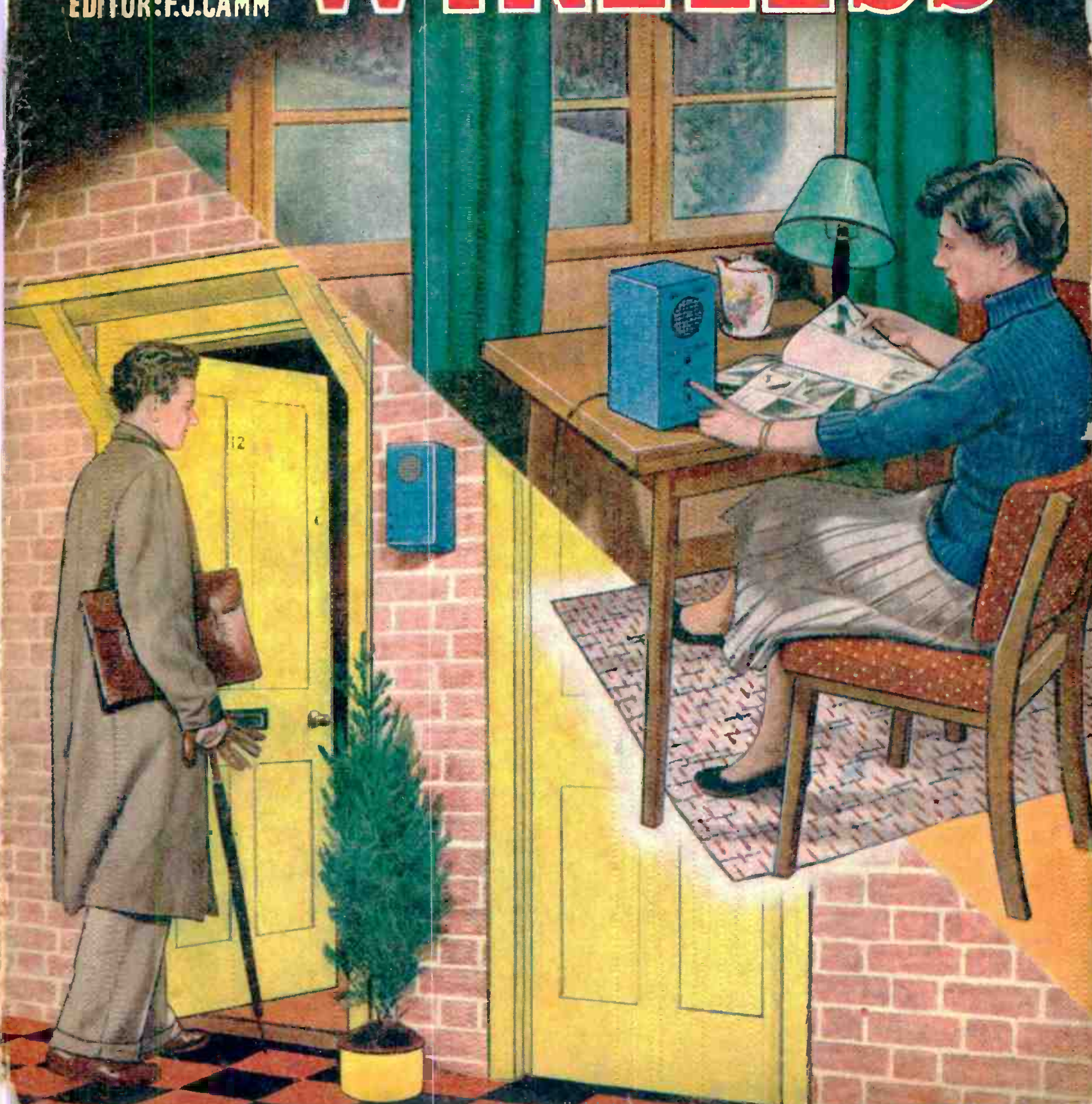
• A FRONT DOOR INTER-COM SYSTEM •

PRACTICAL WIRELESS

1'3

DECEMBER 1956

EDITOR: F.J.CAMM



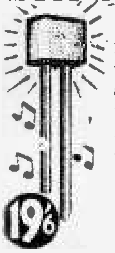
PUSH PULL OUTPUT TRANSFORMER

Potted Midget type standard matching. Ref. No. 866. Size 1in. x 1in. x 2¼in. Price 8/6 post free.

PUSH PULL INPUT TRANSFORMER

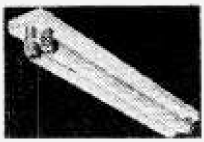
Potted Midget type Ref. No. 4358. Size 1in. x 1in. x 1¼in. Price 6/6 post free.

"CHIMELITE"

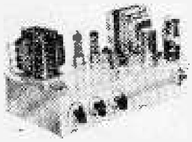


It is a hall light as well as a double chime and you can make it in a couple of evenings for the total cost of only 19/6 including instructions, post, etc., 2/- data available separately price 2/-.

FLUORESCENT LIGHTS



These are a complete fluorescent lighting fitting. Built-in ballast and starters—stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench, and in similar locations.
Single 40. 4ft. 3in. long, uses a 40-watt standard tube. Price, 39/6 complete with tube. Carriage and ins., 5/6.
Twin 20. uses two 20-watt standard tubes. Price, 29/6, less tubes. Carriage and ins. 4/6.



MULLARD AMPLIFIER "510"

A Quality Amplifier designed by Mullard. Power output exceeds 10 watts. Frequency response almost flat from 10 to 20,000 C.P.S. For use with the Acos "Hi G" and other good pick-ups. Made up and ready to work is £12.10/-, plus 10/- carr. and insurance.

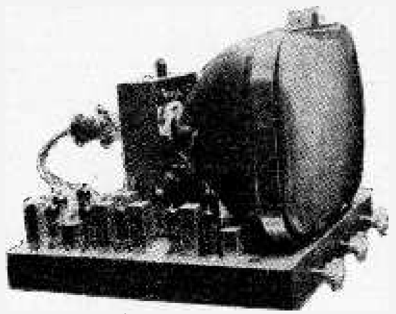
CONNECTING WIRE

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

12in. T.V. CABINET—15/-

We are offering these at not much more than the cost of the plywood they contain. If not wanted for T.V. many useful items can be made — record storage cabinet, H.F. loudspeaker case, book case, etc., etc. Price 15/-, carriage 3/6.

THE UNI—T.V.



Undoubtedly the most up-to-date televisor for the home constructor. You can build all or only part and the set when finished will be equal to a factory-made equivalent. What other constructor T.V. has all these features?

- ★ Made up units if required.
- ★ All miniature valves.
- ★ Metal rectifier.
- ★ No expensive transformers.
- ★ 13-channel circuitry.
- ★ Multi-vibrator time bases.
- ★ Ferrox cube, E.H.T. and scan coils.
- ★ 34/37 Mc/s I.F.
- ★ Suitable for any modern 12, 14 or 17in. tube.
- ★ Modern contemporary cabinet if required.

The building cost (less tube) is only £31.10.0, plus 10/- carriage and insurance. All parts guaranteed 12 months. Full information and data free with parts or available separately price 3/6.

THE STATESMAN

THIS IS ON OFFER AT APPROX. HALF COST TO MAKE.

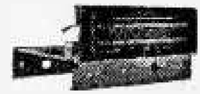
An impressive costly looking cabinet originally designed for T.V. but simple modification makes the cabinet suitable for radio-gram amplifier, tape recorder, or reflex speaker—size 23in. wide, 22in. deep and 37½in. high. Limited quantity at £8/15/- each, carriage 12/6.

South London Branch.—For the benefit of callers south of London we have opened a branch at **266, London Road, Croydon.**

THE CLEVELAND ORGANTONE

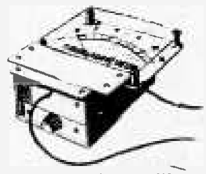
5 valve superhet covering Long, Medium and Short waves. Miniature valves—Low loss coils—permeability-tuned I.F.S.—full A.V.C.—variable negative feedback—gram. position—4 watts output — particularly fine tone. Price £11/10/0. Carriage and insurance, 7/6.

CHASSIS ASSEMBLY



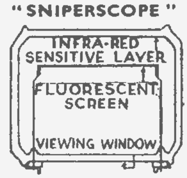
Three-colour 3-waveband scale covering standard, Long, Medium, and Short wavebands, scale pan, chassis, punched for standard 5-valve superhet, pulley driving head, springs, etc., to suit. Scale size 14½ x 3½in. Chassis size 15 x 5in. x 2in. deep. Price 15/- plus 1/6 post. Note.—This is the one that fits our 47/6 table cabinet.

HIGH VOLTAGE TESTER



An instrument that will measure voltages up to 10,000 but which draws no current from the source, will probably be a valuable addition to your workshop equipment. It can be made entirely from odds and ends. Booklet giving full instructions, plans, etc., 2/6 post free.

"SNIPERSCOPE"



"Cat's eye" used for seeing in the dark. Will work burglar alarms, counting circuits, smoke detectors and the hundred and one other devices as will the simpler type of photo cell. Price 5/- each. Post and ins. 1/-. Data will be supplied with cells if requested.

DON'T BE CAUGHT LIKE THIS

CAR STARTER CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following:

Mains transformer	19/6
5-amp. rectifier	17/6
Regulator Stud Switch	3/6
Resistance Wire	2/-
Resistance Former	2/6
Mains on/off Switch	1/-
0-5 amp. Moving Coil Meter	9/6
Constructional Data	1/6

or if bought all together price is 52/6, plus 2/- post and packing.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to E.P.E., LTD., Dept. 5, 123, Terminus Road, Eastbourne.

Post enquiries to Eastbourne with stamped envelope, please.

42-46, Windmill Hill, Ruislip, Middx. Phone: RUISLIP 5780 Half day, Wednesday.	152-3, Fleet Street, E.C.4. Phone: FLEet 2833 Half day, Saturday.	29, Stroud Green Rd., Finsbury Park, N.4. Phone: ARChway 1049 Half day, Thursday.	249, Kilburn High Road, Kilburn. MAIda Vale 1921.

SPECIAL OFFER 12 VALVES for 18/-, Post 2/-.

LIMITED STOCKS—ORDER NOW.

These are NOT the usual 2X2, EB34 types offered. A good selection of obsolete and older type valves—of great interest to all constructors and service men.

ARE YOU BUILDING THIS POPULAR KIT?

Modern Portable. A.C./D.C. Mains/Battery Receiver. Four valves, DK96, DL96, etc. 2 Waveband Superhet. In an attractive Lizard Grey case, size 8¾in. x 8¾in. x 4½in. Full Kit of Parts down to last nut and bolt.

£9 . 9 . 0

Or if you prefer you can build the battery version first for **£7/17/6** and add the mains components later. Post extra on Kit, 3/-.

Full Circuit Diagram, Shopping List, and Point-to-Point Wiring Diagram, 3/-.

CHOKES

20H, 250 ohms, 60 M/A. Clamp construction, each	6/-
10H, 200 ohms, 90 M/A. Clamp construction, each	9/3
10H, 200 ohms, 150 M/A. Clamp construction, each	13/-
10H, 300 ohms, 40 M/A. Midget Clamp construction, each	5/3

TRANSFORMERS FOR BATTERY CHARGERS

230 v. Input tapped 6-12 v. 1 amp., each	13/6
230 v. Input tapped 6-12 v. 8 amp., each	18/-

We have large stocks of Yaxley Type Switches. ALL BRAND NEW. With long locating spindles. Various numbers of Switch and Wafer Combinations. To clear at the **SPECIAL PRICE. 9/- per dozen.** Post 1/6.

TRANSFORMER MT8
Small mains transformer suitable for TV converters, etc. Primary 230 v., Secondary 250 v. 40 M/A and 6.0 v. 15 amp. Price **15/6** each, postage 1/6.

WESTINGHOUSE RECTIFIERS
Type 14A86. 13/6 each.

OUTPUT TRANSFORMERS

Multi Ratio Type, each	6/6
Midget for 384 Output, each	4/6
Standard 5,000 ohms, each	4/6
Standard 10,000 ohms, each	4/6

CHARGER RECTIFIERS—All Full Wave

12 volt 1 amp., each	5/3
12 volt 2 amp., each	8/6
12 volt 3 amp., each	13/6

TSL FERROMAGNETIC AERIAL ROD
A length of Ferrite Rod with full instructions for winding Medium or Medium and Long Wave Internal aerials. 6/- each.

SPECIAL OFFER
Antiference Aerial Type CD4 Indoor with full instructions, etc., 13/6 each. Carriage Paid.

Our NEW 1956-57 Illustrated Catalogue is now ready. 44 pages of interesting reading. Send 1/- for your copy.

HEATER TRANSFORMERS—All 230 v. Input.

2 volt .5 amp., each	5/-
2 volt 3.0 amp., each	8/3
4 volt 1.5 amp., each	5/6
4 volt 3.0 amp., each	10/6
5 volt 2.0 amp., each	10/6
6.3 volt .5 amp., each	5/6
6.3 volt 1.5 amp., each	6/6
6.3 volt 3.0 amp., each	9/6
12 volt .75 amp., each	5/6

CONDENSERS

BEC 100 MFD 25 v.	1/9
BEC 500 MFD 12 v.	1/9
TCC 25 MFD 25 v.	1/3
DUBILIER 100 MFD 12 v.	1/9
BEC 50 MFD 50 v.	2/-
TCC 25 MFD 50 v.	1/9
TCC 50 MFD 25 v.	1/9
TCC 250 MFD 12 v.	1/6
BEC 250 MFD 25 v.	1/6
BEC 12 MFD 50 v.	1/-
TCC 50 MFD 12 v.	1/9
BEC 250—250 MFD 6 v.	1/6
DUBILIER 50—12 MFD 12 v.	1/9

VOLUME CONTROLS
Type with Single Pole Switch. 5K ohms; 10K ohms; 20K ohms; 50K ohms; 100K ohms; ½ meg.; ¼ meg.; 1 meg.; 2 meg. All 3/6 each.

DUAL VOLUME CONTROL
With Double Pole Switch 500K ohms and 500K ohms. Price 6/9 each.

TYANA SOLDERING IRONS
Lightweight 40-watt iron, with easily replaceable elements and bits, 200/250 v., price 16/9 each.

TURNOVER CRYSTAL PICK-UP CARTRIDGES
Acos Type HGP37-3c. Long-playing and standard with styli (as used in latest radiograms). Price **18/6** each.

PURETONE TAPE
1,200ft. Reels, Plastic Spool. **12/6** each.

VIBRATOR UNIT
12 volt Vibrator Unit by Mallory, complete with vibrator, **17/6** each.
Aerialite Band III Aerials, 5 element, 702 x U. An array with universal 1in.-2in. masthead bracket, suitable channels 8, 9 and 10. Price **41/-**, carriage 4/6.
Aerialite Coaxial outlet boxes at **4/6** each.
Aerialite Coaxial plugs and sockets at **1/1** each.

COIL FORMERS

Alladin Coil Formers ⅜in., complete with Iron Dust Cores, each	9d.
Alladin Coil Formers ¼in., complete with Iron Dust Cores, each	6d.
Ceramic Coil Formers ⅜in. dia. 1in. long 4 Ribs, each	4d.
Paxolin Coil Formers ⅜in. dia. 2¼in. long. These have been removed from R.A.F. Beam Approach equipment and are in some cases complete with Trimmers, each	3d.

CONDENSERS. TELEVISION ELECTROLYTICS

100 MFD 450 v. TCC, each	2/-
60-120 MFD 300 v. BEC, each	5/-
100-200 MFD 275 v. BEC, each	5/-
60-250 MFD 275 v. BEC, each	5/-

PUBLICATIONS

	each
No. 134—F.M. TUNER CONSTRUCTION by W. J. May ★Easy to Build, Point-to-Point Wiring ★Super High Fidelity Response ★32 Pages ★All Components for this Circuit available ex stock	2/6
No. 138—HOW TO MAKE AERIALS FOR TV (Band I and 3) and V.H.F. (Band 2) Data for all Channels. Ten different designs for local and fringe areas	2/6
No. 135—ALL DRY BATTERY PORTABLE CONSTRUCTION. ★Simple and cheap to build ★Point-to-point wiring ★Dual Fenite aerial for high sensitivity	2/6
No. 100—A COMPREHENSIVE VALVE GUIDE, Book No. 1. No. 121—A COMPREHENSIVE VALVE GUIDE, Book No. 2 (Characteristics and Base Connections	5/-
No. 103—RADIOFOLDER "A" The Master Colour Code Index for Radio and Television	1/6
No. 114 RADIOFOLDER "E" An inexpensive Tape Recorder	2/6

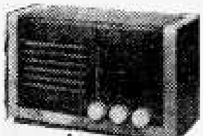
Please include 4d. postage per copy.

CRT ISOLATION TRANSFORMERS
NR9A 2 v.; NR9B 4 v.; NR9C 6.3 v.; NR2D 10.8 v.; NR9E 13.3 v. Price **10/6** each, all for use on receivers with own transformer.

NR14 Input 230/240 v., output 2-2¼-2½-2¾-3 volts at 2 amps., **17/6** each.

NR12 Input 220/240 v. Multi output 0-2-4-6.3-7.3-10-13 volts. 25% and 50% BOOST. **21/-** each.

NR15 Input 220/240 v. Output 6.3 v., with 25% and 50% BOOST. Price **17/6** each.



ALPHA 3 VALVE T.R.F. KIT

£5 . 10 . 0

- ★ Easy to Build.
- ★ Valves 6J7, 6K7, 6V6GT plus metal rectifier.
- ★ Walnut cabinet.

Full instructions, point-to-point wiring diagram. Circuit diagram and full shopping list 1/-. All components may be purchased separately.

LOUD SPEAKERS

All PM Types less Transformers

	Each
3½in. Square Type Elec. Speaker	19/6
5in. Types by Elac., Lectrona, Celestian, etc.	17/6
6½in. Types by Goodmans, Rola, R. & A.	18/6
8in. Types by Goodmans, Plessey, R. & A.	19/6
10in. Types by R. & A., Celestian, etc.	25/6
12in. Plessey Lightweight	35/-
Elliptical Speakers, Goodmans, 4in. x 7in.	19/6
Mains Energised Units 6½in. & 8in. ohm field	19/6

Post extra, 2/-.

ALPHA RADIO SUPPLY CO.

**5/6 VINCES CHAMBERS
VICTORIA SQUARE
LEEDS I.**

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 1/-; 20/- add 1/6; 40/- add 2/-; £5 add 3/- unless otherwise stated. Minimum C.O.D. fee and postage 3/-. All single valves postage 6d.

MAIL ORDER ONLY

R.S.C. BATTERY CHARGING EQUIPMENT

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

ASSEMBLED CHARGERS

6 v. 1 amp	19/9
6 v. or 12 v. 1 amp.	25/9
6 v. 2 amps.	29/9
6 v. or 12 v. 2 amps.	38/9
6 v. or 12 v. 4 amps.	56/9

Above ready for use. Carr. 2/9. With mains and output leads.

HEAVY DUTY KIT

12 v. 30 amp. Suitable for Garage or firm with a number of vehicles. Mains input 200/250 v. 50 c/s. Outputs 12 v. 15 amp. twice. Consists of Mains Trans. 2 Metal Rectifiers. 2 Meters, 4 Fuses, 4 Terminals, 2 Rheostats and circuit. Only 9 gns., carr. 15/-.

BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case, Fuses, Fuse-holders, Grommets, panels and circuit. Carr. 2/6 extra.

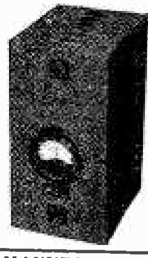
6 v. or 12 v. 1 amp	22/9
6 v. 2 amps.	25/9
6 v. or 12 v. 2 amps.	31/6
6 v. or 12 v. 4 amps.	49/9

BATTERY CHARGER KIT

Consisting of F.W. Bridge Rectifier 6/12 v. 5 a. Mains Trans.; 0-9-15 v. 6 a. output and variable charge rheostat with knob. Only 45/9.

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 **46/9** Carr. 3/6.



Assembled 6 v. or 12 v. 4 amps. Fitted Ammeter and variable charge selector. Also selector plug for 6 v. or 12 v. charging. Double fused. Well ventilated steel case with blue hammer finish. **69/9** Ready for use with mains and output leads. Carr. 3/6.

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

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

TOP SHROUDED DROP THROUGH

250-0-250 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a	16/9
300-0-300 v. 70 mA, 6.3 v. 2.5 a	16/9
350-0-350 v. 80 mA, 6.3 v. 2 a, 5 v. 2 a	18/9
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a	22/9
350-0-350 v. 100 mA, 6.3 v. 4 a, C.T. 0-4-5 v. 3 a.	23/9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a	29/9

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a, Midget type 2½-3-3in.	17/6
350-0-350 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a	19/9
250-0-250 v. 100 mA, 6.3 v. 4 v. 4 a, C.T. 0-4-5 v. 3 a	26/9
250-0-250 v. 100 mA, 6.3 v. 6 a, 5 v. 3 a, for R1355 conversion	31/-
300-0-300 v. 100 mA, 6.3 v. 4 v. 4 a, C.T. 0-4-5 v. 3 a	26/9
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	27/9
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
450-0-450 v. 250 mA, 6.3 v. 6 a, 6.3 v. 6 a, 5 v. 3 a.	69/9

FILAMENT TRANSFORMERS

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

SMALL POTTED MAINS TRANSF.

Removed from New Ex-Govt. units. Primary 0-200-230-250 v. Secs. 250-0-250 v. 60 mA, 6.3 v. 2 a, 5 v. 2 a. Size 3½ x 4½ x 3in. **11/9**

E.H.T. TRANSFORMERS

2,500 v. 5 mA. 2-0-2 v. 1.1 a, 2-0-2 v., 1.1 a for VCR97, VCR517, etc. ... 36/6

ELIMINATOR TRANSFORMERS

Primaries 200-250 v. 50 c/s	14/9
120 v. 40 mA, 5-0-5 v. 1 a	15/9
90 v. 15 mA, 4-0-4 v. 500 mA.	9/9

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries: 0-9-15 v. 1½ a, 11/9; 0-9-15 v. 3 a, 16/9; 0-3.5-9-17 v. 3 a, 17/9; 0-3.5-9-17.5 v. 4 a, 18/9; 0-9-15 v. 5 a, 19/9; 0-9-15 v. 6 a, 22/9.

SMOOTHING CHOKES

250 mA 5 H 100 ohms	12/9
150 mA 7-10-250 ohms	11/9
100 mA 100 H 200 ohms	8/9
80 mA 10 H 350 ohms	5/6
60 mA 10 H 400 ohms	4/11

OUTPUT TRANSFORMERS

Midget Battery Pentode 66 : 1 for 3S4, etc.	3/9
Small Pentode, 5,000Ω to 3Ω	3/9
Small Pentode 7/8,000Ω to 3Ω	3/9
Standard Pentode, 5,000Ω to 3Ω	4/9
Standard Pentode, 7/8,000Ω to 3Ω	4/9
Multi-ratio 40 mA, 30 : 1, 45 : 1, 60 : 1, 90 : 1, Class B Push-Pull	5/6
Push-Pull 10-12 watts 6V6 to 3Ω or 15Ω	15/9
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15Ω	16/9
Push-Pull 15-18 watts, 6L6, KT66	22/9
Push-Pull 20 watts, sectionally wound 6L6, KT66, etc., to 3 or 15Ω	47/9
Williamson type exact to spec.	85/-

FOR CALLERS ONLY. WE HAVE MANY CLEARANCE LINES BOTH SMALL AND LARGE, INCLUDING SMALL NUMBER OF 1954 and 1955 AMPLIFIER KITS

MANUFACTURERS' SURPLUS MAINS TRANSFORMERS.

Primaries 250-250 v. 50 c/s. Fully shrouded upright mounting 425-0-425 v. 150 mA, 6.3 v 3 a, 5 v. 3 a, 29/11, post 2/9. Wearite 325-0-325 v. 100 mA, 6.3 v. 2.5 a, 5 v. 2 a, 19/9. Drop Through Chassis type 250-0-250 v. 70 mA, 6.3 v. 2.5 a, 10/9.

EX-GOVT. TRANSFS., 230/250 v. 50 c/cs 460 v. 200 mA, 6.3 v. 5 a, 25/9; 300-0-300 v. 150 mA, 4 v. 3 a, 9/9; 0-16-18-20 v. 35 a, 69/6, carr. 7/6.

EX.-GOVT. SMOOTHING CHOKES

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
100 mA, 10 H 150 ohms Tropicalised	3/11
L.T. type 1 amp. 2 ohms	2/9

EX.-GOVT. METAL BLOCK (PAPER CONDENSERS

4 mfd. 500 v., 2/9; 4 mfd. 1,000 v., 4/9; 4 mfd. 1,500 v., 5/9; 8-8 mfd. 500 v., 6/9; 8 mfd. 500 v., 4/9; 10 mfd. 500 v., 5/9; 4 mfd. 400 v. plus 2 mfd. 250 v., 1/11.

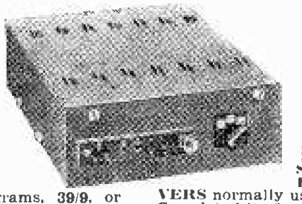
EX-GOVT. ELECTROLYTICS. Removed from unused equipment. 8-16 mfd. 550 v., 1/3; 1,000 mfd. 6 v., with clip, 1/9; 50 mfd. 50 v., with clip, 9d.

EX-GOVT. VALVES (NEW)

1T4	7/9	6F6G	7/9	6AT6	7/9
1S5	7/9	EF39	5/9	ECC83	9/9
3S4	8/9	6V6GT	6/9	EF80	7/9
5Y3G	8/9	6X5GT	7/9	EB91	8/9
5U4G	8/9	6L6G	11/9	EF36	4/9
5Z4G	8/9	807	7/9	EL32	3/9
6K7G	5/9	12A6	7/9	EL91	5/9
6K8G	9/9	15D2	4/9	KT44	8/9
6SJ7GT	6/9	25Z4G	9/9	KT66	11/9
6SL7GT	8/9	MH4	4/9	SP61	2/9
6SN7GT	9/9			35Z4	8/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS

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



Type BM2. Size 8 x 5½ x 2½in. Supplies 120 v., 90 v., and 60 v., 40 mA and 2 v. 0.4 a to 1 amp. fully smoothed. **Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators.** When connected to A.C. mains supply 200-250 v. 50 c/cs. **SUITABLE FOR ALL BATTERY RECEIVERS** normally using 2 v. Accumulator. Complete kit of parts with diagrams and instructions 49/9, or ready for use 59/6.

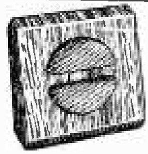
H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Input 200-250 v. A.C. Output 120 v. 40 mA. Fully smoothed and rectified supply to charge 2 v. accumulator. Price with louvred metal case and circuit, 29/6. Or ready for use, 8/9 extra.

SPECIAL OFFERS 8-8 mfd. 450 v. small can electrolytics in lots of six, 1/6 ea. Small .0005 mfd. 2 Gangs, 4/9 ea.

T.V. CABINETS. Leading manufacturers surplus. Attractive designs. Walnut veneered, with doors for 15, 16, or 17in. Tube, £3-19-6. Carr. 7/6.

EXTENSION SPEAKERS

Ready for use in walnut veneered cabinet. 6½in. 2-3 ohms, 29/6. 8in. 2-3 ohms, 35/9. Very limited number.



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

EX-GOVT. UNIT RDF1. Brand new, cartoned. Complete with 14 valves, including 5Z4, E.H.T. rectifier. Trans. Choke, etc. Only 29/9, carr. 7/6.

ELECTROLYTICS (current production) NOT EX-Govt.

Tubular Types

8µF 450 v.	1/9
8 mfd. 500 v.	2/6
16µF 350 v.	2/3
16µF 450 v	2/9
16µF 500 v.	3/9
32µF 350 v.	3/9
32 mfd. 500 v.	5/9
25µF 25 v.	1/3
50µF 12 v.	1/3
50 mfd. 25 v.	1/6
50µF 50 v.	1/9
100 mfd. 12 v.	1/9
100 mfd. 25 v.	2/3
6,000 mfd. 6 v.	3/9

Can Types

8 mfd. 600 v.	2/11
16 mfd. 500 v.	3/9
16 mfd. 350 v.	1/11
16µF 450 v.	2/9
32µF 350 v.	2/11
32 mfd. 450 v.	4/9
100 mfd. 450 v.	4/9
8-8µF 450 v.	2/9
8-16µF 450 v.	2/11
16-16µF 450 v.	3/11
16-32µF 350 v.	4/9
32-32µF 350 v.	4/9
32-32µF 450 v.	5/9
60-100 mfd. 350 v.	6/11
64-120 mfd. 350 v.	7/9
100-200 mfd. 275 v.	6/9

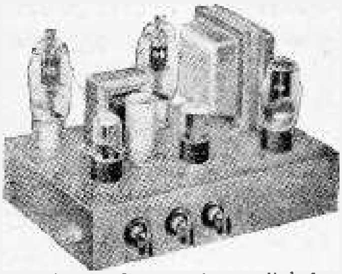
Many others in stock.

HUNTS MOLDSEAL CONDENSERS. .005 mfd. 400 v., .01 mfd. 400 v., .04 mfd. 500 v., 5/6 doz. (one type); .1 mfd. 350 v., 8d. ea.; .25 mfd. 500 v., 1/3; .5 mfd. 500 v., 1/8 ea.

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

NEW 1956 Model High-Fidelity Push-Pull Amplifier with "Built-in" Tone Control, Pre-amp stages. High sensitivity. Includes 5 valves (807 outputs). High Quality sectionally wound output transformer, specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut." Frequency response ± 3 db. 30-30,000 c/cs. Six negative feedback loops. Hum level 71 db. down. ONLY 70 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs. For **STANDARD** or **LONG-PLAYING RECORDS**. For **MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS**, etc. **OUTPUT SOCKET** with plug provides 300 v. 20 mA. and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT**. Size approx. 12-9-7in. For A.C. mains 200-230-250 v. 50 c/cs. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value at £7/15/-, or factory built 45/- extra. Carriage 10/-.

£7-15-0



If required louvred metal cover with 2 carrying handles can be supplied for 17/6. Additional input socket with associate Vol. Control so that two different inputs such as Gram and "Mike" or Tape and Radio can be mixed, can be provided for 13/- extra. Guaranteed 12 months.

TERMS on assembled two input model. **DEPOSIT 25/6** and nine monthly payments **22/4**.

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

SUPERHET FEEDER UNIT

Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). A Triode Heptode F changer is used. Pentode I.F., and double Diode Second Detector. Delayed A.V.C. Ae. Grid F.C Coupling is by bottom end condenser Coupling giving freedom from alignment troubles when Ae. of varying lengths and capacity are used. Both Frequency Changers and I.F. valves are A.V.C. controlled from the very low distortion Double Diode so arranged that very high Percentage modulation of the Transmitter can be handled without distortion. The Feed for the delayed A.V.C. is arranged so that A.V.C. distortion is avoided. The Ch. Sw. incorporates Gram. position. Controls are Tuning. W., Ch., and Vol. Only 250 v. 15 mA. H.T., and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-point wiring diagrams, instruction and priced parts list with illustration, 2/6. Total building cost, £4/15/-. For descriptive leaflet send S.A.E.

GARRARD 3-SPEED MIXER AUTO-CHANGER RC110. Current Model. Brand new, cartoned. Provision for taking 10 records. Fitted High-Fidelity turnover pick-up head with dual sapphire point stylus for Standard or Long-playing records. Very limited number at only **£8/17/6**. Carr. 5/6. Or deposit **3 gns.** and six fortnightly payments of **1 gn.**

B.S.R. MONARCH 3-SPEED MIXER AUTOCHANGER. For standard 200-250 v. 50 c/cs. mains. Autochanges on all 3 speeds. Plays Ten mixed 7in., 10in. and 12in. records. Separate sapphire styli for L.P. and 78 r.p.m. High-fidelity type crystal pick-up. Minimum baseboard size needed 14in. x 12in. x 5½in. high. Brand new, cartoned, at **£7/15/-** carr. 3/6.

B.S.R. TU8 3-SPEED SINGLE RECORD PLAYING UNITS for 7in., 10in. or 12in. records at 33⅓, 45, or 78 r.p.m. Supplied with high-fidelity crystal pick-up with dual sapphire point turnover stylus for standard or long-playing records. Only **£4/13/6**, plus 3/6 carr.

LINEAR 4-5 WATT QUALITY AMPLIFIER. Size only 6 x 5 x 5½in. high Designed for use with B.S.R. or Garrard Autochanger. Fitted separate Bass and Treble controls. Vol. Control and mains switch. Latest type Miniature B.V.A. valves used. For 200-250 v. A.C. mains. Ready for use. Sensitivity 45 m.v. for full output. Power supply available for T.R.F. or Superhet. Feeder Unit. CHASSIS IS NOT "ALIVE." Suitable for most microphones and all types of pick-ups. Built to high standards and attractively finished. Full manufacturer's guarantee. Only 6 gns.

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

A highly sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high-fidelity pick-up heads, in addition to all other types of pick-ups and practically all mikes. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 db. down. 15 db. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape Deck preamplifier. For A.C. mains input of 200-230-250 v. 50 c/cs. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with green crackle 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.

B.S.C. TA1 HIGH QUALITY TAPE DECK AMPLIFIER. For ALL Tape Decks with High Impedance, Playback and Erase Heads, such as Lane, Truvox, etc. (Unit can now be supplied for use with latest Collaro Tape Transcriptor : refer to TA1C.) For A.C. Mains 230-250 v. 50 c/cs. **Ready for Use. ONLY 11 GNS.**

Positive compensated identification fo recording level by Magic Eye. Recording facilities for 15, 7½ or 3¾in. per sec. Automatic equalisation at the turn of a knob. Linear frequency response of ± 3 db., 50-11,000 c.p.s. Negative feed-back equalisation. Minimum microphony and hum. High output with completely effective erasure and distortionless reproduction. Sensitivity is 15 millivolts so that any kind of crystal microphone is suitable. Only 2 millivolts minimum output required from Recording head. Provision is made for feeding a P.A. amplifier. Unit can also be used as a gram-amplifier requiring input of 0.75 v. R.M.S. Carriage 7/6. Illustrated leaflet 6d.

PICK-UPS. Collaro high-fidelity high impedance magnetic type. Only **31/6**. Brand New.

R.S.C 30 WATT ULTRA LINEAR HIGH-FIDELITY AMPLIFIER A6

A highly sensitive Push-Pull, high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response ± 3 db. 30-30,000 c/cs. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used, and separate Bass and Treble controls. Minimum input required for full output is only 30 millivolts so that **ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE.** The unit is designed for **CLUBS, SCHOOLS, THEATRES, DANCE HALLS** or **OUTDOOR FUNCTIONS**, etc. For use with Electronic **ORGAN, GUITAR, STRING BASS**, etc. For standard or long-playing records. **OUTPUT SOCKET PROVIDES** L.T. and H.T. for a **RADIO FEEDER UNIT.** Amplifier operates on 200-250 v. 50 c/cs. A.C. Mains and has outputs for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 17/6. An extra input with associated vol. control so that two separate inputs such as Gram. and Mike can be mixed, can be provided for 13/- extra. The amplifier can be supplied, factory built with 12 months' guarantee, for 50/- extra. **TERMS** for assembled two input model : **DEPOSIT 28/9** and 9 monthly payments of **28/9.**

ONLY 9 GNS. Carr. 10/-

P.M. SPEAKERS. All 2-3 ohms, 5in. Goodmans, **17/9.** 7 x 4in. Elliptical Goodmans, **19/6.** 6½in. Plessey, **16/9.** 8in. Plessey, **16/9.** 8in. Rola, **19/9.** 10in. Plessey Heavy duty, **26/9.** 10in. R.A., **26/9.** 12in. Plessey, **29/11.** 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts, high-fidelity type. Highly recommended for use with any of our amplifiers, **£4/10/9.** 12in. Plessey, 15 ohm 10 watts, **3 gns.**

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

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

COAXIAL CABLE 75 ohms, ¼in. **8d.** yard. Twin Screened Feeder, **11d.** yard.

SELENIUM RECTIFIERS

6/12 v. 1 a.	5/9	6/12 v. ½ a. H.W.	2/9
6/12 v. 2 a.	8/9	**H.T. Types H.W.**	
6/12 v. 3 a.	11/9	150 v. 40 mA.	3/9
6/12 v. 4 a.	15/9	250 v. 50 mA.	4/11
6/12 v. 6 a.	19/9	250 v. 80 mA.	6/9
6/12 v. 10 a.	25/9	250 v. 150 mA.	9/9
L.T Types H.W.		300 v. 250 mA.	12/9

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

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

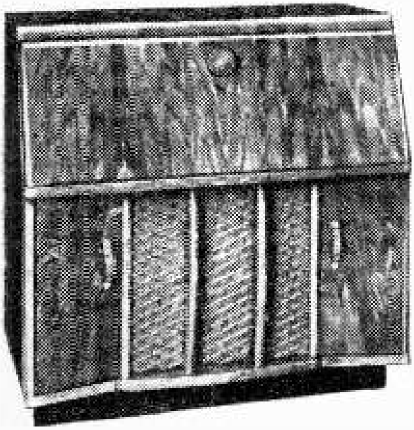
THE SKYFOUR T.R.F. RECEIVER

A design of a 3-valve 230-250 v. A.C. Mains receiver with selenium rectifier. It consists of a variable-Mu high-gain H.F. stage followed by a low distortion anode bend detector. Power pentode output is used. Valve line up being 6K7, SP61, 6F6G. Selectivity and quality are well up to standard, and simplicity of construction is a special feature. Point-to-point wiring diagrams, instructions and parts list, 1/9. This receiver can be built for a maximum of **£4/19/6** including attractive Brown or Cream Bakelite or Walnut veneered wood cabinet 12 x 6½ x 5½ in.

Terms : C.W.O. or C.O.D. NO C.O.D. under £1. Post 1/9 extra under £2 : 2/9 extra under £5. Open 9 to 5.30 ; Sats. until 1 p.m. Catalogue 6d., Trade List 5d. S.A.E. with all enquiries.

RADIO SUPPLY CO. (LEEDS) LTD. 32, THE CALLS, LEEDS, 2

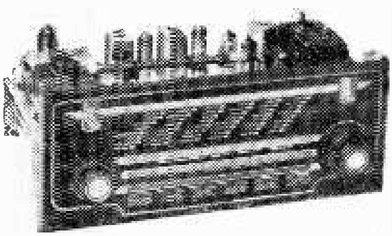
Build yourself a 75gns Radiogram for £54-7-6 only



CABINET CAT. NO. CAB/03

A magnificent Bureau-type Cabinet of the very highest quality in specially selected Walnut veneered exterior. Light Sycamore interior with Rexine lining to match. Outside dimensions: length, 34in., depth 17¼in., height 33in. Sloping control panel on right-hand side approx. 16in. x 10¼in. Removable baseboard on right side approx. 15¼in. x 15in. *Packing and carriage* 25/-.

CASH **£17.6.6** Or on Credit Terms.



CHASSIS CAT. NO. CR/AFM49/PP

9-valve Superhet with F.M./V.H.F. Band (4 wavebands). Push-pull output. Slow-motion tuning drive. Full provision of Automatic Volume Control. Sockets provided for Aerial, Earth, Gram, Pick-up and Extension Speaker. Connections provided to Gram. Motor controlled by Chassis On/Off switch. The tone-controls have been given an extra wide range to embrace all types of recordings. A.C. 200/250 volts 50 cycles only. *Packing and carriage* 15/-.

CASH **£27.6.0** Or on Credit Terms.

AUTOMATIC RECORD CHANGER

CAT. NO. RC/A. The latest multi-speed changer incorporating 16 r.p.m. for "talking-books." and arrangement for manual control. Fitted with high-fidelity Crystal Turnover Pick-up Head. A.C. mains 200/250 volts 50 cycles only. *Packing and carriage* 12/6.

CASH **£9.15.0**

CABINET CAT. NO. CAB/02 ★

A well-designed Bureau-type Cabinet in a medium size. Veneered in a highly figured Walnut. Outside dimensions: length 29¾in., depth 16in., height 32in. Sloping control panel on right-hand side approx. 13in. x 10¼in. Removable baseboard on right-hand side approx. 13¾in. x 13in. Large record compartment inside the cabinet, located at the top on left-hand side.

CASH ONLY **12 Gns.**
Packing and carriage 20/-.

OTHER CHASSIS

CAT. NO. CR/A. 5-valve Superhet, 3 wavebands.
12 Gns. *Packing & carr.* 12/6.

CAT. NO. CR/AFM47. 7-valve Superhet with F.M./V.H.F. Band (4 wavebands).
23½ Gns.
Or on Credit Terms.
Packing and carr. 15/-.

★ F.M. TUNERS ★

CAT. NO. FMT/A. Complete Unit in Cabinet with Magic-eye tuning. **16½ Gns.**
Or on Credit Terms.
Packing and carriage 12/6.

CAT. NO. FMT/B. Chassis only excluding magic-eye. Unboxed, 11¾in. long x 5¾in. overall depth x 4in. high.
CASH **£13.15.0**
Packing and carriage 12/6.

★ LOUDSPEAKERS, GRAM, AMPLIFIERS, TAPE-RECORDER equipment, etc., available at keenest prices. Send for large illustrated Catalogue.

ALL FULLY GUARANTEED. Generous extended credit terms on orders exceeding £15. Dealers supplied at full discounts.

All enquiries (excluding Northern Area) to:

DOMESTIC
DIRECT SALES LTD.
90 JUDD ST., LONDON, W.C.1. TER. 9876

Northern enquiries only (not Scotland & N. Ireland) to:

MAYLIT LTD
3 MARLBOROUGH RD., ALRTINCHAM, CHESHIRE
Telephone enquiries: ALTRINCHAM 4045

About these acos Hi-g heads . . .

11 Carr Street,
Cougee,
Sydney,
Australia.

Dear Sirs,

"-will track with ease all present day records". So reads your ad. for the new Hi-g Heads. "We will soon see about that", I said. The first test for this new L.P. Head was Decca's Brahms Fourth - always very difficult to handle I found on the old head. The shock I received was enough to put me to bed for a month - where was all that distortion? Where was all that groove jumping? Having recovered my strength and secretly suspecting it was just a fluke, I tried the Swan Lake - also another jumper - and then in a determined effort to prove you wrong, on went the Symphonie Fantastique and Rite of Spring.

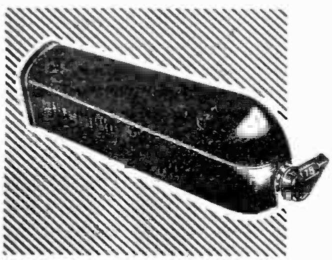
At this stage the neighbours and family were seriously alarmed at sundry cries issuing from my room - they need not have worried - they were cries of pure joy. I had seriously considered installing expensive magnetic Pick-ups - of which I knew very little - but this will obviously be quite pointless now.

"-will track with ease all present day records" to which I say, "blessed be the name of Acos Hi-g"

Yours with relief,
(Sgd) Cliff Davidson.

Over to you, Mr. Davidson

. . that is what Mr. Davidson has written — and we didn't go to Australia to prompt him! His letter sums up what many others have expressed. It really does pay to use ACOS Hi-g pick-ups — both from the point of view of reproduction and of longer record life.



FREE *The subject of Hi-g cannot be adequately explained in an advertisement, so we have produced an interesting booklet—"The ABC of Hi-g". May we send you a copy?*

acos *always well ahead*

ACOS devices are protected by patents, patent applications and registered designs in Great Britain and abroad.

COSMOCORD LTD., Eleanor Cross Road, Waltham Cross, Herts.
Telephone: Waltham Cross 5206

PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXII, No. 600, DEC., 1956

EDITOR : F. J. CAMM

24th YEAR OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

Editorial and Advertisement Offices :
"Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone : Temple Bar 4363.
Telegrams : Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

Car Radio

THE demand for car radio receivers continues to increase and the number of cars now fitted with them is 300,000.

Great interest was shown in the car radio receivers exhibited at the Radio Show. We still think, however, that there is considerable room for improvement, for in spite of careful suppression of electrical apparatus on the car itself, interference from trams, electrical railways and other public transport is still severe. Although the Government has made a move towards the compulsory suppression of domestic electrical apparatus causing interference, it has left the major causes of it alone.

V.H.F.

SINCE Wrotham opened in May, 1955, no fewer than 450,000 V.H.F. sets have been sold and the demand increases daily. There can be no doubt that this is the answer to interference-free reception of very high quality, and in the course of a few years the system must inevitably oust the older one.

RADIO FILM SHOW

WE recently witnessed some excellent films dealing with transistors, valves, and cathode-ray tubes and their methods of manufacture. These films were so interesting that we made the suggestion to the producers that they should be shown to a wider audience, and, accordingly, the films are to be shown at the Caxton Hall (Great Hall Site) on Thursday, February 21st, 1957. Admission will be free, but by ticket. There will be an interval for refreshments. Readers wishing to attend this film show should send in requests for tickets immediately. Address your letters to "Film Show," PRACTICAL WIRELESS, address as on this page. The meeting will commence promptly at 8 o'clock in the evening.

There is bound to be a large demand for seats, and accommodation is limited. Please, therefore, apply early.

BLUEPRINTS—PRICE INCREASE

OWING to a rise in cost of producing blueprints, we are compelled, as from this issue, to increase the price of each by 6d. This is the first price increase since our Blueprint Service was inaugurated over 20 years ago. We have deferred increasing the price until rising costs left us with no alternative.

The Editor and Staff Join in Wishing Every Reader a Very Happy Xmas

BINDERS FOR VOL. 31

ON page 689 of this issue we give details of the new arrangements for binding this journal. We are supplying a loose-leafed binder in which readers can insert their copies month by month, without having to wait for the completion of the volume before they can have them bound in the ordinary way. When the volume is completed the index can, of course, be inserted. This method will prevent copies becoming mutilated or misplaced. The covers are in black cloth, lettered in gold, and are grease- and water-proof.

Volume 32 will be completed with our issue dated February, 1957, as owing to the printing strike we did not publish two issues. Indexes will, of course, be available at 1s. 3d.

TWO NEW HANDBOOKS

TWO new handbooks have recently been published from the offices of this journal : "The Home Electrician" (206 pp., 147 illustrations) deals with the installation, overhaul and repair of all domestic electrical apparatus. It costs 12s. 6d., or 13s. 2d. by post. "The Elements of Mechanics and Mechanisms" (432 pp., 481 illustrations) deals with the natural forces, laws of motion, thermodynamics, hydraulics, etc., and gives hundreds of examples of particular mechanisms. It costs 30s., or 31s. 3d. by post.—F. J. C.

OUR NEXT ISSUE, DATED JANUARY, 1957, WILL BE PUBLISHED ON DECEMBER 7th

Round the World of Wireless

By "QUESTOR"

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of August, 1956, 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 ...	1,291,963
Home Counties ...	1,288,706
Midland ...	1,001,448
North Eastern ...	1,303,831
North Western ...	992,843
South Western ...	819,041
Wales and Border Counties ...	514,358
Total England and Wales ...	7,212,190
Scotland ...	927,197
Northern Ireland ...	205,757
Grand Total ...	8,345,144

New British Standards

THE following new Standards are announced:

Thin vulcanised fibre sheets (including leatheroid) for electrical purposes (B.S. 2768 : 1956).

Basic characteristics of radio service selection and intercommunication systems for civil aircraft (B.S. R.2 : 1956).

Copies of these British Standards may be obtained from the Sales Branch, British Standards Institution, 2, Park Street, London, W.1, price 3s.

F. R. W. Strafford Resigns

F. R. W. STRAFFORD, M.I.E.E., has resigned from Belling and Lee, Ltd., where he has served for many years as technical manager, to become a consulting radio and electronic engineer on his own account.

Mr. Strafford, who is well known to the technical Press for his many contributions on aerials and interference suppression, has been intimately associated with the technical side of the industry for 33 years. His work has included domestic radio, telecommunications, radar and general applications of electronics.

He was the originator of G9AED, the first U.K. Band III pilot television transmitter.

Mr. B. H. Douthwaite, A.M.I.E.E., has joined Belling and Lee, Ltd., with effect from October 1st last, taking up the appointment as administrative head of the research and development activities of the company.

V.H.F. in the West

THE BBC's Very High Frequency sound broadcasting station at North Hessary Tor, South Devon, has now been brought into service and transmits the West of England Home Service on 92.5 Mc/s, the Light Programme on 88.1 Mc/s and the Third Programme on 90.3 Mc/s, each with an effective radiated power of 60 kW. The transmissions are horizontally polarised. This new station is on the same site as the BBC's North Hessary Tor Television Station.

The V.H.F. service will be further extended in the West Country when the installation of additional transmitters is completed later at the BBC's V.H.F. station at Wenvoe, near Cardiff. The Wenvoe station, which at present transmits the Welsh Home Service, will then transmit in addition the West of England Home Service and the Light Programme and will provide good reception in North Devon, Somerset, and parts of Dorset, Wiltshire and Gloucestershire.

R.N.V.R. (Wireless) Reserve

YOUNG men who join the Royal Naval Volunteer (Wireless) Reserve may, when qualified, be issued by the Admiralty with a complete radio transmitter and receiver, together with a G.P.O. Transmitting Licence. This equipment can be used in their own homes, on Naval wavelengths, to enable the volunteers to keep in practice by communicating with other naval units. One of the radio stations issued under this system was the main feature of an exhibition of hobbies recently held at Cheltenham Town Hall.

Radio Aids British Harvest

RADIO is speeding an important part of Britain's 1956 harvest. In the fields of Yorkshire and Lincolnshire harvesters are speaking over two-way short-wave radio, keeping in touch with a central control point and calling in men, machines and transport as required.

This new development is being

R.N.V.R. Telegraphist E. Fowles seen explaining the working of one of the Admiralty issued radio stations to possible R.N.V.R. recruits at the hobbies exhibition at Cheltenham. Young men who qualify before National Service are guaranteed entrance to the Navy when called up.

used by Batchelors Peas, Ltd., now at the peak of their garden pea harvesting season. The crops from many thousands of acres have to be brought in within six short weeks.

Lt.-Col. Maurice W. Batchelor, chairman of the company, said, "We have installed two-way radio in our agricultural representatives' cars and fitted it at our vining stations. A control office has been set up at headquarters in Sheffield.

"The peas are separated from the pods mechanically at the vining stations, and when a particular field is ready for cutting our fieldsman radios the station, warning it of the variety and quantity of the crop to expect."

Servicing Examination Results

THE Radio Trades Examination Board and the City and Guilds of London Institute have now published the results of the Radio and Television Servicing Certificate Examinations for 1956.

Entries for both these examinations showed an increase over the figures for 1955, particularly in the Radio Servicing Certificate Examination, for which 822 entries were received, representing an increase of 55 per cent.

The number of successful candidates in the Radio Servicing Certificate Examination was 322. In addition, 185 candidates were referred in the practical test. In the Television Servicing Certificate Examination, 60 candidates were successful and 51 were referred in the practical test.

The next Radio Servicing Certificate Examination will be held on 7th, 9th and 18th May.

The next Television Servicing Certificate Examination will be held on 13th and 15th May and 22nd June.

Scottish Radio Show

THE Radio Industry Council has announced that the Scottish Radio and Television Exhibition will be held at Kelvin Hall, Glasgow, from May 22nd to June 1st, 1957.

The exhibition will be the first to be organised by the radio manufacturers since television began in Scotland and will precede by a few months the opening of the first Scottish commercial television station.

The only previous exhibitions held in Scotland by the radio manufacturers were at Kelvin Hall in 1933, 1934 and 1935. The Scottish Radio Retailers' Association, however, have organised two very successful exhibitions since the war at St. Andrew's Hall, Glasgow.

BBC Presents Scholarships

THE BBC are presenting one or two research scholarships each year, valued at £385 per annum, to University graduates in electrical engineering or physics who obtain good honours degrees, giving them the opportunity to work for a higher degree at any University in the United Kingdom, not necessarily at the one where they graduated. The scholarships are for two years in the first instance with the possibility of extension in suitable cases, if necessary. The scholarships are limited to male British subjects normally resident in the United Kingdom. The only condition applying to the subject for research is that it must be in those fields of telecommunications or physics which have an application to sound or television broadcasting.

The Corporation has given one research scholarship only this year and that was to Mr. P. C. J. Hill, who graduated at Birmingham University with first-class honours in electrical engineering. Mr. Hill will conduct his researches in the Department of Electrical Engineering at the Imperial College of Science and Technology, under the supervision of Dr. D. Gabor.

Weather by Phone

WITH reference to the illustration published on page 445 of our September issue, we are asked to point out that the number to dial for the weather reports is WEA 2211.

Ear Radio

IT is reported from America that a transistor radio has been produced small enough to be worn in the ear, and so cheap to produce that they can be discarded in three or four weeks when the battery is exhausted. Mr. Glen Schmidt, of the company making these radio sets, said they would cost just over 9s., and each would be tuned to a single station. They would be colour-coded to indicate to which station they were tuned.

This Marconi engineer is standing on the site of a V.H.F. multichannel radio station at Kuh-i-Sefid, 16 miles from Arak in Iran. Not far away the temperature can exceed 120 deg. F. in the shade. In all, 84 Marconi multi-channel equipments Type HM.181 together with a considerable quantity of telephone carrier equipment are being installed along the National Iranian Oil Company's new 60-mile oil pipe-line from Abadan to Teheran. This picture was taken when the survey team traversed the route selecting suitable sites. Kuh-i-Sefid ("The White Mountain") is 10,000ft. in height. The site shown (8,000ft.) is immediately above a valley which is often rendered impassable by snow, and was chosen so as to enable the radio signals to be shot along and through the valley in one hop.

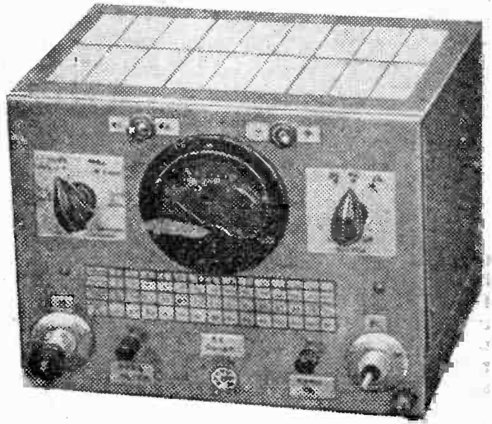
BBC's New Norwich H.Q.

THE BBC has acquired premises known as St. Catherine's Close, All Saints' Green, Norwich, for use as a sub-regional studio centre.

A Versatile Valve Voltmeter

ANOTHER INTERESTING SERVICING AID AND ACCESSORY FOR THE EXPERIMENTER'S WORKSHOP

By J. Hillman



THIS is a combination instrument which can measure ohms, D.C. volts or A.C. volts, and additionally is particularly useful for measuring grid voltage, high resistances, as well as insulation testing. Its input resistance on D.C. is 60 MΩ. The instrument is self-contained and can be used to measure from 0.05 ohms up to 750 megohms on its resistance range. On the voltage ranges from 0.1 volt up to 1,200 volts the meter is 20 MΩ per volt.

Provision is made for changing the polarity of the output leads without removing them from the testing points.

The scale of the meter may seem a little unusual, because it is marked 0-3 and 0-15, but the writer is of the opinion that these markings are more useful than the usual commercial ones of multiples of 10. The majority of voltages requiring to be measured in servicing sets occur in the ranges 1.5 to 2.5, 100 to 150, and 250 to 300, and with a meter scale of 3,150 and 300 the readings occur in that part of the scale where the meter is more accurate. With most commercial instruments these readings come either half way or right at the very end of the scale.

If the reader does not desire the above scales, but prefers the commercial type scale, no alteration is needed to the instrument as the scale can be 0-2 and multiples of this, i.e., 2, 10, 20, 100, 200, 400. The initial setting up is the same.

For those who wish to use the scale I recommend

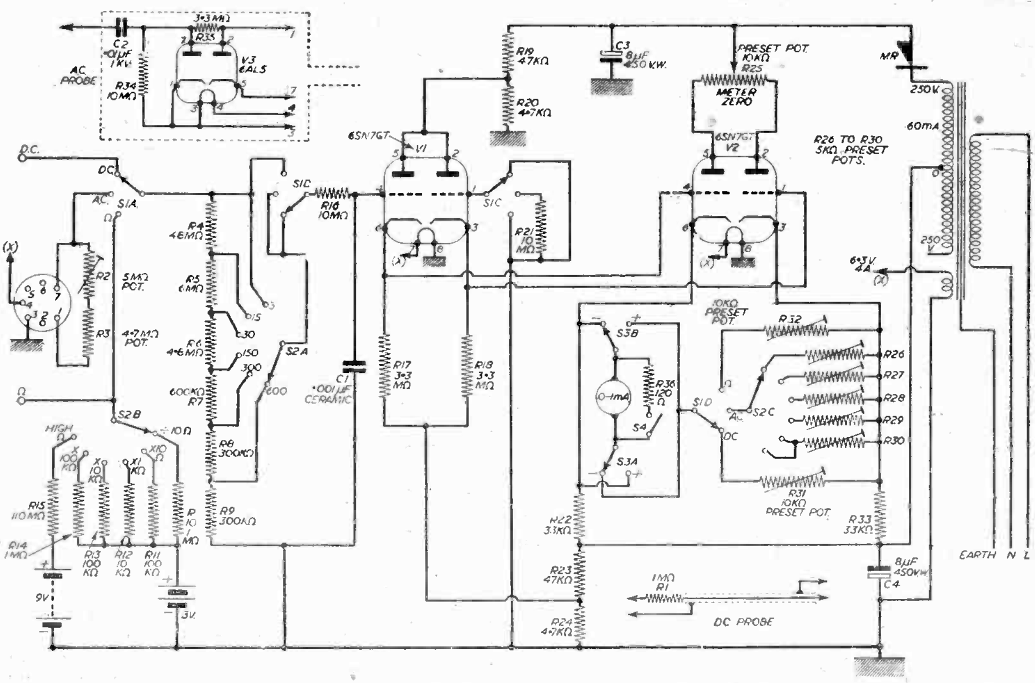


Fig. 1.—Theoretical circuit of the Meter. R and C details are given and the remaining components are listed on page 664.

the following procedure should be adopted to modify the 1 milliamp meter. First place the meter on a clean sheet of paper out of all draughts and in a dust-free room. Remove the three small countersunk screws around the case of the meter, one of which may be sealed but can easily be chipped off. Next, carefully withdraw the movement and place face upwards on the paper and measure the radius of the existing scale. To remove the scale plate it will be necessary to take out two or more countersunk screws holding it to the magnet, taking care the screwdriver does not slip and damage the pointer. The scale can now be slid upwards under the pointer arm and turned over, and the new scale drawn using

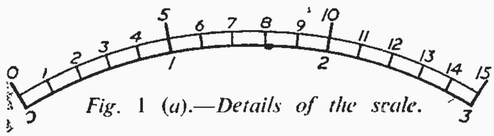


Fig. 1 (a).—Details of the scale.

the same radius. Marking it in pencil first, then in Indian ink. The scale should be divided up as in Fig. 1(a), and numbered 0-15 on top part and 0-3 underneath. By reversing the procedure the instrument can now be reassembled, taking care that the zero pin of the setscrew in the case lines up with the slot on the meter movement.

Construction

First mark out the panel as in Fig. 2 and bend the ½in. edges at right angles and drill all holes as shown. Fig. 7 shows the drilling template for the pre-set potentiometers.

Now mark out the chassis as in Fig. 3 and bend at A and B first, then C, D, E, F, G and H in that order. Keep the edges C and F inside the chassis, and drill and bolt up to the back piece. Finally, bolt up to the front panel after drilling holes to suit, and the final chassis should look like Fig. 4.

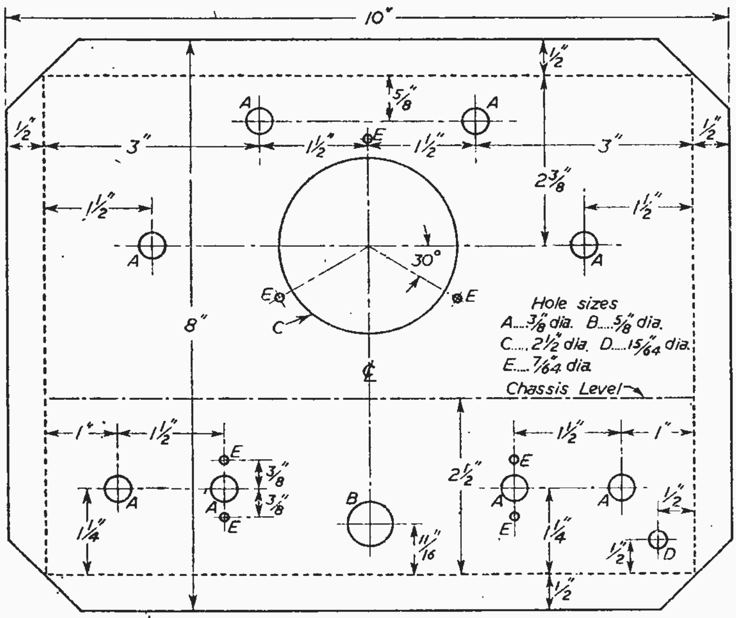


Fig. 2.—Panel drilling and bending data.

Next mark out the top cover Fig. 5 and bend in the following order A and B, C, D, and E, and bolt up the back piece with the " L " ends inside the cover. The bottom cover plate can be cut next as in Fig. 6. Finally, the potentiometer bracket (Fig. 11) is made as in Fig. 7, bending the 1in. section at right angles.

The various parts are now assembled on the panel and chassis. The potentiometers are all mounted on the bracket, Fig. 7, and wired up with differen coloured wires before fixing the bracket to the

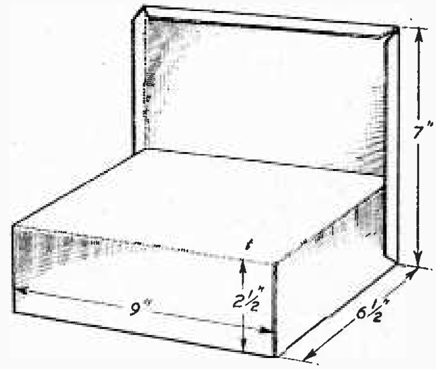


Fig. 4.—How the chassis is made up.

chassis, as this makes wiring up much easier. It is advisable to thoroughly clean all switches before using, to ensure that there are no leakages due to dirt and grease. In mounting the B7G valveholder on the front panel keep the holder behind the panel as this makes a neater job.

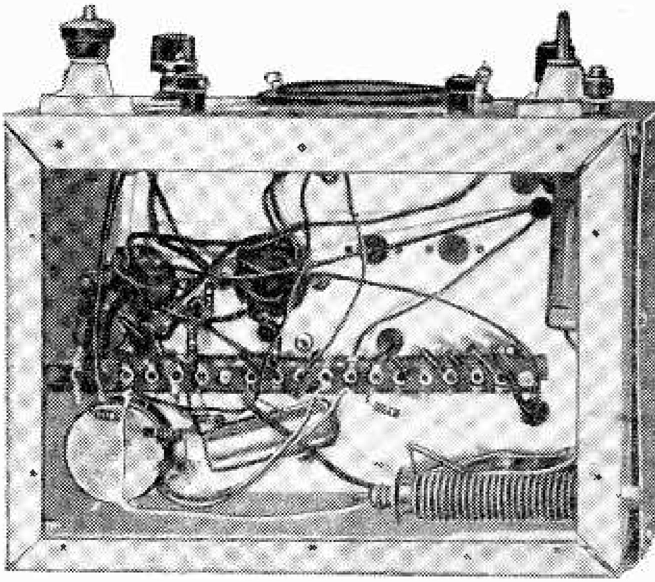
Wiring

Resistances of S2A are made up from ±10 per cent. midget type, and these have been found quite stable in use, but precision resistors can be used here, of course, if greater accuracy is required. The resistors can be made up as follows using standard ±10 per cent. type: R4=18 MΩ+15 MΩ+15 MΩ making 48 MΩ; R5=3.3 MΩ + 2.7 MΩ making 6 MΩ; R6=3.3 MΩ+1.5 MΩ making 4.8 MΩ; R7=330 KΩ+270 KΩ making 600 KΩ; R8 and also R9=120 KΩ + 180 KΩ making 300 KΩ. R10 is a piece of resistance wire which can be measured off with a rule and by consulting the appropriate table of resistance data one ohm can be cut fairly accurately. R15, 110 MΩ, is made up of five 22 MΩ resistors in series and is mounted for convenience on a tag strip below the chassis. All the other resistors connected with S2 are mounted on the contacts of the switch itself.

R36 is found by trial and error as it may vary according to the resistance of meter.

The 3-volt battery is a twin cell, and connection is made to it by flexible leads and crocodile clips, whilst the 9 volt battery is a grid bias battery, using flexible leads and wander plugs to make connections to it.

The mains transformer is mounted on top of the chassis and the heater wiring run along the top of the chassis to a grommet at V1 valveholder. The insulated terminal of the stand-off bracket is made from an accumulator terminal with the brass stud cut off, and a hole drilled and tapped 2 B.A.



A view of the underside of chassis.

A.C. Probe

The A.C. probe is made from an old electrolytic condenser case. One end (the terminal end) is sawn off and the inside removed and a hole drilled in the remaining end to take a small grommet as in Fig. 8. Into this a piece of 4 B.A. threaded rod is secured by means of nuts either side of it, and the end of the rod is filed to a point, a piece of insulated sleeving threaded over it so as to leave just the tip bare. A lead is soldered to the end of the rod and goes to C2. The valve, valveholder and R34, R35 and C2 are all wrapped in polythene strip and pushed inside the condenser case and flexible leads (four coloured ones) are brought out and twisted together for about 3ft. and terminated in a B7G plug. If 7/33 flex is used quite a light lead results.

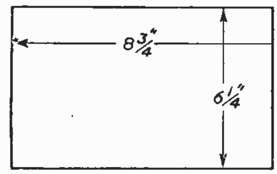


Fig. 6.—Bottom cover plate.

D.C. Probe

The D.C. probe consists of a length of coaxial cable as in Fig. 9, one end terminated in a porcelain insulator to which is bolted a length of 4 B.A. rod filed to a point at one end, and with sleeving over it and the other end terminated in two spade terminals. One point to note is that R1 is fitted inside the porcelain insulator of the D.C. probe, and its purpose is to minimise any effect on the external circuit under test, so that no matter what range is used there is always 1 megohm resistance between the meter and the external circuit.

R21 must be efficiently earthed and this is done by connecting it to chassis at a convenient point to the switch, and also by running a direct earth wire from it to the heater earth. This is important, as on A.C. it may cause erratic readings if not properly earthed.

No on-off switch is fitted, as the mains lead can then be kept well away from the front panel, but one could easily be fitted if required.

The S2 switch should have widely spaced contacts, the one used by the writer was made up from two ex-government 2-P six-way wafer switches; if,

MISCELLANEOUS COMPONENTS

Meter 0-1 mA. 2½in.
2 Int. octal valveholders.
2 B7G valveholders.
1 B7G plug.
1 SPST toggle switch.
1 DPDT toggle switch.
1 3P 6 w. w/c switch.
1 4P 3 w. w/c switch.
2 stand-off insulators.
1 OBA Earth terminal.
2 spade terminals.
4 crocodile clips.
1 metal rectifier 250 v. 60 mA.
1 mains transformer, 250-0-250 v. 60 mA, 6.3 v. 4 a.
2 wander plugs.
1 Yard coaxial cable.
Rubber grommets as required.
Connecting wire as required.
7/33 PVC flex coloured as required.
4 BA and 6 BA nuts, bolts and washers as required.
2 pointer knobs.
Self-tapping screws as required.
1 tag strip.
3-core flexible mains lead.

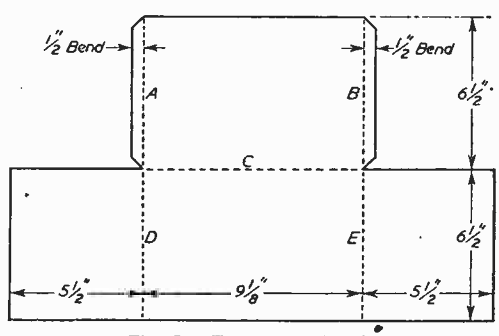


Fig. 5.—Top cover details.

however, a ceramic switch is available this will be better still.

Marking

The panel should be marked as in Fig. 10, using pieces of paper cemented to the panel and marked in

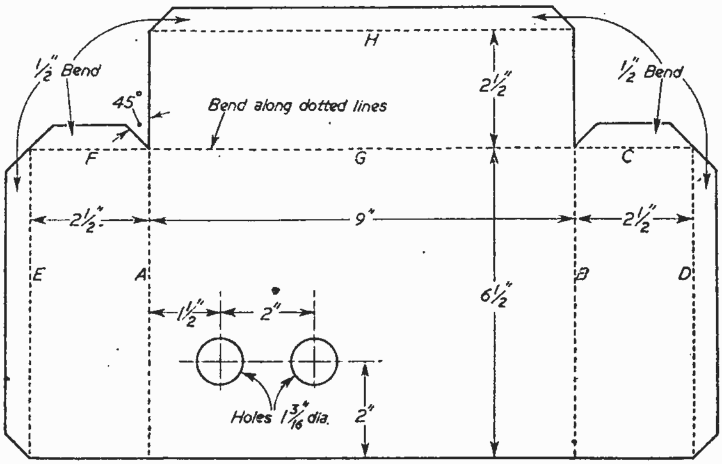


Fig. 3.—Chassis bending and drilling data.

with Indian ink, and then smeared over with cellulose cement when dry. The potentiometer bracket is also marked as in Fig. 11. The resistance chart is shown in Fig. 10A and this is the average readings; a more accurate and detailed chart is cemented on the top cover for more exact readings, and each range can then be shown.

Calibration

First allow the meter to warm up for an hour or so and then with the D.C. probe connected, set S2 to three volts, S1 to D.C., S3 to + and adjust zero meter control to bring pointer to zero. Now connect the end of D.C. probe to a standard voltage. The more accurate the voltage the more accurate will the meter be. The standard used by the writer was a 2 volt accumulator charged and allowed to stand for a day, then its reading checked on a 1,000Ω per volt meter was 2.2 volts. R31 D.C. on the potentiometer bracket is now set to give this reading on the meter; the probe is next disconnected from the battery and the meter zero used again to zero the pointer, and this procedure is carried on until no further change in reading is noted. The rest of the ranges on D.C. should now be checked and should be found correct.

The polarity reversing switch S3 should now be checked, and there should be no difference between the readings in the positive and negative positions. Should the readings differ try changing the 6SN7 valves. Meter doubling switch S4 can now be adjusted by trial and error to give twice scale reading in ×2 position.

For A.C., set S1 to A.C., S3 to A.C., S2 to 15 volt range, and use balancing potentiometer R2 to get meter to zero and to give R25 its range to zero meter. For 3-volt range the scale would have to be calibrated separately as the scale is not linear, and as the writer is of the opinion that this range is of little use in practical servicing the first range to be cali-

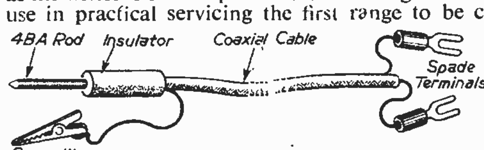


Fig. 9.—The D.C. probe.

brated is the 15-volt one. By using a 6.3 volt mains transformer connect A.C. probe to its terminals and adjust R26 to give correct reading on scale and using meter zero each time until no difference in off and on readings is obtained. Similarly with 30 volt use R27; 150 volts use R28; 300 volts use R29; 600-volts use R30; using two 6.3 volt heater transformers phased to give 13 volts for the 30 volt range. Use a battery eliminator transformer 150-0-150 for the rest of the ranges, and use the mains as a check voltage on the 300-volt and 600-volt range.

For resistance calibration set S1 to Ω, S2 to ÷10Ω range, S3 to Ω and zero ohms at one end of scale, then switch S1 to A.C. and zero meter and S1 to Ω and zero ohms until meter

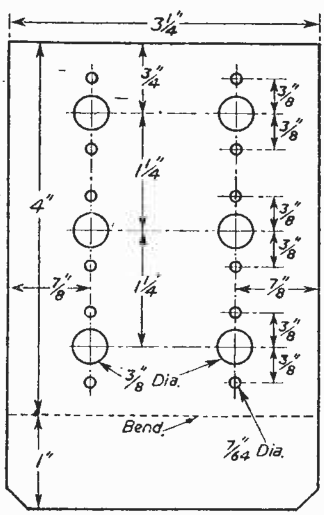


Fig. 7.—Drilling and bending details of the potentiometer bracket.

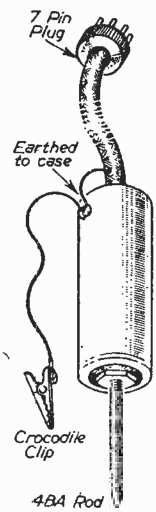


Fig. 8.—The A.C. probe.

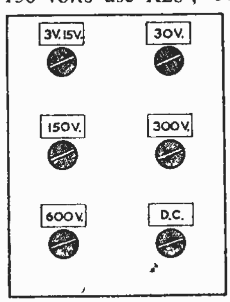
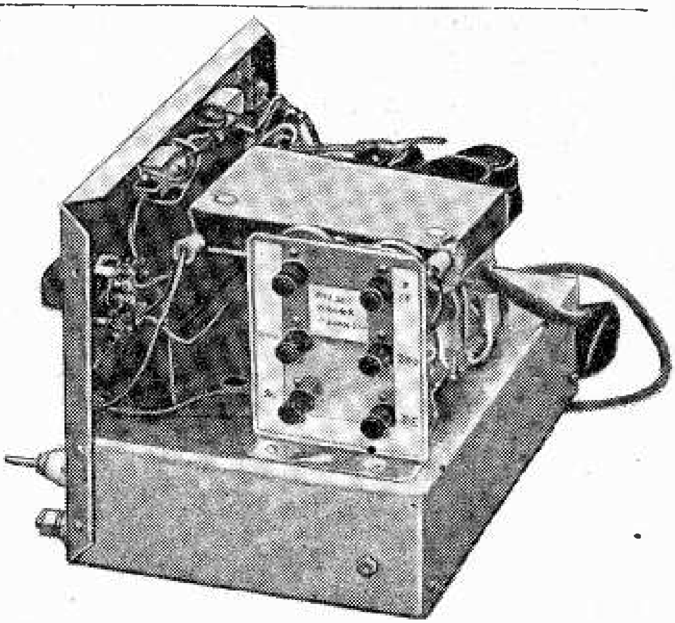


Fig. 11.—The potentiometer bracket.

reads correctly zero at each end of scale. Now switch to A.C. to prevent running battery down, whilst making preparations for calibration. One point to note is that the zero ohms adjuster adjusts the scale at maximum and this is at the maximum reading of the meter unlike ordinary ohm meters. For the first range use a large battery charging one ohm variable resistor so that by counting the turns on it the one ohm can be sub-divided into decimal fractions of an ohm. Connect the resistor with fairly heavy flexible leads and switch S1 from A.C. to ohms each time a reading is taken, and then allow a minute or so for the battery to recover before proceeding with the calibration. Do not keep the switch S1 in the ohms position longer than is necessary to take the reading, as at this low resistance a heavy current tends to flow. For the other ranges use the zero ohms R32 in conjunction with the zero meter for each range and use ±10 per cent. resistors to calibrate the meter, noting the readings for each division on the scale. By using two or more resistors in parallel the lower readings can be calibrated, e.g., for 5 ohms use two 10 ohms resistors in parallel, and for 4 ohms use three 12 ohm resistors in parallel. The normal 10 per cent. range extends to 22 MΩ and by using a number of these in series the range can be calibrated up to about 264 MΩ which is when 12 resistors are used in series. For higher calibration points 50 MΩ resistors may be used if available. The writer used 5-watt carbon ex-government ones, which are not very accurate, but then accuracy is not essential at these high values as this range is used more for insulation testing. As a substitute for high resistances a piece of soft wood can be used which can be measured on the scale already calibrated and then resistors added in series to calibrate the higher readings.



Three-quarter rear view of the instrument.

Range	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ω	1	2	5	8	10	15	20	30	40	50	60	125	150	270
All others ...	.82	1.8	2.7	3.3	4.7	6.8	8.2	12	15	18	27	33	56	100
High Ω MΩ ...	2.7	6.8	8.2	12	15	25	32	40	50	68	90	100	200	370

Fig. 10A.—The Resistance Chart.

One last point regarding the wiring to the mains transformer; use three-core flex for the mains lead and put the earth wire to the screen of the mains transformer, but do not connect this to the chassis, as otherwise when checking voltages above earth potential the lead will short the H.T. to earth in the circuit under test.

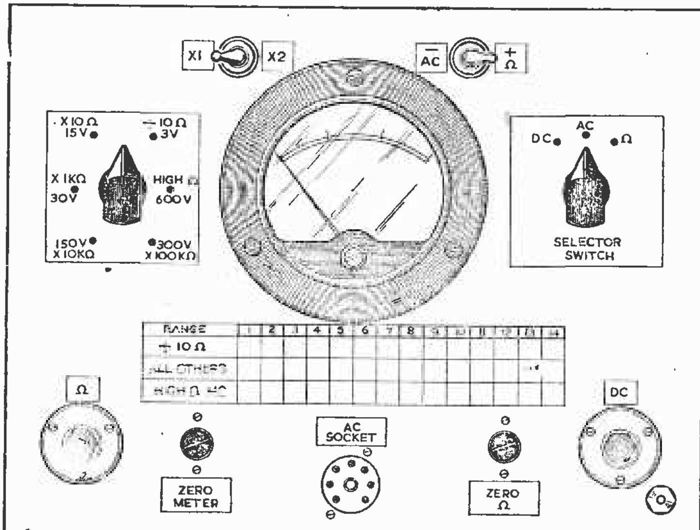


Fig. 10.—Details of the panel layout

A Beginner's SHORT-WAVE THREE

AN A.C.-OPERATED SHORT-WAVE RECEIVER

By

V. M. Meadows

(Concluded from page 614, November issue.)

IT should be noted that the variable condenser CA should *not* be earthed to the panel or chassis at any point; if it were, then it is obvious that all the signals derived from the aerial would simply go straight to earth. The condenser should be mounted to the panel and chassis front drop by means of two insulated washers, these being of paxolin, and a short length of tubing, either of the same material or of rubber.

Before fitting the condenser into position ensure that the hole into which it is to be fitted is larger than that normally required for the condenser bush alone. Then, placing one of the paxolin washers over the bush, place the condenser into position. From the front of the panel slide over the condenser bush the short length of paxolin or rubber tube, following this with the remaining insulated washer and the normal fixing nut.

Wiring the Circuit

It is best to commence the wiring by connecting up the power supply section of the circuit. In this manner the heater wiring may be so carried out that all the heater leads are placed near the chassis deck. Assuming that the specified components are being used (see component list) wiring may now commence, but before doing so a few words about this may not come amiss, especially to the beginner reader about to construct his first receiver.

It is a good plan for readers building this receiver to use various colours of PVC wire for differing portions of the circuit, this being of considerable help when tracing possible faults if and when they arise. The following colours have been used in the prototype: Red for H.T.+; White for the tuned circuits; Black for earthed wiring and Green for the audio connections.

All the individual components should be suspended with their respective wires, but, at the same time, these should be reasonably taut and securely anchored to the valve tags, etc., before soldering. The use of insulated sleeving over the component wiring, after having been cut to the required length, especially where they are carrying H.T. potential, is to be thoroughly recommended. In this manner H.T. shorts to the chassis, etc., are avoided.

The component wire ends, when cut to the correct length, should be thoroughly tinned *before* soldering into position, this being extremely important if dry joints and consequently bad connections are to be avoided.

Power Supply (V3)

Having mounted the mains transformer in such a manner that the two thick green wires protrude through the grommet nearest the rear chassis wall, looking at the underside of the chassis, solder one of these green covered wires to the earthed tag of the five-way tag strip mounted above the rectifier valveholder. Solder the other green wire to tag 1 of V1. Before soldering these two wires, however, the enamel covering over the copper wire should first of all be removed by scraping with a knife or old razor blade, the bare copper then being thoroughly tinned before finally securing as outlined above.

These two wires are the 6.3 volt heater leads, and reference to the circuit diagram of Fig. 1 will enable a clearer understanding of the mains transformer colour code as used in the Ellison type MT162.

The thin blue and red wires coming through the same grommet as the green heater leads should next be cut short, the ends being separately bound with insulation tape so that no possible contact with each other or the chassis can possibly occur. These

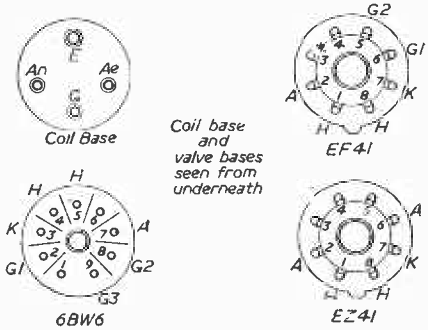


Fig. 7.—Details of valve base connections.

should then be tucked away neatly between the L.F. choke and the chassis wall.

The thin green wire is next soldered to the five-way tag strip, that tag nearest the rear chassis wall being used for this purpose. The thin black wire should now be soldered to the next tag of the same strip.

Proceeding now with the wires coming through the other grommet, solder the white and the yellow wires to the centre tag of the five-way tag strip, this particular tag being that bolted to the chassis wall and therefore at earth potential. These two wires should be brought along between the L.F. choke and the chassis side wall.

Next, dealing with the two thick systoflex-covered red wires, cut these short and securely tape them with insulation tape separately. Having completed this, tuck them away between the L.F. choke and the chassis wall. These are the 5-volt heater leads, not required with the particular type of rectifier that we are using.

The two thin red PVC covered wires should now be brought along between the L.F. choke and the chassis wall, one being soldered to tag 6 of V3 valve-holder and the other to tag 2 of the same valve. (See circuit diagram.)

The next step is to bring in the mains lead. A suitable length of twin flex should be fed through the grommet on the rear wall of the chassis. Bare both ends of this flex and solder these to the switch tags on the rear of the potentiometer, one to each tag, of course. At a point near the five-way tag strip, cut *one* of these leads only and bare both severed ends. Solder one of these to the same tag already holding the thin green wire from the mains transformer, and the other end to that tag already containing the thin black wire from the transformer. At the other end of the mains lead fit a suitable mains plug.

Dealing next with the valveholder of V3, solder tag 1 to the central metal spigot and join this to the earthed tag previously fitted under one of the holding bolts. Next, with a suitable length of black PVC wire, join tag 8 of V3 to tag 4 of V2, taking the connecting wire as close to the chassis deck as possible and along the chassis rear wall. From tag 7 of V3 take a short length of red-covered PVC wire to the tag of C9, and from there to one tag of the L.F. choke (it does not matter which one). From the other tag of the L.F. choke, connect to the tag of C8, and from there to a free tag of the strip situated on the rear chassis wall. From this latter tag take a short length of PVC wire to one side of the speaker transformer primary winding.

This completes the wiring of the power stage. Note should be taken of the fact that the five-way tag strip mounted above the rectifier valveholder is of the type having the central tag *only* bolted to the chassis. If another type should be used the main point to be noted is that only the white, yellow and one thick green wire coming from the mains transformer should

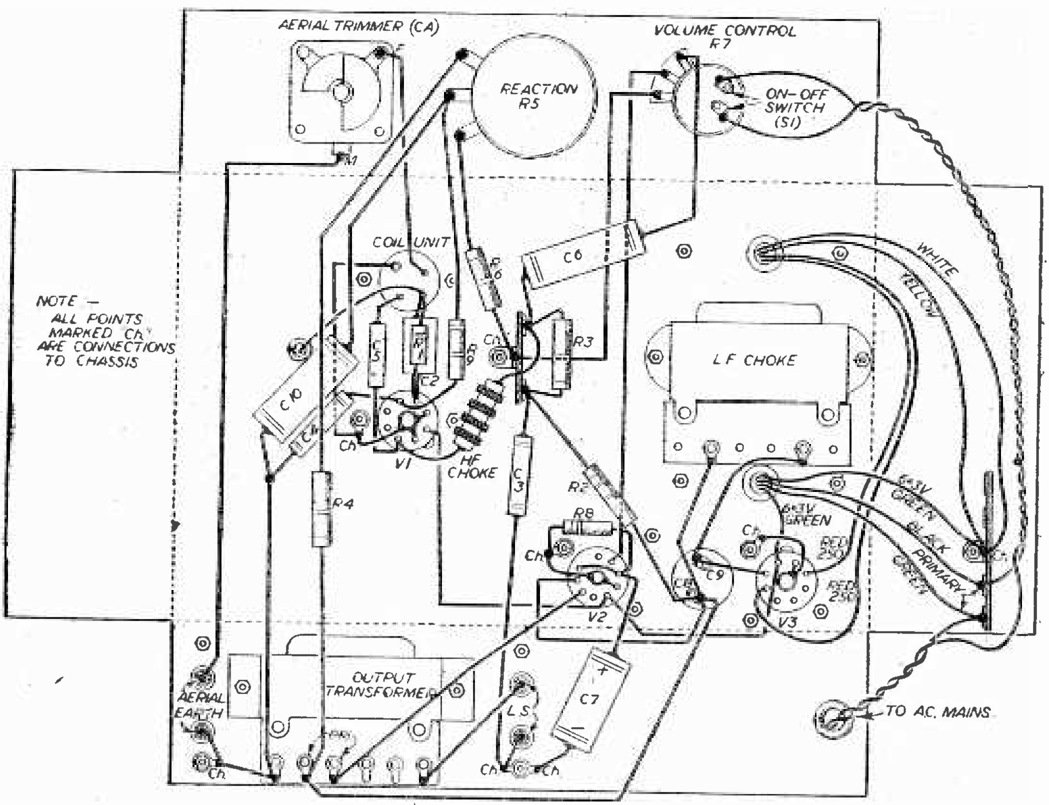


Fig. 6.—Below chassis wiring details.

be earthed. All the others should be soldered to free tags, i.e., not connected to the chassis in any way.

Output Stage

Dealing with this stage next, this being the easiest way in which to wire the receiver, connect tag 4 of V2 to tag 1 of V1. As this is the heater lead, position the PVC covered wire as closely as possible to the chassis deck, taking the wire midway between the two respective valveholders. By means of a short length of bare wire, connect tag 5 of the valveholder (V2) both to the centre metal spigot of the valveholder and to the earthed solder tag fitted under one of the fixing nuts.

From tag 3 of V2 solder one end of R8, the other end of which is connected to the earthed solder tag. To fit C7, first solder the negative end to the solder tag fitted on the holding bolt of the speaker output terminal strip contained on the rear chassis wall. (Note : The negative end is coloured black.) Having done this, solder a short length of bare wire to the positive end of the condenser and connect the other end of this wire to the cathode of V2, i.e., tag 3. Now join tags 3 and 9 of the valveholder by means of a short length of PVC wire.

From tag 8 connect a length of wire to the connecting tag of C8. From tag 7 join to the other side of the output transformer primary winding. Dealing with the output transformer secondary winding, connect one end to the earthed tag contained on the aerial/earth paxolin strip and the remaining end to one of the tags of the speaker output strip. The remaining free tag of this latter strip should now be soldered to the earthed tag fitted under this strip.

Dealing next with the grid circuit, connect tag 2 of V2 direct to the centre tag of the potentiometer R7. The left-hand tag of R7, looking at the component from the rear, should be connected to the earthed fixing tag of the three-way paxolin strip shown mounted in mid-chassis. The right-hand tag of R7 should next be wired to the negative end of C6, the other end of which should be connected to the tag of the three-way tag strip just mentioned. The tag nearest the front of the chassis is best for this last connection. To this same tag connect one end of R3 and the R.F. choke. The other end of R3 should now be soldered to the third tag of the strip, i.e., nearest the rear of the chassis. From this last mentioned tag connection should now be made to the positive end of C3, the other end of which is next soldered to the earthed tag situated on the rear wall of the chassis. From the positive end of C3 join one end of R3, the other end of which is connected to the solder tag of C8.

This has now completed the output stage wiring and part of the detector circuit. Before proceeding farther, a careful check should be made, both with these instructions and with the circuit diagram of Fig. 1, to ensure that no possible errors in respect of the wiring exist.

Detector Stage

This stage is the "heart" of the receiver, and careful attention to layout is essential if the maximum results are to be achieved. Constructors are urged carefully to study the under-chassis view of the receiver and obtain a clear idea of the layout before proceeding with the actual wiring of the circuit.

It is best to commence by wiring up the earthed portions of the valve and the associated components. Thus, with a length of bare wire, connect tags 8 and 7 of V1 to the central metal spigot of the valveholder, and from there connect this to the earthed tag fitted under one of the holding nuts of the valveholder itself. From this same earthed tag take a length of bare wire to the earth connection of the coil holder—this being that tag greater in diameter than the others.

Connect to tag 2 of V1 the free end of the R.F. choke and one end of C5, the other end of this latter component being now connected to the reaction winding tag of the coil holder (see inset to Fig. 1 or, where new coils are purchased, the leaflet enclosed). To tag 6 of V1 solder one end of C2 and R1. It is best to cut these to length and to solder the connecting wires together, at both ends, before finally

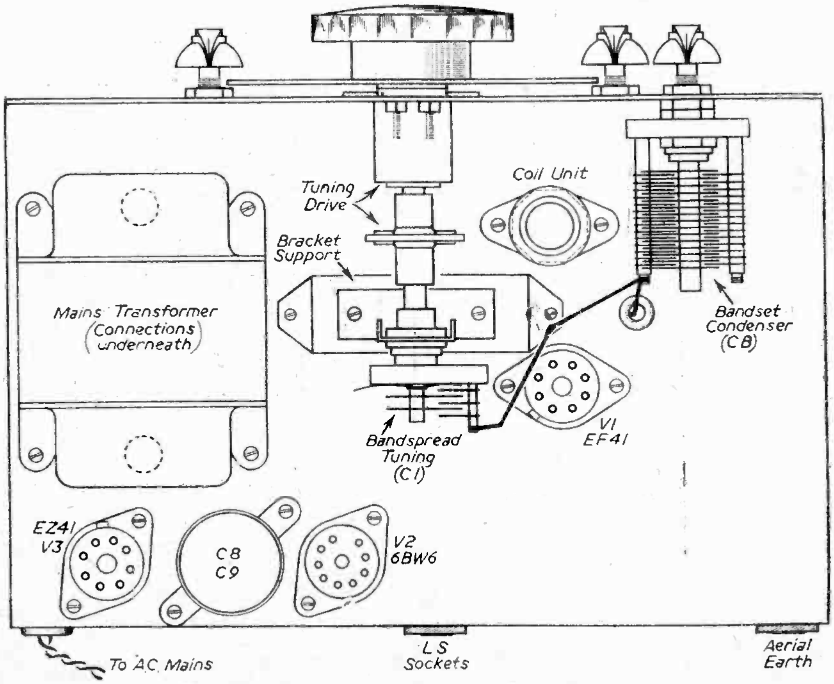


Fig. 5.—Above chassis wiring and layout details.

connecting them into circuit. The other ends of both C2 and R1 should then be connected to the grid winding tag of the coil holder. To tag 5 of V1 solder one end of R9 and C10 (positive end). The other end of R9 is then soldered to the centre tag of the potentiometer R5. The remaining end of C10 is next taken to the earthed side of the speaker transformer secondary winding.

To the right hand tag of R5, looking at the rear of the component, connect one end of the resistor R4, the other end of which is connected to the H.T.+ connection of the output transformer. To the centre tag of R5 add one end of C4 (positive), the negative end of which is soldered to the earthed side of the output transformer secondary winding. To the left-hand tag of R5 connect one end of R6, the other end of which is soldered to the earthed tag of the 3-way tag strip mounted on the chassis deck.

From the grid winding tag of the coil holder, connect a suitable length of PVC covered wire and, feeding this through the chassis via the rubber grommeted hole, connect the other end to C1. From this latter connection take a length of wire to CB, the bandspread condenser.

From the aerial winding connection of the coil holder connect a length of wire to the variable condenser CA, the aerial control; solder this wire to the static plate connection. From the other side of this condenser, i.e., the rotor or moving vanes connection, take a length of wire direct to the aerial input solder tag mounted on the rear wall of the chassis. The earth socket tag associated with the aerial input socket should now be soldered both to the earthed solder tag fitted under one of the holding nuts attached to the aerial/earth paxolin strip and also to the earthed end of the output transformer secondary winding.

The wiring of the receiver is now complete and, having again made a check of the instructions, together with Fig. 1, the constructor may proceed with testing the receiver before inserting the valves V1 and V2.

Testing the Receiver

In order to test the receiver, insert V3—the rectifier—and connect the power lead to the mains. Switch on and read the H.T. voltage at the junction of C8 and the L.F. choke. This should be around 320 volts depending on which make of meter is used—assuming, of course, that one is to hand. Having done this, insert V1 and V2, the speaker, aerial and earth. The various voltage readings which one would expect are then given in Fig. 1. The conditions under which these voltages were obtained have already been given.

Operating the Receiver

Having selected the coil appropriate to the range of frequencies over which it is desired to tune, rotate the Bandset condenser until a signal is heard. Advance the reaction control until the point of oscillation is passed—heard as a rushing sound in the speaker—bring the control back until this oscillation just ceases and then adjust the aerial condenser for the maximum signal. The A.F. gain control will, of course, have to be at maximum setting in order to obtain a sufficient volume of audio signal. Generally speaking, once the aerial condenser CA has been set for best results with a particular coil no further adjustment of this control will be necessary; each coil having its own setting so far as this condenser is concerned.

The Finishing Touches

In order that the completed receiver may present a pleasing appearance, both to the owner and others, the front panel should be treated with a good coat of paint. That used in the prototype was black hard-gloss enamel paint which is readily available from the local branch of the popular stores.

The various control panels and wording are those available under the trade name "Panel-Signs"—available at most radio shops; those shown on the photographs are from Set No. 1.

Conclusion

The receiver has been air tested over a period of some months and it has produced good results throughout that time. Comparatively simple to construct, it is a good receiver for the beginner or as a stand-by receiver for the more advanced.

B.I.R.E. Premium Awards

THE Council of the British Institution of Radio Engineers has recently announced the award of Premiums for papers published in the Brit.I.R.E. Journal during 1955.

The Clerk Maxwell Premium

(The senior Premium for the most outstanding paper in the Journal) to E. M. Bradley, B.Sc., and D. H. Pringle, Ph.D., for their paper on "The Theory and Design of Gas-discharge Microwave Attenuators." Dr. Pringle is, and Mr. Bradley was, with the Electronics Research Laboratory of Ferranti Ltd.

The Heinrich Hertz Premium

To R. Filipowsky, Dr.Ing., for his paper on "Electrical Pulse Communication Systems." Dr. Filipowsky is at present with the Westinghouse Electric Corporation, Baltimore.

The Louis Sterling Premium

To D. R. Coleman, D. Allanson and B. A. Horlock, for their paper on "The Development and Design of an Underwater Television Camera." Messrs. Coleman and Allanson are at present with Pye Ltd., and Mr. Horlock was formerly with that company.

The Marconi Premium

To Sin-Pih Fan, M.S., Ph.D., for his paper on "The Magnetron Beam Switching Tube: its Operation and Circuit Design Criteria." Dr. Fan was formerly with the Burroughs Research Centre, Paoli, Pennsylvania, and has now returned to China.

The Leslie McMichael Premium

To D. J. Fewings, B.Sc., and S. L. Fife, for their paper on "A Survey of Tuner Designs for Multi-channel Television Reception." Mr. Fewings is with Marconi's Wireless Telegraph Company, and Mr. Fife is with the English Electric Company.

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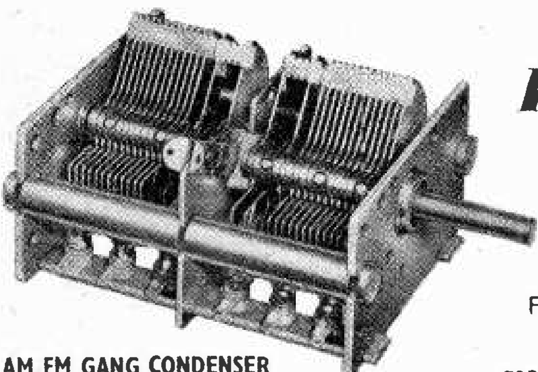

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TCC CONDENSERS. Main Amplifier, 55/-. Passive Unit, 12/9. Pre-Amplifier, 18/9.

All resistors and condensers are available separately. Full details in list.

OUTPUT TRANSFORMERS. Partridge P3591A, 99/-. Gilson WO710, 52/6. Whiteley, 32/-.

MAINS TRANSFORMERS. Partridge H300/110 (P3591B), 75/-. Elstone MT912, 40/6. Whiteley, 78/-.

SMOOTHING CHOKES. Partridge C10/135, 33/6. Whiteley, 18/9.

SWITCHES. Specialist Switches. Main Amplifier, 14/- the pair. Passive Unit, 11/6. Pre-Amplifier, 10/6.

CHASSIS. Drilled. Whiteley, steel, gold finish, 34/8. Denco, plain aluminium, 14/6.

PANELS. Main Amplifier only. Tele-Radio, 14/3. Denco, 6/6. Drilled for Passive or Pre-Amp., Denco, 7/6.

VALVES. Z729, Osram, 24/4; alternative, 15/-. B309, Osram, 19/6; alternative, 10/-. N709, Osram, 16/- each; alternative, 1/26 each. U709, Osram, 11/10.

COMPONENTS by Bulgin, Belling Lee and all other items are always in stock. Full details are given in our free price list.

COMPLETE KITS. Main Amplifier only.

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Kit B. Complete Kit with Partridge Transformers and Choke, Denco Chassis and alternative valves, **£21.17.0.**

Kit C. Cheaper Kit with Elstone Mains Transformer, Gilson Output Transformer, Whiteley Choke, Denco Chassis and alternative valves, **£19.17.0.** Remember that these kits are really complete.

PASSIVE UNIT if required with the above kits, **£2.13.0** extra.

PRE-AMPLIFIER if required with the above, **£4.15.0** extra with Osram Valve or **£4.6.0** extra with alternative valve.

G.E.C. METAL CONE SPEAKER, always in stock at **£9.5.0.**

CREDIT TERMS. Complete or part kits can be supplied on Credit Terms. Please state exact requirements and we will send a quotation.

MULLARD 510 AMPLIFIER

INSTRUCTION MANUAL, 3/6. PRICE LIST Free.

RESISTORS. Lab. Kits. MA10/56. All resistors and potentiometers for the Main Amplifier only. R1-R39, 39/-. MA10/PA/B. All resistors and potentiometers for Main Amplifiers and Pre-Amplifier Version B. R2-R22, R27-R29, R31-R54, 57/6. MA10/PA/A for Pre-Amplifier Version A only, R31-R46, 16/10.

CONDENSERS. TCC Kits. Main Amplifier, 45/-. Our alternative kit for Main Amplifier, 30/-. TCC Kits for Pre-Amplifiers, Version A, 15/-. Version B, 24/3.

CHASSIS. Denco. Aluminium ready drilled. Main Amplifier with base plate, 19/6. Pre-Amplifiers, Version A, 8/6. Version B, 12/6.

PRINTED PANELS. Denco. Main Amplifier, 6/6. Pre-Amplifiers, Version A, 1/6. Version B, 2/6.

OUTPUT TRANSFORMERS. Partridge P3667 (tapped for 6 k and 8 k load), 52/6. Elstone OT6 (6 k), 45/-. Elstone OT8 (8 k), 45/-. Ellison OP67 (8 k), 40/-. OP67A (6 k), 40/-. Gilson WO696A (8 k), 47/6. WO696B (6 k), 47/6.

MAINS TRANSFORMERS. Elstone MT/510 Main Amplifier only, 36/-. Elstone MT/MU for amplifier when Pre-Amplifier or FM Tuner are used, 42/6.

VALVES. EF86, Mullard, 24/4; alternative, 15/-. ECC83 Mullard 19/6; alternative, 10/-. EL84 Mullard, 16/-; alternative, 12/6. EZ80 Mullard, 11/10. EZ81 Mullard, 11/10.

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COMPLETE KITS. Main Amplifier only. Note—These kits include the MT/510 Mains Transformer. If the pre-amplifier or FM Tuner are to be used the MT/MU Transformer is required. Elcom Plugs and Sockets will also be required and the price of these and the difference on the transformer must be added to the kit.

Kit A. Complete kit with TCC Condensers, Mullard Valves and Partridge Output Transformer, **£16.6.0.**

Kit B. As Kit A, but with alternative valves and condensers, **£13.16.0.**

Kit C. As Kit B, but with Ellison Output Transformer, **£13.4.0.**

PRE-AMPLIFIER KITS. Version A with Mullard Valve, **£5.4.0.** With Alternative valve, **£4.15.0.** Version B with Mullard Valve, **£6.19.0**; with alternative valve, **£6.10.0.**

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An Electronic Metronome

ANOTHER INTERESTING TRANSISTORISED ACCESSORY

By P. Cheetham

WORTH building if only to demonstrate the versatility of the transistor, this circuit can be completed in an hour from the contents of the average spares-box, plus one 10/- transistor. There is no point in using a valuable low-noise, high-alpha transistor in this circuit: one which does not come up to scratch in other respects will still be perfectly satisfactory here.

The transformer may be any standard output transformer with a low resistance primary; in fact, the one actually used was a push-pull type which had one half of its primary burned out, the remaining half having a resistance of 180 ohms.

Using a 2½in. speaker, it is possible to build the metronome of a size which fits easily into the pocket, but the larger the speaker, of course, the louder will be its tone, although, again, it is quite unnecessary to use a first-class speaker for it has only to croak like a death-watch beetle and not sing like a nightingale. The prototype model used a speaker with a badly damaged cone repaired with Sellotape, yet it worked quite well.

LIST OF PARTS

250μF 25 VW Condenser.
100K ¼ watt Resistor.
1 Meg. Potentiometer with Switch.
½ Meg. Potentiometer with Switch.
2½in. Loudspeaker.
Speaker Transformer (low resistance primary).
Junction Transistor (any type).

Constructional Details

The three-ply case is 3¾in. square and 1½in. deep (inside measurements) with a 2⅛in. diameter hole for the speaker. An excellent grille can be found by attacking the old civilian respirator with a tin-opener, and all components, including a deaf-aid battery, may be glued into the case once the loudspeaker has been bolted down. The transistor is best left supported only by its springy leads, and these leads should not be cut, for there is always the danger of overheating when making the soldered joints, but it is advisable to thread half their lengths with sleeving as a safeguard against short circuits.

Switching Arrangements

By the use of two potentiometers, it is possible to have a " low " and " high " range, and with switches connected as shown in the circuit diagram, the sub-miniature (deaf-aid) potentiometer serves as the main on/off switch and low speed control. Any other 1 MΩ control with switch would serve here, but as these are available at a shilling only, and occupy no space at all *inside* the case, it seems pointless to use anything else.

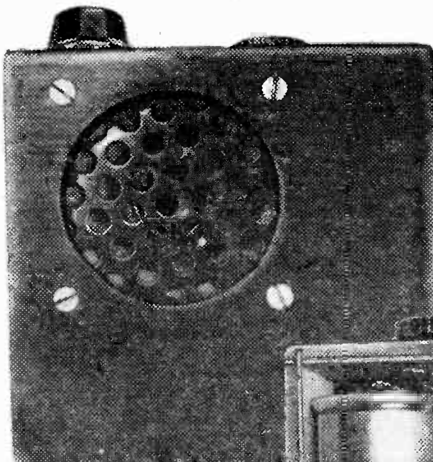
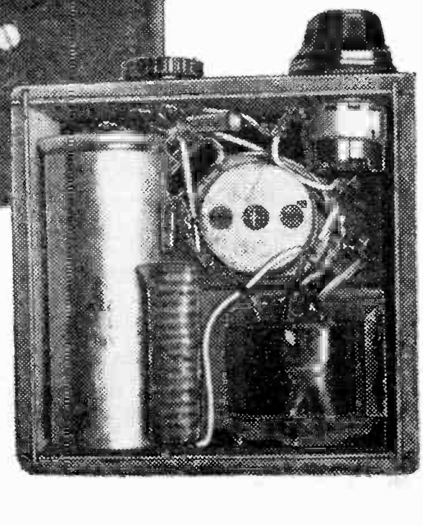
When the ½ meg. control is switched on, the low speed control is shorted out and by continuing to turn, any high-speed setting may be chosen. Meanwhile the slow speed setting has remained undisturbed and it is only necessary to switch off the high-speed control in order to return immediately to these low-speed clicks.

Calibration

The speed of the clicks depends not only upon the time constant of the C.R. circuit but on the voltage of the battery, so the latter should be chosen to cover the ranges desired. The value of the capacitor may be increased or reduced, as long as its working voltage is not likely to be exceeded, but not much is gained by changing the values of the resistors shown. The 100 K fixed resistor is for limiting the current flow through the transistor to a safe value, and any attempt to increase the value of the potentiometers may lead to inaccuracies due to leakage paths set up by moisture, etc.

The operating voltage should be chosen from the table on page 674 and the scales calibrated by comparison with a pendulum or a stop-watch.

Incidentally, with only 1½ volts, the metronome becomes an excellent tunable A.F. oscillator!

Front and rear views of a unit made up from the circuit described here.

Battery volts	Total range
22½	5 per min. to 3 per sec.
18	10 per min. to 4 per sec.
12	20 per min. to 5 per sec.
6	1 per sec. to 10 per sec.
3	15 per sec. to 200 per sec.

Current consumption in all cases is less than ½ mA so deaf-aid batteries may be used.

Uses

The finished instrument is far more versatile than its name suggests and has been in regular use in a technical college laboratory for counting slowly oscillating phenomena (pendulums, pistons, springs) by synchronising the speed of the clicks with that of the movements, and scaling off the period of oscillation on the metronome. The exceptionally sharp and clearly defined clicks produced when working voltages are not too low, lead to the most accurate readings, and also enable the metronome to be used in the photographer's dark-room for counting off seconds.

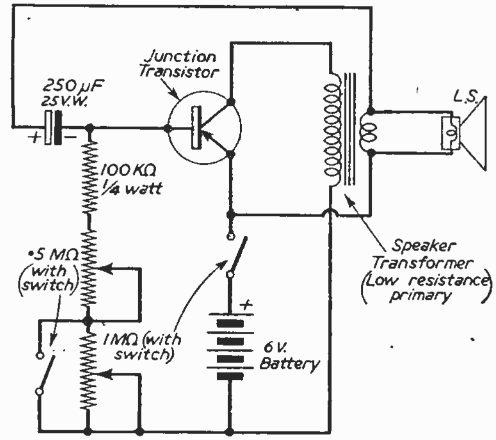


Fig. 1.—Theoretical circuit of the Metronome.

News from the Clubs

THE WARRINGTON AND DISTRICT AMATEUR RADIO SOCIETY

Press Sec. : R. Dyke, 22, Stetchworth Road, Walton, Warrington, Lancs.

THE Society meets at 7.30 p.m. at the Royal Oak Hotel, Bridge Street, Warrington, on the first and third Thursday of each month. In addition to the usual lectures, etc., it is proposed to hold a series of talks on radio theory up to the standard of the R.A.A. Visitors and prospective new members will always be welcome at any of the meetings.

TORBAY AMATEUR RADIO SOCIETY

Hon. Sec. : L. H. Webber, G3GDW, 43, Lime Tree Walk, Newton Abbot.

AT the September meeting, which was held under the chairmanship of G2GK, heartiest congratulations were extended to blind member George Western, who has succeeded in obtaining his full licence G3LFL. Two other members are waiting for their licences.

A new member to the district was also welcomed in Cliff Stagg, G3KPW, whose address is 3, West Street, Ashburton, Devon.

A junk sale will be held at the November meeting and members are asked to bring their unwanted spare apparatus for disposal.

CLIFTON AMATEUR RADIO SOCIETY

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

AT the Annual General Meeting held on September 14th, the following officers were re-elected: J. Lambert, G3FNZ, chairman ; N. Moore, hon treasurer ; C. Bullivant, G3DIC, hon. secretary ; C. Hatfull, G3HZI, and W. Martin, G3FVG, committeemen. One of the major decisions taken during the meeting was the setting up of an emergency fund into which a certain amount of money will be placed each year. The object of the fund is to ensure that the Society will have a reserve to fall back on during possible lean years. Ultimately it is hoped to have sufficient funds to obtain a permanent club room.

Forty-three members and friends were present at the Junk Sale held on September 28th.

November Diary : 9th and 23rd—Constructional evening and ragchew ; 16th—"Progress of the Avometer," by Mr. J. A. Thomas ; 30th—Junk Sale.

Meetings are held every Friday at 7.30 p.m. at the club rooms, 225, New Cross Road, S.E.14. Details of membership can be obtained from the Hon. Secretary.

PLYMOUTH RADIO CLUB

Hon. Sec. : Cyril Teale, G3JYB, 3, Berrow Park Road, Peverell, Plymouth.

THE Club now have an 1154TX and WS36 for "20," "15" and "10" and BC348 receiver.

Visits to the local power station and local BBC stations are arranged. Lectures are also arranged.

Next meetings are November 13th and 27th, December 11th, 8th January, 7.30 p.m., at Virginia House Settlement, Barbican.

THE BRADFORD AMATEUR RADIO SOCIETY

Sec. : F. J. Davies, 39, Pullan Avenue, Eccleshill, Bradford, 2.

THE syllabus for the coming winter is now out and the club will be pleased to let anyone interested have a copy.

The club meets on alternate Tuesdays at 7.30 p.m. at Cambridge House, 66, Little Horton Lane, Bradford, and holds morse instruction there from 7.0 to 7.30 before the meetings.

CRAY VALLEY RADIO CLUB

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

AT the November meeting of the club to be held at Station Hotel, Sidcup, Kent, Tuesday 27th, 8.0 p.m., Mr. L. Clinch will talk on "Natural Sound in the Home." He will show by means of demonstrations of home-built equipment how amateurs can make the most of the high quality transmissions and recordings that are available to the public today.

Visitors, particularly those interested in recent audio developments, are cordially invited to the meeting.

SPEN VALLEY AND DISTRICT RADIO AND TELEVISION SOCIETY

Hon. Sec. : J. Stubbs, 5, Manor Street, Hartshead Moor, Cleckheaton, Yorks.

THE 1956-57 season of the above society opened on September 19th with a social evening. Other meetings in future include : November 14th—Visit to MRG Bradford. 7.0 at works. Limited number.

Officials for 1956-57 : President, G3GJV, H. Brooke ; Vice-president, G8OK, P. Dennison ; Treasurer : Mr. L. A. Metcalfe ; Joint Secs. : G3KNA, J. Stubbs, and G3IJC, J. Charlesworth ; Committee : G3KRL, J. Schofield, G3JQC, G. Hawkesworth, G2CGR, G. Crossley.

Anyone wishing further information regarding the above society please write to the Hon. Sec. Meetings are held Wednesday fortnightly.

THE SLADE RADIO SOCIETY

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

FOURTH quarter's programme :—November 9th, "Microwave Techniques," by Mr. T. J. Hayward, G3HHD (member), of the R.A.F. School of Radio. Generation, transmission, reception and uses of microwaves. November 23rd, Annual General Meeting. December 7th, "The Labgear LG300 Transmitter," by Mr. S. R. Kharbanda, of Labgear (Cambridge) Ltd. December 21st, "Fun and Games," presented by Messrs. L. H. Blackwell and G. L. Turner (members).

The club station (G3JBN) at the Church House is available every day of the week for the use of members. Instructional and constructional classes are held on every Tuesday and Wednesday evening. The "Slade Net" will be on the air on the following Friday evenings : November 30th and December 28th.

On Your Wavelength

BY THERMION

BBC Pronunciation

I HAVE recently taken the BBC to task for permitting their announcers to adopt their own methods of pronunciation, in opposition to common usage. One announcer is now referring to "cunference" and "cunfident." There is not one English dictionary in the whole world which gives such a pronunciation. You will remember that I tackled them some years ago over "Raif" for "Ralph." I know many men with such a Christian name and not one of them is known as "Raif." Then there was that frightful word "cumbat," again a pronunciation not to be found in an English dictionary. To-day these BBC announcers with their supercilious, snobbish Kensington shop-girl type of pronunciation have produced "humage" (homage). In my view the BBC has no authority to mess about with etymology and pronunciation in this way. What is wrong with pronouncing the word as the dictionary says? Learned savants have given their lives to standardising pronunciation, and the BBC now wishes to set it all at nought by introducing BBC English. Imagine the confusion this is causing among those who teach English in our universities, colleges and schools, and consider how it is confounding foreigners over here learning English. They are taught how to pronounce one way at school and hear it pronounced over the air in another. Some years ago the BBC set up a committee to decide upon pronunciation where there were alternative pronunciations. It is true that, instead of having a committee composed entirely of English men of letters, we had to have a Scotsman and a Welshman to teach us how to pronounce English! I should have thought that the BBC would have been more concerned that their artistes pronounce words properly, especially singers. Take this gem from Doris Day's programme: "When the rad, rad rarbin carms barbarbarbin' alarng." Every night one hears "yeeou (you), trew (true), larv (love)." Nearly all of the vocalists who sing "parpular sarngs" endeavour to ape the pronunciation of the negro. For example, "Ahm (I am) gawn (going) barse (boss)." No doubt you can think of many hundreds yourself. The BBC does nothing about that. I agree that in general BBC London announcers speak better English than is heard from the Scottish, Welsh or Irish stations, whose announcers are still full of dialect and have never studied an English dictionary, but the BBC must really not invent a pronunciation of their own.

Hot Gospelling on the Air

I AM glad that the BBC does not permit commercialised hot gospelling on the air as does Radio Luxembourg. This station regularly spawns into the ether a lot of jargon with quotations from the Bible in the high-speed hot gospelling perfervid style of W. Graham. I was listening in the other evening to one of these hot gospellers quoting disconnected passages from the Bible and accusing the whole human race of being sinners and in an accusatory tone, interspersed with hymns not to be found in the British hymnal, and then—could it be?—it was, the maestro himself, W. Graham, who spouted for a considerable time in the same accusatory tone about clouds, punctuated with a lot of well-known quotations about clouds. There was one quotation about clouds, however, which he omitted, and it seems apropos. I refer to that rhyme from Tennyson's "Revenge," which goes "He vanished like a cloud upon the silent summer heaven." It was apropos because he was promptly faded from my set. The fact is that this hot gospelling has become a highly profitable business and W. Graham has begot a large number of disciples all endeavouring to copy the style of the master. They shout, rave, rant and quote and at the end of it have said nothing. I wonder that Radio Luxembourg permits such trash to spoliate the ether.

Servicing Printed Circuit Receivers

THE replacing of a defective component in a printed circuit receiver is not so simple as one might suppose. The soldering of components into a printed circuit is a special technique and it is recommended by two companies that the defective component should not be unsoldered but cut out. One manufacturer recommends the following equipment for servicing printed circuits. A small, pointed soldering iron of 35 watts, soft wire brush, 60/40 resin core solder, diagonal wire cutters, long-nosed pliers, thin-bladed knife, polystyrene dope, and acetone as a solvent for it. The defective component should be cut out so as to leave as much of its lead wires as possible. Next clean the wires of the new component and form the ends into small loops, slip these over the old wire ends and apply a soldering iron. If the old wires are too short the defective component should be cut in half in order to retain the extra length of wire inside it.

If in some cases this practice cannot be adopted, carefully heat the joint, using as little heat as possible, brush the solder away and then release the component. After the new component has been soldered in, the area should be brushed over with the dope to protect against short circuits. Make quite sure that solder does not bridge gaps between conductors. If a break occurs in the printed circuit foil this can, of course, be bridged with solder.

Valve Prices

I AM glad to see that the valve manufacturers who have exercised their monopoly, in my view, far too long, have at last agreed in view of the Monopolies Commission, to reduce their prices. All valves and TV tubes are priced extortionately as far as the public is concerned. Manufacturers, of course, obtain them at specially low prices, which is but a tithe of what the retailer charges you when you want a replacement valve. Whilst I do not altogether agree that monopolies are bad things, in this case, they have not worked in the public interest.

Making A Radiogram Cabinet

A CONTEMPORARY DESIGN FOR THE HANDYMAN

By R. J. Applin

(*Concluded from page 595 November issue*)

WHEN the main panels have been cut a chamfer may be worked on the front edge as for the bottom member, working from top to bottom.

Next a full length mitre must be accurately cut along the top edge, and a similar stopped mitre 6in. wide at the front of the bottom edge.

This being done and the panels being an accurate fit when placed in position, they may be fixed with glue—applied to the framing and held in position for drying by clamps similar to those shown in the drawing.

The panels must be fixed to allow $\frac{1}{4}$in. projection beyond the back of the framing to cover the edges of the plywood back panel.

The last of the panelling, the top, may now be applied.

As will be seen on examination of the drawing, the lid is not in the centre of the cabinet, there being a 3in. wide panel one side and a 9in. wide panel the other.

This means that the record player, when in position, is partially hidden but is definitely not inaccessible.

The two small side panels and the lid in one piece are cut to an overall length of 36in. and a width of $16\frac{1}{4}$in.

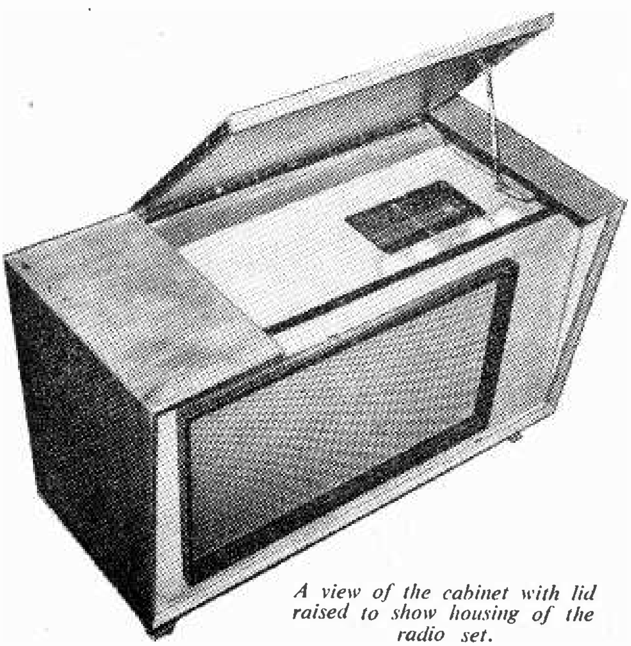
A full length 45 deg. chamfer is next worked on to the front edge in the same way as the other panels and it is then cut into the required three lengths.

A mitred edge is cut on each of the small end panels to fit accurately with that cut on the sides. These two members may then be glued and cramped into position, re-using the cramps employed for the side panels, and left to dry.

The accuracy required when cutting the two mitred edges running along the top of the cabinet cannot be over-emphasised as a shoddy joint here cannot possibly be disguised.

The lid may next be prepared and fixed into position.

A rebate $\frac{3}{8}$in. wide by 3/16in. deep is cut into either edge of the lid on the underside to accommodate a strip of brass which is fixed in position with counter-sunk brass screws at 3in. centres.



A view of the cabinet with lid raised to show housing of the radio set.

This metal strip is necessary to stop the lid from warping.

With the brass strips fixed into position the lid may be fastened with a 24in. brass piano hinge.

The hardwood edging may now be applied around the metal fret of the front panel. On the original this was made from $1\frac{1}{2}$in. by $\frac{3}{8}$in. splayed black walnut, mitred at angles and glued into position to the edge of the plywood; held by wedges whilst drying.

This provides a very simple and effective way of finishing off the fret panel—the dark wood contrasting with the light chestnut cabinet.

The two panels remaining to be constructed are the fascia to the radio and the motor board.

They are both cut from $\frac{3}{8}$in. thick birch-faced plywood and made to fit exactly between the framing.

A panel of the required size must be cut from the fascia to provide a "window" for the tuning dial.

The rounded corners to this panel are achieved by first drilling a $\frac{3}{4}$in. diameter hole in each corner of the piece to be removed and then cutting the remainder with a fine saw.

The edges to this opening are at this stage filled with sealer and given three coats of black cellulose lacquer—an application which provides a professional touch to the finished article.

When this has been done a panel of ⅛in. thick clear Perspex may be cut, allowing a lap of ¼in. all round, and glued to the back of the opening using Perspex cement as an adhesive.

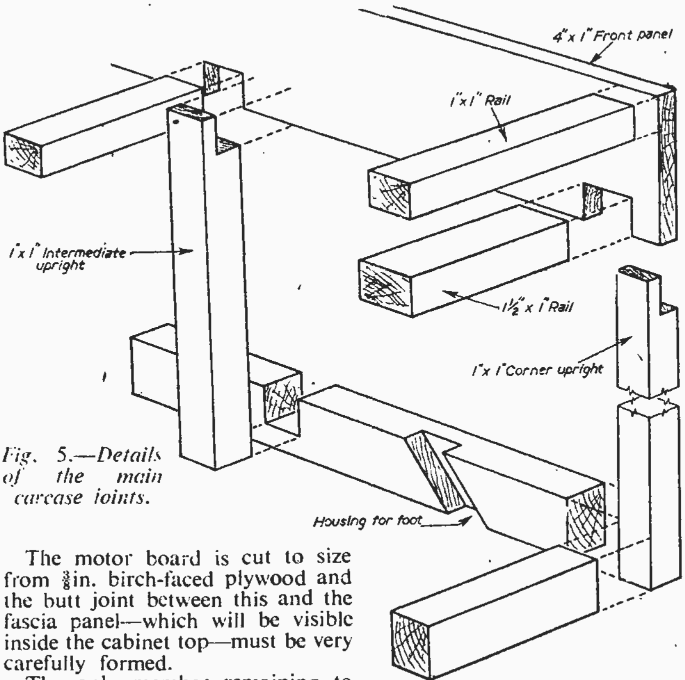


Fig. 5.—Details of the main carcase joints.

The motor board is cut to size from ⅜in. birch-faced plywood and the butt joint between this and the fascia panel—which will be visible inside the cabinet top—must be very carefully formed.

The only member remaining to be made is the plywood back panel This is cut from ⅛in. thick plywood to fit between the rebates formed by the projecting bottom, side and top panels. Several slots or louvres are cut in this panel near the top to provide an exit for the cooling air to the radio and further holes are provided to allow the earth, aerial and power leads to enter the cabinet.

This panel may then be secured in position to the framing using small brass cups and screws.

Having completed the structure of the cabinet it is now necessary to prepare the cabinet to receive a polish.

The first operation is to work over the entire cabinet with coarse and then fine sandpaper in order to remove any scratches present and to provide a perfectly smooth surface.

When this has been done an application of grain-filler must be given to all surfaces to be polished, and then left to dry thoroughly; after which it must again be rubbed down with fine sandpaper to provide a surface to receive the polish.

Before the polishing is commenced a black cellulose finish is given to the two edges of the top panelling which are exposed when the lid is raised, together with the front edge.

These three edges must be given a preliminary application of several coats of grainfiller to provide a perfect base for the cellulose—this applying particularly to the front edge where it is necessary to disguise the joint between the chestnut inner panel and the ⅜in. thick plywood outer fret.

When the cellulose is perfectly dry a polish may be applied to the rest of the cabinet.

A well-known brand of commercial french polish should be chosen and in the case of the original a clear polish was used to preserve the colour of the woods.

Several coats of polish should be applied with a brush, rubbing down the surface between each coat with fine sandpaper and gradually building up a good enough surface to receive the final coat.

A linen pad filled with cotton wool may now be used to work up a fine finish on the cabinet, the method of working with the polisher being best left to the discretion of the individual.

It will be found easier to polish the motor board and fascia panel before fixing, and these may then be secured from the underside by the use of small brass angle brackets fixed to the framing as shown.

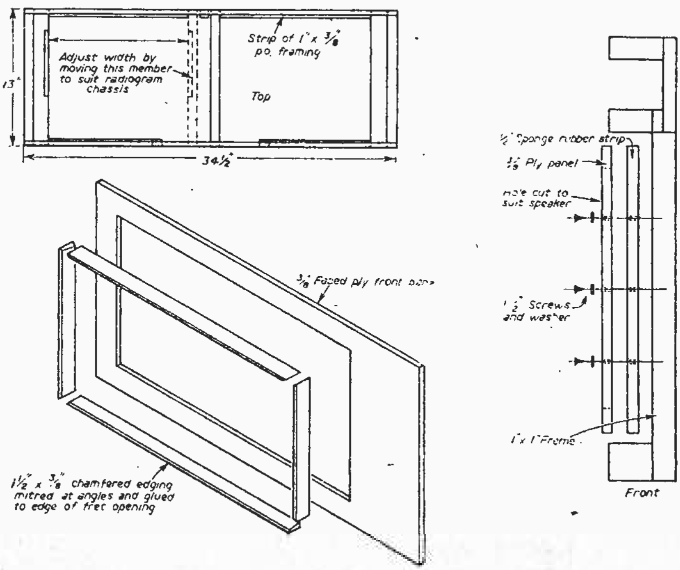


Fig. 6.—Baffle, front and further constructional details.

When the polishing has been completed a stay may be fixed to the lid in the open position.

The bottom of the stay-member is fixed to a small block of wood which may be glued and screwed to the underside of the top panel in an appropriate position.

The cabinet itself is now complete and all that remains to be done is the installation of the radio chassis, speaker and 'gram turntable.

The unit used in the original is a commercially produced radiogram chassis coupled with a 10in. speaker.

The speaker was mounted on a ⅜in. thick panel of plywood which was fixed to the inside framing with cups and screws and two strips of sponge rubber as shown in the detail.

The front ends of the chassis were bent to provide two fixing lugs as shown, and the chassis was dropped into position between two rebated cross-members and screwed into position. Two small felt pads being provided to give a cushioning effect.

However, the methods adopted for fixing the radio components will necessarily differ, and it is hoped that the above methods as used on the original may be of some assistance.

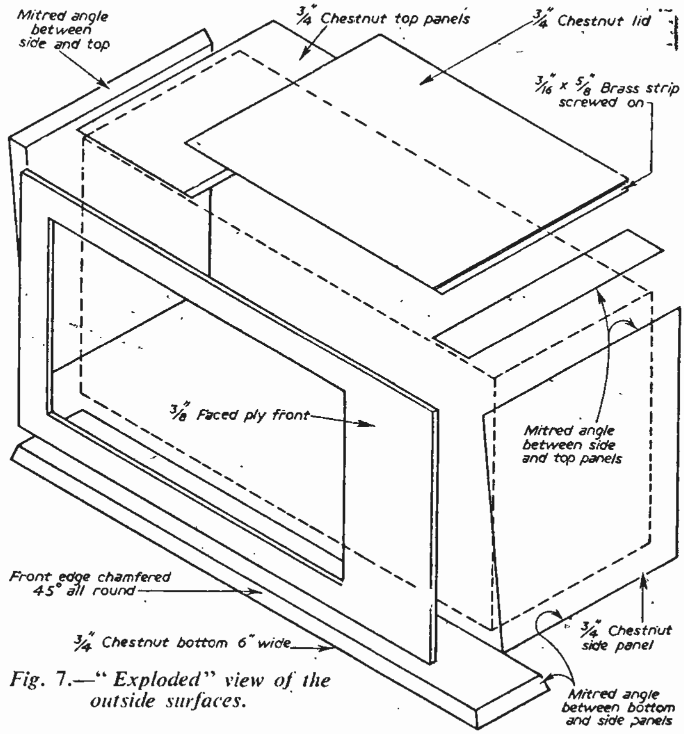


Fig. 7.—" Exploded" view of the outside surfaces.

If these constructional notes are followed through systematically in the order suggested, no difficulty will be experienced in producing a finished cabinet which will hold its own with anything a modern furniture manufacturer will produce, and which will provide many years of trouble-free service.

B.R.V.M.A. Statement

CHANGES in the constitution and trading practices of the British Radio Valve Manufacturers' Association, having effect from September 1st, 1956, are announced in the following statement issued to the Press on October 4th.

" It will be known that the Association abandoned its 'stop list' and allied provisions some years ago and it has now discontinued all arrangements for collective resale price maintenance on the part of the manufacturers. This has been made necessary by the Restrictive Trade Practices Act which, in effect, prohibits this practice. It will in future be for each individual manufacturer to maintain the prices of his own valves and tubes if he so desires.

" Hitherto 'B.V.A. Prices' have been fixed by agreement of all manufacturers who are members of the Association. This policy has also been abandoned. From knowledge of the structure of the industry, however, and in view of the present period of recession with continually rising costs, it will be appreciated that although prices are no longer to be fixed by agreement it does not follow that the prices of comparable valves and tubes will necessarily vary between one manufacturer and another in the immediate future.

" In coming to the decision to abandon collective fixing of prices, the Association has had in mind that if this practice were to be continued it would in all probability have to be justified in the very near future before the Restrictive Trade Practices Court in the light of the narrow economic criteria set out in the Act. The practice of fixing prices by agreement is not in the present state of the industry of the same degree of importance as it has been in the past or as it may well be in the future.

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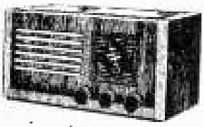

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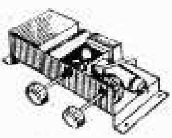

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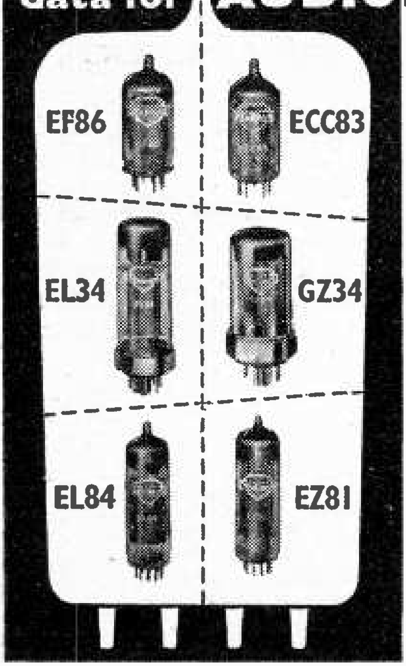

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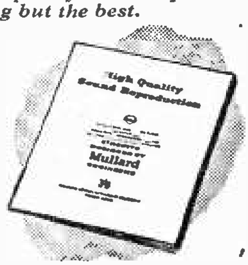

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Hard Valve Model Control Receivers

CIRCUITS FOR THE EXPERIMENTER USING MODERN MINIATURE VALVES

By F. G. Rayer

THE simpler type of model control receiver uses a "soft," or gas-filled, valve. This has the great advantage of small size, good range, and ease of adjustment. Unfortunately, however, this type of valve is expensive, and has a relatively short life. Circuits for hard, or vacuum, valves are therefore worth using when circumstances permit—that is, when a little extra weight can be carried, when great range is not important, and when the more careful adjustment necessary can be undertaken. In such circuits valves of small type, including the 1S5, 1T4 and 1S4, and hearing-aid miniatures, can be employed, their life being the same as in ordinary broadcast receivers. The resultant equipment is particularly suitable for boats used on small sailing ponds, where the extra size is unimportant, and working is at relatively short distances.

A normal type of super-regenerative circuit is shown in Fig. 1, resembling that used with a gas-filled valve. Such a circuit will operate successfully with a 1T4, 1S4, or similar type, but is very critical to adjust. At no time can a range anything like so great as with a gas-filled valve be achieved, though short-range working can be obtained.

Quenching and regeneration have to be adjusted

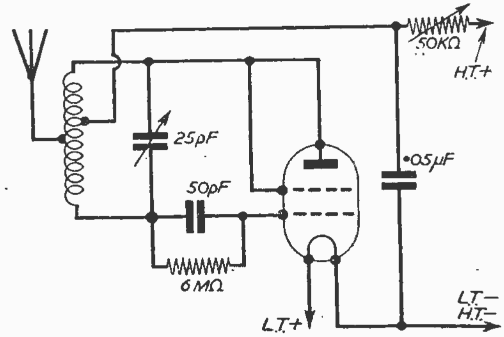


Fig. 1.—Super-regenerative one-valver.

carefully, with a meter in series with the relay (which is wired to the H.T. positive lead in the usual way). A wide range of H.T. voltages can be used, and the battery voltage will govern the setting of the 50K potentiometer. The H.T. tap on the coil will usually require to be about three and a half turns from the anode end, if the coil consists of 13 turns of 20 S.W.G. wire, self-supporting, 1in. in diameter. The position of this tap, and the aerial tapping, greatly influence oscillation. Aerial damping should be such that the valve only goes into oscillation with the 50K potentiometer near zero value.

The current dip will be less than with a gas-filled valve, so that a careful setting of the relay is also required. It is helpful to use a transmitter running at the maximum permitted output, to facilitate adjustments and improve range.

Diode Detector

A short-range circuit extremely easy to set up is shown in Fig. 2. When a signal is present, the rectified output of the diode develops a voltage across the 10 megohm leak, thereby changing the valve anode current, which operates the relay. A valve such as the 1S5 will have a change in anode current of about .3 mA, for a change in grid voltage of .5 volt, with suitable standing bias, and this is ample to operate a relay.

To tune this circuit, a microammeter is wired in parallel with the 10 megohm leak, and the 25 pF condenser adjusted for maximum reading. The grid bias voltage is then arranged so that a satisfactory change in anode current arises when the transmitter is keyed. The anode current can be arranged to increase or decrease, when a signal is received, according to the way the diode is connected. The relay is then adjusted in the accustomed manner for

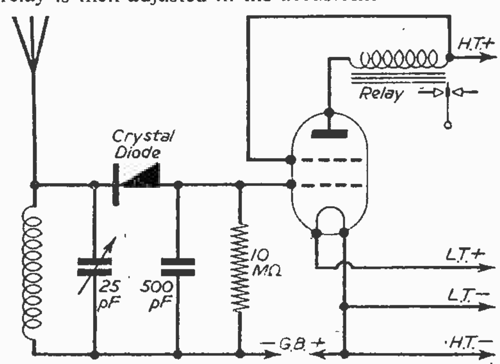


Fig. 2.—A diode-valve circuit.

maximum sensitivity over the current values present.

The range of this circuit naturally depends upon the transmitter and aerials, but with a sensitive relay a useful range can be achieved for boats on a pond of the kind usually found for model sailing.

Modulation Control

The circuits described only require the usual unmodulated signal. If modulation can be provided, additional methods of working become feasible. Those using various modulation tones, with tuned-reed relays, will be familiar to model-control builders, but it is also possible to use one tone, of any frequency, so that the receiver will take the place of the gas-filled triode type.

Such a circuit is shown in Fig. 3, and its range can be increased up to the maximum likely to be wanted by adding more A.F. amplifiers between detector and relay valve. The detector functions in the usual manner, but must be adjusted for low hiss, or the hiss itself may cause operation of the relay valve. The latter is supplied with bias to the point when virtually no anode current flows. Upon the audio tone being received, the valve conducts when each positive audio cycle reaches the grid, causing anode current to flow, which operates the relay.

The circuit may be adjusted by applying normal bias and wiring phones from anode to H.T. positive. The receiver is then carried to a distance (preferably at least 50 yards from the transmitter) and adjusted for maximum volume in the phones. These adjustments will consist of tuning, modification of aerial and H.T. feed coil tappings, and adjustment of the 50 K oscillation control. When maximum volume is obtained just sufficient bias is applied to prevent the second valve conducting, with transmitter off.

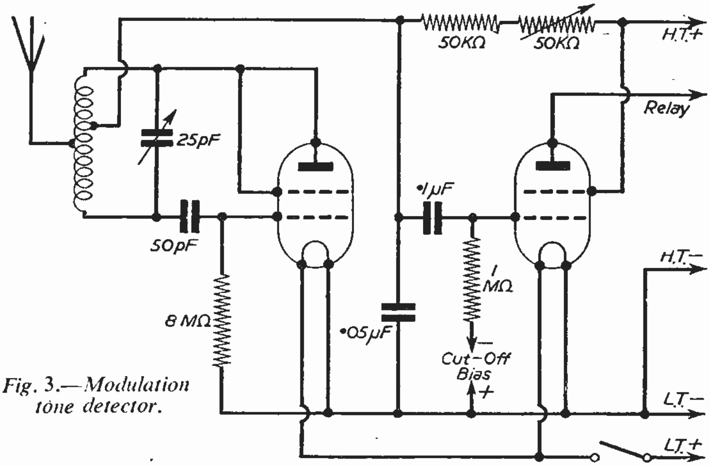


Fig. 3.—Modulation tone detector.

It will usually be necessary to employ a minimum of two valves to modulate the transmitter. The tone is immaterial, but it will be found that maximum efficiency is obtained with a fairly high, clear tone. Low tones present fewer conductive positive cycles to the relay valve grid, while very high tones usually result in a reduction of transmitter output, since the audio modulation will generally fall in power at such frequencies. If the relay armature is light and tends to produce an audible note, then the winding should be shunted by a condenser of about 1μF.

With either two- or three-valve circuits it is in order to use transformer coupling between stages, to increase gain. If the detector is quenching at very high frequency, one transformer may be shunted with a fixed condenser to prevent this frequency reaching the relay valve, causing it to conduct.

The D.C. Amplifier

A very good range may be obtained with vacuum valves by employing one of the various forms of directly-coupled amplifier, and these circuits may be operated from an unmodulated transmitter. With the hard valve it is difficult to obtain a good change of anode current at other than short range, and it is for this reason that such valves are of limited use in one-valve circuits. *Some* change in anode current does arise, however, even at a range of several hundred yards, when the circuit is correctly adjusted. By means of a D.C. amplifier this change may be increased, so that a relay can be operated.

A typical circuit of this kind is shown in Fig. 4, the whole detector stage being the same as in Fig. 1. With the transmitter off, a certain voltage drop arises in the 50 K fixed resistor. By adjusting the 50 K potentiometer, this will result in such bias being applied to the second valve that a small anode current flows. When a signal is received the current flowing through the 50 K resistor drops, making the second valve grid grow more positive, so that anode current increases in this stage, operating the relay. (It will be noted that the latter now operates in the reverse manner, since current increases on the signal being transmitted, instead of falling, as with one-valve circuits.) As a small change in anode current in V1 will produce a relatively large change in anode current in V2, a good degree of sensitivity is achieved.

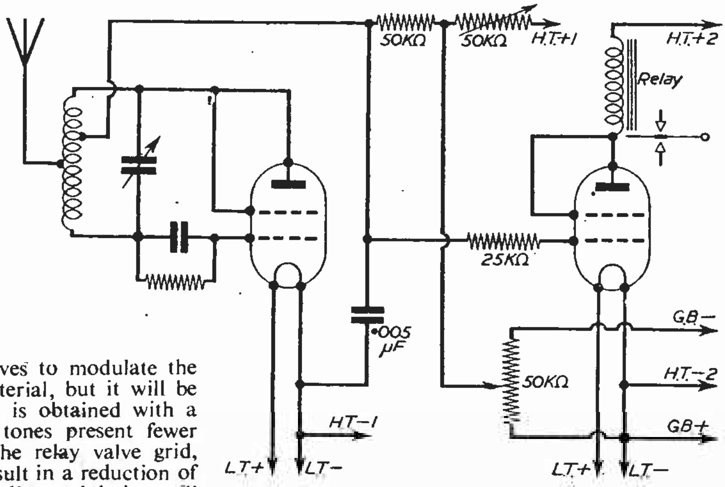
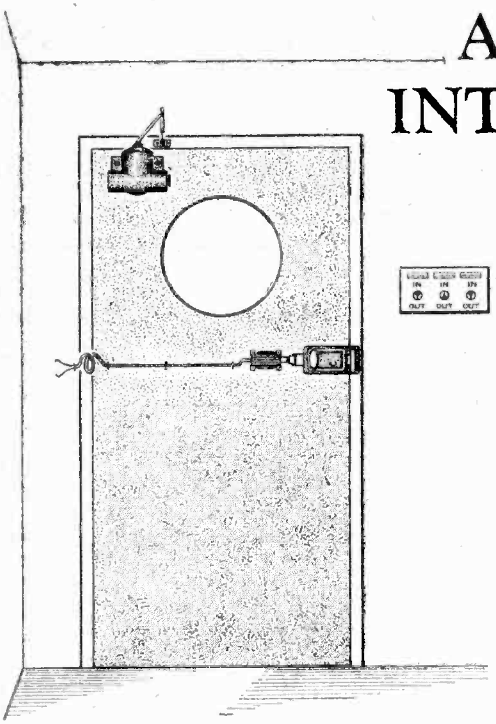


Fig. 4.—Direct-coupled amplifier.

The main disadvantage of the circuit is the need for separate batteries so that the filament circuits can be isolated. This cannot be overcome with directly heated valves. If a 6 volt accumulator were used in the model, it would be feasible to use 6.3 volt .15 amp. indirectly heated valves with this, to avoid two L.T. batteries.

A FRONT DOOR INTER-COM SYSTEM



AN INTERESTING COMBINED MIKE, LOUDSPEAKER AND DOOR RELEASE MECHANISM FOR A BLOCK OF FLATS

By K. V. R. Bowerman

THE installation to be described is suggested for use in small blocks of flats (or houses converted into two or three flats) of the type that share a single street door and have no porter in attendance.

The installation comprises four sections :

(1) *A front door unit.* This has a bell-push corresponding to each flat ; a signal lamp for each bell-push ; a 3in. loudspeaker and an electrically-operated bolt (see later).

(2) *A relay unit*, containing two main relays (common to all flats) and one further relay individual to each flat (total of 5 P.O.-type 200-500 ohm relays for a 3-flat installation).

(3) *A simple two-stage amplifier*, using one 6J7 valve, one 6V6 valve and a metal rectifier.

(4) *The flat units.* These each have a 3in. speaker, two push-buttons, one toggle switch and a bell or buzzer.

The System

A caller presses the bell-push corresponding to the flat which he wishes to enter. The bell or buzzer starts sounding in this flat and continues to sound until the answerer operates a switch on the local unit. The answerer then presses his "press-to-speak" button and asks the caller his business ; he releases the "press-to-speak" button and the caller is able to reply via the front door speaker. If the answerer is satisfied as to the identity of the caller and wishes him to enter, he again presses the "press-to-speak" button, tells his caller to push open the door, and then presses the door-lock release. This operates a solenoid which withdraws a spring bolt and allows the front door to be pushed open. The act of pushing the door open restores all circuits to normal and a door-closing spring shuts the door. The spring bolt automatically locks as the door closes. If a flat is to be left unoccupied, the tenant, on his way out, operates a switch (marked "IN" or "OUT") near the front door. If, when the switch is in the "OUT" position, a caller pushes the bell-push corresponding to the empty flat, the buzzer does not operate. Instead, a panel reading "OUT" is illuminated next to the name of the tenant.

When one flat is in communication with a caller at the front door, the speakers in the other flats are muted, thus ensuring privacy. With this installation, the necessity for descending and ascending flights of stairs every time there is a caller is eliminated. How does the tenant get back ? He uses his ordinary cylinder lock key.

The Circuit

The circuit is best understood by following, on the circuit diagram (Fig. 1), the complete cycle of events described above.

(1) Caller pressed bell-push for Flat 1 (PB7). RY1 is energised by the 6-volt rectifier MR2 via door switch and lamp LP1. LP1 is a 6-volt 0.3-amp. cycle lamp bulb. RY1 passes only a few milliamps and therefore the bulb does not light. RY1 closes contacts RY1A, RY1B and RY1C. The first two pairs of contacts bring the remote speaker SK1 into circuit ; RY1C shorts out PB7 and LP1, thus locking relay RY1 in the energised state. Buzzer (or bell) B1 is effectively in parallel with the relay coil and will therefore start sounding and will continue to do so as long as the relay is energised and switch SW1 is closed.

(2) Answerer operates SW1, silencing the buzzer by

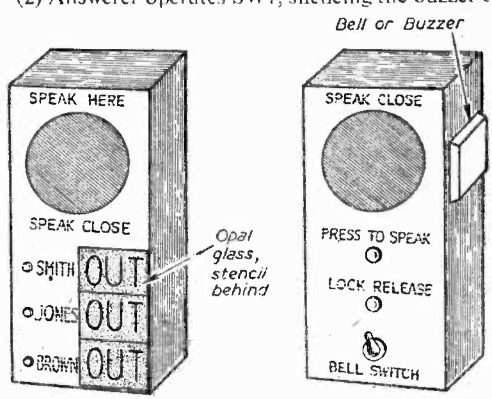


Fig. 2.—Details of the front door (left) and the room units (right).

breaking its connection to line 4. He then presses push-button PB1 (a "press-to-speak" button) and this operates relay RY4 by joining line 2 (L.T. negative) to line 3, which is connected to one end of the coil of RY4. The other end of this coil is joined to

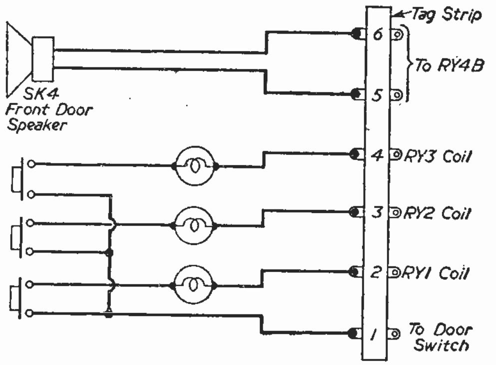


Fig. 4 (b)—Door unit wiring.

L.T. positive. When RY4 operates, the two change-over contacts RY4A and RY4B join speaker SK1 to the input transformer (T1) of the amplifier, and speaker SK4 (at the front door) to the output transformer (T2). The answerer's speech is thus amplified and can be heard by the caller.

(3) Answerer releases PB1. This causes RY4 to release and allow contacts RY4A and RY4B to change back to the "rest" position. Speaker SK4 then becomes the "microphone" feeding T1, and SK1 is fed by the output transformer T2. The caller can thus talk back to the answerer, who, when satisfied, pushes PB2. This joins line 2 (L.T. negative) to line 5 (one side of RY5 coil). The other side of the coil is connected to L.T. positive. Contacts RY5A and RY5B close. Contacts RY5A put a short across lines 2 and 5 and the relay thus "locks on." Contacts RY5B (heavy duty) feed A.C. at mains voltage to the electric bolt solenoid (see later). The bolt is thus held "open" as long as RY5 is energised.

(4) Caller pushes door open and breaks the door switch. This disconnects L.T. positive, RY1 falls off and with it all other relay circuits including the electric bolt. The whole installation is thus restored to normal. The door-closing spring closes the door and the de-energised spring bolt latches automatically.

(5) Should the tenant be out, he will have switched SW4 to the "OUT" position. This shorts out RY1, and when PB1 is pushed by the caller a direct connection exists between lamp LP1 and the L.T. supply. This lamp is arranged to light up behind a small opal glass panel beside the bell-push reading "OUT" (see Figs. 2 and 3).

(6) A tenant returning to the building inserts his key into the existing cylinder lock, which although modified (see later) to operate electrically, still functions normally when operated by hand.

The equipment and wiring for each flat is similar and may be repeated for any number of flats.

Construction

We will take separately each section as outlined at the beginning of this article.

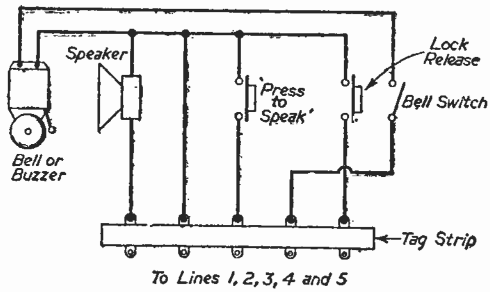
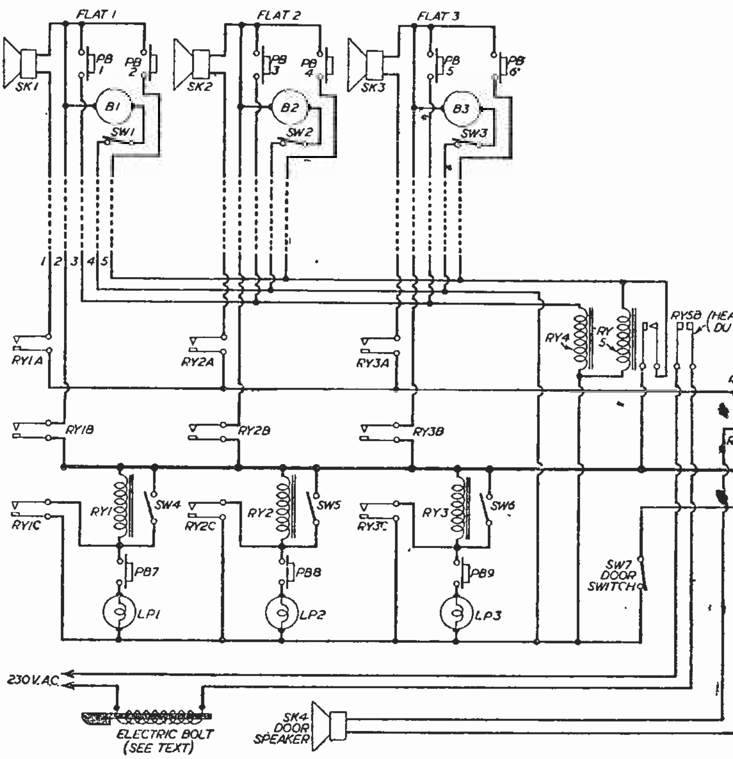


Fig. 4 (a)—Flat unit wiring.



The Front Door Unit

Parts required :

Length of ½in. thick wood to make a suitable case.
Piece of 3-ply with speaker aperture and indicator panels cut out.
A piece of expanded aluminium for speaker grille.
Three bell-pushes suitable for mounting flush within approximately 1in. square space.
Electric bolt (see text).
Three M.E.S. lampholders.
Three 6-volt 0.3-amp cycle lamp bulbs.
One 3in. Midget P.M. loudspeaker (3-ohm speech coil).
One tag strip (6-way).
One piece opal glass.

Mount the electrical components within the box as shown in Fig. 3 and wire up as in Fig. 4 (b). Fix a piece of flashed opal glass behind the aperture next to tenants' names. Gum to the rear of the glass a cardboard stencil reading "OUT" for each aperture. This will not be readable unless illuminated from behind. The speaker is positioned pointing downwards as a protection against the weather. The unit should be mounted in a reasonably sheltered position and the outside painted with weatherproof paint. To secure the unit, use two angle brackets or screws through the back of the case. If necessary a "roof" made from zinc sheeting could be tacked over the top half of the box as a further safeguard.

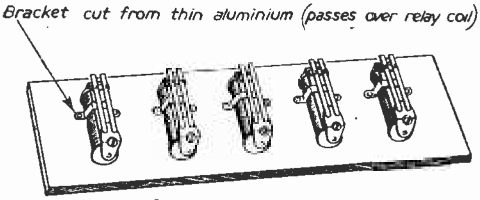


Fig. 7.—Method of fixing relays.

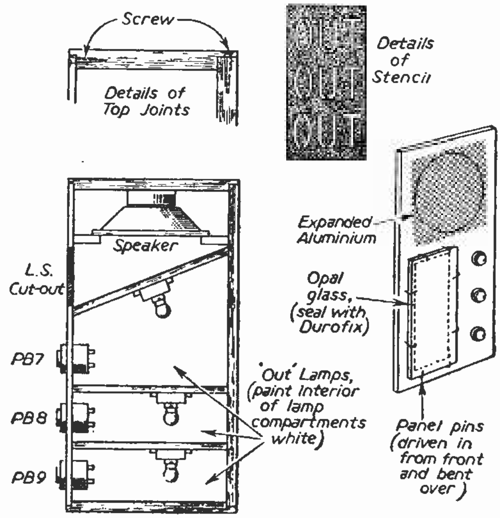


Fig. 3.—Constructional details of the front door unit.

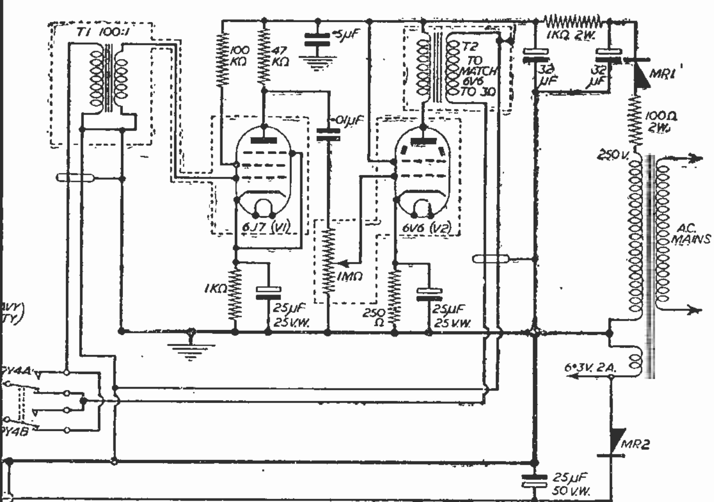


Fig. 1.—Complete circuit of the novel inter-com. Illustrations of the door and room units will be found on page 683, whilst the list of parts for the amplifier appears on page 686.

The electric bolt can be bought ready-made or can be made up by the reader. It is assumed that there is a cylinder lock of standard pattern already installed on the front door. If two holes are drilled in the casing (just behind the knob which is used to open the door from inside), a pair of rods (Meccano, or stiff piano wire) can be passed into the lock. These are threaded 6 B.A. and attached to the sliding spring bolt within ; the other ends are attached to a powerful 230-volt A.C. solenoid (type S.B.-R.A. Webber, Ltd., obtainable from M.R. Supplies, New Oxford Street, London W.C.2). Figures 5 and 6 show exactly how to do this. When the solenoid is energised the bolt is smartly withdrawn from its hasp. When the solenoid is de-energised the spring returns the bolt. To ensure efficient w[illegible] one or two convolutions [illegible] spring could be cut off to weaken it slightly. The spring must be stretched again, after cutting, to its original length. This modification in no way alters the normal function of the cylinder lock.

Other types of lock must be modified according to design, and readers will no doubt be able to adapt the idea to suit the particular lock in use. If a separate ready-made electric bolt is installed, then a car ignition switch of the cylinder lock variety could be used to complete the electric bolt circuit and so enable tenants to enter the building in the normal way. For safety the solenoid should be enclosed in a wooden cover.

The door switch can be very simple. Two strips of springy brass could be attached, one to the door and one to the lintel, so that they are in contact when the door is closed and separate as the door opens. An alternative (and possibly more elegant) method would be to mount a push-button or micro-switch in the door jamb at the hinged side so that it is kept pressed when the door is shut and is released as the door opens.

The Relay Unit

Parts required :

5 type 3,000 P.O. relays (200-500 ohm coils):
- RY1—3 pairs of "make" contacts (normally open).
- RY2—3 pairs of "make" contacts (normally open).
- RY3—3 pairs of "make" contacts (normally open).
- RY4—2 sets of "changeover" contacts.
- RY5—1 pair of "make" contacts (normally open). 1 pair of heavy duty "make" contacts (normally open).

3 toggle switches (SPST).

These relays are best mounted within the amplifier case and they may be grouped together for ease in wiring on a strip of paxolin (see Fig. 7). They are normally used for automatic telephony and special racks are provided in the exchange for mounting them. There is no need to be elaborate in this case, however, and the writer has found the method (indicated in Fig. 7) of fixing by thin metal strips passed over the relay coils to be entirely satisfactory. The bolts and nuts securing the metal brackets should be tightened just sufficiently to hold the relay lightly but firmly. Wiring is shown in Fig. 4 (c).

Note that switches SW4, SW5 and SW6 are on flying leads so that they can be positioned on a separate block near the front door.

The Amplifier

Parts required :

Valves—1 6J7 (V1) ; 1 6V6 (V2).

Transformers—1 mains transformer, 250-0-6.3 (2 amps.) ; 1 metal rectifier, 250 volts ; 1 metal rectifier (selenium), 6-12 volts, 2 amp., for L.T. relay supply.

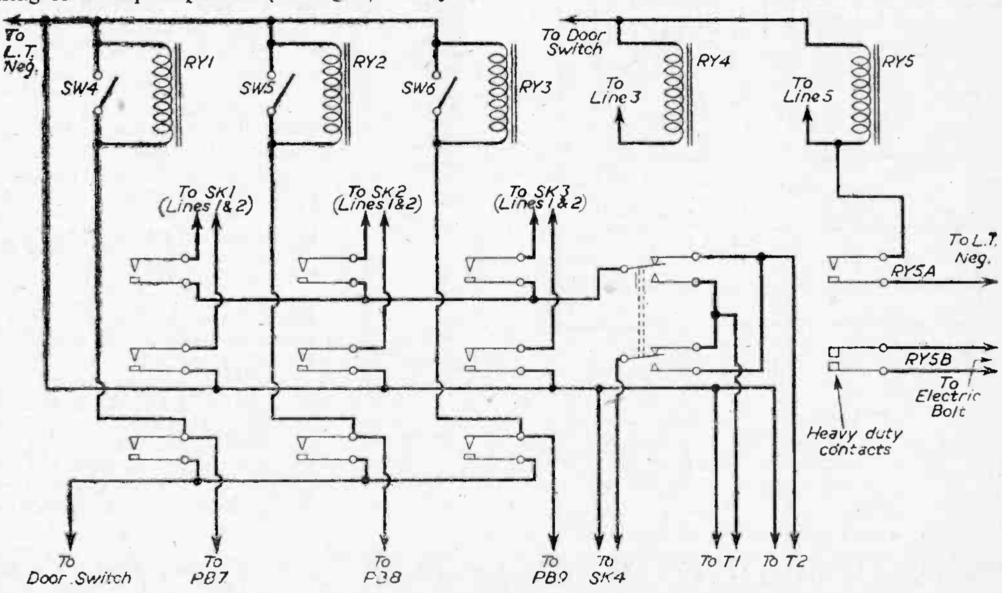
Resistors : ($\frac{1}{2}$ watt) 100 KΩ, 47 KΩ, 1 KΩ, 250Ω ; (2 watt) 1 KΩ, 100Ω, Pre-set 1 meg. pot. (log scale).

Condensers : .01 μF ; .5 μF (500 v.w.) ; 2 25 μF (25 volt w.) electrolytic ; 1 32 + 32 μF (350 volt. w.) electrolytic.

Chassis, screening can, screened leads, solder tags, etc.

The amplifier is so straightforward that Fig. 1 speaks for itself. The only unusual feature is the transformer input. This can be any output transformer with a primary of reasonably high impedance and a secondary of 3 ohms. A ratio of approximately 100 : 1 should be aimed at. But you can, in fact, use a twin of T2, which is suitable for matching a 6V6 to a 3-ohm speaker (40 : 1), but this will give slightly reduced volume. T1, of course, is connected in reverse, the 3-ohm secondary being used as a primary. This has been done so that the long lines to the speakers in the flats can be at low impedance to minimise hum pick-up and capacity effects. A certain

(*Concluded on page* 689)



—Complete relay unit wiring.

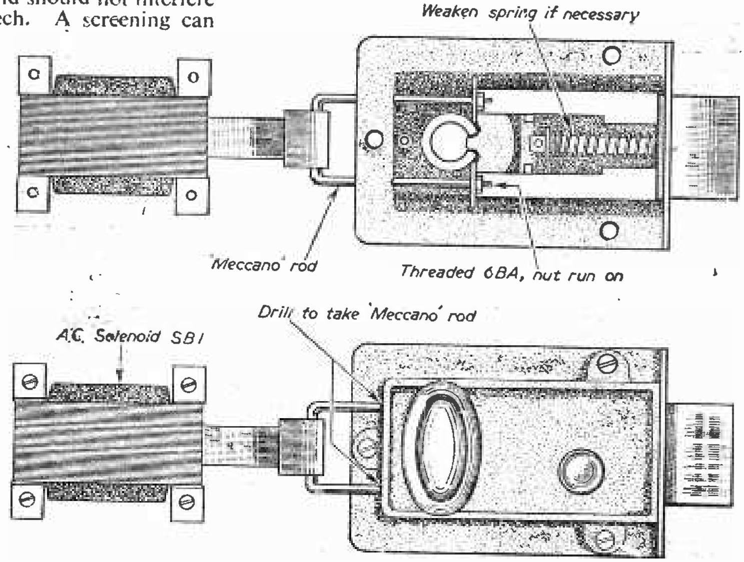
amount of hum pick-up is inevitable with this installation, but if the input and output circuits of the amplifier are fully screened, as indicated, hum will be reduced considerably and should not interfere with the intelligibility of speech. A screening can should be used for the 6J7, and both transformers should be well screened. The grid leads to both valves should also be screened. R1 is a pre-set volume control which should be adjusted to the most convenient level and left there. The casing of this component should also be well earthed.

The Flat Units

Parts required :
3in. speaker (3-ohm).
Bell or buzzer.
2 push buttons.
1 toggle switch (SPST).
5-way tag strip.
Expanded aluminium for speaker fret.

These units can be constructed on similar lines to the front door units (see Fig. 2). A smaller wooden box may be used, and the speaker can be mounted directly behind the plywood front. The buzzer (or bell) unit could be mounted on the side of the box. Wiring is shown in Fig. 4 (a).

The amplifier and relay unit can be housed in a suitably ventilated wooden box, and should be placed on a shelf near the front door, high enough to be out of reach of children. It could equally well go in the "cupboard under the stairs," if there is one. The



Figs. 5 and 6.—Cylinder lock modifications.

important things are, first, to leave a hole for a screwdriver so that any necessary adjustments can be made to VR1 ; secondly, to place SW4, SW5 and SW6 in a prominent position on a switch block near the door, plainly marked "IN" and "OUT".

Programme Pointers

Our Critic, Maurice Reeve, Reviews Some Recent Programmes

A RECENT letter in the Press gives me the opportunity of raising again the subject of signature tunes. The gist of the correspondent's complaint was this: that before the BBC asks radio listeners to tone their sets down when they are near open windows in the fine weather, they should study more carefully the quality of the music being disseminated and which is evidently calculated, if too strident and rasping, to destroy the quiet and sociable amenities of neighbours. In other words, how the rock 'n' roll can I have my Sunday nap when the Joneses' set is blaring away like it always does when I'm at home!

The logic that prompted the letter is transparently clear. The poorer the "music," the more unacceptable it will be: the better, the less. Granted that Mozart himself may at times be an intruder and that radio is, like Government, of the people, by the people, for the people, it cannot be denied by any sane, if unsophisticated, person that some of the so-called signature tunes, together with the "effects" that punctuate many popular programmes, are so truly awful and hideously unrelated to anything in the shows they summon us to, that we wonder a deputy to the Lord Chamberlain wasn't long ago appointed to control them.

With one exception, not one is even skilfully written; nor does it bear the slightest relation to the character of the show it precedes. I recently mentioned the accompanying noises to the new—and good—programme, "Curiouser and Curiouser": it is difficult to imagine whether it could be any worse emanating from the window next door or the next room under one's own roof.

The exception to this padded cell fitted with the ravings of musical madmen is, of course, the theme-song prefacing "The Archers," a graceful piece, arresting to those who may not know it, and wholly in character to the programme to which it has been attached.

Note.—The letter I have referred to naturally comprises more than signature tunes: the writer refers to the whole hotch-potch of miscellaneous fare under the generic title of "entertainment," such as "Round and About" encompasses on Saturday afternoons.

Letters

The series, on Sundays, of letters addressed by practitioners in various callings such as music, authorship, medicine, etc., to young people about to seek their fortunes in those professions, was interesting and instructive to the layman listener like myself. Whether the aspirant to a consulting room in Harley Street, chambers in Lincoln's Inn or the writer of a book selling a hundred thousand copies before publication did, I wouldn't know. I should think he most probably did. But it would be deeply interesting if someone in each subject were engaged to make a reply!

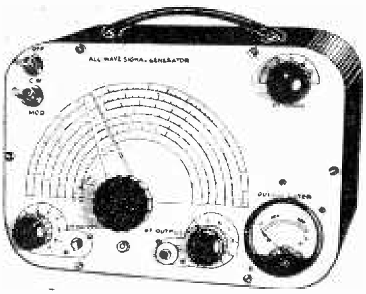
So long as there are an England and a Scotland, so long will the story of the tragic rivalry of Elizabeth the First and Mary Stuart be sought by dramatists, novelists and historians. It has every possible ingredient: so many, in fact, that a writer has to select certain ones to avoid what might turn out to be an incurable attack of indigestion. The German poet-dramatist Schiller, in his "Maria Stuart"—brilliantly done on the Third—lays the emphasis on the political rather than the romantic, and on the treachery of the Earl of Leicester in particular. Margaret Rawlings, perhaps, sounded too beautiful as Elizabeth, and Barbara Jefford not quite enough so. But they made an excellent pair of two totally different and contrasting women. Marius Goring was excellent as the double-dyed scoundrel Leicester. A long cast all added to a first-rate production by Julius Gellner. The translation was by Joseph Mellish. Again there were some truly abominable "musical" interspersions, this time by Roberto Gerhard. Had it woken me up from next door whilst having my Sunday "post prandial" in the sun, the neighbour—to speak in under-statements—would have heard expressions of my annoyance. The Greeks have a word for it.

The Promenades

The close of this year's Promenade Concerts coincided with the announcement of the coming retirement of Sir Malcolm Sargent as chief conductor. Fortunately, this will not affect his appearances at next year's Proms. Few more colourful personalities than Sir Malcolm's have adorned our concert platforms. For this reason alone we hope his baton will wave as often as ever, because not for many years has the world of music known so few "characters."

Edinburgh Festival

As usual many splendid things came from the Edinburgh Festival; so many, in fact, that I am only going to name one (next year I must consider devoting a whole article to this opulent occasion). Many of the symphonies, sonatas, quartets, etc., performed there are to be heard all the year round. At Edinburgh they are usually done by slightly more celebrated virtuosi and with more reverence and swank than we are used to in mundane London. My special mention is for Strauss' "Salome," done by the Hamburg State Opera Company. Based on Oscar Wilde's play, it is a sumptuous work, even when there is nothing to look at. *And* it is not to be heard every day. It seemed to be beautifully performed and it came over excellently.



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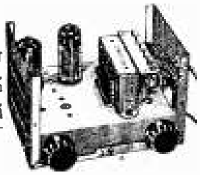

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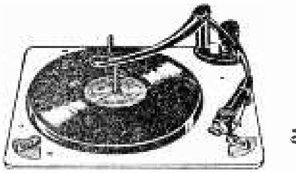

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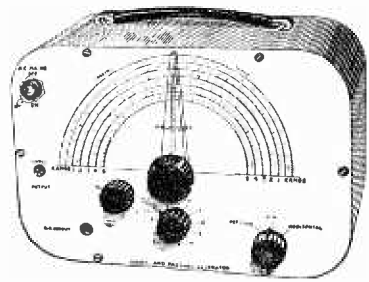

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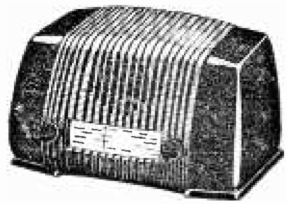

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MATCHED CRYSTALS

HOW TO BALANCE A PAIR OF CRYSTALS FOR AN F.M. CIRCUIT

By A. M. St. Clair

MOST of the F.M.-V.H.F. units designed for, or by, the amateur constructor make use of a ratio detector, embodying a pair of so-called "matched crystals." In commercial apparatus we usually find a double-diode valve. It is worth examining, therefore, the relative merits of the two methods Let us first look at the pair of matched crystals, without specifying at the moment precisely what is meant by the term "matched."

Crystals (usually germanium diodes) need no heater supply; they eliminate a valveholder from the chassis; they are compact, which is not only an advantage in itself, but enables the discriminator wiring to be made neater and more efficient; and the absence of heater wiring means the elimination of a danger spot which, in the case of the valve, often leads to the unwanted distribution of I.F. ninth harmonic all over the chassis.

Against all this the valve appears able to offer only a slightly increased detection efficiency and a much higher reverse resistance. Since neither of these considerations is of the first importance in the application being considered, and since a pair of crystals may be purchased at a lower cost than that of a suitable valve, we may well ask where the snag is. And, of course, it resides in that word "matched."

The writer was recently engaged on a design which called for a ratio discriminator, using crystals, and giving a really Hi-Fi performance. This occurred at the time of the last radio show, and he therefore repaired to Earls Court and made a round of several of the manufacturers offering germanium diodes, seeking information on the subject of matching procedures. Although one representative claimed that all the crystals produced by his firm under a certain type number were, in fact, matched, subsequent investigation proved this to be untrue. As for the rest, the consensus of opinion was: "Not really a recommended application." So, thrown back on his own devices, he returned to his bench, where the following method was worked out.

Difficulties

First let us consider the difficulties. Supposing we try the obvious thing, matching forward and reverse resistances. Suppose, further, that we try to do this by means of a meter. To see what is likely to happen, look at Fig. 1. This shows the voltage-current curve of a typical germanium diode. Looking at the forward characteristic, let the voltage applied by the meter to the crystal be V. This brings us to the point B on the curve, and the current passed is therefore I. The meter thereupon indicates a resistance of V/I ohms, corresponding to the slope of the line OB. But the true resistance of the crystal, working at a mean applied voltage V, with an A.C. signal which is not too large, i.e., which does not drive it into serious non-linearity, corresponds to the slope of the curve at the point B, which is the same thing as the slope of the tangent line AB. The correct reading should thus be (volts difference between A and V)/I ohms. The ohm-meter method fixes a point on the characteristic curve, but tells us nothing about the slope of the curve. Hence, a pair of crystals matched by this method will probably have curves similar to those shown in Fig. 2. A meter which has 1/5 of a volt across its terminals when passing 1 mA from its internal battery will read each as 200 ohms, while the actual dynamic resistances at the point B are 50 ohms for curve X and 150 ohms for curve Y. The differences actually encountered may not be so great as these, which have been chosen for clarity in the diagram, but they are big enough to invalidate the ohm-meter method.

Now before the "experts" dash off to design methods for measurement of dynamic resistance at the working point, or for displaying the whole characteristic on the C.R.T., let me point out a few

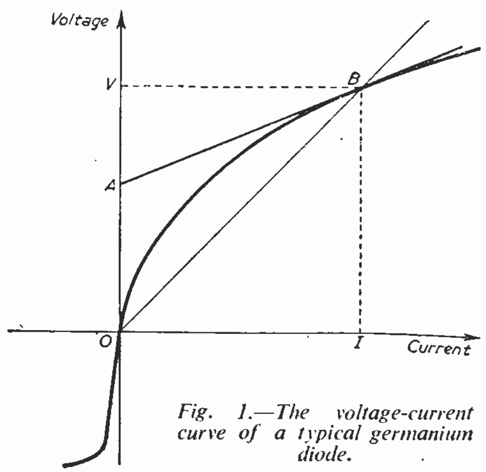

Fig. 1.—The voltage-current curve of a typical germanium diode.

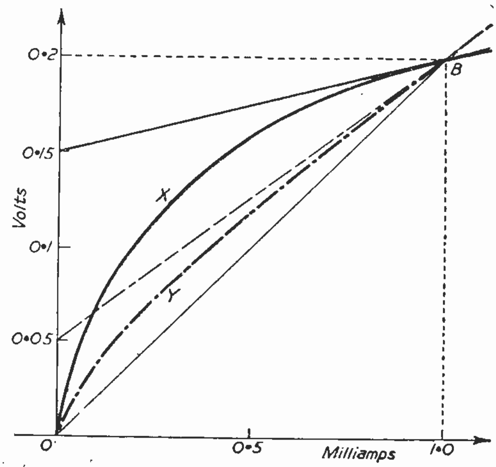

Fig. 2.—Curves for a test pair of crystals.

other things. First, when using a ratio discriminator the "working point" of the crystals is not easy to define. In Fig. 3, which shows the relevant portions of a ratio discriminator, the crystals are seen to be partially backed off by the electrolytic condenser C. Where there is no limiter, or where the final I.F. amplifier is worked as a semi-limiter (the normal practice), the voltage across this condenser will vary with signal strength, and the operating point of the crystals with it. Hence you may find that a pair of crystals which are balanced for the Third Programme are quite otherwise on the Light. And even if you do go to the trouble of designing a jig for matching characteristic curves, you may still find that you have not achieved a perfect match in operation. From a variety of reasons for this two should be mentioned.

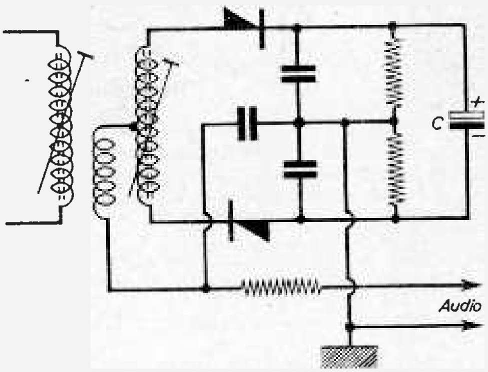

Fig. 3.—A ratio discriminator.

First, in most F.M. discriminators the output is basically the difference between two quantities of the same order of size; hence small variations in the nature of these quantities may produce large variations in the nature of the output: and, secondly, the presence of the electrolytic condenser in the ratio discriminator introduces complexities into the mode of operation of the crystals, one of which is the increase of audio voltage across them to a degree sufficient to affect their performance. (Crystal matching is much less critical in the Foster-Seeley discriminator.)

What is required, then, if we are to avoid making a very large number of measurements on each crystal, is a "performance match" accomplished under something like working conditions. Let us suppose, first of all, that we have a perfectly matched pair of crystals; that is to say, it is impossible to tell them apart by any electrical test. It is obvious that the performance of a discriminator using these crystals will be quite unaffected if we interchange them, so that each is wired in the position previously occupied by the other, and this quite independently of any considerations of accuracy of balance in the discriminator itself. Thus, if we interchange the crystals in a discriminator, the degree of misalignment caused is an indication of the mismatching of the crystals. It is too severe a check in the case of the ratio discriminator, however, and a better method of proceeding is as follows.

The Procedure

Disconnect the electrolytic. Insert a pair of crystals. (It is as well in performing these tests to provide some form of simple spring clip for the crystals. It not only facilitates the work, but it avoids too much soldering and unsoldering of the crystals, which is likely to impair them.) Adjust the discriminator for zero audio output, as in the normal procedure for alignment. Interchange the crystals. Leaving the discriminator adjustments unchanged, reset the signal generator to obtain an audio null once again. Note the change required, write it on a piece of paper and attach the paper to either one of the crystals. The other crystal remains in the discriminator and provides the "base line" for the tests. Identify it with a spot of red paint or in some other unmistakable manner. Make no further adjustments on the discriminator or on the unit of which it is a part; for the rest of this test only the signal generator is adjusted. Insert a fresh crystal in the position vacated by the one you have just tagged, and adjust the signal generator again for null. Note the reading. Reverse the crystals, readjust for null, note the reading. Tag the crystal with the two readings. Repeat for all the available crystals. In this way all the crystals except the red spot reference one will have two readings attached. (The second reading of the first crystal is the original balance point, which should of course be the correct I.F.—usually 10.7 Mc/s.) These readings should be identified according to the side of the discriminator on which they were obtained, e.g., a given crystal might be marked "Right, 10.72 Mc/s; Left, 10.64 Mc/s." To obtain markings for the "red spot," find the crystal which has the least difference between its two figures, and use these figures. If you have no crystal whose figures are within 0.02 Mc/s, then you have no crystal which will match well with the "red spot," and it should be left out of further consideration.

Now arrange the crystals in order according to their markings. If they are arranged with reference to, say, the right-hand figures, then the left-hand figures should also be reasonably closely ordered. If this is not so, then either an error has been made or an unfortunate choice of a poor reference crystal. If you set the crystals in order of right-hand figures as they come off the first test you will be able to spot discrepancies here, before too much effort has been wasted. Select a pair of crystals having reasonably similar figures to each other. (The exact meaning of "reasonably similar" will, of course, depend largely on the number of crystals you are working with.) Place them in the discriminator. Adjust the signal generator to the correct I.F., and the discriminator for correct balance (audio null). Interchange the crystals. The readjustment required on the signal generator to restore balance should be small compared with those needed in the first part of the testing. If it is not, try another pair of crystals—change only one if you have several with closely corresponding figures. When you have found a suitable pair, leave the discriminator in balance and reconnect the electrolytic. Readjust the discriminator transformer secondary to restore balance, if necessary. If only a trivial adjustment is necessary the pair is matched.

Starting with about a dozen crystals you may hope for perhaps two well matched pairs. The remainder are not necessarily bad crystals—you just do not happen to have suitable mates for them. The larger the number you start with, the higher will be the percentage yield, and the more rigorously will you be able to interpret closeness of readings and "triviality" of adjustments. The more you have, the more pairs you get, and the better the pairing.

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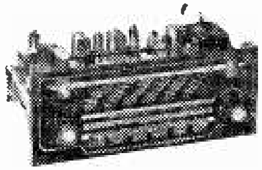

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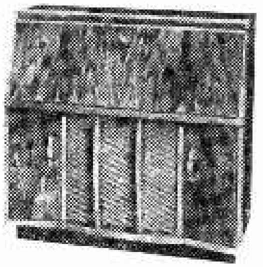

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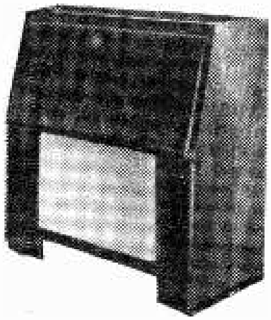

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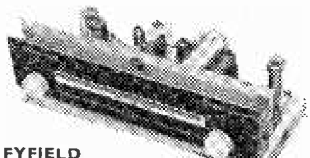

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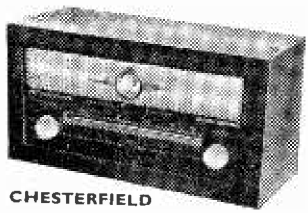

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KOLSTER-BRANDES MODEL FB10FM

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

THIS is a small transportable receiver for reception of the V.H.F.-F.M. transmissions only, and can also serve as an efficient F.M. adaptor for coupling to the audio circuits of more elaborate radios and radiograms or act as an F.M. tuner in front of an A.F. amplifier or record reproducing unit.

It features an inbuilt power unit for A.C. mains only, contains four valves, plus metal rectifier, and is housed in a plastic cabinet of contemporary design. It is of very similar appearance—using the same kind of cabinet—to the Kolster-Brandes "A.M. only" transportable—Model FB10.

This is the final article in the present series. Next year a new series will commence and will include combined A.M./F.M. models, and receivers using transistors.

As the receiver was first released in 1955, it has not been in the field long enough to exhibit so-called "stock faults" and consistent characteristics which generally show up after three or four years' service. Nevertheless, it was considered desirable to use this somewhat simple model to introduce to our readers the current trend in the design of commercial F.M receivers. A knowledge of this model may also be of assistance to the many readers who have requested information for converting their existing receivers for the reception of F.M.

The Circuit

A complete circuit of the receiver/adaptor is shown at Fig. 1. As will be seen, the first valve V1 is a double-triode; section A is used in the form of an earthed-grid R.F. amplifier, while section B is arranged as a self-oscillating frequency changer. This mode is truly representative of the R.F./frequency changer stages of almost all commercial receivers, whether for both systems or just F.M. With combined receivers, however, this double-triode "front-end" is generally built into a small metal case.

The dipole signal is applied to the cathode of the R.F. amplifier triode across L2 by way of the small coupling coil L1. The resistors and capacitors in L1 circuit simply isolate the aerial from the receiver chassis which, as will be seen, is connected to one side of the mains supply. The grid of V1A is connected directly to chassis, and the amplified dipole signal occurs across the R.F. coil L3 in the anode circuit.

Since the impedance at the cathode of V1A is extremely low, L2 is heavily damped by this low impedance and also by the dipole. It thus responds over the entire F.M. band (Band II) and needs no variable tuning. L3, however, being in a much higher impedance circuit, needs to be tuned for optimum response over the band, and this is achieved by C1 section of the tuning gang.

L5 is the oscillator coil, which is tuned over the band by C2 section of the gang. Feed-back coupling is secured by coil L4 in the grid circuit of V1B. The signal across L3 is coupled to the grid of V1B at the junction of two capacitors across L4. These two capacitors in conjunction with the inter-electrode capacitances of V1B and the capacitor on the "earthy" side of L4 form a bridge circuit of somewhat delicate balance.

When the balance is achieved, there exists very little or no oscillator voltage at the junction of the two capacitors across L4. Such a bridge circuit is a salient feature of all F.M. "front-ends," since it precludes feed-back of the oscillator signal, via the R.F. stage to the aerial. This avoidance of oscillator

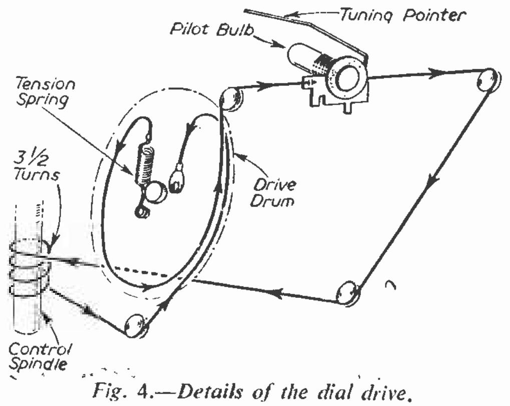

Fig. 4.—Details of the dial drive.

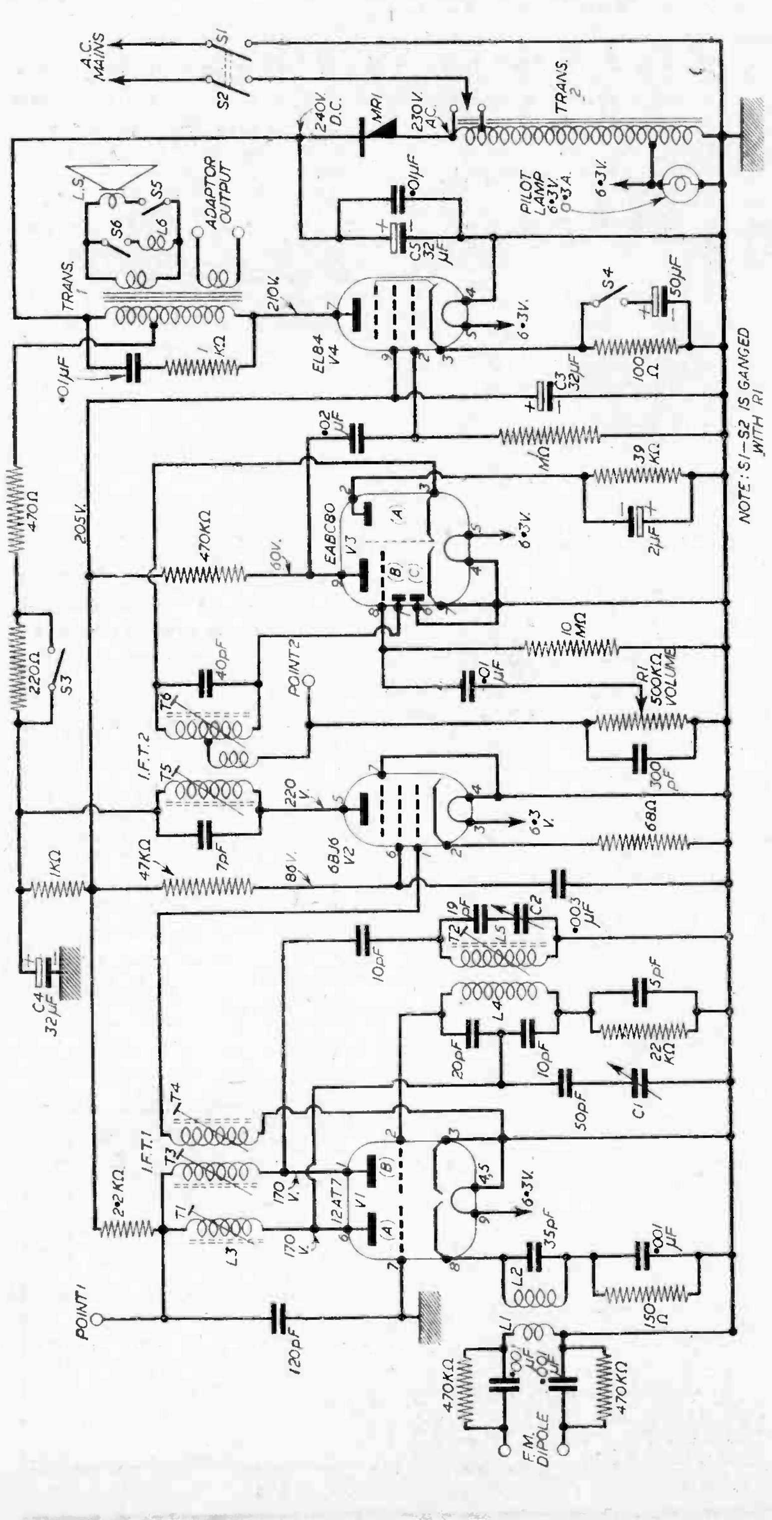

Fig. 1.—Theoretical circuit of the K.B. FB10FM.

signal feed-back does not assist operation of the receiver in any way, but it prevents the oscillator signal getting out through the aerial (dipole) and either its fundamental or harmonics causing interference on nearby radio or television receivers. That this may happen can well be realised when it is considered that the oscillator works at about 100 Mc/s, and that its second harmonic falls right in the centre of television Band III (the commercial band). The R.F. stage is thus coupled to the self-oscillating frequency changer at the capacitive centre-tap across L4, which is completely dead so far as oscillator voltage is concerned.

The oscillator is working the I.F. above the signal frequency, the two signals are thus mixed in V1B and appear across the first I.F. transformer I.F.T.1 10.7 Mc/s. This is a typical F.M. I.F. which was chosen after considerable discussion as a satisfactory compromise for minimising the possibilities of I.F. interference and radiation interference. Its relatively high value also eases the I.F. pass-band problem, for with F.M. a bandwidth of some 200 kc/s is essential in order to secure full advantage of the F.M. system of broadcasting, and enables two I.F. transformers (one at 470 kc/s A.M. and one at 10.7 Mc/s F.M.) to be connected in series in combined receivers without one seriously affecting the performance of the other.

The I.F. signal is applied to the grid of V2 for amplification and is developed in the

(*Continued on page* 701)

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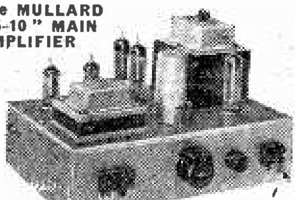

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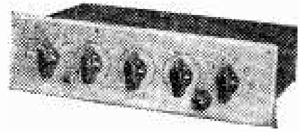

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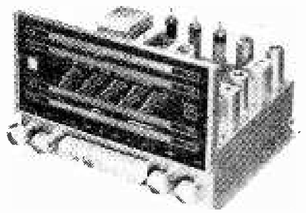

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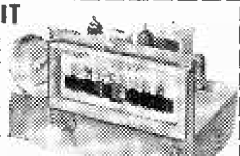

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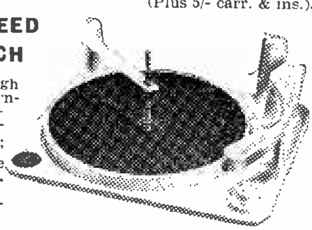

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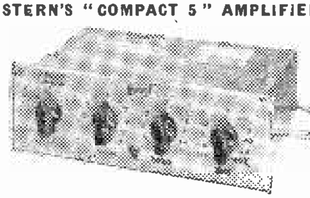

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anode circuit across the second I.F. transformer I.F.T.2. This is a fairly conventional stage, and one to which we have become accustomed in A.M. sets. The wide bandwidth is maintained due to the damping effect of the valves and circuits at 10.7 Mc/s. This second I.F. transformer is often referred to as the "discriminator transformer," for it is this, in this set anyway, which feeds the F.M. discriminator.

Here the discriminator is in the form of the popular ratio detector, comprising double-diode V3 A/B and associated resistor and capacitor. The circuit is of the unbalanced variety, and the audio signal is taken from across the 300 pF capacitor in the tertiary winding of the transformer. For those readers who require a full description of the working of the ratio detector, reference should be made to PRACTICAL WIRELESS, November, 1955, under the article entitled "Understanding F.M. Discriminators."

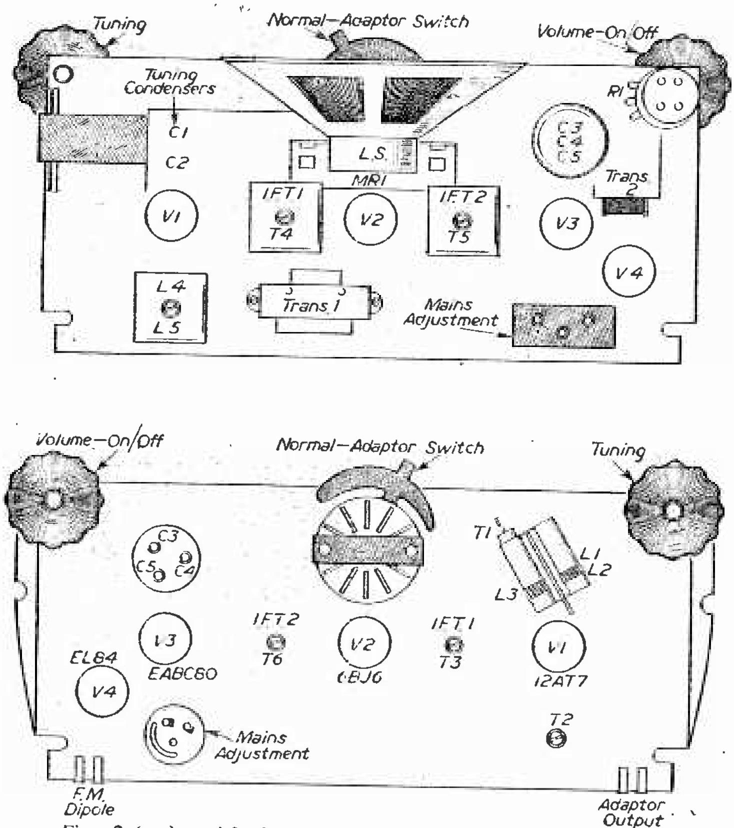
It will be seen that the two diodes are connected in series across the centre-tapped secondary of the transformer, and that the circuit is completed through the resistor-capacitor parallel combination. This section forms a time-constant and serves to endow the detector with the feature of amplitude limiting, since the time-constant is relatively large compared with the duration of a pulse of amplitude interference. The A.F. load consists of the volume control R1, and from this is fed the required level of A.F. to the grid of the triode section of V3(V3C).

Valve V3 is, in fact, one of the new range developed primarily for use in F.M. receivers. It features three diodes and a triode. Usually, the diode shown earthed in V3C section is used as the A.M. detector diode in combined sets. It serves no useful purpose, however, in the circuit under discussion.

The triode acts as an A.F. amplifier in conventional mode. The amplified A.F. appears across the 470K. resistor in the anode circuit, and is coupled by way of the 0.02 μF capacitor to the control grid of the output pentode V4.

The output transformer and associated circuitry is rather interesting. The primary of the transformer is tapped as a means of neutralising hum in the output stage. It will be seen that the output of the metal rectifier is connected to one side of the primary, and that H.T. for the rest of the receiver is picked up from the tap; the other side, of course, connects to the anode of the output valve in the usual manner. There are two secondary windings. One is the normal one for driving the loudspeaker, while the other is a spare which is connected to the adaptor output terminals, and it is from here that the signal is taken for operating a separate A.F. amplifier when the adaptor facility is required.

Switches S3, S4, S5 and S6 are ganged and form the receiver/adaptor switch (see Figs. 2 and 3). When the receiver is operated on its own internal loudspeaker switches S3, S4 and S5 close and S6 opens. In the "adaptor" position of the control, however, S3 opens and reduces the H.T. voltage by introducing an extra 220-ohm resistor in the H.T. feed; S4 opens and introduces negative feed-back by disconnecting the 50 μF electrolytic capacitor in the cathode of V4; S5 opens and disconnects the loudspeaker; and S6 closes and connects a dummy load L6 in place of the loudspeaker across one of the transformer secondaries.



Figs. 2 (top) and 3 (lower).—Top and bottom chassis details.

Tone correction and de-emphasis is provided by the 0.01 μF capacitor and series connected 1 K resistor across the primary of the output transformer. Considerably enhanced response occurs in the "adaptor" position owing to the introduction of negative feed-back in the output stage.

H.T. is provided by the metal type rectifier MR1 (type 18RA2N1151), and smoothing is aided by electrolytic unit comprising C3, C4 and C5. It will be noted that an auto mains transformer is employed and that one side of the mains is connected to receiver chassis. The chassis, therefore, might well be live to earth. Switch S1/S2 is the on/off switch and is ganged to the volume-control R1.

It should be mentioned that some earlier versions adopted a valve type EZ80 rectifier in place of the currently used metal rectifier. Also, instead of an EL84, a 6AM6 valve was used in the output stage.

Sufficient output is available from the adaptor sockets to drive fully the A.F. stages of most "A.M. only" receivers and audio amplifiers. When the adaptor facility is utilised it is often necessary to attenuate the signal by means of resistor pads to prevent overloading and to maintain a correct match. It is general practice to connect the adaptor signal to the pick-up sockets of radios and radiograms. Stand-off resistors can be used to prevent the adaptor, where permanently connected to a radiogram, from shunting the pick-up signal.

Fig. 4 illustrates the tuning drive system. Nylon drive-cord should be used when replacement becomes necessary, and a total length of about 40in. is required.

Alignment

Optimum performance is achieved only when the circuits are accurately aligned, and this applies particularly to I.F.T.2. For best results the use of a wobbulator and oscilloscope are required. Details of this method of alignment are given in the March, 1956, issue of PRACTICAL WIRELESS.

The method outlined, though not as accurate as the wobbulator/scope method, often serves.

A D.C. voltmeter should be connected across the 39 K resistor in the ratio detector diodes circuit, with the positive side of the meter to the chassis connection. With a 10.7 Mc/s unmodulated signal applied to the control grid of V2, trimmer T5 should be adjusted for maximum voltage reading. It is desirable, initially, to unscrew trimmers T5 and T6 until they are half-way out of their formers.

The signal should now be transferred to point one on the circuit, and trimmers T3 and T4 adjusted for maximum voltage reading. With the signal very loosely coupled to the first stage, by connecting the "live" generator lead to a nearby earth point, trimmers L5, L3 and L4 should be adjusted, in that order, for maximum voltage reading. It may be necessary to put in a larger signal than hitherto for these adjustments.

The voltmeter should now be removed from across the 39 K resistor, and in its place should be connected two accurately matched series-connected resistors. A microammeter should be connected between the junction of these resistors and point two on the circuit.

A 10.7 Mc/s unmodulated signal should again be connected to point one on the circuit and trimmer T6 very carefully adjusted for zero reading on the microammeter, which will occur midway between a negative-going and positive-going indication. Since T6 was initially unscrewed for the previous adjustments, it will have to be screwed in correspondingly to reach the point of balance.

Before making any of the foregoing adjustments, the mains should be connected to the set so that the chassis is on the neutral line. The "live" side of the generator should also be connected via a capacitor of 0.001 μF. It is also desirable to connect the "earthy" side of the generator to the chassis through a similar capacitor.

Adjustments of T1 (the R.F. coil) and T2 (the oscillator coil) are best made on an actual transmission, preferably on the "Third Programme." The receiver tuning should be adjusted so that the cursor coincides with the scale frequency of the local Third Programme, and T2 should be very carefully adjusted until the signal is accurately tuned. T1 should then be adjusted for maximum sensitivity.

Scratch Filters

IT is quite possible that many readers will have shared my difficulty in obtaining details of a unit, simple in construction but at the same time efficient, to eliminate that old "bugbear" of record scratch so evident with the older 78 r.p.m. recordings.

Briefly, the equipment used by the author consists of a Collaro 2010 transcription unit fed into a Leak TL/10 pre-amp with the main amplifier output to a two-speaker system consisting of Wharfedale W12/CS and Super 8/CS/AL.

The circuit described (Fig. 1) gives excellent results with far less "top" cut than any other arrangement tried to date. Providing the unit is kept not less than 2ft. 6in. from the mains transformer, etc., no increase in hum will occur.

By means of the trimmer condensers "cut off" frequency is variable between 5-10 Kc/s. For maximum efficiency the two trimmers should be adjusted to have approximately the same capacity, and this can be achieved with very little effort, and once set seems to give good results with a large number of recordings. The choke should have an iron core and inductance of 5 Henries and a suitable component may be obtained from Osmor Radio. The switch used by the author is a four-bank Yaxley type obtained for 1s. 6d. from a radio shop dealing in ex-Government gear. It is, of course, important to see that the switch has a sufficiency of terminals.

In accordance with the usual practice for such equipment, all leads should be screened to prevent hum and for added efficiency the unit could be mounted into a metal box which would, of course, completely screen the switch mechanism and wiring.

The second arrangement (Fig. 2) is simpler and cheaper, and considering these factors gives good results.—L. SHELDON.

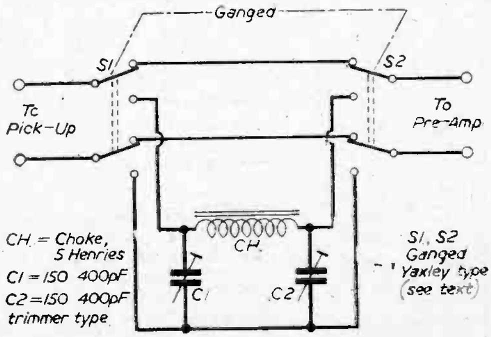


Fig. 1.—One of the filters referred to.

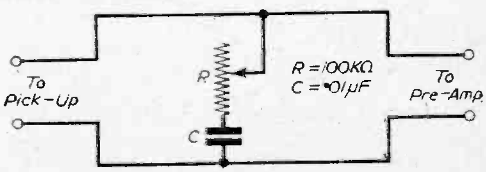
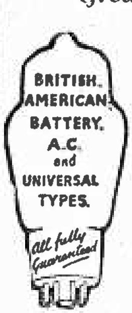


Fig. 2.—A simple and cheaper arrangement.

Great Britain's Valve Mail-Order House



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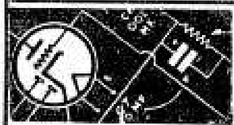

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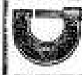

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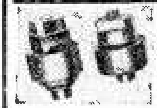

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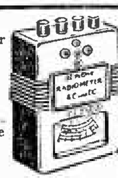

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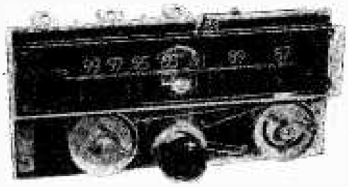

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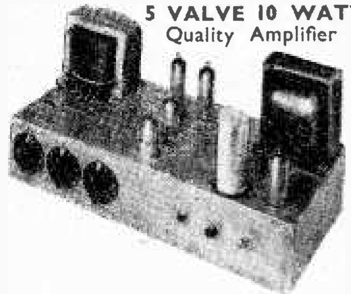

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TRANSMITTING TOPICS

807s IN CLASS AB2

By O. J. Russell, B.Sc., A.Inst.P. (G3BHJ)

(*Continued from p. 598, November issue.*)

Anode Regulation

FINALLY, while the anode regulation is not altogether critical, power will be lost if the regulation is poor. The screen supply should be regulated in any case. It is rather startling to observe the violent drop in power pack voltage under full signal conditions with a typical condenser input circuit. Clearly if the anode potential at full output sags from say 500 volts to 400 volts, then the output will only be that to be expected with a 400 volt supply. Thus instead of the expected 75 watts of audio we shall only obtain an audio output of 55 watts! This would in effect give a considerable undermodulation of the P.A. stage, particularly as the bias appropriate for 400 volt operation is 25 volts, or 4 volts less than that required for 500 volt operation. Accordingly we might also anticipate higher distortion and limiting effects, which might further reduce the actual audio power developed. An amateur baulking at the use of a choke input power supply might therefore use a pack giving a higher anode potential under quiescent conditions, which falls to the " required " value under full signal conditions. However, this may cause trouble with excessive currents and dissipation under quiescent conditions, particularly as the bias will be too low under quiescent conditions if it is right for full signal conditions. There seems little reason for baulking at a choke input power supply when building a modulator from scratch, unless of course a power supply is already on hand that might serve to power the modulator stage. The ratings of Fig. 2 apply for a screen supply of 300 volts in each case. The full signal anode current of the modulator stage is 240 mA in each case. This latter current is actual D.C. input and not merely the peak value at full signal conditions. An anode current meter may be used as an indication of modulator operation therefore.

An Example

As an example of a modulator circuit typical of the use of push-pull tetrodes, Fig. 5 is given. This is in fact based upon some recent modulator experiments by the writer, and the following features are mentioned for their interest in ensuring trouble-free operation. Thus at the input pin of the coaxial socket, a 47 pF condenser and a 4.7 K resistor are used to attentuate any R.F. that might be picked up by the mike lead. Constructionally, the first valve grid pin should be as close as possible to the coaxial socket so that there is the minimum of connection lead length, thus obviating R.F. pick-up. Even with a coaxial mike lead, R.F. pick-up in the shack may easily cause instability. Conversely, of course, the writer has known the mike lead to be resonant and to be so " hot " with R.F. when the beam array was firing towards the shack, that a neon could be lit on the mike stand, yet the modulator remained perfectly stable! However, precautions against R.F. pick-up of the type mentioned will enable R.F. induced instability to be reduced. In the writer's case the 47 pF condenser and 4.7 K resistor effected a cure for R.F. pick-up when experimenting with the present modulator circuit.

The resistance capacity by-passes in the H.T. feed lines to the first two amplifier stages are useful in suppressing audio instability, and should not be omitted. The coupling capacitor for the grid potentiometer input of the second amplifier stage is made deliberately small to provide a bass " roll-off " that attenuates the extreme bass frequencies to tailor the speech response curve for more effective communication requirements. The driver valve is a 6V6, and optionally a negative feedback network may be added to improve the driver regulation so that

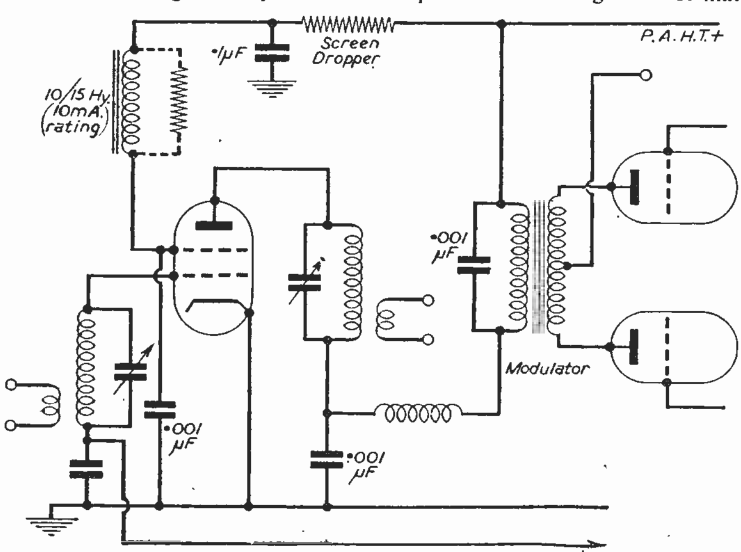

Fig. 4.—The self screen modulator circuit reproduced from last month's issue.

the grids may be smoothly swung into the positive region. There is adequate gain in any case when using crystal microphones, so that negative feedback may be comfortably applied. Alternatively, or in addition to negative feedback, the secondary of the driver transformer may be shunted by a resistor of from 5 K to 1.2 K, and a value of some 3.3 K is a good average value to use. A further component is a condenser of 300 pF shunted across the driver secondary, which some may care to add. Further, the grid input to the second amplifier stage incorporates a top "roll-off" to attenuate the extreme upper top register, thus minimising excessive sideband spread and splatter. However, these aspects of modulator frequency response curves were covered recently in the article entitled "Tailoring the Speech," and readers will no doubt "tailor" their own modulators to suit their personal voice characteristics rather than adopt the values shown, which will serve for initial work.

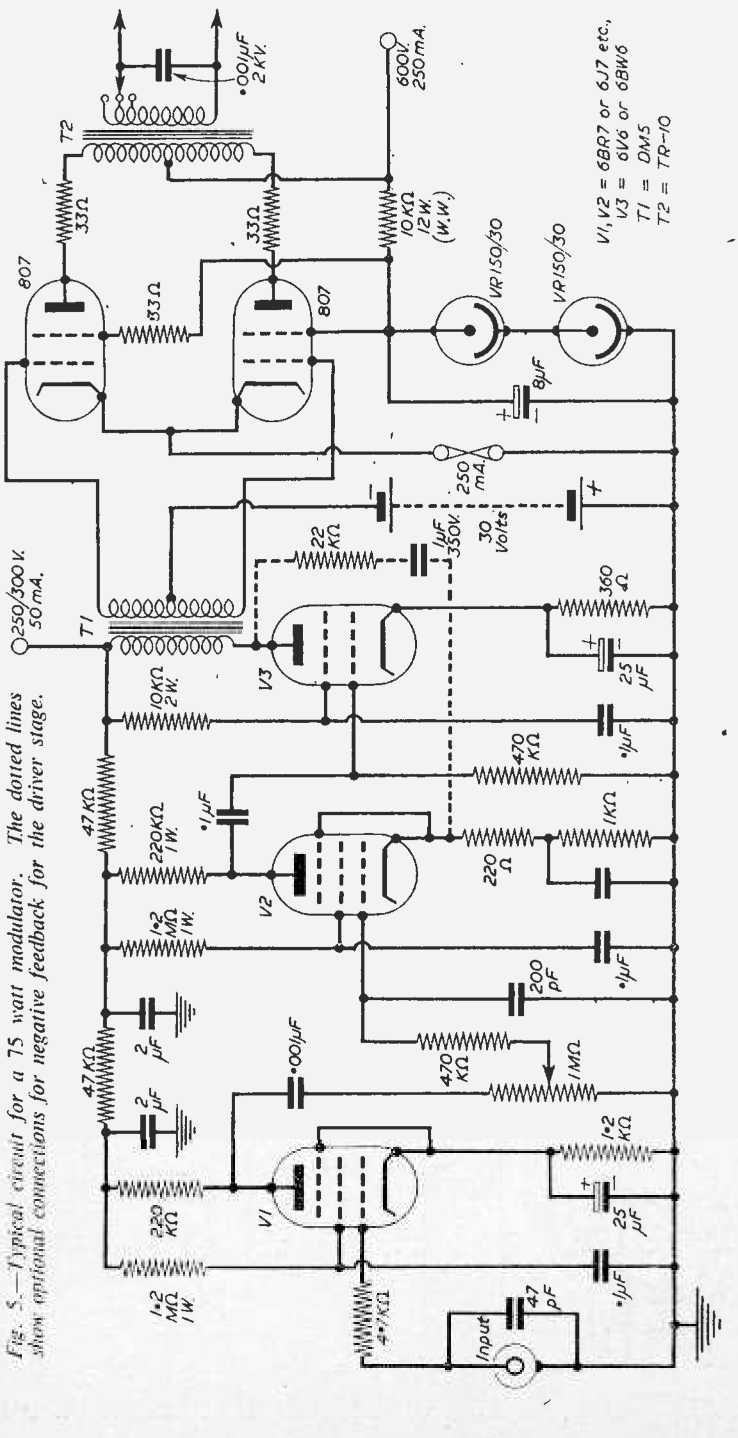

Fig. 5.—Typical circuit for a 75 watt modulator. The dotted lines show optional connections for negative feedback for the driver stage.

A further point is the use of a 250 mA cartridge fuse in the 807 cathode to earth line. This serves to protect the tubes in the event of bias failure or other fault conditions. For the bias supply a convenient solution is the use of miniature deaf-aid type cells for the bias voltage. These cells will last almost indefinitely in such bias service, especially as the grid current flow tends to charge-up the bias batteries rather than discharge them. In fact some users regularly place their bias cells on load to prevent "over-charging" when used as bias cells for amplifiers driven into grid current flow conditions, and this tip may be worth remembering.

One final point is the use of a .001 μF mica condenser shunted across the modulator secondary. This condenser should be a high voltage type, and the TCC M3KO series will be found useful in this service. As is well known, it is possible by condenser loading to "build-out" the modulation transformer to level the upper register, and yet provide a sharper cut-off outside the top speech frequencies. The precise value of loading capacitor depends upon the impedances and other factors, and is a refinement that should be incorporated in all modulators.

A COMPACT H.T.—L.T. UNIT FOR PERSONAL RECEIVERS

AN ALL-DRY BATTERY MAINS REPLACEMENT UNIT

By L. Baker

THE purpose of this unit is to provide the L.T. and H.T. supplies for the average " Personal " receiver. There must be many of these type receivers in use as bedroom sets and for occasional listening. The writer's own model is an R.C.A. type with miniature B7G valves in a superhetrodyne circuit. As the cost of batteries for this set was rather prohibitive, it was decided to make a small unit to provide the necessary supplies, namely, 90 volts H.T. and 1.5 volts L.T. In order that the set should retain its portable qualities it was decided that the unit should be as small as possible and should fit inside the set with no alterations to the wiring of the set itself, and be so arranged that it could be removed and substituted by the normal batteries at any time. The unit described proved to be satisfactory in every way, and indeed, after long periods of use gave no trouble.

In size it is comparable to the average 20 packet of cigarettes. The case which was made of 1/16in. aluminium is shown in Fig. 2. Basically, it will be seen that the case (which also serves as chassis) is a flat rectangular tray 4¾in. long by 3½in. wide by ½in. deep. A lid to suit the above dimensions was made from the same material and this lid covers the components when in use. The 3/16in. tabs at the sides serve to hold on the lid, which is screwed to the tabs by means of small ⅛in. woodscrews. The aluminium should be cut to the dimensions shown in Fig. 2, and before bending it holes should be drilled for the mounting clips of C1 and C2, also C3 and C4. The hole for the output socket should also be made before bending, as also the mounting holes for T1, Ch1, the H.T. rectifier, the L.T. rectifier, and variable resistor R1 should be drilled while the aluminium is flat. As the components to be used will differ slightly, it is not possible to lay down hard and fast drilling dimensions. It will be a help, of course, to mark out the space for components (4¾in. by 3½in.) before bending the material, and in this space position the actual components to be used. In this way the case or chassis can be drilled with enough accuracy to suffice. Having completed the drilling, the chassis may then be bent to shape and the components mounted inside.

The Mains Transformer

This unit is specially wound to suit the power supply. In the writer's model the basis of this was an old bell transformer which was stripped down and the bobbins used to accommodate the new windings. The same core was used which consisted of a number of E. and I. pieces. The primary was wound on its own bobbin and consisted of 1,320 turns of 36 s.w.g. enamel wire. The start or inside wire was passed through the cheek of the bobbin and anchored to a tag strip, which was held on to the transformer core by one bolt which was originally used to hold the laminations together. Every 200 turns of wire was insulated by a thin layer of empire tape, and when the final layer was wound the whole bobbin of wire was given a coat of shellac. The end wire was passed through the cheek again and soldered to another tag on the strip already mentioned. The winding for the H.T. was wound next. This was also on its own bobbin and consisted of 850 turns of 36 s.w.g. wire. This was not insulated at intervals, but instead wire with a single silk covering was used. The wire was passed through the cheek of the bobbin as before, leaving some 5in. protruding to reach its required anchor points. The final secondary for the L.T. was then wound and this consisted of 30 turns of No. 20 s.w.g. wire enamel, also in its own bobbin with long, protruding ends as before. The final unit was dipped in shellac to bond it tightly together and prevent buzz.

The Choke

This was made from the core stampings of a discarded miniature audio choke. All wire was stripped off, the bobbin retained. On the bobbin were placed 200 turns No. 20 wire, long ends left protruding for connection purposes. The choke also was given a coat of shellac. When wiring up the unit, pieces of sleeving were used over all wires protruding from ends of choke and transformer to insulate them from the chassis and components.

The H.T. and L.T. Rectifiers

In the writer's model these units were both rescued from ex-W.D. equipment. The H.T. rectifier is a small half-wave unit about ½in. long and fins of about

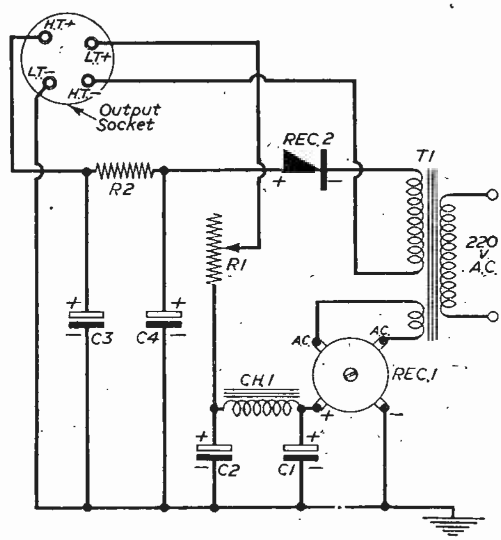

Fig. 1.—Theoretical circuit of the unit.

⅜in. It was rated at 25/30 mA max current. This is more than adequate for the H.T. requirements of the average personal receiver. It was mounted by single hole fixing. No doubt readers will have to hand other metal rectifiers of slightly different shape, these should work just as well provided they are small enough to be accommodated in the case and they are known to be in good condition. The L.T. unit was a full-wave type and rated at 4/8 volts at 1 amp. max. It was found that the consumption of the L.T. portion of the writer's set was .25 amp., and therefore the output of the rectifier for L.T. was adequate. It was noted also that the consumption of the average personal receiver using B7G valves was almost the same. The valve complements of several sets were checked and it was found the valve line-up was usually DK92, DF91, DAF91, DL92. The filament of this set-up requires 1.5 volts at .25 amp. Many other sets will have a similar consumption; however, to provide for a slight adjustment the variable resistor R1 is included in the output from the L.T. rectifier. In the rectifier used by the writer there were actually only three connections to it, the fixing bolt being the negative side of the output rectified current. To simplify the diagram, Fig. 1, and the pictorial diagram, Fig. 2, four connections are shown. By way of warning it is extremely important to observe the polarity of both rectifiers and those which clearly show the cathode or positive terminal should be used. On no account should dubious units be used, especially in the L.T. circuit as damage to the valves could result.

Wiring

This is simple and straightforward. All wires should be well insulated, especially the wires from the transformer and choke. The output socket was taken from an old H.T./L.T. battery for the receiver and in the completed unit it should be carefully checked that the output of the unit should be taken to the correct lugs on the socket so that the receiver plug for H.T. + and − and L.T. + and − go to the correct positions. Use soldered connections only, and wire earth connections directly to the case where shown on circuit diagram in Fig. 1. It will be seen that the H.T. negative output of the unit does not go to the chassis but is taken direct to the output socket. This is in order to provide for the automatic bias system of the receiver. The H.T. negative usually goes to earth via the bias resistor in the receiver proper.

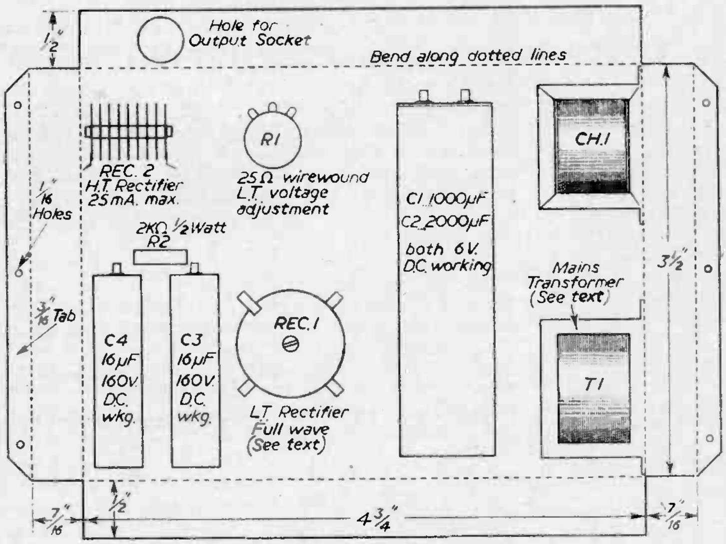

Fig. 2.—Layout and component values.

Adjustment and Operation

Having completed wiring and checked for mistakes, etc., it would be as well to check with the ohmmeter between various points to see that no short-circuits will occur. If all is in order, with the unit *not* connected to the receiver check for the various voltages. The no load outputs should be approximately 120 volts H.T. and approximately 3 or 4 volts L.T. If an old valve of the B7G type with good filament is to hand it is advisable to connect its filament across the L.T. output and measure the voltage on load. The voltage should now drop quite a bit. For this test turn the slider of R1 so that all the resistance is in circuit, then with voltmeter connected across the socket holding the valve, check that the L.T. voltage can be varied by adjustment of R1. If the voltage can be reduced to 1 volt or so all is in order. If not, recheck wiring and especially check and replace the L.T. rectifier. Having completed this test return R1 to its setting with all the resistance in circuit and connect the unit to the receiver. With meter across L.T. output and the set switched on, adjust R1 until exactly 1.4 volts show on the meter. Check again with the meter the H.T. voltage on load. This should now be in the region of 80 or 90 volts. It should not be more than 90 volts, if it is increase the value of the carbon smoothing resistor by the required amount to drop it to 90 volts. This completes adjustments. The set should now play normally with little or no trace of hum. If hum is present try changing about the leads to the mains plug. If it still persists all condensers should be checked, especially the L.T. smoothing and H.T. smoothing condensers.

It will be noted that no switch has been included in the unit. In order to switch off, therefore, the A.C. has to be switched off at the wall socket or by removing the plug. If desired a small toggle switch could be included in the unit, or if the unit is to take a permanent place in the set the switch on the set itself could be used removing all connections from it and wiring them in the permanently "on" position. Then using screened lead, wire in the switch to the primary of the transformer primary lead.

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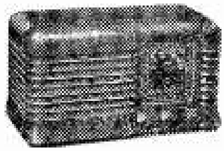

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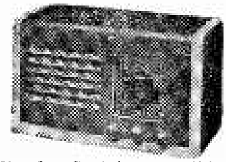

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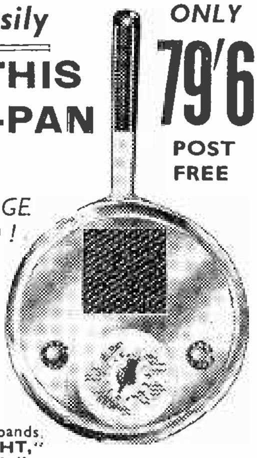

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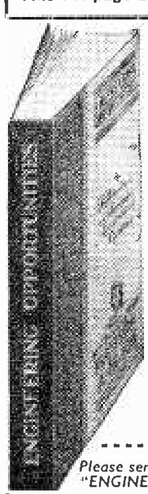

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6K8GT	9/6	DAF96	8/6	EF85	8/6	UL41	10/-
6L18	11/6	DCC90	6/6	EF86	12/6	UY41	8/6
6Q7GT	9/6	DF33	11/6	EF91	7/6	W77	6/6
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The Editor does not necessarily agree with opinions expressed by his correspondents

S.W. Listeners

SIR,—In reference to the letter by H. F. Barker, of Reading, printed in your "Open to Discussion" feature.

I agree that the S.W. listener is not fully catered for in most of the large radio societies; I agree that these societies are of value to the S.W. listener, but not in the practical sense.

I have found that in most local radio societies the S.W. listener is way out of the picture if in the company of licensed operators, and sits in the background whilst the hams talk of their Q.S.O.s.

In my opinion this is the reason why so many are dropping out of our hobby of S.W. radio.

The answer to this problem would, indeed, be to issue a novice licence, using low power and Xtal controlled, and providing the S.W. listener can prove that he is a genuine experimenter and that he can find a licensed operator to inspect the novice station to see that things are in order, etc.

This, in my opinion, is the only possible way for many S.W. listeners making the grade. Many inexperienced operators are using mobile nets in commercial fields, so why not the genuine novice experimenters?—L. G. HUTTON, M.S.M.(P.) (G5229) (Birmingham).

Radio Alarm Clock

SIR,—With reference to your article by John Williams, August issue, on "Radio Alarm Clock", may I be permitted to say that ingenious as the clock contact arrangements may be they make the construction of this piece of equipment unnecessarily tedious for the service that the contacts are capable of giving.

A well-tried arrangement is the fitting of an insulated metal strip to the rear of the clock; this forms one contact, the alarm winder and case the other, as this rotates when the alarm rings. The metal strip stops the winder when the alarm spring pressure has put it under tension. (To reset, wind alarm half a turn.)

This completes the time switching with much more robust contacts than the foil. This switch is placed in the neutral line, of course. Now, for those with the qualms about the almost full mains voltage appearing across the clock contacts, when the master switch is over to alarm.

All that is required is a relay and a means of energising it (one is produced commercially, 4.5-volt battery operation) by either a battery or small transformer. The relay can be mounted inside the set and the clock left to switch the energising side of the relay, the main contacts breaking one lead to the set transformer, etc., or double pole switching if the relay has contacts available.

With the reasonably heavy contacts on the relay, the bed lamp-radio cum tea brewer, etc., really becomes a possibility, without blowing a hole in the foil each time the contacts open and close, and the accompanying electrical interference.—D. C. RAYNER (Electrical Engineer, Leeds).

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.

Correspondents Wanted

SIR,—I am 16 years old and interested in electronics. Through your columns I would like to get in touch with pen friends with similar interests. If many reply I will file and forward letters to enable as many as possible in similar circumstances to correspond together.—RICHARD C. HARDWICK (Abbeylands, Sherborne, Dorset).

SIR,—I would be glad to hear from anyone who would like to correspond with me, as I have no one to help me over my technical matters. I have built sets of my own and am 17 years of age.—M. KING (47, Whitwell Road, Broxtowe, Nottingham).

"Transmitting Topics"—November, 1956

SIR,—On reading through this article we note that the author, Mr. O. J. Russell, mentions that data on the 807 valve is not available. We should like to point out that full operating conditions and data may be obtained for the Brimar 807 valve on application to our Valve Application Department.—G. C. Fox (Valve Application Department). S.T. and C., Ltd., Footscray, Sidcup, Kent.)

Amateur Results

SIR,—Recent remarks about the early detector and low frequency receivers induced me to unearth some old components and build a medium wave version of the "Prefect Three," blueprint No. 63. This type of set possesses an odd kind of fascination; perhaps because of its being capable of giving good results, in spite of its simple nature! It is good, strong and clear on the Home and Light, and distant stations can be obtained on the 'phones.

A five-to-one universal transformer and a Lissen H.F. choke are large and weighty items: I had to make the plywood chassis 4 in. deep. I used a two-gang .0005 with the tuners joined, and an old .0001 vernier, with long handle. Noting the admonition to use thick wire, I made up coils of 17, 28 and 15 turns of 26 gauge on a ribbed 3in. ebonite former. The coil ends are joined to plug-in pins, which plug in to a seven-pin valve holder. This makes an ideal base An ordinary output transformer is used and an 8in. Celestion speaker.

With this simple old set some of that hypnotic spell, well known to the early pioneers, returns! Then home building was universal; it swept America and Europe—the commercial set was almost unknown! The "influence," was even more potent than is that of television to-day! There were, however, a great many beautifully made components on the market. They possessed terminals and screws for joining and fastening. With them it was easier to construct sets than it is with the tag-ended components available to-day!—A. TROWBRIDGE (Staines).

The R.1155

SIR,—I note in PRACTICAL WIRELESS that there have been several queries with regard to the R.1155. Having carried out instruction on these Rx's while in the R.A.F. I can clear up a few points:

Range	RX1155, 1155A, B, C, D, E, F, M	R1155L and 1155N
1 H.F.	18.5 to 7.5 Mc/s.	18.5 to 7.5 Mc/s
2 H.F.	7.5 to 3.0 Mc/s	7.5 to 3.0 Mc/s
2A H.F.	Not applicable	3.0 Mc/s to 1,500 kc/s
3 M.F.	1,500 kc/s to 600 kc/s	1,500 kc/s to 600 kc/s
4 M.F.	500 Kc/s to 200 kc/s	500 kc/s to 200 kc/s
5 M.F.	200 kc/s to 75 kc/s	Not applicable

I.F. 560 kc/s. Bandwidth 4.3 kc/s at 6 db. attenuation.

L.O. freq. 560 kc/s above incoming signal freq.

VALVES

V1, V2—D.F. switching	Triode hex. VR99A (X65 or X66)
V3—R.F. amplifier	Vari-μ pentode VR100 (KTW62 or KTW61)
V4—Freq. changer	T-H. VR99 (X65 or X66)
V5, V6—I.F. amps.	Vari-μ pent. VR100 (KTW62 or KTW61)
A.V.C. and B.F.O. V7, V8—2nd detector Visual meter switching limiter and output	VR101 double-diode-triode. MHLD6
V9—Visual meter switching	Double triode VR102 BL63
V10—Tuning indicator	VI103 Y61 or Y63

The VR99A and VR99 where being replaced with VR1581 (ECH35).

The frequency of the B.F.O. is 280 kc/s ± 3 kc/s.

The second harmonic is used to prevent the B.F.O. from being locked by the incoming I.F. signal.

I hope these few facts will come in useful to readers.—D. B. SMITH (Nottingham).

Training Courses

SIR,—The radio and television servicing course now running at Wesley Institute is intended for new entrants to the industry, and also for amateurs who wish to solve their home problems. Students wishing to take less advanced examinations can be catered for.

Details are as follows:

1. Evenings: Wednesdays, probably to be expanded to Mondays also (7 p.m. to 9 p.m.).
2. Fee: 20s. per one evening per session; 27s. 6d. per two evenings the session, ending July, 1957.
3. The instructor is employed in the research department of a well-known firm in the industry.

Wesley Institute is just off the Harrow Road, at Stonebridge, N.W.10.—E. N. FENNELL, B.Sc.(Econ.), F.R.G.S., L.C.P. (Head of Institute).

Amateur Tracking of "Mouse"

SIR,—Your correspondent, Mr. A. P. Buchanan, in reference to operation "Mouse," has written an interesting and thought-provoking letter.

Although some of us cannot hope to keep pace with the technical side of such matters, an article should prove of much interest to all types of readers and from the humblest amateur upward we are brought nearer to these great projects by the advent of the Great Magician—radio.

May I remark, if it is not out of place, to those who are modellers in any way, that many of the small fittings and gears as used in radio cannot be excelled for use in modelling, especially as radio apparatus demands such a high standard of workmanship and quality generally.—M. K. HUGGARD (Co. Wicklow).

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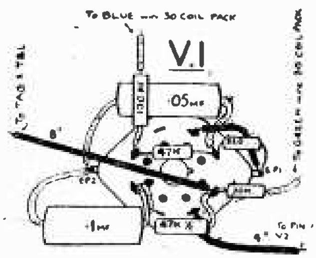

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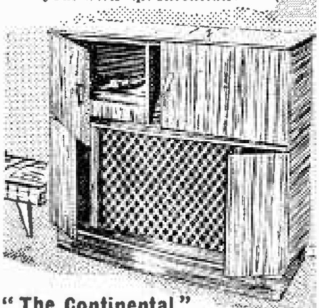

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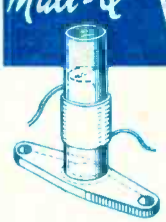

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