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PRACTICAL 1/3

MAY
1958

EDITOR: F.J. CAMM

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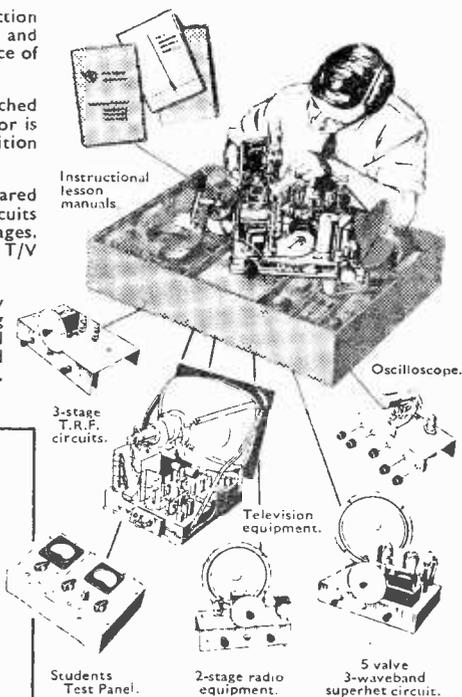
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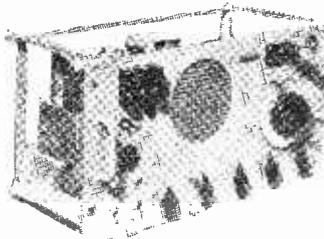
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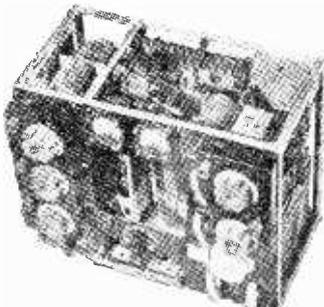


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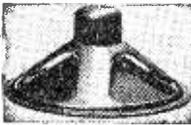
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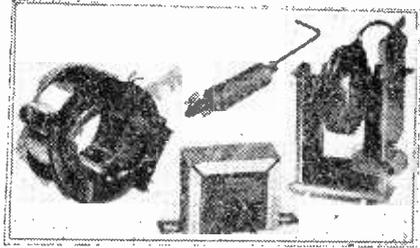
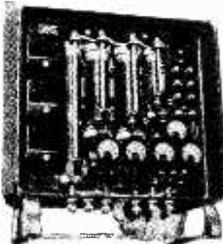


A 4-valve truly portable battery set with very many good features, as follows: ferrite rod aerials, low consumption valves, superhet circuit with A.V.C. ready-built and aligned chassis if required, beautiful two tone cabinet covered with I.C.I. rexine and Pyral. Guaranteed results on long and medium waves anywhere. All parts, including speaker and cabinet are available separately or if all ordered together the price is £7 15/- complete, or 35/- down and 7

payments of £1 0/0. post and ins. 3/-, ready built chassis 30/- extra. Instruction booklet free with parts or available separately, price 1/6.

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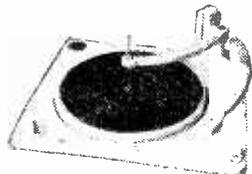
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 - R-1082 A.S.B.-3
 - R-1355 Indicator 62A
 - B.C.1206-A/B Indicator A.S.B.3
 - B.453-A (or-B) Indicator 92
 - B.454-A (or-B) Indicator 6K
 - B.455-M-A (or-B) R.F. unit 24
 - Transmitter T1154 R.F. unit 26
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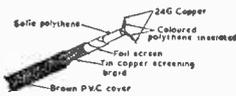
11 amp., 3/6; 5 amp., 8-6; 2 amp. OMB, 5/6; 15 amp. OMB, 15/- 15 amp. wall mounting type, 19/6.

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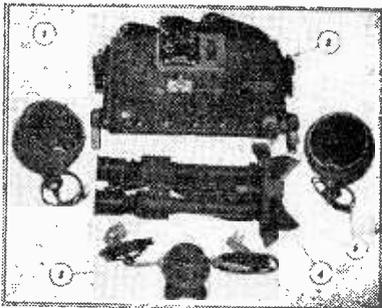


Superhet Chassis, 3-waveband, coloured scale, scale pan, pulleys, driving head, springs, drum, etc. Scale size 1 1/2in. x 3 1/2in. Chassis size 1 1/2in. x 1 1/2in. x 2in. Price 15/- plus 1/6 post. Note: We can supply cabinet for this. Price 39/6 plus 5/- carr. and insurance.

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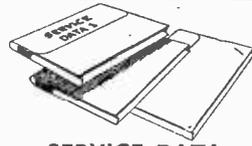
R. & C. SUBSTITUTION BOX
As described in last month's issue—author describes this as second most used instrument on his bench. Kit of components with full instructions, £2.10.0, plus 2/6 post and insurance.

SIMPLETON

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.



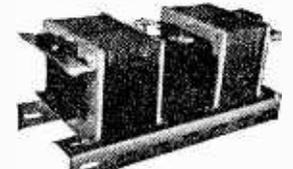
TV Masks
Latest type grey crystallate.
14in., 10", 17in., 12"
Plus 1/- Post.



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. 1in. long by a little over 1in. 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, 6 v., 5 mfd, 12 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	

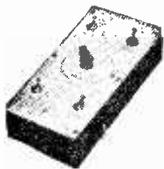
Discount of 10% allowed where a dozen of one type ordered. Special quotes 144 or over.

Tube Tester and Re-Activator

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

Transistor Timer

All the parts for making transistorised Enlarging or Process Timer with constructional details. £2 10/-, plus 2/6 post and pkg.



Beginner's Superhet

All the component, including metal chassis, valves, metal rectifier, coils, tuning condenser, etc., etc. required to build the "Beginner's Superhet" as described in the January issue, are available as a parcel. Price £3, plus 3/- post and ins.



Condenser Tester and Re-Activator

This unit tests condensers under correct working conditions at proper voltages, it can also be used for "reforming" electrolytics. All basic parts and full instructions, 50/- plus 2/6 post and ins.

Band III Converter

Suitable for Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF80 valves, coils, fine tuner, contrast control, condensers, and resistors. Metal case available as an extra. Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately 1/6.



Making a Solder Gun

A 7-second solder gun of the type costing £2.4 was described in Elec. Mech. Only two essential parts are required—(a) transformer and (b) push switch. These we can supply at 13/6, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

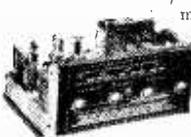


A.C./D.C. Multimeter Kit
15 Basic Ranges

Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, zinc moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions. Price 19/6, plus 2/6 post and insurance.



AM/FM Chassis



made by the famous McCarthy Radio. This employs a printed circuit in the F.M. Tuner section. It uses 8 valves and has a very attractive three colour dial, size approximately 12 x 5 1/2 in., covers four wavebands: 1000-2000 m., 200-550 m., 15-50 m., and 83-100 mc/s. This is a precision made chassis with four controls, tuner, volume, wavechange and tone, fully gear. Price £22 10/-, post and ins. 5/-.

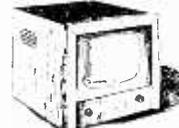
19 Range Testmeter



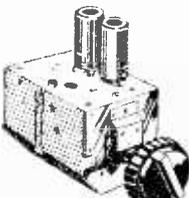
Can be yours for only 10/- deposit and 19 payments of 10/- weekly. Like all AVO meters it is a very fine instrument: it has a sensitivity of 10,000 ohms per volt and 19 most useful ranges as follows—D.C. volts 0-1.000 (seven ranges), A.C. volts 0-1,000 (five ranges), 0-1 amp. (3 ranges), resistance 0-2 meg. (2 ranges), complete with test leads. Immediate delivery. Cash price £9.10.0 non-callers please add 3/6 post & ins.

14in. T.V. CABINET

14in. T.V. cabinet of the latest styling made for one of our most famous firms—beautifully veneered and polished—limited quantity 19/6 each. Carga and packing 2/6 extra.



NOW 2 MODELS Turret Tuner



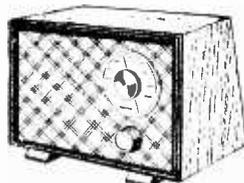
Brand new stock, not surplus, with coils for Band I and III complete with valves. Model 1 I.F. output 33.33 Mc/s. Series heaters. Model 2 I.F. output 16.19 Mc/s. Parallel heaters. With instructions and circuit diagram, 79/6. With knobs 3/6 extra, post and insurance 2/6.

THIS MONTH'S SNIP

A 10 valve unit complete with valves, unused but a little soiled only 19/6 plus 7/6 carriage and insurance. This unit, the RL135, contains a famous I.F. strip which is usable almost without modification for television. It is in fact an I.F. Amplifier for the R.F. units 24, 25, 26, 27, etc. Data is available showing how to make a television, etc., etc. Contains 10 tubes, transformers, coils, pot-meters, etc., etc. for gain not to be missed.

HUGE MINISTRY PURCHASE
R.1155—yours for £2 down.

Frequency 75 Kcs to 18 Mc. 10 valves metal case 10tube receiver cost 0.00 £20 to make—will give years of service, very little used. Price £10 of 5 payments of £2. (cash & bank) cas. 15/-.



THE SKYSEARCHER

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

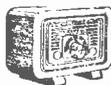
ALL-MAINS AMPLIFIER



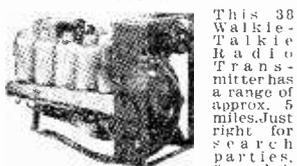
Powerful three-valve Mairs amplifier ideal for dances, parties, etc. Complete less chassis, cabinet and speaker (available if required)—data 1/6 (free with parts). Price 19/6, plus 2/6 post and insurance.

Simplex Transistor Kit

Makes ideal bedroom radio, uses one transistor and one crystal diode. Complete less case 19/6, case 5/- extra post and ins. 1/6.



Complete Walkie-Talkie for £1.



This 30 Walkie-Talkie Radio Transmitter has a range of approx. 5 miles. Just right for search parties, fire brigades, etc. Operates on dry batteries. Complete with five valves and in metal case. Size approx. 9" x 8" x 3 1/2". Un-used but not tested or guaranteed. £1 only, plus 2/6 post and insurance.

GLASS PANELS

Size 10 x 9 1/2—parcel of five panels, 7/6, plus 3/6 carriage.



ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders are dealt with from Eastbourne, so for prompt attention please send your orders to 66 Grove Road, Eastbourne, marked Department 7.

43-45, Windmill Hill, 66, Grove Road, 129, Stroud Green Rd., 266, London Road, 4, Guildship, Middx., Eastbourne, Sussex, 1, Croydon, (Phone: RUSLIP 5700) (PHONE: ARCHWAY 1049) (Phone: CRU 6554) Half day, Wednesday. Half day, Saturday. Half day, Thursday. Half day, Wednesday.

R.S.C. BATTERY CHARGING EQUIPMENT

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. 58/9
 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 I.T. Types H.W. 24 v. 1 a. 1/11
 6/12 v. 2 a. 9/9 6-12 v. 1 a. H.W. 2/9
 6/12 v. 3 a. 11/9 H.T. Types H.W. 150 v. 40 mA. 3/9
 6/12 v. 4 a. 14/9 250 v. 50 mA. 5/9
 6/12 v. 5 a. 18/9 250 v. 80 mA. 7/9
 6/12 v. 10 a. 25/9 250 v. 250 mA. 11/9
 6/12 v. 15 a. 35/9

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 Carr. 3/9. **49/9**

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



Assembled 6 v. or 12 v. 4 amps.
 Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finish. Fused and ready for 75/- use with mains and output leads. 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/c's. Screened.
TOP SHROUDED DROP THROUGH
 250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 a. 18/9
 330-0-330 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. 23/9

FULLY SHROUDED UPRIGHT
 250-0-250 v. 60 mA. 6.3 v. 2 a. 5 v. 2 a. 17/6
 Midret type 1/3-3 in. 26/9
 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 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. 26/9
 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/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 2 1/2 v. 1.5 a. 17/6.

FUNCTION TRANSISTORS.
 Brand new R.F. Type 17/6. A.F. 7/6.
VOLUME CONTROLS with long (1/4 in. 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, 23/6, or ready for use, 8/9 extra.

CHARGER TRANSFORMERS
 All with 200-230-250 v. 50 c/c's Primaries :
 0-9-15 v. 1 a. 11/9; 0-9-15 v. 3 a. 16/9;
 0-9-15 v. 4 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, 10 H 200 ohms ... 8/9
 80 mA, 10 H 350 ohms ... 5/9
 60 mA, 10 H 400 ohms ... 4 11

OUTPUT TRANSFORMERS
 Midret Battery Pentode 66:1 for 354, etc. 3/9
 Small Pentode, 5,000 Ω to 3 Ω ... 3/9
 Small Pentode 7/8,000 Ω to 3 Ω ... 3/9
 Standard Pentode, 5,000 Ω to 3 Ω ... 4/9
 Standard Pentode, 7/8,000 Ω to 3 Ω ... 4/9
 10,000 Ω to 3 Ω ... 4/9
 Push-Pull 10-12 watts 6V6 to 3 Ω or 15 Ω ... 15/9
 Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15 Ω ... 16/9
 Push-Pull EL84 to 3 Ω or 15 Ω ... 16/9
 Push-Pull 15-18 watts, 6L6, KT66 22/9
 Push-Pull 20 watts, sectionally wound 6L6, KT66, etc., to 3 or 15 Ω 47/9

MAINS TRANSFORMER
 Manufacturers' surplus. Primaries 200-250 v. 50 c/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 mA. 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

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. approx. Completely replaces batteries supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/c's is available. Suitable for all battery operated receivers requiring 1.4 v. and 90 v. This includes latest low consumption types. Complete kit with diagrams, 39/9, or ready to use, 48/9.



Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. 40 v. and 60 v., 40 mA. and 2 v. 0.4 a to 1 amp. and 2 v. Fully smoothed. Thereby completely replacing both H.T. batteries and I.T. 2 v. accumulators. When connected to A.C. mains supply 200-250 v. 50 c/c's. **SUITABLE FOR ALL BATTERY RECEIVERS**

VEIS normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions, 48/9, or ready for use, 58/6.

MINIATURE MOTORS. 24/28 v. D.C. or A.C. made by Hoover Ltd., Canada. Size only 2 1/2 x 1 1/2 in. Spindle 1 1/2 in. long. 1 1/2 in. diam. Brand New 9/8.

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.
 6in. 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;

ELIMINATOR TRANSFORMERS
 Primaries 200-250 v. 50 c/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 24/19/6, including attractive Brown or Cream Bakelite or Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

EX-GOVT. DOUBLE WOUND STEP DOWN TRANSFORMERS.
 10-0-100-200-220-240 v. to 0-7-5-115-135 v. or REVERSE. 80-100 watts. Only 12/9, plus 2/9 post. 10-0-100-200-220-240 v. to 0-4-10-12-136-148 v. or REVERSE. 200 watts. 35/8, plus 7/6 carr. Both 50 c.p.s.

EX-GOVT. MAINS TRANSFORMER.
 Primary 0-10-120-210-220-230-240-250 v. 50 c.p.s. Secs. 275-0-275 v. 100 mA. 6.3 v. 7 a. 5 v. 3 a. Govt. ratins. 22/9. Following with 230-250 v. primaries, 400-0-400 v. 200 mA. 5 v. 3 a. 5 v. 2 a. 10/9; 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 14-10-8 1/2 in. high. Well ventilated, black crackle finished, undrilled case. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE, OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage. Size 8 1/2 x 13 1/2 x 8 1/2 in. 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
354	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
6KT7	6/9	12A6	7/9	EZ90	6/9
6S17GT	6/9	15D2	4/9	EL84	10/6
6SL6GT	8/9	35ZACT	8/9	FW4/500	9/9
6SN7GT	8/9	MH4	4/9	SP61	2/9
6AT7	7/9	ECC63	8/9		

SPECIAL OFFERS: Electrolytics. 32-32 mfd. 250 v. Dublier 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. 4-8-ANAL. CABLE, 75 ohm. 1 1/2 in. 8d. yd. Twin-Screened Feeder 11d. yd.

ELECTROLYTICS (current production) NOT EX-GOVT.

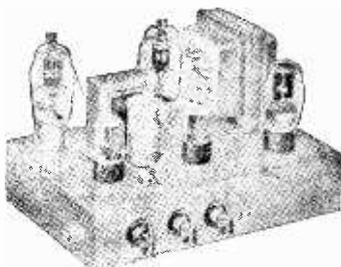
Tubular Types		Can Types	
8 μF 450 v. ...	1/9	16 mfd. 350 v. 111	
8 mfd. 500 v. ...	2/8	16 mfd. 500 v. 2/9	
16 μF 350 v. ...	2/3	16 μF 450 v. ...	2/9
16 μF 450 v. ...	2/9	32 μF 350 v. ...	2/11
16 μF 500 v. ...	3/9	32 mfd. 450 v. 4/9	
32 μF 350 v. ...	3/9	160 mfd. 450 v. 4/9	
25 μF 25 v. ...	1/3	8-8 μF 450 v. ...	2/9
50 μF 12 v. ...	1/3	8-16 μF 450 v. 3/11	
50 μF 25 v. ...	1/6	16-16 μF 450 v. 4/11	
50 μF 50 v. ...	1/9	32-32 μF 350 v. 4/9	
100 mfd. 12 v. ...	1/9	32-32 μF 450 v. 5/9	
100 mfd. 25 v. ...	2/3	100-100 mfd. 350 v. 5/9	
1,500 mfd. 6 v. 1/8		100-200 mfd. ...	8/9
3,000 mfd. 6 v. 3/9		275 v. ...	8/9

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

High-Fidelity Push-Pull Amplifier with Built-in Tone Control, Pre-amplifier Stages, High sensitivity, 12 diode valves (807 outputs), High Quality sectionally wound output transformer specially designed for Ultra Linear operation, and a reliable small condenser of German manufacture. **INDIVIDUAL CONTROLS FOR BASS AND TREBLE**, "Lift" and "Cut." Frequency response 3db. 30-30,000 c/s. Six negative feedback loops. Hum level 71 db. down. Only 70 millivolts INPU 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.** **BETTER SOUND** with plug noise at 300, 20 mA and 6.3 v. 1.5 A. For supply of a **RADIO FEEDER UNIT**. Size approx. 12-9/16 in. For A.C. mains 200-250 v. 50 c/s. Outputs for 3 and 15 ohm speakers. Kit is complete but just not. 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



cutting handles can be supplied for 18/9. Additional input socket with associated 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. Keep cash prices or Credit terms if supplied with amplifier.

COLLARO R54 3-SPEED AUTO-CHANGERS with Studio Pick-up Brand new. For 110 v. 50 c/s. A.C. mains. Price with 110 v. to 230-250 v. Auto Trans. only 7 Gns. Carr. 5/-.

COLLARO CONQUEST 4-SPEED AUTO-CHANGERS with large 60-110 Studio Pick-up. Latest model Brand new. Cartoned. For 200-250 v. 50 c/s. A.C. mains. Our price £9 19/3. Carr. 5/6. Credit Terms. Deposit 3 gns. and 6 monthly payments of 21/6.

COLLARO 4-SPEED SINGLE PLAYER with separate pick-up, as fitted to R54. 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. Complete for 2-3 ohm speaker. For 200-250 v. 50 c/s. A.C. mains. Overall size 6 1/4 x 4 1/4 x 2 1/4 in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 55/9.

SUPREME FEEDER UNIT Designed to a high quality Radio Tuner Unit especially suitable for use with any of our Amplifiers. Delayed A.V.C. employed. The W.C. Schw. incorporates Gram position. Controls are Tuning, W.C. and Vol. Only 250 v. 15 mA. H.T. and L.F. of 6.3 v. 1.5 A. and record from amplifier. Size of unit approx. 9-8/16 in. 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.

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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.F. of 6.3 v. 1.5 A. is available for the supply of Radio Feeder Unit or Tape Deck pre-amplifier. For A.C. mains input of 200-230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with 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.



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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/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used, EF86, EF86, EC88, 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 PROVIDED** L.T. and H.T. for a **RADIO FEEDER UNIT** control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has outputs for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. It required cover as for Carr. 10/-.

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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/-.

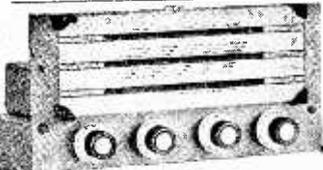
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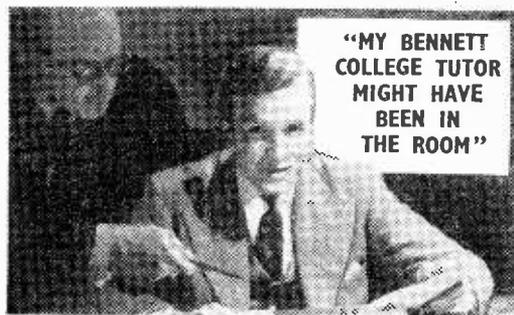
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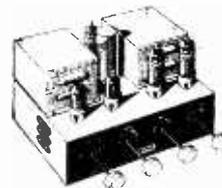
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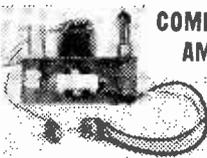
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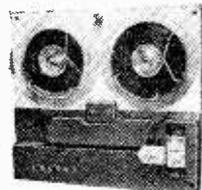
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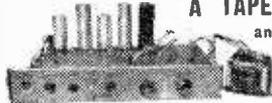
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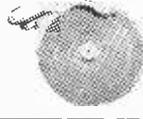
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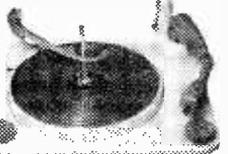
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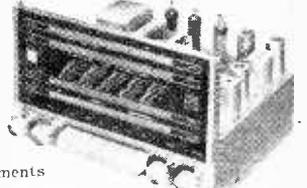
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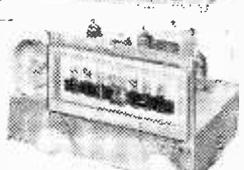
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A 5-valve Tuner incorporating the latest Mullard Permeability Tuning Heart and a "Magic Eye" Tuning Indicator.

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READY FOR USE (Plus 7/6 carriage and insurance.)
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(b) Credit: Deposit £3.12.6 and 9 monthly payments of £1.8.7.



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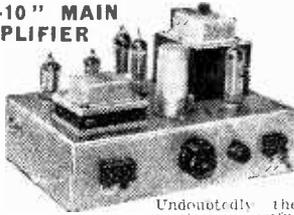
-You can build this unit for **£10.10.0.** Full Assembly Instructions are available for 1/6.

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PLEASE SEND S.A.E. WITH ALL

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

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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 PARMKO Ultra-linear Output Transformer. Has power available to drive Radio Tuning Unit. **COMPLETE KIT OF PARTS £10.00** Alternatively, we supply **ASSEMBLED and TESTED (Carriage & Insurance 5/- extra.) £11.10.0** This "5-10" with the latest PARTRIDGE ULTRA-LINEAR OUTPUT TRANSFORMER for **£16.0 extra**

Please enclose S.A.E. if ILLUSTRATED and alternatively, the COMPLETE ASSEMBLY MANUALS 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 £16.0 EXTRA IF THE PARTRIDGE TRANSFORMER IS REQUIRED.

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 PARMKO 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. Main Amplifier. COMPLETE KIT OF PARTS, **£11.0.0** Alternatively, we supply **ASSEMBLED AND TESTED 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.

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Telephone: FL Eet 5312 3/4
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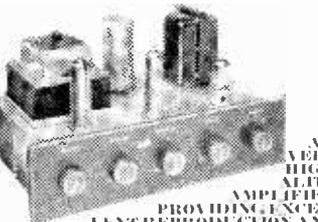
MULLARD'S NEW 2-STAGE PRE-AMPLIFIER - TONE CONTROL UNIT



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 ● Equalisation for the latest R.I.A.A. characteristics.
 ● Input for variable resistance.
 ● 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 (Carriage & Insurance 5/- extra.) £8.0.0**

DESCRIPTIVE LEAFLETS are required; MANUALS, containing component Price Lists and Practical Drawings, etc., are available at 1/6 each.

THE NEW COMPLETE MULLARD "3-3"



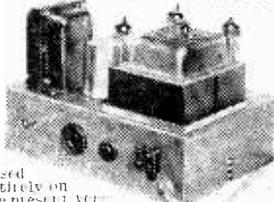
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The complete specification is available for 1/6. Developed from the very popular 3-valve 3-watt Amplifier designed in the Mullard Laboratories. Our kit is complete to MULLARD'S SPECIFICATION including supply of specified components, valves and a PARMKO OUTPUT TRANSFORMER. We also include switched inputs for 78 and L.P. records, plus a radio position. Extra power to drive a Radio Tuning Unit is also available.

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION

WE ALSO SUPPLY SEPARATELY:
 (a) The 2-Stage (plus Rectifier) AMPLIFIER **£4.2.6**
 (b) THE PORTABLE CARRYING CASE **£3.17.6**
 (c) P.M. SPEAKER **18 9**
 Carriage and Insurance 4/- extra.
 We also have a smaller PORTABLE Case Ideal for Record Players. PRICE ONLY **£3.3.0** (plus 3/- carr. & ins.).

THE NEW MULLARD "3-3" MAIN AMPLIFIER



Based entirely on the best of the popular "3-3" model and designed to operate in conjunction with the new 2-stage PRE-AMPLIFIER (shown left); thus providing all the facilities associated with the more expensive "Hi-Fi" Equipment. We recommend it as the IDEAL HOME INSTALLATION where very high quality is desired at the lower volume level (up to 3 watts). We supply complete to MULLARD'S SPECIFICATION including the latest PARMKO 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 (Carriage & Insurance 5/- extra.) £8.0.0**

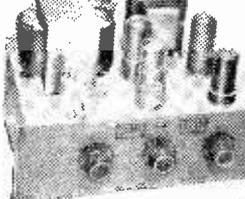
NOTE WE DO NOT USE SURPLUS OR CHEAP COMPONENTS IN ANY OF OUR MULLARD KITS OF ASSEMBLED UNITS.

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

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 H.P.: DEPOSIT £7.10.0 & 9 Monthly Payments of 19/-
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 H.P.: DEPOSIT £9.5.0 & 12 Monthly Payments of 17/6.

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

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



Has power supply for Radio Tuning Unit. **COMPLETE KIT OF PARTS (plus 5/- carr. & ins.) £7.10.0** SUPPLIED, ASSEMBLED and READY FOR USE **£9.10.0**

Proved one of the most popular models offered to the HOME CONSTRUCTOR. Provides excellent reproduction up to 8 watts, employing 6V6s in push-pull, incorporating negative feedback. Provides use of both 3 and 15 ohm speakers.

SPECIAL CASH ONLY OFFER !!

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



The Amplifier consists of a 2-Stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS. The Portable Case will also accommodate almost any make of Auto-changer, and is attractively finished in Maroon and Grey Reflex.

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COMPLETE, READY TO SWITCH ON

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S.A.E. for Illustrated Leaflet.

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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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HIT TRANSFORMERS. 5.5 kV. (Rect.) with 2 v. 1 a. 79/6. 7 kV. (Rect.) with 2 v. 1 a. 89/6. 2.5 kV. (Rect.) with 2-0-2 v. 1.1 a., 2-0-2 v. 2 a. (for VCR97 tube, etc.). 42/6 (postage 2/- per trans.).

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2 valve A.C./D.C. 3 watt Amplifier designed for portable record player. Fully guaranteed—only 52/6. Post and packing 1/6.

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This well constructed portable amplifier cabinet in 2 tone colour with 3 watt A.C. amplifier, 6 1/2" P.M. speaker, output transformer, the four items for only £8.50. Post and packing 7/6. Cabinet will house most makes of auto-changers. Cabinet only 72/6. Post and packing 5/-.

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New lightweight pick-up with HGP 59/1 t/over cartridge and rest. 32/6. Post and packing 1/6.

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A large stock of new design cabinets, speaker enclosures, portable and non-auto cabinets at reduced prices.

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Our new improved I.T.A. Converter with internal crossover filter. A reliable unit. £4.19.6, plus 2/6 post and packing. I.T.A. co-axial cable, 9d. yard, 8/6 per doz. yards.



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1/2 watt 2%	...	1/3
1/2 watt 2 1/2%	...	1/-
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SPEAKERS BY :

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8 valve AM/FM chassis with printed circuit FM tuner section. Illuminated dial in 4 colours. Coverage 1,000-2,000 metres. 200-550 m., 15-50 metres. 88-100 mcs. Dimensions 13in. x 9in. x 6in. Fully guaranteed. £22.10.0. Post & packing 7/6.



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New standard 5in. plastic take-up spools 3/- Standard 7in. plastic spools 3/9 Postage 6d.

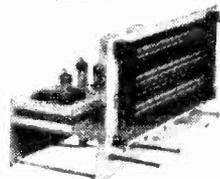
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Completely assembled in stove enamel finish. £7.19.6. Postage and packing, 4/-.

COLLARO 4/564 4-speed single player with studio crystal t/over pick-up. A.C. mains, only £6.19.6 plus 5/- post and packing.

COLLARO JUNIOR 4-speed player with crystal t/over pick-up using HGP 59/1 cartridge. Our price £4.10.0 plus 4/- post and pkg.

BRAND NEW 5-VALVE SUPERHET RADIOGRAM CHASSIS



sockets. Our price £9.10.0. Post & pkg. 7/6

Complete with miniature valves. 3 wavebands, L.M. and Short, P/Up and extension speaker

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New range of sub-miniature capacitors for transistor circuits by well-known manufacturers.

1 uf 18 v.	2/6	16 uf 12.5 v.	3/6
1.6 uf 6 v.	2/6	25 uf 6 v.	3/6
2.5 uf 6 v.	3/-	8 uf 25 v.	3/6
5 uf 12.5 v.	3/-	32 uf 3 v.	3/6
8 uf 6 v.	3/6	25 uf 25 v.	3/6

Post and packing 6d.

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Junction type PNP Transistors. Red-spot audio freq., 6/6. Blue-spot mixer and freq. changer, 10/- White-spot R.F. stage, 20/-.

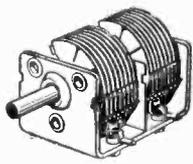
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A popular tool for radio and handy repairs. **SOLDEX** solder dispenser. Saves solder waste, using fluxed solder sufficient for 600 small joints, 2/6, plus 6d. post. Solder refills available.

New .0005

miniature 2-gang tuning condensers by famous manufacturer. Only 6/9, postage 1/-.



.0005 single-gang tuning condenser, 4/9, postage 1/-.

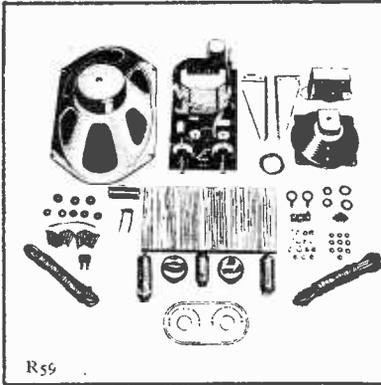
10 amp. Panton D.P. switch, 5/6, postage 6d.

Small single-pole bakelite slide switch, 1/9, postage 6d.

New semi-midget Hi-Q 465 k/cs I.F. transformers, dust-core tuning by well-known maker. 5/6 pair, postage 1/-.

First of a new range of **COSSOR** KITS

**AN EASY-TO-ASSEMBLE
AMPLIFIER**
for the "Do-it-Yourself" enthusiast



This new Cossor kit consists of a printed board, two loudspeakers and all the components necessary to assemble a 3 watt high-quality amplifier. Fully illustrated easy-to-follow instruction manual included.

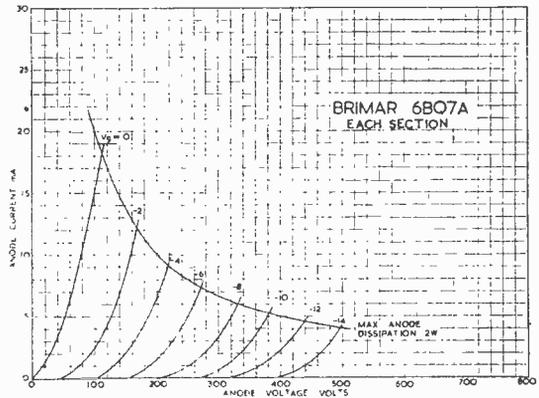
£9.15.0
(Including Tax)

NOW AT YOUR LOCAL COSSOR DEALER

Cossor Radio & Television Ltd., Cossor House, Highbury Grove, N.5.

BRIMAR 6BQ7A

The Brimar 6BQ7A is a double triode consisting of two independent high slope sections with similar characteristics. The valve is particularly useful as a cascode R.F. amplifier for television receivers and also as a combined oscillator and mixer for frequency modulation receivers. It can, of course, be used wherever high slope triodes are required, and features low interaction between the sections as an internal screen is provided which is brought out to a separate base pin.



TYPICAL CHARACTERISTICS

Heater voltage.....	6.3 volts
Heater current.....	0.4 amp
Anode voltage.....	150 volts
Cathode bias resistor.....	220 ohms
Anode current.....	9 mA
Mutual conductance.....	6.4 mA/V
Amplification factor.....	39
Anode resistance.....	6,100 ohms
Grid cut-off voltage ($I_a = 10 \mu A$).....	-10 volts approx.

Write to the Publicity Department for a data sheet.

Standard Telephones and Cables Limited **FOOTSCRAY SIDCUP KENT** Footscray 3333

PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXIV, No. 617, MAY 1953

EDITOR : F. J. CAMM

26th YEAR
OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

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.

Editorial and Advertisement Offices :
PRACTICAL WIRELESS

George Newnes, Ltd., Tower House,
Southampton Street, Strand, W.C.2.

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

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Round the World of Wireless



Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of 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-

By "QUESTOR"

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 continu-

ous 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.

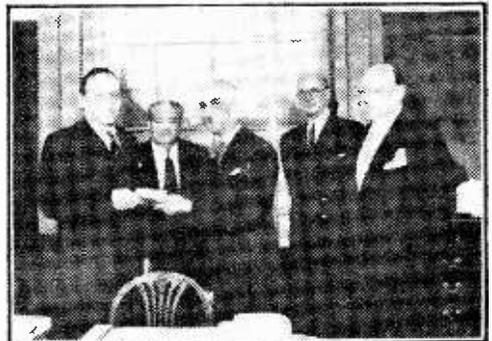
Radio versus Rustlers

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



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

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.

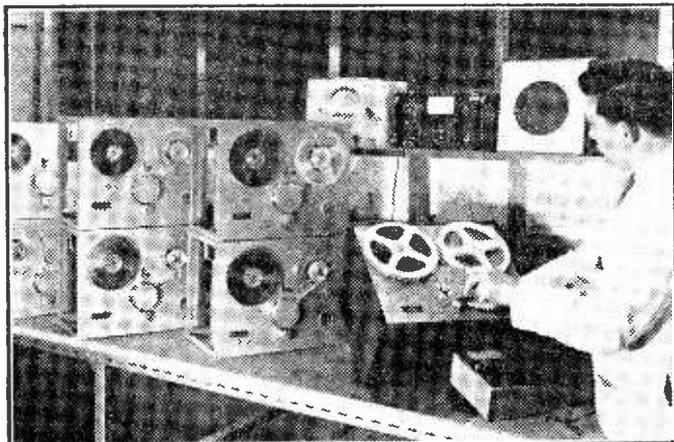
North Eastern: Wednesday April 9th, at 6 p.m., Annual General Meeting followed by a programme of technical films.

Scottish: Thursday, April 17th, at 7 p.m., Institution of Engineers and Shipbuilders, 39,

The improved production in December was concentrated in other than 78 and 33 $\frac{1}{2}$ 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. 33 $\frac{1}{2}$ r.p.m. were up by less than

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.



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

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.

10 per cent, while production of other types expanded by over 90 per cent.

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

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.

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 1/2 in. 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.F. 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 μ F condenser.
- Pin 5 to earth.
- Pin 6 to earth.
- Pin 7 already connected to C13 and R6 see under H.T. 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 μ F 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.F. 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

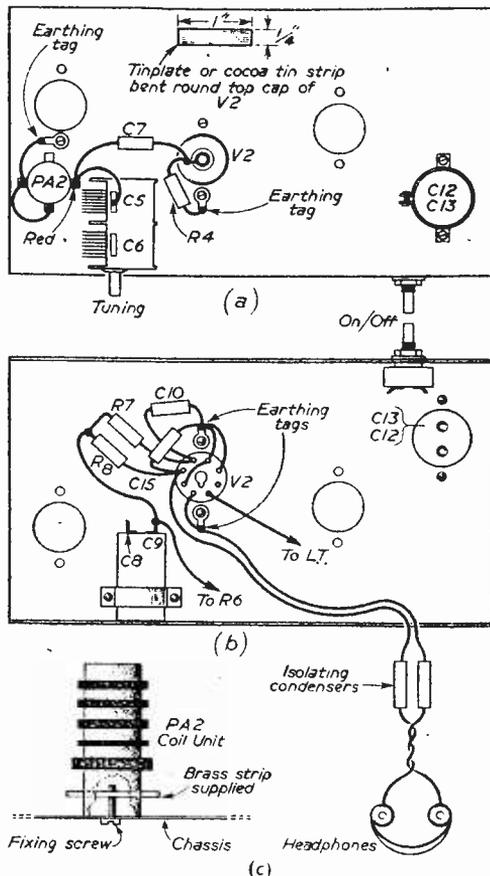
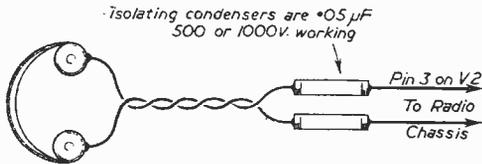


Fig. 10(a).—Wiring for Fig. 9. 10(b).—Underside of chassis (battery supplies not shown and previous wiring omitted). Fig. 10(c).—Details of coil fixing.

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 $\frac{1}{2}$ 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.



Note: All joints should be in junction box or well taped

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.

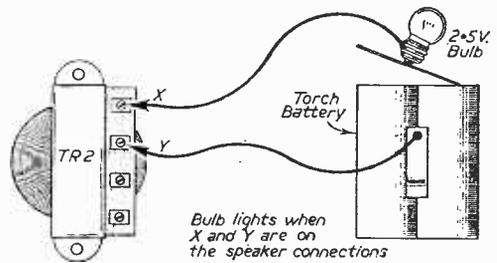


Fig. 13.—Testing to find the secondary winding.

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

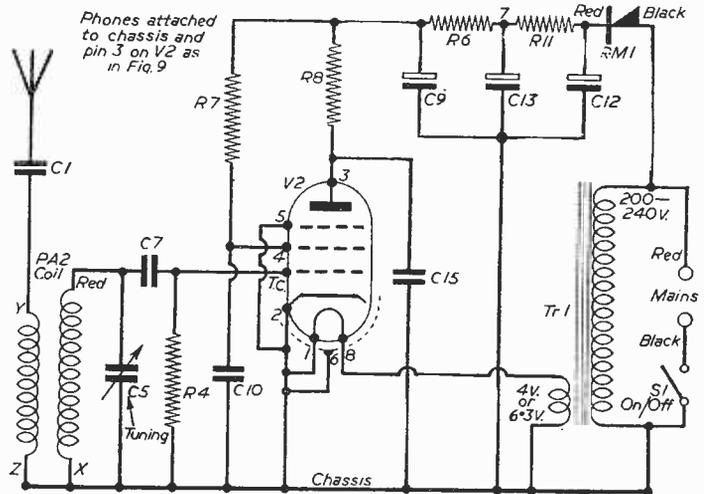


Fig. 12.—The complete detector stage circuit.

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.F. You may test this transformer in a similar way to that described

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

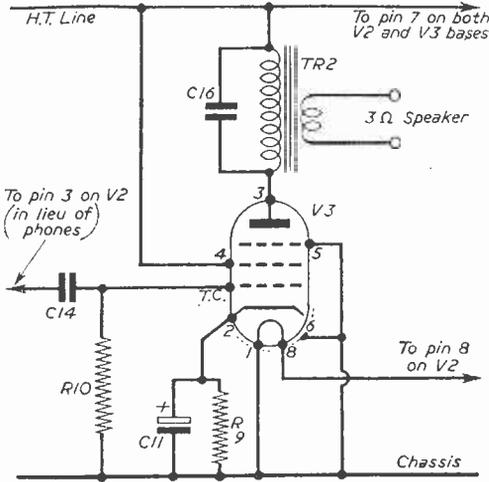


Fig. 15.—The output stage which is added to Fig. 12.

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 position, 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.F. 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

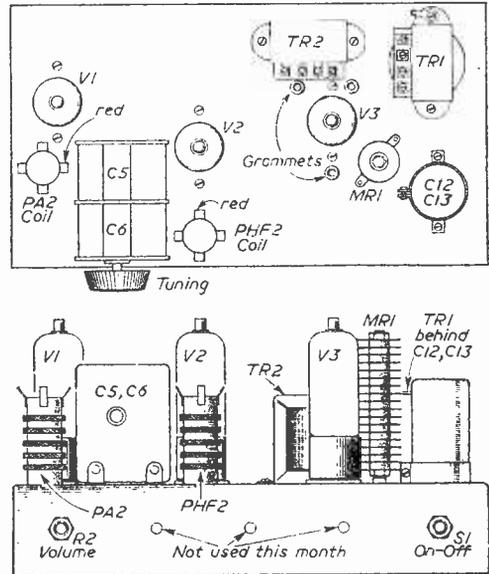
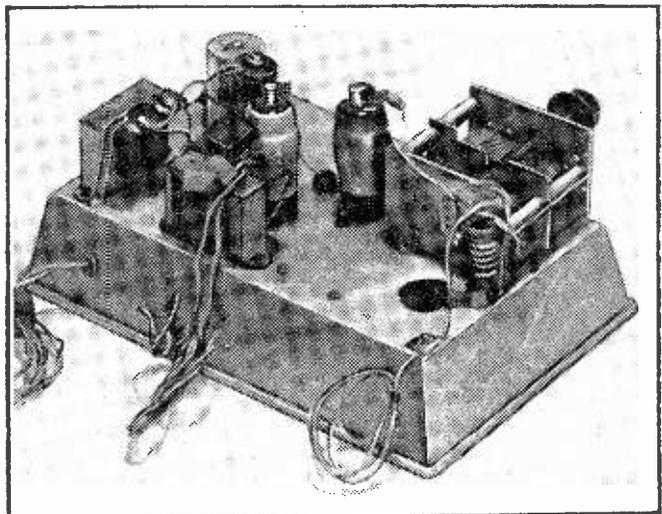


Fig. 14.—Top and front views of this month's development.

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

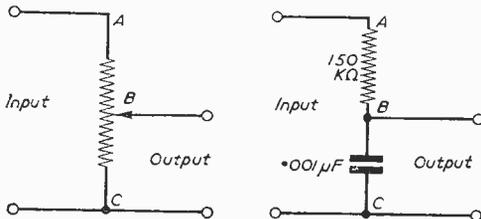


Fig. 1.—(Left) Simple volume control, and Fig. 2 (Right) Treble cut control.

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

TABLE II

Ratio	1	1 1/4	1 1/2	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

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 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 c.p.s.

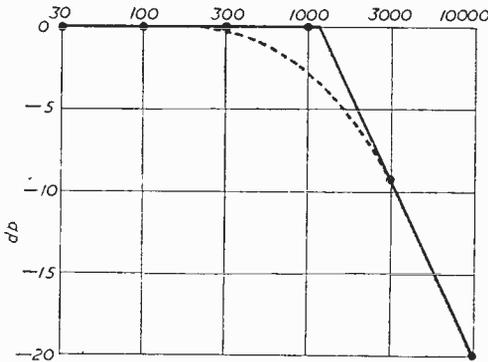


Fig. 3.—A frequency response curve.

(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.

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

where the two impedances are equal, should be 3 db.

Bass Boost

Fig. 4 shows another common network. This

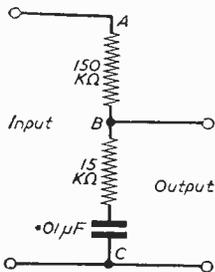


Fig. 4.—Bass boost circuit.

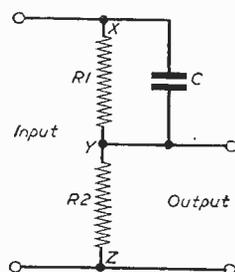


Fig. 6.—Treble boost circuit.

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

TABLE III

c.p.s.	30	100	300	1,000	3,000	10,000
BC (.001 μF)	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

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

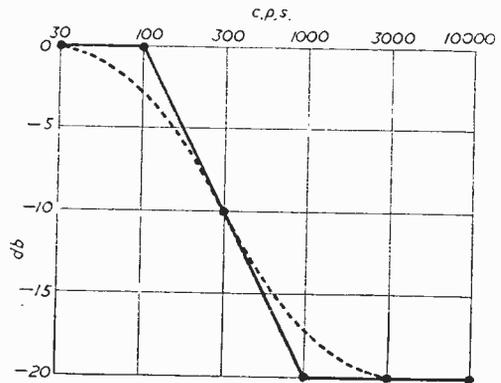


Fig. 5.—Response curve for bass boost circuit.

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, capacitive, 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
.01 μF	500K	160K	50K	16K	5K	1.6K
BC (Rule 1)	500K	160K	50K	16K	5K	1.6K
AC (Rule 1)	500K	165K	165K	165K	165K	165K
Ratio	1	1	3 1/2	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,

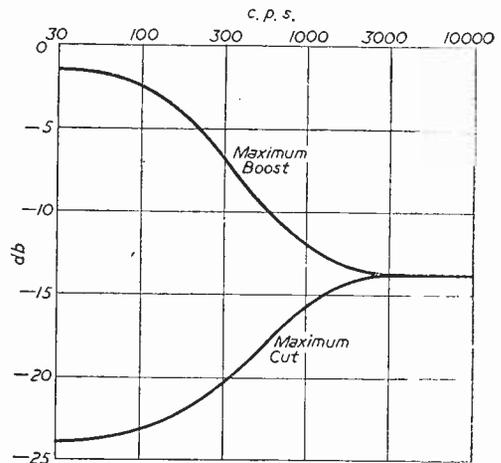


Fig. 10.—Curve of Bass Control Circuit

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 jωt 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.

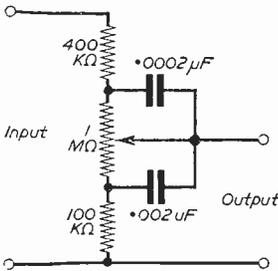


Fig. 7.—Bass boost-cut circuit.

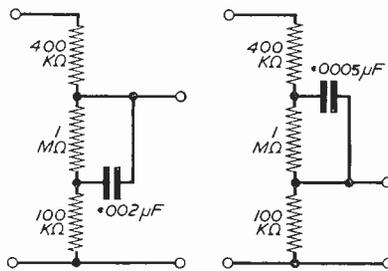


Fig. 8 and Fig. 9.—Rearrangement of the Fig. 7 circuit.

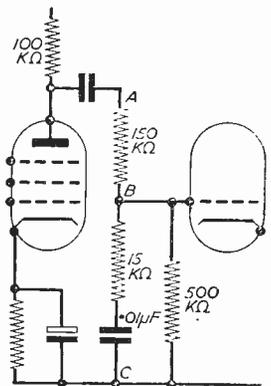


Fig. 11.—A pentode tone control stage.

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-

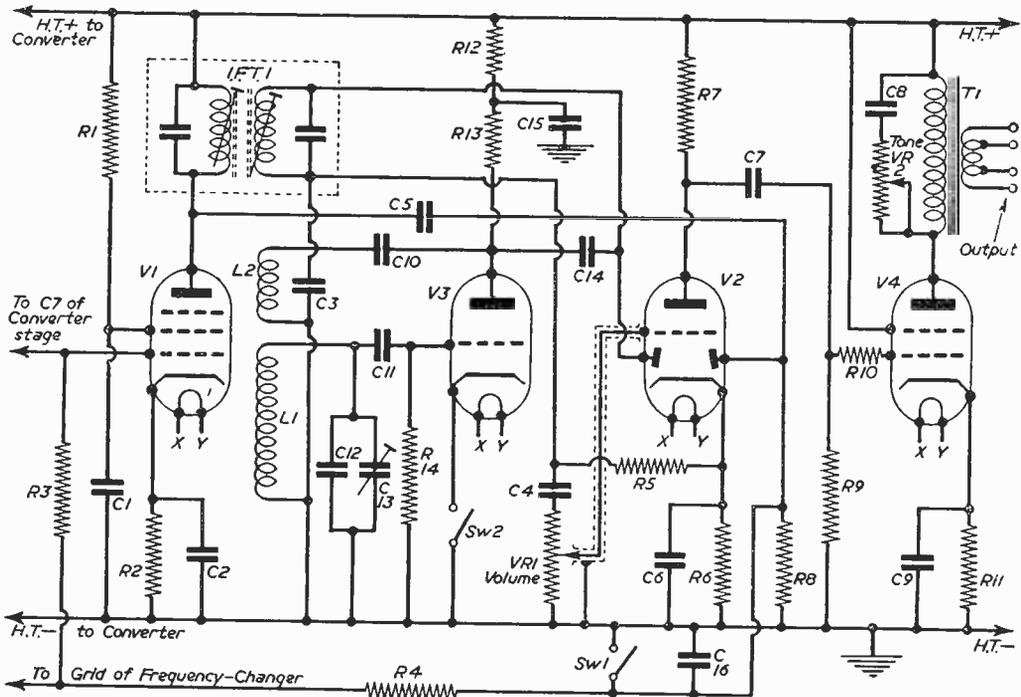


Fig. 1.—Amplifier section for use with the R1155 Converter.

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

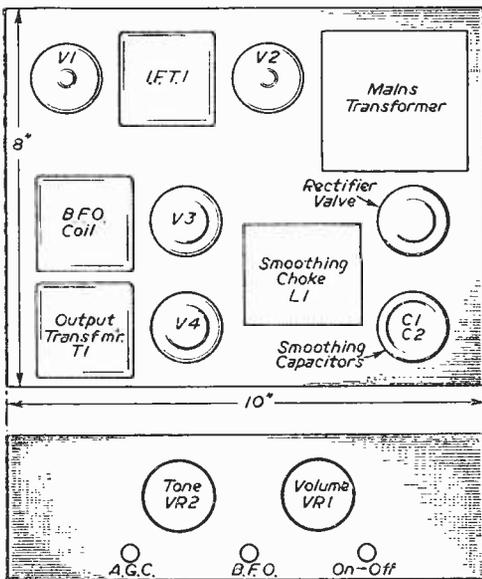


Fig. 2.—Chassis layout and panel control details.

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.

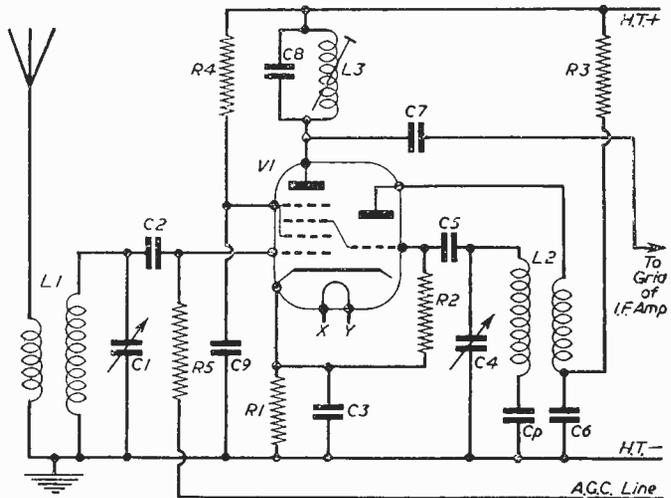


Fig. 3.—Frequency converter circuit for use with the amplifier shown on page 189.

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 Lancastrian 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 flobbered 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. 6KB Mixer. 6SK7 1st and 2nd I.F. 6R7 2nd Det. 6C5 B.F.O. 6K6 output. Size 6 1/2 x 1 1/2 in. Easily converted to mains operation as described on page 453 of the September "Practical Wireless." £5/10/- Carr. 7/6.

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R.F.26. 50-65 Mc/s., 20/- each.
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Complete with valves and circuit.

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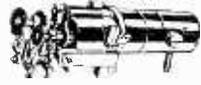
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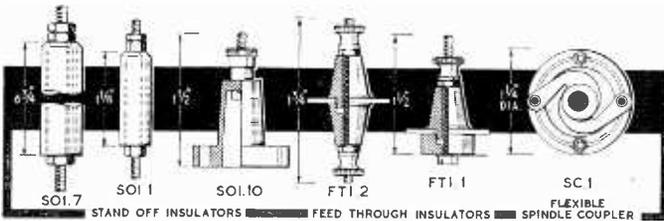
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Ebonite Rod: 1/2 in. dia., 1 - per foot; 3/4 in. dia., 1/9; 7/16 in. dia., 2/3; 1/2 in. dia., 3/8.
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Paxolin Tube: Square 1/2 in. x 1/2 in. x 1/32 in. wall, 3 - per foot. Round 1/2 in. o.d. x 7/16 in. i.d. 1, 3 per foot; 1/2 in. o.d. x 1/2 in. i.d. 2, 7; 1/2 in. o.d. x 1/2 in. i.d. 1, 5; 1/2 in. o.d. x 1/2 in. i.d. 4, 3; 1/2 in. o.d. x 1/2 in. i.d. 3, 1/2 in. i.d. 4, 3; 1 1/2 in. o.d. x 1 1/2 in. i.d. 4, 6.
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1A7	12/6	6CH6	7	7106	21/5	12Z3	15/6	85A2	15	-D77	5	EC882	9	EZ41	10	6	KT61	15	6	PEN4BA		TH22	12	6	UCH41	11	6		
1D5	15/6	6E30T	10	-7108	21/5	1487	14/6	14147	7	6/D52	5	EC883	9	EZ80	8	-	KT63	10	11	6	TP25	23	6	UCH42	13	6			
1D6	10/6	6F1	19	7117	8	19A05	9/-	1054A	15/9	DAC32	9	EC884	10	EZ81	8	-	KT66	17	6	PEN46	6	-	TH4	13	6				
1H3	10/6	6F1	19	7117	8	19B56G	17	10B56G		H8TH	23	6	DAP91	9	EC885	10	6	KT66	12	6	PL23	8	6	TH4	11	6			
1N3	9/9	6F12	8	787	12/7			21/-	61BT	15/-	DAP96	6	EC891	7	EC2	14	6	KT66	12	6	PL28	23	6	U22	7	6			
1R3	8/9	6F13	18	6	784	7	2011	14	6	61SPT	15/-	DF33	9/9	ECF89	12	6	FC13	14	6	KT66	12	6	PL28	16	6				
1S3	8/9	6F14	23	6	8103	8	2012	23	-621T	25/-	DF91	6	ECF82	12	6	FC13	14	6	KT66	12	6	PL28	16	6					
1T4	8/-	6F15	15	6	903W	18/9	20F2	23	6	180BT	30/-	DP92	6	ECF81	21/-	FW4	30/6	14	6	KT66	12	6	PL28	16	6				
1U5	10/6	6H6	3	40C1	18	-	20L4	23	6	303	8	DP96	9	ECF42	9	6	KT66	12	6	PL28	21	-	U37	22	6				
3A3	12/6	6J5GT	6	6	10C2	18	6	20F4	23	6	304	8	DP97	9	ECF35	12	6	FW4	30/6	14	6	PM2A	10	-	U50	8			
3Q4	10/6	6J6	7	6	10P1	23	6	20F4	23	6	305	8	DP96	9	ECF35	12	6	FW4	30/6	14	6	PM2L	10	-	U52	8			
3Q5	9/9	6J7GT	10	-	10P3	21	-	20F5	21	-	328	9	DP76	8	ECF50	12	6	GZ32	11	6	MH4	12	6	U76	8				
3S4	8/-	6K7GT	10	-	10P9	12	6	35A91	18	6	329	9	DP77	7	ECF52	13	6	H39	4	9	MH4	8	6	PM2A	18	6			
3V4	8/6	6K8GT	12	3	10L11	15	6	35L6CT	9	-	AC3 PEN	14	DP7	10	6	EP9	21	-	H63	10	-	MH4	18	6	PM2M	11	6		
5V40	8/6	6K25	19	6	10P13	21	-	25Y3	10	6	-	DP79	11	6	EP97A	10	3	HL92	11	6	MH4	12	6	U132	19	6			
5Y3GT	8/6	6L1	17	6	10P14	18	6	25Z4	9	-	AC3 PEN	15/-	DP79	11	6	EP97	7	6	HL13DD	MKT4	6	PM202	15	6	U191	18	6		
5Z40	10/-	6L6	7	6	11D3	23	-	25Z5	10/-	6	-	DP92	11	6	EP40	15	-	11	6	-	PM20	15	6	U191	18	6			
6A7	13/6	6L18	12	4	11D5	23	-	25Z6	9/-	6	AC3 PEN	15/-	DP96	9	EP41	9	6	FW4	35/0	14	6	PM24	15	6	U281	18	6		
6A8	10/-	6L19	21	-	12A3	6	6	30C1	12	6	-	DP96	9	EP42	12	-	12	-	MH4	10	-	PM24	15	6	U282	20	6		
6AK5	6/6	6L30L2	13	-	12A4H	10	-	30F5	12	6	ACHT	29	6	EL35	13	6	EP50(A)	4	6	1W1	30/0	14	6	U31	18	6			
6AL5	6/6	6L32D9	15	3	12A76	8	9	30FL1	12	6	ACHT	11	6	EL35	13	6	EP80	8	6	-	N19	8	-	PM20	18	6			
6AM6	6/6	6N7GT	8	-	12A77	8	9	30L1	11	6	ACHT	11	6	EL35	13	6	EP80	8	6	-	N19	8	-	PM20	18	6			
6AN5	5/-	6P1	16	-	12A77	8	9	30F4	23	6	-	DP96	9	EP86	12	6	EP50	12	6	EP50	12	6	U31	18	6				
6AQ5	7/6	6P25	18	6	12A77	8	9	30F4	23	6	ACHT	29	6	EL35	13	6	EP80	8	6	-	N19	8	-	PM20	18	6			
6AT6	7/6	6P28	23	6	12B46	8	9	30F16	10	6	ACV1	23	6	EAC80	9	6	EP91	8	6	KL52	N42	6	SP4	15	6				
6AT6	15/6	6Q7GT	20	6	12B46	8	9	35A5	10	6	ACV1	23	6	EAC91	10	-	EP92	9	-	14	6	N53	11	3	SP41	3	10		
6B8	4/3	6SA7GT	8	6	12J3GT	7	-	35L6CT	10	-	AC3 PEN	14	DP92	11	6	EL32	5	6	KL25	10	6	N150	10	-	SP42	12	6		
6B46	8/6	6S47	8	6	12J7GT	10	-	35V4	8	-	-	EB41	10	6	EL33	3	6	KL25	10	6	SP41	12	6	U31	18	6			
6B26	8/3	6S47	8	6	12K7GT	8	6	35Z3	10	-	AC3 PEN	14	DP92	11	6	EL37	21	-	KL22	10	6	N108	16	6	TH4	21	6		
6B48	21	6S47	8	6	12K7GT	8	6	35Z4	9	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6	
6B46	7/6	6S47	8	6	12K8GT	3	5	35Z5	10	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6	
6B47	12/-	6S47GT	7	-	12L	12	3	35Z6	10	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6	
6B46	8/6	6S47GT	8	6	12Q7GT	8	6	39C0D6	8	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6	
6B47	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6	14	23	6	EP80	12	6	EP88	23	6	KL22	10	6	PL28	12	6	TH4	21	6
6B46	8/6	6T4GT	11	6	12S47	8	6	37	6	16	6																		

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, C_n would have to equal C_{ag} .

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 C_{cb} and R_{cb} .

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.

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

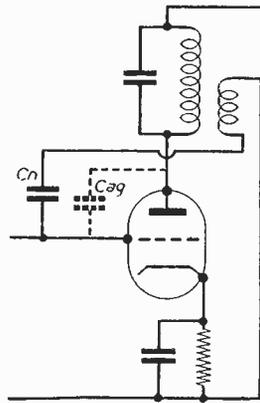


Fig. 34.—The transformer neutralising circuit.

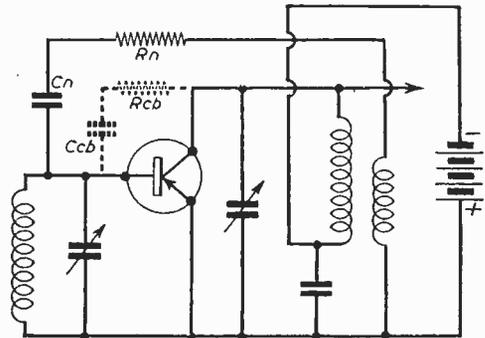


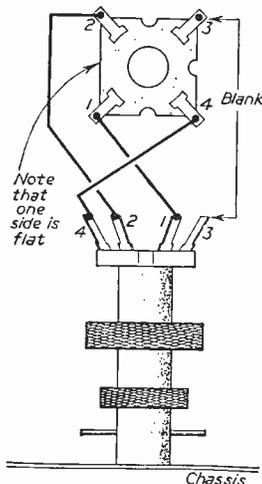
Fig. 35.—The neutralised transistor stage.

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 μ F 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 aluminium 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.



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

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 $1\frac{1}{2}$ 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 $5/16$ in. 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

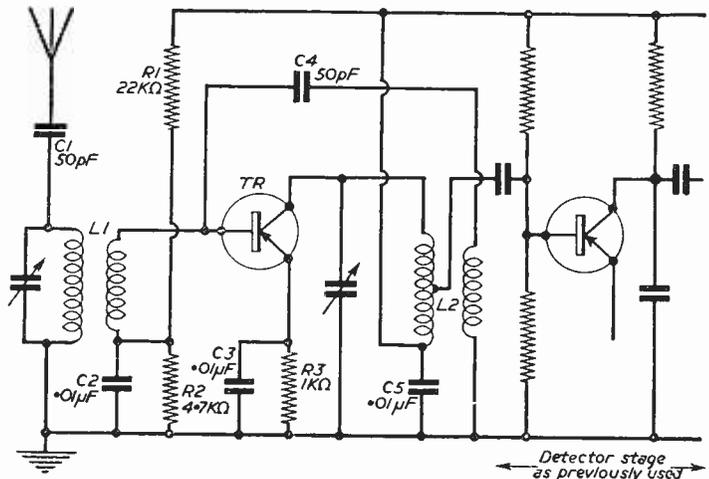


Fig. 36.—Circuit of the R.F. stage.

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

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 wave-band 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

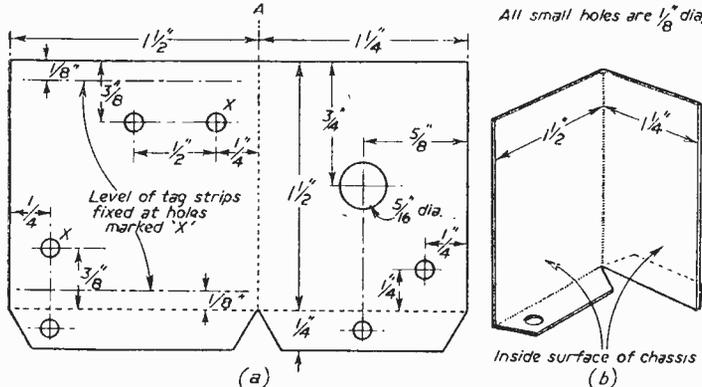


Fig. 37.—Details of the chassis for the R.F. stage.

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,

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	R1—22 K Ω
C2—.01 μ F	R2—4.7 K Ω
C3—.01 μ F	R3—1 K Ω
C4—50 pF	TR—Golpet V6/R8
C5—.01 μ F	L1—Osmor
	L2—Osmor (as used for regenerative Detector.)

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

(To be Continued)

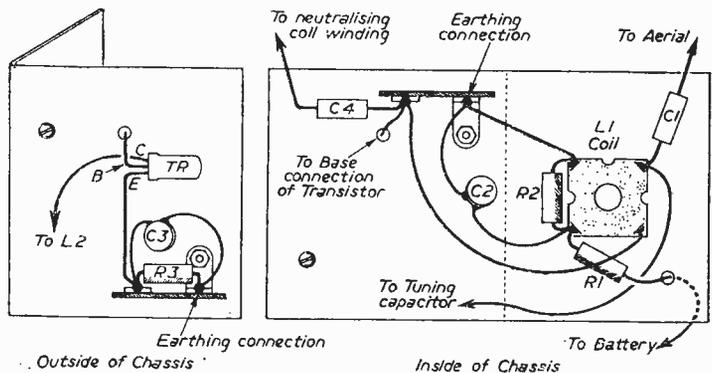


Fig. 38.—Wiring diagram of the R.F. stage.

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

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

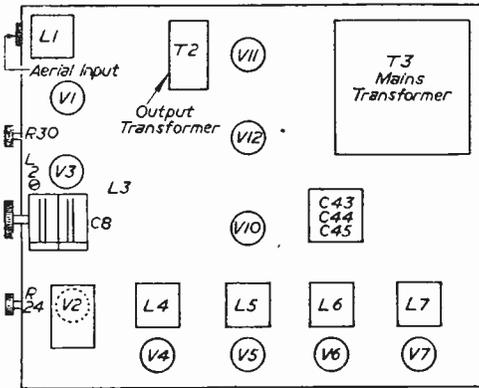


Fig. 2 (a).—Top of chassis layout.

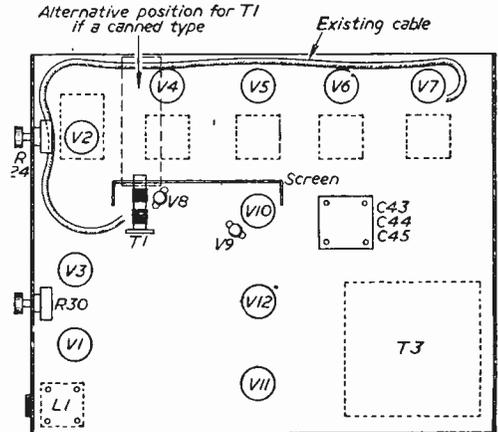


Fig. 2 (b).—Underside of chassis.

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

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.

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 μ F.
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 μ F.
C37—300 pF.
C41—50 μ F.
C43, C44, C45— $8 \times 8 \times 8 \mu$ F.

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 valvholder at the rear of the chassis and re-fixing it underneath in front of the EC52 valvholder. (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 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 valvholders in the strip, connecting the freed pins to chassis.

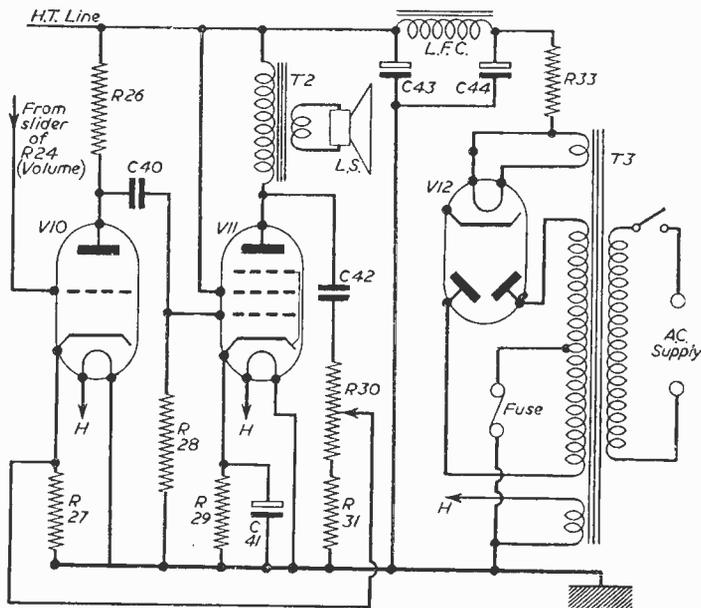


Fig. 1 (c).—Power and audio section.

Disconnect R15 (originally 2.2 K Ω) which lies across the underside of the can and solder in a new resistor of 47 K Ω . 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

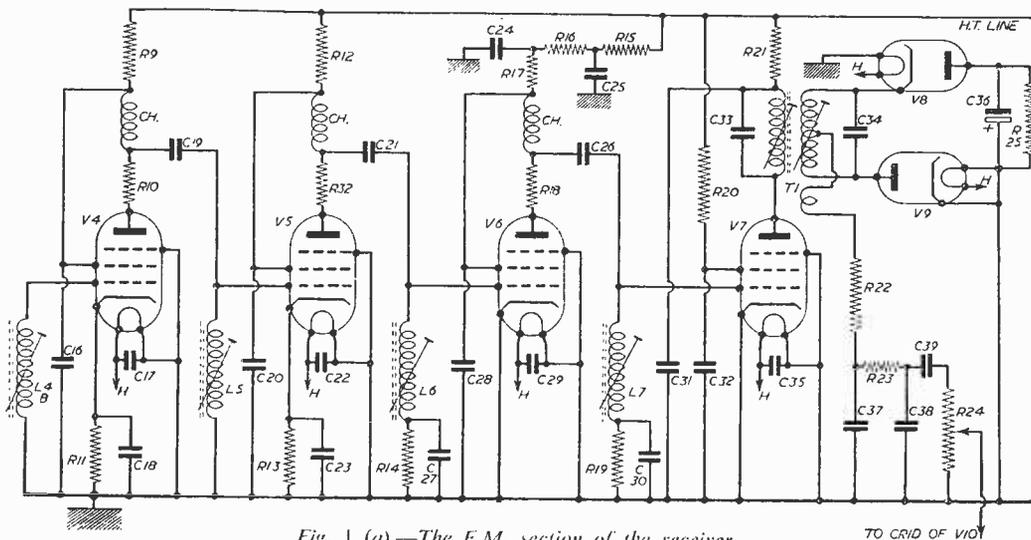


Fig. 1 (a).—The F.M. section of the receiver.

TO GRID OF V10

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

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.

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. } Spaced wire thickness } canned
L2	4½	28 enam.	3/8		Spaced twice wire thickness
L3	3½	28 enam.	3/8	Spaced twice wire thickness
L4-7	See Text			
T1	Primary 28 Secondary 15+15	28 enam. 28 enam.	0.3	Closewound Bifilar, spaced ⅛ in. from primary
	Tertiary 10 (see text)	28 enam.		Over primary—remotest end from sec.

this a dual tuning wand will be found a useful accessory.

Broader Tuning

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

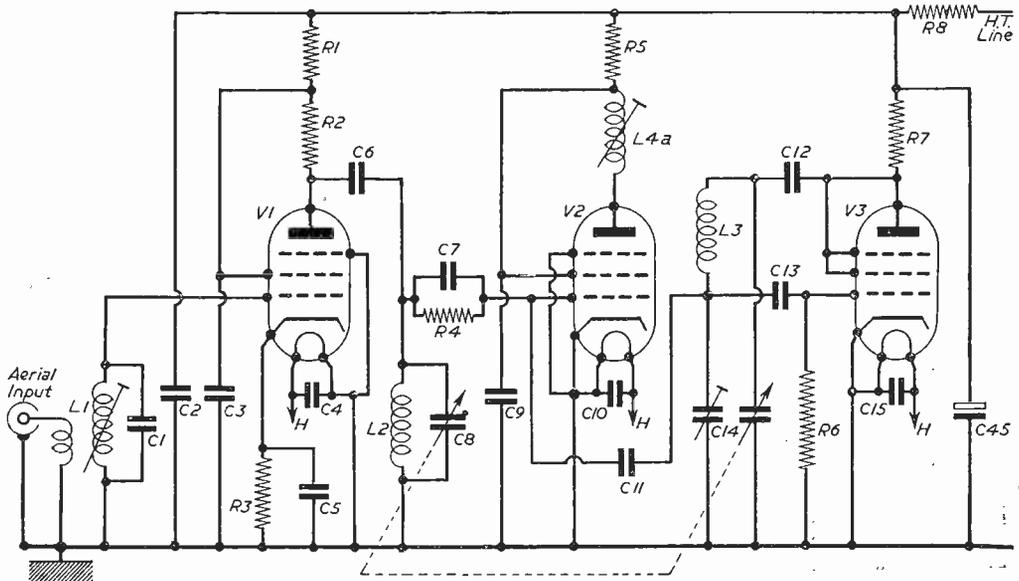


Fig. 1 (b).—The A.M. section of the converted R.D.F.1.

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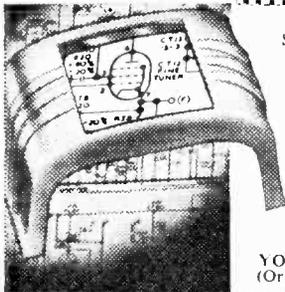
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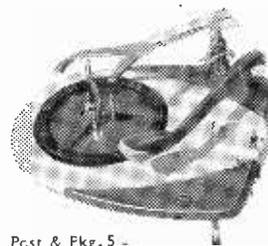
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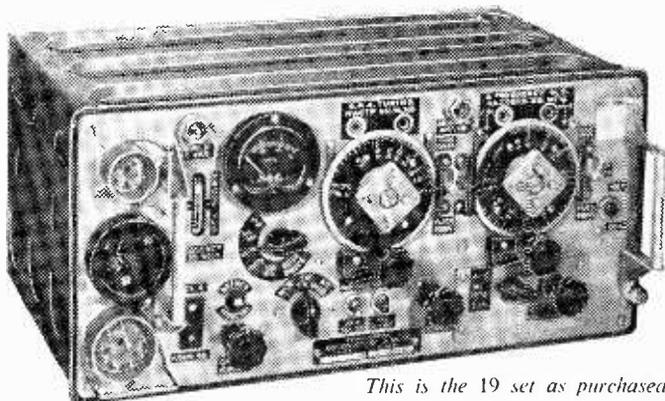


Converting the 19 Set

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 (0.1 μF) 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.

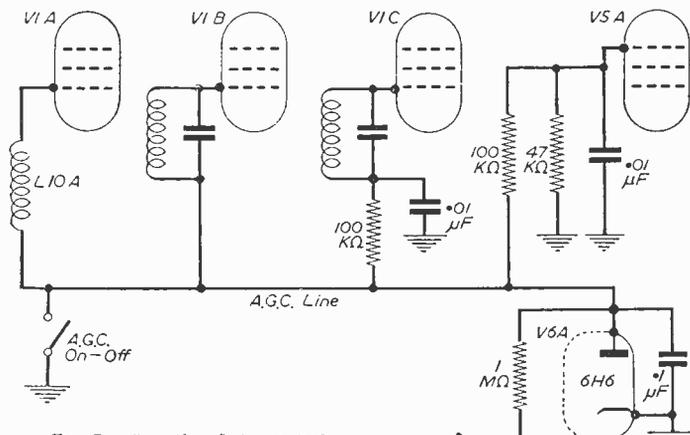


Fig. 7.—Details of the A.G.C. arrangements.

(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 1/4in. 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

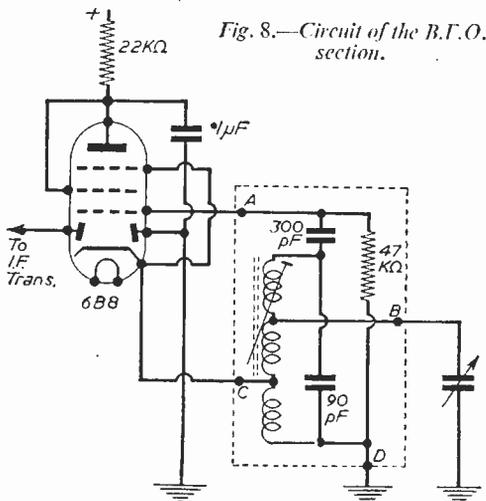


Fig. 8.—Circuit of the B.F.O. section.

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 50μV 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.

News from the Clubs

BURY RADIO SOCIETY

Hon. Sec.: Mr. L. Robinson, 56, Avondale Ave., Bury, Lanes. 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, Sidecup, 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 (G3GW)

Hon. Sec.: S. J. Berridge (G3JTW), 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 (G3GJU),

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

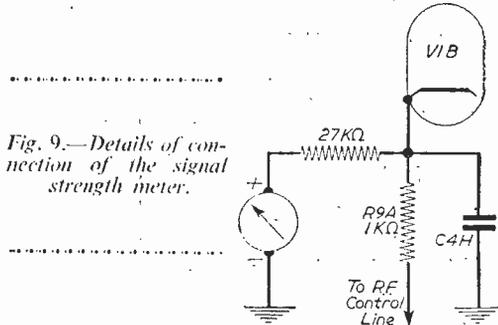


Fig. 9.—Details of connection of the signal strength meter.

mesh. The B.F.O. coil should now be aligned to zero beat, so that a further moving of the hct. 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.

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 G2FCF.

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.

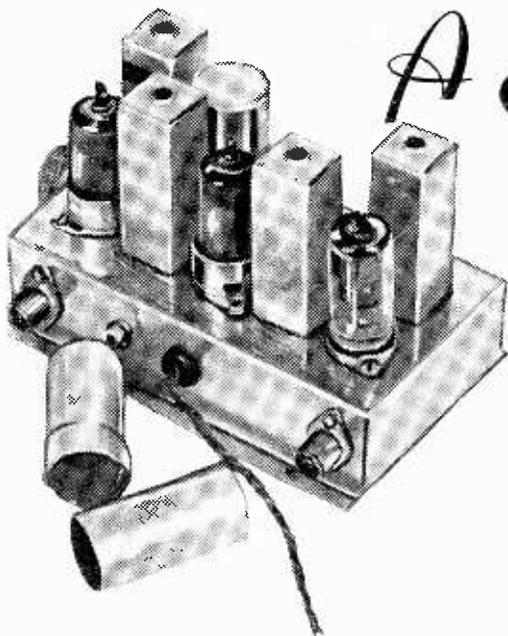
Programme for April:

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 FM Tuner

A HIGH-QUALITY TUNER WITH "DIOMATIC" FREQUENCY CONTROL
By P. Michael

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.

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.

LIST OF COMPONENTS

R1—220Ω
R2—1.5 K.
R3—22 K.
R4—1.5 K.
R5—470 K.
R6—47 K.
R7—10 K. 1 W.
R8—47 K.
R9—47 K.
R10—10 K.)
R11—10 K.) } matched
R12—47 K.
R13—10 K.
R14—47 K.
V1—ECC81

V2) ECF80 or
V3) ECF82
Pair of matched diodes,
OA79 or GEX34
VR1—Variable 2 K.
C1—1,000 pF MC
C2—1,000 pF MC
C3—33 pF MC
C4—1,000 pF MC
C5—1,000 pF MC
C6—10,000 pF MC
C7—1,000 pF MC
C8—1,000 pF MC
C9—1,000 pF MC

C10—330 pF MC
C11—1,000 pF MC
C12—0.1 μF P
C13—330 pF MC
C14—330 pF MC
C15—8 μF E
C16—12 μF E
C17—12 μF E
C18—1,000 pF MC
C19—1,000 pF MC
C20—12 μF E
C21—3-5 pF MC
MC—Midget ceramic
P—Paper

E—Electrolytic
L1 and L2—See text
L3—Q PCM
L4—Q 1FM
L5—Q 1FM
L6—Q 1D } C. & G.
Kits, Ltd.
1 Chassis
3 Nylon loaded B9A
valve holders. (2 with
skirts and screens.)
1 Switch (1 pole 3 way)
2 Co-axial input sockets
1 Rubber grommet
3 Ferrocart heads

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 Q.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.

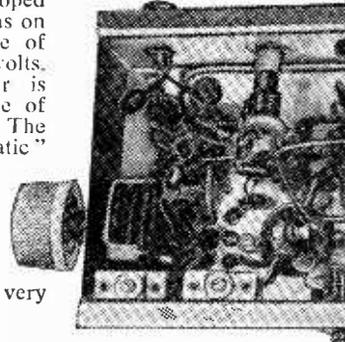
6. *Cathode follower output stage.*

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 "Dromatic" 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 "Dromatic" 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 "Dromatic" frequency control also enables the oscillator voltage to be confined to the oscillator coil which helps to keep radiation to very small proportions.



Construction

An underside vi

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

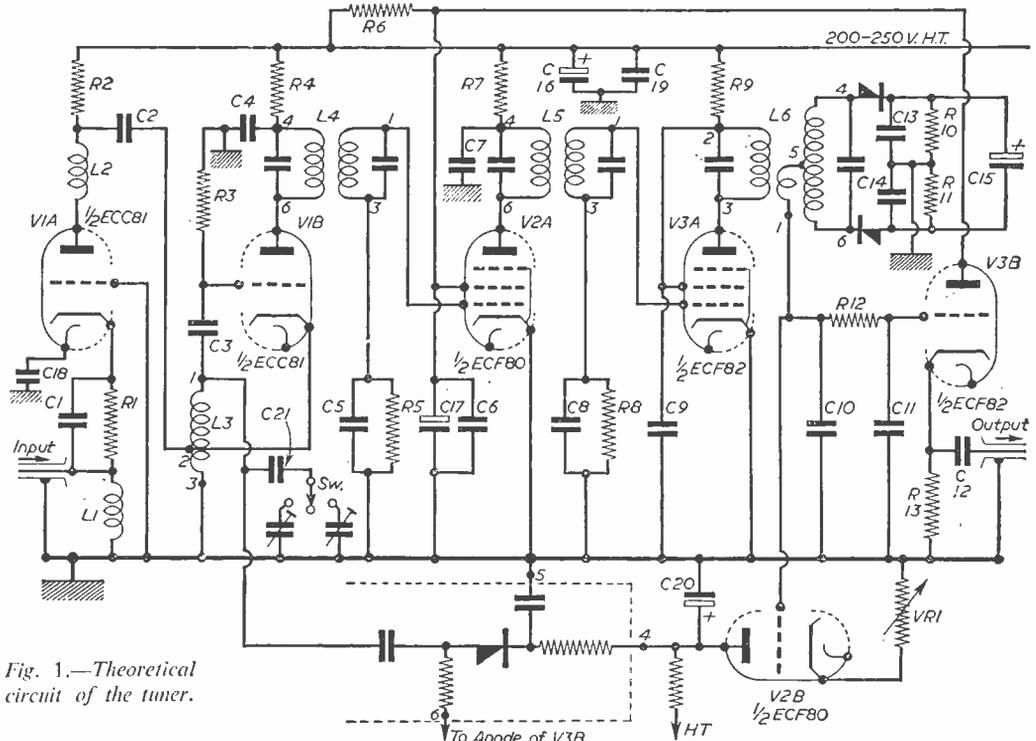
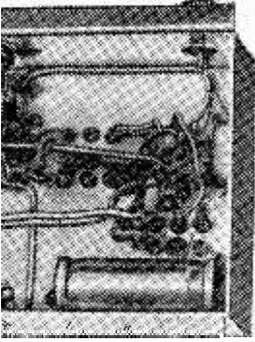


Fig. 1.—Theoretical circuit of the tuner.

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 connected 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.



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

of the tuner.

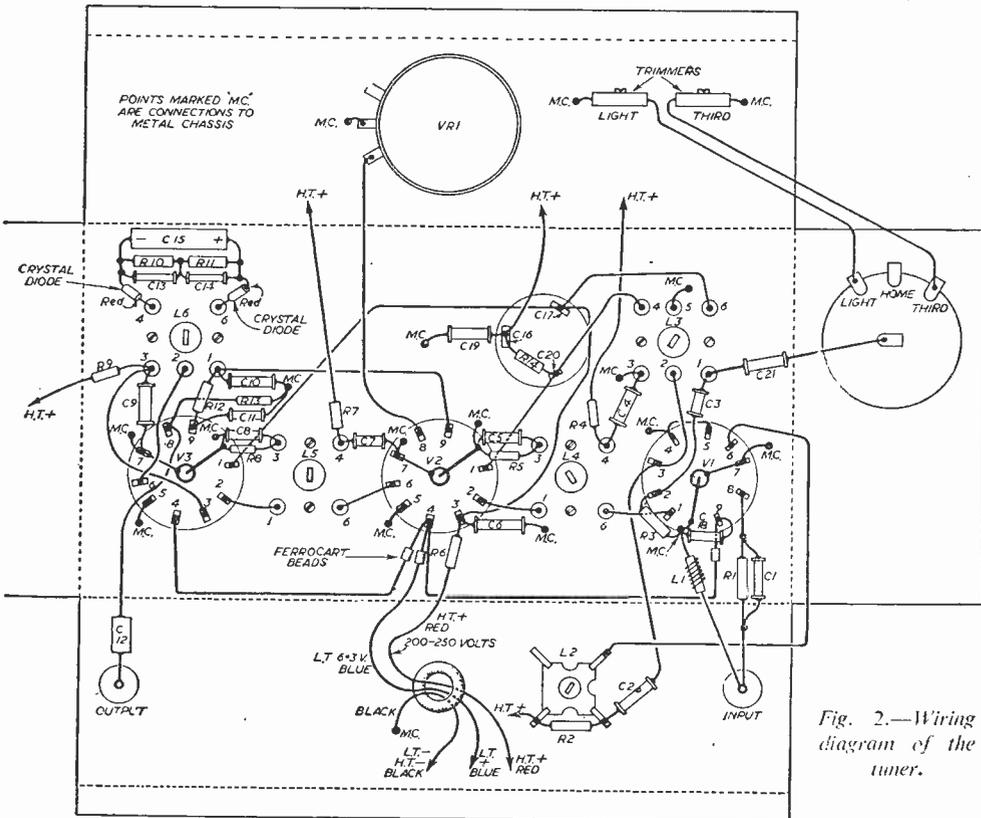


Fig. 2.—Wiring diagram of the tuner.

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.

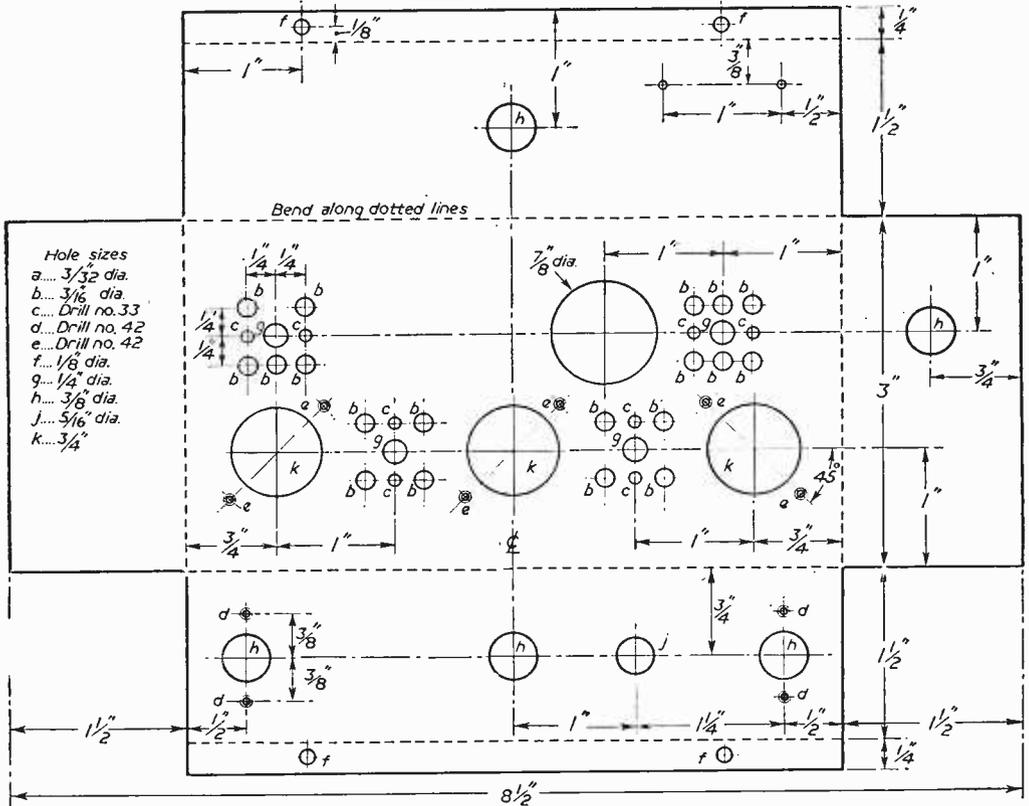


Fig. 3.—Full chassis data for constructing your own chassis.

Coils

L1 four turns of thin insulated wire on half a dust core.
 L2 six turns of 20 s.w.g. enamelled on 1/4 in. 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.

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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.

<i>Exhibitor</i>	<i>Stand No.</i>	<i>Exhibitor</i>	<i>Stand No.</i>
Standard Insulator Co., Ltd.	1	Telegraph Condenser Co., Ltd.	54
Wandleside Cable Works, Ltd.	2	Siemens Edison Swan, Ltd.	55
Geo. Salter & Co., Ltd.	3	London Electrical Manufacturing Co., Ltd.	56
Mullard, Ltd.	4	Reslosound, Ltd.	57
Diamond H. Switches, Ltd.	5	London Electric Wire Co. & Smiths, Ltd.	58
Zenith Electric Co., Ltd.	6	Egen Electric, Ltd.	59
Thermo-Plastics, Ltd.	7	James Neill & Co. (Sheffield), Ltd.	60
Cathodeon Crystals, Ltd.	8	Westinghouse Brake & Signal Co., Ltd.	61
Waveforms, Ltd.	9	Standard Telephones & Cables, Ltd.	62
Associated Electronic Engineers, Ltd.	10	Long & Hambly, Ltd.	63
Stratton & Co., Ltd.	11	Wingrove & Rogers, Ltd.	64
Suflex, Ltd.	12	Parmeko, Ltd.	65
Mica & Micanite Supplies, Ltd.	13	Permanoid, Ltd.	66
H. J. Enthoven & Sons, Ltd.	14	Ferranti, Ltd.	67
Taylor Electrical Instruments, Ltd.	15	Murex, Ltd.	68
Morganite Resistors, Ltd.	16	N.S.F., Ltd.	69
Alfred Imhof, Ltd.	17	Truvox, Ltd.	70
Radio Instruments, Ltd.	18	Measuring Instruments (Pullin), Ltd.	71
Belling & Lee, Ltd.	19	Telephone Manufacturing Co., Ltd.	72
Connollys (Blackley), Ltd.	20	Antiference, Ltd.	73
Mullard Overseas, Ltd.	21	McMurdo Instrument Co., Ltd.	74
Mullard, Ltd.	22	British Electric Resistance Co., Ltd.	75
Wego Condenser Co., Ltd.	23	Vactite Wire Co., Ltd.	76
Woden Transformer Co., Ltd.	24	Geo. Tucker Eyelet Co., Ltd.	77
Carr Fastener Co., Ltd.	25	Gresham Transformers, Ltd.	78
Duratube & Wire, Ltd.	26	Whiteley Electrical Radio Co., Ltd.	79
Colvern, Ltd.	27	Mycalex and T.I.M., Ltd.	80
Goldring Manufacturing Co. (Great Britain), Ltd.	28	Reliance Manufacturing Co. (Southwark), Ltd.	81
Erie Resistor, Ltd.	29	British Physical Laboratories, Ltd.	82
Cosmocord, Ltd.	30	J. Beam Aerials, Ltd.	83
British Insulated Callenders Cables, Ltd.	31	Thorn Electrical Industries, Ltd.	84
Reproducers and Amplifiers, Ltd.	32	Haddon Transformers, Ltd.	85
Dubilier Condenser Co. (1925), Ltd.	33	Walter Instruments, Ltd.	86
Weymouth Radio Manufacturing Co., Ltd.	34	Wimbledon Engineering Co., Ltd.	87
Collaro, Ltd.	35	Wolsey Electronics, Ltd.	88
Stability Capacitors, Ltd.	36	Electro Methods, Ltd.	89
Goodmans Industries, Ltd.	37	Langley London, Ltd.	90
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Jackson Bros. (London), Ltd.	39	Power Controls, Ltd.	92
Welwyn Electrical Laboratories, Ltd.	40	Magnetic Devices, Ltd.	93
Vitavox, Ltd.	41	Stocko (Metal Works), Ltd.	94
Painton & Co., Ltd.	42	Lustraphone, Ltd.	95
Rola Celestion, Ltd.	43	Oliver Pell Control, Ltd.	96
A.B. Metal Products, Ltd.	44	Minnesota Mining & Manufacturing Co., Ltd.	97
Steatite & Porcelain Products, Ltd.	45	A. K. Fans, Ltd.	98
Richard Allan Radio, Ltd.	46	Daly (Condensers), Ltd.	99
A. F. Bulgin & Co., Ltd.	47	Insulating Components & Materials, Ltd.	100
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Sydney S. Bird and Sons, Ltd.	52	Creators, Ltd.	105
Safford Electrical Instruments, Ltd.	53	Plannair, Ltd.	106
		Linton & Hirst, Ltd.	107

<i>Exhibitor</i>	<i>Stand No.</i>	<i>Exhibitor</i>	<i>Stand No.</i>
Electronic Components	108	Swift Levick & Sons, Ltd.	141
Geo. Bray & Co., Ltd.	109	Newmarket Transistor Co., Ltd.	142
H. D. Symons & Co., Ltd.	110	Ardente Acoustic Laboratories, Ltd.	143
Fine Wires, Ltd.	111	Henry & Thomas, Ltd.	144
H. Clarke and Co. (Manchester), Ltd.	112	British Communications & Electronics	145
Static Condenser Co., Ltd.	113	Ministry of Supply	146
Simon Equipment, Ltd.	114	Ministry of Supply	147
Mallory Batteries, Ltd.	115	Department of Scientific & Industrial Research	148
Guest, Keen & Nettlefolds (Midlands), Ltd....	116	Hinchley Engineering Co., Ltd.	149
Micanite & Insulators Co., Ltd.	117	M.O. Valve Co., Ltd.	150
Geo. L. Scott & Co., Ltd.	118	Ekco Plastics, Ltd.	151
Hellermann, Ltd.	119	E.M.I. Sales & Service, Ltd.	152
Electrothermal Engineering, Ltd.	120	Siemens Edison Swan Ltd. (Valve Division)	153
Harwin Engineers, Ltd....	121	Morgan Brothers (Publishers), Ltd.	154
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Shell Chemical Co., Ltd.	123	Standard Telephones & Cables, Ltd. (Valve	
Formica, Ltd.	124	Division)	156
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Fortiphone, Ltd.	126	Plessey International, Ltd.	158
K.L.G. Sparking Plugs, Ltd.	127	Technical Ceramics, Ltd.	159
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Tufnol, Ltd.	130	Telegraph Construction & Maintenance Co.,	
Henry Wiggin & Co., Ltd.	131	Ltd.	162
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Aero Research, Ltd.	135	Associated Iliffe Press, Ltd.	166
Hallam, Sleight & Cheston, Ltd.	136	English Electric Co., Ltd.	167
Lion Electronic Developments, Ltd.	137	Instrument Review	168
Simmonds Aeroccessories, Ltd.	138	Brayhead (Ascot), Ltd.	169
W. T. Henley's Telegraph Works Co., Ltd. ...	139	Brayhead (Ascot), Ltd.	170
Ever Ready Co. (Great Britain), Ltd....	140	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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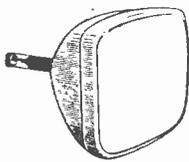
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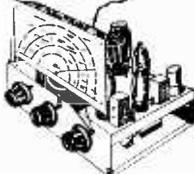
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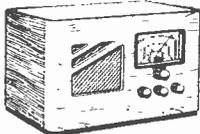
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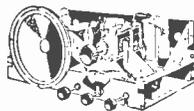
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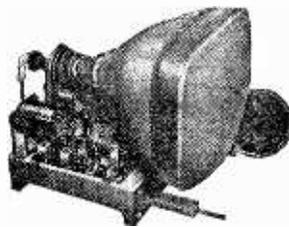
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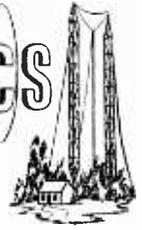
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TRANSMITTING TOPICS



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"

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

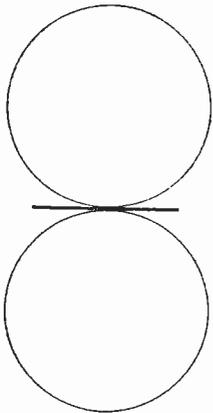


Fig. 1.—Diagrammatic representation of the polar diagram of a dipole in free space.

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.

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

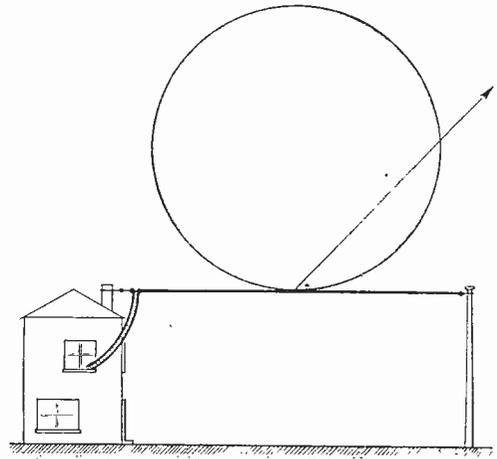


Fig. 2.—Neglecting ground reflections, it is clear that at high angles there is appreciable radiation "off the end" of a horizontal dipole. Only in a direct "end on" direction in the exact line of the wire itself is there zero radiation.

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

ings on topband are almost invariably affected mainly by ionospherically reflected energy.

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

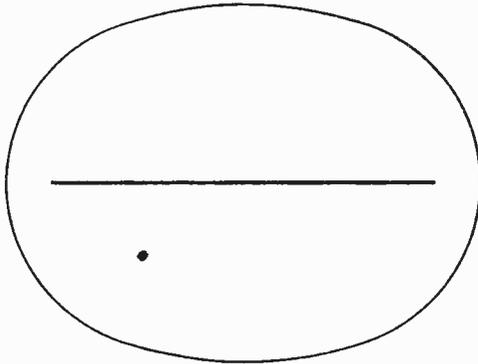


Fig. 3.—The polar diagram for a dipole that is not too high is similar to the above for propagation angles of thirty degrees or so to the vertical. This means that for European contacts up to about a thousand miles on the lower frequency bands, radiation is virtually omnidirectional.

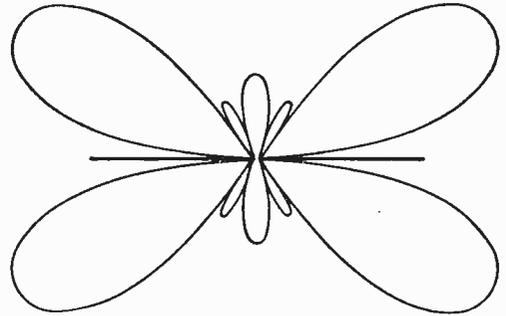


Fig. 4.—Schematic impression of a typical long wire radiation pattern. Ground reflection effects may in some cases tend to blur the sharpness of the null radiation directions.

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 work-

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

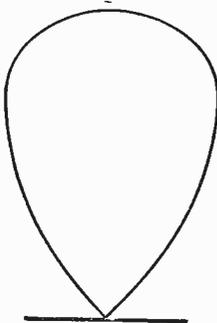


Fig. 5.—The effect of ground reflections on an aerial close to the ground is to concentrate energy skywards. This situation applies especially in topband and eighty metre working.

(Continued on page 217)

HOME RADIO OF MITCHAM

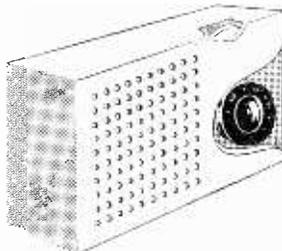
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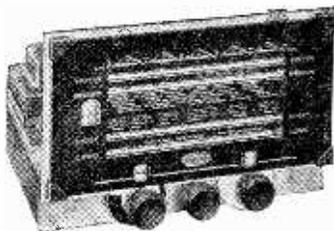
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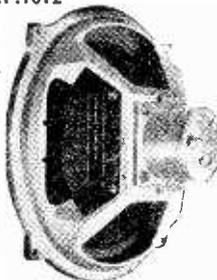
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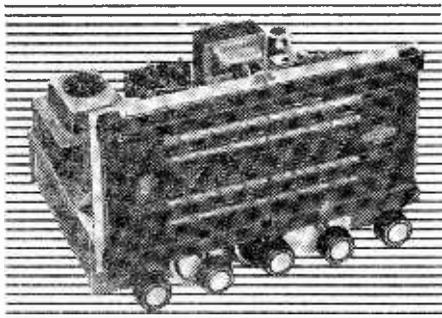
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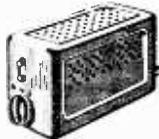
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radiation desirable. Also, for a given aerial height, the higher the frequency, the lower the angle of radiation will be for a horizontal dipole. Thus, a "reasonable" height will serve about equally well for all bands.

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

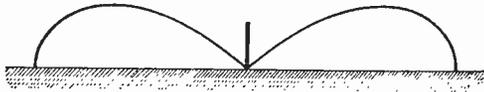


Fig. 6.—A short vertical aerial located over high conductivity soil has maximum radiation at low angles.

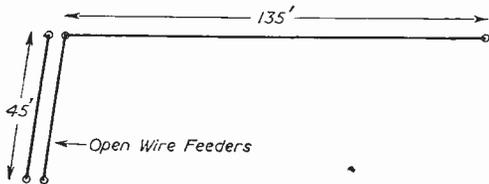


Fig. 7.—An end fed long wire aerial that makes a simple and highly effective system. It is a favourite aerial with a large number of leading DX operating stations. Many leading stations use long wires exclusively.

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

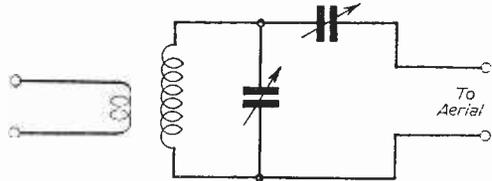


Fig. 8.—A universal aerial tuner, which will be found ideal for use with the aerial of Figure 6. It may be used for series and parallel tuning or a combination of both.

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.

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Another constructional feature deals with a Pattern Generator which is invaluable for testing television receivers, and also for test purposes there is described in this issue a Response Curve Generator. The latter, of course, is primarily of use for testing the tuning sections of a set, whilst the former enables all the more critical adjustments to be made.

Other articles deal with a Modified Scope Layout, Scanning and Synchronisation, Some Interesting Faults and Their Cure, Aerial Construction and Servicing the G.E.C. 1746.

The regular features are also included.

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.

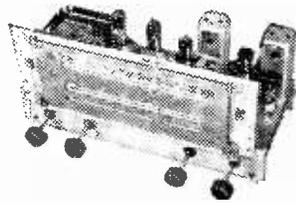
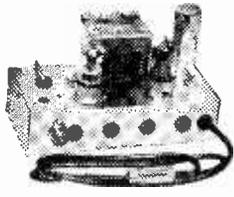
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2Z4	9	6	2516	10	6	1P91	8	6	1P82	10-
6AT5	9	6	6AB6	9	6	1E41	10	6	1P83	11 6
6K7	8	6	6B91	6	6	1E84	11	6	1P80	9 6
6K8	8	6	6B41	10	6	1E85	11	6	1P81	9 6
6Q7	8	6	6B93	6	6	1E74	12	6	1P82	9 6
6N7	8	6	6C84	12	6	1E86	14	6	1P83	10 6
6S5	7	6	6CF80	12	6	1E210	8	6	1P22	8 6
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8 500 v. Dub.	2 9	10	450 v. T.C.C.	5 6
8 450 v. Dub.	4 6	32	450 v. Dub.	4 6
8 250 v. T.C.C.	5	32	250 v. T.C.C.	6 6
16 450 v. B.E.C.	3 6	32	250 v. T.C.C.	6 6
16 500 v. Dub.	4	20	500 v. B.E.C.	8 6
16 16 450 v. T.C.C.	5 6	60	500 v. T.C.C.	6 6
16 250 v. Dub.	4	60	10 500 v.	11 6
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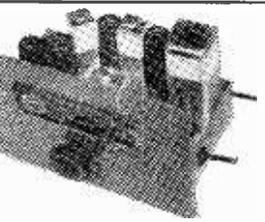
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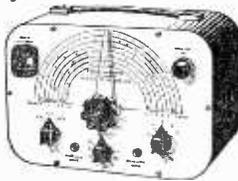
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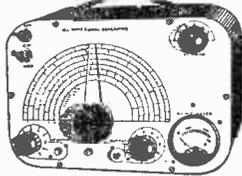
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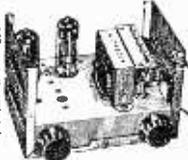
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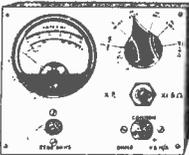


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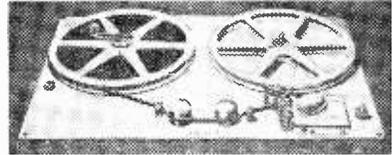
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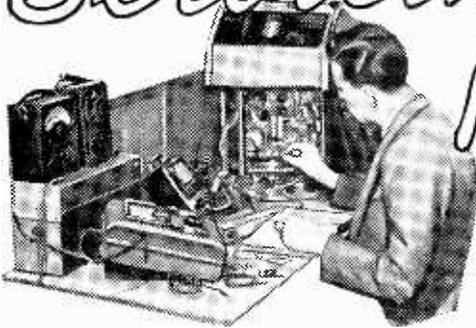
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Servicing Radio Receivers



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 side-board 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. X 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. X 6in. elliptical unit for medium frequencies, plus a 6in X 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.

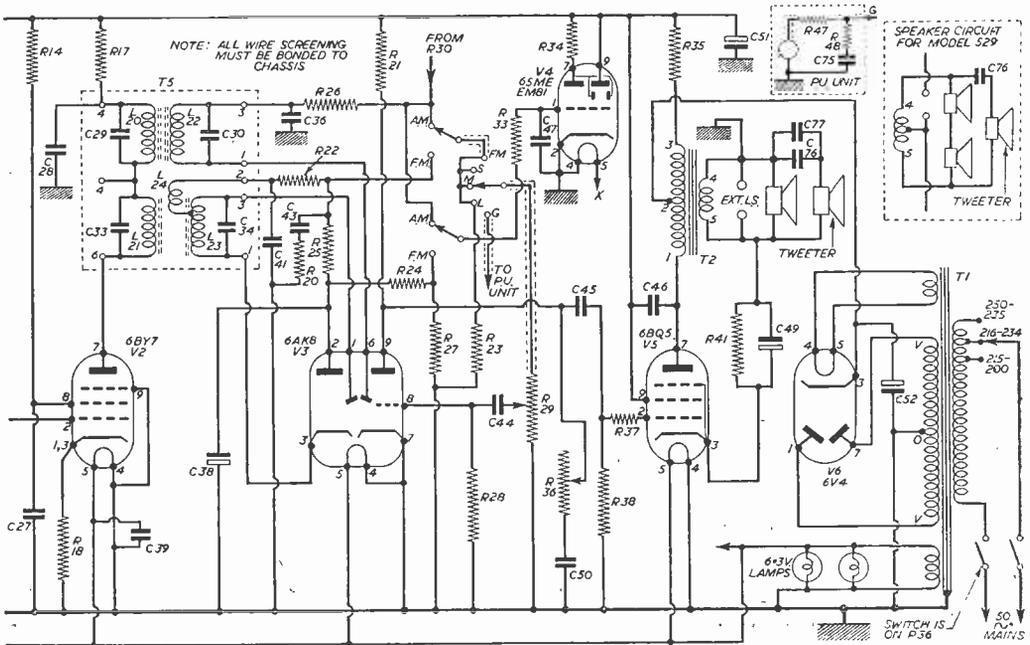


Fig. 3.—Output and power pack section of the Cossor receiver dealt with here.

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)

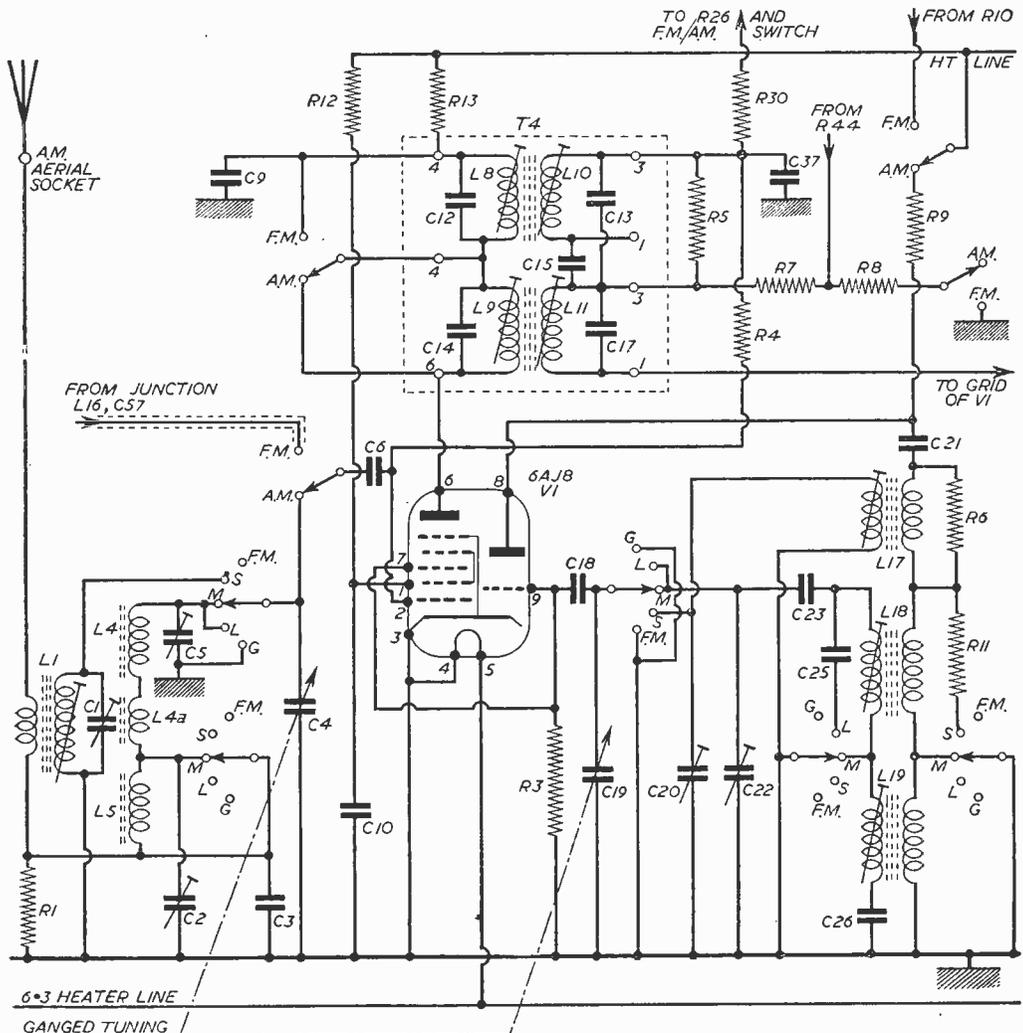


Fig. 2.—This is the A.M. Frequency changer and F.M. I.F.

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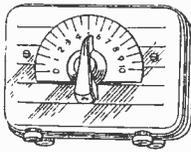
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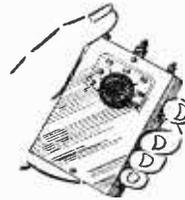
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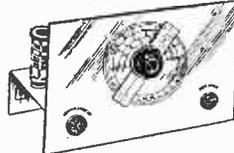
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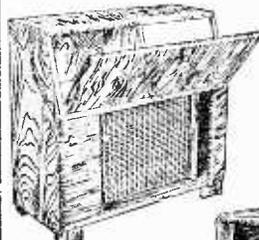
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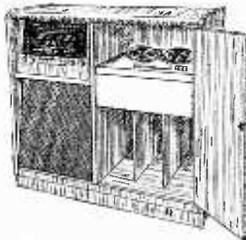
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Tuning of the switched aerial circuits is performed by C4 section of the tuning gang, while the oscillator is tuned by section C19. The A.M. tuning is also ganged to the F.M. tuning, the latter being arranged by the controlled movement of dust-iron 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 (I5). 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 (I5) 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/I3 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.

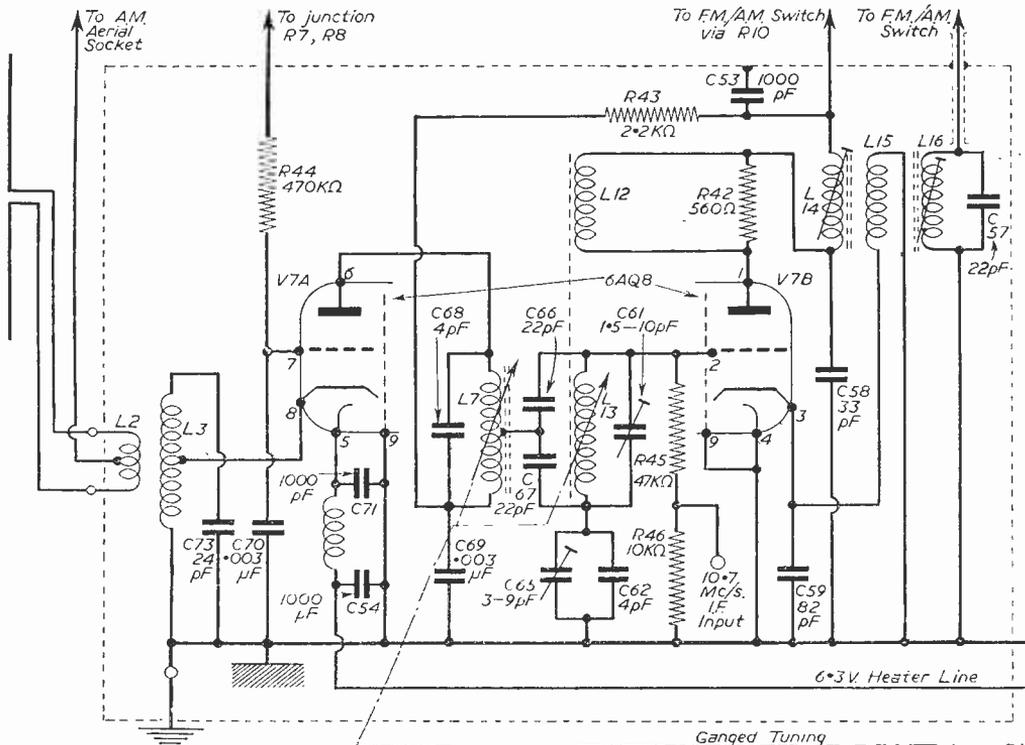


Fig. 1.—The tuner section of the receiver.

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

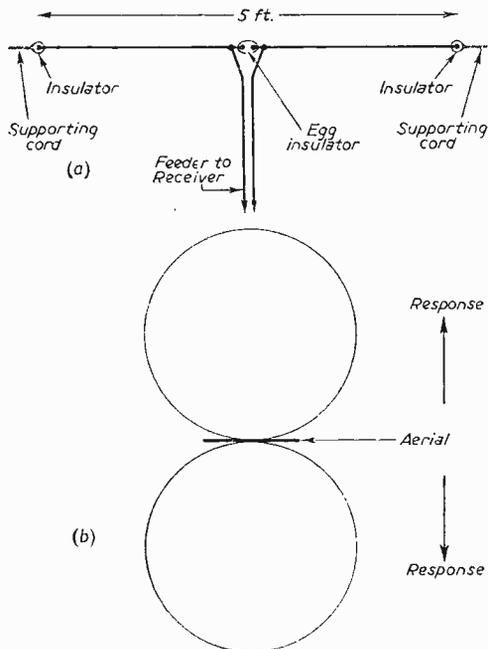


Fig. 4 (a and b).—A suitable aerial and its polar diagram.

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 wobblator 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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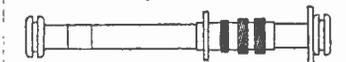
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Open to Discussion



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, LI. COL. R.A.E.C. (Singapore).

A Short-wave Hint

SIR.—Although I am not a transmitter I always read the Transmitting Topics article, and the recent details concerning aeriels 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 bedroom 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 33 $\frac{1}{3}$, 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

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.

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. EAMLS (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).

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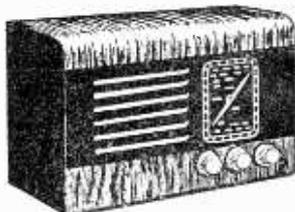


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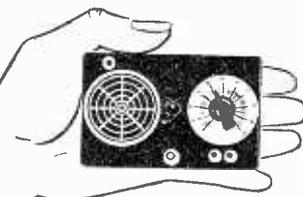
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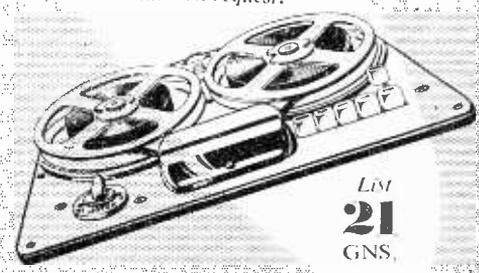
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Programme Pointers



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, decides to make every use of its conveniences. 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," "likelyps" 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,

Our Critic, Maurice Reeve, Reviews Some Recent Programmes

by Wm. Gerhardt, 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 of his hand. But Sir Donald Wolfitt, in the title rôle, made him sound repugnant and revolting as well as rapscaillionish and rascally. Richard Hurdnall was excellent 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.

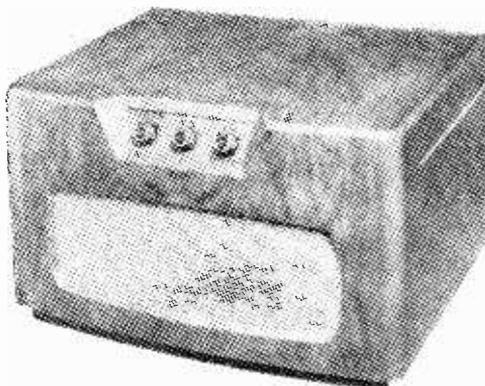
Music

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

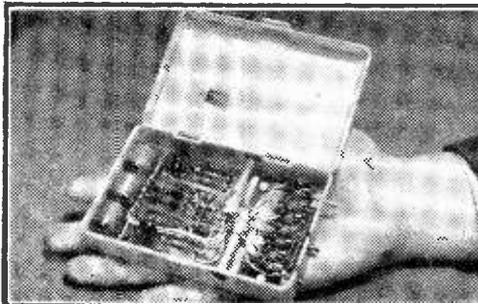
A RECENT important advance in the design of larger types of rare-gas thyratrons is the use of the disc-seal construction technique usually associated with V.H.F. communications valves.

A new Xenon-filled triode thyatron, 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

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1:1.25 giving a 25% boost on secondary. 2 v., 10/6; 4 v., 10/6; 6 v., 10/6; 10 v., 10/6; 13.3 v., 10/6. Ditto with main primaries. 12.6 each. Type B. Mains input 220-240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity suitable for most of the Ray Tubes, 21-. Ditto for 6.3 C.R. Tubes only. 17/6. Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220-240 volts. Output 2-21-24-27-30 volts at 2 amps. With Tag Panel. 17/6 each. NOTE.—It is essential to use main primary types with T.V. receivers having series-connected heaters.

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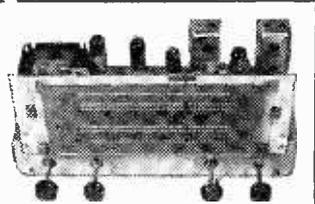
1,200 ft. on standard 7" metal reels. Spare Reels 7" plastic 4/3, 7" metal, 2/3. FERROVOCIE 1,200ft. Plastic Tapp 25/- on Plastic Reels.

O.P. TRANSFORMERS. Heavy Duty 50 mA., 4/6. Multitap, push-pull, 7/8. Miniature, 3/4, etc., 4/6. L.F. CHOKES. 100 H. 50 mA., 5/-; 19 H. 80 mA., 8/6; 19 H. 150 mA., 12/6. MAINS TRANS. 350-0-350, 80 mA., 6/2 w. tapped. 4 v. 4, 4 v. 5, tapped 1 v. 2 a., ditto 250-0-250, 22.6. Bargain 300-0-300 65 mA., 6 v. 4, 4 v. 2 a., 15/-. HEATER TRANS. Tapped prima. 200/250 v. 6.3 v. 11 amp., 7/6; tapped sec. 2, 4, 6, 8 v., 11 amp., 8/6; prim. 230 v. Sec. 6.3 v. 3 amp., 10/8.

ALADIN FORMERS and core, 4 in., 8d.; 5 in., 10/0. 0.3 in. FORMERS 5837/8 and Cans TV1/2. 2 in. sq. x 3 in. and 4 in. sq. x 1 in., 2/- ea., with cores. TYANA. 3-Mid. Sol. Soldering Iron. 200-250 v. or 230-250 v., 18/9. Solon Instrument Iron, 24/-. MAINS DROPPERS. 3 in. x 4 in. Adv. Siders. 6.3 amp. 750 ohms 4/3. 0.2 amp. 1,000 ohms, 4/3. LINECORD. 3 amp., 69 ohms per foot, 2 amp., 100 ohms per foot, 2 amp., 8d. per foot, 3-way, 7d. per foot. LOUDSPEAKER P.M. 3 OHM. 2 in. square, 17/6. 5 in. Goodman, 17/6. 7 in. x 4 in. Goodman, 21/- 3 in. square, Blac., 21/-. 1 in. Plesey, 19/6. 4 in. Goodman, 18/6. 10 in. R. & A., 30/-. TSW. Tweeter, LS473, 8/6. 250 Plesey, 30/0. 5 in. M.K. 4-5k. field, tapped O.P. transd. 24/6. 15 ohm Plesey 10 wt. 12 in. with Tweeter, 7/8. CRYSTAL DIODE G.C.M., 2/-, GEX34, 4/-.

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Table with 4 columns: All Boxed Valves, New, and Guaranteed. Lists various valve types and their prices.



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JASON F.M. TUNER COIL SET. 28/-, H.F. coil, aerial coil, Oscillator coil, two I.F. transformers 10.7 Mc/s. Detector transformer and heater choke. Circuit book using four 6AM6, 2/-, J.B. chassis and Dial, 15/6. Complete Jason F.M. Kit, £5.15.0. With Jason superior calibrated dial, £6.15.0.

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6AT5	8/-	12Q7GT	7/6	EC81	8/-	FW4.500	9/-	U85	9/-
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6F12	6/-	35Z5GT	9/6	ECH81	8/-	PCF82	10/9	UY41	7/6
6K7G	4/6	43	13/6	ECL80	10/-	PCL82	10/-	UY85	7/6
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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

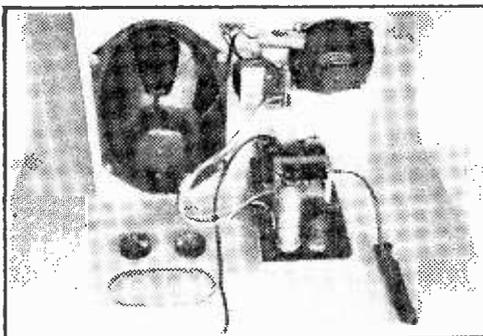
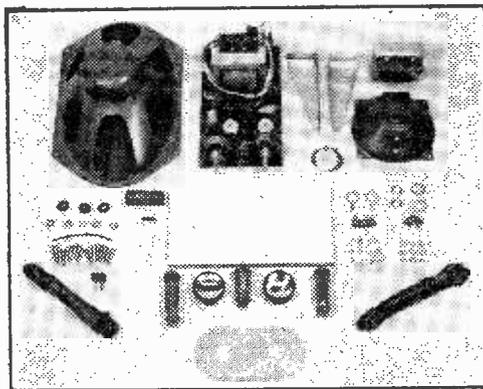
expected that these kits will prove as popular among home instructor enthusiasts as the kit oscilloscopes and valve voltmeter marketed by Cossor Instruments Limited.—Cossor Radio & Television Ltd., Cossor House, Highbury Grove, London, N.5.

"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:—

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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.



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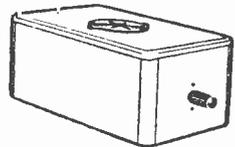
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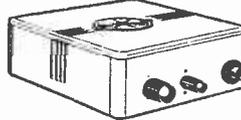
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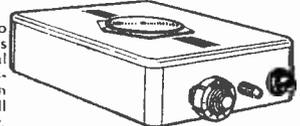
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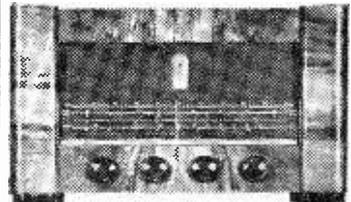
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1	7.6
1.1 16in.	8-
1 1/2	8.9
1 1/4	10-
1 3/4	11.3
1 1/2	12.6
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(Continued on page 241)

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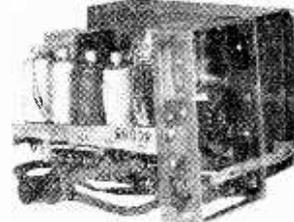
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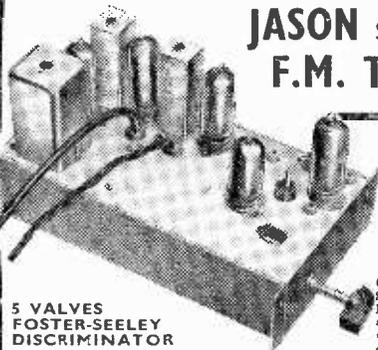
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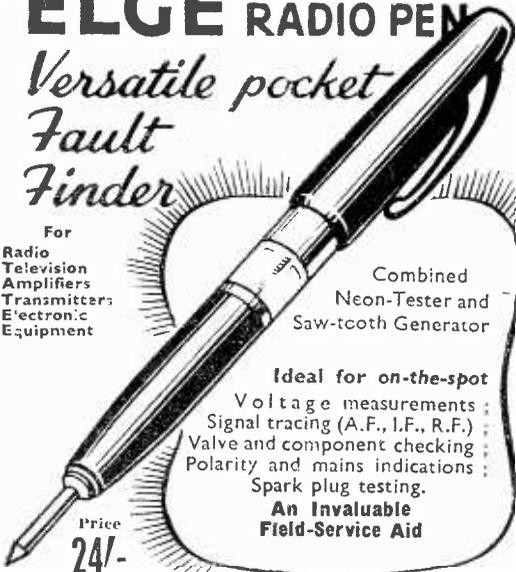
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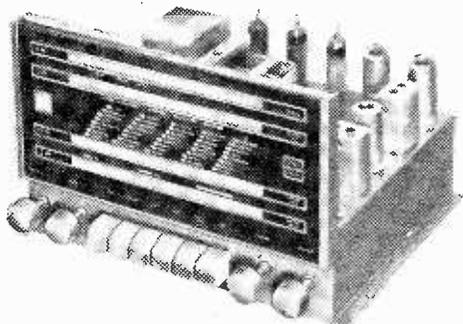
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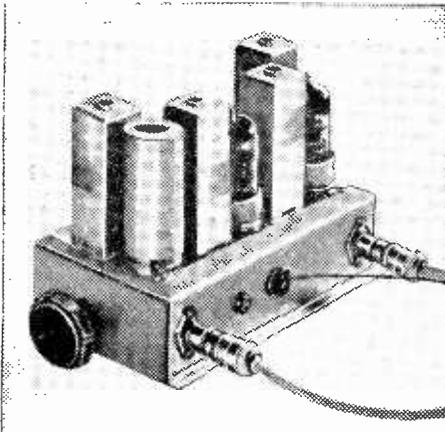
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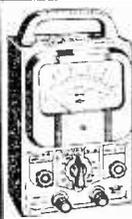
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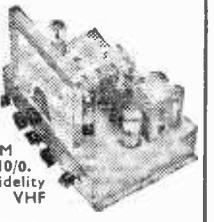
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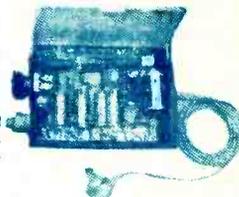
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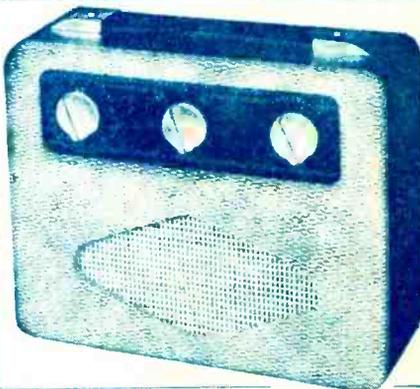
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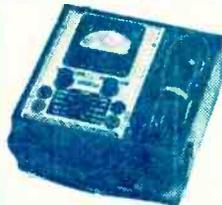
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