH

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

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a, Midget type 2½-3-3in.	17/6
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.	26/9
250-0-250 v. 100 mA, 6.3 v. 6 a, 5 v. 3 a. for R1355 conversion ...	31/-
300-0-300 v. 100 mA. 6.3 v. 4 a, 5 v. 3 a.	26/9
350-0-350 v. 100 mA. 6.3 v. 4 a, 5 v. 3 a.	28/9
300-0-300 v. 130 mA, 6.3 v. 4 a. 6.3 v. 1 a, for Mullard 510 Amplifier ...	35/9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a.	33/9
350-0-350 v. 150 mA, 6.3 v. 2 a, 6.3 v. 2 a, 5 v. 3 a.	35/9
425-0-425 v. 200 mA, 6.3 v. 4 a, C.T. 6.3 v. 4 a, C.T., 5 v. 3 a. Suitable Williamson Amplifier, etc....	49/9

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

JUNCTION TRANSISTORS. Brand new R.F. Type 17/6. A.F. 7/6.

VOLUME CONTROLS with long (¼in. diam.) spindle all values less switch, 2/9; with S.P. switch, 3/9; with D.P. switch, 4/6.

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

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

SMOOTHING CHOKES

250 mA, 5 H 100 ohms ...	12/9
150 mA, 7-10 H 250 ohms...	11/9
100 mA, 100 H 200 ohms...	8/9
80 mA, 10 H 350 ohms ...	5/9
60 mA, 10 H 400 ohms ...	4/11

OUTPUT TRANSFORMERS

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

MAINS TRANSFORMER
Manufacturers' surplus. Primaries 200-250 v. 50 c/s. 375-0-375 v. 150 mA. 6.3 v. 4 a. C.T. 6.3 v. 1 a. Fully shrouded, 22/9. 325-0-325 v. 100 m/a. 6.3 v. 2.5 a, 5 v. 2 a. Drop through type 18/9. Postage on either type 2/9.

EX-GOVT. SMOOTHING CHOKES

250 mA, 20 H 200 ohms ...	19/9
250 mA, 5 H 50 ohms ...	12/9
150 mA, 10 H 100 ohms ...	11/9
150 mA, 6-10 H 150 ohms Trop.	6/9
120 mA, 12 H 100 ohms ...	9/9
100 mA, 5 H 100 ohms ...	3/11

ELIMINATOR TRANSFORMERS
Primaries 200-250 v. 50 c/s.

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

THE SKYFOUR T.R.F. RECEIVER. A design of a 3-valve Long and Medium wave 230-250 v. A.C. Mains receiver with selenium rectifier. It consists of a high gain H.F. stage and low distortion anode bend detector. Power pentode output is used. Valve line-up 6K7, SP61, 6V6G. Selectivity and quality are well up to standard, and simplicity of construction is a special feature. Point-to-point wiring diagrams, instructions and parts lists, 1/9. Maximum building costs £4/19/6, including attractive Brown or Cream Bakelite or Walnut veneered wood cabinet 12 x 6½ x 5½in.

EX-GOVT. DOUBLE WOUND STEP UP/STEP DOWN TRANSFORMERS. 10-0-100-200-220-240 v. to 5-0-75-115-135 v. or REVERSE. 80-100 watts. Only 12/9, plus 2/9 post. 10-0-100-200-220-240 v. to 0-0-110-122-136-148 v. or REVERSE. 200 watts, 35/9, plus 7/6 carr. Both 50 c.p.s.

EX-GOVT. MAINS TRANSFORMER. Primary 0-110-120-200-210-220-230-240-250 v. 50 c.p.s. Secs. 275-0-275 v. 100 mA. 6.3 v., 7 a, 5 v. 3 a, Govt. rating, 22/9. Following with 230-250 v. primaries. 400-0-400 v. 200 mA. 5 v. 3 a, 5 v. 2 a, 19/9; 230-0-230 v. 100 mA, 12.6 v. 1.5 a. 5 v. 2 a, 11/9; 12.6 v. 3 a, 5 v. 3 a, 9/9. Postage 2/9 on any type.

EX-GOVT. CASES. Size 14-10-8½in. high. Well ventilated, black crackle finished, undrilled cover. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE, OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage. Size 8½ x 13½ x 6½ ins. with undrilled well ventilated cover, finished in stoved grey enamel. Suitable for charger or instrument case. 7/9, plus 2/9 post.

EX-GOVT. VALVES (NEW)

1R5	7/9	6J5	5/9	ECC91	4/9
1T4	7/9	6J6	4/9	EF80	7/9
1S5	7/9	6V6G	7/9	EB91	4/9
3S4	7/9	6X4	6/9	EF91	8/9
5Y3G	8/9	6X5GT	8/9	EL32	3/9
5U4G	8/9	6L6G	11/9	KT44	8/9
5Z4G	9/9	807	7/9	KT61	9/9
6K7G	5/9	12A6	7/9	EZ90	6/9
6SJ7GT	6/9	15D2	4/9	EL84	10/6
6SLGT	8/9	35Z4GT	8/9	FW4/500	9/9
6SN7GT	8/9	MH4	4/9		
6AT6	7/9	ECC83	9/9	SP61	2/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces batteries supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. **Suitable for all battery portable receivers requiring 1.4 v. and 90 v.** This includes latest low consumption types. Complete kit with diagrams, 39/9, or ready to use, 46/9.

Type BM2. Size 8 x 5½ x 2½in. Supplies 120 v. 90 v. and 60 v., 40 mA, and 2 v. 0.4 a to 1 amp. fully smoothed. **Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators.** When connected to A.C. mains supply 200-250 v. 50 c/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.

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

MINIATURE MOTORS. 24/28 v. D.C. or A.C. made by Hoover Ltd., Canada. Size only 2¼ x 1¼in. Spindle 1¼in. long, ⅛in. diam. Brand New. 9/9.

HEADPHONES. Brand new. Low resistance. Only 6/9 pr.

EX-GOVT. 50 WATT SPEECH AMPLIFIERS. For normal 200-250 v. A.C. mains. Complete with hand 'mike' with good length of lead and all valves. Ready for use, in wood transit cases. Only 9 Gns., carr. 15/-.

TANNOY RE-ENTRANT 8 WATT SPEAKERS. For use with above, 27/6 ea.

EXTENSION SPEAKERS
Ready for use in walnut veneered cabinet.
6½in. 2-3 ohms, 29/11.
8in. 2-3 ohms, 35/9.
Very limited number.

EX-GOVT. METAL BLOCK (PAPER) CONDENSERS. 4 mfd. 350 v., 2/9; 4 mfd. 1,000 v., 4/9; 8 mfd. 500 v., 4/9; 10 mfd. 500 v., 3/9;

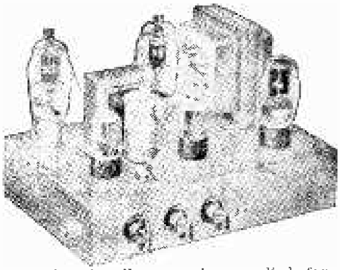
ELECTROLYTICS (current production) NOT EX-GOVT.

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

R.S.C. A8 ULTRA LINEAR 12 WATT AMPLIFIER

High-Fidelity Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages. High sensitivity. Includes 5 valves (807 outputs). High Quality sectionally wound output transformer specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut." Frequency response 3db., 30-30,000 c/cs. Six negative feed-back loops. Hum level 71 db. down. ONLY 70 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs. For STANDARD or LONG - PLAYING RECORDS. For MUSICAL INSTRUMENTS such as STRING BASS GUITARS, etc. OUTPUT SOCKET with plug provides 300 v. 20 mA and 6.3 v. 1.5 a. For supply of a RADIO FEEDER UNIT. Size approx. 12-9-7in. For A.C. mains 200-230-250 v. 50 c/cs. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value at £7 15/- or factory built 45/- extra. Carriage 10/-.

£7-15-0



If required louvred metal cover with 2 carrying handles can be supplied for 18/9. Additional input socket with associate Vol. control so that two different inputs such as Gram and 'Mike' or Tape and Radio can be mixed, can be provided for 13/- extra. Guaranteed 12 months.

TERMS on assembled two input model; **DEPOSIT** 25/6 and nine monthly payments 25/6.

HIGH-FIDELITY MICROPHONES and **SPEAKERS** in stock. Keen cash prices or Credit terms if supplied with amplifier.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response ± 3 db. 30-30,000 c/cs. 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, ECC33, 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/cs. A.C. Mains and has outputs for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built with 12 months' guarantee, for £13.13.0. **TERMS: DEPOSIT** 36/- and 9 monthly payments of 31/-.

ONLY **£10-19-6** Carr. 10/-

COLLARO RC54 3-SPEED AUTO-CHANGERS with Studio Pick-up. Brand new. For 110 v. 50 c/cs A.C. mains. Price with 110 v. to 200-250 v. Auto Trans. only **7 Gns.** Carr. 5/-.

COLLARO CONQUEST 4-SPEED AUTO-CHANGERS with high fidelity Studio Pick-up. Latest model. Brand new. Cartoned. For 200-250 v. 50 c/cs A.C. mains. Our price £8 19 6. Carr. 5/-. Credit Terms. Deposit 3 gns. and 6 monthly payments of 21/3.

COLLARO 4 SPEED SINGLE PLAYER with separate pick-up, as fitted RC457. For 200-250 v. A.C. mains. £4.12.6. Post 3/6.

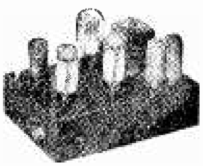
LG3 MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with above or any other single or auto-change units. Output for 2-3 ohm speaker. For 200-250 v. 50 c/cs. A.C. mains. Overall size 6½ x 4½ x 2½in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 55/9.

SUPERHET FEEDER UNIT. Designed 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, instruction and priced parts list with illustration, 2/6. Total building cost £4 15/-. For descriptive leaflet send S.A.E.

LINEAR L45 MINIATURE 4-5 WATT QUALITY AMPLIFIER. Suitable for use with Collaro, B.S.R. or any other 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/cs. Output for 2/3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5-5½in. high. Output for 2-3 ohm speaker. Guaranteed for 12 months. Only £5 19/6. Send S.A.E. for illustrated leaflet. Credit Terms. Deposit 22/6 and 5 monthly payments of 22/6.

LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER. For 200-230-250 v. 50 c/cs. A.C. mains. Valve line-up ECC83, ECC83, EL84, EL84, EZ81 miniature Mullard. The unit has self-contained Pre-amplifier Tone Control stage and separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets are provided. Size is only 9-7-6in. Output Matchings for 3 and 15 ohm speakers. Only **12 GNS.** : or Deposit **26/9** plus 10/- carr. and 9 monthly payments of 26/9. Send S.A.E. for leaflet

R.S.C. 4-5 WATT A5
HIGH-GAIN AMPLIFIER



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high-fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 db. down. 15 db. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape Deck pre-amplifier. For A.C. mains input of 200-230-250 v. 50 c/cs. Output for 2-3 ohms speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4 15/-, or assembled ready for use 25/- extra, plus 3/6 carr.; or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

LINEAR LT45 HIGH QUALITY TAPE DECK AMPLIFIER. With "built in" power pack and output stage. For Tape Decks with High or Low Impedance, Playback and Erase Heads, such as Lane, Truvox, Aspden, Collaro, Brennell, etc. For A.C. Mains 230-250 v. 50 c/cs. **Linear frequency response of** 3 db., 50-11,000 c/cs. Negative feed-back equalisation. Illustrated leaflet 6d.

Ready for Use. ONLY **12 GNS.** Carr. 7/6

SENSATIONAL OFFER

STAAR GALAXY 4 SPEED MIXER AUTO-CHANGER. A precision manufactured unit with a motor which virtually eliminates "wow" and rumble. Playing Desk size 11½ x 10in. Depth below baseboard 2in. Above 5in. Fitted pick-up with dual sapphire tipped stylus. For 200-250 v. A.C. mains. A once in a lifetime opportunity. Only Brand new cartoned.

£3-19-6 Carr. 3/9

R.C.A. 20 WATT RE-ENTRANT SPEAKERS, 15 ohms or 600 ohms matching. For Outdoor work. Only 8 GNS.

P.M. SPEAKERS. All 2-3 ohms, suitable for use with LG3, L45, A5, or A7 amplifiers. 5in. Goodmans, 17/9. 7 x 4in. Elliptical Elac., 19/9. 6½in. Goodmans, 17/9. 8 in. Rola, 19/9. 10in. R.A., 27/9. 10 x 6in. Elliptical Goodmans, 29/9. 12in. Plessey, 29/11. 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts, hi-fidelity type. Recommended for use with our A8 Amplifier, £4/10/9. 12in. Plessey 3 ohms 10 watts (12,000 lines), 59/6.

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

M.E. SPEAKERS 2-3 ohms, 8in. R.A. Field, 600 ohms 11/9.

R.S.C. 3-4 WATT A7
HIGH-GAIN AMPLIFIER

For 230-250 v. 50 c/cs. Mains input. Appearance and Specification, with exception of output wattage, as A5. Complete Kit with diagrams, £3/15/-. Assembled 22/6 extra. Carr. 3/6.

AM/FM RADIOGRAM CHASSIS

HIGH QUALITY 6-8 WATT PUSH-PULL OUTPUT

For 200-250 v. Mains. Long wave, Medium, F.M. and Gram. Complete with 8 B.V.A. valves. Guaranteed 12 months. Only 22 GNS. Or Deposit £2.12/- and 9 monthly payments of £2/12/-.

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. All goods supplied subject to terms and guarantee as detailed in current catalogue. Open 9 to 5.30; Sats. until 1 p.m. Catalogue 6d. Trade list 5d. S.A.E. with all enquiries.

RADIO SUPPLY CO. (LEEDS) LTD., MAUDE ST., (opp. Parish Ch. School) LEEDS, 2

PREMIER RADIO COMPANY

Tel.: AMBassador 4033 — B. H. MORRIS & CO. (RADIO) LTD. — Tel.: MUS. 3451

207 EDGWARE RD., LONDON, W.2 & 23 TOTTENHAM COURT RD., LONDON, W.1

The "Petite" PORTABLE

A completely new design with the **all star** feature from the firm with [illegible] of experience in the supply of designs for the home constructor.

MAY BE BUILT FOR

£7·7·0

Plus p. & p. 3/-.

Batteries Extra. H.T. **10/-** (type B126) or equivalent, L.T. **1/6** (type AD35) or equivalent.

★ Size only 8in. x 8in. x 4½in. ★ Instruction Book 1/6

MAINS UNIT NOW AVAILABLE for ONLY 37/6 plus 2/- p.p.

THE NEW MERCURY

SWITCHED F.M. TUNER

by Jason

Complete set of parts available with built and tested front end.

Price **£9 . 19 . 6** plus 2/6 pkg. & carr.

Power Pack requirements 35 ma.

The NEW De - Luxe TAPE RECORDER TR3

for £6 . 5 . 0 DEPOSIT & 8 MONTHLY PAYMENTS OF £5 . 17 . 11 OR CASH 45 GNS. *plus 21/- post & pkg.*

TRADE ENQUIRIES WELCOMED

Case finished in Red and Cream with gilt styling and fittings. Size 18¼in. x 15in. x 9in. for A.C. Mains 200/250 v. 50 cycles.

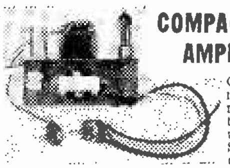
BUILD THE 1-VALVE BATTERY RECEIVER

As shown on B.B.C. T.V. This receiver contains a DAF96 valve and a pair of 4,000 ohm headphones, and is powered by a combined 67½ and 1½ volt battery. Price complete with headphones but less battery **45/-**. Send for free diagram.

2-Volt 16Ah bakelite-cased ACCUMULATOR by Oldham, Dagenite, Exide. New and unused, unspillable. 7½ x 4 x 2. Price **6/6**, plus 1/6 p. & p.

SAVE POUNDS AND PUT IT TOGETHER YOURSELF!

Cabinet **£2/19/6**, *plus 5/- pkg. and post.*
Premier 1 valve Gram. Amplifier **£2 19 6**, *plus 2/6 pkg. and post.*
Premier 2 Valve Printed Circuit Amplifier **£3 5 6**, *plus 2/6 pkg. and post.*
8in. x 5in. Speaker **27/6**, *plus 1/6 pkg. and post.*
Collaro 4-Speed Changer **£8 19 6**, *plus 5/- pkg. and post.*
If a set of parts is purchased together pkg. and post will be 10/-.



COMPACT GRAM AMPLIFIER

Complete ready to connect to any type of Pick-up and Speaker (3 ohms). A.C. Mains 200/250 v. Volume and tone control on 9" extended leads, 1 valve. Overall size 7" long x 6" wide x 3¼" high.

Plus packing and postage 2/6. **£2·19·6**

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Visit our New HI-FI SHOWROOM at 23 TOTTENHAM COURT RD.

The best HI-FI Showroom in the district

(2 minutes from Tottenham Court Road Underground Station)

Tel.: MUS. 3451

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WRITE FOR DETAILS OF PREMIER TAPE RECORDER KIT FOR ONLY £38.15.0.

4-WATT AMPLIFIER

MAY BE BUILT FOR **£4.10.0** Plus 2/6 Pkg. & Carr.

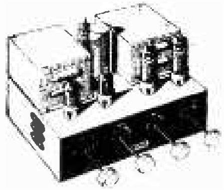
Instruction Book 1/- post free.

A steel case is now available, complete with engraved panel, for **15/6** extra. The amplifier may be supplied complete for **£5.5.0** plus pkg. and post 3/6, or fitted in case at **£6** plus pkg. and post 3/6.

2-BAND T.R.F. RECEIVER

MAY BE BUILT FOR **£5.15.0** Plus 3/- Pk. & Post.

3-Band Superhet Receiver may be built for £7.19.6 plus pkg. & carr. 3/-. These two receivers use the latest type circuitry and are fitted into attractive cabinets 12in. x 6½in. x 5½in. in either walnut or ivory bakelite or wood. Individual instruction books 1/- each. Post free.



8 WATT AMPLIFIER

This design includes 5 miniature valves of the latest types, an ultralinear output transformer suitable for Speakers of 3 and 15 ohms and a very attractive perspex front panel with gold lettering, complete set of parts.

Postage & packing 5/- extra. **£8·8·0**

or **£10.19.6** built and tested. Send 1/6 for Booklet.

B.S.R. T.U.8 3-speed Record Player £3.19.6 plus 2/6 post and packing. P.U. complete with arm, 36/-.

THE LATEST COLLARO 4-SPEED SINGLE PLAYER UNIT COMPLETE WITH PICK-UP AND TURNOVER CARTRIDGE **£4.12.6**, PLUS 2/6 PKG. & CARR.

Why not make the best!

MULLARD AMPLIFIER KIT

Now supplied with ultralinear output transformer.

All the components for Model 510, plus pre-amplifier, on one chassis (total six valves), chassis gold hammer finished. May be purchased for **£12.12.0** plus pkg. and post 7/6. This version complete and tested **£15.15.0.** Or pre-amplifier and tone control in a separate unit **£14.14.0,** plus pkg. and post 7/6.

ADDRESS ALL MAIL ORDER ENQUIRIES TO: (Dept. P.W.) 207 EDGWARE RD., LONDON, W.2

AND NOW THERE ARE TWO

Stern's "fidelity" TAPE RECORDERS

PRICE . . Including CRYSTAL MIKE and 1,200ft. reel of PLASTIC TAPE.
£49.10.0 OR £3 EXTRA WITH REV. COUNTER.

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

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

CREDIT SALE: Deposit £10/5/- and 9 monthly payments of £3/15/2.
HIRE PURCHASE: Deposit £20/10/- and 12 monthly payments of £1/18/-.

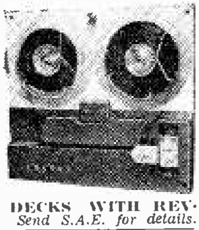
(Plus £1/10 - carriage and insurance of which £1 is refunded on return of Packing Case.)

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

IT INCORPORATES: THE TRUVOX Mk. III TAPE DECK together with correctly matched HF/TR1A TAPE AMPLIFIER and a 7in. x 4in. Speaker.

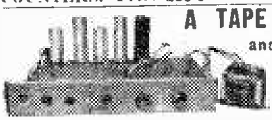
BEFORE CHOOSING YOUR TAPE RECORDER YOU SHOULD HEAR THESE MODELS—TRULY "Hi-Fi" RECORDINGS ARE OBTAINABLE. Alternatively send S.A.E. for ILLUSTRATED LEAFLET.

NEW TRUVOX Mk. IV TAPE DECK



ONE OF THE BEST DECKS ON THE MARKET.
PRICE **£27.6.0.** (Plus 10/- carr. and ins.)
CREDIT TERMS: Deposit £6/17/- and 9 monthly payments of £2/10/-.
H.P. TERMS: Deposit £13/13/- and 12 monthly payments of £1/5/4.
WE ALSO HAVE A FEW DECKS WITH REV. COUNTERS. Price £30/9/-. *Send S.A.E. for details.*

A TAPE PRE-AMPLIFIER and ERASE UNIT



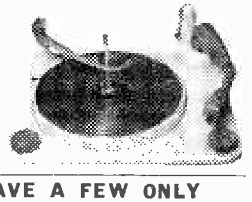
STERN'S MODEL HF/TR1. — A completely assembled Pre-amplifier with own Power Supply. Can be supplied correctly matched for use with Truvox or Collaro Decks and incorporates Recording Level Indicator and Monitoring facilities. Please send S.A.E. with any enquiry. PRICE **£11.10.0.** (Plus 5/- carr. and ins.)
SPECIAL REDUCTION WHEN PURCHASED WITH DECK.

RECORD PLAYERS

THE VERY LATEST MODELS ARE IN STOCK
MANY AT REDUCED PRICES!!!
TRANSCRIPTION UNITS — AUTO-CHANGERS. SINGLE RECORD PLAYERS
Send S.A.E. for ILLUSTRATED STOCK LIST

SPECIAL CASH OFFERS!!

The Latest Collaro 4 Speed Single Record Player.
Incorporating the very popular STUDIO "O" CRYSTAL PICK-UP.
For only **£6.19.6.**
(Plus 5/- carr. and ins.). Incorporates Auto-Stop and Plays 78 r.p.m. and all types of L.P. Records.



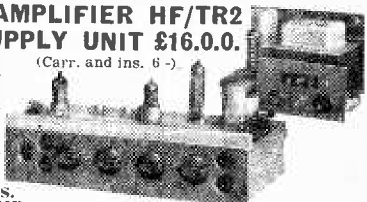
THIS LATEST BRAND NEW B.S.R. MONARCH 4-SPEED AUTOCHANGER
£7.19.6.
(Plus 5/- carr. and ins.)
● Minimum base-board size required 14in. x 12½in. with height above 5¼in., & height below baseboard 2½in.

WE ALSO HAVE A FEW ONLY

COLLARO 4-Speed "Mixer" Auto-changers. The Units are BRAND NEW and incorporate the STUDIO "O" Pick-up. PRICE **£8.15.0.** (Plus 5/- carr. and ins.)

WE HAVE THE FULL RANGE OF DULCI CHASSIS IN STOCK. *Send S.A.E. for Leaflets.*

"fidelity" TAPE AMPLIFIER HF/TR2 With POWER SUPPLY UNIT £16.0.0.

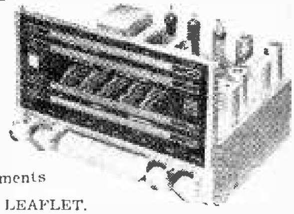


(Carr. and ins. 6/-)
H.P. TERMS: Deposit £8 and 9 months of £1.
CREDIT TERMS: Deposit £4 and 9 monthly payments of £1/9/4. When ordering, please advise make of deck in use. Send S.A.E. for full details.
HOME CONSTRUCTORS.
We can supply a COMPLETE KIT OF PARTS to build this TAPE AMPLIFIER for £12 (plus 5/- carr. and ins.). The Assembly Manual, Practical Diagrams, etc., are available for 2/6.

Can be supplied to correctly operate with Collaro and Truvox Decks.

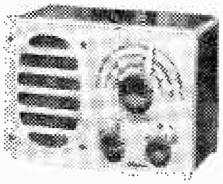
WE MAKE SPECIAL PRICES TO PURCHASERS OF TAPE EQUIPMENT (i.e., buyers of Deck and Amplifier together, etc., etc.). SEND YOUR ENQUIRY TO US . . . H.P. and CREDIT TERMS ARE AVAILABLE.

MODERNISE YOUR OLD RADIOGRAM



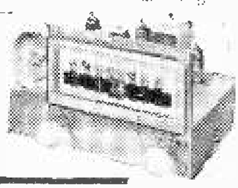
The NEW ARMSTRONG PB. 409 A.M./F.M. Radiogram Chassis
A VERY HIGH QUALITY CHASSIS EMPLOYING 9 LATEST B.V.A. VALVES. **£29.8.0.**
Credit terms £7.7.0 and 9 monthly payments of £2.14.0. (Plus 6/- carr. & ins.)
H.P. £14.14.0 and 12 monthly payments of £1.7.3.
SEND S.A.E. FOR ILLUSTRATED LEAFLET.

"FRUSTRATED EXPORT ORDER"



The Cossor Model 527. X 4-Valve "All dry" Battery Portable.
Offered for **£6.15.0.** Plus 5/- carr. & Ins.
Consists of a 4-valve Superhet Receiver covering Medium Waveband 197-575 metres. and two Short Wavebands 13.6 to 136 metres. The new low consumption valves are incorporated and the whole is accommodated in an attractive robustly made case. Battery required is 90 volts and 1.4 volts (price 19/6) and is external to case.

STERN'S "F.M." TUNING UNIT



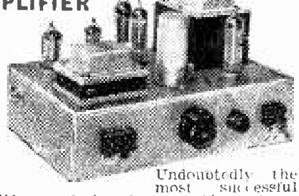
A 5-valve Tuner incorporating the latest Mullard Permeability Tuning Heart and a "Magic Eye" Tuning Indicator.
PRICE ASSEMBLED READY FOR USE **£14.10.0.**
(Plus 7/6 carriage and insurance.)
TERMS: (a) Hire Purchase: Deposit £7.5.0 and 9 monthly payments of 18/4.
(b) Credit: Deposit £3.12.6 and 9 monthly payments of £1.6.7.
HOME CONSTRUCTORS —You can build this unit for **£10.10.0.** Full Assembly Instructions are available for 1/6.

STERN RADIO LIMITED (Dept. P.W.)

PLEASE SEND S.A.E. WITH ALL

1958 NEW LOOK MULLARD DESIGNS FOR THE "Hi-Fi" ENTHUSIAST

The VERY POPULAR MULLARD "5-10" MAIN AMPLIFIER



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

COMPLETE KIT OF PARTS **£10.0.0**

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

(Carriage & Insurance 5/- extra.)

This "5-10" with the latest PARTRIDGE ULTRA-LINEAR OUTPUT TRANSFORMER for **£1.6.0** extra

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

A completely new design employing two EF86 valves, and in particular designed to correctly operate with the Mullard range of Power Amplifiers.

Briefly it incorporates:

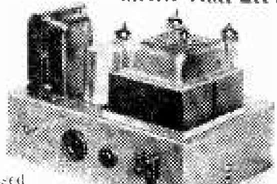
- Equalisation for the latest R.I.A.A. characteristics.
- Input for variable reluctance.
- Magnetic Pick-Ups.
- Input for Crystal Pick-Ups.
- Input for Tape replay.
  - (a) Direct from High Impedance Tape Head.
  - (b) From a Tape Amplifier or Pre-Amplifier.
- Sensitive Microphone Channel.
- Wide range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

COMPLETE KIT OF PARTS **£6.0.0**

Alternatively, we supply ASSEMBLED and TESTED **£8.0.0**

(Carriage & Insurance 5/- extra.)

THE NEW MULLARD "3-3" MAIN AMPLIFIER



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

COMPLETE KIT OF PARTS **£7.0.0**

Alternatively, we supply ASSEMBLED and TESTED **£8.0.0**

(Carriage & Insurance 5/- extra.)

NOTE WE DO NOT USE SURPLUS OR CHEAP COMPONENTS IN ANY OF OUR MULLARD KITS or ASSEMBLED UNITS.

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

SPECIAL PRICE REDUCTIONS . . .

(a) The COMPLETE KIT OF PARTS to build both the "3-3" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT **£12.10.0**

(b) The COMPLETE KIT OF PARTS to build both the "5-10" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT **£15.15.0**

PRICES FOR THE "5-10" ARE SUBJECT TO £1.6.0 EXTRA IF THE PARTRIDGE TRANSFORMER IS REQUIRED.

HIGH QUALITY OF THIS NATURE HAS NEVER BEFORE BEEN OFFERED AT SUCH LOW COST.

(a) The "3-3" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED **£15.0.0**
CREDIT: DEPOSIT £3.15.0 & 9 Monthly Payments of £1.7.6.
H.P.: DEPOSIT £7.10.0 & 9 Monthly Payments of 19/-.

(b) The "5-10" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED **£18.18.0**
CREDIT: DEPOSIT £4.15.0 & 9 Monthly Payments of £1.14.7.
H.P.: DEPOSIT £9.9.0 & 12 Monthly Payments of 17/6.

When ordering include an extra 7/6 to cover Carriage and Insurance

THE NEW COMPLETE MULLARD "5-10" AMPLIFIER

ANOTHER NEW DESIGN. ILLUSTRATION NOT AVAILABLE AT TIME OF GOING TO PRESS.

This Amplifier is similar to the "5-10" illustrated above, but it has ALL CONTROLS incorporated on the Amplifier Chassis in the same way as the "3-3" (illustrated alongside), finished with our attractive PERSPEX FRONT PANEL, thus forming a complete Amplifier.

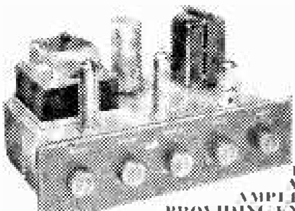
We supply it complete to the MULLARD'S SPECIFICATION, including specified Valves and components and incorporating the latest PARMEKO ULTRA-LINEAR OUTPUT TRANSFORMER and switched inputs for 78 and L.P. Records, plus a Radio Tuning Unit. Extra power is available to drive the Tuning Unit.

Separate BASS and TREBLE CONTROLS provide excellent range of tone and we recommend the Amplifier to those with limited Cabinet spaces who require GENUINE HIGH QUALITY at a higher volume level than the "3-3" but without the versatility of the separate Pre-amplifier-Control Unit with Main Amplifier. COMPLETE KIT OF PARTS **£11.0.0**

Alternatively, we supply ASSEMBLED AND TESTED **£13.10.0**

Credit Sale. Deposit £3.7.6 and 9 Monthly Payments of £1.4.11. H.P. Terms. Deposit £6.15.0 and 8 Monthly Payments of 19/3. Send S.A.E. for ILLUSTRATED LEAFLET or alternatively the COMPLETE ASSEMBLY MANUAL for 1/6.

THE NEW COMPLETE MULLARD "3-3"



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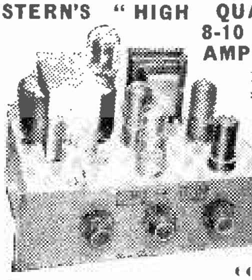

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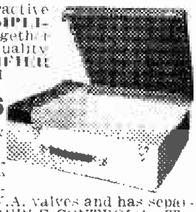

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COLLINS TCS TRANSMITTERS. Special offer of these famous American Transmitters. Frequency Range 1.5-12.0 Mc/s in 3 bands. Employs 7 valves. 2 of 1625 in P.A. Stage. 1625 buffer and 1625 modulator stage. 3 of 12A6 in Oscillator stage. Radio Telephone or Radio Telegraph. Provision for VFO or Crystal Control 4 Crystal positions. Has Plate and Aerial Current meters. IN BRAND NEW CONDITION. ONLY **£12.10.0** (carriage, etc., 15/-).

COMMUNICATIONS RECEIVER R.1155.—The famous Bomber Command Set Covers 18.5-7.5 Mc/s, 7.5-3.0 Mc/s, 1.500-600 Kc/s, 500-200 Kc/s, 200-75 Kc/s. Late Model "B" fitted with Super Slow Motion Tuning. Slightly used, but in First-class Condition, aerial tested before despatch. 14-page booklet supplied giving circuits and notes, etc. (or available separately 1/3). ONLY **£7/19/6** (carriage 10/6).

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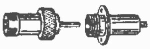

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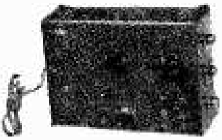

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PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXIV, No. 617, MAY 1958

EDITOR : F. J. CAMM

26th YEAR OF ISSUE

COMMENTS OF THE MONTH — BY THE EDITOR

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PRACTICAL WIRELESS
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Telegrams : Newnes, Rand, London.
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SUBSCRIPTION RATES
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Inland - - - 19s. per annum.
Abroad - - 17s. 6d. per annum.
Canada - - - 16s. per annum.

CONTENTS :

THE VOICE OF AMERICA

THE Voice of America is again broadcasting the Amateur Radio Show for fifteen minutes every week. The programme is devoted to the latest gossip on the amateur bands, interviews with radio amateurs round the world, propagation forecasts and discussions on the latest technical news of interest to radio amateurs and short-wave listeners. These programmes have been resumed after a lapse of a year. They commenced ten years ago. The programmes are radiated between 21.00 and 21.30 GMT every Tuesday, from WDSI, WLWO, WIWO (all U.S.A.) and Tangier and Morocco, and Munich, Germany.

The programme is repeated at 22.30 GMT on the long-wave transmitter at Munich.

THE REAL MIDGET

TINY pocket receivers are very popular in America, and several manufacturers cater for this market. A contributor in this journal recently invited comments as to whether there was a demand in this country for such tiny transistorised receivers operating from midget batteries of comparatively low voltage. From the response to those remarks, it is evident that there would be a large demand for such receivers which have a number of uses which cannot be catered for by the home receiver nor by the usual somewhat cumbersome battery portable. An examination of the English market, however, shows that only three makers have entered this market with receivers which can easily be slipped into the pocket. They give reasonable quality of reproduction through a midget loudspeaker or they may be used for earphone listening whilst the rest of the family is otherwise engaged and thus is not disturbed. All these midget receivers make use of transistors and printed circuits. We have received a reasonable demand for a P.W. design for a midget but before we could make arrangements for a printed circuit to be prepared we should need to be assured that the demand would justify manufacturers' going to the expense involved. If you are interested in a pocket midget, we should be glad if you would send us a postcard saying so. Address the postcard to Midgets, address as on this page.

RADIO SALES

ALTHOUGH TV licences approach the eight million mark, and thus bid fair to overhaul sound licences within a short time, we are glad to note that the sales of sound receivers do not show any marked diminution. This is surprising when we bear in mind that to some extent TV duplicates the sound service. The majority of viewers, however, seem more interested in watching I.T.V. than the BBC TV and the possession of a sound receiver is, therefore, a necessity. No doubt, in the distant future, the sound broadcasts will vanish altogether, except for shipping news and other programmes which do not need vision.—F. J. C.

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

Round the World of Wireless

By "QUESTOR"

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of January, 1958, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	Total
London Postal	1,059,208
Home Counties	1,068,430
Midland	791,959
North Eastern	1,033,246
North Western	769,203
South Western	662,095
Wales and Border Counties ...	414,470
Total England and Wales ...	5,798,611
Scotland	762,592
Northern Ireland	181,824
Grand Total	6,743,027

Brabazon Premium

AT the annual parents' day and apprentices' prize-giving of A. C. Cossor Limited, Mr. K. E. Harris, technical director of Cossor Radar and Electronics Limited, presented the prizes, and himself received an ovation for the award to him of the British Institute of Radio Engineers Brabazon premium for the most outstanding contribution to radio and electronic devices for aircraft safety, for his paper "Some problems of Secondary Surveillance Radar Systems."

Broadcast Receiving Licences

DURING January the number of combined television and sound licences throughout Great Britain and Northern Ireland increased by 137,453 bringing the total to 7,898,247. Sound only licences total 6,743,027 including 327,266 for sets fitted in cars.

BBC Engineering Division Appointment

THE BBC announce the appointment of Mr. W. R. Fletcher, B.Sc. (Eng.), A.M.I.E.E., as Regional Engineer, North Region, in succession to Mr. B. H. Vernon, Assoc. M.I.R.E., who has retired owing to ill-health after nearly thirty-five years' service with the Corporation.

Mr. Fletcher joined the Engineering Division of the BBC in 1936. He will be taking up his new duties in the summer, and, until he takes over, Mr. E. L. Lycett, M.B.E., the Assistant Superintendent Engineer, Sound Broadcasting, Outside Broadcasts, will be Acting Regional Engineer, North Region.

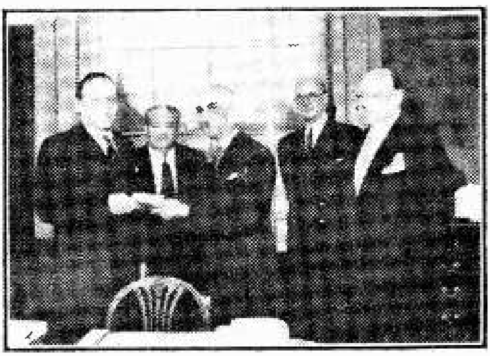
Radio Exports 100 per cent Up

A NEW high level was reached for exports of British radio equipment in 1957, it is announced by the Radio Industry Council. The value, £43.4 millions, exceeded the record total for 1956 of £40.2 m. by more than £3 m., and was nearly twice that for 1951 (over £22m.).

The continued rapid increase in the exports of sound reproducing equipment is largely due to the high reputation of British equipment in the American market, where "U.K. for Sound" is becoming a slogan.

30 Years With Cossor

W. J. G. BROWN, Cossor Radio & Television Limited representative for Middlesex and East Anglia, has just completed 30 years continuous service with this company, dating from 1927, the year the famous Cossor "Melody Maker" range of radio kits was introduced. Mr. Brown (centre), is shown here being presented with a gold watch by the Marquess of Exeter, chairman of the Cossor Group of Companies, on behalf of (left to right) Mr. J. S. Clark and Mr. H. Chisholm, joint managing directors of the Cossor Group of Companies, and Mr. H. C. Roberts, sales director of Cossor Radio and Television Limited.



Mr. W. J. G. Brown of Cossor, receiving a gold watch after 30 years' service.

Radio versus Rustlers

THE high incidence of cattle stealing in the Karamoja district of Uganda has led the police authorities to install a V.H.F. radio network as a means of forestalling the sporadic raids of local tribes on the herds of neighbouring villages. The system, which will be under the control of the native-recruited Uganda Police, uses Marconi equipment throughout. The network links up 14 local police posts with a headquarters post. Any suspicious activities observed by local constables are reported to the H.Q. post and a patrol is sent to investigate in radio-equipped vehicles.

B.I.R.E.

THE following meetings will take place during April, 1958:

London: London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C.1. Tuesday, April 15th, at 6.30 p.m., "Factors in the Design of Airborne Doppler Navigation Equipment"—E. G. Walker. Wednesday, April 23rd, at 6.30 p.m., "Measurement of the Frequency Response of a

Nuclear Reactor" R. J. Cox. B.Sc., A.M.Brit.I.R.E., D. Harrison and R. B. Stevens. B.Sc., A.M.Brit.I.R.E.

North Eastern: Wednesday April 9th. at 6 p.m., Annual General Meeting followed by a programme of technical films.

Scottish: Thursday. April 17th. at 7 p.m., Institution of Engineers and Shipbuilders. 39. Elmbank Crescent. Glasgow. Annual General Meeting followed by a programme of technical films.

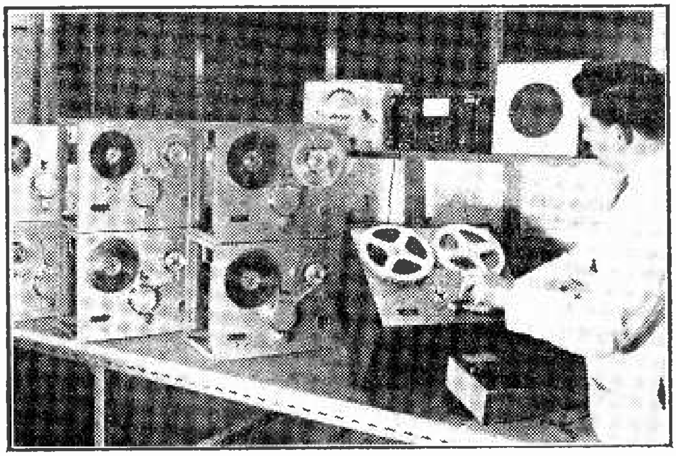
South Midlands: Friday. April 25th. at 7 p.m., North Gloucestershire Technical College. Cheltenham. "The Automatic Factory"—J. A. Sargrove, M.Brit.I.R.E.

Gramophone Record Production

DECEMBER gramophone record production at 7.5 million (compared with 6.4 million in December 1956), brought the total for the year to 78.3 million compared with 66.5 million in 1956, an increase of 11.8 million (18 per cent.) and of 27.4 million (54 per cent.) compared with 1954.

Manufacturers' sales in December 1957, exclusive of purchase tax, amounted to £1.6 million, the total for the year being £14.1 million, an increase of £2.9 million (26 per cent.) over 1956. In value terms, exports during 1957 accounted for about 25 per cent. of total sales.

The improved production in December was concentrated in other than 78 and 33⅓ r.p.m. records, thus continuing the trend of recent months. For the three months October to December combined production of 78 r.p.m. showed virtually no change compared with the corresponding period of 1956. 33⅓ r.p.m. were up by less than 10 per cent. while production of other types expanded by over 90 per cent.



The long playing tape decks referred to in the paragraph entitled "Heavy Duty Players"

Heavy Duty Players

REFLECTOGRAPH continuous tape players, which reproduce music for entertainment or control frequencies for automation in factories, are now being manufactured by Multimusic Limited, a subsidiary of Multicore Solders Limited, at Hemel Hempstead. These machines are believed to be the first heavy duty continuous players to be produced in quantity in Britain. They will play up to two hours on each of two tracks on the tape, reversing automatically at the end of each track and continuing to operate until switched off. The reversal is achieved by a 20 cycle tone, which actuates relays in the machine but cannot be heard by the human ear.

Cossor Leads Team

MR. L. A. WOODHEAD, Director and General Manager of Cossor Instruments Ltd., has been appointed to lead a team sponsored by the Scientific Instrument Manufacturers' Association of Great Britain which will visit Canada in mid-March.

The team, consisting of senior executives of seven S.I.M.A. member firms, will see the major industrial and scientific organisations in Toronto, Ottawa and Montreal. It will be the first group to follow up the successful visit of the Canadian Trade Mission to the United Kingdom last December.

Isle of Man V.H.F.

THE BBC's new V.H.F. sound broadcasting station at Douglas, Isle of Man, transmitting the North of England Home Service on a frequency of 92.8 Mc/s, was brought into regular service on Sunday, 9th March. The station has been working on an experimental basis since 20th December, 1957, while being completed, so that listeners in the Isle of Man with V.H.F. receivers could take advantage as soon as was possible of the improved reception provided by the V.H.F. transmissions.

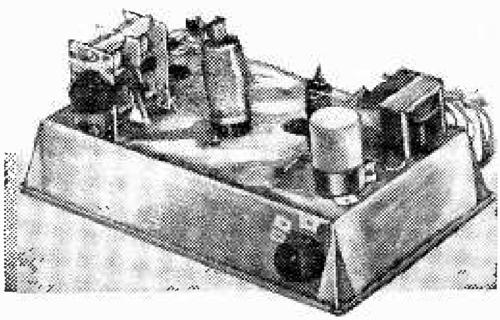
The new transmitter is installed on the same site as the BBC's Douglas television station, and a single mast carries the transmitting aerials for both services. The effective radiated power is 6 kW and the transmissions are horizontally polarised, which means that receiving aerials should be fixed horizontally.

All-travelling-wave-tube Radio Links

THE G.P.O. has placed an order with Marconi's Wireless Telegraph Company Ltd. for the supply and installation of a single-way U.H.F. radio link between London and a point near Norwich. The link provides two broadband channels primarily intended for the conveyance of television signals, but, if the necessary return channels were provided, they could be used for telephony, each being capable of providing up to 600 high-grade telephone channels simultaneously.

It is hoped to bring the link into operation in the Spring of next year.

A Beginner's CONSTRUCTIONAL COURSE—III



A NEW SERIES WRITTEN ESPECIALLY FOR THE AMATEUR

By E. V. King

2.—FINISHING THE 1-VALVE SET

The Detector Stage (V2)

Two types of detector are common in this type of receiver. The most sensitive is known as "leaky grid," but the system which is probably most widely used in commercial instruments and which gives the best selectivity is known as "anode bend." It is intended to use leaky grid detection in the first instance as it is easy to fix up and get working and requires less expense and components. Later it will be modified to the other system.

The theoretical circuit is given in Fig. 9 and Figs. 10a and 10b give the practical wiring layout. Keep to a colour code in the wiring. The author used the following :

Mains—clear plastic.
L.T.—grey plastic.
Earth—tinned copper.
H.T.—red plastic.
T.C. Grid circuits—yellow.

Make sure that you have the correct resistors in the H.T. circuit and in particular that the smoothing resistor R11 is of 3,000 ohms, with a red dot or band on it if colour coded. Also note that C15 is 100 pF and not 100 uF.

Fix the two gang (with trimmers attached) variable tuning condenser to the chassis, small metal angle pieces may have to be made to do this. Remember to allow the vanes to have room to open when in a cabinet (if you intend to use one).

Fix the PA2 coil in position (Fig. 10 (a)) by the method shown in (Fig. 10 (c)). The makers of the coil do not, for some reason, supply the screw, which should be obtained from the coil suppliers (or you will have one in the spares box). Make sure the red tag is in the position shown in Fig. 10, this is most important. Make or buy a top cap connector to the valve, never solder directly to this position. The Mazda Octal top cap is much larger than an International Octal. The two types are not interchangeable.

Connections on Top of the Chassis

Connect C1 to Y tag of coil (Fig. 9) and a flying lead to the aerial run from the other side of C1. Make sure that the condenser will not be pulled by the aerial wire, i.e., fix the latter by a small clip which will take the strain.

Join together tags Z and X by careful bending or use connecting wire and earth them to a tag. Now take a lead from the red tag to the condenser C5. This is the condenser bank nearest the back of the chassis and the connection must be beyond doubt to the fixed vanes. Examine the condenser carefuly before making this connection or you may short out the tuned circuit altogether. The other bank of the variable condenser is not yet used, and you will have no use for the trimmers this month. Now take another lead from the red tag of the coil and connect it, via the small condenser C7, to the top cap connector of V2. Keep the lead as short as possible. Do not let it touch the metallising of the valve. Now solder in R4 between the top cap and a suitable tag on the chassis. Check your wiring with Figs. 9, 10 and 12.

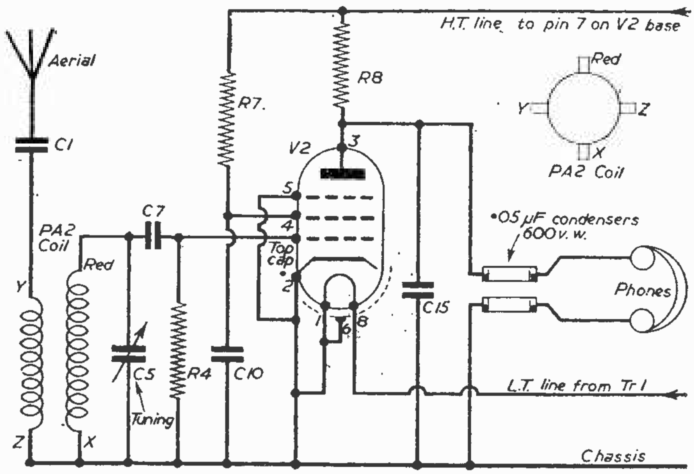


Fig. 9.—The leaky grid detector.

Connections Underneath the Chassis

The L.T. and H.T. systems should have been completed and tested. This wiring is not to be disturbed in any way.

Here is a suggested plan to follow. Earth to a separate tag attached with the valve holder pin No. 1 of V2. Earth pins 2, 5 and 6 to another tag (it is best to earth filaments on a separate tag to avoid hum troubles). Shorten the leads of R7 and R8 to about ½in. and solder R7 to pin 4, and R8 to pin 3. Now join the ends of these condensers by a short length of wire running also to junction C9 and R6 (previously wired in the H.T. circuit). Now take pin 4 to earth via C10, which is held by its leads. Join pin 3 to earth via C15 in the same way. The wiring is now complete. Check with Figs. 9, 10 and 12. Check also as follows:

Pin 1 to earth.
Pin 2 to earth.
Pin 3 through a 470k resistor to H.T. point.
Pin 3 to earth via 100 pF condenser.
Pin 4 through a 1 megohm resistor to H.T. point.
Pin 4 to earth via .1 μF condenser.
Pin 5 to earth.
Pin 6 to earth.
Pin 7 already connected to C13 and R6 see under H.F. section.
Pin 8 already connected to Tr1, see L.T. section.

Incidentally, this "round the clock" system of checking wiring is very useful even to the experienced man.

Testing the Completed One-valver

Take some ordinary high or low resistance phones. If you are buying do not buy C.L.R. ex-service phones, but search for D.L.R. types which are much more sensitive and useful. Solder carefully to the leads two .05 μF condensers of 500v. or more working volts. To these condensers attach flying leads. Wrap the lot in insulated tape. When testing mains receivers one lead of these phones can be earthed to chassis and the other placed at various places, i.e., anodes, to test for L.F. signals. The phones are thus insulated from direct current voltage and can do no harm to wearer or receiver. It is not wise for the beginner to use phones on a mains receiver unless they are thus protected.

Connect one phone lead to chassis and the other to pin 3 of the valve just wired up.

Plug in to mains the right way round, switch on at mains and at S1. Wait one minute. Connect a reasonably long aerial (50ft. or more) directly to the red tag of the PA2 coil. You should immediately hear the local station more or less irrespective of the position of the tuning condenser. The tuning is damped by the long aerial. Now attach the aerial to the flying lead from the condenser C1. Tune C5 and you should receive Light and Home programmes easily and probably some Continental stations, but do not expect too much from this stage on its own. It is not even fitted with reaction. These should be very little hum. More will be said about this later.

If, on testing, no results are obtained proceed as follows:

1. Verify that the filament is heated to redness.
2. Verify that H.T. is arriving at junction R6 and C9 by shorting to earth temporarily with a screwdriver. A flash should be obtained.
3. Remove T.C. of V2 and touch with the finger. Loud hum and oscillations should come from the phones. If it does the fault most likely lies in the tuned circuit, PA2 coil and variable condenser. If hum is not apparent then the fault lies either with the valve or its pin connections, resistors or condensers.

Lastly, as the author has previously stated in this magazine, draw the complete circuit of Fig. 12 on paper and ink it in carefully line by line as it is checked against your receiver. In this way any fault is bound to be discovered unless you are reading the colour code of resistors wrongly, or have faulty components.

Checking the Voltages and Current (H.T.)

If you have a voltmeter you may check the voltage at junction R6 and C9 (approximately 280v.), and also at pins 3 and 4 of the valve. The readings will not be true ones (since the meter draws current through R7 and R8 when connected), but may be noted so that if you have

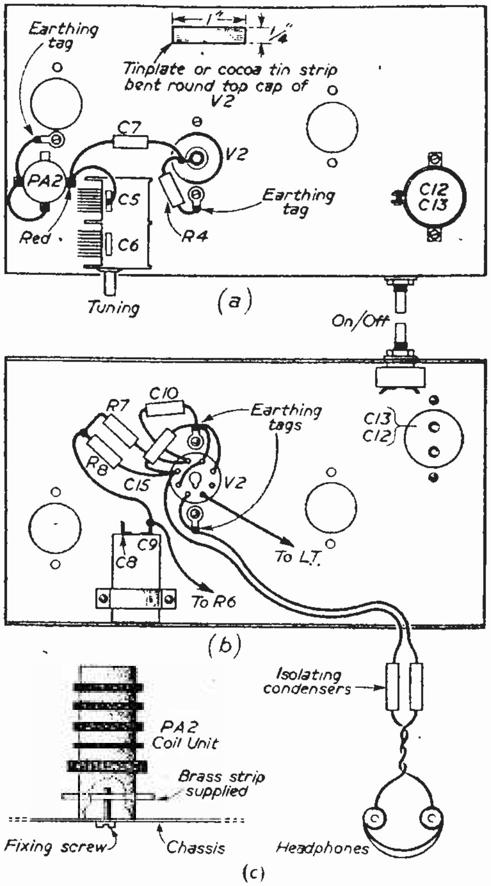


Fig. 10(a).—Wiring for Fig. 9. 10(b).—Underside of chassis (battery supplies not shown and previous wiring omitted). Fig. 10(c).—Details of coil fixing.

any future troubles you know what the readings should be with your meter. To check current insert the meter in the earth lead from pin 2. use low range of mA (about 10 mA first, for safety). It should be about ½ mA.

Later. details will be given for adding an H.F. tuned amplifier and anode bend detection. After this the radio will receive dozens of stations on a few yards of aerial at good loudspeaker strength.

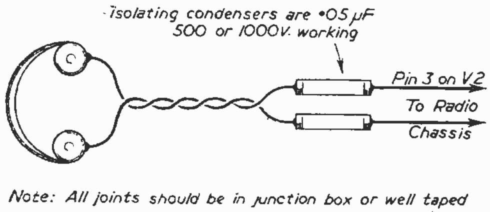


Fig. 11.—Using headphones with safety.

When the receiver is wired and tested it should give satisfactory results. provided a decent aerial is used. If. in the future, this part of the radio should give trouble the maker will at least know how to test it with phones. The enthusiast will no doubt be anxious to get the receiver working a loudspeaker. with this in mind the output stage is added next.

The Output Stage

Another valve identical to that used for V2 is used. You cannot use an SP41 in one stage and an SP61 in another as the filaments are of different voltages. The SP41/61 is not really an output valve but it is cheap and gives good reproduction in a loudspeaker when used as an L.F. amplifier provided the signal input is kept down and not too much volume is expected. Later in this series a suggested output stage to give about 2 watts of power can be substituted. This latter stage uses a 6V6. and if you wish to use it you would be advised to keep to 6 volt filaments. The use of the SP41/61 valve also means economy in rectifying and smoothing the H.T. supply. while the symmetry of the bases throughout the set will enable you to build it with a minimum of error.

Mounting the Components

Fix an ordinary (or multi-ratio) output transformer in the position shown in Fig. 14. Note that the laminations are at right angles to the filament transformer. This is to avoid "hum" pick up from the mains. Make sure it is mounted firmly.

Mount the valve base. with the tags in exactly the same positions as in V2 and with soldering tags underneath, where the mounting nuts and bolts pass through. Make the holder dead central so that the valve pins cannot short to chassis. Three holes are needed through the chassis and these should be fitted with grommets. Sometimes one hole would do where three are shown, but the real beginner is advised to keep to separate holes for each wire.

The speaker is not part of the radio and can be mounted separately until the radio is completed. but room is allowed for a 5in. speaker if desired between C6 and C13 (Fig. 14). The speaker must be about 3 ohms impedance. 5in.

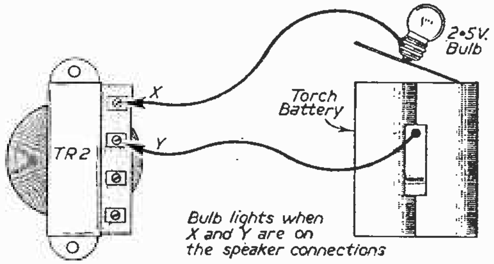


Fig. 13.—Testing to find the secondary winding.

is ideal but any size will do. If it is not fitted with a baffle or case lie it flat on its face on the bench to avoid damage to the speaker when testing the receiver.

Wiring Up the Output Stage

A theoretical circuit is given in Fig. 15 which adds on to the complete circuit already given (Fig. 12). Probably, by now. the beginner will feel he can work from the diagram in Fig. 15. but in case he cannot, a top view of the *added* wiring will be given next month.

The four tags on the transformer must be sorted out first. If it is a multi-ratio type directions will be supplied with it. and you

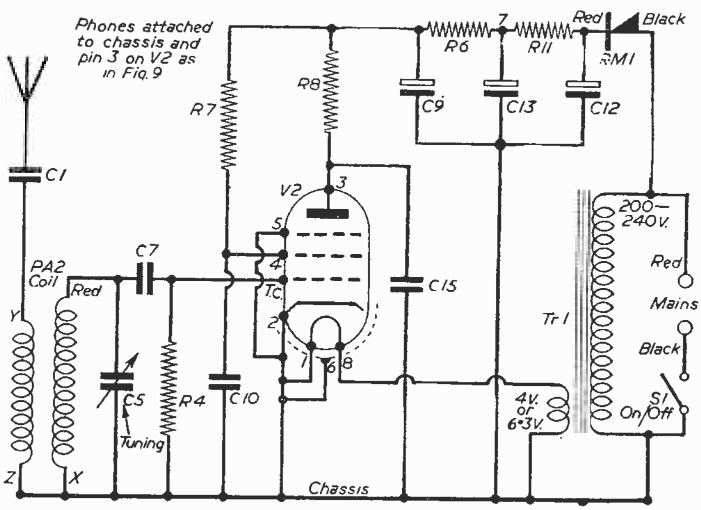


Fig. 12.—The complete detector stage circuit.

should choose a ratio as near to 80 : 1 as possible. Experiments with tappings on this transformer will do no harm if you are in doubt. With a standard type (used in the prototype) the thick wires go to the speaker and the thinner ones to the anode and H.T. You may test this transformer in a similar way to that described

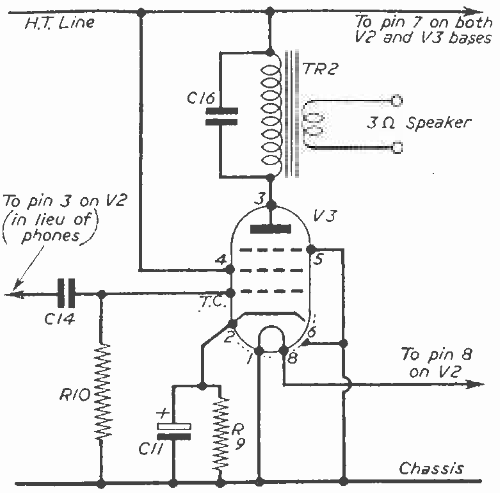


Fig. 15.—The output stage which is added to Fig. 12.

for the filament transformer using a flash lamp and torch battery (Fig. 13).

Here is a suitable plan for the beginner to follow. Earth pin 1 on valve 3 to earthing tag adjacent. Join pins 5 and 6 together and earth to the other chassis tag. Fix R9 in air between pin 2 and any earthed pin, i.e. pin 6. Fix C11 in the same position, i.e. between pin 2 and chassis noting that the plus or red side of this condenser must go to the pin and the negative to earth. This condenser must be of low working voltage type. If this condenser is largish you may fix an earthing tag in any convenient pisition, but when drilling verify that your drill will not penetrate through some component on the other side of the chassis. If the condenser has no apparent negative connection it is earthed through the fixing to chassis and cannot be suspended in air but must be fixed firmly to chassis with a suitable clip. Connect pin 3 via a grommet to the primary of the speaker transformer. Join pin 4 to pin 7. Join pin 7 to the pin 7 of the valve already wired (V2) to pick up an H.T. supply. Take a lead through another grommet from the other side of the transformer primary to pin 7 on V3 (the output valve). Join pin 8 (V2) to pin 8 (V3).

Now remove the phones from circuit. Attach C14 (which must be a good new condenser, preferably any type but paper) to pin 3 of the detector valve (V2) and the other end as

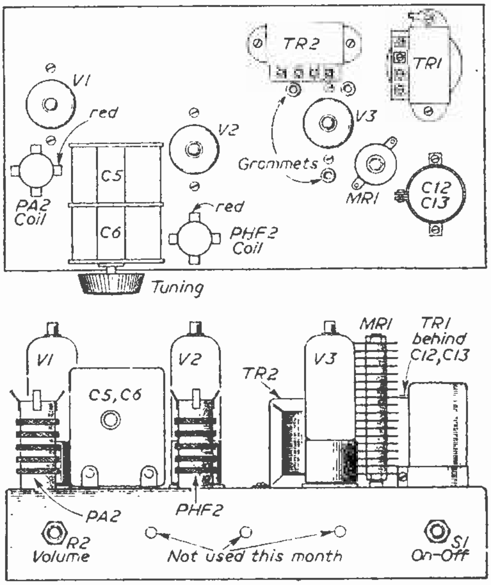
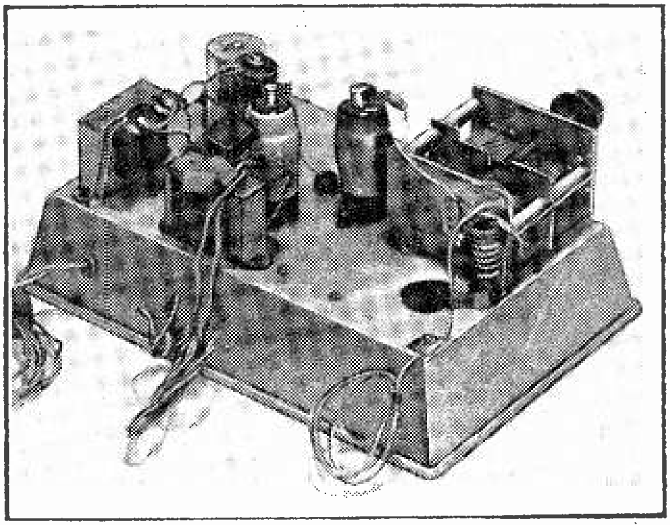


Fig. 14.—Top and front views of this month's development.

directly as possible via a grommet to the top cap of V3. If this condenser is faulty the valve will suffer and the output will be distorted. Metal cased condensers of the Sprague type are ideal as coupling capacitors. The functions of the components will be given later.

(*To be continued*)



Rear view of the second stage.

SIMPLE TONE CONTROLS

HOW TO CALCULATE VALUES WITHOUT COMPLICATED MATHEMATICS

By H. C. Parr, M.A., F.R.C.O.

MANY amateurs with quite a wide general knowledge of audio amplifiers tend to leave the understanding and design of tone controls and tone correction networks to the experts, under the impression that their mathematics is not equal to the task. In the case of simpler examples this is an erroneous impression, and there is no real difficulty in predicting the frequency response of a given network, or designing one's own circuit to give a desired curve.

The basis of these simple tone controls is the behaviour of a condenser towards audio signals of

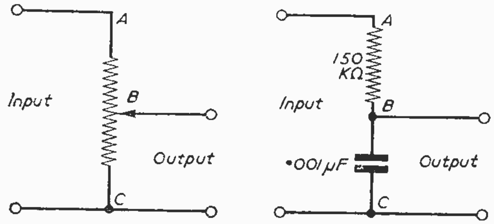


Fig. 1.—(Left) Simple volume control, and Fig. 2 (Right) Treble cut control.

different frequencies, the impedance it presents being inversely proportional to the frequency. Thus a .001 μF condenser has an impedance of 160 KΩ at 1,000 c.p.s., 80 KΩ at 2,000 c.p.s. and 40 KΩ at 4,000 c.p.s. Table I shows the approximate impedance in ohms represented by various common values at selected frequencies. While some readers may like to cut this out and keep it for reference, others will find this unnecessary if they retain the one fact that *1 μF presents 16Ω at 10,000 cycles*. Then, remembering that impedance is inversely proportional to capacity, and to frequency, it is possible to work out mentally every entry in Table I to the degree of accuracy required, which need never exceed about 10 per cent. in these applications.

Every simple tone correction network can be considered as a potential divider, of which the simplest example is the ordinary volume control (Fig. 1). Suppose we set the movable contact, B, so that the resistance between B and C is 100 KΩ, i.e., one tenth of the total. Then, if we have as input an audio signal of 1 volt, say, since this voltage drops uniformly as we move from A to C, at B it must be 1/10 volt, and the signal is attenuated to one tenth.

Circuits

The degree of attenuation produced is always expressed in *decibels*, a measure which has many advantages over the plain ratio. One of these is the fact that it bears a closer relationship to the effect produced on the ear. Now the fundamental characteristic of the decibel scale is that the *ratio* of output to input is expressed as a *difference* of decibel level. To take the network of Fig. 1 as an example, an attenuation ratio of 1/10 corresponds to a decibel difference of 20 db., so that if the input level were described as 30 db., the output would be 10 db. But note that the zero of the decibel scale has no significance, and it would be just as correct to describe the input as 10 db., and the output as −10 db. Table II gives the decibel difference corresponding to various ratios of signal voltage.

Treble Cut

Now let us consider the simple "treble cut" circuit of Fig. 2. At low frequencies the condenser will have a high impedance and so provides practically the whole of the impedance between A and C, and there is no appreciable attenuation. For higher frequencies the impedance between B and C will decrease, and the ratio of output to input will fall, giving attenuation in the treble.

To describe this quantitatively we can draw up a table (Table III) obtaining the approximate attenuation at each of our selected frequencies. We know that the ratio of output to input is the ratio of the impedances BC to AC. The first of these is obtained directly from Table I for each frequency, but the second, being of a condenser and resistance in series, offers considerable difficulty if it is to be treated exactly. However, we can make a great simplification whenever we have such a series combination by assuming its impedance to be *equal to the larger of the two component impedances* at any particular frequency. We shall call this Rule 1. The effect of phase changes in the condenser actually makes this a better approximation than would at first sight appear, and the error never exceeds 3 db. Furthermore, it can be allowed for later when

TABLE II

Ratio	1	$1\frac{1}{4}$	$1\frac{2}{3}$	2	3	4	5	7	10	14	20	30	40	50
Db.	0	2	4	6	9	12	14	17	20	23	26	29	32	34

TABLE I

c.p.s.	30	100	300	1,000	3,000	10,000
.1 μF	50K	16K	5K	1.6K	500	160
.05	100K	30K	10K	3K	1K	300
.02	250K	80K	25K	8K	2.5K	800
.01	500K	160K	50K	16K	5K	1.6K
.005	1M	300K	100K	30K	10K	3K
.002	2.5M	800K	250K	80K	25K	8K
.001	5M	1.6M	500K	160K	50K	16K
500 pF	10M	3M	1M	300K	100K	30K
200	25M	8M	2.5M	800K	250K	80K
100	50M	16M	5M	1.6M	500K	160K
50	100M	30M	10M	3M	1M	300K

the response curve is drawn. The second row of Table III is obtained in this way, and the third by dividing

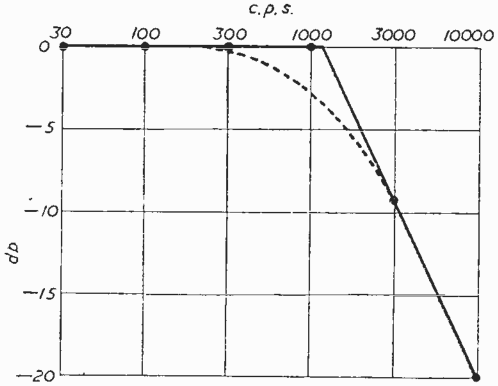


Fig. 3.—A frequency response curve.

(approximately) the second by the first. The attenuation in db. then comes from Table II, and has to be reckoned negative because it *is* an attenuation. This can now be plotted as the usual type of frequency response curve (Fig. 3). The frequency scale of such a diagram is always logarithmic, and since the frequencies we are considering, 30, 100, 300, etc., are roughly in geometric progression, the lines representing them are drawn practically equidistant.

This method of working always gives a graph of straight lines, with "sharp corners," but if we "smooth these out" a little, we are, in fact, com-pensating for the inaccuracy of Rule 1. The dotted curve in Fig. 3 is thus a more accurate representation, and the attenuation at 1,000 cycles, where the two impedances are equal, should be 3 db.

TABLE V

c.p.s.	30	100	300	1,000	3,000	10,000
200 pF.	25M	8M	2.5 M	800K	250K	80K
XY (Rule 2)	400K	400K	400K	400K	250K	80K
XZ (Addition and Rule 1)	500K	500K	500K	500K	250K	100K
Ratio XZ/YZ	5	5	5	5	2½	1
Db.	−14	−14	−14	−14	−8	0

Bass Boost

Fig. 4 shows another common network. This provides bass boost at 6 db. per octave (i.e., 6 db. each time the frequency is halved) exactly as is needed for correcting the bass in a tape play-back amplifier. It will be seen to differ from Fig. 2 in two respects. Firstly, the condenser has ten times its former value, so that the attenuation will be obtained at frequencies one tenth of those obtained from the first circuit. Secondly, the 15 KΩ resistor will prevent the impedance of BC ever falling below this value, and so will give a constant attenuation of 20 db. (for BC is then about one tenth of AC) at high frequencies. Table IV and Fig. 5 show the derivation of the response curve of this circuit. In Table IV, BC is obtained by applying Rule 1 to the condenser and the 15 KΩ resistor, and AC by applying it to the condenser and the total resistance, 165 KΩ. Note that the corners have again been rounded off in Fig. 5.

Now to illustrate the reverse procedure, let us design a treble boost circuit giving 14 db. boost, beginning at about 2,000 cycles. Fig. 6 is an obvious suggestion, the condenser behaving like an open circuit at low frequencies, and "letting more through" as the frequency rises. No simple circuit, of course, can actually produce "boost": it can only attenuate those frequencies we do not wish to boost. Choosing 100 KΩ as a suitable value for R2, it is easy to calculate R1. If the attenuation in the bass is to be 14 db., a voltage ratio of 1 to 5, R1 and R2 together must be five times 100KΩ and so R1 must be 400 KΩ. Now C is to take charge at above 2,000 c.p.s., and so its impedance must be comparable to R1 at this frequency. Putting it equal to this value, it must be 80 KΩ at 10,000 c.p.s., and from Table I we find C=200 pF.

We can now work out Table V to check the performance of this circuit. As R1 and C are in parallel, we are confronted by a new problem, but this

TABLE III

c.p.s.	30	100	300	1,000	3,000	10,000
BC (.001μF)	5M	1.6M	500K	160K	50K	16K
AC (Rule 1)	5M	1.6M	500K	160K	150K	150K
Ratio	1	1	1	1	3	10
Db.	0	0	0	0	−9	−20

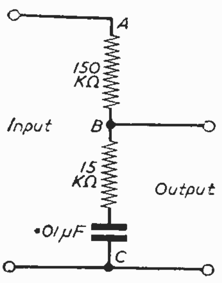


Fig. 4.—Bass boost circuit.

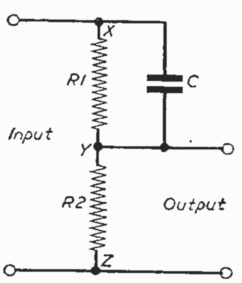


Fig. 6.—Treble boost circuit.

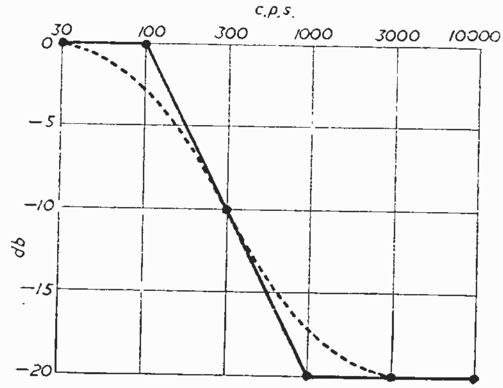


Fig. 5.—Response curve for bass boost circuit.

is solved as easily as the series case. We assume the resulting impedance to be *equal to the lesser of the two component impedances*, and call this Rule 2. This approximation is just as satisfactory as, and has similar consequences to, Rule 1, and is used to obtain the impedance XY in Table V. When adding the 100 KΩ, YZ, to these values to obtain the third row of our table, we must notice that the values for XY in the upper frequencies are, in fact, values of the impedance of C. XY is, therefore, capacitative, and Rule 1 must be applied to give XZ.

A curve could be drawn from the data of Table V, (see previous page) with the corners suitably rounded off, and would confirm that we have achieved the response desired.

Variables

Variable tone controls, even quite complicated ones, can usually be dealt with easily by considering separately the two circuits produced when the moving contact of the potentiometer is at either end of its travel. The bass boost/cut control of Fig. 7 becomes Fig. 8 and Fig. 9 when treated in this way, and each of these can be dealt with as outlined in the above paragraphs. The two response curves derived from Figs. 8 and 9 can be plotted on the same diagram, Fig. 10, to illustrate the effect of the bass control in its two extreme positions.

There is one further point which must be considered when tone control networks are to be included in amplifier circuits, and that is to ascertain what effect, if any, the internal impedance of the source,

TABLE IV

c.p.s.	30	100	300	1,000	3,000	10,000
.01μF	500K	160K	50K	16K	5K	1.6K
BC (Rule 1)	500K	165K	50K	16K	15K	15K
AC (Rule 1)	500K	165K	165K	165K	165K	165K
Ratio	1	1	3½	10	10	10
Db.	0	0	−10	−20	−20	−20

and the impedance of the load, will have on the performance of the network. This effect will be negligible if the source is of low impedance, and the load of high impedance, compared with the elements of the tone control itself. In other cases, however, they must be taken into consideration. Referring back to Fig. 4 for an illustration, it is clear that the source impedance of the input must be added to the resistance AB, and that the load impedance is in parallel with BC. We can suppose the network to be supplied by a pentode stage with an anode load of 100 KΩ (via a coupling condenser, of course, whose effect on the signal should be negligible), and to be supplying the grid of the next valve, with a 500 KΩ grid leak,

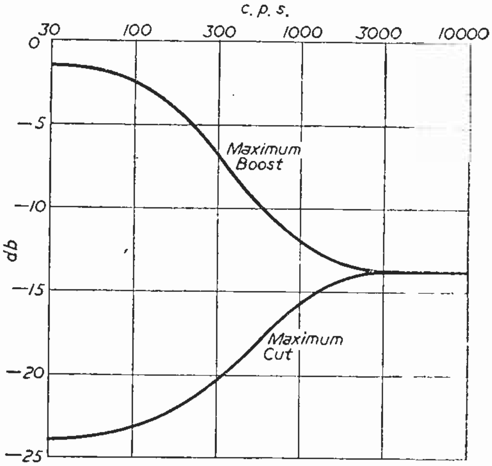


Fig. 10.—Curve of Bass Control Circuit

as in Fig. 11. It is a well known fact that a pentode stage acting as a source behaves as if the anode load were the internal resistance of the source, and so we must add 100 KΩ to the value of AB before we begin our calculations. As for the effect of 500 KΩ across BC, this need not be considered so long as it exceeds the impedance of the condenser (Rule 2). In the extreme bass, however, it prevents BC ever rising above 500 KΩ, and so maintains an attenuation of about 2 db. here.

To a mathematician the above methods will appear appallingly rough and ready, but to those of us who are not so familiar with *j*ω*t* and the Argand Diagram, they will solve surprisingly complicated circuits with fair accuracy. The secret lies in knowing what may be neglected and what approximations may be made, and in this, as in so many activities, practice makes perfect.

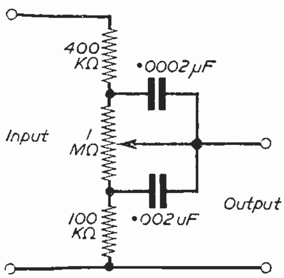


Fig. 7.—Bass boost-cut circuit.

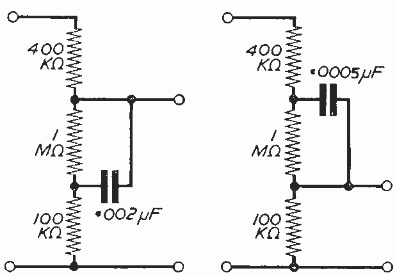


Fig. 8 and Fig. 9.—Rearrangement of the Fig. 7 circuit.

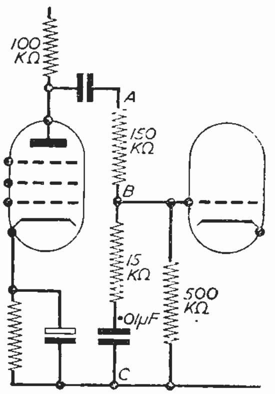


Fig. 11.—A pentode tone control stage.

A Communications Receiver

AN AMATEUR RECEIVER INCORPORATING THE R1155 CONVERTER

By R. H. Wright

MANY amateur constructors are frequently diverted from building a superheterodyne receiver because of the ensuing difficulties of alignment. unless one possesses, or has access to. a signal generator. However, if the R1155 converter described in the February issue of this magazine is followed by a suitable intermediate frequency amplifier. demodulator and audio-frequency amplifying stages, the whole will give an efficient superhet. receiver well within the building capacity of the average constructor.

If the full range of Denco octal-base plug-in coils are used, the receiver will give continuous coverage from .175 Mc/s to 31.5 Mc/s (1.700-9.5 metres), thus including the long, medium and short wave broadcast bands. trawlers and the 1.8, 3.5, 7, 14, 21 and 28 Mc/s amateur transmitting bands.

Fig. 1 shows the circuit of an amplifier suitable to follow the R1155 converter and which has an intermediate frequency of 465 Kc/s. The converter output is applied across grid and cathode of V1. the intermediate frequency amplifier, and the amplified signal from this valve is transformer coupled to one of the diodes of V2 for demodulation. R5 is the demodulator load resistor and the A.F. component of the signal now passes to the grid of the triode section of V2 via the A.F. gain control (VR1). The output of this triode is resistor-capacity coupled (R7/C7/R9) to the output valve V4. Tone control (VR2/C8) is applied to the output and can prove useful in reducing the effects of interference.

Output can be applied to a loudspeaker or to a pair of low-resistance telephones through the output transformer, T1. If output to either loudspeaker or telephones is required, the output transformer should be of multi-ratio design.

Automatic gain control is provided from the second diode of V2, the I.F. signal being passed from the anode of the I.F. amplifier to this diode via C5 and the actual control voltage developed across R8 Since this resistor is returned to H.T. —instead of the cathode of V2—the A.G.C. voltage is delayed. This is preferable to simple A.G.C. which would reduce the amplification even on weak signals. A.G.C. may be switched off when not required by closing the switch, SW1.

C.W. Reception

For the reception of C.W. signals V3 operates as a beat-frequency oscillator in conjunction with the oscillatory circuit formed by L1/L2 and C12/C13. The B.F.O. signal is applied to the demodu-

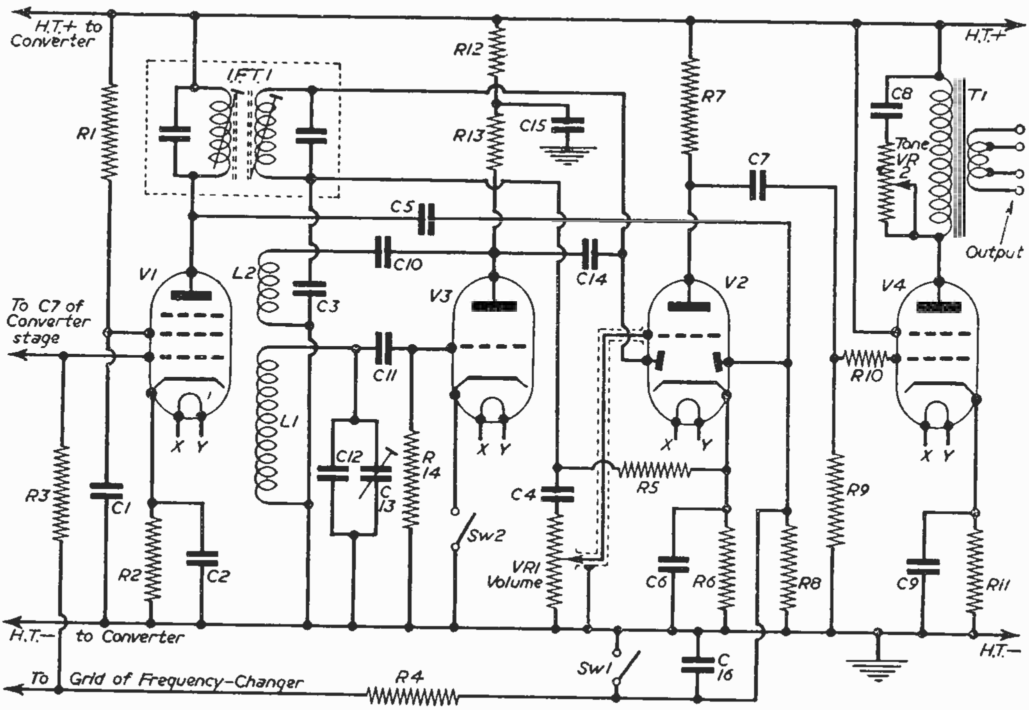


Fig. 1.—Amplifier section for use with the R1155 Converter.

later diode through C14. This oscillator may be switched off or on by SW2.

Construction

The amplifier unit can be constructed as an independent unit and mounted close to the converter; the actual positioning of the components on the chassis does not require any particular care, but a suggested above-chassis layout is given in Fig. 2, the chassis measuring 10in. × 8in. × 2½in. A suitable chassis is manufactured by Denco in either steel or aluminium. Shaped holes may be cut in the chassis either by means of a fretwork frame and a metal cutting saw

Range	Coverage		Padder value	Pin No.
	Mc/s	Metres		
1	.175/.525	1,700/570	140 pF	4
2	.515/1.54	580/194	350 pF	5
3	1.67/5.3	180/57	1100 pF	7
4	5.00/15	60/20	3000 pF	2
5	10.5/31.5	28/9.5	none	6

blade or a punch. Alternatively, hardboard could be used if preferred although the "professional" look would suffer accordingly.

The original converter was designed primarily for use in conjunction with the R1155 receiver and in order to avoid short-circuiting the bias in that receiver, H.T. negative and the earth line had to be kept separate in the converter. However, if the converter is used in conjunction with this amplifier this separation will be unnecessary and the following circuit alterations may be made: C2 should be removed and R1, C3 and H.T. negative connected to the chassis, similarly with the bottom end of the grid coil of L1. The switch S1 (a), (b) and (c) will no longer be required, L.T. to the converter and amplifier being controlled by the on/off switch of the power unit. Fig. 3 shows the converter circuit as it will now appear and

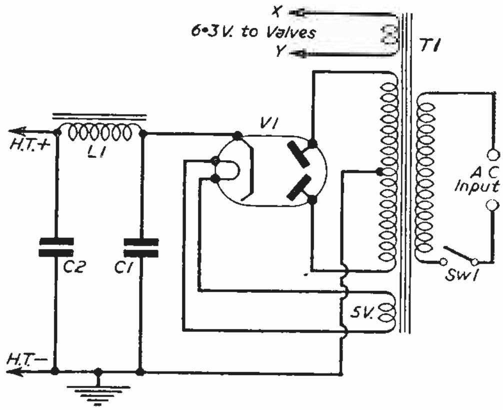


Fig. 4.—Mains unit.

A.G.C. is applied to the frequency-changer valve through R5.

An alternative arrangement would be to build the converter section and amplifier on a larger chassis together, this arrangement providing a complete communications receiver. The complete receiver could be housed in an Eddystone cabinet, type 787, and would then have an appearance and performance that would compare very favourably with many commercial types.

LIST OF COMPONENTS

For the amplifier section :
R1, R12, R13, R14—47 K.ohms.
R2—270 ohms.
R3, R4, R9—470 K.ohms.
R5—220 K.ohms.
R6—1,000 ohms.
R7, R10—100 K.ohms.
R8—1 megohm.
R11—330 ohms, 1 watt.
(All resistors ½ watt unless otherwise specified.)
VR1—Carbon variable 500 K.ohms.
VR2—Carbon variable 50 K.ohms.
C1, C2, C8, C15, C16—0.1 μF, paper, 350 volt working.
C3, C5, C10, C11—100 pF.
C6, C9—25 μF, 25 volt electrolytic.
C4—.05 μF.
C7—.01 μF.
C12—140 pF.
C13—0-20 pF trimmer.
C14—5 pF.
SW1, SW2—on/off toggle switch.
I.F.T.1—Denco I.F. transformer, type I.F.T.6B/465.
T1—Multi-ratio output transformer.
L1 L2—Denco B.F.O coil, type B.F.O.2 465.
Chassis—Denco steel or aluminium, type C1111. (See text.)
V1—Mullard EF92 or Osram W77.
V2—Mullard EBC90 or Osram DH77.
V3—Mazda 6L18 or Mullard (or equivalent) EF91 triode connected, i.e., anode, suppressor and screen grids joined in parallel.
V4—Mullard EL91 or Osram N77.

For the converter section :
C1, C4—300 pF variable. Alternatively, 500 pF variable with 0.001 μF (mica) fixed capacitor in series.
C2—0.01 μF.
C3, C6, C9—0.1 μF, 350 volt working.
C5, C7—100 pF.
C8—300 pF pre-set.
Cp—Padding capacitor. (See text.)
R1—220 ohms, 1 watt.
R2—68 K.ohms, ½ watt.
R3, R4—47 K.ohms, 1 watt.
L1/L2—Denco octal based plug-in coils, blue for aerial, red for oscillator according to range required. (See text.)
L3—Denco blue range 1 chassis mounting coil.
V1—Osram X61M or Mullard ECH35.
Addition to previous circuit given in February P.W.
R5—470 K.ohms, ½ watt.

For the power unit :
T1.—Mains transformer, 230 volt primary, sec. 250-0-250, 80 mA, 5v., 2 amp., 6.3 v., 3 amp.
L1—20 H, 80 mA. smoothing choke.
SW1—on/off toggle switch.
C1, C2—8 μF electrolytic, 400 volt working.
V1—Rectifier type 5V4G.
Suitable valve bases will be required for all valves, together with two international octal valve bases for the coils in the converter section.

Adjustment

In addition to the adjustments required for the converter originally the cores of the I.F. transformer, I.F.T.1, in the amplifier should be adjusted for maximum signal strength and C13 in the B.F.O. section adjusted to give an audio note of about 1,000 cycles on C.W. signals.

As already mentioned, Denco octal-base plug-in coils may be used to give continuous frequency coverage from .175 to 31.5 Mc/s (1,700-9.5 metres), but each oscillator coil requires a different value of padding capacitor. This is made easy for constructors since the end of the oscillator grid coil winding that is connected to the padding capacitor is taken to a different pin on the base of each coil and so the required padder may be permanently wired into position on the octal-valve base into which the coil is plugged. Actually, the padding capacitors may be omitted, though, if used, they do help to keep the two tuning capacitors in step. The table on page 190 shows the appropriate coil ranges and pins to which the padding capacitors are connected and also the padder values.

Two coils will be required for each range—

BLUE for aerial.

RED for oscillator.

Fig. 4 shows a suitable power unit for use with the complete receiver though it may, of course, be operated from any existing power unit giving 6.3 volts at 3 amps for L.T. and 250 volts at 80 milliamps for H.T.

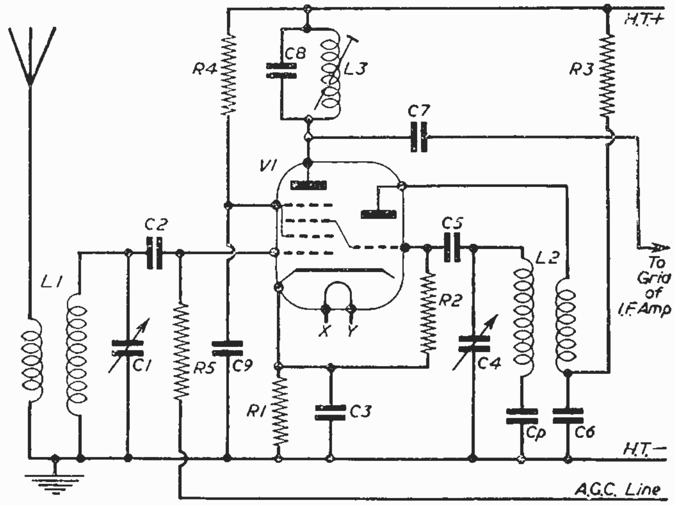


Fig. 3.—Frequency converter circuit for use with the amplifier shown on page 189.

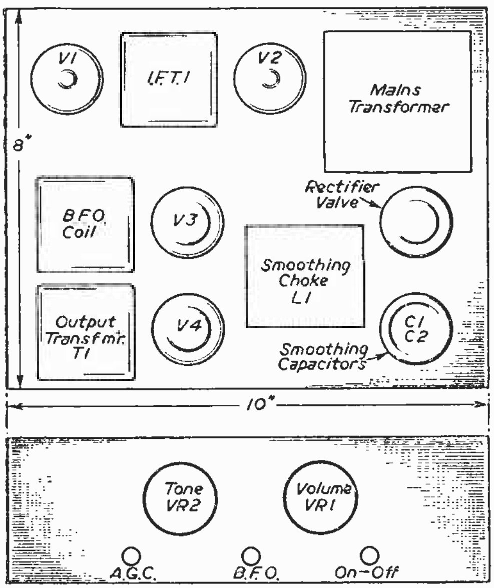


Fig. 2.—Chassis layout and panel control details.

New Transistor Factory

A MAJOR achievement by British industry lies behind the completion of a unique £300,000 transistor factory for Semiconductors Limited at Swindon, in readiness for the arrival of key production equipment valued at over £100,000, by chartered aircraft from America.

Formed only in May, 1957, by The Plessey Company Limited and the Philco Corporation in America, Semiconductors Limited will manufacture a wide range of silicon and germanium high frequency transistors, in their entirety, for the first time in this country, and such rapid progress has been made that the factory will be in production by the middle of this year.

During these past nine months logistic problems have been overcome, key personnel have been engaged and trained in the Philco transistor factory in America and a 40,000 sq. ft. factory, the construction of which started only six months ago, has been completed by the main contractors, Richard Costain Limited.

The factory is specially insulated and features an air conditioning plant which controls the ambient temperature to ± 2 deg. F. humidity ± 5 per cent. and by electrostatic and mechanical filtration controls ambient dust to less than one cubic micron per centimetre of air. Such features are indispensable to a production process of a highly reliable transistor.

Facilities are provided in the factory for supplying extremely pure water of 18 million ohms/centimetre resistivity. Ultra pure gases are piped through the plant and are available at strategically located points. To control dust, the assembly area is free from overhead piping, all services being brought up through the floor.

On Your Wavelength

BY THERMION

On Pronunciation

I HAVE often tilted at the BBC announcers' pronunciation of standard words. Mr. M. E. Northey of Oakhampton endeavours to support them. He says that if covenant is pronounced "kuvenant," Coventry should be pronounced "Kuventry," which only goes to show that he could not have read my comments closely. Of course, there are thousands of anomalies in the English language, but where all dictionaries have agreed on a particular pronunciation, I see no reason why the BBC should decide for itself upon a new pronunciation. There is no justification for Kuventry, which is a place name and is not so pronounced locally. There is no justification for Raif for Ralph, furrin for foreign, nor for any of the other words I have listed here from time to time. The dictionary must be our guide. A great deal of this mispronunciation is due to the fact that when our school teachers go to a training college they are not taught pronunciation, enunciation and diction. That can be the only explanation for a Yorkshire teacher pronouncing Mother as Moother, and book is boook. If the teachers do not speak correct English, the scholars cannot be expected to. I challenge any Yorkshireman or Lancasterian for that matter, to justify their pronunciations by quoting a dictionary. Mr. Northey seems to think that we should pronounce our words as we think fit. He does not want standardisation of pronunciation and presumably therefore as he wishes to dispense with the dictionary as a standard he is against standard spellings. In other words, we should spell and pronounce words as we think fit.

Service Sheets

MR. J. M. NEWBY of Shildon wishes to draw my attention and presumably yours to the fact that most manufacturers will not supply service sheets for their receivers, and that owners are therefore left to purchase the service sheets advertised at 4s. 6d. each. This sum, by the time poundage on postal orders and postage stamps are added, mounts up to over 5s. It sometimes costs 2s. 6d to 5s. deposit to borrow an instruction manual for a fortnight. Here is a chance for someone! Manufacturers obviously wish every purchaser to take his receiver to the dealer, and even a letter to the manufacturer asking for technical advice fails to produce any useful information. You are fobbed off with the name and address of your nearest agent. If people who bought radio and television receivers demanded service data before they purchased from the dealer, the dealers themselves would bring pressure to bear on the manufacturers. Dealers do not like losing sales! In this do-it-yourself age, the attitude of the manufacturers is out of joint with the times. It is unfortunate that some dealers have earned an unenviable reputation for overcharging and there can be little surprise that public confidence in some of them is at a low ebb.

The Printed Circuit

LARGE numbers of readers have expressed their interest in the printed circuit and suggest that this journal should sponsor a design incorporating it. I have no doubt that something will be done, but it would be impossible to produce a design which would satisfy the multifarious requirements of our readers. Some want a portable, others a radiogram, and so on. A start would have to be made with a simpler circuit.

Credits

A READER resident at Hawthorne Crescent, Slough, who signs his letter so illegibly that he does not wish me to know his name, refers to my comments on those lengthy credits given at the end of TV programmes. I said that these credits are meaningless, although they may flatter the vanity of some of the people responsible for either production of the film or acting in it. You will gather from this that I have a very poor opinion of actors and actresses generally, and I am not easily deluded by the ballyhoo and aura of publicity which surrounds their unoriginal work. For all acting is unoriginal. The words are written by the author, the dresses and sets are designed by other people, the gags are turned out on production line method, and the producer tells them how, when and where to place their feet. They are "empty shells from eight till ten filled with the wit of other men." You can always find a Hamlet, but you can't find a Shakespeare. I emphasise that the public does not care two hoots who produces the programme.

If credits are necessary, it should be a short list, with the author's name first, followed by the leading actors and the name of the producer. But to string out a long list of names, of those who merely have walking on parts, or a couple of lines to utter, is boring, meaningless, and merely flattering to the vanity of these people even if pleasing to their friends. It is one of the annoyances of the cinema that the list of credit titles occupies so long—a hefty list of names of no interest whatever to the audience—and names usually which cannot be pronounced and presumably must be sneezed. I do not wish to know, for example, the name of the man who cut the film, nor the man responsible for sound effects. I am not in the least interested who manufactures a pound of sausages, nor who weaves the cloth of the clothes I wear. I repeat that it is merely pandering to the vanity of the lank hair Chelsea types who surround the stage, the cinema and the entertaining professions generally.

BENDIX RECEIVER RA 10.

A 4 waveband superhet covering 150 kc/s-10 mc/s Valves 6SK7 1st R.F. 6K8 Mixer. 6SK7 1st and 2nd I.F. 6R7 2nd Det. 6C5 B.F.O. 6K6 output. Size 6½ x 15½in. Easily converted to mains operation as described on page 453 of the September "Practical Wireless." **£5/10/-**, carr. 7/6.

GOODMAN OUTPUT TRANSFORMERS. Impedance 5,000 ohms to 3 ohms, 3 watt, suitable for 6V6's, 6BW6, etc., **4/6** each. P. & P. 1/-.

HIGH RESISTANCE HEADPHONES. 4,000 ohms. Brand new, **11/6** each, P. & P. 2/-.

INDICATOR UNIT SLC No. 5. Ideal for conversion into an Oscilloscope using a 139A or ACR 10 tube. Unit consists of 2-VR65, 1-VR66, various resistors, condensers and pots. Size 11 x 6 x 3in. Brand new, complete with modification circuit. **20/-**. P. & P. 3/- each.

COLVERN WIRE WOUND POTENTIOMETERS. 25 watts 50k and 100k. Price **6/-** each.

LEAD ACID ACCUMULATORS (unspillable). 2 volts 16 A.H. Ideal for 6 volts and 12 volts supply. Brand new original cartons. Size 4in. x 7in. x 2in. **5/6** each. P. & P. 2/6. 3 for **15/-**. P. & P. 3/6. 6 for **27/6**. P. & P. 5/-.

AMERICAN THROAT MICROPHONES. Type T.S. 30 **3/-** each. Post paid.

CONVERTERS. Easily the most useful units released by the Ministry. Within minutes you can extend the frequency of any receiver to cover the following:—
R.F.26. 50-65 Mc/s.. **20/-** each.
R.F.25. 40-50 Mc/s., **8/6** each.
R.F.24. Shop soiled, **7/6** each.
Complete with valves and circuit. 3/6 Postage on each.

PYE 45 mc/s. I.F. STRIPS. Complete with seven valves. 6-EF50, 1-VR92, 6 tunable I.F. transformers. **30/-**. Post paid.

DYNAMIC SOUND POWERED HEADPHONES. Type D.L.R. 5. 60 ohms. Individual earpieces can be used for room-to-room communication. No Batteries required—just connect up. Can also be used as miniature speakers. ONLY **7/6** pair. P. & P. 2/6.

INFRA-RED MONOCULAR. Ideal for night viewing, etc. Complete with push button power unit and focus lenses. Brand new in beautiful carrying case. Originally cost Govt. £40. Our Price, **25/-**. P. & P. 3/6.

AMERICAN MIDGET ACCUMULATORS. 36 volts, lead acid type. **2/6** ea. P. & P. 1/-.

VIBRATOR POWER PACK. Input 12 v., output 150 V. at 100 milliamps. 2 bias packs 50 V each.

Complete with screen lead for battery. Completely smoothed. Brand new. Price **20/-**. Postage and packing 3/6.

WALKIE/TALKIE SET

ONLY **60/-** EACH

consisting of transreceiver covering 7.4-9 Mc/s., range approx. 10 miles, complete with 5 valves, headphones, microphone, junction box, & 6ft. telescope aerial. Only requires 150 v. & 3 v. dry battery. These magnificent Walkie Talkie sets (as used by H.M. Forces) are ideal for any application and can be operated with ease by young and old alike. Only **60/-** each. P. & P. 4/-.

SIGNAL GENERATOR AND WAVEMETER

Type W.1649. Frequency of Signal generator: 140 to 240 Mc/s. Accuracy ± 0.5 Mc/s. Frequency of Heterodyne Wavemeter: 155-255 Mc/s. Accuracy ± 0.2 Mc/s. Containing VR.135 and 4-VR91, 5 meg. crystal. Retractable aerial. Power requirements: 6.3 volts and 120 volts. Unit housed in copper lined wooden case. Size 15½in. x 13in. x 14½in. **45/-**. Plus 10/-.

R.C.A. MAINS TRANSFORMERS

Input 110-240 v., output 345-0-345 at 150 mA. 6.4 v. at 4.5 amps. 5 v. at 2 amps. Brand new fully shrouded. Limited quantity. Write now. Only **35/-**. P. & P. 3/-.

COMMUNICATION RECEIVER R.1155

This magnificent 10 valve 5 wave band receiver gives world wide reception over a coverage of 75-200 Kc/s., 200-500 Kc/s., 600-1500 Kc/s., 3-7 Mc/s., 7.5-18.5 Mc/s. (4000-15 Metres) incorporating Medium, Long and Short wave bands. Requires 250 volts and 6 volts. Fully tested and dispatched in full working order, complete with Super slow motion drive, circuit and instruction book. Originally cost £70. **Our Price only £8.10.0.** Carr. 10/-.

POCKET VOLT TEST METER

Two D.C. ranges: 0-250 v. and 0-15 v. Complete with test prods. Brand New Very limited quantity. ONLY **10/6**, p. & p. 1/6.

WIRELESS SET
NO. 19 MK. II

As described and recommended for Amateur use in April and May issues of "Practical Wireless." This famous Transmitter-Receiver incorporates "A" Set—TX/RX covering 2-8 Mc/s. (37.5—150 metres). "B" Set—VHF TX/RX covering 230-240 Mc/s. (1.2-1.3 metres) and intercom amplifier. Complete with 15 valves, 500 microamp check and tuning meter, circuits and instruction book. (American manufacture) In magnificent condition, **60/-** carr. 10/-.

ATTACHMENTS FOR ABOVE:

Variometers ...	20/-
Headphone and microphone assembly ...	13/6
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Relda Radio Ltd.

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LOUD HAILER SPEAKERS

Sound powered with output transformer, impedance of speech coil 7 ohm, handling capacity 8 watts. Ideal for inter-communication. Complete with carrying strap. Price **20/-**. Packing and carriage 5/-.

WHEATSTONE BRIDGE. Consisting of four stud switches: 0-10 ohms, 0-100 ohms O-INF. Galvanometer centre zero F.S.D. 2.5 mA. Ranges easily extended. Housed in oak cabinet 16 x 7½ x 6in. Complete with instructions, **40/-**. P. & P. 4/-.

MUIRHEAD VERNIER SLOW MOTION DRIVES. Scaled 0-180 deg. Ratio 25 to 1. 3in. dia. **10/6**. P. & P. 1/6.

R.T.-7/APN-1 ALTIMETER TRANSCEIVER. Brand new complete with 14 valves: 3-12SJ7, 4-12SH7, 2-12H6, 1-VR150, 2-9004, 2-955. Famous Wobbulator Unit, Dynamotor, Relays 3,500 ohms and 6,500 ohms. A.F. amplifier. Receiver section covers 400-450 mc/s. Transmitter sweeps 418 to 462 mc/s. Ideal for model control work, etc. Only **35/-**, carriage 10/-.

PUSH BUTTON COIL PACKS. 465 Kc/s. I.F. Gram., long, medium and 6 short waveband spread. **8/6**. Post 1/6.

RELAYS. 6,500 ohms and 3,500 ohms. **8/-** pair, Post paid.

WAVEMETER TYPE W1433. Frequency 154-260 mc/s., with crystal check and calibration chart. Mains 50 cycle. **50/-**. Carriage 10/-.

BENDIX RECEIVER MN26.C. Covering 150-1,500 kc/s in 3 bands. Valves used 5-6K7, 2-6N7, 2-6J5, 1-6F6, 1-6L7. Complete with switching motor and dynamotor. This superb unit has been modified for 12 v. operation. Ideal car radio. With circuit. Only **80/-**. Carr. 8/6.

WESTON 1 Amp. H.F. METERS. 2in. circular. Brand new, **5/6**. P. & P. 1/-.

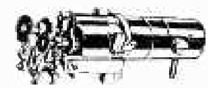
ARMOUR RECORDING WIRE. U.S.A. top quality on original reels. Length 3,700 yds. **10/-**. P. & P. 1/6.

COMMAND RECEIVERS. 1.5-3 mc/s. fully valved, with circuit. **65/-**. P. & P. 3/6.

LUMINOUS MAGNETIC MARCHING COMPASS. Pocket size. Brand new with instructions. Only **12/6**. P. & P. 1/-.

COMPLETE HEADPHONE AND 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.

AMERICAN GEARED MOTOR. 24 v. D.C. with built-



in precision gearbox. No. 1 drive 24 R.P.M. No. 2 drive 6 R.P.M. On 12 v. No. 1 drive 16 R.P.M. No. 2 drive 4 R.P.M. Overall size of motor and gearbox, 7½in. x 3½in. x 3in. Weight 1 lb. 14 ozs. Brand new. ONLY **17/6**. P. & P. 3/-.

TRANSISTORS in Practice

6.—R.F. AMPLIFICATION

By R. Hindle

(Continued from page 120, April issue)

THE tap is assumed to be midway along the coil and the two capacitors are assumed equal. Therefore there is no signal between the two centre-taps, capacitor and inductive. As the inductive tap is at zero (earth) signal potential the capacitor centre-tap must also be at zero signal potential and so no signal is fed back.

In practice, the exact inter-electrode capacitance cannot be accurately forecast because besides the valve itself, the base and the wiring all add to the feedback strays, but by providing a variable neutralising capacitor the correct value can be chosen by adjustment whilst setting up the receiver. It is clear from this argument that in actual fact the tap on the inductance need not be in the centre so long as the capacitors are so arranged as to have a like proportion. Under these conditions also the bridge can be balanced.

A tapped anode coil is not an essential. Phase reversal can be obtained by means of a secondary winding connected in the appropriate sense so that the required phase relationships are provided. This method of neutralising is given in Fig. 34. The neutralising capacitor size will be determined by the ratio of the transformer—if this were 1 : 1, of course, Cn would have to equal Cag.

Neutralising Transistors

The same arguments apply to transistor circuits, but with one difference—the feedback through the transistor is not purely capacitive but has a resistive component also. For perfect cancellation, therefore, the neutralising feedback loop should also consist of a resistance and a capacitance. The circuit is in Fig. 35 where the transistor internal feedback path is shown dotted and outside the transistor as Ccb and Rcb.

But of course, the practical man is not necessarily a perfectionist. All that he wants is to prevent instability and this he can do by feeding back through the neutralising circuit a signal that is not necessarily exactly anti-phased to the feedback via the stray path internal to the transistor provided that it has a component that reduces the effective feedback to below the level of instability. The neutralising components, therefore, are not so critical as it seemed at first glance. It is quite common, in fact, for the resistive part of the feedback to be ignored and a capacitance only to be included in the neutralising circuit. Nor is the value of this component very critical under most circumstances. Some degree of positive feedback, so long as it is below the value that would cause instability or distortion does, in fact, increase the sensitivity of the circuit.

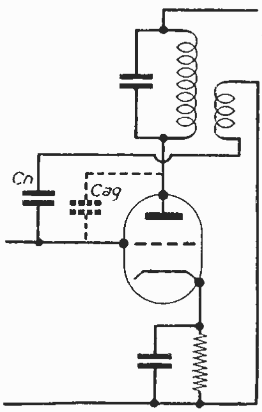


Fig. 34.—The transformer neutralising circuit.

There are benefits to be derived from complete neutralisation (referred to as "unilateralisation" because by this means the transistor is made into a device that effectively conducts only in one direction). In particular, by eliminating the resistive feedback the interdependence of input and output resistances, a complicating factor in transistor design work, is avoided and the more highly developed theoretical considerations are similarly simplified. But to set up such a condition is not an easy matter for the home constructor to face and he will generally take the easier way out by selecting a feedback condition that prevents instability without aiming at theoretical perfection. Indeed, the internal feedback that causes this trouble, being a characteristic of the transistor itself, and transistor characteristic spreads being what they are, the circuit could be completely unilateralised for only one transistor, and a replacement transistor is unlikely to have the same constants.

In fact, in practice, transistors commonly used at present do not appear to be at all critical regarding the exact values of neutralising components used and commonly published designs for home construction specify fixed components rather than the variables that the experimenter in earlier valve days used to adjust with such care.

It should be pointed out that it is not sufficient just to avoid the point of instability. Before the circuit goes unstable there will be a degree of distortion and so some margin of safety should be allowed for.

At this point practical experience in transistor

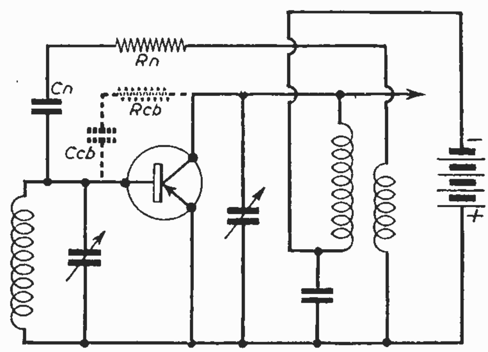


Fig. 35.—The neutralised transistor stage.

R.F. amplification is sought and so a stage of tuned R.F. will now be added to our experimental transistor receiver.

An R.F. Stage

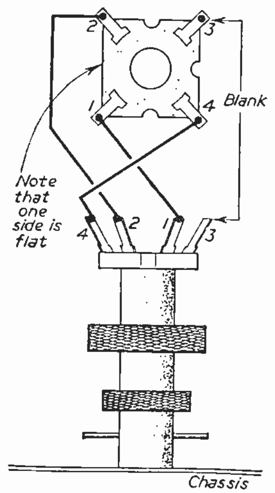
Fig. 36 gives the circuit for the R.F. stage. L2 is the coil used previously for the regenerative stage but, as will be seen from the circuit, the secondary winding that was used previously for the regenerative feedback is now used for the neutralising feedback across the R.F. stage. The first move, therefore, is to disconnect the wiring previously going to this winding and to complete the collector wiring of the detector transistor without this winding as shown in Fig. 36, in effect connecting together the two points that previously were connected to the two ends of the feedback coil. Another change is to break the connection from the bottom end of the tuned winding of this coil, which was previously connected to earth, to connect C5 which is .01 μF from this end of the coil to earth and also to connect the same end of this coil to the negative battery supply. The collector of the R.F. transistor will be connected to the upper end of the tuned winding of this coil in due course and will receive its current via the coil, which thus forms the collector load.

The R.F. stage is built up on a small aluminium sub-chassis cut from a piece of thin alumiuium to the shape and dimensions given in Fig. 37. Before drilling this chassis it will be as well to check that the positions of the holes are right for the components to be used. The two holes marked "x" are intended to take small tag strips, each with one tag plus earth, and it is these that might vary because such tag strips do vary in size. When mounted, these strips should lie $\frac{1}{8}$in. from the edges of the chassis, one along the inside top of the chassis and the other along the outside bottom of the chassis. The wiring diagram will clarify this instruction.

The chassis, which in the flat should look like the drawing in Fig. 37, should be folded so that the surface as drawn is inside and the corner along line "a" is square. The two fixing flanges at the bottom are then bent square with the walls of the chassis so that the shorter one on the $1\frac{1}{4}$in. side bends outwards and the longer one ($1\frac{1}{2}$in.) inwards as in Fig. 37 (b). This should now be placed on to the main chassis to occupy the corner between the front panel and the regenerative coil already mounted. This sub-chassis should fit flush with the front panel and should enclose the hole through which the lead from the half of the tuning capacitor not previously used passes. Holes are then marked and drilled in the main chassis to coincide with the holes on the R.F. sub-chassis. For this purpose the tuning capacitor should be disconnected and removed, and preferably it should be left off until later on when the sub-chassis is screwed on to the main chassis.

Having thus prepared the main chassis, the R.F. stage can be constructed and this is done before mounting the sub-chassis on to the main chassis. Up to now in this series the soldering in to the circuit of transistors has been avoided, but now with an R.F. stage liberties can no longer be taken or instability will result, so this is the point at which the soldering-in technique is to be adopted. The warnings previously given, however, with regard to the avoidance of damage to the transistors by the application of heat from the soldering iron has to be heeded and, in fact, the transistor is the last component to be wired to the sub-chassis. The two soldering tag strips are provided as convenient points to which the transistor leads can be soldered. The hole alongside the mounting hole for the tag strip at the top of the sub-chassis is to take the base lead to the circuit inside the sub-chassis.

The coil is mounted in the 5/16in. fixing hole, with the coil itself projecting into the inside of the chassis. The R.F. chassis thus forms the screen round this coil, which is also in this way mounted at right angles to the other coil, so



This additional illustration clarifies the connections to the coil shown in Fig. 29a of the March issue.

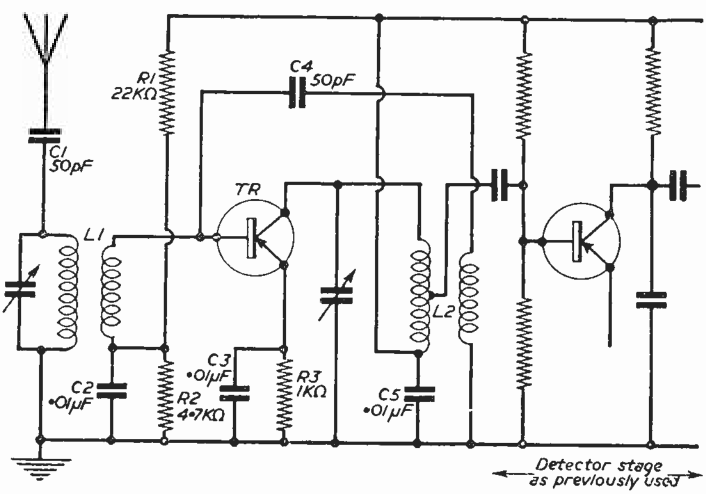


Fig. 36.—Circuit of the R.F. stage.

reducing coupling between coils to negligible proportions.

Wiring

The wiring of the sub-chassis can now proceed according to Fig. 38. The components mounted on the outside tag strip have to be so placed that they will fit into the space available underneath the coil on the main chassis and so, before doing this part of the wiring, it will be as well to try the sub-chassis in position so as to see what space is available. Miniature components must, of course, be used for a chassis of this size. Inside the sub-chassis the coil can be connected up. Four connections will be left for attention after the mounting of the sub-chassis, i.e., C1 to

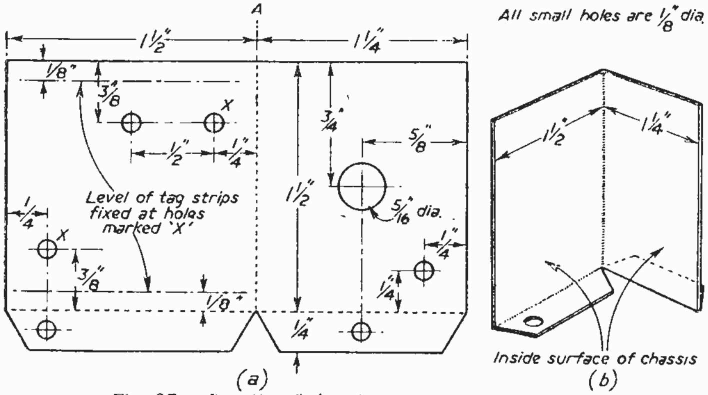


Fig. 37.—Details of the chassis for the R.F. stage.

the aerial input, C4 to the neutralising winding, the lead from the coil to the tuning capacitor and the lead from R1 to the battery negative lead tag. Finally the transistor itself can be fixed. This is held in place outside the sub-chassis by its wires and as these are soldered they must be held in the jaws of a pair of small pliers which will act as a heat shunt. The pliers must be in contact with the wires and not merely with sleeving, of course, but sleeving must be used, short enough to leave room for the pliers but yet in such a position to prevent short circuiting of the leads. The base lead passes through the hole in the sub-chassis to be soldered to the tag as shown in the wiring diagram, and this connection is first made. Then the emitter lead is soldered to the outside tag strip. The collector connection goes direct to the second coil, and so this connection has to be left until the sub-chassis is in position.

It will be unsatisfactory to take the aerial lead from inside the sub-chassis to the socket previously used for this purpose at the rear of the main chassis alongside the second coil. Consequently a separate socket should be mounted either on the front panel inside the sub-chassis area, or on a bracket placed at the side of the chassis, again inside the sub-chassis area. A very convenient way, and that adopted on the prototype for first testing, was not to wire C1 on to the coil as shown in Fig. 38, but instead to solder it to the tag on the appropriate half of the tuning capacitor above the main chassis and to connect the aerial lead directly on to the other end of C1.

It is assumed that the tuning capacitor used is fitted with trimmers. If this is not so it will be necessary to mount two trimmers alongside the main tuning capacitor above the chassis. These are necessary, now that two stages are to be tuned, and the procedure is similar to that adopted when setting up a valve receiver, except that no tuning scale has been used and so there is not the need to tune up to the calibrations determined by such a dial. A signal at the upper end of the tuning range is used first, and the coil cores adjusted for maximum signal: then a signal in the lower half of the waveband is used and the trimmers adjusted for maximum signal. These two processes proceed alternately until satisfied that the best results are being obtained. It would be a useful refinement if one of the small reduction drive units were fitted to the tuning capacitor spindle to aid tuning. In the absence of signal in the earlier stages it will be found that as the circuits come into tune there is a slight rushing noise in the earphones.

LIST OF PARTS FOR R.F. STAGE

C1—50 pF	Miniature	R1—22 KΩ
C2—.01 μF		R2—4.7 KΩ
C3—.01 μF		R3—1 KΩ
C4—50 pF		TR—Goltep V6/R8
C5—.01 μF		L1—Osmor
		L2—Osmor (as used for regenerative Detector.)

Components unspecified are as used in earlier parts of the design.

(To be Continued)

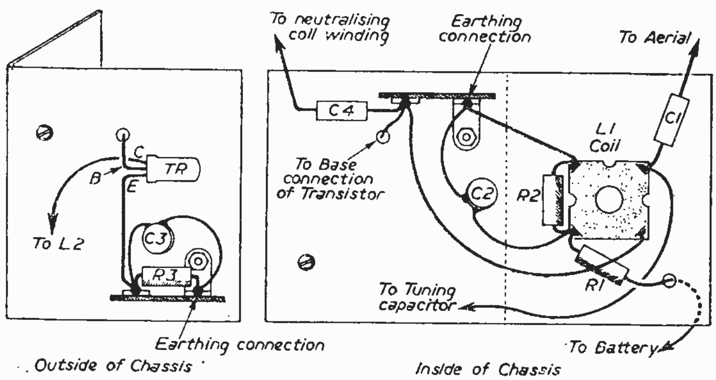


Fig. 38.—Wiring diagram of the R.F. stage.

Re-Converting the R.D.F.1

HOW TO MODIFY THIS POPULAR EX-GOVERNMENT RECEIVER FROM TV TO F.M. USE

By A. Sydenham

ANYONE who purchased the ex-Government R.D.F.1 unit for conversion to TV and who now has it lying idle will find that it is possible to modify the chassis as a F.M. receiver, complete with front end, four stagger-tuned I.F. stages (two of which may be limiters), two audio stages, power supply. By utilising most of the original material, expense is kept small and a self-contained receiver results which works surprisingly well despite the fact that the first three valves are operating well above their recommended working frequencies.

The circuit is illustrated in Fig. 1, which, although looking forbidding at first, is not so, most of it being already in existence, the main section of the diagram comprising the original I.F. strip. Small modifications are required here which include building up the discriminator section.

The remainder of the diagram shows that part which must be built but as the power supply and audio sections—V10, V11, V12—occupy the positions occupied by the previous supply, plus the fact that the "front end"—V1, V2, V3—stands in front of it, there is little complication or need for drilling.

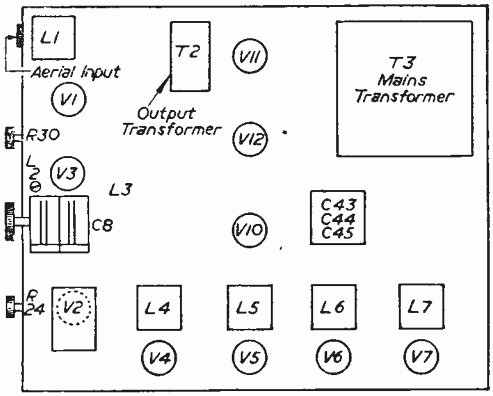


Fig. 2 (a).—Top of chassis layout.

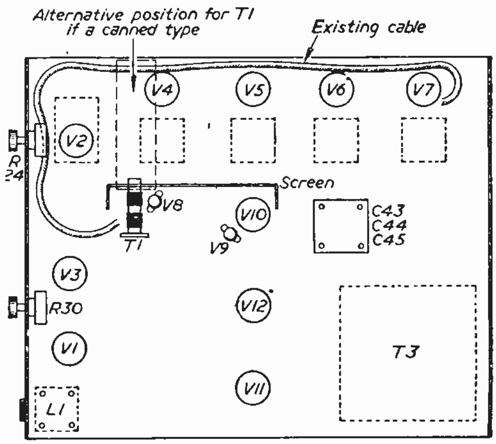


Fig. 2 (b).—Underside of chassis.

Modifications

First strip all components from the chassis except the actual I.F. strip and its wiring, which

LIST OF COMPONENTS

NOTE.—The majority of the components associated with valves 2, 4, 5, 6, 7, are already in position. Additional capacitors of some 500 pF might also be found connected across the screen decoupling capacitors and these may be left in place.

Capacitors

C1, C34—3 pF.
C2, C3, C5, C9, C16, C18, C20, C23, C28, C31, C32, C39, C40, C42—0.01 μF.
C6, C12—100 pF.
C4, C7, C10, C13, C15, C17, C22, C27, C29, C30, C35—50 pF.
C8—20 pF, twin gang.
C11—1 pF.
C14—30 pF, trimmer.
C19, C21, C26—200 pF.
C24, C38—2,000 pF.
C25—500 pF.
C33—10 pF.
C36—4 μF.
C37—300 pF.
C41—50 μF.
C43, C44, C45—8 × 8 × 8 μF.

Resistors

R1—2 K.
R2, R5, R21, R31—5 K Ω.
R3, R11, R13, R27—100 Ω.
R4, R6, R14—100 K Ω.
R7, R19—50 K Ω.
R8, R9, R12, R16, R17—1 K Ω.
R10, R18, R32—27 Ω.
R15, R20—47 K Ω.
R22—68 Ω.
R23—22 K Ω.
R24—1 M Ω pot.
R25—20 K Ω.
R26—3.3 M Ω.
R28—470 K Ω.
R29—270 Ω.
R30—50 K Ω pot.
R33—68 Ω, 5 watt.

Valves

V1-V7—SP61.
V8, V9—EA50.
V10—EC52.
V11—6V6.
V12—5V4.
T3—mains input. Output: 250-0-250 v. at 100 mA, 6.3 v. at 6 amps, 5 v. at 2 amps.
T2—To match 6V6 to LS.
LFC—10 Henries, 100 mA.

leave intact. Mount components as illustrated removing the EA50 diode valveholder at the rear of the chassis and re-fixing it underneath in front of the EC52 valveholder. (A position will be found where fixing holes already exist.)

Wind L1, L2, L3 and T1 as given in the table. (Note: A commercially made transformer may be used for T1 if desired, in which case it must be mounted horizontally across the I.F. strip—see diagram.) Mount these coils, then remove all I.F. transformer cans and strip off the windings, removing at the same time any parallel-connected damping resistors. The valve in the first can—the large one—becomes the mixer, but the coil former is not used. In can 2 remove the H.F. choke at the bottom. Solder an end of 36 s.w.g. d.s.c. wire to one of the tags previously associated with the choke, then wind 20 turns on to the coil former, soldering the end to the other tag from which the choke was freed. This coil is L4 (a). Cover winding with a single layer of tape then wind an identical coil on top, connecting its ends to the original coil tags. This is L4 (b). Wind 20 turns of the same wire on each of the remaining coil formers, connecting the ends to the respective tags. In can 4 cut the chassis return lead (black wire) and insert R14, C27. In can 5 remove the green wire that originally went to the diode cathode and insert R19, C30. Connect a valve top-cap and lead to upper end of L7. Replace all cans.

Below chassis remove the 5,000 Ω potentiometer associated with the I.F. strip, also remove bias resistors from the first, fourth and fifth valveholders in the strip, connecting the freed pins to chassis.

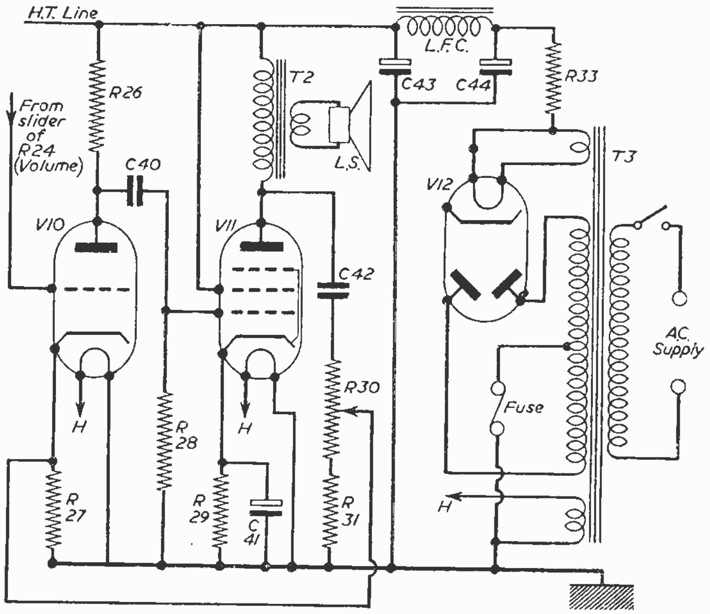


Fig. 1 (c).—Power and audio section.

Disconnect R15 (originally 2.2 KΩ) which lies across the underside of the can and solder in a new resistor of 47 KΩ. Solder the length of screened cable which runs at the side of the strip to pin 3, V7, at one end and to T1 at the other. Modify the screen and anode feeds to conform to those specified. Wire up remainder of circuit

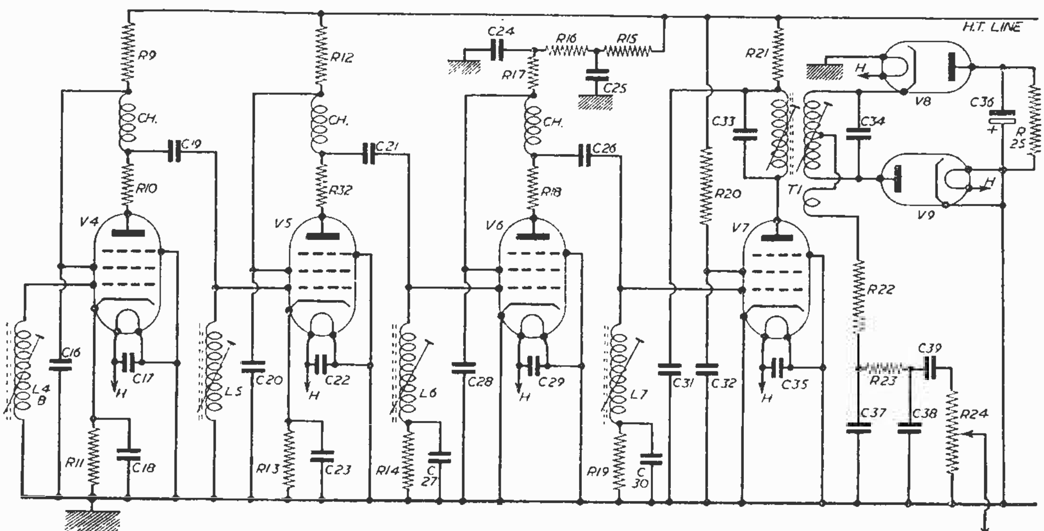


Fig. 1 (a).—The F.M. section of the receiver.

keeping all leads associated with valves 1, 2, 3 as short and direct as possible even at the expense of tidiness. Electrolytics C43, C44, C45 are parts of the existing block.

Testing the Set

This completes the receiver. Valves may now be inserted, routine tests made for H.T. shorts, etc., and the receiver switched on.

I.F. alignment should be carried out with a signal generator but subsequent "front end" alignment may be made on the signal and for this a dual tuning wand will be found a useful accessory.

COIL CHART

Coil	Turns	Wire (s.w.g.)	Former (dia. in.)	Remarks
L1	Primary 2 Secondary 4½	22 22 enam.	0.3 0.3	P.V.C. covered over sec. } canned Spaced wire thickness }
L2	4¼	28 enam.	3/8	Spaced twice wire thickness
L3	3¼	28 enam.	3/8	Spaced twice wire thickness
L4-7	See Text			
T1 (see text)	Primary 28 Secondary 15+15	28 enam. 28 enam.	0.3	Closewound Bifilar, spaced $\frac{3}{16}$ in. from primary
	Tertiary 10	28 enam.		Over primary—remotest end from sec.

Broader Tuning

In the I.F. strip, fixed resistors, value 6.8 to 10 KΩ may be connected across the coils to broaden the bandwith if necessary.

R.C.A. Junction Transistor

THE 2N404 is a junction transistor of the germanium p-n-p alloy type. It is specifically designed for use in switching circuits of compact, medium-speed military and industrial electronic computers. This transistor is also useful in other low-level, medium-speed "on-off" control circuits.

The 2N404 features a maximum collector-to-emitter saturation voltage of −150 millivolts at a current gain of 30, a maximum collector cut-off current of −5 ua at 25°C and −90 ua at 80°C, and a minimum alpha cut-off frequency of 4 megacycles per second. These features permit the design of electronic computers having exceptional stability over wide variations in temperature.

Careful control of the characteristics of this transistor with respect to saturation current, leakage current, breakdown voltage, and switching time contribute to the dependable performance of the 2N404 in critical military and industrial computer applications.

The 2N404 is hermetically sealed in a metal case. Its maximum diameter is 0.360in. and its maximum body length is 0.250in.—R.C.A., Gt. Britain Ltd., Lincoln Way, Windmill Road, Sunbury-on-Thames, Middx.

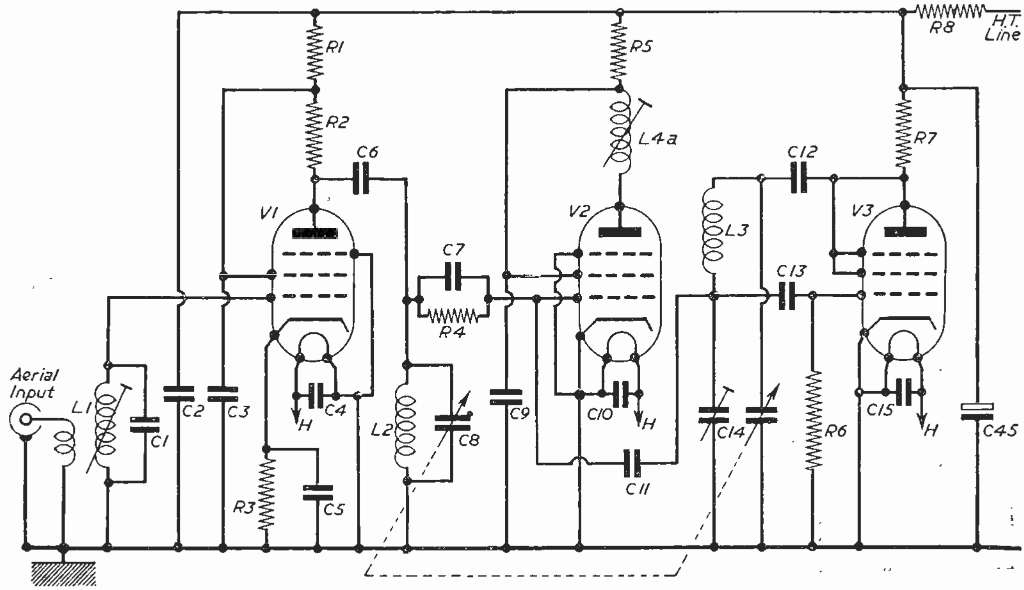


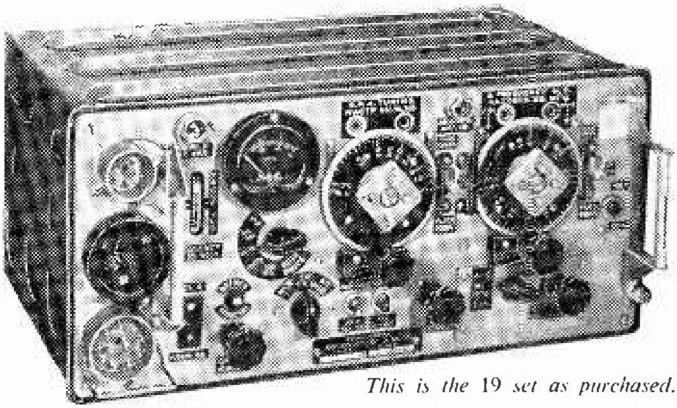
Fig. 1 (b).—The A.M. section of the converted R.D.F.1.

Converting the 19 Set

HOW TO MODIFY THIS POPULAR EX-ARMY RECEIVER FOR AMATEUR USE

By K. E. Marcus

(Continued from page 105 April issue)



This is the 19 set as purchased.

CONTINUING the modification of range coverage, which is the eighth phase. (F) Reconnect C10E to tag 5 of L21 and C10F to tag 5 of L6 (refer to Fig. 1).

(G) Fix 50 pF trimmers to the following coils: (1) L22 instead of C10.1A (10 pF). (2) L7 between lug 5 (bottom lug leading to range switch S11A, segment 2) and earth. (3) L4 between lug 5 (bottom lug leading to range switch S11A, segment 4) and earth.

(H) From four-gang condenser remove in each section carefully six plates from the rotor and five plates of the stator. This reduces the maximum capacity from 470 pF to 253 pF. Thereafter, bring all the four trimmers on the gang to minimum capacity.

(I) Between range-switch S11A, segment 6 and the grid of the mixer, there is a capacitor C5A (0.1µF) in parallel with a resistor R42A (10 KΩ). Remove these and join grid line and gang directly to segment 6.

The set should next be re-tested. It will cover now, on the low range 3.3—7.4 Mc/s, on the high range 7.0—15.5 Mc/s. But it is not time yet for realignment.

Ninth Phase (B.F.O. and Meter)

This part of the conversion concerns itself with the B.F.O. and the meter.

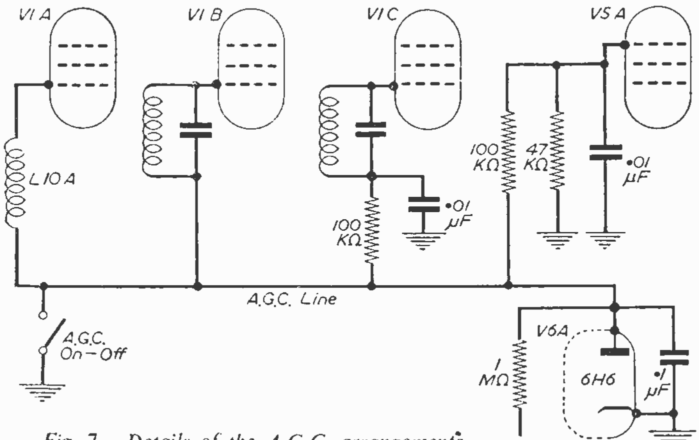


Fig. 7.—Details of the A.G.C. arrangements.

(A) Remove the B.F.O. coil from its can, unsolder all components and unwind the coil.

(B) Mount 4 Perspex 1/32in. thick washers 1in. dia. close fitting to the coil former, space them ¼in. apart, thus creating 3 winding chambers, and fix them with dope.

(C) Wind 75 turns of the salvaged Litz wire into each chamber and connect up according to Fig. 8.

(D) Drill holes into the can for the leads to B.F.O. valve—grid (A) and to het. control (B). Mark connections C and D on the base plate of the coil unit and reassemble it into the can.

(E) Fit the B.F.O. assembly back into the set and finish wiring up the detector—B.F.O. valve according to Fig. 8.

(F) Use the old B-set tuning condenser as het. tone control. Bend one starter plate in such a way that it shorts to the rotor at full mesh. In this way the het. tone control works as a B.F.O. on/off switch when brought to full mesh.

(G) There was a lead running from the cathode of V1B (1st I.F. amplifier) to the meter switch. This lead is taken through a hole in the chassis to the meter, and connected to its positive terminal via a resistor 27KΩ, according to Fig. 9.

This meter will now give the tuning indication.

Final Remarks and Alignment

The conversion is now completed and it is advisable to go again round all parts of the set to remove all surplus wiring and components before alignment is begun.

As the set is highly sensitive an output meter and a signal generator are essential. The output meter is set to 600Ω impedance and plugged into the 600Ω line jack. The injection of the generator signal is through a parallel combination of a resistor 100KΩ and a

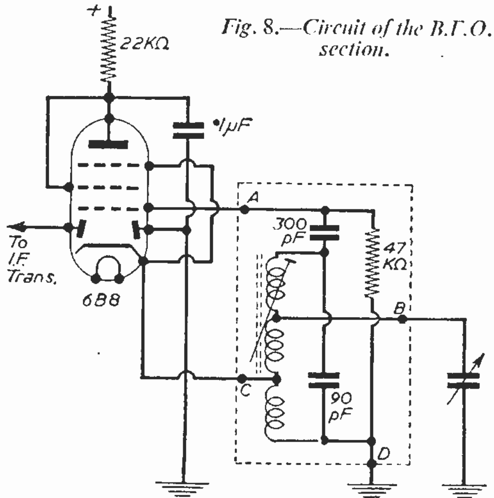


Fig. 8.—Circuit of the B.F.O. section.

capacitor 0.01µF into the grid of the valves, without taking off the grid leads. All screening cans should be in position.

The alignment is done with A.G.C. on, B.F.O. off, audio gain control full on, R.F. gain control full on.

The I.F. is 465 Kc/s. The sensitivity expected for 50 mW out is 50µ V into the mixer grid. The I.F. curve should be checked for equal skirts at 6db down and 20db down. The bandwidth at 6db down should not be less than 6 Kc/s.

After bringing back the signal generator to I.F.-middle the modulation should be switched off and the het. tone control moved just out of

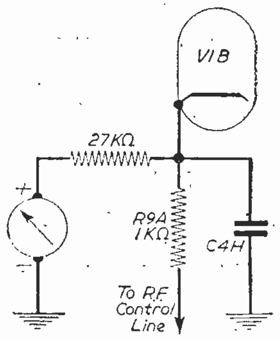


Fig. 9.—Details of connection of the signal strength meter.

mesh. The B.F.O. coil should now be aligned to zero beat, so that a further moving of the het. control produces a rising beat note.

The oscillator tracking and the R.F.-alignment follows the usual practice. This will require some "wire pulling" at the low frequency end of each range. A "magic wand" (dust iron one end, brass the other) will prove useful for determining whether to "push" or to "pull." On the high frequency end of each range it is all trimming.

The lower range should be aligned first. Trimming to be done underneath the chassis. Only if one of these trimmers does not "reach" use should be made of the corresponding gang trimmer.

The sensitivity expected for 50 mW out is 3µV into the aerial on all frequencies. The R.F. alignment should be repeated if one end of the range is less sensitive than the other.

News from the Clubs

BURY RADIO SOCIETY

Hon Sec. : Mr. L. Robinson, 56, Avondale Ave., Bury, Lancs.

THE above society holds its meetings at the George Hotel, Kay Gardens, Bury, at 8 p.m. on the second Tuesday of each month.

Forthcoming meetings : April 8th, a lecture by Mr. H. Whalley (G2HW), subject to be announced later. May 13th, Technical Forum—"Aerials."

CRAY VALLEY RADIO CLUB

Hon. Sec. : S. W. Coursey (G3JJC), 49, Dulverton Road, New Eltham, London, S.E.9.

AT the meeting of the Cray Valley Radio Club, to be held at 8.0 p.m. Tuesday, April 22nd, 1958, at the Station Hotel, Sidcup, Kent, Mr. C. Burgess will give a talk entitled "Some Aspects of Directional Aerial Design." Visitors welcome.

SCIENCE MUSEUM RADIO SOCIETY

Hon. Sec. : G. C. Voller.

THE 1957/8 session of lectures comes to an end on April 15th, when the British Amateur Television Club will give a demonstration of Amateur Television. This meeting will be open to non members, who are requested to make prior arrangements with the Secretary, Mr. G. C. Voller. Ken : 6371, ex 237.

NORTHAMPTON SHORT WAVE RADIO CLUB (G3GWB)

Hon Sec. : S. J. Berridge (G3FTW), 20, Ethel Street Northampton.

THE Club now has 22 members, 11 of whom are licensed amateurs. At the close of the winter programme, which included five recorded lectures and two film shows, the committee would like to express its thanks in this column to those who gave so much assistance, particularly to Roy Goode (G3GHU), for the loan of his tape-recorder and to Jim Robinson (G3IAI) for the use of his services, films and projecting equipment. With the opening of the summer season prospective new members are invited to contact the Hon. Sec. at the above address for details of proposed Club activities which are now in process of being arranged.

LEICESTER RADIO SOCIETY

Hon. Sec. : P. G. Goadby (G3MCP), 535, Welford Road, Leicester.

THE following are fixtures for April :—

14th : Symposium on the "Cub" by G3MCP.

21st : Free night (work on new clubroom, etc.).

28th : Aerials by G2CFC.

The club meets every Monday at H.Q. as above at 7.30 p.m.

CLIFTON AMATEUR RADIO SOCIETY

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

THE highlight of the February meetings was on Friday, February 21st, when members heard a most interesting talk by P. Horwood, G3FRB, on "Receiver Alignment." In covering R.F. and I.F. amplifiers, and crystal filters, Mr. Horwood gave many useful tips to improve the performance of communication receivers. A further talk has been promised when it is hoped to cover other stages of receivers and give details of "S" meter circuits.

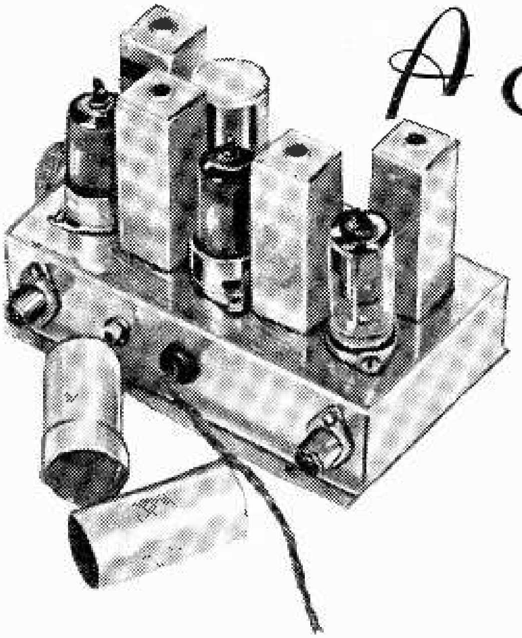
Programme for April :

11th. "K.W. Products for the Amateur," by R. Shears, G8KW.

18th. Constructional Evening and Ragchew.

25th. "Direction Finding," by C. Hatfull, G3HZI.

Meetings are held every Friday at 7.30 p.m., at the clubrooms, 225, New Cross Road, London, S.E.14, when new members and visitors will receive a warm welcome.



A Switched F.M. Tuner

A HIGH-QUALITY TUNER WITH "DIOMATIC" FREQUENCY CONTROL

By P. Michael

SEVERAL units for the reception of the V.H.F. transmission have been described in these pages, but so far none has the facility of station switching as opposed to station tuning with the aid of a magic eye or by ear.

The advantages of switching are obvious, but unfortunately it is impossible simply to substitute a switch for the tuning condenser, as the very real problem of oscillator drift raises its ugly head. To combat this problem a compensating device of one form or another has to be fitted. Usually this takes the form of a reactance valve such as has been described in these pages quite recently. By using the new circuitry of "Diomatic" frequency control, a control about ten times as effective as a reactance valve is possible.

As may be seen from the diagram the circuit is unusual but very simple, compactness having been obtained by employing double valves throughout and by using midget construction principles.

Circuit Description

1. Earthed grid R.F. stage, V1A.

By using a triode in this position in place of the more usual pentode, a very much lower noise factor for the receiver has been obtained as well as a simplified circuit. There is, however, a disadvantage that modulation hum may appear unless heater chokes are used. These are rather bulky, so ferrite beads have been used with very great success in removing this bugbear of earthed grid circuits. The signal developed across L1 is injected into the cathode and appears at the anode after amplification. It is unnecessary to tune L1 accurately, as it is damped by the very low impedance of the cathode. L2, however, is not so damped and is consequently tuned to the centre station to ensure a similar level on all three stations.

2. The frequency changer, V1B.

Experience has shown that in general, conventional mixers are not so efficient at V.H.F. as self-mixing oscillators. The circuit is of an electron-coupled Hartley oscillator working as a multiplicative mixer. It is essential for correct oscillator operation that C4 is wired as shown.

3. The I.F. amplifier, V2A.

The cathode of this stage is directly earthed. Grid bias is produced by grid current flowing in the 470K ohm grid resistor. This provides a degree of A.G.C. which is not essential on V.H.F. receivers as the following stage provides complete limiting.

LIST OF COMPONENTS

R1—220Ω	V2 } ECF80 or	C10—330 pF MC	E—Electrolytic
R2—1.5 K.	V3 } ECF82	C11—1,000 pF MC	L1 and L2—See text
R3—22 K.	Pair of matched diodes, OA79 or GEX34	C12—0.1 μF P	L3—Q PCM } C. & G. Kits. Ltd.
R4—1.5 K.	VR1—Variable 2 K.	C13—330 pF MC	L4—Q 1FM
R5—470 K.	C1—1,000 pF MC	C14—330 pF MC	L5—Q 1FM
R6—47 K.	C2—1,000 pF MC	C15—8 μF E	L6—Q 1D
R7—10 K. 1 W.	C3—33 pF MC	C16—12 μF E	1 Chassis
R8—47 K.	C4—1,000 pF MC	C17—12 μF E	3 Nylon loaded B9A valve holders. (2 with skirts and screens.)
R9—47 K.	C5—1,000 pF MC	C18—1,000 pF MC	1 Switch (1 pole 3 way)
R10—10 K. } matched	C6—10,000 pF MC	C19—1,000 pF MC	2 Co-axial input sockets
R11—10 K.	C7—1,000 pF MC	C20—12 μF E	1 Rubber grommet
R12—47 K.	C8—1,000 pF MC	C21—3-5 pF MC	3 Ferrocart beads
R13—10 K.	C9—1,000 pF MC	MC—Midget ceramic	
R14—47 K.		P—Paper	
V1—ECC81			

4. The driver limiter, V3A.

This stage is similar to the last stage, but working voltages are very much lower. Interference is completely eliminated by using this stage in conjunction with a ratio detector.

5. Ratio detector O.I.D.

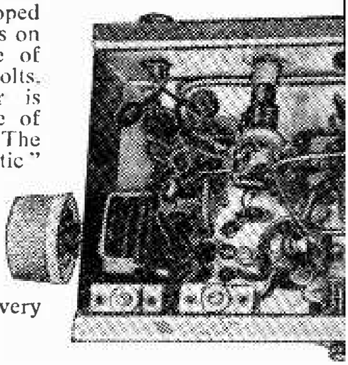
The operation of this form of detector will be found in text books on the subject and is too complex to describe here. For best interference limiting the voltage developed across C10 should be zero; on one side of this point it will be positive and on the other side negative.

6. Cathode follower output stage.

This is a straightforward design using a 10K ohm resistor in the cathode. It will be observed that there is no blocking condenser in the grid circuit. This has become redundant due to the "Diomatic" frequency control. The inclusion of this stage enables a long length of screened lead to be used between the amplifier and the tuner without fear of hum pick up or treble attenuation. This valve may be easily modified to a conventional amplifier giving very much higher gain. The anode provides a decoupled voltage source for the frequency control element.

7. The "Diomatic" frequency control circuit.

This is the most interesting feature of the unit. When incorrectly tuned, the voltage which is developed across C10 is amplified with a D.C. amplifier V2B. This changes the bias on the junction diode connected across the oscillator coil. The diode is biased to cut-off and acts as voltage sensitive capacitor, changing the oscillator frequency which reduces the error signal developed across C10. The bias on the diode should be of the order of 10-20 volts. A variable resistor is used in the cathode of V2B for adjustment. The use of "Diomatic" frequency control also enables the oscillator voltage to be confined to the oscillator coil which helps to keep radiation to very small proportions.



An underside vi

Construction

It is essential to follow the layout very accurately especially with regard to earthing points. Tags should not be used but leads soldered direct to the chassis. It is preferable to use a supply with one side earthed, but a balanced supply may be used. Wire all leads carrying signals by as short leads as possible. Wire

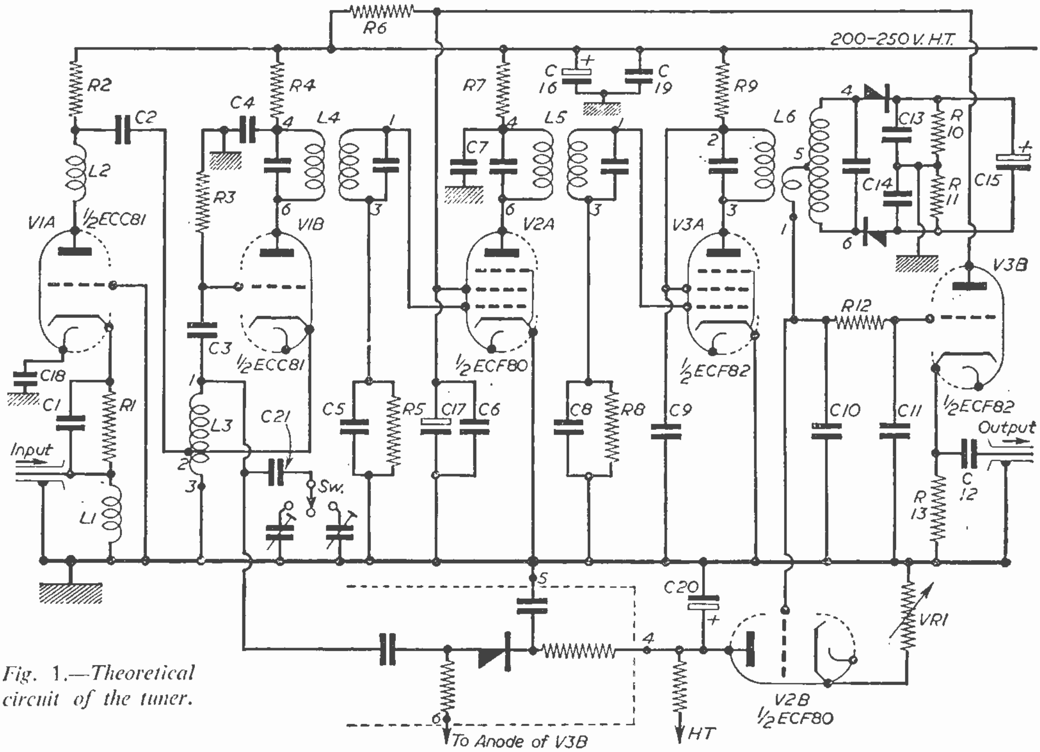
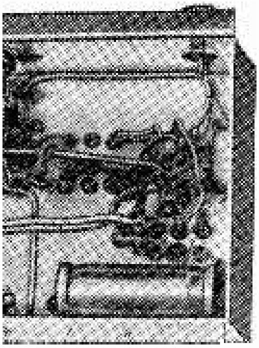


Fig. 1.—Theoretical circuit of the tuner.

the unit starting at V1 and finishing at Q.1D. The crystal diodes should be handled with care and soldered very quickly using a pair of pointed pliers and a heat shunt. Wire all H.T. dropping resistors vertically on short leads and connect them to a bus-bar after all else has been done. The bar should be thick copper wire conected at C16, taken direct to a tag on L2 and then bent at right angles and taken to the end of the chassis in line with the valves. V1 and V2 should be screened with a 2in. screening can. Check the wiring from Fig. 2.



of the tuner.

Alignment

Connect a high resistance D.C. voltmeter on its 100 volt range with the positive terminal on C17 and the negative on C20. Adjust VR1 for 15 volts. Connect meter across C15, and an unmodulated signal generator tuned to 10.7 megacycles between the chassis and the grid of V3A (pin 2). Adjust the top core of Q.1D for maximum voltage. Transfer input to the oscillator coil (pin 1 Q PCM) and adjust both cores on L4. and L5 for maximum voltage, reducing the input so that the voltage never exceeds 5 volts. Leaving the input across the oscillator coil, transfer the meter to C10 and earth. Now adjust the bottom core of L6. When adjusted the reading will increase and then pass zero to the opposite direction, the correct point is as it passes through zero. Re-check all the coils as above, adjusting as necessary.

Tuning

Connect the aerial to the input socket and an amplifier to the output socket. A hissing should be heard in the loudspeaker. With the switch in the centre position adjust L3 with a plastic-bladed screwdriver until the Home Service is heard. There will probably be two tuning positions, one of which sounds distorted whilst the other clicks into tune. Now move the switch in one direction and adjust that trimmer for the Light programme and similarly for the Third in the other position. On the Third programme

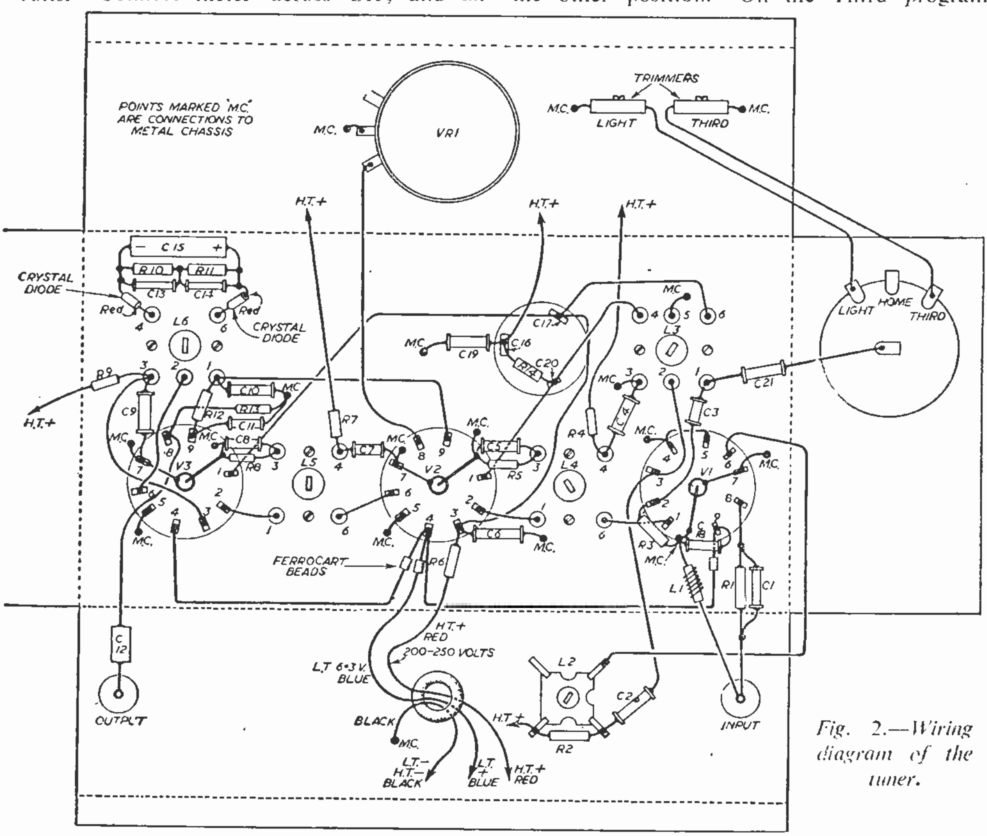


Fig. 2.—Wiring diagram of the tuner.

adjust L2 in conjunction with L3 for maximum voltage across C15. Retune the unit (L3 and trimmers) for zero voltage across C10.

(2) Insert a 47K ohm resistor in series with the anode lead (pin 2).

(3) Connect C12 to pin 1 instead of pin 8.

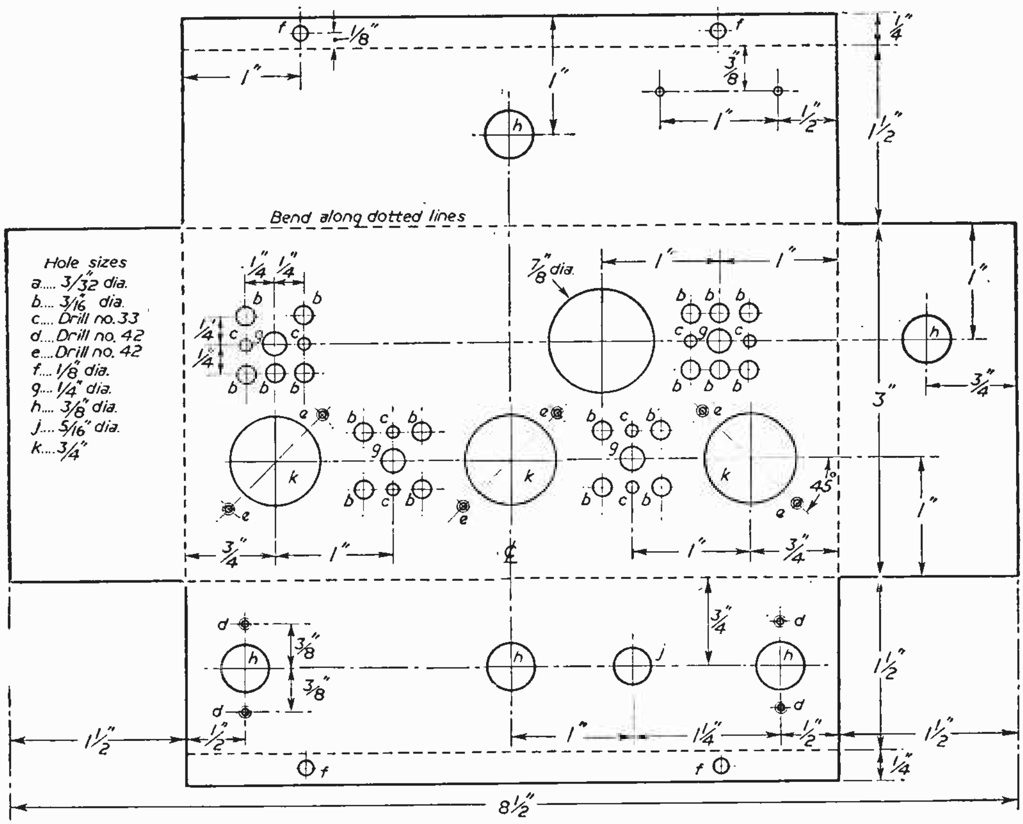


Fig. 3.—Full chassis data for constructing your own chassis.

Coils

L1 four turns of thin insulated wire on half a dust core.

L2 six turns of 20 s.w.g. enamelled on ¼in. former with grey tuning core.

Aerials

If you are in the primary service of the transmitter the tuner will probably work on a simple Band II dipole. However, it is highly recommended that a loft mounted dipole is used. For longer distances a loft mounted. two or three element aerial may be required.

Pre-amplifier

The cathode follower low impedance output stage has a gain of slightly less than unity and from a suitable signal will deliver 0.5 volts into the amplifier. This should be suitable for nearly all types of medium and high gain amplifiers. In a case where the amplifier is insensitive. this stage may be into a conventional amplifier delivering 10 volts.

(1) Replace R13 with a 1000 ohm resistor.

Power Supplies and Modulation Hum

The H.T. required is 200-250 volts at 30-40 mA. This must be adequately smoothed and decoupled. The L.T. of 6.3 volts at 1.2A should have one side earthed. If a centre tapped supply is used another decoupling capacitor at pins 4. 5 on V1. may be required to prevent modulation hum. A suitable component is a 1000 pF ceramic.

Radio Component Show, 1958

GROSVENOR HOUSE, APRIL 14th TO APRIL 17th

THE following is a complete List of Exhibitors at this year's Radio Components Show, in Stand order. This is the fifteenth Annual Private Exhibition of British Components, Valves and Test Gear for the Radio, Television, Electronic and Telecommunications Industries.

Exhibitor	*Stand No.*
Standard Insulator Co., Ltd.	1
Wandleside Cable Works, Ltd.	2
Geo. Salter & Co., Ltd.	3
Mullard, Ltd.	4
Diamond H. Switches, Ltd.	5
Zenith Electric Co., Ltd.	6
Thermo-Plastics, Ltd.	7
Cathodeon Crystals, Ltd.	8
Waveforms, Ltd.	9
Associated Electronic Engineers, Ltd.	10
Stratton & Co., Ltd.	11
Suflex, Ltd.	12
Mica & Micanite Supplies, Ltd.	13
H. J. Enthoven & Sons, Ltd.	14
Taylor Electrical Instruments, Ltd.	15
Morganite Resistors, Ltd.	16
Alfred Imhof, Ltd.	17
Radio Instruments, Ltd.	18
Belling & Lee, Ltd.	19
Connollys (Blackley), Ltd.	20
Mullard Overseas, Ltd.	21
Mullard, Ltd.	22
Wego Condenser Co., Ltd.	23
Woden Transformer Co., Ltd.	24
Carr Fastener Co., Ltd.	25
Duratube & Wire, Ltd.	26
Colvern, Ltd.	27
Goldring Manufacturing Co. (Great Britain), Ltd.	28
Erie Resistor, Ltd.	29
Cosmocord, Ltd.	30
British Insulated Callenders Cables, Ltd.	31
Reproducers and Amplifiers, Ltd.	32
Dubilier Condenser Co. (1925), Ltd.	33
Weymouth Radio Manufacturing Co., Ltd.	34
Collaro, Ltd.	35
Stability Capacitors, Ltd.	36
Goodmans Industries, Ltd.	37
Garrard Engineering & Mfg. Co., Ltd.	38
Jackson Bros. (London), Ltd.	39
Welwyn Electrical Laboratories, Ltd.	40
Vitavox, Ltd.	41
Painton & Co., Ltd.	42
Rola Celestion, Ltd.	43
A.B. Metal Products, Ltd.	44
Steatite & Porcelain Products, Ltd.	45
Richard Allan Radio, Ltd.	46
A. F. Bulgin & Co., Ltd.	47
A. H. Hunt (Capacitors), Ltd.	48
Multicore Solders, Ltd.	49
Partridge Transformers, Ltd.	50
Electro Acoustic Industries, Ltd.	51
Sydney S. Bird and Sons, Ltd.	52
Salford Electrical Instruments, Ltd.	53
Telegraph Condenser Co., Ltd.	54
Siemens Edison Swan, Ltd.	55
London Electrical Manufacturing Co., Ltd.	56
Reslosound, Ltd.	57
London Electric Wire Co. & Smiths, Ltd.	58
Egen Electric, Ltd.	59
James Neill & Co. (Sheffield), Ltd.	60
Westinghouse Brake & Signal Co., Ltd.	61
Standard Telephones & Cables, Ltd.	62
Long & Hambly, Ltd.	63
Wingrove & Rogers, Ltd.	64
Parmeko, Ltd.	65
Permanoid, Ltd.	66
Ferranti, Ltd.	67
Murex, Ltd.	68
N.S.F., Ltd.	69
Truvox, Ltd.	70
Measuring Instruments (Pullin), Ltd.	71
Telephone Manufacturing Co., Ltd.	72
Antiference, Ltd.	73
McMurdo Instrument Co., Ltd.	74
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Vactite Wire Co., Ltd.	76
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Anglo-American Vulcanized Fibre Co., Ltd.	102
Ross Courtney & Co., Ltd.	103
Technograph Electronic Products, Ltd.	104
Creators, Ltd.	105
Plannair, Ltd.	106
Linton & Hirst, Ltd.	107

Exhibitor	Stand No.
Electronic Components	108
Geo. Bray & Co., Ltd.	109
H. D. Symons & Co., Ltd.	110
Fine Wires, Ltd.	111
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Static Condenser Co., Ltd.	113
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Mallory Batteries, Ltd.	115
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Micanite & Insulators Co., Ltd.	117
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Marrison and Catherall, Ltd.	125
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Hassett & Harper, Ltd.	132
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Enalon Plastics, Ltd.	134
Aero Research, Ltd.	135
Hallam, Sleigh & Cheston, Ltd.	136
Lion Electronic Developments, Ltd.	137
Simmonds Aerocessories, Ltd.	138
W. T. Henley's Telegraph Works Co., Ltd.	139
Ever Ready Co. (Great Britain), Ltd.	140
Swift Levick & Sons, Ltd.	141
Newmarket Transistor Co., Ltd.	142
Ardente Acoustic Laboratories, Ltd.	143
Henry & Thomas, Ltd.	144
British Communications & Electronics	145
Ministry of Supply	146
Ministry of Supply	147
Department of Scientific & Industrial Research	148
Hinchley Engineering Co., Ltd.	149
M.O. Valve Co., Ltd.	150
Ekco Plastics, Ltd.	151
E.M.I. Sales & Service, Ltd.	152
Siemens Edison Swan Ltd. (Valve Division)	153
Morgan Brothers (Publishers), Ltd.	154
Anderton Springs, Ltd.	155
Standard Telephones & Cables, Ltd. (Valve Division)	156
Plessey Company, Ltd.	157
Plessey International, Ltd.	158
Technical Ceramics, Ltd.	159
Wireless Telephone Co., Ltd.	160
Telcon Magnetic Cores, Ltd.	161
Telegraph Construction & Maintenance Co., Ltd.	162
Magnetic & Electrical Alloys, Ltd.	163
Victoria Instruments, Ltd.	164
Mansol (Great Britain), Ltd.	165
Associated Iliffe Press, Ltd.	166
English Electric Co., Ltd.	167
Instrument Review	168
Brayhead (Ascot), Ltd.	169
Brayhead (Ascot), Ltd.	170
Brayhead Products, Ltd.	171

Northern Mobile Rally

Sunday, April 13th 1958, at Harewood House, Leeds.

BY kind permission of H.R.H. The Princess Royal, and the Earl and Countess of Harewood, Harewood House is to be the venue for the First Northern Mobile Rally. Organised by the Spen Valley Amateur Radio Society, in conjunction with the Leeds, Bradford and Leeds University Union Radio Societies, this first Annual Northern Mobile Rally will be held on Sunday, April 13th, 1958, from 12.15 p.m. to 6 p.m.

Rally Arrangements

Central stations will be sited at Harewood House, radiating on Top Bank, 80 metres and, it is hoped, 2 metres to guide visitors to Harewood from either Leeds or Harrogate. Fixed stations have undertaken to guide visitors into Leeds or Harrogate. Mobile stations are asked not to "call" the control stations until they are in Leeds or Harrogate.

On arrival, visitors will be directed to Reception, asked to leave their cards, sign in and receive a special Attendance Card. Car park is free (a special concession) and entrance fee to grounds, etc., is 1s. each.

Three judges will inspect the mobile equipment of those enlisting in the Concours D'Elegance, and equipment will be judged for neatness, etc. A trophy, to be held for one year, has been donated and will be presented by Mr. J. R. Petty (G4JW), the Regional Representative of the R.S.G.B.

Various items of equipment have been donated by members of the Radio Industry and these will be raffled to defray the cost of the Rally.

Harewood House will be open to visitors (1s. 6d.) per head, and Hostesses will be in attendance to direct visitors to the House, Grounds, Farm and other attractions of this Royal Residence.

Meals

There is a pleasant up-to-date cafeteria and in addition, a private room has been made available to those making bookings in advance.

Specimen menus will be sent on request.

Intending visitors are asked to write to the Spen Valley Secretary, Mr. N. Pride, 100, Raikes Lane, Birstall, Nr. Leeds. Car stickers will be available on request.

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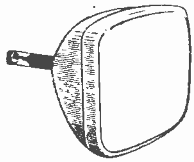
17in. £7. 10. 0.
14in. £5. 10. 0.



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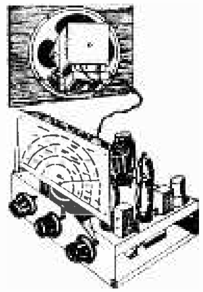
TUBES WITH BURNS, £1. Have one of these for stand-by or testing, while stocks last. Carr. included.

DENCO RADIOGRAM CHASSIS, 97/6



A.C./D.C. 4 w/band turret tuned s/het chassis with speaker. 5 valve international octal. Chassis size : 8½in. x 10in. x 12in. Ins., Carr., 7/6.

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5 valve (octal) s/het chassis, including 8in. speaker. 4 control knobs (Tone. Volume. Tuning. w/change sw.), 4 w/band with position for gram P.U. and extension speaker. A.C. Ins., Carr., 5/6.

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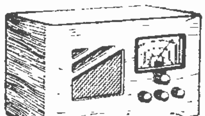
Made by famous manufacturer. R.F. E.H.T. unit included. Drawing 2/6 or **FREE** with order. Chassis in 3 separate units (Power, s/vision, Timebase inter-connected). These chassis can easily be fitted into existing console cabinets. Less valves and tube. Channel 1-2, 3-5. Easily converted to I.T.A. Ins. Carr. 10/6.

HOME RADIO, 79/6



A.C./D.C. Universal mains. 5 valve octal superhet. 3 w/band receiver. Can be adapted to gram P.U. In attractive wood cabinet. 18½in. x 11½in. x 8½in. Ins., Carr., 7/6.

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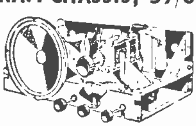

3 w/band & gram. 5 valve s/het International octal. Ideal table gram but still giving high quality output. 4 knob control. 8in. P.M. speaker, 7/9 extra. Set of knobs, 2/-. Chassis size : 12in. x 6in. x 9in. Less valves. Ins., Carr., 4/6.

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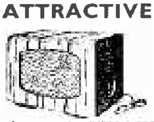

Complete, fitted with 8in. P.M. speaker "W.B." or "Goodmans" of the highest quality. Standard matching to any receiver (3-5 ohms) Flex & switch included. Money refunded if not completely satisfied. Ins., Carr., 3/6.

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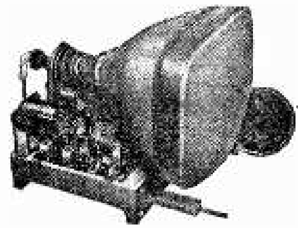

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6P28	10/9	6SG7	3/9	DF66	5/9	EF36	5/9
EZ40	8/9	77	3/9	EB34	1/9	PEN46	6/9
4D1	2/9	8D2	3/9	KTW61	6/9	EL32	6/9
6B8	3/9	8D3	7/9	ECC81	8/9	EL91	3/9
6F12	7/9	12AU7	5/9	ECH42	8/9	PEN45	6/9
EF92	3/9	12BE6	6/9	EF39	6/9	TT11	6/9
6H6M	1/9	EAF42	8/9	EF41	8/9	451U	10/9
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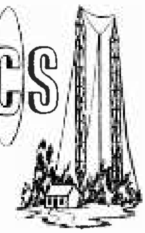


THE IMPORTANCE OF THE AERIAL

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

THE beginner, whether armed with the "simplest" crystal oscillator set, or with a more complex multiband outfit, or even a commercial manufactured transmitter, is faced with a multitude of aerial problems. In fact, if he takes too seriously all that has been written about amateur band aerials, he will find so many conflicting, or apparently conflicting statements, that he will be at a loss as to how to proceed. Generally he may adopt some "recommended" aerial, and operate with this for some time, but perhaps wondering if he is getting the best results, or indeed anywhere near the correct mode of operation. Coupled with the inevitable vagaries of propagation conditions, it is often difficult to come to any assessment of an aerial system without a considerable period of operating.

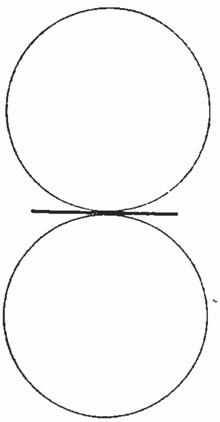


Fig. 1.—Diagrammatic representation of the polar diagram of a dipole in free space.

The examination of some of the fundamentals of aerials is clearly necessary, if only as an antidote to some of the bewildering statements often made. It should be noted that two dogmatic and apparently conflicting statements made about an aerial may both be true, provided that the conditions under which the statements apply are considered. A simple example of this is given by the half-wave dipole. The "radiation pattern" in a horizontal plane of a half-wave dipole is usually given as shown in Fig. 1, together with a few tips on aligning the direction of the aerial wire to guide the aspiring novice. Indeed the aspiring novice is then rapidly calculating that he will need at least a pair of dipoles per band to cover all directions, and that for good coverage in all directions three dipoles per band would seem safer. Gazing mournfully at his average size back garden, he is convinced that getting out a "good" signal in all directions is beyond his means.

The fact is, of course, that Fig. 1 is a snare and a delusion. It refers solely to the radiation of a dipole in free space. It also gives the "radiation pattern" at zero angle for a dipole mounted over the earth, where of course zero angle radiation is extremely small. For all other cases, the radiation pattern is strongly affected by ground reflections. Even in the absence of ground reflections, Fig. 2 shows that there is appreciable radiation "off the end" of the aerial at appreciable vertical angles. Fig. 3 illustrates the "effective polar diagram" of a dipole at vertical angles of, say, 30 degrees or more from the direction of horizontal radiation. Thus, for propagation in which radiation at appreciable vertical angles is effective, a horizontal half-wave dipole is effective in almost any direction. This explains why a southern station with a wire running north and south can work into Scotland with ease, despite the fact that the GM stations are right off the end direction of the aerial. Similarly, the typical "long wire" free space radiation pattern of Fig. 4 needs to be interpreted

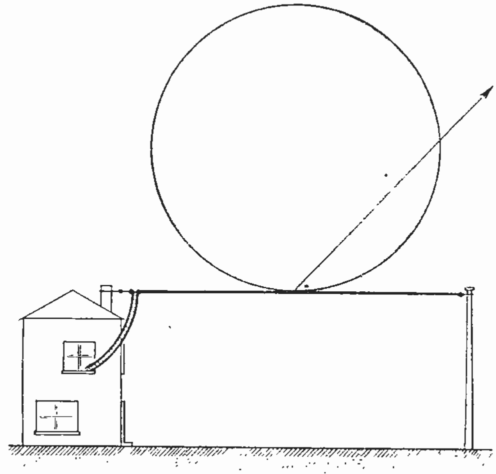


Fig. 2.—Neglecting ground reflections, it is clear that at high angles there IS appreciable radiation "off the end" of a horizontal dipole. Only in a direct "end on" direction in the exact line of the wire itself is there zero radiation.

cautiously, as the sharp nulls may be blurred by ground reflection effects.

The effect of ground reflections also has another interesting effect. With horizontal aerials that are "close" to the ground, the effect of ground reflections is illustrated in Fig. 5. This shows that most of the energy is radiated skywards. Note that "close" indicates that the height of the aerial wire is a small fraction of a wavelength. Thus, on topband an aerial wire running 50ft. above ground is still rather close, as is a 30ft. high horizontal wire for 80 metres. Incidentally, two stations a few miles apart on 80 or even 40 metres are, in effect, talking over some 120 miles of "airline." This is because most of the radiated energy goes straight up to the ionosphere, and is reflected down again on these low frequencies. However, with disturbed conditions, it is often possible to hear even a local topband, 80-metre or 40-metre station fading violently and sounding just like a DX signal, complete with sideband distortion. This is an unusual and dramatic proof that workings on topband are almost invariably affected mainly by ionospherically reflected energy.

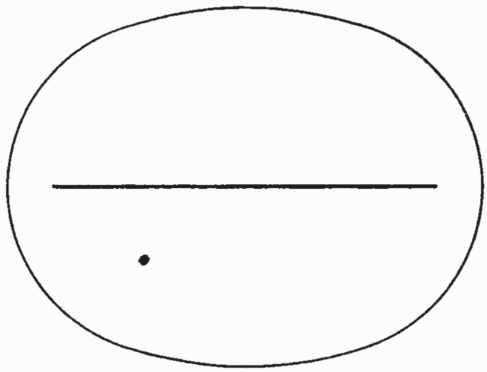


Fig. 3.—The polar diagram for a dipole that is not too high is similar to the above for propagation angles of thirty degrees or so to the vertical. This means that for European contacts up to about a thousand miles on the lower frequency bands, radiation is virtually omnidirectional.

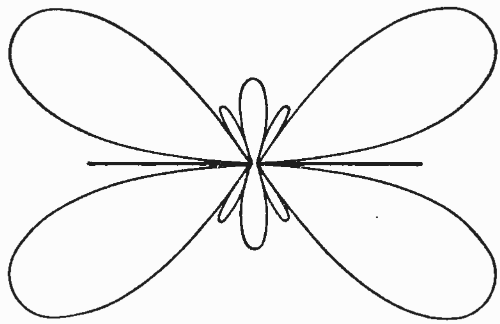


Fig. 4.—Schematic impression of a typical long wire radiation pattern. Ground reflection effects may in some cases tend to blur the sharpness of the null radiation directions.

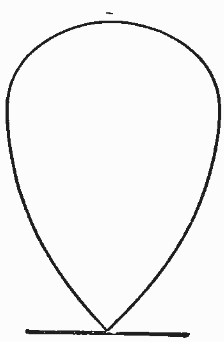


Fig. 5.—The effect of ground reflections on an aerial close to the ground is to concentrate energy skywards. This situation applies especially in topband and eighty metre working.

Vertical Aerials

This points up the fact that a vertical radiator on topband with the enhanced low angle radiation may make a dramatic difference to signals within a 50 mile radius. It is easy to calculate that a topband station 30 miles away should produce an S9 signal by genuine ground wave. Usually on horizontal aerials signals may be quite weak in the S5 region. With vertical radiators a good local coverage should be achieved, and this points out the popularity of RAEN emergency networks, who for mobile use obtain good results with short vertical aerials. It is fortunate that vertical aerials which are necessary for compact mounting on mobile RAEN stations operating from cars are also those which provide for reliable local coverage. For guidance, the radiation pattern of a short vertical antenna located over a good conduction soil is shown in Fig. 6.

It is hoped that the above has helped to clear up some of the aspects of radiation patterns, ground effects and so forth, which can be expected to worry some beginners. When we consider DX working on the higher frequency bands it may well be found that the radiation pattern begins to behave "more like" the textbook free space pattern suggests. The answer is found in Fig. 5. This shows that an aerial "close" to the ground radiates at high vertical angles. However, on the higher frequency bands, where the wavelength is shorter, the aerial is becoming less "close" to the ground. Thus, on 10 metres a dipole only 15ft. to 20ft. off the deck is no longer to be considered as "close" to ground. Moreover, on the higher frequencies, the lower angle radiation is mainly responsible for long distance communication. Thus, the height of the aerial is still important. This poses the question as to what height is "best" for the aerial system. In point of fact the higher the frequency the lower the angle of

(Continued on page 217)

radiation desirable. Also, for a given aerial height, the higher the frequency, the lower the angle of radiation will be for a horizontal dipole. Thus, a "reasonable" height will serve about equally well for all bands.

The novice, beginner or experienced amateur is earnestly counselled to take height considerations into account, preferably right at the start. A 60ft.

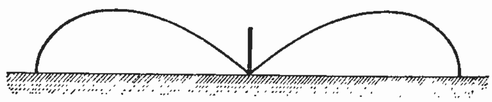


Fig. 6.—A short vertical aerial located over high conductivity soil has maximum radiation at low angles.

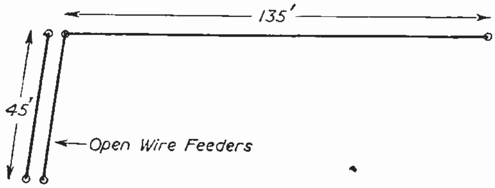


Fig. 7.—An end fed long wire aerial that makes a simple and highly effective system. It is a favourite aerial with a large number of leading DX operating stations. Many leading stations use long wires exclusively.

high aerial is definitely to be aimed at, even if this requires a little outlay and trouble in erecting a suitable mast. This, however, may be much less trouble than erecting a shorter mast, and then having to remove it and replace by a higher mast. Unfortunately, of course, costs rise steeply with increases of mast height. However, heights up to about 50ft. or so are feasible by bolting together two lightweight poles supported by simple guying systems. Greater heights involve more elaborate guying systems and some searching for suitable poles. Simple wooden towers may be made by the amateur, but steel towers and masts may involve heavy expenditure unless one is lucky with surplus purchases.

Unfortunately even 60ft. is not the ideal height. Certainly DX operators with 60ft. high aerials seem to outperform those with 40ft. high aerials. However, even 120ft. is not the "best height." A recent article analysing the problems in "getting out" of high power commercial short-wave stations using enormous rhombic aerials supported at the 100ft. mark has shown that a little more appreciation of communication problems would have resulted in an even higher choice of mast. In fact, somewhere around the 200ft. mark in height would enable more solid QSOs, or should we say "traffic handling," on the part of these commercial stations. Moreover, the increased height would enable communication to be maintained longer over a given path than with the lower aerial height. This increase in operating time over a DX path amounted to around an hour.

Height

The importance of getting a reasonable height for an aerial is certainly underlined by the above. The moral, then, for a beginner interested in horizontal aerials is to arrange for as high a mast as possible. Having decided to put up as high an aerial as one can conveniently manage, the question arises as to the sort of aerial one should use. Leaving out the question of further expenditure on beam arrays and automatic rotators for the moment, the "universal" long wire antenna of Fig. 7 is a simple multiband aerial that will enable one to work much DX in many directions. If this

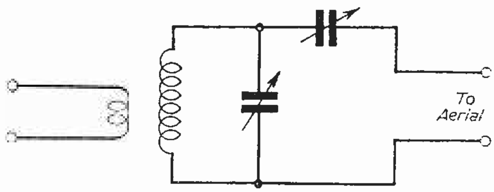


Fig. 8.—A universal aerial tuner, which will be found ideal for use with the aerial of Figure 6. It may be used for series and parallel tuning or a combination of both.

aerial is arranged to run approximately north and south, a glance at a Greatcircle map will show that it has, on the H.F. bands, four main lobes (Fig. 4) that will cover North America, South America, Africa and Australasia. Moreover, with odd lobes from the middle directions, it will be found that a good effective signal may be placed in almost any direction.

The SWL who is in process of becoming an amateur would do very well to erect now the sort of aerial he might be expected to employ when he gets his transmitting ticket. This may give a good angle on what directions he will expect to work.

Servicing Transistor Receivers

CONSIDERATIONS IN THE HANDLING OF APPARATUS CONTAINING TRANSISTORS

By E. G. Bulley

WHEN servicing the conventional radio, it is common practice in the first place carefully to check the valves. but in transistorised circuitry it is advisable to adopt a different approach. The reason being that. although the transistor is mechanically sound and is considered to have indefinite life if it is operated correctly. it is susceptible to damage either electrically or through operating temperatures. Trouble from the latter can be caused to any transistor type radio if the receiver has been operated above or nearby a hot electric. gas or coal fire. Excessive heat affects transistors as is now well known. and such heat will be in excess of the manufacturers' storage temperature rating. If such is the case however. it is advisable to substitute the transistors in the circuit with some of the same type. and thus by elimination one is able to isolate the faulty transistor or transistors.

Nevertheless. assuming the receiver has been operated in a suitable position. it is advisable to remove the battery and measure the voltage at the battery terminals. A maximum permissible drop of battery voltage is approximately 40 per cent. of its original value. in which case. if the voltage has fallen to this value there is every likelihood that the receiver in question will become unstable as well as deliver a loss of volume.

Caution

It is as well to mention at this stage that on no account should connections be broken or made when the battery power is switched on. otherwise damage to transistors will result. Furthermore. when breaking or making a circuit, extreme care must be taken when soldering, otherwise. the transference of heat from the iron will likewise damage or destroy the transistor.

Practically all transistor receivers use miniature condensers for coupling and bypassing. Such condensers are either the electrolytic or tantalum anode type. These condensers have a fairly high capacitance for their physical size and should any of these become a dead short. leaky or open circuit. loss of gain or oscillatory effects will result. For example. a faulty bypass condenser used in the conventional bias arrangement of the emitter results in a loss of current flowing in the collector circuit. whereas a completely short-circuited condenser will result in the destruction of the transistor. as the full H.T. will be applied to the emitter and base connections.

Nevertheless. by inserting a suitable microammeter in the collector feed (with battery power off). the collector current can be checked when the power is switched on. It may be as well to mention here that the D.C. bias voltage can also be measured by connecting a high resistance voltmeter across the collector and the base line.

Using Test Meters

Extreme care must be taken if using multi-range meters in servicing transistorised equipments as one must remember that when used as an ohmmeter. there is every possibility that the meter may inject a current into the circuit far in excess of that which the transistor will withstand. It is advisable therefore. when making continuity checks on transformers. etc.. carefully to withdraw the transistors from the circuit unless you are certain what you are doing.

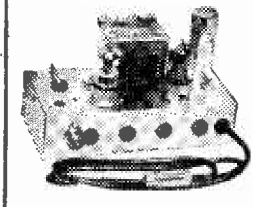
Individual checks on transistors can be carried out if one has a suitable multi-range meter and is sure that the current that will pass will not exceed that specified by the transistor manufacturer. A resistance check can be made on PNP types for emitter to base. and likewise collector to base. If such values obtained are far in excess. or alternatively well below. the value specified by the manufacturer. then it does indicate that the transistor is faulty.

Many circuits incorporate or adopt a push-pull output stage. Both these transistors. as in valve practice. are matched. and should one of these prove faulty it will be extremely difficult to obtain one to match the good one. It is therefore. necessary to replace both transistors with a matched pair. Failure to do so will result in distortion and poor quality reception. Likewise. faulty R.F. or I.F. amplifier transistors when replaced. may result in the circuit having to be realigned to obtain optimum results.

A Useful Test

An extremely useful test for transistors is that of gain. and can be considered as one of importance. Suitable transistor testers are or will be available in the near future. and such testers will be able to cater for the gain test. Such testers will undoubtedly be designed by experimenters and constructors and it will not be long before articles will be published describing their construction.

In conclusion. one must always bear in mind that great care must be taken when servicing such circuits as the receivers or equipments in question are usually small and compact. The compactness does not allow for probing or much disturbance of the wiring or components. otherwise. leads or components will touch and short circuit. Nevertheless. as time progresses. the constructor and experimenter will gain confidence as his predecessors did in the early valve days.



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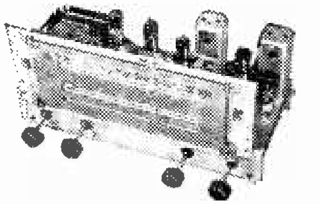

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6SN7	8/6	ECC84	12/6	EY86	14/6	PY83	10/6
6V6	7/6	ECF80	12/6	EZ40	8/6	U22	8/6
6X4	7/6	ECF82	12/6	EZ80	8/6	U25	12/6
6X5	7/6	ECH42	10/6	EZ81	8/6	UCH42	10/6
7C5	9/-	ECH81	10/6	MU14	9/6	UF41	10/-
7Y4	8/6	ECL80	10/6	PCC84	10/6	UL41	10/6
DAF96	9/-	ECL82	12/6	PCF80	10/6	UY41	8/6

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8/450 v. B.E.C.	2/3	8 16/450 v. Hunts	5/-
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8 / 16/450 v. T.C.C.	5/-	32 32/275 v. Hunts	4/6
16/450 v. B.E.C.	3/6	32 / 32/450 v. T.C.C.	6/6
16/500 v. Dub.	4/-	250/50 v. B.E.C.	8/6
16 / 16/450 v. T.C.C.	5/6	60/250 v. T.C.C.	6/6
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32/500 v. Dub.	5/-	60 / 60/275 v.	12/6
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Many other types in stock.

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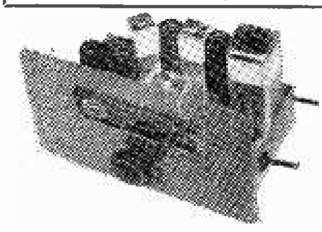

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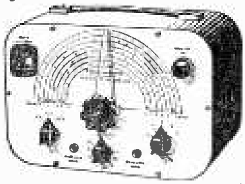

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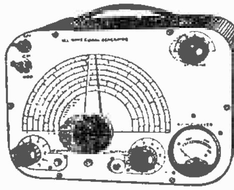

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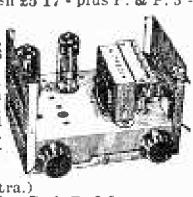

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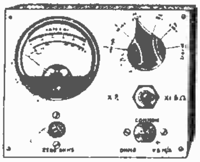

Comprising 2in. moving coil meter, scale calibrated in AC/DC volts, ohms and milliamps. Voltage range AC DC 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wire-wound pot. (for ohms zero setting), toggle switch, resistors and rectifier. In grey hammer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

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approx. size 6½in. x 2½in., incorporating 2 valves, contact-cooled metal rectifier, bass and treble lift controls and double wound mains transformer 230-250 v. **39/6** Plus P. & P. 3/6. **5" P.M. SPEAKER & O.P. TRANSFORMER**, if purchased with the above, 18/6. Plus P. & P. 1/6.

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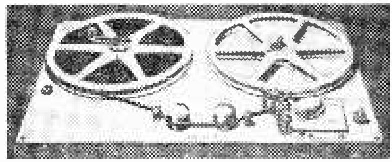

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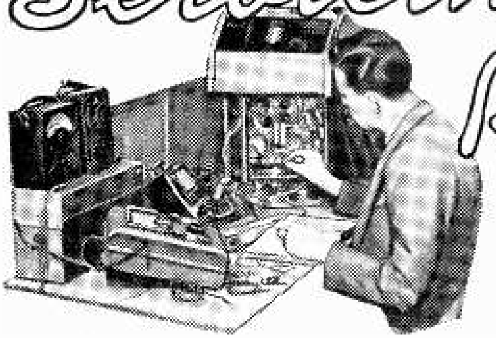
Servicing Radio Receivers



COSSOR A.M.-F.M. AUTORADIOGRAM MODEL 529

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

THE Cossor Model 529 is housed in a sideboard style cabinet which is finished in a blond veneer; there is also space in the cabinet for record storage. Three loudspeakers, twin 8in. medium-frequency units, plus an elliptical 6in. × 4in. tweeter, are featured, connection being made to the output stage as shown in the inset at the top right-hand of the circuit in Fig. 3. The record player is a three-speed unit with a dual stylus crystal pick-up.

Cossor A.M.-F.M. Console Model 540

Using the same circuit and chassis assembly is the Console Model 540. This, however, has two speakers only, a 10in. × 6in. elliptical unit for medium frequencies, plus a 6in × 4in. tweeter. Both models have provision for the connection of an extension 3 ohm loudspeaker. Switched pick-up sockets are available on the console for the connection of a record player with a high impedance or crystal pick-up.

A five-position band-selector switch provides for the switching of four bands (L.W., M.W., S.W. and V.H.F.-F.M.) and gram. The circuit, which consumes approximately 60 watts on radio, uses seven valves, including a full-wave rectifier and a magic-eye tuning indicator, is fully detailed in the accompanying circuits. There are two chassis sections, the main chassis and the F.M. chassis.

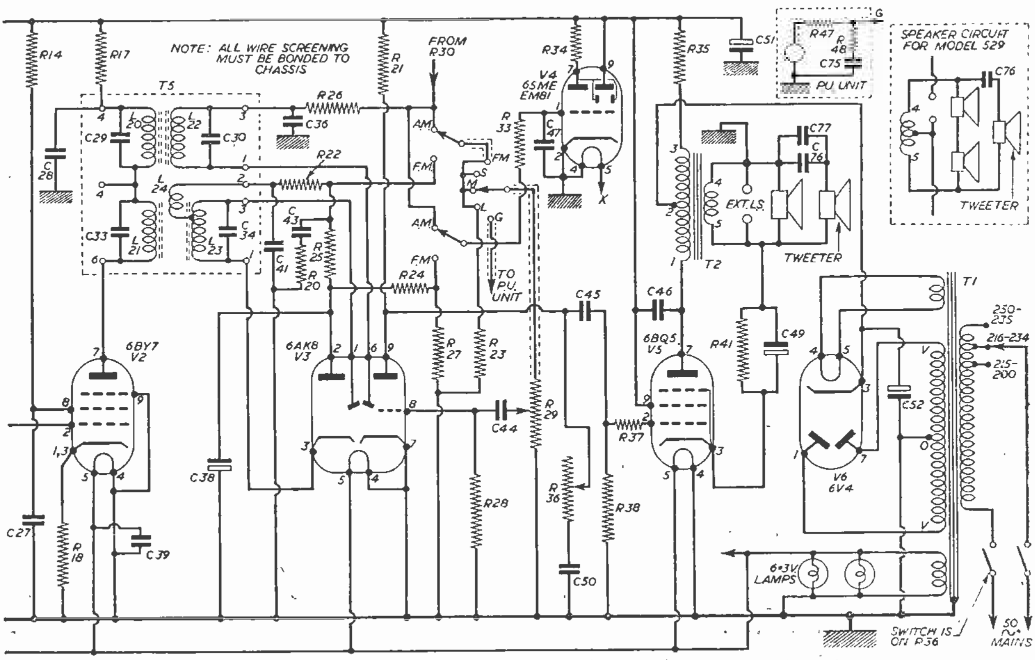


Fig. 3.—Output and power pack section of the Cossor receiver dealt with here.

Circuit Details

Valve V1 serves on A.M. as a conventional frequency changer, and on F.M. as an I.F. amplifier. The anode circuit of the mixer section is loaded into two series-connected I.F. transformers (housed in a common screening can and designated T4), L8/L10 being the A.M. I.F. tuned to 470 Kc/s, and L9/L11 being the F.M. I.F. tuned to 10.7 Mc/s. As a means of avoiding interference, the primary section of the transformer out of use is shorted out by reason of the associated F.M./A.M. changeover switch section.

A study of the circuits will reveal that there are several of these F.M./A.M. changeover sections in various parts of the receiver. The switch contacts are situated along a side-switch which extends the length of the chassis so as to keep each switch section close to its associated circuit and avoid long connecting wires. The side-switch is mechanically ganged to the main band-selector switch and is actuated only when switching on or off the F.M. position.

The mixer section of V1 is thus responsive to signals at 470 Kc/s and 10.7 Mc/s. On A.M. the 470 Kc/s I.F. is produced in the ordinary way by the local oscillator (triode section of V1) signal heterodyning with the incoming signals. On F.M. the mixer section of V1 is supplied with 10.7 Mc/s signals from the F.M. tuner. In this connection H.T. is removed from the anode of the oscillator triode and applied to the F.M. tuner valve, while at the same time the grid circuit of the oscillator triode is connected to chassis. These functions account for two more F.M./A.M. changeover sections.

(*Continued on page 225*)

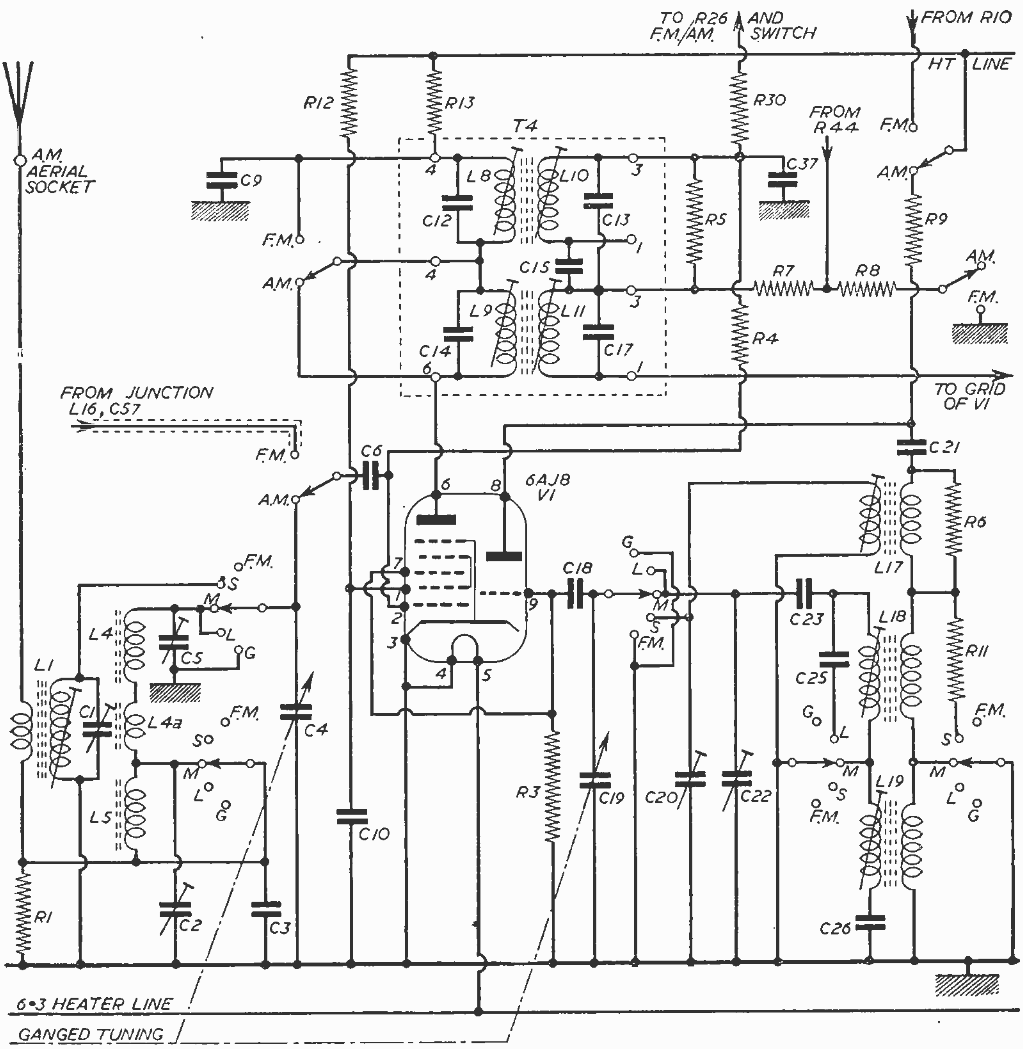


Fig. 2.—This is the A.M. Frequency changer and F.M. I.F.

Tuning of the switched aerial circuits is performed by C4 section of the tuning gang, while the oscillator is tuned by section C19. The A.M. tuning is also ganged to the F.M. tuning, the latter being arranged by the controlled movement of dust-iron cores within the associated R.F. and oscillator coil formers.

The appropriate I.F. signal is applied to the control grip of the common I.F. amplifier valve V2 whose anode circuit is also loaded with transformer primaries tuned to 470 Kc/s and 10.7 Mc/s. Thus the I.F. signal appropriate to the service in use is developed either across L22 or L23 (T5). If the set is switched to the A.M. bands, the signal is developed across the secondary of the A.M. transformer (L22) and is passed to the third diode of the triple-diode-triode valve V3. This diode acts as the A.M. detector, and if the F.M./A.M. switching in this section is followed it will be seen that the volume control (R29) serves as the A.F. load of the detector circuit.

From the volume control, the A.F. signal is applied to the grid of V3 triode section, and an amplified A.F. signal is developed across the load resistor R21 in the anode circuit. From here the signal is conveyed to the control grid of the output valve (V5) through the coupling capacitor C45 and part of a potential-divider R37. The loudspeakers are driven from the anode circuit of V5 by way of a split primary output transformer, this serving to a large extent as a hum neutralising device.

A useful degree of negative feedback is obtained by passing the cathode circuit of the output valve through the secondary of the output transformer. A simple tone control system embraces the tone control itself (R36) and the associated capacitor C50, shunting the anode circuit of V3.

On F.M. the 10.7 Mc/s I.F. signal is developed across L23 (T5) and fed to the diodes of the ratio detector (part of V3). The remainder of the ratio detector comprises L24, the load resistors R24 and R27 in series, the stabilising capacitor C38 and capacitor C41. The A.F. component of the F.M. signal is developed across C41 and, as in the A.M. case, applied to the volume control through changeover switches. The required degree of de-emphasis is given by C43 and R20. From the volume control the A.F. circuits operate the same as for the A.M. case, already considered.

The F.M. Tuner

The double-triode valve (V7) serves both as an earthed-grid R.F. amplifier and a self-oscillating frequency changer. The grid of the R.F. section is "earthed" through C70 and the aerial signal is applied by way of a 70-80 ohm balanced feeder and the matching transformer L2/L3 to the cathode. The matching transformer is responsive over the whole of Band II, but the anode circuit comprising L7 and C68 is of greater "Q" and is variably tuned by means of a dust-iron core.

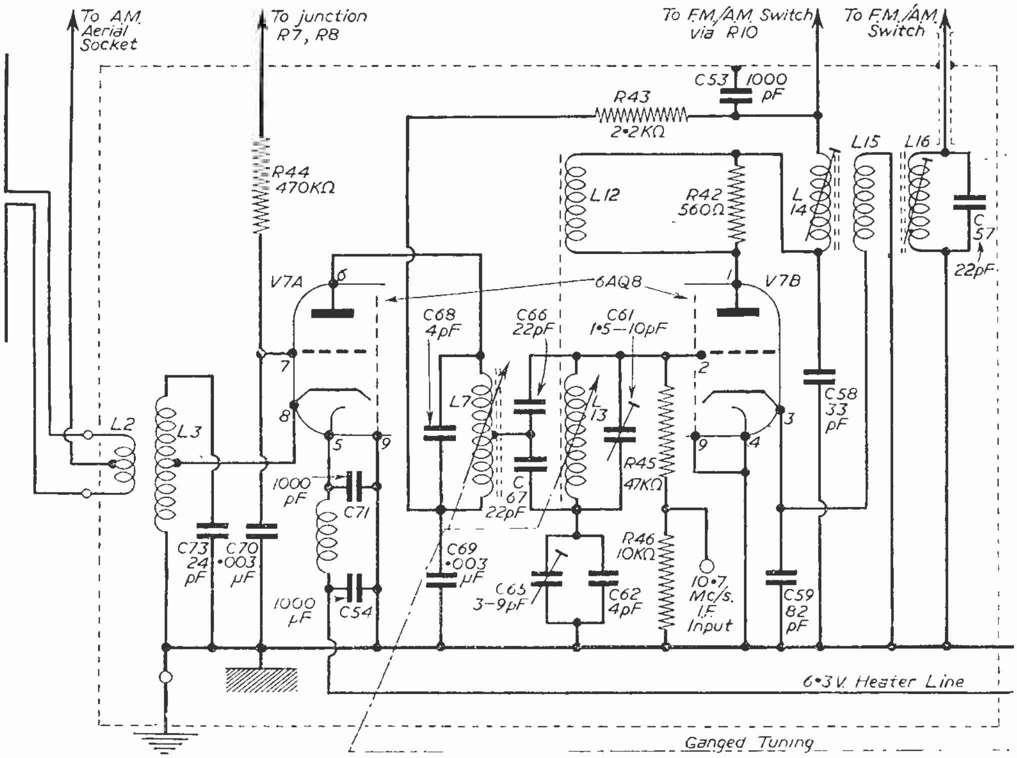


Fig. 1.—The tuner section of the receiver.

L13 and C61 form the oscillator tuned circuit. the core in L13 being ganged to that in L7. The R.F. signal is coupled from the R.F. stage from a point of optimum impedance on L7 to a point of zero oscillator voltage at the junction of C66 and C67. The idea of this is to prevent re-radiation of the oscillator signal through the

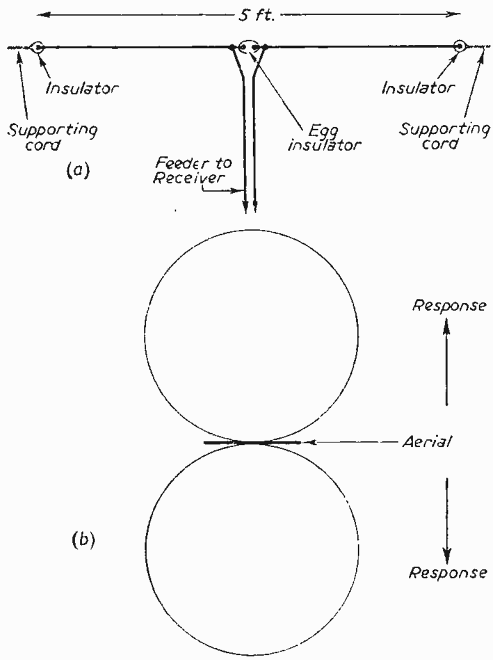


Fig. 4 (a and b).—A suitable aerial and its polar diagram.

aerial by way of the R.F. stage. In common with most F.M. tuners. a bridge circuit is formed by the capacitances of the oscillator valve, C66, C67 and C65. and provided the bridge is in reasonable balance zero oscillator voltage exists at C66/C67 junction. To facilitate adjustment of balance C65 is in the form of a trimmer which should be adjusted only when component changes are made. and then only very slightly for minimum oscillator signal at the aerial.

The Tuning Indicator

L14 forms the anode load of the frequency changer. and a small degree of positive feedback is given by the coupling L15. The 10.7 Mc/s I.F. signal is developed across L16 and is fed to the first F.M./A.M. changeover switch section through coaxial cable.

Signal for the tuning indicator is picked up from the A.G.C. line on A.M.. and from across a portion of the ratio detector load resistor (R27) on F.M.

The power circuits are conventional. A fully isolated mains transformer drives a full-wave rectifier (V6) to give 285 volts D.C. at the cathode. The H.T. winding is rated at 250-0-250 volts, and two 6.3 volt L.T. windings supply the rectifier and valve heaters. The 6.5 volt 0.3 amp MES dial lamps are energised from the main heater line.

Servicing Notes

The centre-tap on the F.M. aerial coupling coil L2 enables the F.M. aerial to serve also on the A.M. bands by making the connection as shown on the circuit diagram. It is not necessary to remove this link when receiving F.M.

Internal aerials are contained within the cabinet for both services. However. to ensure interference-free reception for which F.M. is noted. an external horizontal dipole aerial is highly recommended in areas of doubtful signal strength and in locations which fall outside the 25 mile service zone. An elaborate array is called for only in fringe areas. and in most cases a simple attic-type system is adequately suitable. This can be made up with a 5ft. length of insulated wire cut in the centre and connected mechanically by means of an egg insulator. Similar insulators can be used either end to support the aerial in tension by means of cord attached to attic or roof-space beams. The twin feeder is connected to each section of the dipole across the insulator as shown in Fig. 4 (a). As a horizontally-mounted dipole possesses a figure-of-eight polar diagram (see Fig. 4 (b)). it must be orientated so that it is broadside to the transmitter.

For best results on F.M. the aerial signal should be large enough almost to close fully the magic-eye tuning indicator. or to produce. at least. 6 volts of A.G.C. as measured on a 20.000 ohms per volt meter on the 25 volts range across C38 (ratio detector stabilising capacitor).

Excessive distortion on F.M. (A.M. reception normal) accompanied by possible modulation hum and critical F.M. tuning. should lead to a substitution check of the 6AK8 (V3). If this valve is in good order. and the voltage across C38 (positive to chassis) rises on two definite peaks as the receiver is tuned over an F.M. signal.

Alignment

The complete alignment process. which is somewhat complex and requires the use of a wobbulator and oscilloscope. need not be performed. Two resistors. each of 47.000 ohms. should be connected in series and then connected across C38. Between the junction of the resistors and point 2 (junction of C41 and R22) of T5 should be connected a 20.000 ohms per volt meter (25 volt range). A 10.7 Mc/s signal (unmodulated) is applied to the control grid of V2 (screen of signal lead to chassis) and the signal voltage raised until either a positive or negative indication is given on the meter. The core in L23 should then be adjusted for zero reading on the meter. After having checked with various levels of signal. the resistors and meter should be removed from the circuit.

Distortion on both A.M. and F.M. should first lead to a test of the voltage. relative to chassis. at the cathode of V5. If the voltage is considerably in excess of 7 volts. C45 should be replaced. It may also be found necessary to replace V5 in this case.

Tuning drift on F.M. is sometimes caused by a faulty 6AQ8 (V7): a substitution check is necessary to prove this possibility conclusively.

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			PCL83 14/6	UABC80	W77 8/6	6AC7 6/6	6K6GT 7/-	8D2 2/9	10/-
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AC/TH1 34/9	ECH21 24/4	EY51 13/6	PP225 3/11	UBF80 9/6	Y63 9/-	6AQ5 7/6	6K8GT 9/6	12AT6 10/6	30F5 12/6
ATP4 3/6	ECH35 10/6	EY86 17/6	PX25 12/6	UCC84	Z309 11/6	6AT6 8/6	6K25 20/11	12AT7 9/-	30FL1 12/6
AZ31 17/5	ECH42 10/-	EZ40 9/-	PY80 9/-	20/11	Z359 11/6	6AU6 10/6	6L6G 9/-	12AU7 7/6	30P4 21/7
CBL31 24/4	ECH81 9/-	EZ41 10/-	PY81 10/-	UCF80 23/-	Z759 11/6	6B4 5/-	6L7 7/6	12AX7 8/6	30P12 12/6
CCH35 24/4	ECL80 13/6	EZ80 8/9	PY82 8/6	UCH42 10/6	1A3 3/6	6B8G 4/-	6N7 7/6	12BA6 9/-	35L6GT 9/6
CL33 20/2	ECL82 12/6	EZ81 11/10	PY83 10/-	UCH81 11/6	1A5GT 6/-	6BA6 7/6	6P25 13/6	12BE6 10/-	35W4 8/6
CY31 17/5	EF22 8/6	EZ90 8/-	PZ30 20/11	UCL82 23/-	1A7 12/6	6BE6 8/-	6P28 27/10	12BH7 11/6	35Z4GT 8/-
DAF96 10/6	EF36 6/-	E1148 2/-	PEN4DD	UCL83 25/9	1C2 11/6	6BG6G 24/4	6Q7GT 9/-	12C8GT 8/-	35Z5GT 9/-
DF96 10/6	EF37A 12/-	GZ32 12/-	27/10	UF41 10/6	1C5GT 12/6	6BH6 16/-	6SA7GT 8/-	12H6GT 3/-	42 8/-
DK96 10/6	EF39 6/6	H30 5/-	PEN25 5/-	UF85 10/6	1D6 12/6	6BJ6 9/-	6SG7 7/6	12J5GT 4/6	50C5 11/6
DL96 10/6	EF40 13/6	HL23DD 8/6	PEN44 27/10	UF89 10/6	1H5GT 10/6	6BR7 11/6	6SH7 6/-	12J7GT 10/6	50CD6G
DM70 8/6	EF41 9/9	HL92 12/6	PEN45 27/10	UL41 10/6	1L4 6/6	6BW6 8/6	6SJ7 8/6	12K7GT 8/6	31/4
EA50 1/6	EF42 14/-	K40N 9/-	PEN46 7/-	UL44 27/10	1LD5 3/6	6BW7 10/-	6SK7 6/-	12K8GT 13/6	50L6GT 8/6
EABC80 10/-	EF50 4/-	KF35 8/6	PEN220A	UL46 24/4	1N5 10/6	6C4 7/-	6SL7GT 8/-	12Q7GT 8/6	75 11/6
EAC91 7/6	EF54 6/-	KK32 23/-	4/-	UL84 11/6	1R5 8/-	6C5GT 6/6	6SN7GT 7/6	12SC7 2/6	77 7/6
EAF42 10/6	EF55 10/-	KLL32 8/6	PENA4 15/-	UU6 20/11	1S4 10/6	6C6 5/-	6SQ7 9/3	12SG7 7/6	80 8/6
EB34 2/-	EF80 9/6	KT24 5/-	QP21 7/6	UU8 27/10	1S5 7/6	6C8G 5/-	6U4GT 14/-	12SH7 5/6	142BT 3/6
EB41 9/6	EF85 9/-	KT33C 10/-	R16 27/10	UU9 8/6	1T4 7/6	6CD6G 31/4	6U5/6G5 8/6	12SJ7 8/-	185BT 34/9
EBC33 7/6	EF86 13/6	KT36 27/10	R19 13/6	UY41 8/6	2C26 2/6	6CH6 7/6	6U5G 8/6	12SK7 6/-	210DDT 4/6
EBC41 10/6	EF89 10/-	KT55 13/6	SP41 3/-	UY85 10/-	2X2 4/6	6D6 5/-	6U7G 8/6	12SL7 8/-	210VPT 3/6
EBF80 10/6	EK32 8/6	KT66 15/-	SP61 3/-	VP2B 8/-	3A4 7/-	6F1 13/6	6V6G 7/-	12SN7GT	807 6/6
EBF89 18/1	EL32 5/6	KTW63 7/6	SP220 3/11	VP23 6/6	3D6 5/-	6F6G 7/6	6V6GT 7/-	17/6	954 2/-
EBL21 24/4	EL33 20/2	KTZ41 8/6	T41 24/4	VP41 8/6	3Q4 9/-	6F6M 7/6	6V6M 8/6	12SQ7 8/6	955 4/9
EBL31 24/4	EL38 27/10	ME91 7/6	TH2 9/-	VR105/30	3Q5GT 9/6	6F13 14/-	6X4 7/6	14S7 14/6	956 3/6
EC52 6/-	EL41 10/6	MH4 7/6	TH30C 8/-	6/6	3S4 8/-	6F15 14/-	6X5G 7/-	15D2 7/9	9001 5/6
ECC40 12/6	EL42 12/-	MH41 7/9	TP25 27/10	VR116 4/-	3V4 9/-	6F33 5/6	6X5GT 7/-	19BG6G	9002 5/6
ECC84 10/3	EL84 10/6	N37 18/1	U10 10/6	VR150/30	4D1 3/-	6G6G 4/6	6/30L2 12/6	24/4	9003 5/6
ECC85 9/6	EM34 10/6	N78 12/6	U22 8/-	9/-	5R4GY 9/6	6H6 2/6	7B7 8/6	20D1 16/-	9004 5/6
ECF80 13/6	EM80 10/6	OZ4 5/6	U24 12/6	VS70 3/-	5U4G 8/-	6H6GT 2/6	7C5 8/-	20F2 27/10	9006 5/6

HEATER TRANSFORMERS — Each

230 v. Input 2 volt .5 amp.	5 -
230 v. Input 2 volt 3.0 amp.	8 3
230 v. Input 4 volt 1.5 amp.	5 6
230 v. Input 4 volt 3.0 amp.	10 -
230 v. Input 5 volt 2.0 amp.	10 -
230 v. Input 6.3 volt .5 amp.	5 6
230 v. Input 6.3 volt 1.5 amp.	6 9
230 v. Input 6.3 volt 3.0 amp.	10 -
230 v. Input 12 volt .75 amp.	5/9

Solid Dilectric Condensers.—.0001, .0002, .0003, .0005 .... ea. 4 6

EM80 Type Tuning Indicators Escutcheon ..... 2 -

Avo Minor Case with Carrying Strap 7 6

The Brayheal Turret Convertor.—Comprehensive installation instructions, plug-in facilities for over 600 popular models of T.V. sets of standard I.F. ranges £7.7.0

Illustrated leaflets available. Adaptors Price 7 6

Implosion Guards for 17in. tubes outside dimensions 17¼in. x 12¼in. Brown escutcheon 7 6

Postage 3 -

WB "Stentorian"

Model HF 812 Die cast chassis	84 6
,, HF 1012 ,, ,,	99 9

Universal speech coils.

Co-axial Cables, etc. — yd.

Aerialite Aeraxial 597, semi-airspaced	9d
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Ribbon feeder (Flat) 300 ohms	6d.

12 Yaxley Type Switches. Various Combinations. All brand new .... doz. 9 -

Full Range Condensers available from stock. Cardboard covered wire-ended types.

TCC 10 mfd. 450v.	1 11
Dubilier 8 mfd. 500v.	2,9
BEC 8 x 8 mfd. 450v.	4 -
,, 16 mfd. 450 v.	2 3
,, 16 x 8 mfd. 450v.	4 -
,, 16 x 16 mfd. 450v.	4 6
,, 32 mfd. 450v.	3,-
,, 32 x 32 mfd. 350v.	4/6
Dubilier 16 x 16 mfd. 500v.	5/-
,, 8 x 8 mfd. 500v.	4/-
,, 16 x 8 mfd. 500v.	4/-

Standard Can Types :

24 x 24 x 16 mfd. 350v.	3 9
32 x 32 MA 450v.	6 6
60 x 60 mfd. 350v.	4 6

These are just a few of the types—good stocks of low voltage electrolytics, etc., etc.

CHASSIS

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

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

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

PRE SET CONTROLS

Available wire wound 1K and 10K ohms, 2K ohms, 30K ohms.

Available carbon track 50K, 100K, ¼ Meg., 1 Meg., 2 Meg., 20K ohms, ½ Megohms.

VARIOUS MAKES and **TYPES** 150K ohms. All one price .... 1,9 ea.

LOUDSPEAKER UNITS

Make	Type	Size	Price
Plessey	Square	3in.	19 6 each
Lectrona, Plessey	Round	5in.	17 6 each
Goodmans, Plessey	Round	6½in.	18 6 each
Goodmans, R. & A.	Round	8in.	19 6 each
Plessey, R. & A., Elac	Round	10in.	25 6 each
Elac	Elliptical	7in. x 4in.	19 6 each
Elac	Elliptical	10in. x 6in.	25 6 each

All the above are PM units with 2 to 3 ohms speech coils.

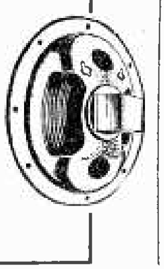
RTC 12in. heavy duty 20 watts model 15 ohms Speech Coil £5 5 0

5in. Mains Energised Speaker £1 0 0

6½in. Mains Energised Speaker 17 6

8in. Mains Energised Speaker £1 1 0

All have field coils of approx. 600 ohms.



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Just a few 8in. units by Goodmans and Lectrona fitted with standard output transformer .... £1 1 6 each

8in. P.M. Speaker Units with Output Transformer removed from equipment .... 11 6 each

OUR 1958 ILLUSTRATED CATOLOGUE is now available. Send 1 - in stamps for your copy.

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3 Way Mounting Type.

MT1

Primary : 200-220-240 v. Secondaries : 250-0-250 v. 80 m A 0-6.3 v. 4 amp. 0-4 v. 2 amp. Both tapped at 4 v., **21 9** each.

MT2

Primary : 200-220-240 v. Secondaries : 350-0-350 v. 80 m A 0-6.3 v. 4 amp. 0.5 v. 2 amp. Both tapped at 4 v. **21 9** each.

MT3

Primary : 200-220-240 v. Secondary 30 v. 2 amps. Taps at 3 v., 4 v., 6 v., 8 v., 9 v., 10 v., 15 v., 18 v., 20 v., 24 v., **21 9** each. Postage and Packing please add 2 - per transformer.

ALPHA RADIO SUPPLY CO.

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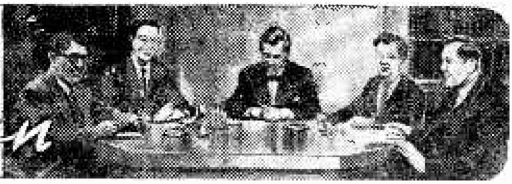
TERMS : Cash with order or C.O.D. Postage and Packing charges extra, as follows : Orders value 10/- add 1/- ; 20/- add 1/6 ; 40/- add 2/- ; £5 add 3/- unless otherwise stated. Minimum C.O.D. fee and postage 3/-. All single valves postage 6d. Personal Shoppers Monday-Friday 9 a.m. to 5 p.m. Saturday 10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

Open to Discussion



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

A Condenser Tester

SIR.—I should like to thank you for the Condenser Tester Design published in the February issue. I made this up—a total of two evenings spare-time work and dug out all my old condensers. I found that at least 75 per cent. were worthless, or at least only fit for throwing away, and I am sure that others will find this of great value in saving time by using dud components or wasting time wiring them into sets only to have to throw them out afterwards.—H. YOUNG (Woking).

"Front to Back"

SIR.—I am ashamed to say that recently, during the alignment of a superhet, I placed the leading lady in the back row of the chorus. That is to say, I plugged a 6BE6 frequency changer into the output valve's holder, which was correctly wired for a 6AK6 output pentode. She performed with great volume and purity of tone in this unaccustomed position, and I was only apprised of my error by the low bias voltage on her cathode. I am glad to say that her vital statistics have not been affected by this indignity.—R. PAGE, LT. COL. R.A.E.C. (Singapore).

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.

A Short-wave Hint

SIR.—Although I am not a transmitter I always read the Transmitting Topics article, and the recent details concerning aerials have brought up a point which I should like to pass on. I am mostly interested in short waves and have tried everything in the way of an aerial, from a wire indoors across the ceiling, to a most elaborate long wire out in the garden. I have found however, that the best results were gained when I had a wire hanging from a bedrooom window upstairs down to the room in which the set was placed. I have since found that most short-wave broadcasting stations abroad use a mast radiator and thus the vertical wire is most desirable. If therefore you find that your short waves are not coming in well, try a wire as mentioned above, but keep it at least 3 feet from the wall and insulate it very thoroughly at the top and bottom. The glass type of ex-government insulator is to be recommended.—G. R. JOHNS (Reading).

Wrong Speed Records

SIR.—Some time ago I became interested in hi-fi record reproduction and bought a most expensive outfit. I have played many records but find that there is one most disturbing fault which I should very much like to overcome, and I wonder if one of your vast number of readers may have come up against the same problem and found a ready solution. My main interest is in organ music and I happen to own a small electronic organ which is in the same room as the record player. I find that with quite a number of organs, the speed of recording is such that the discs are not in tune. No doubt this also applies to many other vocal and orchestral records. I can play my organ with most broadcast items, except at certain times when a recorded item is relayed and this also suffers from the wrong speed. The problem is, that the record player has fixed speeds of 33⅓, 45 and 78, and no adjustment is available to these. It would appear that a very small variation each way would be all that is necessary but I cannot see any player on the market with this facility. I have tried small friction brakes and although they will slow up the record, I cannot speed them up, and one or two discs require a slightly higher speed to get them at the right pitch. Has any other reader met this difficulty and perhaps found a solution?—G. F. WATTS (Edgware).

Stereophonic Reproduction

SIR.—I notice that great strides are being made with stereo reproduction, including the development of gramophone records embracing this feature. It would appear that the means of obtaining this is, however, somewhat cumbersome and necessitates two amplifiers and two loudspeakers. If two loudspeakers are placed in a room as recommended, surely it is essential that you should sit exactly in the centre, and also how can the spacing of the speakers be decided? With stereoscopy the two pictures may be placed exactly the same width apart as the eyes, and then viewed through a suitable optical system. With the ears, however, there is quite a different effect, and many sounds we hear come from a single source. There is therefore no need for two speakers and the sound from a piano, say, played by stereophonic means from two speakers situated some feet apart would surely produce a wrong impression in the mind of a listener? Perhaps an orchestra might sound better for being produced from two sources, but vocalists, single instruments and speech surely should come from a single source only and our two ears supply the stereophonic effect.—R. WILLIAMS (Cardiff).

An Ancient Set

SIR,—I see that Thermion recently had the pleasure of hearing an old set (February issue) and was surprised at the results. I have a set still in use which was new many years before the war and apart from one valve replacement is still apparently as good as new. I believe that it has, in fact, deteriorated during the years, but so slightly as to be imperceptible, and it still brings in the foreigners. I use headphones, and can roam the world almost any night and apart from having to manipulate three controls I find the selectivity much better than most modern receivers. This is due, in the main, I think, to the use of variometer tuning and a remarkably smooth reaction control. The variometer is air-spaced and wound with fairly heavy gauge wire, whilst the reaction control is a combination of condenser and potentiometer. Batteries supply a quiet and steady power, and a pair of Brown's super headphones give crystal clear reception. I should like to see some of these older circuits brought out and modernised as I am sure they have good features.—B. BURTON (Leicester).

Echoes on Tape

SIR,—I have a tape recorder which has given many hours of pleasure, but I have come up against a snag. Many modern broadcasts owe their fine effects to a simple device known as "echo," and I believe this is put in either by a second mike placed at a distance, by a loudspeaker in a special room facing a mike, or by a special type of cable known as a "delay cable" in the circuit. None of these is practicable for recording at home, however, and I wonder if any one has found a simple way of producing an echo without using another recording head. I wish to record certain orchestral items from the radio, as well as my own piano playing, and I should like to put echo in some of those items which seem to sound "flat." There must surely be some fairly simple way in which this can be done, but so far have never seen anything published on the idea. What about it, fellow readers?—G. B. JAMES (N.W.).

Using Old Eliminators

SIR,—There must be many listeners, like myself, who are lumbered with an old type battery eliminator which they used when they first had mains facilities and wished to run their battery sets. These units delivered low H.T., round about 100 to 150 volts at about 30 or 40 mA, and in many cases contain also a trickle charger for keeping a 2-volt battery up to scratch. It seems a pity to throw these units away, and I wonder if any reader can suggest a really useful way of putting them into commission. It does not appear to me that there is anything in them which can have deteriorated and I am sure there must be some way of turning them to use.—H. YOUNG (Reading).

A Supersensitive Transistor Receiver

SIR,—I note that in the article in the March issue describing the above receiver the type of battery which was specified was given as Mallory RM250. I should like to point out that that should, in fact, have been quoted as RM625, and, as stated, is available from practically any Boots stores.—F. BRINTON (S.W.).

Transistors

SIR,—I have read several articles recently on transistors, and I note that these are easily damaged when soldering them into a receiver. Why do not the makers supply these in the form of "plug-in units"? Surely it would not be difficult for a manufacturer to provide them with a small paxolin or similar base and pins so that they could be inserted in small holders similar to miniature valves. This would also facilitate servicing, by enabling alternatives to be tried out easily, instead of having to unsolder three wires and solder up three new ones. Can there be any definite reason why a base is not fitted, or why they cannot be made "plug-in"? Perhaps the manufacturers will let us know.—F. R. EAMES (Finchley).

Baby Alarms

SIR,—I built some time ago a small baby alarm and I know there are dozens of these in use. They are only small amplifiers which have a mike and they pick up the cry of a baby and superimpose it on the radio or television so that you can hear it. I do not know sufficient about the technical side but it appears to me that it would be much better if it could be arranged that, when the baby cried, when the cry reached a certain volume it could cut out the sound coming from our radio or TV and the cries only would be heard from the loudspeaker. Couldn't this be done, say, with a relay or something and an adjustment provided so that you could set it so that weak cries or murmurings had no effect, but when the baby really got going, then our radio cut out and only the cries come through the speaker? I should like to see something on these lines.—G. B. FAIRBAIRNS (Hove).

Novices' Band

SIR,—I would like to say how much I agree with the idea of a novices' band. In my opinion a high frequency band should be used and a limited power of 20 watts on C.W. No phone to be used.

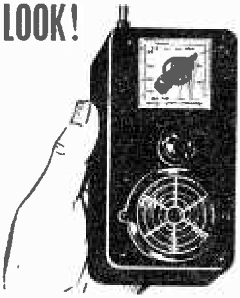
One more point which I would like to state is that I think a £1 per annum charge by the G.P.O. would ensure that no one who just wanted to make a nuisance of himself would come on to the band.—G. J. KNOCK (Tonbridge).

CALLING THE WIMBORNE CIRCUIT FANATIC

Will the anonymous reader in the Wimborne area of Dorset who has been inundating us with circuits without a covering letter, please let us have his name and address.

NO EXPERIENCE NEEDED TO MAKE THESE CHEAP RADIOS !

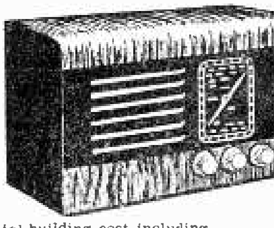
LOOK!



BUILD THIS **POCKET RADIO** FOR ONLY **37/6**

AT LAST ! In response to many requests we now present the **HIGH EFFICIENCY PENTODE "SKYPOCKET,"** a beautifully designed precision **POCKET RADIO.** No radio knowledge needed !—EVERY SINGLE PART TESTED BEFORE DESPATCH ; **our simple, pictorial plans take you step-by-step.** This set has a remarkable sensitivity due to painstaking design. Covers all medium waves 200 to 550 Metres. Size only 5¾in. x 3in. x 2in. in Strong. Transparent case with panel. cover and ivorine dial. A really personal-phone, pocket-radio **WITH DETACHABLE ROD AERIAL.** Self-contained all-dry battery operation. Average building time 1 hour. **Total Building Cost—including Case, High Efficiency Pentode Valves, etc., in fact, everything down to the last nut and bolt—ONLY 37/6, with plans.** Postage etc., 2/-. C.O.D. 2/- extra. (Parts sold separately. Priced Parts List, etc., 1/6.) **Demand is certain to be heavy—so SEND TODAY !**

47/6 **Build this exceptionally sensitive high efficiency Pentode radio.** Uses unique assembly system and can be built by anyone **without any radio knowledge whatever** in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6¼in. x 5in. x 3in. Covers all Medium and Long waves—uses only one all-dry battery. H.T. consumption only 1 to 1.5 mA. Uses personal phone. Ideal for Bedroom, Garden, Holiday, etc. **Many unsolicited testimonials. Mr. Norton, of Oxted writes :** *Yesterday evening on the Medium waveband, I counted 32 separate stations : I am very pleased with the set, which is well worth the money.* **BUILD THE "SKYROMA" NOW ! Total building cost—everything down to last nut and bolt—47/6** (Postage, etc., 2/-)—**with full set of clear, easy-to-follow plans.** (Parts sold separately. Priced Parts Lists, etc., 1/6.) C.O.D. 2/- EXTRA.



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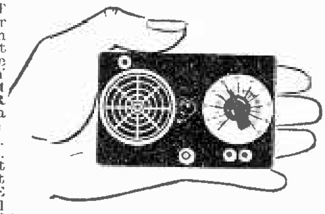
Total building cost including choice of beautiful walnut veneered cabinet or ivory or brown bakelite. **This is the lowest possible price consistent with high quality. No radio knowledge whatever needed . . . can be built by anyone in 2-3 hours,** using our very simple easy-to-follow diagrams. The terrific new circuit of the **"OCEAN-HOPPER"** covers all medium and long waves with optional negative feedback, has razor-edge selectivity, and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple easy-to-follow plans—in fact, everything ! All parts sparkling brand new—no junk ! **Every single part tested before despatching.** Uses standard octal-base valves : 6K7G high-frequency pentode feeding into 6J5G anode-bend detector triode, coupled to 6V6G powerful output beam-power tetrode, fed by robust rectifier. For A.C. Mains, 200-250 Volts (low running costs—approximately 18 Watts !). Size 12in. x 6in. x 5in. **Build this long range powerful midget NOW. All parts and set of plans, £5.7.6.** (Post and packing 3/6.) Parts sold separately. Priced Parts List, 1/6. C.O.D. 2/- EXTRA.

Build This TRANSISTOR POCKET SET For Only 47/6!

FEW ONLY AT 95/- !

NEW in maker's sealed cartons !—limited quantity of the famous 4-speed record player units, exceptionally easy to fix, with lightweight pick-up, incorporating "Acos" crystal turnover head and separate sapphire styli for Standard and Long-Playing. With full instructions and fixing plans. **Unbeatable price 95/-,** plus 3/6 Post. Packing, etc. C.O.D. 2/- extra. **RUSH YOUR ORDER NOW —BEFORE IT'S TOO LATE !**

WE'VE DONE IT AGAIN ! . . . our design department in response to a great many requests have designed this **"SKY PIXIE" Vest-Pocket TRANSISTOR RADIO** which gives a superb performance It is highly sensitive. Size only 4¼in. x 3¼in. x ¾in., the weight under 7 ozs. !—yet it is a **TWO - STAGE** receiver covering all medium waves, working entirely off a tiny "pen-light" battery, which costs 6d.—fits inside the case—and lasts many months. Uses personal phone and has push-button **LUMINOUS** On/Off Switch. 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 47/6 with plans.** Postage, etc., 2/-. C.O.D., 2/- extra. (Parts sold separately. Priced parts list, etc., 1/6.) As the building cost is absolutely "rockbottom" (it might increase later) **DEMAND WILL BE VERY HEAVY—RUSH YOUR ORDER TO-DAY !**



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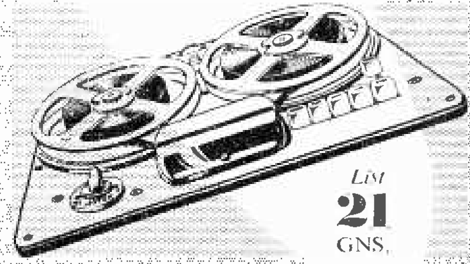

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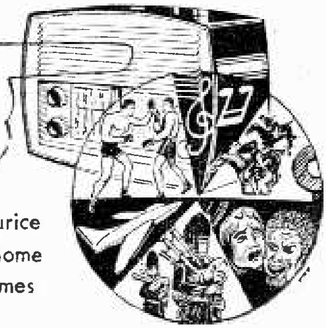
Programme Pointers



Our Critic, Maurice Reeve, Reviews Some Recent Programmes

AN original and refreshing play was "The Time of the Serpent," by Bruce Stewart, based on the Queensland legend of Mrs. Fraser, a widow. She was shipwrecked on its inhospitable coast some hundred years ago. Stumbling across the jungle she encounters Bracefell, an escaping convict from Botany Bay. He avers that he knows of a way through for both of them. When love rears its inevitable head Mrs. Fraser, whilst stalling off its more serious possibilities, desides to make every use of its conveniencies. When civilisation is reached poor Bracefell is scarcely given a thank you. An encounter with aborigines on the way adds stimulant to the exciting story.

Joan Hart played Mrs. Fraser with just the right amount of feline self-interest, and Jack McGowran was excellent as the convict with the heart of gold though his soul seemed destroyed.

"The Donkey's Crusade," too, was original and interesting. One of the Monday series of plays specially written for radio, it told of the quest for Prester John to elicit his help in freeing the Holy places from the infidel. I particularly liked Elizabeth Poston's little bits of music for percussion, psaltery, treble recorder, oboe, 'cello and flute, all beautifully played. There was a very long cast in it.

The Weather

The weather forecasts, under the revised system, are as wearisome and repetitious as ever. The "general situation" gives so much detail that the "regional" forecasts, which follow immediately after, are often word for word the same. Also, the pinpointing of localities only a few miles apart for meticulously calculated details of wind, rainfall, temperature, etc., is in such a small country and such a notoriously unstable "island" climate as ours is, a great mistake. In spite of a liberal supply of "probablys," "likelys" and "howevers," it is bound to lead to unnecessary errors and disappointments. To assert that the sunshine in Berkshire will last a little longer than in neighbouring Buckinghamshire, or that the rainfall "may" be rather heavier in Norfolk than in Suffolk, is, to say the least, assuming occult powers, unwarranted and "probably" unwanted!

Plays

Plays again seem the best things of the month, so I will mention one or two more. Rasputin! Monks and priests have frequently played large and sometimes decisive rôles in revolutions. Few have more sinister reputations than he who both gave his name to this piece and figured so largely in the Russian upheaval of 1917 and the immediately preceding years. This account of him, by Wm. Gerhardi, takes the opposite view to that generally held, and paints him in quite heroic colours.

Like all his tribe, Rasputin was a devil with the ladies and had those of the Russian Royal family eating out if his hand. But Sir Donald Wolfit, in the title rôle, made him sound repugnant and revolting as well as rapscallionish and rascally. Richard Hurdnall was excellect as the weak and ineffectual Nicholas II, Laidman Browne, too, as Baron Fredericks, and Joan Mathieson as the Tsaritsa. One noted that our Ambassador was addressed as the "English" instead of the "British."

Shaw Novels

Bernard Shaw wrote five novels before setting out on his career as a dramatist. They were never looked upon by him as anything but pot boilers: first attempts at earning money by his pen. I don't think any of them were accepted for publication, and probably didn't deserve to be. But the "Third" performed a service by giving a radio adaptation of one of them, "Love Among the Artists." For it showed unmistakably the buds which flowered so profusely later on. It contained many touches of Shavian wit and barb though they were, as yet, more or less in embryo.

Joan Hart was delightful as Mary Southerland, the girl who is told real truths about going on the stage. And Clifford Evans was equally good as Owen Jack, who tells them. The admirable cast was completed by Kenneth Connor, Denis Goacher, Jack Shaw, Patience Collier, Betty Hardy and Roger Snowdon. Adaptation by Edward Marsh. Narrator, Desmond Gordon. Production, Christopher Sykes.

Music

The first performance of Michael Tippett's Second Symphony by the BBC Symphony Orchestra, under its old chief, Sir Adrian Boult —and commissioned by the BBC—was marked by the unusual event of a breakdown shortly after the opening, and a return to the commencement. It was due to a false entry by the violins. By bringing the proceedings to this summary conclusion, Sir Adrian gallantly shouldered the responsibility. The work, by the way, is enormously difficult as well as pleasing and attractive.

News from the Trade

NEW HI-FI RECORD REPRODUCER

THE "Cavalcade" Record Reproducer is the first instrument of its kind to be featured in the Dynatron range. This record reproducer provides reproduction from records which sets new standards for an instrument of its size. An outstanding specification includes the latest Garrard four-speed auto-changer or single record

The "Cavalcade" Record Reproducer.

player with plug-in high fidelity pick-up head, a five-stage, 8-w. push-pull amplifier with extension loudspeaker and radio/tape input sockets, separate bass and treble controls and a dual front facing high fidelity speaker system consisting of one 10in. elliptical and a 5in. high note, both with high flux magnets. The "Cavalcade" is designed for ease of operation, the fully illuminated control panel being situated at the front of the cabinet enabling volume, bass or treble adjustments to be made when it is closed for operation.

Superbly constructed, the acoustically balanced bow-fronted cabinet has, together with the attractive external control panel, a bronze finished speaker grille. The "Cavalcade" is available finished in a choice of light or medium walnut or mahogany high quality veneer.

Two optional extras are offered: a set of screw-in ebonised contemporary legs and an elegant bow-fronted table for the more traditional furnishings. The "Cavalcade" GR1 with auto-changer costs 49 gns. (including P.T.) and the "Cavalcade" GR2 with single player costs 46 gns.

E.M.I. PULSE GENERATOR

E.M.I. ELECTRONICS LTD. have developed this handy pulse generator for testing and demonstrating oscilloscopes and similar instruments. The pocket size instrument generates square and sawtooth waveforms simultaneously at amplitudes of 2.5, 5 or 7.5 v., and repetition rates of 100 c/s, 1 Kc/s or 50 Kc/s.

The top photograph shows an external view illustrating its compact size in comparison with a fountain pen and a three-penny piece. The lower photograph is an interior view showing the compact transistorised circuit employed.

NEW MULLARD THYRATRON

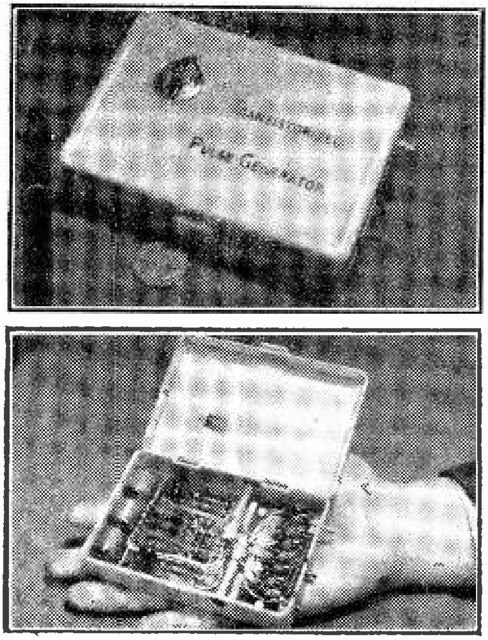
A RECENT important advance in the design of larger types of rare-gas thyratrons is the use of the disc-seal construction technique usually associated with V.H.F. communications valves.

A new Xenon-filled triode thyratron, type XR1-6400A, using this technique has been introduced by Mullard Limited. It is rated at 6.4A average, 80A peak cathode current, with a maximum inverse anode voltage rating of 1500V. The control characteristic is negative over the working range. The valve is a plug-in replacement for the American type 6807.

As distinct from conventional designs, the grid structure of the XR1-6400A is at the centre of a large disc which is sealed into the glass envelope above the heater-cathode assembly and parallel with the base. The edge of the disc protrudes beyond the envelope, connection to the grid pin being made by a copper strip running externally down to the base. The anode—a dish-shaped electrode carrying the connecting cap—is sealed to the top of the envelope.

The advantages of this type of construction are several. In the first place, the grid is supported rigidly from the sides of the envelope and not from the foot as in conventional designs. This makes for greater mechanical strength and more consistent performance. Second, the entire

(Continued on page 237)



The E.M.I. Pulse Generator

structure is extremely simple and therefore inherently more reliable.

Third, the grid forms an effective shield across the anode-cathode discharge gap and prevents spurious long-path voltage breakdown between cathode and anode, giving, consequently a greater margin of safety on voltage limits.

Fourth, since the entire upper surface of the anode and part of the grid are exposed to the air, cooling is greatly improved, grid emission current is reduced and so is the possibility of arc-back from the anode. Furthermore, the need for extra heat shields between anode and grid and grid and cathode is eliminated, thus further simplifying the structure of the valve.—Mullard Ltd., Mullard House, Torrington Place, London, W.C.1.

NEW ELECTRONIC FAULT-FINDER

DESIGNED to provide a quick, easy and effective method of overhauling transmission equipment not in service, a new portable percussion test amplifier has been recently introduced by the Automatic Telephone & Electric Company Limited.

Known as the Type M7A, it is a rectifier type test set designed primarily for testing audio or multi-channel carrier equipment. Advantages of this type of fault-detector over earlier instruments, are improved sensitivity and the reduction of tone level reaching the loudspeaker, rendering the detector easier to use for long periods.

The instrument operates on the following principle: when, in a circuit under test, a bad connection is disturbed, transient modulations occur in the current of the test tone. These transients are rectified, filtered and passed as an audio frequency into an L.F. amplifier, and are heard as clicks and crackles in the loudspeaker.

The manufacturers claim that even low-level disturbances in the circuit under test may be readily detected.—Automatic Telephone & Electric Co. Ltd., Strowger House, 8, Arundel Street, London, W.C.2.

COSSOR "DO-IT-YOURSELF" KIT

COSSOR RADIO & TELEVISION LIMITED have again entered the radio "do-it-yourself" market which they pioneered in 1927 with the famous "Melody Maker" radio kits. The new kit, now available, is for a high quality, 3 watt, twin speaker, audio amplifier.

The kit contains all the necessary components, including a printed circuit board with most of the components soldered into position, and 10in. elliptical and 4½in. tweeter loudspeakers. A sectional template is provided to facilitate mounting the amplifier and loudspeakers into an existing cabinet. An illustrated construction manual with circuit diagram and all necessary data is supplied with each kit, and model 562K provides a compact and versatile printed circuit amplifier suitable for operation from radio, microphone, gramophone and other audio sources. Retail price is £9 15s. inc. tax.

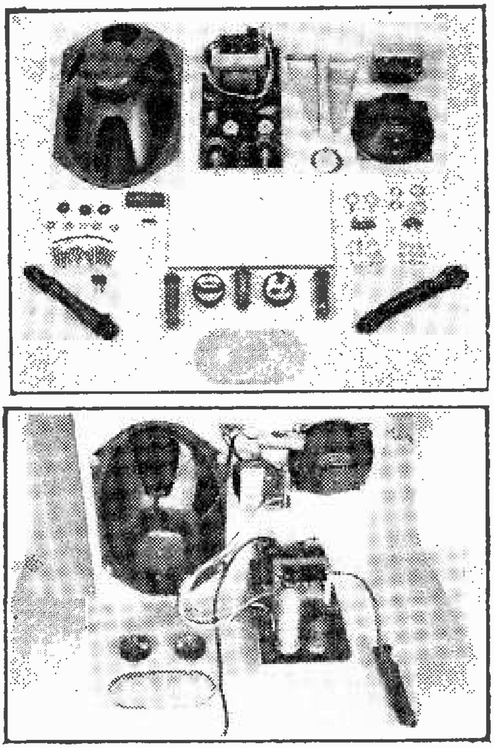
The 562K amplifier is the first of a series of "Do-it-Yourself" kits which will be marketed by Cossor Radio and Television Limited. Additions will be announced shortly. It is confidently expected that these kits will prove as popular among home instructor enthusiasts as the kit oscilloscopes and valve voltmeter marketed by Cossor Instruments Limited.—Cossor Radio & Television Ltd., Cossor House, Highbury Grove, London, N.5.

"SIEMAX" BATTERIES PRICE REDUCTION

SIEMENS EDISON SWAN LTD., have pleasure in announcing that, consequent upon improved production facilities, etc., retail prices for most of the popular "Siemax" radio batteries are being reduced as follows:—

Type	Old price s.	d.	New price s.	d.
S.101	12	6	11	6
S.102	10	0	9	0
S.103	19	6	18	6
S.104	8	6	8	0
S.107	14	9	14	0
S.114	8	3	8	0
S.117	14	9	14	0
S.126	10	0	9	0
S.127	21	0	20	0
S.129	17	6	16	6
S.136	17	6	16	9
S.138	17	6	16	6
1340	11	0	10	6

The reduced prices were effective to the trade on and after 20th February, and to the public from 10th March.



The parts and an assembled amplifier by Cossor. This is a "Do-it-yourself" kit.

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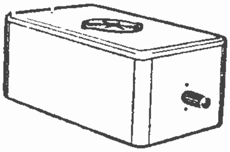
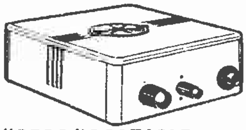


A low cost beginner's radio Kit includes all parts, transistor, diode, and super sensitive Phone for private listening, neat plastic case and 1.5V battery for months of dependable listening. Only 25/-.
Parts Price List, Wiring Diagram, 1/-.

"RECO" TRANSISTOR 2 PORTABLE



Receives home and Continental stations. Ferrite rod aerial. Attractive plastic case, 4½" x 4½" x 1½" balanced armature output unit and all parts. 49/6 inc. 3 volt battery.
Parts Price List, Wiring Diagram, etc., 1/3.

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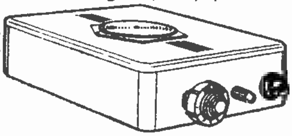

Similar specification to the "Reco" 2, but uses high gain frame aerial mounted on metal chassis. Has variable gain control. 65/- buys all parts, case and battery.
Parts Price List, Wiring Diagram, etc., 1/3.

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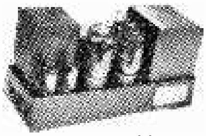

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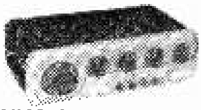

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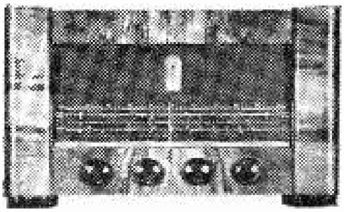

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(Continued on page 241)

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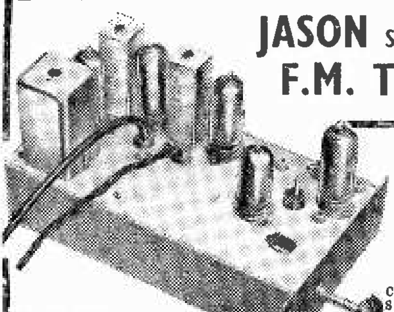

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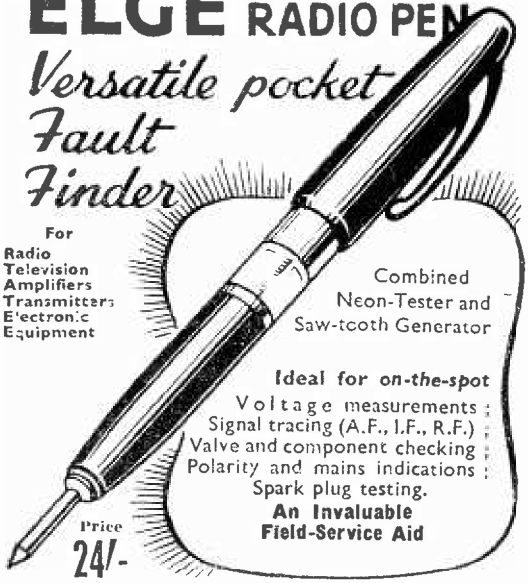

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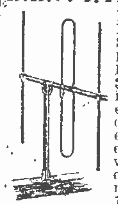

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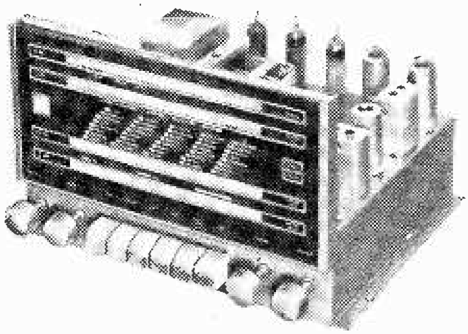

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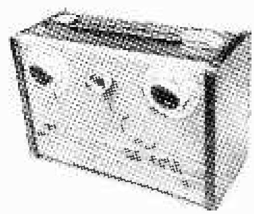

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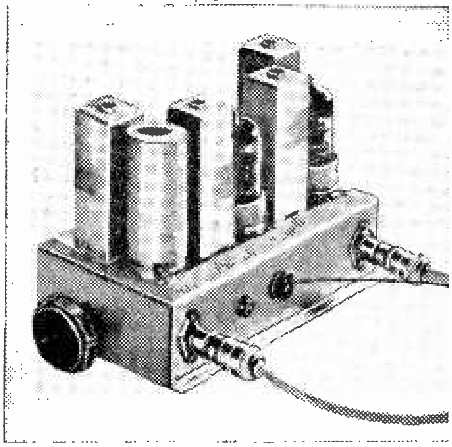

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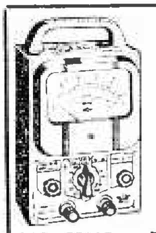

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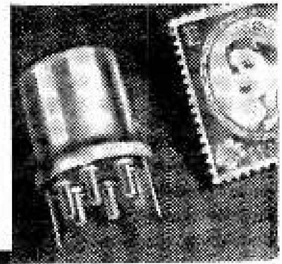

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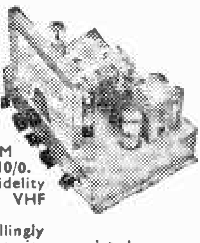

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