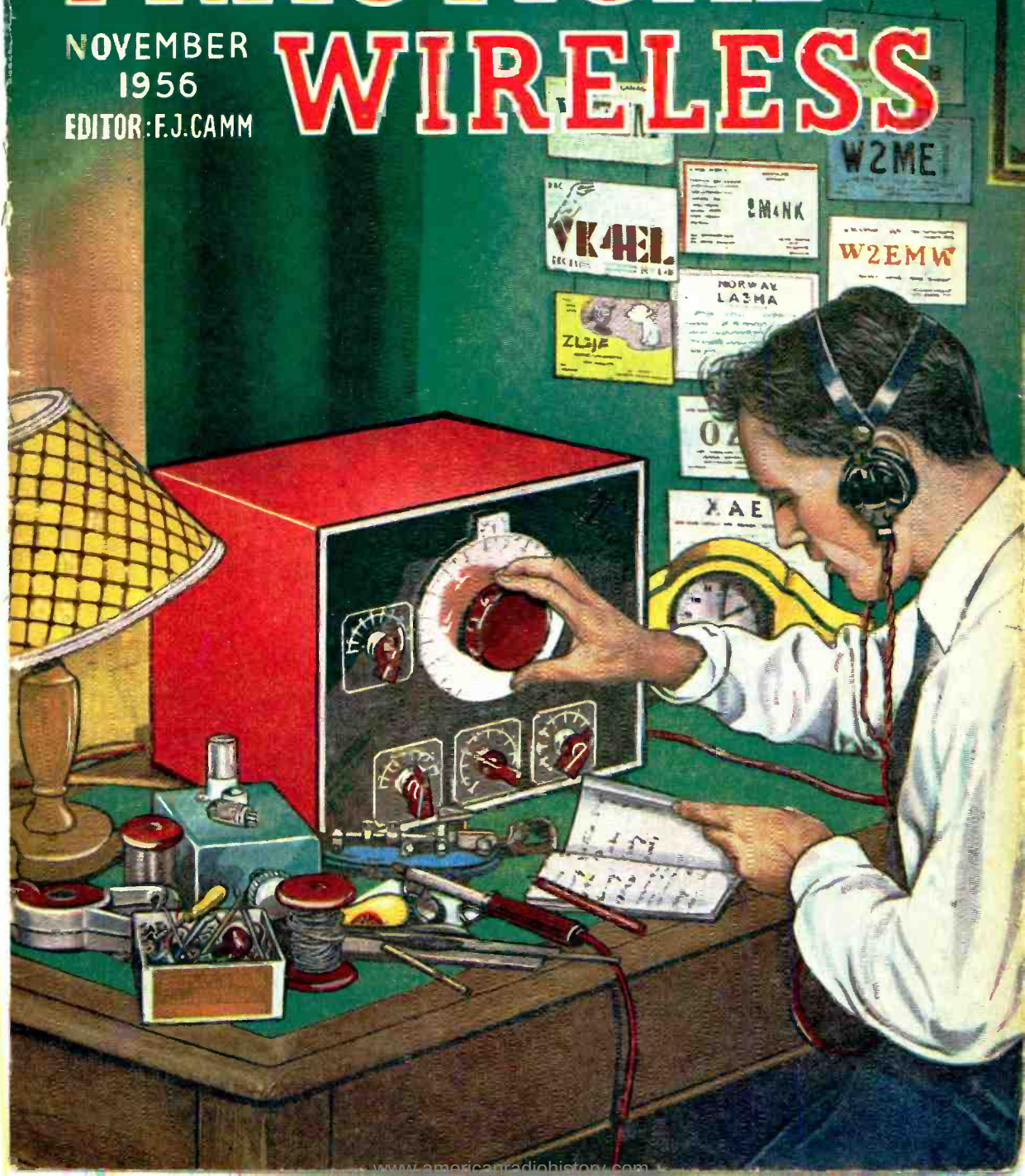
• THE BEGINNER'S SHORT-WAVE 3 •

PRACTICAL WIRELESS

1/3

NOVEMBER
1956
EDITOR: F.J. CAMM



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

LIMITED STOCKS—ORDER NOW.

These are NOT the usual 2 X 2 EG34 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. 2/6.

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. 3 amp., each..... 18 -

HEATER AUTO TRANSFORMERS

Designed to adapt common low-tension voltages 4 v., 5 v., 6.3 v. at 3 amps., centre tapped and interchangeable. Each 7 9.

TRANSFORMER MT6

Small mains transformer suitable for TV converters, etc. Primary 230 v., Secondary 250 v. 40 M.A. and 6.0 v., 1.5 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 3S4 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

SPECIAL OFFER

Indicator Unit Type 6 with Tube, Less Valves. Many useful Components 17 6. Carriage Paid. Anti-reference Aerial Type CD4 Indoor with full instructions, etc.. 13 6 each. Carriage Paid.

Our NEW 1956-57 Illustrated Catalogue is now ready. 48 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; ¼ meg.; ½ 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 IRON

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 stylli (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 F. An array with universal 10in.-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.

Transmitters T1154N, 25/- each. Transmitter: T1154H, 37 - each Transmitters T1154 in tough condition. 15 - each.

Carriage and postage on above transmitter is 12 6.

Meters 0-100 m/a., panel mounting, 7 6 each.

Meters 0-5 amp. R.F. panel mounting, 7 6 each.

PUBLICATIONS

each

No. 124—Bernard's Radio Manual "AT A GLANCE EQUIVALENTS" ★More than 8,000 Valves listed ★All Equivalents shown on one line ★Army, Air Force, Navy types ★Complete C V to Commercial Listing..... 5/-

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 1 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 Ferite 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 Please include 4d. postage per copy.

CRT ISOLATION TRANSFORMERS

NR8A 2 v.; NR8B 4 v.; NR8C 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 250/240 v., output 2-2½-2½-2-3 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.

LOUD SPEAKERS

All PM Types less Transformers

	Each
5in. Types by Elac, Lectrona, Celestion, 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., Celestion, etc.	25 6
6½in. Water Speaker by Truvox, suitable for Car Radio, etc.	20 -
12in. Plessey Lightweight.....	35 -
Elliptical Speakers, Goodmans, 10in. x 7in.	19/6

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.

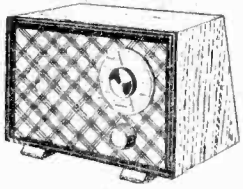
ALPHA RADIO SUPPLY CO.

5/6 VINCES CHAMBERS
VICTORIA SQUARE
LEEDS 1.

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

THE SKYSEARCHER
An all mains set for 19/6



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

THE REALITE

This is a complete fluorescent fitting, stove enamelled white, with starter and ballast all ready to install. Price 25/-, plus 4/6 carriage and packing. 40-watt tube, 10/-, no extra for packing if ordered with fitting.

MINIATURE MOTOR

Size only 2½ins. long by 1¼ins. diameter—American made—laminated poles and armature—intended for 28-volt D.C. but O.K. on lower D.C. voltages and A.C. mains, through step-down transformer—price 10/6, post, etc., 2/-.

MULTI-METER KIT

Parts suitable for making a multi-meter to measure volts, milliamps and ohms. Kit containing all the essential items including moving-coil meter, resistors, range selector, calibrated scale, etc., etc., is only 15/-, plus 1/- post and packing.

W.D. CIRCUIT DETAILS

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

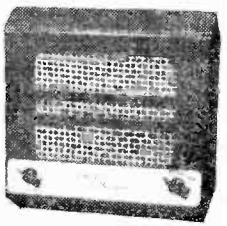
American Service Sheets	
A.1134	78 receiver
BC.348	76 receiver
BC.312	R28/ARC5
R.103A	R1116/A
BC.342	RA-1B
RA-1B	AR88D
R.2/8	AN/APA-1
R-1155	78
R-1124A	76
R-1132A/R-1481	R.T.18
R-1147	CAY-46-AAM-
R-1224A	RADAR
R-1082	A.S.B.-3
R-1355	Indicator 62A
B.C.1206-A/B	Indicator A.S.B.3
B-455-A (or -B)	Indicator 62
B-454-A (or -B)	Indicator 6K
B-456-A (or -B)	R.F. unit 24
Transmitter T1154	R.F. unit 25
Fifty-eight walkie talkie	R.F. unit 27
Frequency meter BC.221	Wireless set No. 19 Demobbed valves

The "CRISPIAN" Portable Radio

A 4-valve truly portable battery set with very many good features as follows: Ferrite rod aerials, low consumption valves, superhet circuit with A.V.C. ready-built and aligned chassis if required, beautiful two-tone cabinet covered with I.C.I. Rexine and Tygan. Guaranteed results on long and medium waves anywhere.

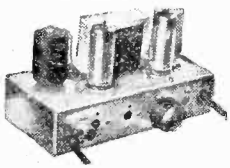
All parts, including speaker and cabinet, are available separately or if all ordered together the price is **£7.15** complete, post and ins. 3/6, ready-built chassis 30/- extra. Instruction booklet free with parts or available separately price 1/6.

OFFICE INTERCOM.



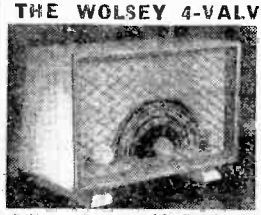
This is a 2-station "master" unit comprising an A.C. mains operated push-pull amplifier with built-in P.M. speaker which acts as microphone or loudspeaker depending on whether switch is set to "talk" or "listen." Complete in polished cabinet ready to work. Price only **£4/19/6**, plus 3/6 carriage and insurance. Sub stations 19/6 each.

PRODUCTION INCREASED — CIRCUIT IMPROVED—PRICE REDUCED



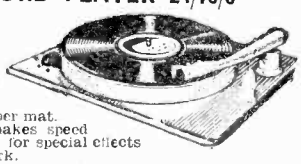
To-day's best value in Band III Converters suitable for your T.V. or money refunded. Complete ready to operate, **49/6** non mains, or **69/6** mains, post and insurance, 3/6.

THIS MONTH'S SNIP.
THE WOLSEY 4-VALVE SUPERHET



This excellent little receiver employs standard circuitry and is ideal as a second receiver for bedroom, kitchen, etc. It is a broadcast band set and will receive with only a few feet of aerial all stations of reasonable local strength. With a longer aerial hundreds of stations can be received. Complete, ready to work in modern-looking oak cabinet—limited quantity offered this month at **£6.15.0**, plus 5/- carriage and insurance. Overall size approximately 11¼" x 7" x 8".

RECORD PLAYER £4/10/0



3-speed Gramophone Motor

Latest rim drive 3-speed motor with metal turntable and rubber mat. Small mod. makes speed easily variable for special effects and dance work.

Hi-Fi Pick-up

Using famous Cosmocord Hi-G turn-over crystal. Separate sapphire for each speed. Neat bakelite case with pressure adjustment.

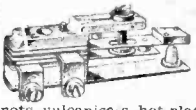
Special Snip Offer This Month

The two units for **£4/10/-**, plus 5/- post and insurance, or made up on board as illustrated. **£5/10/-**, plus 5/- post.

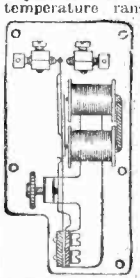
ELECTRIC BLANKET WIRE

Waterproof P.V.C. covered, so blanket washable. 16½ ohms per foot—1/6 per yard. 14 yards, ideal for average blanket, **£1** post free.

THERMOSTATS

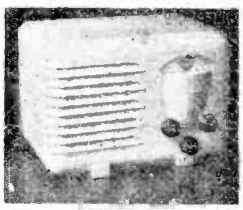


Useful for the control of appliances such as convectors, glue-pots, vulcanisers, hot plates, etc. Adjustable to operate over the temperature range 50-550 deg. F. 1½ amp., 3/6; 5 amp., 8/6; 2 amp. QMB, 5/6; 5 amp. QMB, 15/-.



HIGH-SPEED RELAY

This is a miniature type relay with change-over platinum contacts. Bobbins are 250 ohms each. Brand new — limited quantity. 7/6 each, post 1/6.



MAINS-MINI

Uses high-efficiency coils, covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, **£4/10/0**, plus 3/6 post. Constructional data free with the parts, or available separately 1/6.

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:—

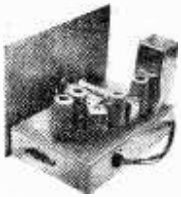
Mains transformer	19/6
5-amp. rectifier	17/6
Regulator Stud Switch	3/6
Resistance Wire	2/-
Resistance Former	2/6
Mains on/off Switch	1/-
0-5 amp. Moving Coil Meter	9/6
Constructional Data	1/6

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

BABY ALARM

Unlike most baby alarms, this not only enables you to hear baby but also to talk to him. Price complete with one microphone and 100ft. twin flex, **£6.19.6**, carriage 3/6, additional microphone, 19/6.

F.M. TUNER



This tuner is based upon the very successful circuit published by Data Publications. We have made up models at all branches and will gladly demonstrate. Stability is extremely good and making and aligning most simple. Cost of all parts, including valves, prepared metal chassis, wound coils and stove enamelled scale, slow-motion drive, pointer, tuning knob, in fact everything needed, is **£6.12.6**. Data is included free with the parts or is available separately, price **2**-.

THE TWIN 20

This is a complete fluorescent lighting fitting. It has built-in ballast and starters—stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the work-bench, and in similar locations. It uses two 20-watt lamps. Price, complete less tubes, **29.6**, or with two tubes, **39.6**. Post and insurance 5-. Extra 20-watt tubes, **7.6** each.

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 or 4 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 TV, many useful items can be made — record storage cabinet, H.F. loudspeaker case, book case, etc., etc. Price **15**-, carriage 3.6.

Cabinets For All

This is the "Empress," undoubtedly a beautiful piece of furniture, elegantly veneered in figured walnut and in white sycamore. The radio section is raised to convenient level but is not drilled or cut. The lower deck acts as the motor board, again is uncut. It measures 16" x 14" and has a clearance of 5" from the lid. There is a compartment for the storage of recordings. Overall dimensions of this essentially modern cabinet are 3ft. wide, 2ft. 8in. high and 1ft. 4½in. deep. Price **£14.14.0**, carriage and insurance 20-.

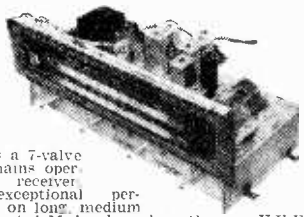
THE UNI—T.V.

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.
- ★ Ferruxcube, E.H.T. and scan coils.
- ★ 34/38 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 **£29.10.0**, plus 10- carriage and insurance. All parts guaranteed 12 months. Full information and data free with parts or available separately price **3.6**.

AM/FM RADIOGRAM CHASSIS



This is a 7-valve A.C. mains operated receiver. An exceptional performer on long, medium and short A.M. bands and on the new V.H.F. band. It is an ideal unit for a quality radiogram. Special features include magic eye tuning indicator, extra long scale and pointer travel—latest circuitry employing full A.V.C. feed-back, etc., etc. Undoubtedly one of the finest AM FM chassis available today. Chassis size 17in. x 6¼in. x 7½in. Price **£23.17.6**. Carriage, packing and insurance 20- extra.

NEW CIRCUIT

OCCASIONAL 56—we have evolved a new T.R.F. circuit and have had really good results, equal in fact to many superhets. You really should try this circuit. All parts including valves (6K7, 6J7, 6F6, and 6X5) and Bakelite case with back cost only **£5/10**-, plus 2.6 post and insurance. Data included with the parts is also available separately, price **2**-.

HUGE MINISTRY PURCHASE

R.1155—yours for £2 down

Frequency 75 kcs to 18 mcs—10 valves—metal case—robust receiver—cost over £60 to make—will give years of service, very little used. Price **£10** or 5 payments of **£2**. *Carr. & transit case 15-.*

SOMWEAVE

This really lovely loudspeaker fabric we offer at approximately a third of today's cost. It is 42in. wide and our price is **12**- per yard, or panels 12in. x 12in., **1.9** each. This is also very suitable for covering plain wooden case, for portable radio amplifiers, etc.

INDUSTRIAL OVERHEAD HEATER

Garages, large workshops, and other places difficult or impossible to heat by normal means can now have "warm spots" at relatively low cost (1d. per hour where electricity costs 1d. per unit). The Infray Major gives light as well as heat and has controls giving four variations. Consumption at full power is 1 kW. Price complete with chains, ready to work, **£7.10.0**, carriage and insurance 5-.

ELECTRONIC PRECISION EQUIPMENT, LTD.

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

Post enquiries to Eastbourne with stamped envelope, please.

42-46, Windmill Hill, Ruislip, Middx.	152-3, Fleet Street, E.C.4.	29, Stroud Green Rd., Finsbury Park, N.4.	249, Kilburn High Road, Kilburn.
Phone: RUISLIP 5780	Phone: FLEet 2833	Phone: ARChway 1049	MAIda Vale 4921.
Half day, Wednesday.	Half day, Saturday.	Half day, Thursday.	

LASKY'S PAGE OF MONEY-SAVING OFFERS

LASKY'S SCORE AGAIN!
GREATEST TAPE RECORDER BARGAIN EVER OFFERED!!

Not a kit, but a first-class, factory-built recorder—**the famous high fidelity "CONCERTONE"**—completely ready for use. Note these brief details: Two speeds, 7½ and 3¾in./sec. Two half-track Heads by Wearite. Power output 3-4 watts. Fast forward, 60 secs. Fast rewind, 45 secs. Overall size, closed, 16½ x 12 x 7in. approx. Gross weight 26 lbs. approx.

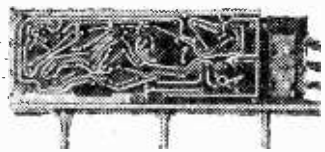
See and hear the incomparable "**Concertone**" at either of our addresses, or order by mail with complete confidence. GUARANTEED BY US FOR 12 MONTHS. Strictly limited number available.

LISTED AT £50.8.0

LASKY'S PRICE 33 GNS.

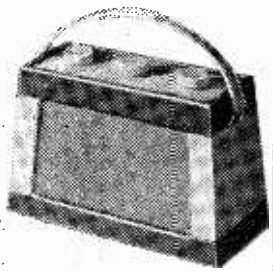
Complete with 1,200ft. reel of Emitape, take-up Spool and Microphone. Carr. and Insur. 21 - extra.

NEW BATTERY PORTABLE FOR HOME CONSTRUCTION ON PRINTED CIRCUIT



CAN BE BUILT FOR

£7.7.0



Uses all latest innovations, giving simplicity of construction with fine quality. The PRINTED CIRCUIT completely eliminates wiring errors.

10 STAR FEATURES make this the finest Portable Radio ever offered to the home constructor. Peak value for money has been obtained without sacrifice of quality or design.

- ★ PRINTED CIRCUIT. 7½ x 2¾in.
- ★ 5-valve Superhet, med. and long wave.
- ★ Low Consumption Valves. Double Battery Life.
- ★ Ferrite Rod Internal Aerial.
- ★ 3 or 5in. P.M. Moving Coil Speaker (your choice).
- ★ Brand New T.C.C. Capacitors.
- ★ Automatic Volume Control.
- ★ New Style Contemporary Case.
- ★ Lightweight and of Handsome Appearance.
- ★ Every Component available separately.

CIRCUIT DIAGRAM, assembly data, all instructions and shopping list, 1 6, post free.

DEMONSTRATION MODELS AT BOTH OUR ADDRESSES

3-SPD. AUTO-CHANGERS

Brand new in makers' cartons

CARRARD RC.110, STILL FURTHER REDUCED. Complete with t.c. crystal pick-up. Cream, brown finish. List £14.13.0.

Lasky's Price Carr. 5/- . **£7.19.6**

CARRARD RC.80. Full length arm with two Decca XMS heads. List £20.15.0.

Lasky's Price **£13.19.6**

Carr. 5/-. Also available with GC3 t.c. crystal p.u. at same price.

COLLARO RC.54, with Studio O t.c. crystal p.u., Carr. 5/-. **£8.19.6**

SINGLE RECORD PLAYERS

COLLARO RC3/554. 3-speed, single record player with studio O t.c. crystal p.u. List £9.9.0. Lasky's Price, **£6.10.0** post free.

B.S.R. type TU.8, 3-spd. motor, turntable, and HGP.59 t.c. crystal p.u., with two styli.

Lasky's Price **92/6** Post 3/6.

Without pick-up, 57 6. Post 2.6.

CONSTRUCTOR PARCELS

Each complete with your choice of Cabinet, 12 x 6½ x 5¼in. deep, walnut or ivory plastic or wood with walnut veneer.

PARCEL NO. 1. Everything to build a 4-valve, 3-wave superhet for 200/250 A.C. mains. Uses 6K8, 6K7, 6Q7, 6V6 valves. **CAN BE BUILT FOR £7.19.6.**

PARCEL NO. 2. Everything to build a T.R.F. 3-valve set for 200/250 A.C. mains, med. and long wave. Uses 6K7G, 6J7, 6V6 and metal rectifiers. **CAN BE BUILT FOR £5.10.0.**

Post 2/6. INSTRUCTION BOOKS, 1/- each, post free. All components available separately.

3-WATT MIDGET AC/DC AMPLIFIER

PUSH-PULL, VERY HIGH GAINS 4 valves: 2 UL41 in push-pull, 1 UCH42 and 1 UAF42. Input voltage 100/100 A.C./D.C. Easily converted to 230 volts. Ideal for ships record players, tape recorders, home record players, baby alarms, etc., etc. Supplied fully assembled with 4 valves and circuit diagram.

LASKY'S PRICE 50/-

Carr. 5/-.

SPECIAL OFFER!

GOODMANS 12in. Audiom 50 P.M. SPEAKERS.

10 watts. Limited quantity. List £6.15.0. **LASKY'S PRICE, 97/6** Post free.

5-VALVE RADIO CHASSIS

Brand new. A.C./D.C. 200-250 v. I.F. 465 kc/s A.V.C., 4-watts output. 3 station pre-set, frame-aerial, fully aligned. Chassis 10 x 5½in., max. height 5¼in. Wired ready for use with the addition of a speaker and output trans., 2 controls, volume and station switch. Valves used: 10C1, 10F9 or UF41, 10LD11, 10P14, U404 or UY41.

Lasky's Price, less valves, Post 3/6. **52/6**

AMAZING OFFER OF

BRAND NEW, PERFECT

16" METAL CONE C.R.T.

6.3 v. heater, Ion trap, 14 K.v. E.H.T., wide angle 70°, standard 38 m.m. neck duodecal base, magnetic focus and deflection. Length 17 11/16in. Gives large black and white picture 11in. x 14¼in.

Unused in original cartons. Guaranteed by us 3 months. Full data, connections and suggested time bases supplied with every Tube.

LISTED AT **£23.9.10** | **LASKY'S PRICE £8.9.6**

Carr. & Insur., 22 6 extra.

Masks, Anti-Corona Rings, Bases and Ion Traps available.

JASON "ARGONAUT" AM/FM TUNER

Complete parcel with power supplies. **£13.19.6** Post 3/6.

BOOK, with price list, 2/-. Chassis Assembly, **57/9**, Post 2/6. I.F. and Coil Set, **78/-**, Post 1/6.

JASON F.M. TUNER

Special Parcel containing data book, chassis, front end, dial, drive, tuning cond., full set of coils, ratio detector, etc., **68/9** Post 2/6.

Book, with price list, 2/-. This tuner can be built for £6.15.0, plus 3/6 post.

LASKY'S RADIO

LASKY'S (HARROW ROAD) LTD.
42, TOTTENHAM COURT ROAD, W.1.
Telephone: MUSeum 2605.
370, HARROW ROAD, PADDINGTON, W.9.
LADbroke 1075 and CUNningham 1979.
Open all day Saturday, early closing Thursday.

MOVING COIL P.M. SPEAKERS

3in. and 3½in., 19 6; 5in., 16/6; 6½in., 17 6; 8in., 25/-; 10in., 26 6; 12in., 29 6.

6½in. with trans., 21/-.
7 x 4 Elliptical, 19/6.
10 x 6 Elliptical, 32 3.

ALL MAIL ORDERS TO HARROW ROAD PLEASE

R.S.C. BATTERY CHARGING EQUIPMENT

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

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

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. **69/6**

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. 2.5 a.... ... 13/9
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
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

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

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**

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.

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 10 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/-

UNREPEATABLE OFFER

5Y3G, 5/9 ;	**5U4G, 6/9 ;**
6J5G, 3/9 ;	**MU14, 7/9 ;**
5Z4G, 7/9 ;	**6K7G, 2/9 ;**
35Z4, 5/9 ;	**EF80, 6/9 ;**
KT44, 5/9 ;	**6SL7GT, 5/9 ;**
6SN7GT, 5/9;	**6U5G, 3/9**

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, clamped upright mounting, 825-0-325 v. 100 mA, 6.3 v. 2.5 a, 5 v. 2 a, 19/9. Clamped upright mounting, small size, 250-250 v. 70 mA, 6.3 v. 2.5 a, 10/9.

EX-GOVT. TRANSFS., 230/250 v. 50 c/cs 8.8 v., 4 a, 9/9 ; 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., 3/9 ; 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. DOUBLE WOUND STEP UP/STEP DOWN TRANSFORMER. 10-0-100-200-220-240 v. to 5-0-75-115-135 v or REVERSE. 80/100 watts. Only 11/9, plus 2/9 post.

EX-GOVT. ELECTROLYTICS. Removed from unused equipment. 8-16 mfd. 550 v., 1/3 ; 16-16 mfd. 350 v., 1/3 ; 1,000 mfd. 6 v., with clip, 1/9 ; 50 mfd. 50 v., with clip, 9d.

EX-GOVT. CASE. Well ventilated black crackle finished, undrilled cover. Size 14 x 10 x 8½in. high. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE, OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage.

EX-GOVT. VALVES (NEW)

1T4	7/9	6V6GT	8/9	6AT6	7/9
1R5	7/9	6X5GT	7/9	EB91	8/9
1S5	7/9	6L6G	11/9	EF38	4/9
3S4	8/9	807	7/9	EL32	3/9
6K8G	9/9	12A6	7/9	EL91	5/9
6SJ7GT	6/9	15D2	4/9	KT66	11/9
6F6G	7/9	25Z4G	9/9	SP61	2/9
EF39	5/9	MH4	4/9	PX25	14/9

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		Can Types	
8μF 450 v. ...	1/9	8 mfd. 600 v.	2 11
8 mfd. 500 v.	2/6	16 mfd. 500 v.	3/9
16μF 350 v. ...	2/3	16 mfd. 350 v.	1 11
16μF 450 v. ...	2/9	16μF 450 v. ...	2/9
16μF 500 v. ...	3/9	32μF 350 v. ...	2 11
32μF 350 v. ...	3/9	32 mfd. 450 v.	4/9
25μF 25 v. ...	1/3	100 mfd. 450 v.	4/9
50μF 12 v. ...	1/3	8-8μF 450 v. ...	2/9
50 mfd. 25 v....	1/6	8-16μF 450 v.	2/11
50μF 50 v. ...	1/9	16-16μF 450 v.	3.11
100 mfd. 12 v.	1/9	16-32μF 350 v.	4 9
100 mfd. 25 v.	2/3	32-32μF 350 v.	4/9
1,000-1,000 mfd 6 v. ...	2/9	32-32μF 450 v.	5/9
1,500v	2/11	60-100 mfd. 350 v.	6.11
6,000 mfd. 6 v.	3/9	64-120 mfd. 350v.	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. 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 m.a. 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.

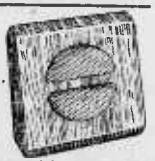
SPECIAL OFFERS 8-8 mfd. 450 v. small can electrolytics in lots of six, 1/6 ea. Small .0005 mfd. 2 Gangs, 4/9 ea.

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

EXTENSION SPEAKERS

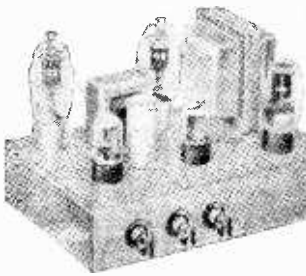
Ready for use in walnut veneered cabinet.

6½in. 2-3 ohms, 29/6.
8in. 2-3 ohms, 35/9.
Very limited number



VOLUME CONTROLS with long (1in. diam.) spindle all values, less switch, 2/9 ; with S.P. switch, 3/9 ; with D.P. switch, 4/6.

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.

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.

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. Minimun 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/-

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. Ac. Grid F.C Coupling is by bottom end condenser Coupling giving freedom from alignment troubles when Ac. 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. Output will load most Amplifiers requiring 500 M.V. input depending on Ac. location. Only 250 v. 15 mA. H.T., and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-8-7in. 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 5¼in. high Brand new, cartoned, at **£7/15/-**, carr. 3/6.

B.S.R. TU 8 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 **£4/17/6.** plus 3/6 carr.

3-4 WATT QUALITY AMPLIFIER. Designed for use with B.S.R. or Garrard Autochanger. Fitted separate Bass and Treble controls. Vol. Control and mains switch. Latest type B.V.A. valves used. For 200-250 v. A.C. mains. Ready for use. Only **£3/19/6.** carr. 3/6.

ELLIPTICAL P.M. SPEAKER, 7 x 4in. Goodmans. Suitable for above. **19/6.**

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.

R.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. Positive compensated identification of 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 0.75v. R.M.S. Carriage 7/6. Illustrated leaflet 6d.

Ready for Use ONLY 11 GNS.

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

P.M. SPEAKERS. All 2-3 ohms, 5in. Goodmans, **17/9.** 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.**

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.** 10in. R.A. Field, 1,000 ohms, **23/9.** 10in. R.A. Field, 1,500 ohms, **23/9.**

COAXIAL CABLE 75 ohms, 1in. **8d.** yard. Twin Screened Feeder, **11d.** yard.

SELENIUM RECTIFIERS

6/12 v. 1 a.	5/9	6/12v. ½a. H.W..	2/9
6/12 v. 2 a.	8/9	**H.T. Types H.W.**	
6/12 v. 3 a.	12/9	150 v. 40 mA.	3/9
6/12 v. 4 a.	16/9	250 v. 50 mA.	5/9
6/12 v. 6 a.	19/9	250 v. 80 mA.	7/9
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 5¼ 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 AN INEXPENSIVE QUALITY RADIO!

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

107/6

LOOK!

BUILD THIS POCKET RADIO FOR ONLY 37/6

AT LAST! In response to many requests we now present the **DOUBLE TRIODE "SKYPOCKET,"** a beautifully designed precision **POCKET RADIO.** No radio knowledge needed!—EVERY SINGLE PART TESTED BEFORE DESPATCH; **our simple, pictorial plans take you step-by-step.** This set has a remarkable sensitivity due to painstaking design. Covers all medium waves 200 to 550 Metres. Size only 5½in. x 3in. x 2in. in Strong, Transparent case with panel, cover and ivorine dial. A really personal-phone, pocket-radio **WITH DETACHABLE ROD AERIAL.** Self-contained all-dry battery operation. Average building time 1 hour. **Total Building Cost—including Case, Double Triode Valves, etc., in fact, everything down to the last nut and bolt—ONLY 37/6, with plans.** Postage, etc., 2/-. C.O.D. 1/6 extra. (Parts sold separately. Priced Parts List, etc., 1/6). **Demand is certain to be heavy—so SEND TODAY!**

47/6

Build this exceptionally sensitive twin-triode radio. Uses unique assembly system and can be built by anyone **without any radio knowledge whatever** in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6½in. x 5in. x 3in. Covers all Medium and Long waves—uses one only all-dry battery. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holidays, etc. **Many unsolicited testimonials. Mr. Norton, of Oxted, writes:** *Yesterday evening on the Medium waveband, I counted 32 separate stations: I am very pleased with the set, which is well worth the money.* **Total building cost—Everything down to last nut and bolt—47/6** (Postage, etc., 2/-)—**with full set of clear, easy-to-follow plans** (For Headphone Reception). Cost of Extra Valve, Speaker, Parts, etc., **38/6. All these fit inside Case** or parts sold separately (Priced Parts Lists, 2/-).

CONCORD ELECTRONICS (Dept. PWC), 69, PRESTON STREET, BRIGHTON, 1

Orders despatched by return of post. Cheques accepted. Cash on delivery 1/6 extra. Suppliers to Schools, Universities, Government and Research Establishments. Complete range of components and valves stocked.

PRACTICAL WIRELESS

EVERY MONTH EDITOR : F. J. CAMM 24th YEAR OF ISSUE

VOL. XXXII, No. 599, NOV., 1956

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.

Technical Trends

IF the Radio Show is intended to indicate to the public the general trend of design, the public must this year have been very disappointed, for it indicated beyond doubt that the trade during the past year had not developed anything which could be described as really new. No doubt the credit squeeze and the hire purchase restrictions are a discouragement to the manufacturers to launch anything new whilst they have large stocks to sell in a reluctant market. It may be, therefore, that the industry will consider it wise to run these exhibitions biennially instead of annually. There were, however, one or two indicative straws, which indicated the direction of the technical current. It was noted that there were gramophone motors having a fourth speed of 16 2/3 r.p.m. There are no records in this country for playing at that speed, and so the provision of this fourth speed must mean that sooner or later records will become available. A surprising development was the production of a 4.5 volt dry battery operated gramophone motor. There are many record players now available which make use of transistors, and the production of this battery motor is a possible indication of new developments in the record player market. The makers claim that the motor requires a current of only 80 milliamps at 4.5 volts, speed control being obtained by means of a variable resistance connected in series with a six volt or nine volt dry battery. The battery is automatically connected by means of a switch when the pick-up arm is swung towards the edge of the record. The speed of the motor is controlled by the usual type of centrifugal governor.

In view of the great publicity given to transistors last year, it was expected that there would be a plentiful supply of them this year. In fact, the number of receivers of this type was disappointingly low. It was stated that there are still production difficulties and that the output is by no means equal to demand. Two manufacturers exhibited in prototype form a method of transistorising car radio. They incorporated a push-pull transistor output stage and made use of special valves operated from a 12 volt H.T. battery providing the high tension supply. It was clear from conversations we had with manufacturers that, due to the shortage of high frequency transistors, there could not be any rapid change over to transistor receivers for some time to come. One manufacturer produced a magnetic disc recorder, which is an addition to their well-known tape recorders. It has a recording head which resembles a pick-up, and if a pick-up is used to replace the recording head the instrument may be used to play gramophone records.

TWO NEW HANDBOOKS

WE have recently published two important handbooks. The first, "**The Elements of Mechanics and Mechanisms,**" deals in a fascinating way with the natural and mechanical forces and the methods of using them. It deals with the laws of motion, horse power, force, energy and power, conduction, convection, radiation and heat, the lever, wheel and axle, inclined plane, wedge, screw, liquid pressure, hydraulics, pumps and water wheels, the Geneva mechanism, intermittent mechanisms, the principle of the gear, transmission methods, whilst a very complete chapter gives practical examples with calculations of a large number of miscellaneous mechanisms. It is an ideal book for the draughtsman, designer and inventor. It contains 432 pages and 481 illustrations and costs 30s., or 31s. by post.

The second volume is entitled "**The Home Electrician,**" costing 12s. 6d., or 13s. by post. It contains 206 pages and 149 illustrations and deals with rules and regulations, house installation, power wiring, electric light, layouts and wiring methods, house circuits, switches and control points, installing domestic apparatus, electric bells, burglar alarms, water heating, motor driven apparatus, accumulator charging and there is a very complete chapter on repairing electrical apparatus.—F. J. C.

OUR NEXT ISSUE, DATED DECEMBER, 1956, WILL BE PUBLISHED ON NOVEMBER 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 July, 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	1,297,303
Home Counties	1,288,887
Midland	1,008,249
North Eastern	1,312,989
North Western	997,965
South Western	823,825
Wales and Border Counties ...	516,188
Total England and Wales ...	7,245,406
Scotland	930,541
Northern Ireland	206,008
Grand Total	8,381,955

Belgian Radio Taxi Service

PYE, LTD., in association with Messrs. Semobel, their agents in Belgium, recently installed radio-telephone equipment in the Fra-Tax fleet of taxis which operates throughout the city of Brussels—the first permanent radio taxi service in Belgium. Each taxi has a compact Pye "Reporter" mobile radio mounted on the dashboard.

From the 15-watt radio control station, with its 13-metre transmitting aerial on the roof of the company's four-storey headquarters in the Avenue de Scheut, taxis can now be directed straight from one job to another without having to return to base after each journey.

Phototelegram Service Links Capitals

CABLE AND WIRELESS, LTD., announce the opening of a phototelegram service between Stockholm (Sweden) and Athens (Greece).

It is operated in Athens by Cable and Wireless, Ltd.

BBC's New Mobile Studio

A NEW mobile studio and control room designed by the BBC's engineering division is on the road and recently came into use.

The new vehicle weighs nearly 4½ tons and is 22ft. long, 7ft. 6in. wide and 9ft. high from road level. It contains an acoustically treated studio some 10ft. long by 7ft. wide together with a control room which provides facilities for controlling the output of the studio and a number of external sources, such as commentators' microphones which may be located at scattered points over the site of a large outside broadcast. Provision is also made for recording and reproducing programmes, for the introduction of effects from gramophone discs and for the reception of speech from commentators using a radio microphone.

Telephones are provided for communication with permanent BBC centres and other points, while the control engineer's and producer's positions are equipped with talk-back facilities enabling them to speak to the studio, or to the commentators for briefing.

V.H.F. in the West

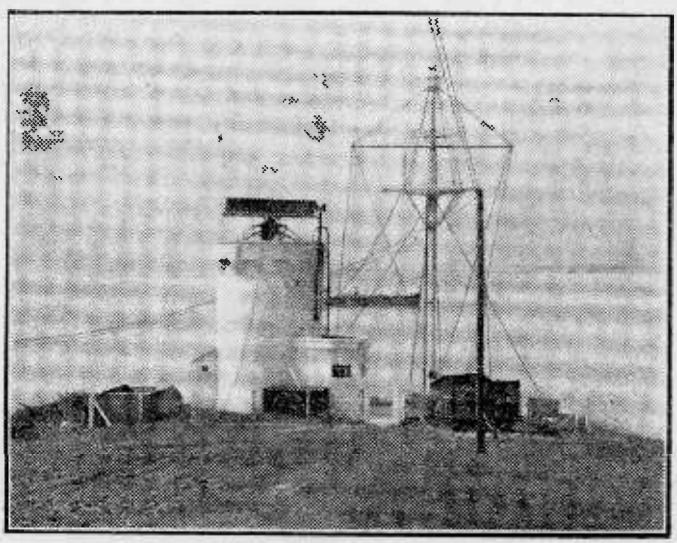
THE BBC's Very High Frequency sound broadcasting station at North Hessary Tor, South Devon, was brought into service on August 7th and transmits the West of England Home Service on 92.5 Mc/s, the Light Programme on 88.1 Mc/s, and the Third Programme on 90.3 Mc/s, each with an effective radiated power 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.

Marconi Radar Scanner

MARCONI'S WIRELESS TELEGRAPH COMPANY have recently carried out a series of functional tests on their 20 kilowatt, X-band surveillance radar type SNW.44 on a coastal site. This is one of a complete range of 3 cm. equipments designed to cope with a variety of control and surveillance problems in the maritime and aeronautical fields.

The SNW.44, by virtue of its narrow beam (0.5 degrees in the horizontal plane) and short pulse length (0.1 microseconds on ranges of 3 miles and below), provides a very high definition PPI display. The low power level of the transmitter, coupled with careful scanner design, ensures relative immunity from side-lobe and multiple echo effects, which can prove an embarrassment in the unequivocal interpretation of a picture.

The key to the performance and adaptability of this series is the high-gain, multispeed, power-tilted scanner. To these features can be



The new Marconi radar unit referred to above.

added that of a switchable polariser grid which introduces an impressive degree of discrimination against rain returns.

The illustration shows the radar scanner mounted on a tower overlooking the sea. The V.H.F. transmitting and receiving aerials are on the adjacent pole mast.

Radio Export Record

EXPORTS of British radio, television and electronic equipment set up a new monthly record of nearly £3.4 million in May, it is announced. The previous highest level had been £3.12 million in November last.

The May exports bring the total for the first five months of the year to over £15½ million, representing an annual rate of over £37 million, compared with a record figure of £33 million in 1955.

May exports by main groups are as follows :—

Radio and television receivers	£315,000
Sound reproducing equipment	£731,000
Components	£693,000
Valves and tubes ...	£264,000
Transmitters, communications equipment, navigation aids, etc.	£1,388,000
	£3,391,000

V.H.F. Radio Changes

THE Postmaster-General has approved the recommendations in the Second Report of the Mobile Radio Committee which advises him on matters affecting the users of V.H.F. mobile radio services. The committee's first report was published in April of last year. The second report incorporates for the record a revised allocation of frequency channels (or wavelengths) amongst the various categories of users of the land mobile services, details of which were approved and sent to users last year. It also contains proposals for introducing improved equipment to permit narrower operating channels in the higher of the two land mobile frequency bands. In brief, they are that 50 kc/s channelling should be adopted as the next stage in the development of the high band, this to become compulsory for new services and new equipment in that band as from January, 1957. It goes on to make certain recommendations about trials related to 25 kc/s equipment and states that early consideration should be given to the introduction of 25 kc/s equipment in the low band. . . .

Finally the report contains a revised sub-allocation plan for the high band based on 50 kc/s channelling.

The report is published by H.M. Stationery Office, price 1s. 6d.

"Sarah" Rescues Air Force Pilot

AFTER seven years' work on a secret product over a thousand workers in their canteen at Acton met the only customer who has used their equipment. He is Flying Officer Nigel Williams, of North Wales, who was the first member of the Royal Air Force to be rescued by the "Sarah" air-sea rescue system. This new system enables a pilot who has crashed to send signals to a rescue aircraft. It received its first real test when Flying Officer Williams, then a member of 66 Squadron, Linton-on-Ouse, was rescued from the North Sea off Filey Brigg following a parachute jump of 30,000ft. from a Hunter aircraft.

Accompanying Flying Officer Williams to the factory was the pilot of the helicopter which picked him up from the sea, Flight-Lieutenant Thompson, of Dagenham, based at R.A.F. Station, Thornaby, Nth. Yorkshire.

At the works of Ultra Electric, the designers and manufacturers of the equipment, the management and workers presented Flying Officer Williams with an inscribed silver tankard. The inscription read, "Whose homely guidance saved him from the drink." ("Sarah" sends out a signal which serves as a homing device.)

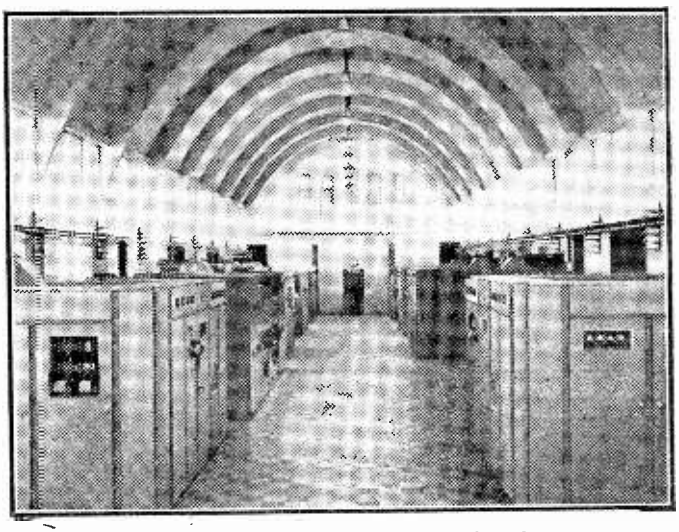
Mr. Edward Rosen, who made the presentation, also gave an Ultra television viewer to Flight-Lieutenant Thompson as a gift for the use of 275 Squadron Crew Room at Thornaby.

Obituary

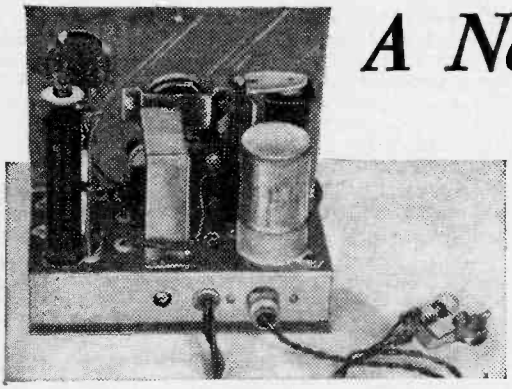
THE death has occurred, in his sixty-sixth year, of Mr. G. M. Wright, C.B.E., B.Eng., M.I.E.E., who was, until his retirement in 1954, Engineer-in-Chief of Marconi's Wireless Telegraph Co., Ltd.

George Maurice Wright was born in September, 1890. He joined Marconi's in 1912, after obtaining his B.Eng. degree at Sheffield University, and was attached to the Research Department, where he assisted C. S. Franklin and Captain H. J. Round, whose names are familiar in radio circles throughout the world.

During the first world war he was attached to the Admiralty for work on direction finding and other special duties, and was granted a temporary commission in the R.N.V.R. He was closely associated with the naval D.F. network, with which close watch was kept on movements of the German naval forces and Zeppelin fleet.



The transmitting hall of S. Africa's largest broadcast station at Parodys, near Bloemfontein. Marconi's have supplied nine 20kW H.F. broadcast transmitters to the South African Broadcasting Corporation's new station.



A Novel Baby Alarm

USING A VOICE-OPERATED RELAY IN A CIRCUIT WHICH IS ALSO SUITABLE FOR AUDIO CONTROL OF TAPE RECORDERS, TRANSMITTERS, ETC.

By Hugh Guy

(*Concluded from page 525 October issue*)

Chassis Details

THE whole device is mounted on a chassis bent from a single sheet of 18 s.w.g. aluminium measuring 6in. by 8¾in. Marking out information is given in the plan of Fig. 3, which shows a top chassis view before bending.

The only additional metalwork required are two brackets ; one is for the preset control VR1 and the other is a clip for mounting the crystal microphone on the front of the unit. The dimensions for both these brackets are given in Fig. 4.

If it is decided to use an externally connected microphone, then obviously no clip will be required, and the hole 1¼in. diameter in the front panel can be omitted. It will be necessary to drill an extra hole for the socket for this external connection, however, and a suitable space can be found at the left of the ¾in. diameter hole on the back of the chassis.

The layout of the chassis assumes the use of a heater transformer in the circuit, and the fixing centres for this component will not necessarily agree with those on the drawing ; one of these holes was also used to fit the potentiometer bracket.

There is ample room on the chassis for any necessary modifications as the photographic views of the complete unit clearly show.

Assembly and Wiring

The components should be mounted as illustrated. The crystal microphone should be screwed on first as the heater transformer will block access to it otherwise. The screened lead should also be wired to it before mounting the transformer for the same reason. The earth terminal of the microphone is marked E and the screened braiding should be connected to it.

It is preferable to connect the heater and H.T. supplies first so that leads carrying A.C., which should be twisted wherever possible to minimise radiation, can be kept close to the chassis. Any unwanted hum picked up in the amplifier will lessen the sensitivity of the device.

The diagram (Fig. 5) shows the method of wiring the chassis to the circuit of Fig. 1.

Testing, Setting up and Use

When the unit is ready for testing, connect a short length of flex with a 6.3 volt pilot lamp at one end, to the socket SK1. Switch the unit on, remembering that the chassis can be live and therefore observing the normal precautions.

While the unit warms up the pilot light will be on. Allow at least five minutes for complete warming up before attempting setting the unit up. The D.C. amplifiers will need this time to settle down to steady operating conditions.

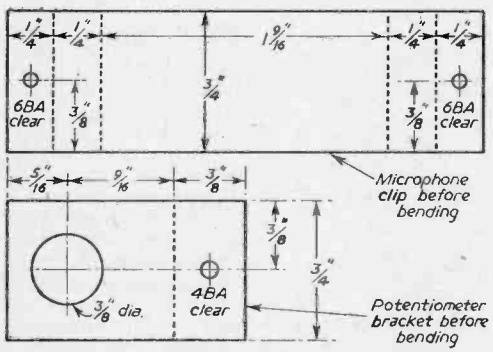


Fig. 4.—Details of the brackets.

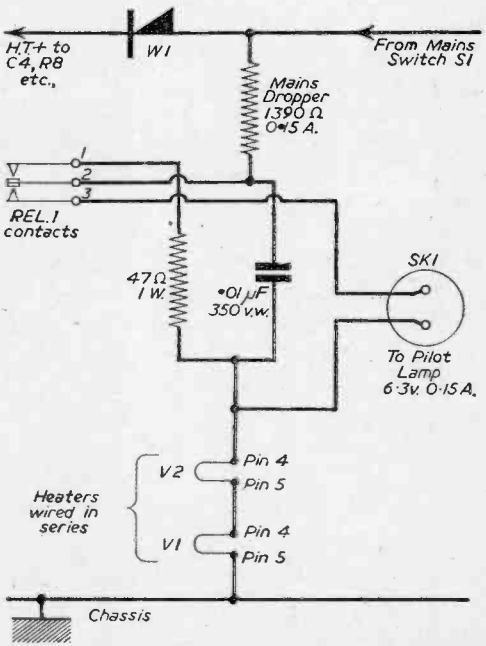


Fig. 2.—Modification for D.C. or A.C./D.C. power supply.

With a screwdriver, turn the preset control fully anti-clockwise when, if the potentiometer has been wired correctly, the relay will be energised, i.e., it will pull in. Now gradually rotate the control in the other direction, being careful to make as little mechanical disturbance as possible. This process should be carried out in relative quiet, too, since any noise may tend to switch the relay over as the control approaches the critical point.

A position will be reached when the relay suddenly drops out. Now the control should be turned back a fraction to energise it again. The amount of "backlash" on the control for the changeover to take place should be very small. A brief whistle or blow into the microphone should now cause the relay to open and close when the signal stops, switching on the pilot light for this duration.

Now it may be that once the critical point has been found the relay starts to click continuously, only stopping if the mains supply is switched off for a few seconds. This effect is caused by acoustic feedback in the unit. The disturbance caused by the relay pulling in is fed to the microphone as a signal which is amplified, just as any desired signal would be, opening the relay again. The disturbance ceases, the relay closes again with a click which sets off the chain once more.

This effect can be used to advantage if an intermittent form of alarm is required. In this case when the instrument warms up one noise of any description will set the relay off, and the latter will then provide its own signal to keep the alarm going. The pilot lamp will glow continuously if the signal (e.g., the baby's cries) are continuous, but will flicker intermittently thereafter until reset by switching off the alarm momentarily.

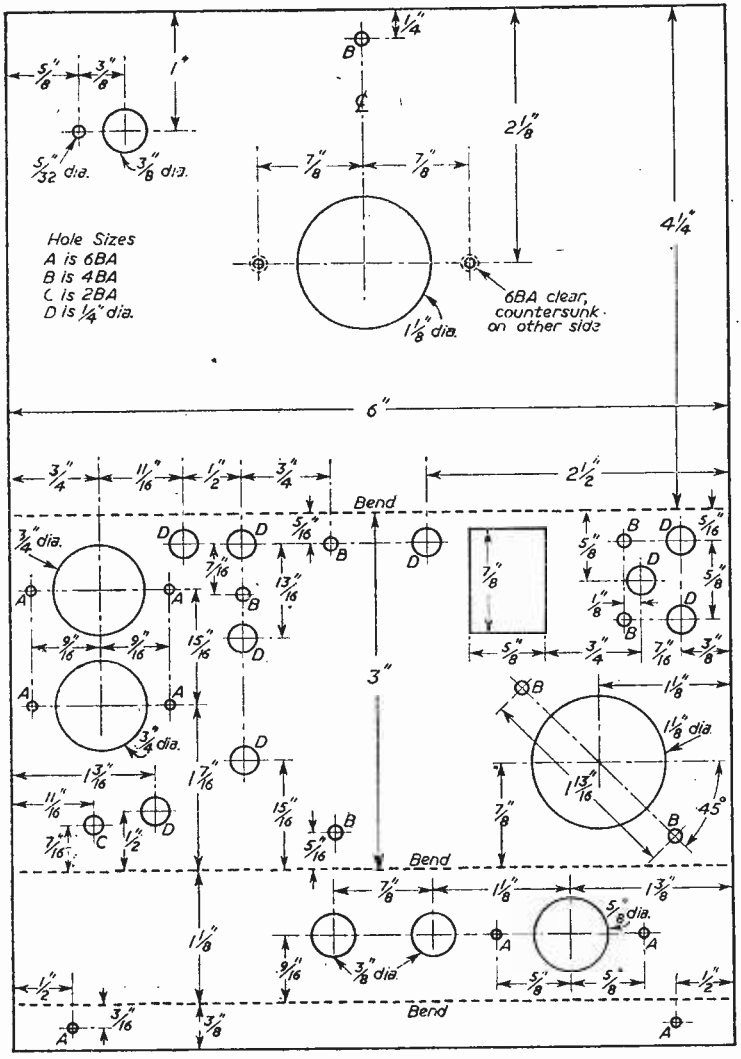


Fig. 3.—Marking out and bending details for the chassis.

Modifications and Precautions

To arrange that signals do not cause intermittent alarms necessitates acoustically screening either the microphone or the relay; preferably the latter. To deaden the click as the relay pulls in adhesive tape may be secured to the pole piece of the relay. This may result in insufficient clearance between the key and the pole piece for the contacts to close. In this case the contacts can be bent slightly or the copper pip on the key filed away. Mounting either the relay or the microphone on "bungy" mounts will also help. For example, two rubber grommets could be used as insulating mounts for the relay. If a cover is available for the relay it should be used, space permitting. Electrically the relay can be quietened by connecting an electrolytic condenser across the coil. A value of 8μF at 150 volts working should prove adequate. This connection may result in a slight loss in sensitivity.

Another method is to connect a 25K wirewound potentiometer temporarily in place of R10, the common cathode resistor to V2. Wired as a variable resistor, this control should gradually be increased until the relay only just pulls in after a signal. This pulling in should be quiet enough not to retrigger the alarm. Once this value has been found a fixed resistor of the same value can be substituted for the control.

However, the most satisfactory method by far is to mount the microphone externally in the manner mentioned previously. This has the added

advantage that the microphone can be suspended exactly where it is wanted, in particular above the infant's cot. The whole device would obviously be far more sensitive this way. If this is done, then both the microphone and its connections must be thoroughly insulated to avoid the possibility of an electric shock.

For the same reason, the unit must be mounted in an insulated cabinet. Quite a simple case can be made from either stiff board or hardboard if the constructor wishes to avoid a lot of woodwork. A suitable cabinet would be about 3½in. deep with a 6in. square front. A 4 B.A. screw holds the front panel at the front of the cabinet and two woodscrews or 6 B.A. screws secure the chassis by means of the mounting flap at the back. Three holes should be cut in the back panel of the cabinet to allow the leads to pass through and to give access to the preset control.

If the device is required to operate the relay once only for an input signal, holding the relay off until reset manually, as for the burglar alarm type of function, then R9 must be increased from 5.6K to 27K.

As a burglar alarm the microphone is best used externally to the device, being hidden at a crucial point so that a mechanical vibration of disturbance would be the signal that operates the alarm rather than a random noise. This would minimise false alarms.

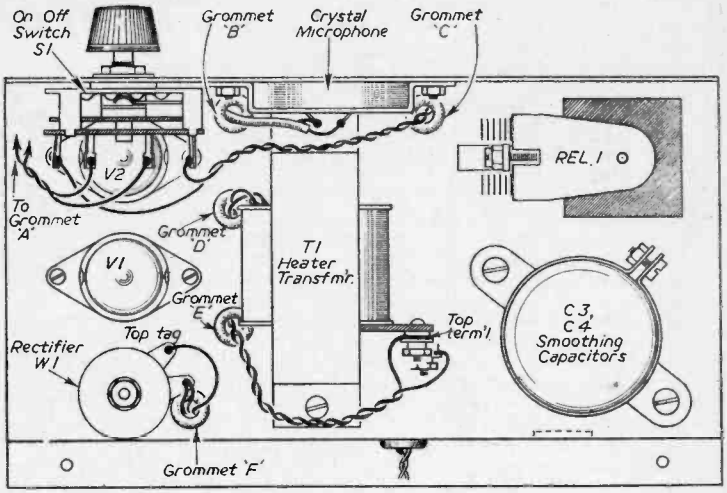


Fig. 6.—Above chassis wiring.

As pointed out in the first article, it should not be a difficult matter for the experimenter to make a device of this nature carry out any desired function where sound picked up by the microphone actuates the relay as a triggering source.

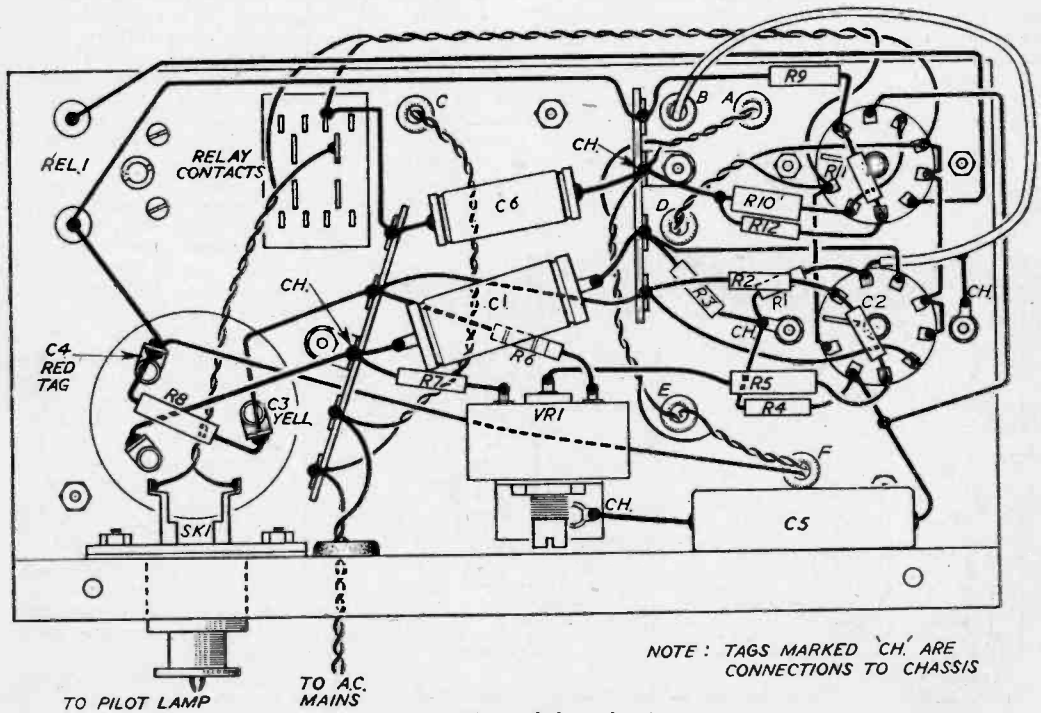


Fig. 5.—Wiring below chassis.

Making A Radiogram Cabinet

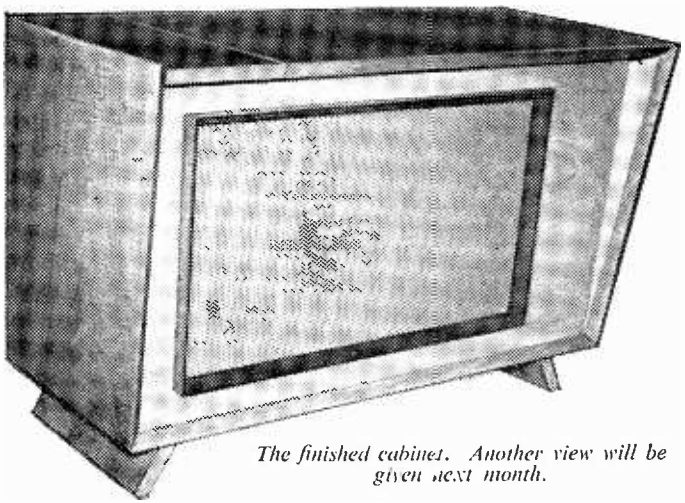
A CONTEMPORARY DESIGN FOR THE HANDYMAN

By R. J. Applin

THE idea behind the construction of this radiogram cabinet was twofold. First, it was an attempt to design a cabinet which would "fit in" with a layout of more modern trends in furniture—a common failing amongst most commercially produced designs—and be pleasing to the eye. Secondly, to construct a cabinet for a minimum sum of money, the resulting cost being approximately five guineas, this being very reasonable in comparison with the ready-made examples available.

The cabinet is of very simple construction, enabling it to be completed in the minimum of time and with no unnecessary loss of temper to such inexperienced cabinet-makers as myself, due to difficult joints occurring everywhere. The colour chosen in the case of the original was basically light in order to tone in with a corresponding furniture lay-out. The woods used being a light hardwood of the obeche family for the basic framing—being easily obtainable and very good to work—chestnut was used for the outer casing, birch-faced plywood for the front and inside top panel, and a trim of black walnut applied around the fret to provide a small decoration. The whole cabinet then being finished with a natural polish to preserve the original colours.

The construction, as said earlier, is very simple and nothing further is required than the tools normally found in an amateur handyman's box. It can be conveniently divided into two sections: the "skeleton" framing and the outer casing.



The finished cabinet. Another view will be given next month.

The Framing

This is constructed completely from 1in. × 1in. and 1½in. × 1in. obeche or similar wood, with the exception of the two 4in. × ½in. × 34½in. lengths of chestnut which form the visible inside faces of the top of the cabinet.

First step in the construction is to cut the two lengths of 4in. × ½in. chestnut to length and notch these members as shown on the drawing where required to accommodate the framing. At this stage it is advisable to work up a finished surface on the inside faces of these two members as they become more inaccessible as the construction proceeds.

The six top cross members may now be cut to size and the whole glued and screwed together, ensuring that it is square and true in all directions.

A cold water resin glue is most suitable for use in this case and 24 hours should be allowed before cleaning up projecting ends of cross-members with a plane.

The next step is to prepare the two long and two short 1½in. × 1in. obeche bottom members, again cutting all notches necessary and also the ½in. deep housing at an angle of 60 deg. on the inside faces in the positions shown on the drawing to accommodate the legs.

Cut the four 1in. × 1in. obeche corner uprights to length and glue and screw these members to the top framing in their appropriate positions.

The four longitudinal bottom members may now be fixed in a similar manner to the bottom of these uprights, and the whole structure again tested for squareness. This is most important.

It will be seen that the joints used here and at the top are plain butt joints, and a query may arise as to their strength and ability to hold the frame together. However, no doubts need be expressed here, as with the correct application of glue and adequate screws the frame is extremely robust when completed.

The 1in. × 1in. intermediate upright members may now be cut to length, notched at their upper ends as shown and glued and screwed into position.

To complete the basic framing the two intermediate 1in. × 1in. bottom members are now cut to

dead length, and likewise fixed in their respective positions.

The Feet

These are cut from ¾in. thick chestnut and must be splayed at an angle of 60 deg. along their bottom edge. This is not a difficult operation and may be done with a smoothing plane, working inwards from both ends to avoid splitting the wood.

The feet are set in the housings in the bottom framing members to show 4in. below the lower edge of the frame and are glued in position and secured with screws driven in from the outside.

It may be profitable here to mention the advisability of preventing the resin glue used from coming into contact with any exposed faces of the chestnut, as a bright purple stain will result which it is difficult to remove, and is obviously most unsightly.

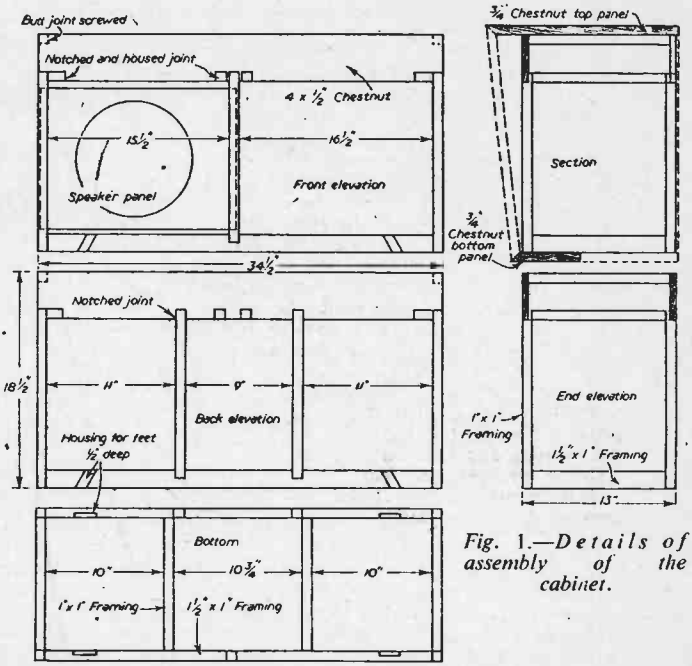


Fig. 1.—Details of assembly of the cabinet.

The Outer Casing

With the "skeleton" framework complete, the outer casing may next be developed and fixed around it. This is done in several operations, the first part to be applied being the plywood front panel.

This is cut from ⅜in. thick faced plywood to a finished size of 34½in. by 18½in., being the overall size of the framing.

A section of wood 25in. by 14½in. is then cut out of the panel for the speaker fret. The edges left must be cleaned and squared up to take the small moulding which surrounds the fret, but the fitting of this moulding is preferably left to a later stage in the construction to avoid possible damage.

The section of plywood removed should be retained as it is to be used as an in-filling panel to the bottom. As the expanded metal material used for the speaker fret is rather expensive, this is best obtained cut to the exact size needed, and in calculating this 1in. should be allowed for fixing all round giving a panel 27in. long by 16½in. high.

This material may be obtained in various colours to suit individual tastes, that used on the original being B.M.A. finish.

A shallow rebate 1in. wide must be formed on the back of the plywood to accommodate the metal fret and this is best done by cutting and stripping off two laminations of the wood—not a difficult operation.

The metal fret may next be fixed into position with washers and very small screws at about 6in. intervals all round.

When this is completed glue may be applied to the front of the framework on the face of all members and the complete front panel pressed firmly into place and held at intervals with small G-cramps until the glue is dry.

Again 24 hours should be allowed before interfering to ensure that adequate strength has developed in the glue.

The bottom panel is the next member to be applied.

As it would be an unnecessary waste of expensive material, this panel does not run the full depth of the cabinet, being only 6in. wide as may be ascertained from the drawing. The remaining gap between the legs being partly covered with plywood.

The bottom panel is cut to size from ¾in.

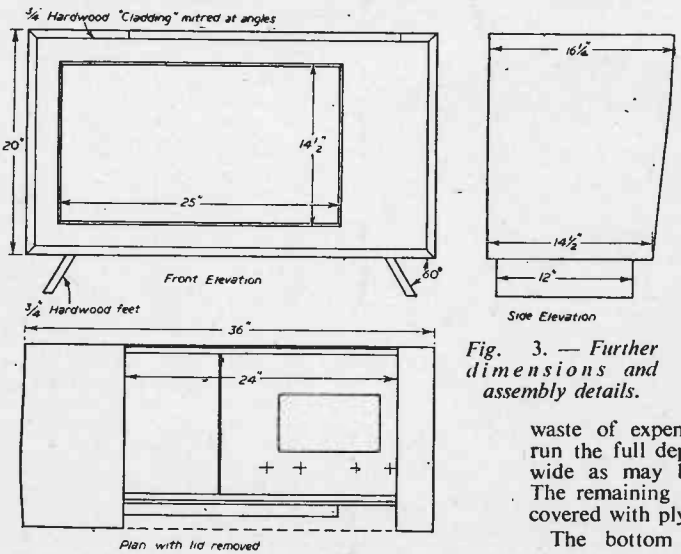


Fig. 3. — Further dimensions and assembly details.

chestnut and is 36in. long by 6in. wide overall.

The first step in the fitting of this member is to cut two slots at 60 deg. and sufficiently deep to accommodate the projecting feet underneath. If these slots are accurately cut they will give added support to the feet to resist spreading.

Next the chamfered front edge must be worked on to the material at an angle of 45 deg., and this may be easily done with a smoothing plane and a guide line. Lastly, two mitres have to be cut on the ends of the panel to form the joint between this and the side panels, and this operation should be most carefully done.

Glue may now be applied to the underside of the framing where in contact with the panel, and the panel slid into position and screwed to the framing.

To fill the void left between this bottom panel and the back of the frame the piece of $\frac{3}{8}$in. plywood cut from the front panel is employed. This is cut to width, $\frac{1}{4}$in. being allowed to project beyond the back of the framing and screwed into position between the feet.

This panel is not large enough to fill completely the void between the feet and the space remaining is left open to allow a current of cool air to circulate around the radio when in operation. Next the two end panels may be cut and fixed in position.

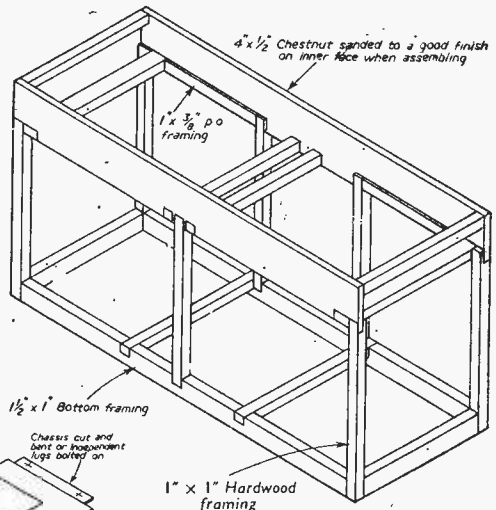


Fig. 2.—Details of the carcass.

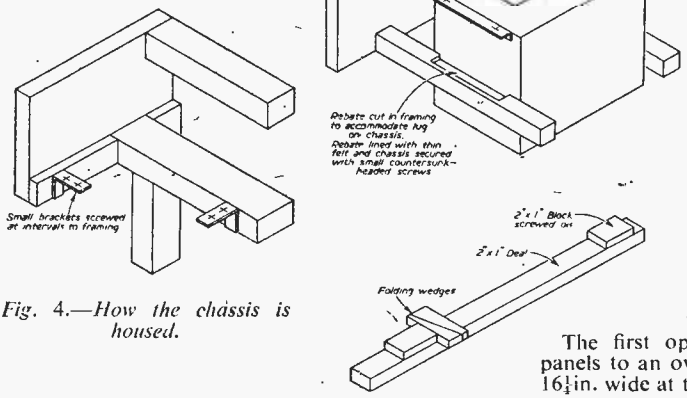


Fig. 4.—How the chassis is housed.

The timber for the end panels and the top should be obtained in one length if possible, so that a continual matching grain is visible in the wood all round the cabinet.

Assuming that this piece of wood is available the end panels will be cut from either end of it, leaving the centre piece for the top.

The first operation, then, is to cut these end panels to an overall size of 20in. high by 14$\frac{1}{2}$in. to 16$\frac{1}{4}$in. wide at the top. *(To be continued)*

LIST OF MATERIALS REQUIRED

Member	Material	Size required	Finished size
Frame :			
1in. × 1in.	Light h/wood (obeche or similar)	16ft. run	—
1½in. × 1in.	— do. —	11ft. run	—
1in. × ⅜in.	— do. —	5ft. run	—
Top frame members ...	½in. thick chestnut	2/36in. × 4in. wide	2/36in. × 4in.
Panelling :			
Bottom	¾in. chestnut	36in. × 6in. wide	36in. × 6in. wide*
Ends (2)	— do. —	20in. × 16¼in. wide	20in. × 16¼in. to 14½in.*
Top	— do. —	36in. × 16¼in. wide	36in. × 16¼in. wide*
Front	¾in. birch-faced ply	36in. × 20in.	34½in. × 18½in. high
Fascia	— do. —	18in. × 13in.	18in. × 12in. wide
Motor board	— do. —	18in. × 13in.	18in. × 12in. wide
Feet (2)	¾in. chestnut	8in. × 12in. wide	8in. × 12in. wide
Speaker panel	¾in. ply	16½in. × 12in. (approx.)	
Back panel	¼in. ply	36in. × 19in.	34½in. × 18½in. high
Sundries :			
Trim to fret	1½in. × ⅜in. walnut	7 feet run	—
Fret	E.M.L.	27in. × 16½in. high	—
Piano hinge	Brass	24in. long	—
'Gram stay	— do. —	—	—
3/16in. × ⅜in. strip ...	— do. —	2 lengths. 16¼in. each	—

* Cut from one sheet.

TRANSMITTING TOPICS

807s IN CLASS AB2

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

FURTHER to information published upon the use of Class AB2 tetrodes in modulators, considerable "on the air," written and personal discussion has revealed that there is a great deal of interest in more detailed information on this subject. This particularly applies to the use of 807 tubes as Class AB2 modulators, as these popular valves are still freely available at very low prices. Generally speaking, there is a need for precise information upon operating 807s at ratings other than those for which data is available. Thus one well-known handbook quotes the "all-out" operating condition for the 807. This "all-out" condition requires an anode voltage of 750 volts and gives 120 watts of audio. However, no indication is given of the load and operating conditions to give an output of, say, 75 watts, as required to anode modulate the final running at our legal maximum of 150 watts P.A. input.

Before dealing with this point, however, there are some other points. While alarm and apprehension are shown at the question of "exact" matching of loads, many other factors of greater importance are completely ignored. These are essential, however, for correct operation of tetrode stages in Class AB2. The question of power supply regulation is one such point. If the rated output power is to be achieved it is essential to operate with well regulated power supplies. Thus, ideally, the anode and screen supply voltages should not vary by more than 7 per cent. from no signal to full output conditions. When the anode current may swing from 60 mA up to 240 mA under full output conditions the need for good regulation is apparent. Note, moreover, that the figure of 240 mA is *not* a "peak" figure; it is the actual standing D.C. input to the modulator stage, and will be indicated by a plate current meter if the modulator is operating on a steady sine wave input producing full output conditions! Under similar conditions the quiescent screen current may be, say, 5 mA, and this rises to 21 mA at full signal output conditions.

The use of a choke input power supply circuit will enable the anode potential to be kept reasonably stable. For the screen supply a straightforward dropping resistor is out of the question due to the large fluctuation in screen current, so that a stabilised supply using two 150-volt neon stabilisers is necessary. Fig. 1 shows the set-up for supplying the screen with a stabilised 300 volts supply, when using a 500-volt main power supply. The 7,000 ohms dropping resistor should be a wirewound unit of at least six watts rating. A 12-watt resistor rating is preferable for a safety margin. The stabiliser tubes should be the Brimar type VR150/30, or some similar tube capable of carrying 40 mA maximum current. If some trifling miscalculation occurs, i.e., a resistor greater than 7 K is used, *or* if the anode supply regulation is not as good as it should be, so that the anode supply rail drops excessively below 500 volts at peak signal outputs, then the neon tubes may be extinguished on voice peaks. The cure is to reduce

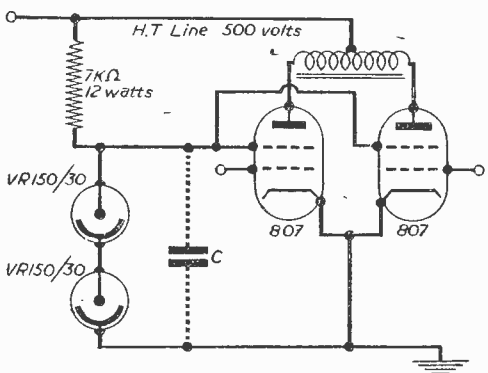


Fig. 1.—A simple stabilising circuit for the screen supply of a pair of 807s. If a higher main power supply voltage is used the dropping resistor must be further increased. Thus for a 600-volt line use a 10 K. resistor. A wirewound 12-watt resistor is recommended. C (8 microfarads) may be required. (See text.)

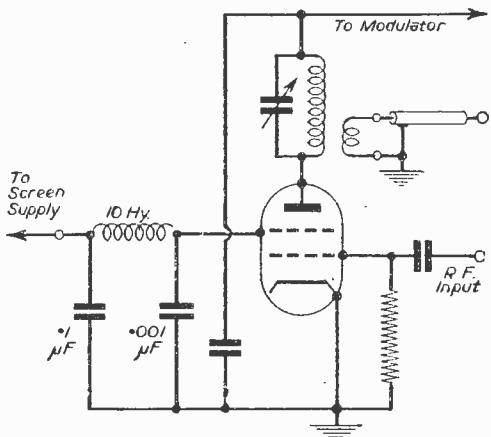


Fig. 3.—Illustrating the "self screen modulation" circuit for obtaining "free" screen modulation power when only the anode supply is modulated in the P.A. stage. A small choke of 10 henries inductance is adequate. The choke should be shunted by a 10 K. to 25 K. resistor if audio "howl" is experienced.

the value of the dropper resistor, but this cannot be carried so far as to permit of passing excessive current through the stabilising neon tubes. A condenser shunted across the screen (dotted lines) may help to prevent the stabiliser tubes extinguishing under these conditions. An 8 μF electrolytic may be used for this function of holding the voltage drop on transient peaks.

A further point that is important is that Class AB2 involves driving the modulator grids into the positive region, and thus drawing grid current. This means that the virtually infinite impedance of the grids in the negative bias region abruptly changes to a very low impedance, say 500 ohms, in the positive region. It also means that appreciable drive power is required when grid current is drawn. In fact, the Class AB2 807s require a drive power of some 0.2 watts. However, a driver tube capable of far more drive power, e.g., a 6V6 should be used, so there is no fear of the driver stage being overloaded, and also so that distortion can be minimised. Moreover, due to the fact that grid current flows at signal peaks, a driver transformer of suitable characteristic is essential. It is necessary for example that the D.C. resistance of each half of the driver secondary winding does not exceed some 500 ohms. In addition the leakage inductance should not exceed a figure giving an impedance of 700 ohms at the highest audio frequency it is desired to handle. A suitable driver transformer may be obtained commercially, such as the DM5 of Technical Services.

Transformers Backwards

However, certain pre-war "output" transformers, such as the Ferranti OP1/C may be used "backwards" as driver transformers. That is to say the low resistance push-pull primary is used as the secondary, and the "high impedance loudspeaker output" winding is used as the anode winding for the driver valve. Several small push-pull output transformers may be used in this way, but it is desirable in any case to load the transformer secondary with a resistance of, say, 10,000 or 5,000 ohms in order to minimise the abrupt change of grid impedance when the grid swings into the positive region. Negative feedback in the driver stage is also helpful to minimise distortion in the driver stage due to the varying loading conditions.

In order to present the possible output conditions compactly, these are shown graphically in Fig. 2. These represent a transition (above 600 volts anode potential) from "Continuous Commercial Service" ratings to the more generous "Intermittent Commercial and Amateur Service" ratings. These do not represent the only possible operating conditions, but will be found convenient in practice. Moreover, for British amateurs, the 75-watt output condition may be achieved with a 500-volt power supply, so that the higher ratings are not so important. However, if one operates at, say, the 600 volts condition, then the extra output power in hand does mean that the power regulation need not be so exact, as the valves need not be driven so hard and the peak current requirements will be lessened.

It should be noted that the bias voltage should not vary by more than 3 per cent. While a stabilised bias voltage supply may be used a simpler solution is to use small deaf-aid cells to provide the bias voltage required, as they will have very long life operating as bias batteries. In fact, the grid-current tends to "charge up" the bias battery, so that if (as is not unknown!) a disused deaf-aid battery discarded because of failing voltage is used, it may charge up after a little service, recover its lost voltage, and heavily overbias the voltage modulator tubes! This is important, as there is only a small change of bias voltage to cover the operating conditions ranging

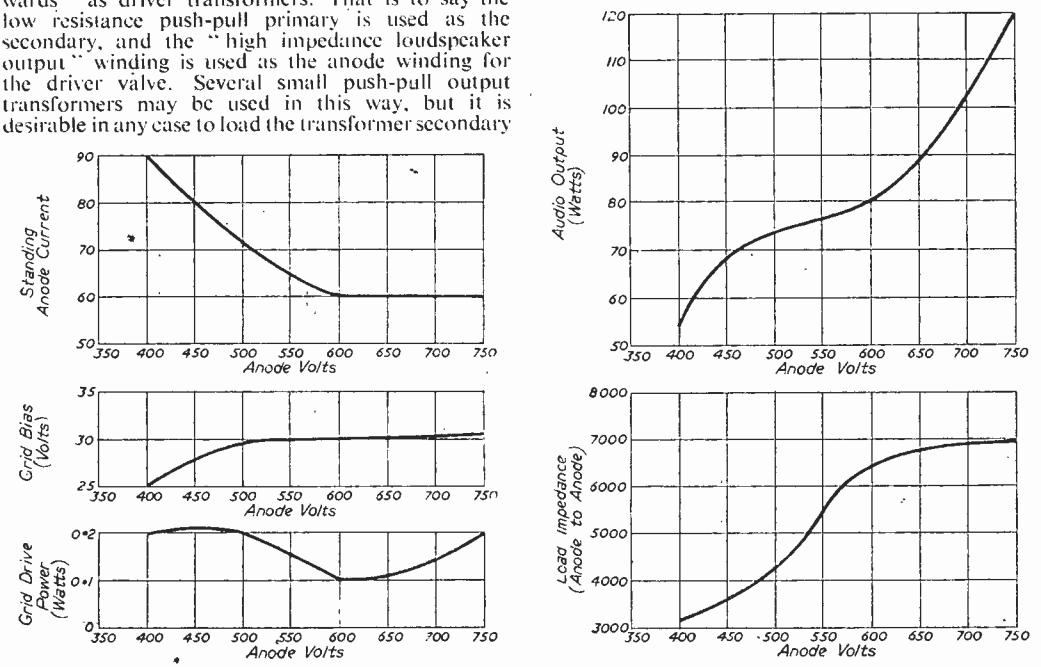


Fig. 2. — The curves show the power output, load impedance, zero signal quiescent current, required grid bias and drive power requirements for a pair of 807 valves in Class AB2 at various anode supply voltages. In all cases the screen potential is 300 volts, and the full signal anode current is 240 mA.

from the 500 volts 75 watts condition to the 750 volts 120 watts condition. This is due to the high mutual conductance of the 807s, and the bias voltages with a 300-volt screen supply should be 29 volts for an anode potential of 500 volts, 30 volts for 600 volts anode potential, rising to 32 volts for 750 volts anode potential. Thus, the bias voltage should be set accurately, and this can be done by checking that the anode current is at the correct value when the screen and anode potentials are as specified.

Correctness of operating potentials can also be checked by operating the modulator with a suitable resistance load and observing waveforms with an oscilloscope (Fig. 3). If, say, six 12-watt resistors each of 500 ohms are used in series, this will give a 72-watt resistor load of 3,000 ohms. This can be matched in to provide the correct modulator load impedance by a suitable multiple ratio modulation transformer.

Monitoring the Waveform

If a double-beam 'scope is available, the grid drive waveform may simultaneously be monitored to see if any distortion occurs in the driver stage, and to decide if output distortion arises in the 807 stage or not. With a sine-wave input the tubes may be run up to full output, and the output waveform carefully watched for peak flattening. Peak flattening may be caused by incorrect load matching, but if this is correct it may be due to poor power supply regulation, incorrect bias or screen potentials, or due to transformer saturation.

Unfortunately, many amateurs conduct modulator tests in a more perfunctory manner. After connecting the modulator to the transmitter, the control is turned up till a monitor receiver or a local contact reports "overmodulation." The control is then eased back slightly, and it is assumed that "full" modulation is occurring. In many cases the splatter ascribed to "overmodulation" may, in fact, be due merely to modulator distortion setting in long before the P.A. is fully modulated! In one case it was found that the imagined "overmodulation" condition was due to an undersized modulation transformer saturating on peaks and thus limiting modulator output. Of course, the results sounded on the air very much like actual overmodulation. However, substituting a generous cored Technical Services TR-10 modulation transformer resulted in an appreciable increase in modulation and a beefier signal, as transformer saturation was eliminated, and the full audio output of the modulator could then be applied to the P.A. stage. Without this transformer substitution, however, a signal much below par would have been radiated under the delusion that a fully modulated signal was being radiated "because increasing the gain control overmodulates."

It is important therefore to ensure that a tetrode Class AB2 modulator stage is really operating correctly before assuming that full modulation is being obtained. It is necessary also to ensure that the stage is correctly matched into the P.A. load. Much nonsense is talked about "correct" matching however, and generally speaking the match should be made to within 10 per cent. Do not forget also that there is a slight power loss in any modulation transformer, so that an allowance should be made for this. Where a tetrode or pentode P.A. stage is used, the screen circuit of the P.A. also consumes power. However in a tetrode or pentode P.A. stage, the screen power requirement may be overcome by using the "self screen modulation" system. In this system the anode of the P.A. only is modulated. A small choke of say 10 henries is inserted in the screen supply and this develops audio across the screen, as the screen current varies with the modulation voltages on the anode. In some cases a resistor of about 10,000 ohms may be shunted across the choke in order to prevent audio "howl" effects.

Therefore to keep a safe "margin" in hand, the amateur running a full 150 watts input P.A. would probably be well advised to run at least the 600 volt supply condition. An amateur running 120 watts (as from a pair of 807s) would have a comfortable margin at the 500 volt/75 watt audio output condition.

Incidentally, while the "drive power" may be taken as a nominal 0.2 watts, for various reasons it is as well to have a driven stage capable of at least 1 watt output. The resistance loading of the driver transformer secondary will waste some of this drive power, but will minimise the impedance variation when grid current conditions are reached.

(To be continued.)

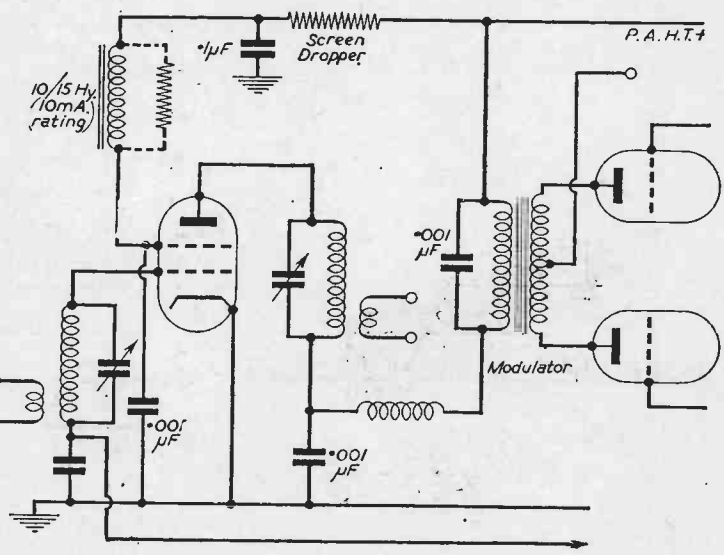


Fig. 4.—"Self screen" modulation. By using a low current L.F. choke in the screen supply line, audio is developed to modulate the P.A. screen. This saves the modulator power that would otherwise have to be supplied from the anode modulator. Thus full plate and screen modulation is achieved without feeding the screen supply from the modulated P.A. supply line. A resistor of 25 to 50 K. may be shunted across the choke if audio singing occurs.

Long Memory

A QUESTION asked at the recent radio show was: "How many original exhibitors' staff members are present at this exhibition that were at the first ever held? And how many have been coming here regularly without a break ever since?" That means the entire run of shows from 1923 to 1956. At least two members of the staff of this journal, including yours truly have done so. The wild enthusiasms of those early years, however, have long since abated. As the public has grown more knowledgeable, it has become more critical and as it has become more critical firms have realised that they must make goods which live up to their claims, or alternatively that they must not make claims which their goods will not support. My feeling at this year's show was that there was nothing new. It was a strictly commercial exhibition and the side-shows stole the show.

Jamming

JAMMING, especially on the short-wave bands, has now become so serious that it is time something was done about it. The jamming comes from both east and west, and it is certainly destroying the hobby of short-wave listening. D.Xers all over the world complain about it. The cause, of course, is the attitude of one nation towards another. Russia, Poland and other subjugated countries give as the reason for the jamming that they consider the Voice of America broadcast to Russia to be slanderous and an insult to their dignity.

"This is what necessitates this jamming to rid the listening public of this annoyance. We believe that you, too, would slam your window if you heard all sorts of offensive remarks coming up from the street. This is only natural. The Soviet people do the same—they close their windows to all insults and slander that come over the air." Russia, however, forgets her long-continued campaign of slander, denigration, insult and venomous vituperation which she has conducted over a long period of years through their radio network. It was her attitude which caused other nations to reply over the air. She cannot complain, therefore, if her own broadcasts are jammed. At least the programmes from the west are accurate, whereas the Russian propaganda programmes are packed with calumny, prevarication and pure invention.

Bulgaria states that they do not operate jamming transmitters at all. Warsaw admits that the situation has developed to the annoyance of all concerned and is leading to anarchy in the air. Prague says they sympathise with the annoyance caused to short-wave listeners, but states that Czechoslovakia does not jam foreign broadcasts because the European service of the BBC can be heard quite well there. It does, however, on certain programmes, simply because they are programmes directly inciting people against their country and constitute an interference in the internal affairs of Czechoslovakia. They ask how else can one describe broadcasts in the BBC Czech service in which hostile emigrés among other people call upon listeners "to be firm," to "show themselves courageous" and, they say, go as far as to appeal to certain people and institutions to sabotage. The I.S.W.C. wrote to our Foreign Office asking whether Great Britain is to continue using jamming transmitters.

The Foreign Office, in their reply, said, "In a written answer in the House of Commons, on July 9th, Lord Hope stated that the BBC Russian service is not being jammed at present from within the Soviet Union, but the jamming of BBC broadcasts in satelite and Soviet languages continues." It went on to say that the Government reserved the right to take any counter measures which they may consider necessary and justified to preserve Cypriot and British lives from outrages directly provoked by these broadcasts, which contain incitement without precedent between allies, and for which it would be difficult to find a parallel in the history of broadcasting. The British Government are jamming broadcasts of Radio Athens and the Egyptian Broadcasting Service.

Tape Recorders at the Show

MR. J. WEIR, of Upper Norwood, says that an otherwise pleasurable visit to the Show was spoiled by what he considered to be the poor showing in the field of tape recorders. He thought that this branch of the business was better catered for last year. Several firms who had promising equipment last year did not show this. It will not be long before radiograms are equipped with tape decks instead of turntables, or in addition to turntables, but I suspect that the difficulty at present is the high cost.

Removing the Chassis

A LETTER in a contemporary draws attention to what may be one of the major causes of high service charges. The reader is referring, it is true, to a TV receiver, but the remarks apply equally to radio receivers. He had to replace the tube in a 9in. receiver which was six years old. The chassis, with knobs, could be withdrawn after removing two bolts and unplugging the speaker lead. Two further screws released the tube strap and the whole job took a few minutes. He had a similar task to perform with the latest model of the same make. At the end, he had 76 separate pieces on the bench, excluding the tube itself. These included 32 self-tapping screws, 14 washers, four bolts, three wood packing strips, four mask brackets, four window brackets, rubber mask, glass filter, speaker, baffle, side cover, rubber ring, cabinet front moulding, cabinet, back cover, four knobs, ion trap and the chassis.

Some ingenuity on the part of the production staff could have avoided a great deal of this, which rather savours of hit and miss methods of design.

Push-pull Amplification

AN EXPLANATION AND A PRACTICAL AMPLIFIER EMPLOYING THE CIRCUIT

By R. Hindle

(*Concluded from page 566, October issue*)

THE effect of C5 is negligible, due to the resistance of VR2, all of which is in series with it. Adjusting VR2 to the upper end of its adjustment C6 becomes comparatively ineffective due to the resistance of the potentiometer being wholly in series with it, whereas the reactance of C5 now favours the passage of the higher audio frequencies giving treble boost; in the middle of its traverse, VR2 renders both capacitors relatively ineffective, giving more or less a straight line response to the upper frequencies. VR3 operates as a bass boost and cut control. When it is adjusted to its upper end C7 is shorted out and C8 is in parallel with the output signal where it bypasses the middle and upper frequencies, thus favouring the lower notes giving bass boost. At its other extreme C8 is shorted out and C7 is operative in series with the output from this limb, attenuating the lower notes to give bass cut.

As an alternative to this pre-amplifier chassis the unit previously described for a two-stage triode amplifier using a double triode could be used if this is already available. Power requirement for either of these pre-amplifiers is derived from the main amplifier.

A crystal pick-up unit is intended to be used with this amplifier; generally no tone compensation input circuit is required for such a unit, which can be fed direct into the pre-amplifier. Another type of pick-up may require a compensating network, which the manufacture will specify, and if the pick-up output is less than about .2 volt it will not fully load the amplifier.

Construction

The main unit is built on an aluminium chassis measuring 12in. x 6in. x 3in. deep. Fig. 7 gives the under-chassis wiring view and also indicates the position of the components. As usual, the holes for the valveholders should be punched in the position indicated; the holders are then inserted and revolved until the pins are in the relative positions indicated and then the positions for the mounting screws are marked and drilled. Note that, though the mains transformer and smoothing choke are shown on the diagram these are actually mounted on top of the chassis and the connections are brought through holes as indicated, preferably lined with grommets. A five-pin power outlet is mounted on the wall of the chassis alongside the hole for the mains lead.

When all components are mounted wiring should commence by connecting the heaters to the 6.3 volt tags of the transformer, the centre-tap of this winding being ignored; the heater of the rectifier is connected to its own 6.3 volt winding and not to that used for the other valve. These heater connections are run close to the chassis. The rest of the wiring is direct from point to point following the lines of the wiring diagram and should present no trouble.

Construction of pre-amplifier

Fig. 8 gives the under-chassis layout and wiring diagram. This is built on an aluminium chassis measuring 7in. x 4in. x 1½in. deep with a ½in. flange at the back for mounting, similar to the chassis previously used in this series. As before, the valveholder should be oriented so that the pins are in the position indicated by the diagram. A tag-strip with four tags in addition to earth is provided at the back to anchor the incoming power leads. A second tagboard with two tags plus earth is used near the tone controls to anchor the tone control components as indicated. A five-core input power cable is used to carry heater and H.T. (with common lead to chassis) and to provide two cores for the purpose of switching mains to the main amplifier.

The input side of the amplifier should be screened by the use of coaxial cable. A coaxial input socket is provided for the gramophone input; this is mounted right up to the volume control and consequently this lead does not need screening, but the longer lead from the volume control to the grid pin

(*Concluded on page 605*)

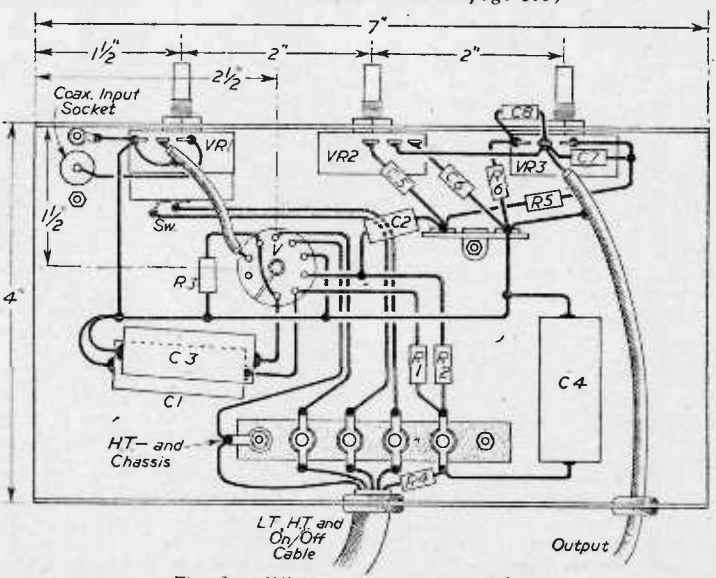


Fig. 8.—Wiring of the pre-amplifier.

A Signal Tracer and Amplifier

ANOTHER INTERESTING SERVICING AID WHICH CAN EASILY BE MADE UP

By T. Hillman

General Description

THIS is a straightforward amplifier which by means of switches can be used for the following purposes.

(1) Tracing a signal right through a radio set from the aerial to the L.S.

(2) Substitute power supply output 250 volt 60 mA 6.3 v. 3 amps.

(3) Stand-by radio set with choice of two programmes.

(4) Substitute output transformer to suit 2.5Ω, 12.5Ω and 15Ω impedance loudspeakers.

(5) Substitute loudspeaker.

Construction

First mark out and cut panel (Fig. 2). Next bend the ½in. edges at right angles and proceed to cut out chassis (Fig. 7). The bending should be done in the following order: A, B, C, D, E, F, G, H and I.

Note that bend I is in the opposite direction (see Fig. 11). Now bolt up the section E.F. to form corners of chassis and join section I to front panel with two 4 B.A. nuts and bolts and bolt front panel edges to chassis. The finished chassis should now appear as Fig. 12. Next cut out the valveholder (1⅛in.) as shown in Fig. 5. Positioning V4 as near to L.F.C. and mains transformer as possible after placing mains transformer in one corner, and L.F.C. in other corner. Now fit all valveholders, switches, volume control and warning light (see Figs. 5 and 6 for approximate positions of main components). The

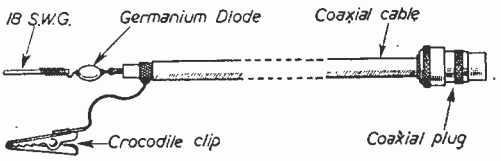


Fig. 10.—Details of the Probe.

warning light is an ex-govt. indicating lamp with a red glass, and by using a .15A bulb this light will indicate when amplifier is on, and will also give a rough guide to the amount of current drawn from the transformer. It will also act as a fuse to safeguard the circuit from overloads. The voltage of the bulb is immaterial, as the current is the main thing in this case.

The cover (Fig. 9) is next made and bolted at its

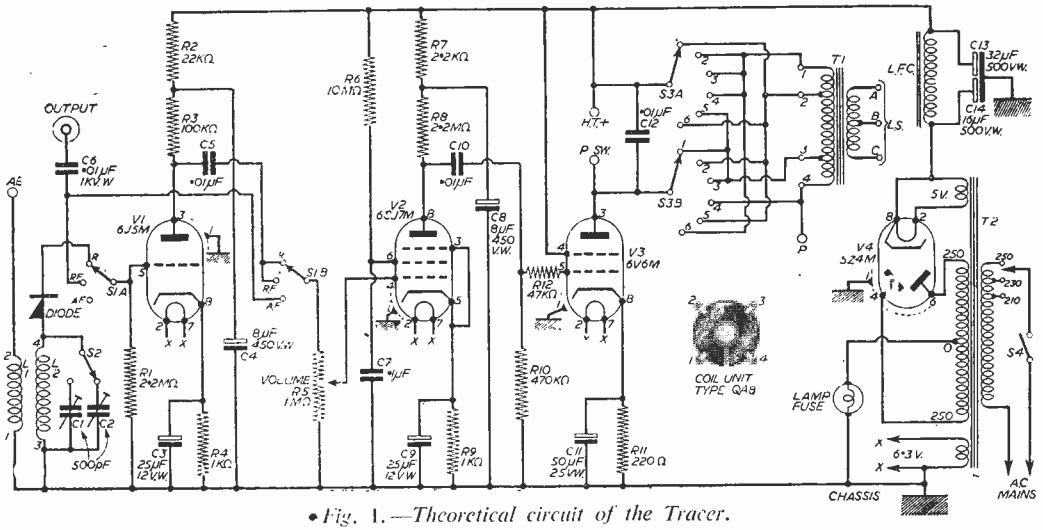
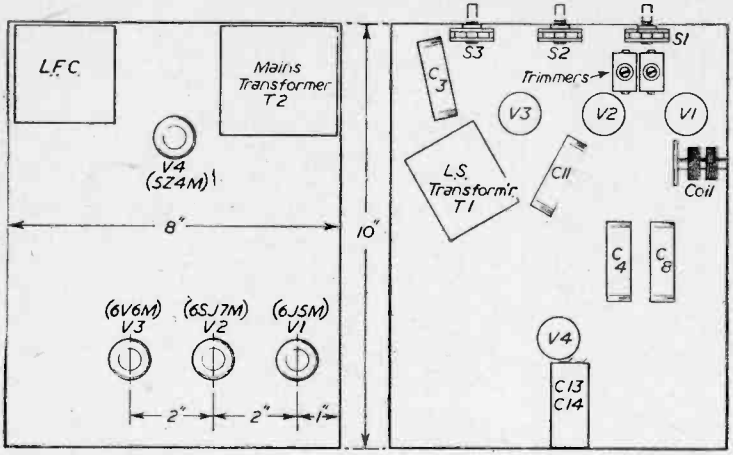


Fig. 1.—Theoretical circuit of the Tracer.

LIST OF PARTS

S1 = 2P 3W.
S2 = 1P 2W.
S3 = 2P 6W.
S4 = SPST toggle.
LFC = 10 Hys. 100 mA.
T1 = R/S "Standard" O/T.
T2 = 250/0/250 v. 100 mA 6.3 v. 4 a. 5 v. 2 a.
2 Germanium diodes.
1 Osmor QA8 coil.
1 indicating lamp panel mounting.
1 .15 a. bulb M.E.S.
1 crocodile clip.
1 yd. coaxial cable.
4 B.A. nuts and bolts as required.



Figs. 5 and 6. — Component Layout.

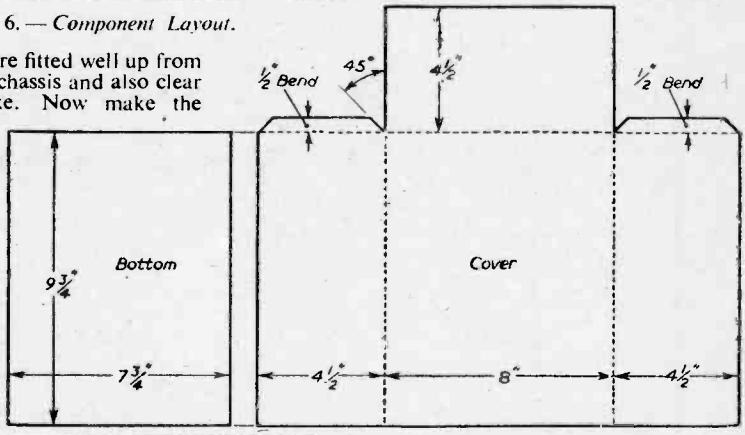
corners, making sure the bolts are fitted well up from the edge which will overlap the chassis and also clear of the transformer and choke. Now make the bottom cover (Fig. 8) and paste a copy of the circuit diagram inside for future reference when needed for servicing.

Wiring

Wiring is fairly straightforward, but first position valve holders so that the shortest grid and anode leads can be made, and then wire up. Use screened wire for the lead from pin 4 V2 to R5 and from R5 to S1B. In wiring up T1 use different coloured P.V.C. wire for the leads, as this helps to identify the wires at the switch, otherwise difficulty may be experienced in sorting out the wires. Make up a coaxial lead (Fig. 10), using one of the germanium diodes soldered to the inner core, and its other end soldered to a piece of 18 S.W.G. T.C. wire for use as a probe. Wrap insulating tape round the diode and solder a length of flex to the braiding of the coaxial cable, terminating the other end in a crocodile clip.

Testing

The amplifier is now ready for labelling and a panel can



Figs. 8 and 9. — Chassis and base bending details.

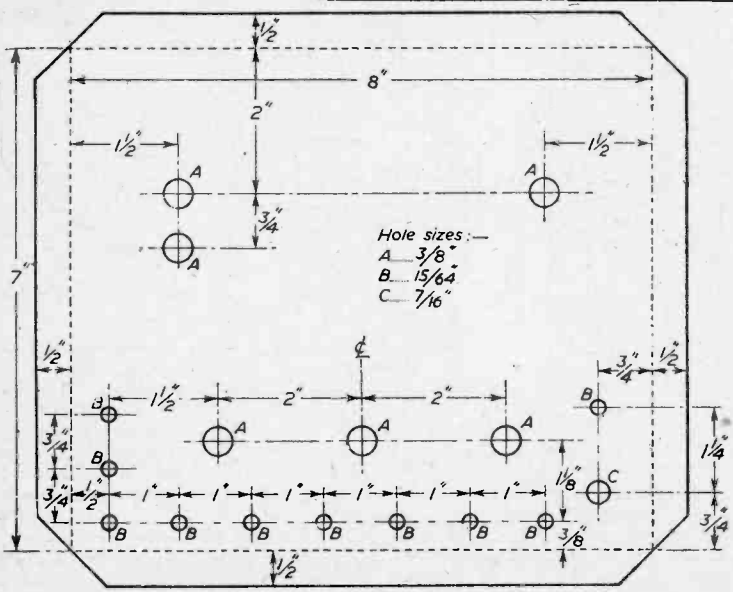


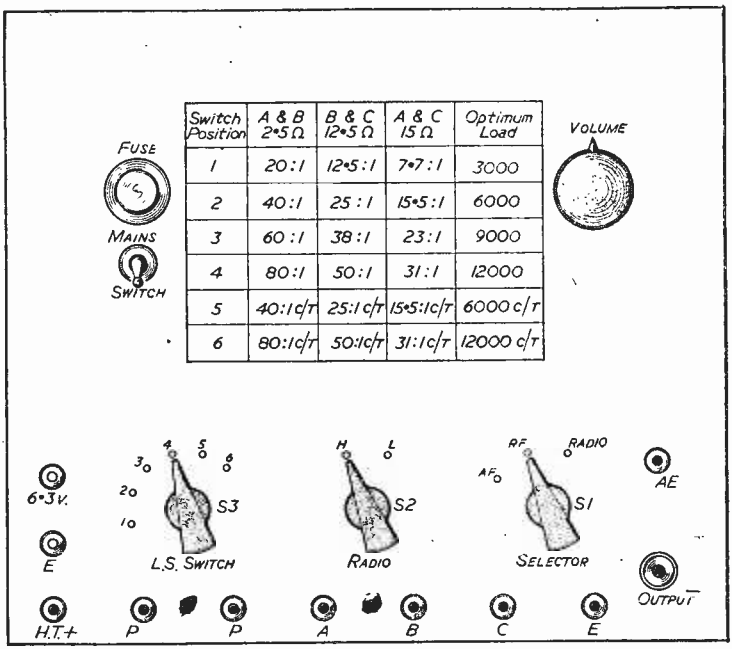
Fig. 2. — Panel drilling details.

be marked on a piece of paper 4in. by 2in. and pasted on the front panel as shown in Fig. 3. Next cut out three circular discs of paper (1¾in.) and mark out the switch positions on them after sticking them on the panel. Use small squares of paper for the lettering of the sockets. When the lettering is dry, paint over the paper with a clear varnish to preserve the markings. A separate loudspeaker in its own cabinet is used with this unit and is plugged into sockets A and B, as this makes it more convenient to use when a substitute L.S. is required at a different place in the workshop. Another point in favour of a separate L.S. is that there is then no danger of valves going microphonic giving rise to howling when volume

is increased. The valves used are ex-govt. metal types, as this means that valve screening cans are not required.

The Tracer may now be tested out and undoubtedly the best plan is to use it first as a straight broadcast receiver. Attach an aerial to the AE socket or terminal and try and tune in the local station. Note particularly that this is only a diode plus amplifier arrangement and, therefore, only a strong local signal can be picked up. However, unless you are situated in a very bad spot some signal will be heard and the effectiveness of the amplifying stages may be checked by this signal. It will also enable the volume control to be checked, as well as hum level and other features on the amplifying side.

When these have been checked and you are quite satisfied with the performance the output from a known good receiver may be checked by connecting to the "output" socket and switching to A.F.



Figs. 3 and 4. — Panel layout and switch setting panel.

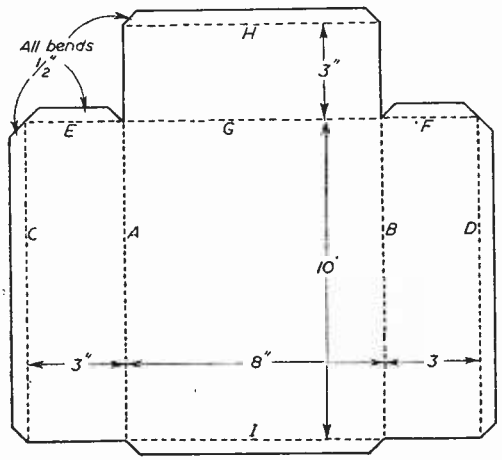
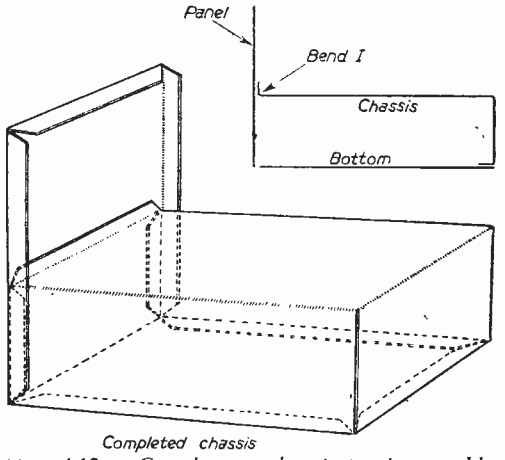


Fig. 7.—Further chassis data.



Figs. 11 and 12. — Complete panel and chassis assembly.

Push-pull Amplification

(*Concluded from page 602*)

of the valve is a piece of coaxial cable. To wire this chassis first run the heater wires from the tagboard to the valveholder and the mains switching leads from the tagboard to the volume control, keeping these down to the surface of the chassis and away from the input signal leads. A heavy tinned copper busbar is then fitted, running from the earth side of the volume control to one of the *unearthed* tags of the tagboard adjacent to the tone controls. This busbar is shaped before fitting to run as indicated in the wiring diagram.

An earth lead is now wired from a soldering tag on one of the holding-down bolts of the input socket to the earth busbar at the volume control tag. Note that this is the only earth connection from the busbar to the chassis; at no other point does an earth go to chassis except the earthy side of the heater/H.T. input at the larger tagboard. Now connect the input socket to the volume control and then take each valveholder pin in turn, connecting as indicated. The tone control circuit is then wired, followed by the smoothing components R4, C4, the output lead which also is a length of coaxial cable, and then the power lead, which is terminated by means of a plug to suit the socket on the main amplifier.

A Simple "S" Indicator

A USE FOR A WORN-OUT TUNING INDICATOR

By R. Dunn

THE present scheme was originally part of a general reorganisation of the famous R.1155, but it can quite easily be applied to any receiver with automatic volume control, especially those employing a " magic eye " tuning indicator, the fluorescence of which has faded beyond a useful minimum.

Besides being a cathode-ray tuning indicator, the magic eye is essentially a triode amplifier with variable-mu characteristics, and in this latter capacity it has a useful residual life. Thus, if a current-reading meter is placed in the H.T. supply it will register any change in grid potential and serve very usefully as an S-meter amplifier.

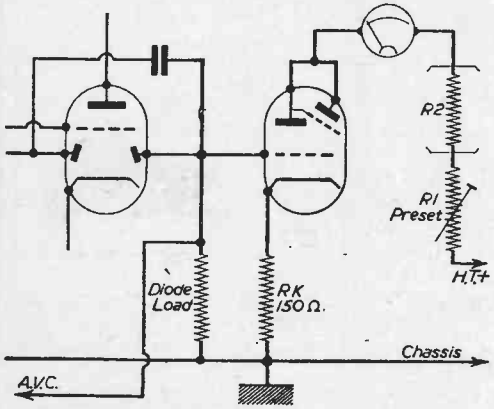


Fig. 1.—Circuit of the tuning indicator.

In the circuit (Fig. 1), it will be seen that the anode and target are strapped together and the H.T. fed via a variable resistor and the meter. Conditions are so arranged that the meter shows full-scale deflection when the negative grid potential is provided solely by the cathode bias resistor. In practice this means that the working conditions are those of " no signal." The grid is connected to the negative end of the diode load of the demodulator valve in the receiver—either the signal or A.V.C. diode. If the receiver already possesses a " magic eye " this connection will already have been made.

When a signal is received it will be rectified by the diode and this will raise the negative potential of the grid and the anode current will fall and be registered on the meter, the decrease being proportional to the strength of the signal. The meter will, therefore, read backwards, the signal strength being read from the position of full-scale deflection.

Meter Readings (Scaled 0-10)	Input at Aerial (Approx. μV).
1.0	10
1.5	15
2.0	30
2.5	50
3.0	150
4.0	750
5.0	4,000
6.0	15,000
7.0	50,000

The variable-mu characteristics of the valve render it relatively far more sensitive to weak signals than to strong ones, which is a very desirable state of affairs, as a good reading is obtained for weak stations and it is possible to observe the position of exact resonance of the tuning circuits. The ever decreasing mutual conductance of the valve at the bottom end of its curve makes it virtually impossible for a strong local station to overload the valve to complete cut-off and in practice one never gets a return to zero deflection on the meter. The measurement of signal strength is a very relative matter, depending on a variety of variable factors (e.g., position of receiver and length of aerial, etc.), so that this non-linear characteristic constitutes no material disadvantage. Fig. 2 shows the curve plotted from feeding the signal from a generator direct on to the aerial of the R.1155. The signal strength is in approximate μV at the aerial plotted against the meter reading. The table shows the complete readings obtained from approximately 10 μV.—50,000 μV.

Components

With regard to component values these are far from critical and may be varied so long as the following conditions are satisfied. The meter can be any instrument with a full-scale deflection less than that of the total permissible anode current of the valve. In practice, arrangements are made for a comparatively low current and this is achieved by a variable (preset) resistor. A 1 mA meter would be a good value and in my own case I have used a diminutive 500 μA ex-Government component with R1=1 MΩ. The limiting resistor R2 is optional and serves to protect the meter from possible gross overloading. Rk provides the valve with a resting negative grid potential for no-signal conditions. Its value is about 150 Ω. R1 should be placed in a more or less accessible position so that it can receive minor adjustments with a screwdriver to correct for circuit, valve or H.T. fluctuations. It is also useful to place a switch in the H.T. lead so that the meter can be cut out if desired. If an A.V.C. on/off switch is present the two switches should be ganged so that the meter is inoperative when A.V.C. is off. This applies in the R.1155.

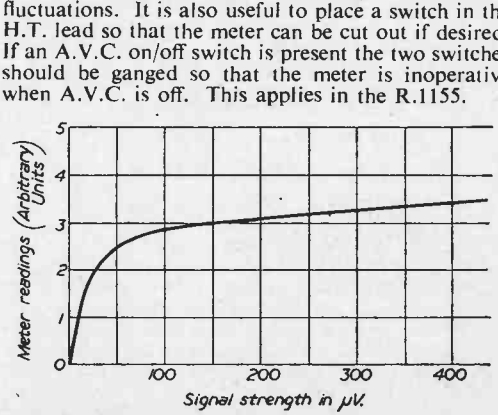
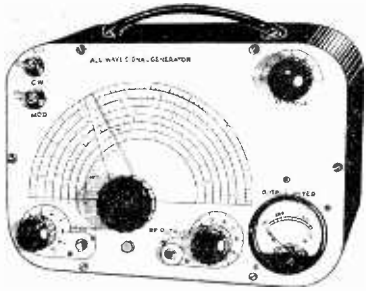


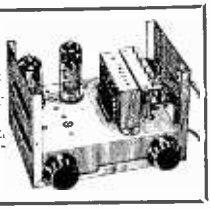
Fig. 2.—Plotted signal strength readings.



COMPLETELY BUILT SIGNAL GENERATOR

Coverage 120 Kc/s-230 Kc/s. 300 Kc/s-900 Kc/s, 900 Kc/s-2.75 Mc's. 2.75 Mc/s-8.5 Mc/s, 8 Mc/s-28 Mc/s, 16 Mc/s-56 Mc/s, 24 Mc/s-84 Mc s. Metal case 10in. x 6¼in. x 4¼in. Size of scale, 6¼in. x 3⅛in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent.. modulated or unmodulated R.F. output continuously variable 100 milli-volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Black crackle finished case and white panel. Accuracy plus or minus 2%. £4/19/6 or 34 - deposit and 3 monthly payments 25 -. P. & P. 4.6 extra.

COMMERCIAL TELEVISION CONVERTER
SUITABLE ANY T.V.
ALL CHANNELS
NO ALTERATIONS TO SET



Complete with built-in power supply. 230-250 v. A.C. mains. Crackle finish case 5⅛in. long, 3⅛in. wide, 4¼in. high Incorporating gain control and band switch. Illustrated with cover removed.

£3.19.6 Plus P. & P. 2/6.

Heater transformer. Pri 230-250 v. 6 v. 1½ amp., 6/-.

Extension Speaker cabinet in polished walnut, complete with 8in. P.M. P. & P. 3/-. 24/6.

8in. P.M. Speakers, removed from chassis, fully guaranteed. All by famous manufacturers. P. & P. 1/6. 12/6.

Volume Controls. Long spindle less switch, 50 K., 500 K., 1 meg., 2/6 each. P. & P. 3d. each.

Volume Controls. Long spindled and switch, ¼, ½, 1 and 2 meg., 4/- each. 10 K. and 50 K., 3/6 each. ¼ and 1 meg., long spindle, double pole switch, miniature, 5/-.

Standard Wave-change Switches. 4-pole 3-way, 1/9 ; 5-pole 3-way, 1/9. Miniature 3-pole 4-way, 4-pole 3-way, 2/6. 2-pole 11-way twin wafer, 5/-. 1-pole 12-way single wafer, 4/-.

1,200 ft. High Impedance recording tape on aluminium spool 12/6 post paid.

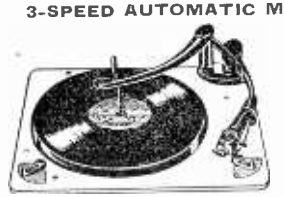
Polishing attachment for electric drills. Quarter-inch spindle, chromium-plated, 5in. brush, 3 polishing cloths and one sheep-skin mop, mounted on a 3in. rubber cup, 12/6. P. & P. 1/6. Spare sheep-skin mops, 2/6 each.

COLLARO RC54

3-speed automatic changer, will take 10 records mixed. Studio 'O' pick-up. A.C. mains 200/250v. **£7.9.6** P. & P. 5/-.

GARRARD RC/110

3-SPEED AUTOMATIC MIXER CHANGER



Will take 10 records, 7in., 10in. or 12in. mixed, turnover crystal head, brand new, current model. A.C. mains 200/250 v. (List price £14/10/-.)

£7.19.6

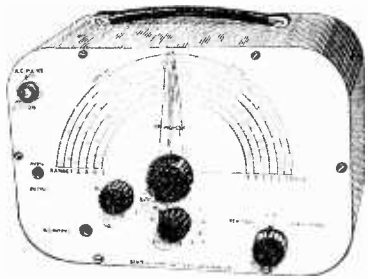
P. & P. 3/6.

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

23, HIGH STREET, ACTON, LONDON, W.3

SIGNAL & PATTERN GENERATOR

Coverage 7.6 Mc's-210 Mc's. in five bands, all on fundamentals, slow-motion tuning, audio output. 8 vertical and horizontal bars, logging scale. In grey hammer finished case with carrying handle. Accuracy ± 1%. A.C. mains 200-250 v.



£6.19.6 P. & P. 5/6. Or £3 deposit and 3 payments of 30 -.

3-speed TRANSCRIPTION MOTOR BY FAMOUS MANUFACTURER

Complete Kit of parts comprising accurately balanced precision made heavy turntable with rubber mat, large constant speed condenser, starting motor, base plate.
Can be asesmbled in half-an-hour. A.C. Mains 200/250 v. Fully guaranteed.
Parts sold separately.

£6.19.6

Post paid.

P.M. SPEAKERS, 6½in., closed field, 18/6. 8in. closed field, 20/6. 10in. closed field, 25/-, 12in., 25/-, 3¾in., 16 6. P. & P. on each 2/-.
Valveholders. Paxolin octal, 4d. Moulded octal, 7d. EF50, 7d. Moulded B7G, 7d. Loctal amphenol, 7d. Loctal pax, 7d. Mazda Amph., 7d. Mazda pax., 4d. B8A. B9A amphenol, 7d. B7G with screening can, 1/6. Duodecal paxolin, 9d.
Twin-gang .0005 Tuning Condensers, 5 -. With trimmers, 6/6.

AC/DC MULTI-METER KIT

Comprising 2in. moving coil meter, scale calibrated in AC DC volts, ohms and milli-amps. Voltage range AC DC 0-10, 0-100 and 0-500. Milli-amps 0-10, 0-100. Ohms 0-1,000 and 0-10,000. Front panel, range switch, wire wound pot. (for ohms zero setting) two toggle switches, resistors and meter rectifier. Complete in case, grey hammer finish.

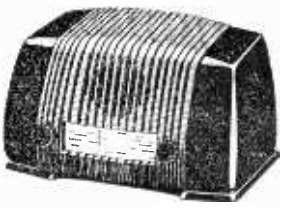
19/6 Plus P. & P. 1/6

Point to point wiring diagram 1'- free with Kit.

Potato & Vegetable Peeler, by famous manufacturer, capacity 4½ lbs., complete with water pump. All aluminium construction, white stove-enamelled finish. Originally intended for adaption on an electrical food-mixer, can easily be converted for hand operation. 39/6. P. & P. 3/-.

T.R.F. KIT in PLASTIC CABINET

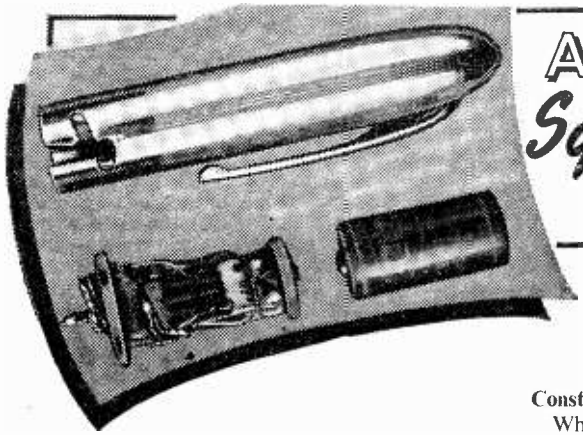
3 valve plus metal rectifier, A.C. mains 200-250 v. Medium and Long waves. In pastel blue or brown. Valve line-up : 2 VR65s and VT52. Size 15½in. long by 9in. high by 7in. deep.



£3.19.6 P. & P. 4/6.

Point to point wiring diagram 1 6 free with Kit.

Where post and packing charge is not stated, please add 1 6 up to 10'- 2,- up to £1 and 2/6 up to £2. All enquiries S.A.E. Lists 5d. each.



A TRANSISTOR Square-Wave GENERATOR

A POCKET UNIT FOR THE EXPERIMENTER AND SERVICEMAN

By P. Cheetham

VALUABLE as a "noise" generator is, its bulk usually prohibits its use in field tests. However, now that transistors can be bought for only 10s., every amateur has the opportunity of equipping himself with a useful addition to his test gear, the whole thing taking up no more space than the cap from an old ball-point pen.

The circuit is that of a quite straightforward multivibrator, translated into transistor terms, while the current consumption is a mere 120 μA at 1½ volts, so a simple deaf-aid cell, type D21, provides adequate power, lasting almost as long as the shelf life of the cell.

Individual Requirements

Two types are shown, both having approximately the same circuit values, but using different transistors. The original model, Fig. 5, was built into the top half of a penlight torch of the type now being sold at a reduced price in many shops since the advent of the new slim penlight torch. The newer torch, unfortunately, does not make such a good case as the old one, the top only of which is used, together with its built-in switch.

The cap from an inhaler forms a neat outlet for the test probe. There is ample room in this case for two Mullard or Brimar transistors, together with standard ¼-watt resistors and Mallory cell, and this model might well have more appeal for those who feel they have not the delicate touch required for really sub-miniature work.

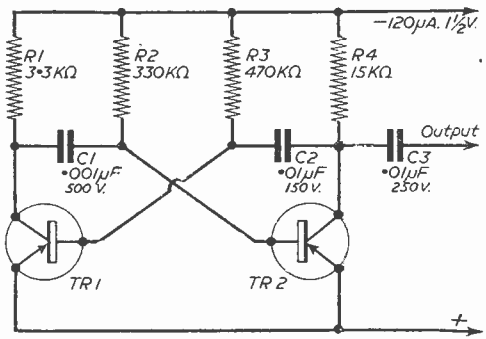


Fig. 1.—Circuit of the device.

Constructional Details

While the original model was built on a Perspex former shaped as in Fig. 2 something more economical of space must be used for the smaller model. The former shown in Fig. 3 was eventually adopted since its bayonet-type fitting into the pen cap provides a simple switch.

One end of each resistor is soldered to one of the needles, the upper end of which is soldered to a short piece of wire which passes round one of the projections of the top end-piece, so that it will be constantly

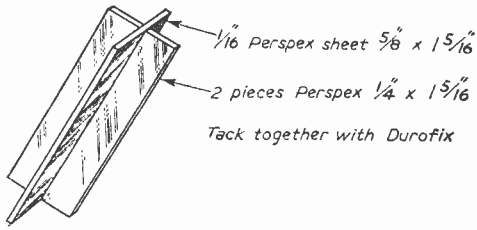
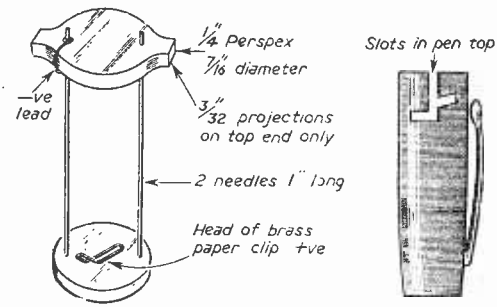


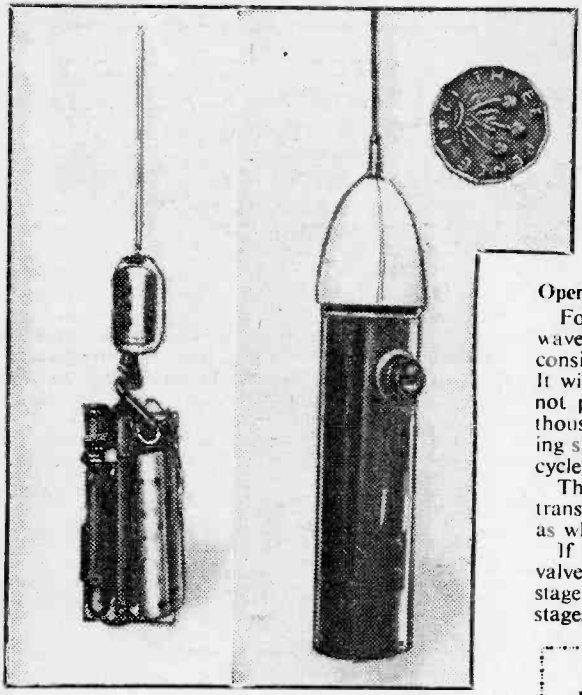
Fig. 2.—Details of the Pen-top Mounting element originally used.

touching the metal pen cap. Since the negative pole of the cell will always be in contact with the pen top we have now to ensure that the wire joining the two emitters can be brought into contact with the brass cap on the cell when required. This can easily be brought about by holding the projections on the Perspex between finger and thumb and twisting, bayonet fashion, until the whole assembly takes up the new position farther into the pen cap, where a brass paper clip, to which the two emitter leads are soldered, presses against the positive pole of the cell.



Figs. 3 and 4.—The former and the slotted pen top.

The needles are held by pliers and firmly pressed against the Perspex and their free ends touched with a hot soldering iron until they sink right in. If they are then allowed a few seconds in which to cool it will be found that the Perspex around them has set and that they cannot be pulled out again. If the needle is found to be a little out of the perpendicular it is a simple matter to repeat this operation until they have been set quite true. A third needle, to act as probe, is "welded" to the centre of the top end-



Figs. 5 and 6.—Detailed illustration of the pen-top generator and on the right an earlier model.

piece in the same way, the output condenser being soldered to its lower end later, taking care not to reheat the needle too much or it will loosen again. Incidentally, if the extreme end of the eye is carefully removed with a pair of pincers the tip of the probe will be forked and thus be easier to hold against thin wires when in use.

A heat shunt must always be used in all sub-miniature work, where component leads have been cut short, for there is otherwise a possibility of damaging the components. A pair of pliers will serve so long as they have a clean grip and these should be held gripping the wire between the component and the iron for at least 10 seconds after the iron has done its job. Heat from the cooling joint is then "shunted" up into the cold and bulky pliers instead of flowing along the thin wire to the component. It is also advisable to make all joints as rapidly as possible.

Since there is no danger of interaction, layout may be made simply a matter of expedience, and components may be actually touching so long as they have a layer of Sellotape between them. Leads should be cut to size and bent before any attempt is made to connect up. For insulation and protection from damage a liberal coating of Durofix should be applied to the finished job. The same adhesive is also useful for holding the components in place while soldering up.

Resistors are sub-miniature types and the circuit has been dressed to take values which are currently available, but the condensers must have their original insulation broken away and replaced by Durofix—a process which reduces their volume to one half.

The output will depend upon the types of transistors used and the values of the components (none of which is at all critical), but may be increased, at the expense of consumption, by reducing the value of the first transistor load R to anything down to about 100 ohms. This change would also enable an interesting demonstration to be made of the transistor's low power requirements, for oscillation is maintained when, instead of a 1½ volt cell, a silver coin and an aluminium disc held in the mouth are pressed into service as a cell!

Operation

Fourier's analysis tells us that a perfectly square wave may be thought of as a series of sine waves, consisting of all the odd harmonics up to infinity. It will be found that the apparatus described, while not producing a *perfect* square wave, will produce thousands of harmonics, so will appear to be oscillating simultaneously at all frequencies from about 500 cycles per second to several Mc/s.

The output available at the collector of the first transistor is much higher but not as rich in harmonics as when taken from the joint shown.

If the probe is touched on the grid of the output valve a clear tone is heard at the speaker if this stage is working; similarly with I.F. and R.F. stages, regardless of position of wave-change switch or tuning nob, greatly simplifying the location of faults in receivers or amplifiers. The limited power output also makes it quite safe for fault location in transistor sets and equipment.

The output tone may be raised or lowered, according to taste, by adjusting the values of R3 and C2.

LIST OF PARTS

R1 3.3k Deaf-aid type
R2 330k " " "
R3 470k " " "
R4 15k " " "
C1 .00 μF 500 v. Dubilier } Type 400
C2 .01 μF 150 v. Dubilier } Type 400
C3 .01 μF 250 v. ex-W.D. (Type Z6/ZF/01031)
TR1, TR2, Henry's or Hivac XFT2.
D21 cell Ever-Ready.

A Beginner's SHORT-WAVE THREE

AN A.C.-OPERATED SHORT-WAVE RECEIVER

By

V. M. Meadows

NOTHING is more thrilling, perhaps, to the average enthusiast than exploring the very interesting short wave bands. Operating over these frequencies, even with comparatively simple equipment, is a most interesting and educative pastime, in which various transmissions from nearly every country in the world, may be heard. No "den" is complete without a short-wave receiver, however simple or, at the other end of the scale, however complex. Before embarking on a short-wave receiver design, however, several very important points have to be considered by the home constructor. These are outlined below so that the reader may obtain a clearer understanding of the points involved before commencing with the construction of the receiver.

Design Considerations

With a receiver designed specifically for the

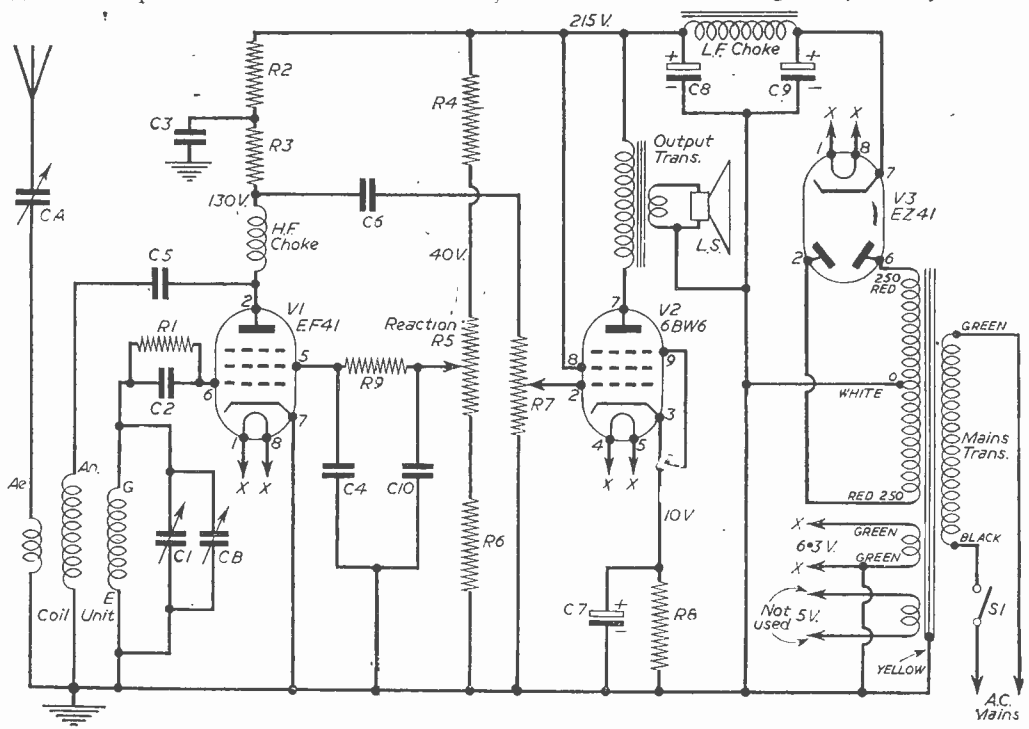
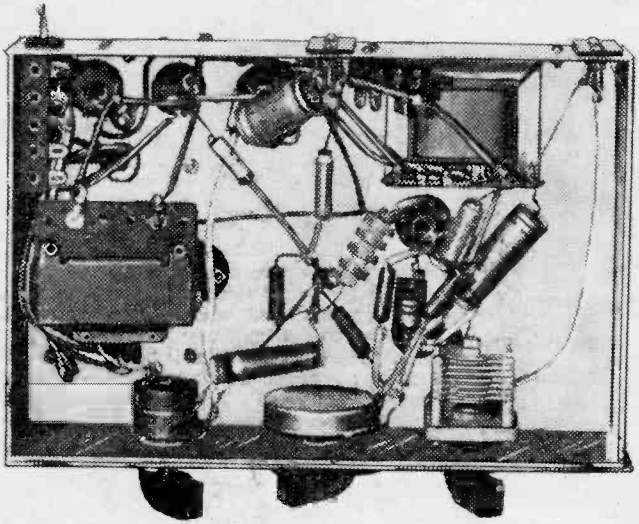


Fig. 1.—Theoretical circuit. A full list of parts appears on pages 612 and 613.

beginner the very first consideration must be the simplicity of the design. This in turn implies that the number of stages must be small; hence, in this receiver there are only two, excluding the power supply.

Plug-in type coils are also necessary in order to obviate switching arrangements, with their attendant losses, and, where a coil pack is home-made, to avoid complicated wiring arrangements. A further advantage here is that the coils may be purchased one at a time, thus making the initial outlay somewhat smaller than would otherwise be the case.



Underside view of the chassis.

Modern components should be used in preference to the "surplus" variety if maximum efficiency and performance are to be achieved. The valves used in the receiver described, together with the coils and all the other components, are, in fact, not only modern, but also new.

Consistent with a good performance, the number of components used should be kept at a minimum, this also being important in relation to the total cost involved. The average enthusiast, not having a "long pocket," is apt to be rather critical of designs which are costly to construct in relation to the results likely to be achieved. Having dealt with simplicity and cost, the next point of note is the design itself.

Miniaturisation being the order of the day, it is of little practical use specifying obsolete valves or components, these soon being confined to the spares box in preference to the modern equivalents.

With a "straight" design it is important that the operator should have complete control of the receiver at all times, and this implies that both the reaction and the aerial controls should be located on the front panel and that both should work with 100 per cent. efficiency. Both these considerations have been catered for in the design shown.

The final consideration, at least in the writer's opinion, is that important factor known as "eye appeal." The completed receiver should have a clean looking layout throughout—i.e., both above and below the chassis—not to mention the panel itself. A glance at the illustrations will show that this has also been carefully carried out.

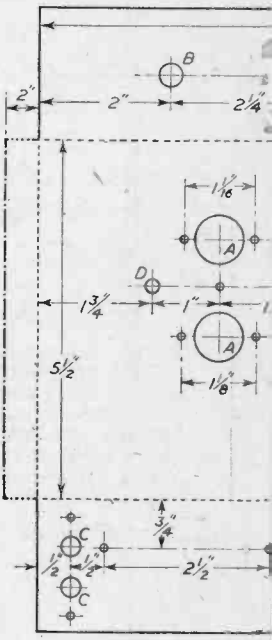


Fig.

Circuit Design

The design itself is shown in Fig. 1, where it will be seen that it is based around the Mullard EF41, the Brimar 6BW6 and the EZ41 rectifier. The EF41 and the EZ41 are both B8A based valves, while the 6BW6 is a noval based type.

The power supply has been incorporated as an integral part of the design and not as a separate item in itself. From the photographs it will be seen that

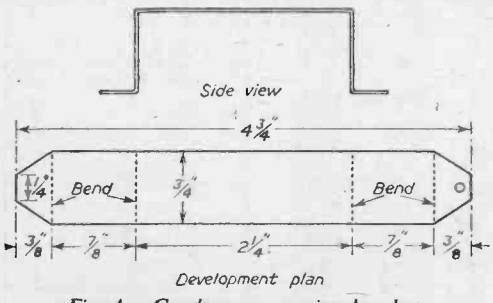


Fig. 4.—Condenser mounting bracket.

LIST OF

Resistors

R1	1M Ω ½ watt.
R2	39k Ω ½ watt.
R3	100k Ω ½ watt.
R4	250k Ω ½ watt.
R5	50k Ω Potentiometer.
R6	10k Ω ½ watt.
R7	500k Ω Potentiometer.
R8	270k Ω ½ watt.
R9	15k Ω ½ watt.

Valves

V1	EF41 Mullard.
V2	6BW6 Brimar.
V3	EZ41 Mullard.

Speaker

5in., Rola, Elac, etc.

Conder

CA	100pF, variable, Eddy
CB	12.5pF, variable, Edd
C1	140pF, variable, Edd
C2	100pF, Mica.
C3	0.01 μF, Tubular, T
C4	0.1 μF, Tubular, TC
C5	100pF, Ceramic.
C6	0.05 μF, Tubular, T
C7	25 μF, Electrolytic, type, CE16DE.
C8	16 μF, Electrolytic, 4
C9	16 μ F,Electrolytic, 4
C10	0.02 μF, Tubular, T

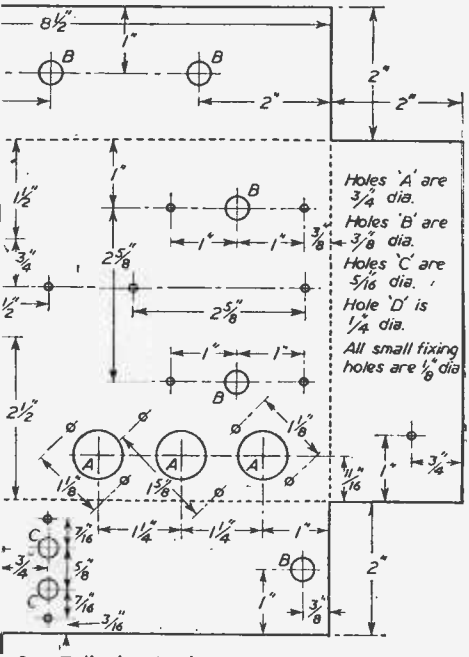
Coils, etc

Eddystone types 706/LB 706/W, 706/P. Coil ho

the power pack components are included on the same chassis as the receiver.

The EF41 functions admirably as a detector for the short wave ranges. Here, as a leaky grid detector, with reaction controlled by variation of the screen voltage, it performs extremely well over the entire range of the receiver (32 Mc/s to 730 kc/s).

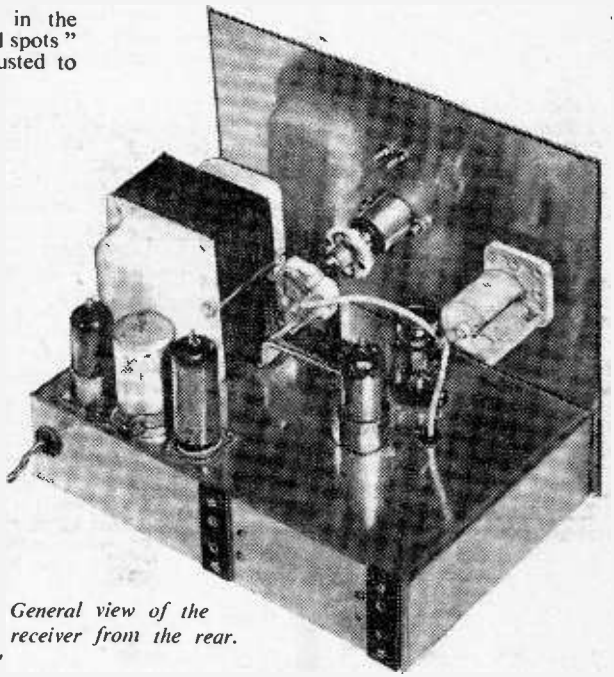
The variable condenser CA is inserted in the aerial input to ensure that there are no " dead spots " with regard to reaction. It should be adjusted to



3.—*Full chassis data.*

give optimum performance with each coil inserted into the circuit. The feedback condenser C5 should preferably be of the ceramic variety. The potential of the screen grid is controlled by variation of R5, the potentiometer connected to the H.T. supply via R4 and to chassis via R6. C4 and C10 act as A.F. and R.F. by-pass, C4 also smoothing out any irregularities in the action of the sliding contact of R5.

The great advantage of this method of obtaining reaction is that it does not alter the tuning of the receiver when being adjusted. It is smooth and



General view of the receiver from the rear.

positive in action and, provided the circuit values given are reasonably adhered to, the threshold of oscillation will be clearly defined, i.e., no overlap or backlash will be apparent.

The grid leak R1 and condenser C2 have values

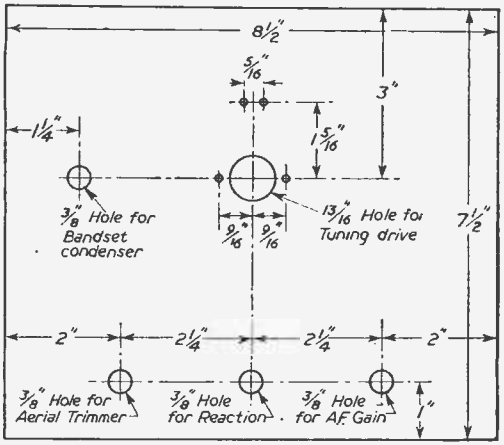


Fig. 2.—Drilling details for the panel.

PARTS

sers	Dial and Drive, etc.
stone type 585.	Eddystone, type 843.
ystone type 580.	
ystone type 586.	R.F. Choke
C type 37N.	Teletron Co., type RFC4.
type CP45N.	
	L.F. Choke
CC type CP35N.	10H, 60 mA (see text).
V. wkg., TCC	
	Chassis and Panel
50 V. wkg. BEC.	5in. x 7in. x 2in., 7in. x 7½in.
50 V. wkg., BEC.	
CC type CP33N.	Panel Bracket
	Eddystone type 708 (for CB).
706/Y, 706/R,	
lder type 775.	Mains Transformer.
	Ellison, type MT162.
	Tag Strips, Nuts and Bolts, etc.

chosen to give a suitable time constant which contributes to the obtaining of good reaction control. Note that C2 is of the mica type.

R3 is the anode load resistor with simple A.F. decoupling being provided by R2 and C3. The output of the detector is fed, via C6, into the volume control R7, the switch shown in the A.C. mains input line also being an integral part of this latter component.

Bias for the output stage is provided by the combination of R8 and C7. Note that with the 6BW6 the beam forming plates are not connected to the cathode internally. Therefore these must be wired to the cathode connection external to the valve. The speaker transformer used is of the multi-ratio type, but any suitable transformer may be used provided it will fit under the chassis as shown in the photographs.

The speaker, a 5in. type, is connected to the output of the receiver via a paxolin output plug and socket arrangement mounted on the chassis rear.

The power supply, constructed around the EZ41, is conventional, and will be found to supply adequate smoothed H.T. to the circuit. The L.F. choke used was one already to hand, but if one has to be purchased the main requirement, apart from the rating, is that it should be of such a size that it is capable of being fitted under the chassis as shown.

The main transformer is the Ellison type MT162, a small, easily obtained component and one that is ideal for this type of small receiver. C8 and C9, both of 16μF, ensure that the H.T. is smoothed and free from A.C. ripple.

Throughout the circuit diagram the numbers shown around the various valves are those of the actual base connections. Coil base connections will be given next month.

The voltage readings shown are those obtained with a Weston meter set to the 250 v. range (H.T. readings) and 10 v. range for the cathode of the 6BW6. All readings have been taken with the reaction control R5 at minimum, the volume control R7 at maximum, under no signal conditions.

Constructional Notes

Apart from the actual circuit itself, the next important consideration with a receiver designed specifically for the short waves is mechanical rigidity coupled with a first-class dial and drive assembly. The vernier slow-motion dial shown in the photographs is the Eddystone type 843, a 4in. anodised satin finished hard aluminium dial with 100 division over 180 degrees, the matching vernier block enabling one tenth of a division to be accurately read. The drive is an epicyclic ball bearing type having a ratio of 10-1. In the prototype shown this is fitted to the bandspread condenser, although there is no reason why this should not be changed over with the bandsetting condenser should individual readers prefer this.

Mechanical rigidity is largely assured by obtaining the chassis specified, this being of a suitable gauge and well made. All components such as the mains transformer, etc., should be securely bolted to the chassis, using nuts and bolts as shown and not screws of the self-threading type.

The chassis and front panel details are shown in Figs. 2 and 3, respectively. Readers constructing this receiver should first drill the front panel, and, having done this, use it as a template for the chassis front with regard to the holes for CA, R5 and R7.

The positions of the main components can be clearly seen from the illustrations, and careful attention to these, together with Figs. 2 and 3, will ensure that no trouble will be experienced with the main assembly work.

It will be noted that the bandspread condenser (CB) is mounted on a metal stand-off bracket (see list of parts). In order to place the main dial in a satisfactory position this bracket must be mounted on an aluminium raised support. Details of this are given in Fig. 4, although there is no reason why these measurements should not be varied by the constructor to suit individual requirements, and mains transformer used if differing from that shown.

Each stage should have an earthed tag fitted at the same time as the valveholders, these being placed on one of the bolts and securely fastened to the chassis. In addition to this, earthed tags should be fitted to the aerial/earth and speaker output paxolin strips mounted on the rear of the chassis.

Three tag strips are used. The first is mounted over the rectifier valveholder and when wired will contain the mains input wiring; the earthed tag of this strip being used for the mains transformer screen and heater connections to chassis. The second is fixed to the underside of the chassis deck and contains the R.F. choke, R2 and R3, R6, C3 and C6. The third tag is used as an H.T. holding strip mounted on the rear wall of the chassis. Only one tag of this latter strip is used, the remainder being utilised at a later date when a further stage will be added.

Having drilled the chassis and panel, the next step is to mount the main components as shown in the photographs—ensuring that these main items are securely bolted to the chassis. Particular note should be taken of the fact that all leads from the mains transformer have to be taken through the chassis deck. Two holes must be drilled for this purpose, each $\frac{3}{8}$in. in diameter, and each *must* be fitted with a suitably sized rubber grommet.

(To be continued)

The R.1155 Communications Receiver

MODIFICATIONS TO THIS POPULAR EX-GOVERNMENT UNIT

By K. A. Brook

(*Continued from page 558 October Issue*)

ANOTHER fault is magic eye dim or out. This could possibly mean that H.T. is a partial short circuit to earth. Check C113 and C114. Check the output transformer windings (both 'phone and speaker transformers should be checked). With the power pack disconnected (Fig. 8), measure the resistance of the H.T. rail to chassis. If this reads less than 10,000Ω, check C25, C29, C32, C38 and C93 for short circuit. Details of these capacitors are given below.

TABLE II. Colour coding of the wiring.

Colour	Representation
Red	H.T. Positive
Yellow	H.T. Negative
Blue	L.T. Positive
Black	Earth
Green	Grids

Capacitor	Value (μF)	Position in circuit
C25	0.001	Anode of V6 to chassis.
C29	0.1	H.T. side, primary of I.F. transformer in anode circuit of V3 to chassis.
C32	0.1	H.T. side, primary of I.F. transformer in anode circuit of V2 to chassis.
C38	0.1	H.T. side, primaries of anode transformers of V1 to chassis.
C93	4	Paper block capacitor near DF1 and DF2 valveholders. (H.T. to chassis.)

Note : C29, C32 or C38 being short circuit will show in the overheating of the resistor wired to one end of these components.

(iii) Magic eye O.K.

Switch on " Het. Osc." and tune set to approximately 280 Kc/s. If a strong whistle is heard, check V1—the anode voltage should be 174 volts. With the master switch set at Omni (i.e., the extreme anti-clockwise position), and the volume control at maximum, the screen voltage of V1 should be 57 volts. If O.K., check the output circuit of V6 and V8.

(iv) Magic eye not responding.

Check V2, V3, V4 and their associated circuits.

SIGNALS WEAK OR DISTORTED.

(i) On all ranges.

Check the power supplies, especially the bias supplies. There should be 30 volts across R1. This resistor is located on the 2.5 μF section of the paper block capacitor underneath the magic eye can. In parallel with this resistor are R3 and R4 in series. On ranges 3, 4 and 5 there should be 3.6 volts across R4 and on ranges 1 and 2 there should be 2.4 volts. (See Fig. 14). If not normal, check R1, R3 and R4, An excessive reading is caused by breakdown of C26, C27 and C28 which are in a tubular can situated between V4 and V6. C26 is connected between the cathode of V6 and chassis, C27 is the anode decoupling for V4 and C28 is the screen decoupling of V4.

(ii) Weak signals, weak beat note on B.F.O.

This is usually caused by C11 having developed a short circuit thus feeding a high potential on to the detector diode. This capacitor has a value of 100 pF and is connected between the anode of V5 and the secondary of IFT3.

(iii) Magic eye not responding.

(a) Not closing when a signal is received.

Check C103 for a short circuit. This capacitor is connected between the grid of the magic eye (pin 5) and chassis. Its value is .005 μF.

(b) Not opening when off tune.

Check C19 for a short circuit. This capacitor is connected between a primary tap on IFT3 and the A.V.C. diode and has a value of .001 μF.

(c) Out on switching on the B.F.O.

If the eye goes out when the " Het. Osc." is switched on, and there is no B.F.O., check C12 for a short circuit. This is connected between chassis and the junction of R17 and R18 (1.5 KΩ and 10 KΩ respectively), the other end of R17 being connected to the " Het. Osc." switch. The value of C12 is .1 μF.

(iv) Volume control not operative when master switch is in Omni position.

Check the resistance between H.T.— and chassis. This should be between 750 and 800Ω on either Omni or A.V.C. positions. The fault is due to H.T.— short circuited to chassis.

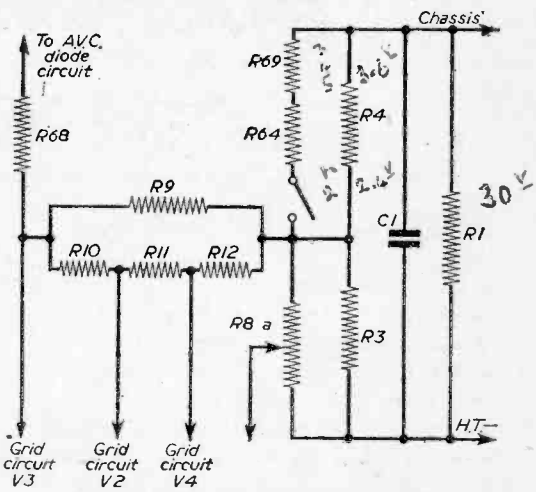


Fig. 14.—Bias network (simplified).

COMPONENTS (Fig. 14)

R1—2 K.	R11—150 K.
R3—1.2 K.	R12—27 K.
R4—120.	R64—100.
R8a—50 K Pot.	R68—56 K.
R9—2 M.	R69—100 Ω.
R10—150 K.	C1—2.5 μF.

Note: After removal of the M.F./D.F. circuits the master switch is only operative in the Omni and A.V.C. positions.

This completes the section on fault finding.

Appendix

Mains Transformer Design.

With this particular transformer, several factors have to be taken into account, and some of these factors may not be considered under more ideal conditions. These factors are:

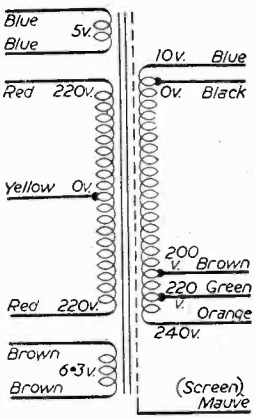


Fig. 15.—Transformer connection colour code.

(1) Size of the transformer, since there is a limited amount of space available.

(2) Temperature rise. The transformer must not be run too hot, due to restricted space and ventilation factors.

It is not recommended that a transformer be hand-wound, as this always increases the physical size of the windings and it would be necessary to increase the flux density at which the iron is worked to reduce the number of turns per volt to accommodate the winding on the bobbin.

The required transformer is:

Primary—10-0-200-220-240 volts 50 c/s.
Secondary I—220-0-220 volts at 100 mA.
Secondary II—6.3 volts at 3 A.
Secondary III—5 volts at 2 A.

Assuming a unity power factor, i.e. the load is purely resistive,

Power dissipated in secondary =

$$220 \cdot \frac{100}{1,000} + 6.3 \cdot 3 + 5 \cdot 2$$

$$= 22 + 18.9 + 10 \text{ W.}$$

$$= 51 \text{ W (approx.).}$$

For a transformer of this type the efficiency will be of the order of 80 per cent.

$$\therefore \text{ Primary power } Wp = \frac{51 \cdot 100}{80}$$

$$= 64 \text{ W (approx.).}$$

For an input of, say, 230 volts,

$$\text{Primary current} = \frac{64}{230} \text{ A}$$

$$= 280 \text{ mA approx.}$$

For this value of primary current, and allowing a current density in the wire of 1,000-1,300A/sq.in., the wire size is 26 s.w.g. enamelled copper.

For the laminations, core area

$$A = \frac{\sqrt{Wp}}{5.6} \text{ (Flux density B = 10 K lines per sq. cm.)}$$

$$= \frac{\sqrt{64}}{5.6}$$

$$= 1.43 \text{ sq. in.}$$

For laminations of size 4A, allow width of 15/16in.

$$\therefore \text{ Size of stack} = \frac{1.43 \cdot 16}{15}$$

$$= 1.526\text{in.}$$

So our laminations will be a 1½in. stack of No. 4A Silcor II.

Now the turns per volt $T = \frac{K}{A}$ where K is a constant which depends mainly on flux density.

A suitable value for this type of transformer is 7.5 for the constant K.

$$\therefore T = \frac{7.5}{1.43}$$

5.25 turns per volt.

For the layer insulation allow one turn of 0.002in. paper. (If desired, Presspahn may be used for this, although it is thicker.)

At the end of each winding wind on three turns of 0.005in. Empire Tape, and also after the electrostatic screen. The exception to this is when completing the transformer, wind on four turns of 0.01in. Empire Tape.

We are now ready to commence the windings.

Primary: 10-0-200-220-240 volts, i.e. a 250 volt winding.

Total number of turns required = 250 . 5.25

1,313 turns of 26 s.w.g. enamelled copper.

Since the winding is tapped, we require 1,313 turns, tapped at 0. 53, 1,103, and 1,208 turns: i.e. 53 + 1,030 + 105 + 105 turns.

The insulation can now be fitted.

Electrostatic screen: One turn of 0.01in. copper foil. This single turn must be suitably insulated when actually completing the turn, otherwise a shorted turn will result and the transformer will not then function correctly, so the insulation must be interleaved with the foil in order to prevent this.

Secondary I: 220-0-220 volts at 100 mA, i.e. a 440 volt winding.

The winding is 2,450 turns of 32 s.w.g. enamelled copper.

Secondary II: 6.3 volts at 3A. To carry this current 16 s.w.g. enamelled copper wire is required.

All the leads from the transformer should come out at one end and not both top and bottom. This facilitates wiring into the set, when the leads can be cut to length.

The winding is then 35 turns of 16 s.w.g. enamelled copper.

Secondary III: 5 volts at 2A. To carry this current 18 s.w.g. enamelled copper wire is required.

The winding is then 28 turns of 18 s.w.g. enamelled copper.

Leads: All leads to be flying leads, colour-coded as shown in Fig. 15.

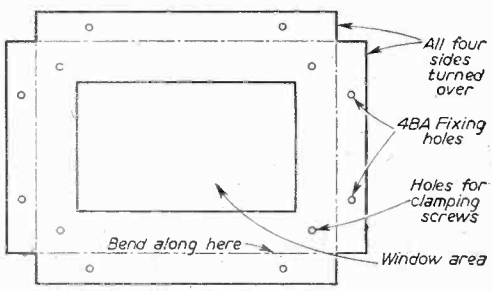


Fig. 16.—A clamp for the transformer.

RADIO COMPONENTS — RETURN OF POST SERVICE

Below we give details of a small section of our extensive stock of Radio and Television Components. All items are usually held in stock and all orders are normally dealt with on the day they are received.

COMPONENTS

CONDENSERS.—Ceramic. 1, 1.2, 1.5, 1.8, 2, 3, 3.9, 4, 4.7, 5, 6.8, 8, 8.2, 10, 15, 22, 27, 50 pF. All 6d. each. 56, 62, 91, 100, 110, 120, 150, 300, 360, 390 pF. All 9d. each.
Midget Hi-K Ceramic. 470 pF, 1,000 pF, 2,200 pF, 3,000 pF, 5,000 pF, 10,000 pF. All 9d. each.
N750 Ceramic. 2 pF, 3.9 pF, 5 pF, 6.8 pF, 8.2 pF, 10 pF, 15 pF, 20 pF. All 9d. each.
Hunts W99 Miniature Tubular. 100 pF, 200 pF, 300 pF, 500 pF, all 600 v. : .001 mfd., .002 mfd., 350 v., .005 mfd., 150 v., .01 mfd., 150 v. All 1/3 each.
.005 mfd., 600 v., .01 mfd., 350 v., .02 mfd., 350 v., .04 mfd., 150 v. All 1/6 each.
Silver Mica. 7, 10, 18, 22, 27, 33, 40, 68, 75, 100, 140, 150 pF. All 6d. each.
150, 180, 220, 300, 340, 470, 500, 540, 560, 680, 1,000, 1,200, 1,500, 2,200, 2,700, 3,300, 5,000, 5,600, 6,800, 7,500, 8,200 pF. All 9d. each.
.01 mfd. 2%. 1/-.
We carry a wide range of condensers. A full list is available free upon request.
RESISTORS.—We stock very many types of Resistors, including Erie Types 8 and 9, Morgan Types T and R, including a wide range of 5%, and 10% values, TSL and LAB High Stability, also wire wound in several sizes. Fully detailed list available.
COILS. Full range of Wearite " P " Coils, Osmor " Q " Coils, and Denco Chassis and Miniature Coils. Leaflets on all makes available.
DENCO COIL PACKS. All in stock. CP3/370, CP3/500, 44/9. CP4 L, CP4 M, 35/- each. CP3/F, 68/7. CP3F G, 69/9. CP4L G, CP4M/G, 43/5. CP3 G, 54/7. Denco Booklet DTB9 gives full details of all Coil Packs with circuits, 1/6.
ELCOM PLUGS AND SOCKETS. As specified for the Mullard Amplifier. Pre-Amplifiers and F.M. Tuner. Miniature Jones type. Flex Plugs, 4 pin, 5/6 ; 6 pin, 6/6. Flex Socket, 4 pin, 5/3 ; 6 pin, 6/9. Chassis Plug, 4 pin, 3/6 ; 6 pin, 5/-. Chassis Socket, 4 pin, 3/6 ; 6 pin, 4/3.
VALVE HOLDERS. McMurdo. B7G less bottom screen. Black, 9d. Nylon Loaded, 10d. Ceramic, 1/3. With bottom shield. Black, 1/3. Nylon, 1/4. Nylon with anti-microphonic mount, 2/-. Cans to fit. 2in. and 2½in. 9d. each.
B8A. With bottom shield. Black, 1/-. Nylon, 1/1.
B9A. Without bottom shield. Black, 10d. Nylon, 11d.
VHF Low Loss, 1/6. With bottom shield. Black, 1/6. Nylon, 1/7. Nylon with anti-microphonic mount, 2/3. Cans to fit. 2in., 9d. ; 2½in., 10d.
International. Octal. Black Moulded. Amphenol, 6d.
COLOURED PVC CONNECTING WIRE. Available stranded (7/33 s.w.g.) or single (1/22 s.w.g.) in eleven colours. 12 yards on handy metal spool. 2/6 each.
CRYSTAL SET COMPONENTS. Teletron HAX Crystal Set Coil. Specially made for use with crystal diodes. With circuit, 3/-. Suitable Crystal, 2/6. Tuning Condenser, 3/10. Knob, 8d. Small metal chassis with aerial, earth and 'phone sockets, tuning dial, 2/9. Headphones, high impedance, 14/6, 17/6 and 21/-.
SOLDER. Multicore Ersin. 60/40 Radio Grade, 5/-, 2/6 and 6d. packets. 1 lb. Reels, 50/50, 15/-. ARAX (not for radio), 6d.
EDDYSTONE COMPONENTS. Wide range in stock. Eddystone illustrated catalogue, 1/-.

TOOLS

SCREWDRIVERS. Insulated with pocket clip, 1/-.
PLIERS. Pointed nose, 6½in., 5/6.
SIDE CUTTERS.—5½in., 5/6.

SPECIAL OFFER OF RECORD CHANGERS

B.S.R. UA8 MONARCH.—The latest four speed model fitted with ACOS cartridge. List Price £9.15.0. OUR PRICE, £7.19.6. Credit Terms : Deposit £1.3.10 and seven monthly payments of £1.3.8.
GARRARD RC88/4.—The latest four speed version of this high class Garrard Changer. Fitted with the GC2 Crystal Cartridge. List Price £17.18.8. OUR PRICE, £13.5.0.
Credit Terms : Deposit £1.16.0 and seven monthly payments of £1.17.0.
GARRARD RC120/4.—Four speed, fitted with GC2 Crystal Cartridge. List Price, £12.17.2 OUR PRICE, £7.19.6.
Credit Terms : Deposit £1.3.10 and seven monthly payments of £1.3.8.

TRANSISTORS

MULLARD.—OC70, 21/- ; OC71, 24/- ; OC72, 30/- ; STC, TJ1, 40/- ; TJ2 45/- ; TS2, 21/- ; TS3, 24/-.

LOUD SPEAKERS

GOODMANS. All 15 ohms. 8in. Axiette, £6.18.6. 12in. Audiom 60, £9.2.9. Axiom 150 Mk. II, £10.15.9. Acoustical Resistance Units, ARU172, £2.15.3. Goodmans Cross Over Chokes, 37 - a pair. Special 10 mfd. Paper Condensers for Cross Over Units, 18/-.
NEW GOODMANS.—Trebax Tweeter, £5.9.3. Midax Middle Speaker, £11.16.0.
WHITELEY H.F. RANGE.—All with universal speech coil. 5in. HF512, 51/6 ; 6in. HF612, 53/6 ; 8in. HF812, 83/6 ; 9in. HF912, 88/6 ; 10in. HF1012, 99/9. Also the new 8in. units, HF816, £6.17.0. T816, £6.10.0. Tweeter T10, £4.4.0. Cross over unit, 30/-. Special Cross Over unit for T816, 38/6.
WHITELEY CABINETS. Packed flat for home assembly. Bass Reflex Corner Console for 18in., £11.11.0. Bass Reflex Console, £10.10.0. Hi-Fi Reproducer Console. For Tape Deck or Record Changer and amplifier with record storage space, £12.12.0. Illustrated leaflet available on Whiteley Speakers and Cabinets.
NEW WHITELEY CABINET.—Junior Bass Reflex Console, £9.9.0.
G.E.C.—The famous Metal Cone Speaker, £9.5.0. We now have the new Presence Unit for this speaker, £3.19.6. This is a " must " for all owners of the Metal Cone Speaker.
WHARFDALE. 10in. Bronze/CSB, £5.11.3. 8in. Super 8/CS, £6.19.11.
TSL.—Moving Coil Tweeter, 39/6. Electrostatic Tweeters. LSH75, 12/6. LSH518, 17/6. LSH100, 21/-. 65 mH. Cross over chokes for TSL Tweeters, 7/6 each.

TEST INSTRUMENTS

AVO.—Model 8, £23.10.0. Model 7, £19.10.0.
TAYLOR.—Model 71, £13.15.0. Montrose, £3.10.0.
PULLIN. Series 100, £13.15.0. Miniature, £9.15.0.
PIFCO.—32/6.
ADVANCE.—Signal Generator, P1, £22.5.0.
RADAR.—Kilo-Volter. For EHT measurements. Reads up to 30 kV., £3.19.6.

RECORDING TAPE

PURETONE.—Special Offer. 1,200ft. Paper Base Tape. Normally £1. Special Price, 15/-.
LONG PLAY TAPE.—1,800ft. on 7in. reel. Scotch Boy, 54/-. Emitape, 50/-. BASF, 55/-. 900ft. on 5in. reel. Scotch Boy, 35/-. Emitape, 28/-.
STANDARD TAPE. 1,200ft. on 7in. reel. Scotch Boy, 35/-. Emitape, 35/-. BASF, 40/-. 600ft. on 5in. reel. Scotch Boy, 21/-. Emitape, 21/-.
CONTINENTAL SIZE.—850ft. Standard Tape on 5½in. reel. Emitape, 28/-. BASF, 34/-.
We stock all sizes of empty spool and many tape accessories. Send for our Recording Tape List.

TELEVISION

CO-AX CABLE. First Grade. Semi-Air Spaced. Entirely suitable for Band 3. 10d. per yard.
CO-AX PLUGS AND SOCKETS.—Belling Lee L734P Plug, 1/3. Chassis Sockets, Surface L804S, 1/3. Flush L734P, 1/-. Cable Sockets L734J. For making cable joins with standard plug, 2/-. Skirting Box, 4/6. Insulated Plug for A.C./D.C. Sets, 1/3.
AERIAL CROSS OVER BOXES.—For combining the feeders from Band 1 and Band 3 Aerials. Belling Lee, 13/-.
ATTENUATORS.—Co-ax. Plug-in type. 3, 12, 18, 24 and 36db., 5/6 each.
300 OHM FEEDER CONNECTORS.—Belling Lee. Flex Plug L677 P, 10d. Flex Socket L677/J, 11d. Chassis Socket L733/S, 5d.
300 OHM FEEDER. Twin Plastic, 6d. yard.
C.R.T. ISOLATING TRANSFORMERS.—Elstone. Mains Primary with optional 20% Boost. Made for either 2, 4, 6.3 and 13 volt tubes. State voltage required when ordering, 18/- each.
COIL FORMERS.—Haynes Type. With screening can. Two Types, 2¼in. and 1¼in. tall. Formers, 5d. each. Cans, 6d. each. Top Plates, 1d. each. Cores, Standard, Purple or Yellow, 3d. each.
TELETRON CONVERTERS.—Mark 1 and 2. Instruction Leaflet, 3d. each. Coil Sets, Mk. 1, 15/- ; Mk. 2, 17/6. Drilled Chassis, Converter only, 3/9. Wide Chassis for converter and power unit, 6/-. EF80 Valves, 10/- each. Transformer, giving 200 v. and 6.3 v. for power pack, 10/-. Suitable Rectifier, 250 v. 50 mA., 6/6.
VIEW MASTER CONVERTER.—We stock all the parts for this and can supply complete kits. Fully detailed list available.
VIEW MASTER AND TELEKING.—We have all items for these sets in stock.

FREQUENCY MODULATION

KITS.—We stock all components for the Jason (Radio Constructor), Denco, Mullard and Osram Circuits. All items available separately.
TSL TUNER.—We can supply this well-known F.M. Tuner, complete with power supply for £13.15.0.
JASON TUNER.—This latest model with permeability tuning now available, £16.12.6. Power Unit, £3.10.6.

GRAMOPHONE PICK-UPS

ACOS.—GP20. Supplied with one HGP 39 Head. Please state whether standard or LP head is required. £3.12.0. Extra head, 44/4.
REPLACEMENT CARTRIDGES.—Acos HGP37, 41/7. Collaro Studio " O " and " P " 41/7. Collaro Transcription, 48/6.
REPLACEMENT STYLUS. We have a wide range of these. See our stylus list for full details. Collaro Studio " O " and " P," 7/-.
BJ PICK-UP ARM.—Standard model, £3.2.11. All other BJ items stocked, including the new Super Arm, £16.3.5.

HIWAYMAN BATTERY PORTABLE
We can supply full constructional details and all components for this excellent design. Complete kit, which includes a two-tone rexine cabinet, £10. Instruction Envelope, 1/6. All items available separately.

CREDIT TERMS 3/- IN THE £ DEPOSIT

Anything we sell can be supplied on Credit Terms. The Deposit is 3/- in the £ and the balance in seven monthly payments. Send details of your exact requirements and we will send our quotation.
TERMS OF BUSINESS. Cash with order or C.O.D. Please add postage to orders under £3. We charge C.O.D. fees on C.O.D. orders under £5.

WATTS RADIO

8 APPLE MARKET
KINGSTON-ON-THAMES, SURREY

Telephone : KINgston 4099

Shop Hours : Monday, Tuesday, Thursday—9 a.m. to 5.30 p.m. Wednesday—9 a.m. to 1 p.m. Friday, Saturday—9 a.m. to 6 p.m.

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1 : 1.25 giving a 25% boost on secondary. 2 v., 10/6 ; 4 v., 10/6 ; 6.3 v., 10 6 ; 10.8 v., 10/6 ; 13.3 v., 10/6.
Ditto with mains primaries, 12/6 each.
Type B. Mains Input 220/240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes. With Tag Panel, 21/- each.
Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2¼-2½-2¾-3 volts at 2 amps. With Tag Panel, 17/6 each.
NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

TRIMMERS, Ceramic. 30, 50, 70 pf., 9d. 100 pf., 150 pf., 1/3 ; 250 pf. 1/6 ; 500 pf., 750 pf., 1/9.
RESISTORS. All values. 10 ohms to 10 meg., ¼ w., 4d. ; ½ w., 6d. ; 1 w., 8d. ; 2 w., 1/-.
HIGH STABILITY. ½ w., 1%, 2/-. Preferred values 100 ohms to 10 meg.

WIRE-WOUND RESISTORS
5 watt, 10 watt, 15 watt — 25 ohms—10,000 ohms 1/3, 1/6, 2/-
15,000 ohms—50,000 ohms, 5 w., 1/9 ; 10 w., 2/3.
KNOBS, GOLD ENGRAVED.—Walnut or Ivory, 1⅛in. diam., 1/6 each. Not engraved, 1/- each.

12/6 PURETONE RECORDING TAPE

1,200 ft. on standard fitting 7" Plastic reels. Brand new, boxed, 12/6.
Spools 5" metal, 1/6, 7" plastic, 4/3.

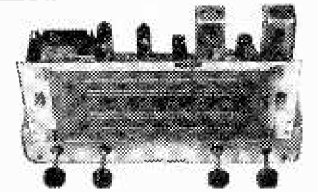
O/P TRANSFORMERS. Heavy Duty 50 mA., 4/6. Multiratio, push-pull 6/6. Tapped small pentode, 3/9.
L.F. CHOKES 15/10 H. 60/65 mA., 5/- ; 10 H. 120 mA., 10/6 ; 15 H. 150 mA., 12/6.
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, 21/-.
HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1½ amp., 7/6 ; tapped sec. 2, 4, 6.3 v., 1½ amp., 8/6.
VCR97 TESTED FULL PICTURE. £2.
COPPER PLATED AERIAL RODS. ½ x 12in. push fitting. 3/- doz., p. & p. 1/-.
ALADDIN FORMERS and core, ¼in., 8d. ; ⅜in., 10d.
⅜in. **FORMERS** with Cans and Core. ⅜in. sq. x 1⅝in. and ½in. sq. x 2⅜in., 2/- ea.
TYANA.—Midget Soldering Iron. 200/240 v. or 230/250 v., 16/9. **Solon** Midget Iron, 24/-.
MIKE TRANSF. Ratio 50 : 1. 3/9 ea. ; 100 : 1. 10/6.
MAINS DROPPERS. 3 x 1½in. Adj. Sliders, .3 amp: 750 ohms, 4/3. .2 amp., 1,000 ohms, 4/3.
LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2 way, 6d. per foot, 3-way, 7d. per foot.
LOUDSPEAKERS P.M. 3 OHM.
5in. Goodmans, 17/6. 7in. x 4in. Goodmans, 21/-. 3½in. square, Elac., 21/-. 8in. Elac., 22/6. 6½in. Goodmans, 18/6. 10in. R. & A., 30/-. 6½in. ditto w/Trans., 21/-. 12in. Plessey, 30/-. 8in. M.E. 2.5 k. or 2 k. field, tapped O.P. transf., 24/6, TSL Tweeter, LSH75, 12/6.
CRYSTAL DIODE, G.E.C., 2/-. Crystal Book, 1/-. **GEX34,** 4/-, Handbook of Germanium Circuits, 2/6.
HIGH RESISTANCE PHONES. 4,000 ohms, 17/6 pr.

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1½ x 3/16in. Bargain Price 6/6. No transformer required.

SWITCH CLEANER Fluid, squirt spout. 4/3 tin.
TWIN GANG TUNING CONDENSERS. .0005 mfd. midget, less trimmers, 6/6 ; .0005 Standard size with trimmers, 9/- ; less trimmers, 8/- ; ditto, soiled, 2/6 ; .0005 mfd. 3-gang, 7/6.
SPEAKER FRET.
Expanded metal. Silver, 15¼in. x 9¼in., 2/- each.

VALVES
A SMALL SELECTION FROM OUR STOCKS

All Boxed			New & Guaranteed	
8/6	5/6	1/6	6/6	10/3
1R5	6B8	EA50	6AL5	5Z4
1T4	9D2	954	6J5	12AT7
1S5	EF50	2/6	6K6	EBC41
3S4	Equip.	2X2	6K7G	EBF80
3V4	SP61	E1148	EB91	ECH35
5U4	SP41	EB34	HVR2	ECL80
6AM6	EF92	3/6	(near)	ECH42
6AT6		3D6		EF41
6J7		6H6M		EF80
6K8	7/6	7/6	7/6	EL41
6SL7	6BE6	6V6G	EL32	EZ40
6SN7	6BW6	6X4	HVR2A	KT33C
6V6GT	6F6	6X5	PEN25	MU14
EBC33	6K7GT	807	U22	PL81
EF50	6K7M	EF39	VP23	PY81
				12K7
Sylv. Red	11/6			35Z4
EF91	EY51	U25		6Q7

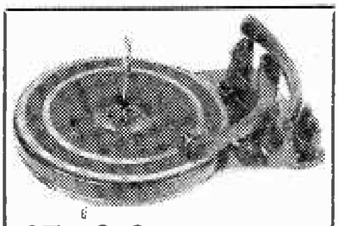


ALL WAVE RADIOGRAM CHASSIS

THREE WAVEBANDS **FIVE VALVES**
S.W. 16 m.—50 m. LATEST MULLARD
M.W. 200 m.—550 m. ECH42, EF41, EBC41,
L.W. 800 m.—2,000 m. EL41, EZ40.
12 month Guarantee.
A.C. 200/250 v. 4-way Switch : Short-Medium-Long-Gram. A.V.C. and Negative feedback 4.2 watts. Chassis 13½ x 5½ x 2¼in. Glass Dial 10 x 4½in. horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory. Aligned and calibrated. Chassis isolated from mains. **T.S.L. Tweeter Supplied Free!**
• **10 gns.** Carr. & Ins. 4/6.
TERMS: Deposit £5.5.0 and six monthly payments of £1.
MATCHED SPEAKERS FOR ABOVE CHASSIS 8in., 19/6 ; 10in., 25/- ; 12in., 30/-.

★ R.C.S. SCOOP ★

Collaro Auto-changer RC531 for 78 r.p.m. 10in. and 12in. records. Brand new in maker's boxes! High impedance lightweight Pick-up with sapphire needle, will match any Amplifier or Radio. Less than half price. **£5.19.6** Carr. and Ins., 5/6.



£7-19-6 Post Free.

Terms: Deposit £4 and six monthly payments of 15/-.
Brand new Plessey 3-speed Autochanger Mixer Unit for 7, 10 and 12in. Records. Twin Hi-Fi Xtal Head with Duopoint sapphire stylus. Plays 4,000 records. Spring mounting. Baseboard required 15½ x 12in. Height 5¼in. Depth 2in. Super Quality. 200/250 v. A.C.

Walnut Veneered Playing Desk cut out ready for Plessey, only sold complete with Changer 10/6 extra.

TAPEMASTER RECORD HEAD, 45/-

ALLDRY UNIT POWER PACK. Replaces Battery B114, etc., 69 v. plus 1½ v. Size 4½in. x 3⅜in. x 1¾in. 4-pin Socket. Same as battery. ONLY 1/- a year to run on A.C. 200/250 v. FAMOUS MAKE. LIST PRICE, 65/-. OUR PRICE, 39/6. Ready for use.

B.S.R. MONARCH. 3-speed Motor and Turntable with selecting switch for 33, 45 and 78 r.p.m. records. 100-120 v. and 200-250 v. A.C. 50 cps. Also **B.S.R. MONARCH** Lightweight Pick-up with Acos Xtal turnover head, separate Sapphire stylus for L.P. and Standard records.
SPECIAL OFFER, THE TWO ! £4.15.6, post 2/6.

T.V. PRE-AMP (McMICHAEL). Tunable Channels 1 to 5. (Will Amplify Output of your Band 3 Converter.) Midget size. High Gain Fringe Model, B.V.A. Valve. Full Instructions. Ready for use. (H.T. 200 v., L.T. 6.3 v., .3 amp. required.) BRAND NEW, 25/- each.
SPECIAL MAINS POWER PACK for above, 25/- extra.

SUPERHET COIL PACK. 27/6. Miniature size 2¼in. x 2¾in. x 1¼in. HIGH "Q" Dust Cored Coils. Short, Medium, Long, Gram Switching. Single hole fixing. Complete with connection diagram, and circuit.

TELETRON BAND III CONVERTER

For London, Midland and Northern Transmissions.
Suitable all T.V. makes. T.R.F. or Superhet. Ready wound coils, two EF80 valves, all components, punched chassis, circuit-diagram, wiring plans. COMPLETE KIT for mains operation 200-250 v. A.C. **£3.10.0.**

As ABOVE less POWER PACK. Requires 200 v. 20 mA. H.T. 6.3 v. .6 a. L.T., **£2.5.0.**
Mains Transformers to above Spec. ... 10/6
Min. Westinghouse Rect. ditto ... 8/6
B.B.C./I.T.A. Aerial crossover unit ... 7/6
Punched and drilled chassis ... 3/9
Larger chassis for Mains Model ... 6/-
Teletron Coilset with plans ... 15/-
Full plans and circuit details ... 6d.

Volume Controls

Long spindles. Guaranteed 1 year. Midget. 10,000 ohms to 2 Meg. No Sw. S.P.Sw. D.P.Sw. 3/- 4/- 4/9
Lin or Log Tracks.

80 ohm CABLE COAX

Semi-air spaced Polythene insulated. ¼in. dia. Stranded core. Losses cut 50%. 9d. yd.
STANDARD ¼in. Coax. 8d. yd.

COAX PLUGS ... 1/- **DOUBLE SOCKET** ... 1/3
SOCKETS ... 1/- **OUTLET BOXES** ... 4/6
BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 1/-. 80 ohms only.
WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. (Carbon 50 K. to 2 m., 3/-.)
WIRE-WOUND 4 WATT. Pots. 2½in. Spindle. Values, 100 ohms to 50 K., 5/6 ; 100 K., 6/6.
CONDENSERS. New stock. .001 mfd. 7 kV. T.C.C., 5/6. Ditto. 20 kV., 9/6 ; 100 pf. to 500 pf. **Micas, 6d.** ; Tubular 500 v. .001 to .01 mfd., **9d.** ; .05, .1, 1/- ; .25, 1/6 ; m.5, 1/9 ; .1/350 v., 9d. ; 1/600 v., 1/3 ; .1 mfd. 2,000 volts, 4/-.
CERAMIC CONDS., 500 v., .3 pf. to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10%, 5 pf. to 500 pf., 1/- ; 600 pf. to 3,000 pf., 1/3. **DITTO 1%** 1.5 pf. to 500 pf., 1/9 ; 515 pf. to 5,000 pf., 2/-

I.F. TRANSFORMERS 7/6 pair

465 Kc/s Slug tuning Miniature Can., 2⅛in. x ⅞in. x ⅞in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.

NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/275 v.	2/-	100/25 v.	2/	8+16/500 v.	5/6
2/450 v.	2/3	8+8/500 v.	4/6	16+16/500 v.	6/-
4/450 v.	2/-	16+16/500 v.	6/	25+20/450 v.	5/6
8/450 v.	2/3			32+32/350 v.	4/6
8/500 v.	2/9	**CAN TYPES**		32+32/450 v.	6/6
16/450 v.	3/6	Clips	3d.	50+50/350 v.	7/-
16/500 v.	4/	16/450 v.	3/6	64+120/350 v.	11/6
32/500 v.	5/6	32/350 v.	4/-	100+200/275 v.	12/6
25/25 v.	1/9	64/350 v.	5/6		
50/25 v.	1/9	50/12 v.	3/	1,000+1,000/6 v.	6/6
50/50 v.	2/-	8+16/450 v.	5/-		

Screw Base Type 512. 8/500 v., 3/- ; 16/500 v., 4/-.
SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kV., 4/3 ; K3/40 3.2 kV., 6/- ; K3/45, 3.6 kV., 6/6 ; K3/50 4 kV., 7/3 ; K3/100 8 kV., 12/6 ; **MAINS TYPE,** RM1, 125 v., 60 mA., 5/- ; RM2, 100 mA., 6/- ; RM3, 120 mA., 8/- ; RM4, 250 v. 275 mA., 16/-.
PANEL LAMPS (Neon Lit), 230 v., A.C./D.C., 3/6.
COILS Wearite, "P" type, 3/- each. Osmor Midget "Q" type adj. dust core, 4/- each. All ranges.
TELETRON, L. & Med. T.R.F., with re-action, 3/6.
H.F. CHOKES, iron cored, 14 M.H., 3/- each.

ALUMINIUM CHASSIS. 18 s.w.g. undrilled With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., 4/6 ; 9 x 6in., 5/9 ; 11 x 7in., 6/9 ; 13 x 9in., 8/6 ; 14 x 11in., 10/6 ; 15 x 14in., 12/6 ; 18 x 16 x 3in., 16/6.

FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 6 or 12 v. 1½ amp., 8/9 ; 2 a., 11/3 ; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., 13/6 ; 4 amp., 21/-.
All BERNARDS books in stock. List 3d.
VALVE MANUALS I & II, 5/- ea. part.
VALVE and TV TUBE equivalents books, 5/-.
ACID HYDROMETER. New Ex Govt. Unbreakable. Packed in metal case 7 x 1½in. dia., 4/6.
WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer, long spindle 6/6
2 p. 2-way, 3 p. 2-way, short spindle ... 2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way, long spindle ... 3/6
3 p. 4-way, 1 p. 12-way, long spindle ... 3/6
VALVEHOLDERS. Pax. Int. Oct. 4d., EF50, EA50, 6d. B12A, CRT, 1/3. Eng. and Amer. 4, 5, 6, 7 and 9 pin, 1/-. **MOULDED** Mazda and Int. Oct. 6d. B7G, B8A, B8G, B9A, 9d., B7G with can, 1/6. VCR97 2/6, B9A with can 2/6.
CERAMIC, EF50, B7G, B9A, Int. Oct. 1/-, B7G with can 1/9.
BLACK CRACKLE PAINT, air drying, 3/- tin.

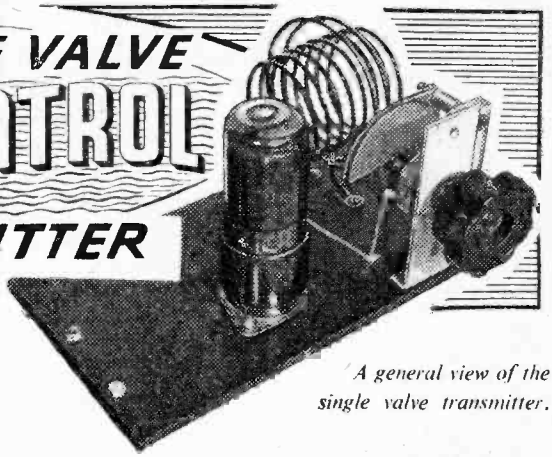
We have no connection with any other firm. Please address all Mail Orders correctly as below.

RADIO COMPONENT SPECIALISTS

307 WHITEHORSE RD., WEST CROYDON
OPEN ALL DAY—(Wed. 1 p.m.) *10 page list 3d.*

Tel. THO 1665, Buses 133 or 68 pass door. **48-hour postal Service.** *P. & P., 1/-. £2 orders post free. (Export Extra.) C.O.D. Service 1/6*

A SINGLE VALVE MODEL CONTROL TRANSMITTER



A general view of the single valve transmitter.

UTILISING A 6V6 VALVE

By F. G. Rayer

THOUGH battery-type valves are frequently employed in model control transmitters, advantages arise from the use of a valve of mains type, in certain circumstances, and the transmitter described here has this type as a self-excited oscillator. The power output from such a valve is much greater than with battery valves, especially when the transmitter is run near maximum rating, with an efficiently resonated aerial. This extra power is very useful when a valveless receiver is being used indoors or for short range outside. In such cases mains will be available and current can be provided by a simple power pack. When mains are not possible, as when controlling a model away from buildings, then a 6-volt accumulator (for heater) and vibrator pack are most suitable. Operation from dry batteries is not feasible, as the H.T. current will be 40 to 60 mA.

The power packs are best made separately, with a socket for easy connecting up of the transmitter. The mains version may employ valve or metal rectifier, according to what is available, and a transformer delivering 6.3 volts for the heater.

The 6V6 is very suitable for this application, but other valves can be used, if to hand. Triodes such as the 6C5 and 6J5 may be inserted without wiring changes, and are particularly suitable for short-range work, quite a good output being possible if the valve is run up to its maximum anode dissipation (2.5 watts, with the 6J5). The 6V6 may be run up to 12 watts anode dissipation. If a larger valve, such as the 6L6, is used (19 watts maximum anode dissipation)

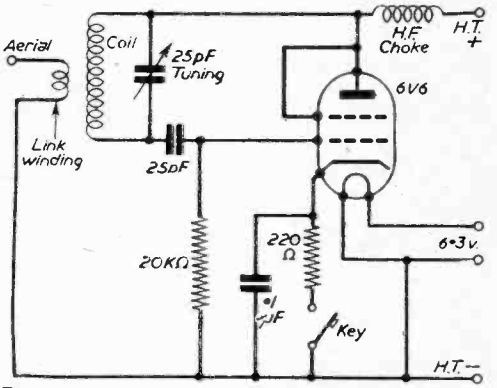
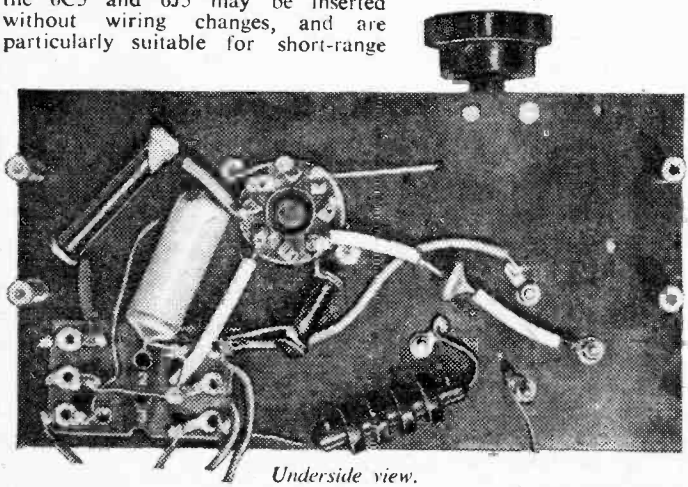


Fig. 1.—Theoretical circuit of the single valve transmitter.



Underside view.

it becomes increasingly necessary to check the aerial current with an R.F. meter to see that the radiated signal does not exceed that permitted. With the smaller valves this will not be so, since only a small part of the anode dissipation can be realised in actually radiated R.F. energy. The aerial current may be reduced, if necessary, by loosening aerial coupling, reducing H.T. voltage or shortening the aerial.

The circuit is shown in Fig. 1, cathode keying being used to avoid H.T. potentials here. For initial testing and setting up the key tags must be shorted. A cathode bias resistor prevents a very high anode current if oscillation should cease. The 25 pF variable condenser is of usual short-wave type. A good quality S.W. choke is required, able

to carry the necessary current. The 25 pF fixed condenser must have mica insulation.

Layout and Coil

Fig. 2 shows a top view of the base which is of paxolin or bakelite to provide the necessary insulation between various points. "M" denotes moving plates tag of the tuning condenser, and "F" fixed plates, this component being on a mounting bracket.

The gauge of wire used for the coil is not important, but should be fairly stout for rigidity, something between 18 and 12 s.w.g. being suggested. A length of the wire is pulled out straight and eight turns are wound upon an object approximately 1¼in. in diameter. The object is then removed and the coil pulled out until it is 2in. long. The ends are cut 1in. long and loops formed at the ends so that the coil stands above the baseboard, when secured by 6B.A. bolts. For the aerial loop or link two turns are required, approximately 2in. in diameter. Loops are formed at such a distance that this coil comes centrally round the eight-turn winding when it is bolted to the base. No wobble or vibration arises in the coils if the wire is sufficiently stout.

Connections and parts under the base will be seen from Fig. 3, a tag-board being used to anchor power leads, etc. One 6B.A. bolt joins 25 pF fixed condenser, one end of coil and fixed plates lead of tuning condenser. A second bolt joins moving plates lead, other end of coil and H.F. choke.

The remaining two bolts support the link coil. The simplest way to energise the aerial is to wire one end of the link to the H.T. negative line and the other to aerial, as in Fig. 3. If an aerial tuning unit is employed a twin flex feeder can be taken from these two bolts instead.

If the key leads are long it may be necessary to include H.F. chokes in these in the usual way. Initially, it is desirable to connect a 0-100 mA meter to these tags, to determine what current is flowing, which will depend on the valve, H.T. voltage and degree of aerial coupling or resonance.

A fairly large control knob or insulated extension spindle is required, and when the transmitter is out of its case it must be remembered that the variable condenser and bracket are at H.T. potential.

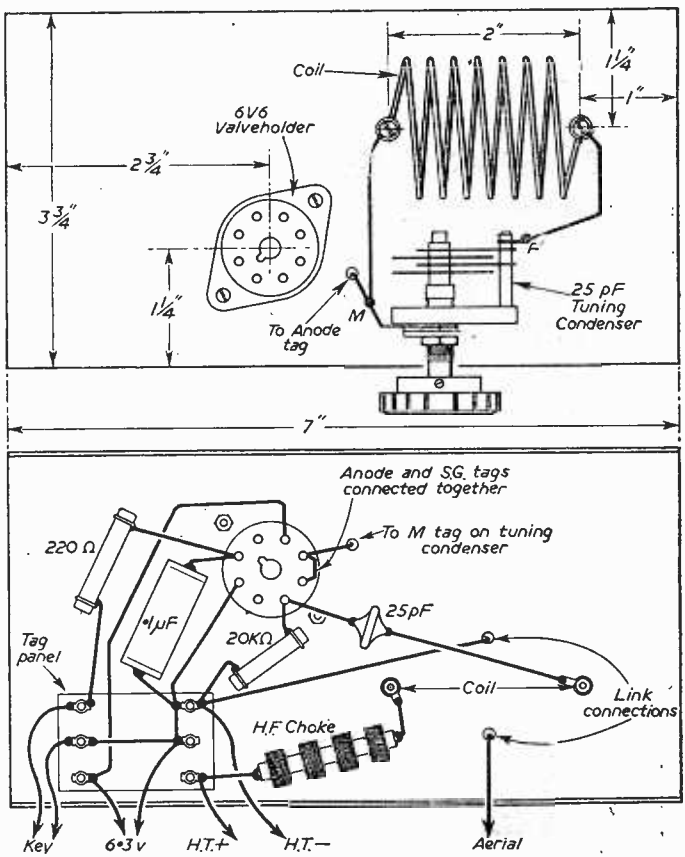
Notes on Operation

A first oscillation test can be made by soldering a 6.3 volt .3 amp bulb to a loop of one or two turns of wire, and bringing this near the coil, when it should light. Alternatively, an R.F. meter may be temporarily connected to the two-turn loop, when it should show an R.F. current of 1 amp or so, according to valve and H.T.

The transmitter may be tuned into the 27 Mc/s band by means of a bulb-type frequency meter held near the coil (say, 2in. to 3in. away). The meter is tuned to the middle of the band and the 25 pF tuning condenser rotated until the meter bulb lights at maximum brilliance. It should be assured that the frequency meter is accurate and intended for this purpose, as some bulb frequency meters for general checking of transmitters prove so inaccurate that the transmitter may be well outside the band, if tuned by their aid.

Aerial Current

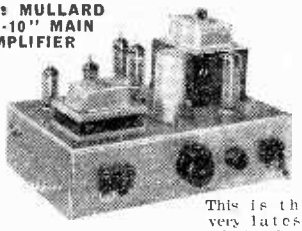
When an aerial is connected a watch should be kept on the H.T. current, which will rise as the aerial draws power. If there is any danger of the maximum rating of the valve being exceeded, then the H.T. voltage should be reduced or a shorter aerial used. Once it has been found that an aerial does not cause an excessive rise in current then it may be adopted, and the 0-100 mA meter may be removed. When using any form of tunable or resonant aerial, current will rise as resonance is approached and it is then essential to see that the maximum figure is not exceeded, as mentioned earlier. With a given H.T. voltage the H.T. current may vary between 20 mA and 60 mA, according to the type of aerial coupling, using the 6V6.



Figs. 2 and 3.—Top and under-chassis layout and wiring.

COMPLETE KITS of PARTS for the "Hi-Fi" ENTHUSIAST

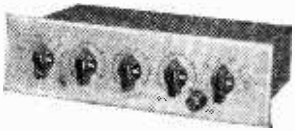
The MULLARD "5-10" MAIN AMPLIFIER



This is the very latest design and needs no recommendation from us. Our Kit is complete to Mullard's specification, including the latest GILSON ULTRA LINEAR OUTPUT TRANSFORMER and the entire MULLARD Valve line up. ALL SPECIFIED COMPONENTS are supplied. **PRICE OF COMPLETE KIT OF PARTS £11.11.0.**

STERN'S "fidelity" PRE-AMPLIFIER-TONE CONTROL UNIT

"A design for the music lover"



Briefly it has inputs for all types of MICROPHONES, HIGH and LOW GAIN PICK UPS and a RADIO TUNING UNIT. It incorporates (a) GRAM EQUALISING CONTROL. (b) STEEPCUT FILTER. (c) Continuously variable BASS and TREBLE CONTROLS and a variable OUTPUT CONTROL which enables its use with any type of Amplifier.

PRICE OF COMPLETE KIT OF PARTS (Plus 5/- carr. and ins.) WE ALSO OFFER IT ASSEMBLED, READY FOR USE, **£8.**

A COMPLETE KIT OF PARTS TO BUILD STERN'S 'HIGH QUALITY' 8-10 WATT AMPLIFIER

Has power supply for Radio Tuning Unit.

PRICE OF COMPLETE KIT OF PARTS £7.10.0.

SUPPLIED ASSEMBLED and READY FOR USE. **£9.10.0.**

Proved one of the most popular models yet offered to the HOME CONSTRUCTOR. Provides really excellent reproduction up to 8 watts, employing 6V6's in push pull, incorporating negative feedback. Provides for use of both 3 and 15 ohm speakers.

THE full SPECIFICATION and PRACTICAL BUILDING INSTRUCTIONS for these Units are available for 1/6 each. SPECIAL PRICE REDUCTION. We supply the two complete Kits—Mullard 5-10 and "fidelity" Preamplifier—for **£16.16.0.** We also supply both fully assembled and ready for use for **£19.19.0.**

MODERNISE YOUR OLD RADIOGRAM

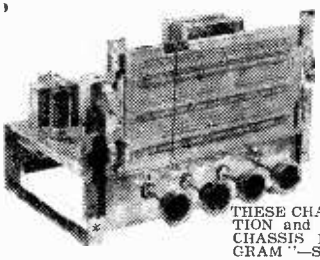
AUTOCHANGERS with modern A.M. and A.M. F.M. RADIOGRAM CHASSIS and matched P.M. SPEAKERS at REDUCED PRICES. (H.P. Terms available). A good varied selection is available . . . SEND S.A.E. for ILLUSTRATED and DESCRIPTIVE LEAFLET.

WE HAVE the latest 3 and 4 SPEED

TWO REALLY GENUINE PRICE REDUCTIONS

OFFER THESE RECEIVER CHASSIS AT SUCH LOW PRICES, and FULLY GUARANTEED

A BULK PURCHASE ENABLES US TO Each is BRAND NEW



The **MODEL AW3-7** A 7-valve 3 waveband Superhet Chassis having a push-pull stage for approximately 6 watts output.

PRICE £12.19.6.

H.P. TERMS: Deposit £6.9.9 and 8 monthly payments of 18/9

The **MODEL B.3** 5-valve 3-waveband Superhet employing Negative Feedback over entire Audio Stages and having a single valve type 6BW6 output for approximately 4 watts.

PRICE £11.11.0.

H.P. TERMS: Deposit £5.15.6 and 7 monthly payments of 19.4.

THESE CHASSIS HAVE "GRAM" POSITION and are IDEAL REPLACEMENT CHASSIS FOR THAT "OLD RADIOGRAM"—Send S.A.E. for details.

NEW! A COMBINED AM/FM RADIO CHASSIS

of EXCEPTIONAL HIGH QUALITY and very pleasing appearance. Provides complete F.M. coverage and Long, Medium and Short Wavebands.

PRICE £21.10.0

RECORD PLAYERS THE VERY LATEST MODELS ARE OFFERED AT GREATLY REDUCED PRICES

★ **TRANSCRIPTION UNITS** ★ **3 and 4 SPEED AUTOCHANGER** ★ **AUTOCHANGERS with MANUAL CONTROL POSITION.** Send S.A.E. for ILLUSTRATED and DESCRIPTIVE LEAFLET. This Leaflet also contains data of a PORTABLE TYPE GRAM AMPLIFIER which has separate BASS and TREBLE CONTROLS. **PRICE £4.12.6., INCLUDING 6½" P.M. SPEAKER** and an attractive PORTABLE CARRYING CASE, **£3.17.6.**

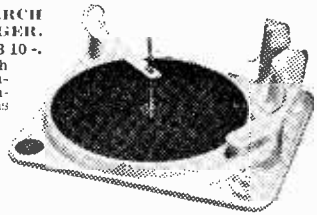
DESIGNS FOR THE HOME CONSTRUCTOR

THE COMPLETE SPECIFICATIONS OF THE FOLLOWING UNITS ARE AVAILABLE FOR 1/6 EACH.
THESE MANUALS ALSO INCLUDE THEORETICAL and simple PRACTICAL WIRING DIAGRAMS AND A COMPLETE COMPONENT PRICE LIST. ALL OF WHICH ARE AVAILABLE FOR SALE SEPARATELY.

- **STERN'S F.M. TUNING UNIT** . . . A 5-valve Tuner incorporating the latest Mullard Permeability Tuning Heart and a "Magic Eye" Tuning Indicator and can be completely built for **£10-.-.**
- **STERN'S COMBINED A.M./F.M. TUNING UNIT** . . . Precisely similar to the F.M. Tuner, but also incorporates the MEDIUM WAVEBAND. It can be completely built for **£13.10.0.**
- **STERN'S HIGH QUALITY 8-10 WATT AMPLIFIER** . . . Designed for High Quality reproduction up to an output level of 10 watts, having 6V6's in Push-Pull and incorporating negative feedback. It is one of the most successful Amplifiers (in the lower price range) yet offered to the Home Constructor. WE can supply the complete Kit ex-stock for **£7.10.0.**

AN EXCEPTIONAL OFFER FOR CASH ONLY £7.7.0.

The **B.S.R. MONARCH 3-SPEED AUTOCHANGER. NORMAL PRICE £13 10-.**

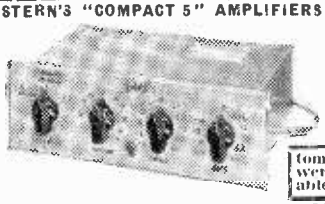


- Complete with High Fidelity Crystal "Turnover" Head which incorporates separate stylus for L.P. and 78 r.p.m. records. ● A "MIXER" Unit that will autochange on 7in., 10in. and 12in. records.
- Brand New in Makers' Cartons, complete with mounting instructions.

(a) The "COMPACT 5-2" A Two-stage high sensitivity Amplifier having SEPARATE BASS and TREBLE CONTROLS and designed to give up to approx. 5 watts with very pleasing quality. PRICE £5 15-.

(b) The "COMPACT 5-3," A Three-stage version of the "5-2" model, but in this case having an additional stage and incorporating Negative Feedback. PRICE £6 16-.

STERN'S "COMPACT 5" AMPLIFIERS



Expressly developed for very high quality reproduction of Gram. Records and particularly suitable for high quality reproductions of the F.M. transmissions. Two models are available: A separate **POWER SUPPLY UNIT** to operate with these amplifiers is available for £2 10-. Has additional supply available for Radio Tuner, etc.

NOTICE

Due to damage to our Packing and Dispatch premises we cannot at present supply any goods on Mail Order—*excepting* **our "fidelity" TAPE RECORDER** *which we can still supply* **to Mail Order Customers. Our extensive stocks were** *not affected* **and are available as usual to Callers Only.**

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

Modifying the Sound Master Tape Recorder

CUTTING DOWN BACKGROUND NOISE

By P. Kurland

THE design of the Sound Master tape recorder, as reviewed in the PRACTICAL WIRELESS some months ago, gives very good results, especially at 3¾ i.p.s., for recordings from a microphone and a radio jack-plug. However, with the introduction of high quality F.M. broadcasts and hi-fi recordings the reproduction has one or two shortcomings, viz., "thin" tone, and high background noise due to undermodulation during recording.

The Modification

After extensive experiment a simple method has been found for eliminating both of these. The modification centres around the resistance-capacitance-inductive circuitry of the top-boost H.F. correction in the record amplifier (Fig. 1). L1, C9 and R14, wired in parallel have an impedance of only 22 K. at 1 kc/s and this rises to 150 kc/s at 10 kc/s. Together with R8, R12 and R13 this stage gives a top lift of about 18 d.B. which falls beyond the frequency of the tuned circuit L1, C9, which is 10 kc/s. This is perfectly satisfactory as the amplification is quite high at the anode of V2. But if the J2 socket is being used and not J1, then there is not so much gain given by V2 alone to allow for the overall loss due to the correction circuit which is placed between V2 and V3a. Thus for inputs of the order of one volt r.m.s., the head can be adequately loaded, but for inputs such as radio-jacks, which cannot be used at J1 due to its low-impedance nature, maximum gain at V2 usually can only just fully load the tape and being of that certain school of thought I like spare extra gain at the volume control. C10 is wired in parallel with R12 thus reducing the impedance at high frequencies of the potentiometer circuit R12, R13 and the R-C-L network, and so also acts as a top-lift.

Higher Speeds

At 7½ and 15 i.p.s. the tone obtained on playback, with both treble and bass controls at maximum, definitely lacks the lower frequencies. I think this also applies to 3¾ i.p.s., but most decidedly at the faster speeds. With the advent of new tapes on the market, e.g., E.M.I. 88 and B.A.S.F., etc., not so much loss is found in the lower register, and thus not so much treble boost is required to compensate for this loss, such as was the case with E.M.I. 50 and Scotch Boy MC1-111 tapes.

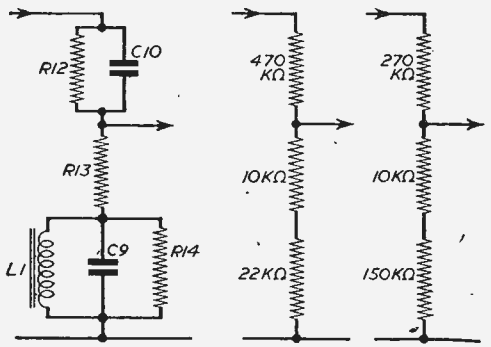


Fig. 1.—Original top-boost circuit of the Sound Master.

By removing C9 and L1 the gain of the first two stages is greatly increased and by introducing a 10 K resistance in parallel with R12-R13 some of the top lift is lost and the overall result is a more powerful amplifier giving a more "full" tone on playback. This tone tends to suit 7½ i.p.s. but becomes a little "thin" at 15 i.p.s. This can be overcome by replacing C9 or replacing it with a different value, ranging from 10 pF to 0.002μF; the higher the value the more the bass is emphasised. The new circuit is given in Fig. 2.

Adjustment of VR4

With C9 out of the circuit the bias level control VR4 should be set so that the bass notes sound pure and deep on playback, and there is no distortion due to top cut, which will become apparent if too much bias is applied through C25. The best method of adjusting VR4 is as follows: with a set position of the main volume control VR1, VR4 should be reduced to zero so that excessive bias is applied. Then VR4 is incrementally increased, until by trial and error the maximum volume of recording is obtained on playback with VR1 unaltered. There should be different settings for VR4 for the three speeds, and so it would be beneficial to have a locating mark somewhere on the spindle which could easily be aligned with some other marks on the chassis. It could also be mentioned that by increasing the bias level we also have an effective scratch-filter, which has obvious application.

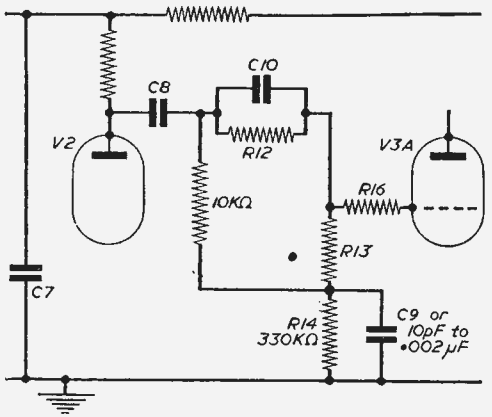


Fig. 2.—The improved circuit.

An Electrostatic Speaker

HOW TO MAKE AN EXPERIMENTAL H.F. UNIT

By N. A. Bargery

AFTER many experiments in this field, the following design proved to be the most promising, and compares very favourably with those on the market at the present time.

The size of the speaker determines its limit of low-frequency response, as well as its radiation coverage. A 6in. square speaker was decided upon as a compromise between ease of construction and useful H.F. response.

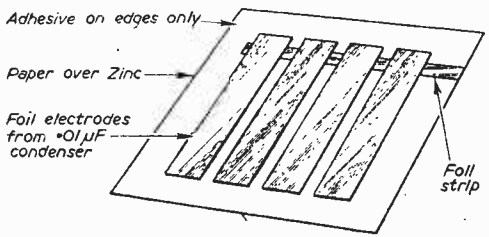


Fig. 1.—Details of construction.

The points which must be watched are that the dielectric material, which carries one set of electrodes, must be as light and thin as possible, but at the same time flexible and possess excellent insulating properties.

Many materials were tried, but one which consistently gave very good results was the paper fabric used to cover model aircraft wings. The other electrode, which also acts as a grille, was ordinary perforated zinc used by builders.

The vibrating electrodes fixed to the dielectric must be of the thinnest metal foil obtainable. It was found that the foil used in a .01μF tubular condenser served very well, as also did gold leaf, but the drawback to gold leaf is its fragility.

Construction

Construction proved fairly simple. The case must be taken so that in the finished speaker the electrodes do not short-circuit under load. A 300 volt D.C. supply and an AVO will serve as a reliable test for this defect. In any case, however, the materials used in the construction of this speaker are so cheap and easily obtained that one can afford several experimental hook-ups until the ideal speaker has passed its tests and is ready for use.

The method of construction is by no means critical. The one used by the author is as follows:

On a piece of hardboard 8in. by 8in. a hardboard or plywood frame (square) ½in. wide is fixed concentric with the edges as in Fig. 2.

In the cavity are layers of soft felt or close-knit woollen material level with the top of the frame.

A piece of builder's perforated zinc is cut to a square 6in. by 6in., and to the back of it is fixed a square of model aircraft tissue paper, at the edges only. Thin foil from a .01μF condenser is then fixed to the paper in strips as in Fig. 1, using celluloid cement or adhesive.

Make sure that, when the foil is secure, the paper is free from the zinc by blowing through the front of the metal plate and noticing if the paper leaves the plate temporarily. The paper carrying the electrodes must be fixed to the zinc at its edges only, and the metal foil strips must occupy only that area of the paper resting on the soft material in the frame.

The next step is to cut a strip ½in. wide of aluminium foil, such as is used to wrap tobacco, and lay across the top of the material in the recess, leading it in the gap and on to the terminal where it is secured

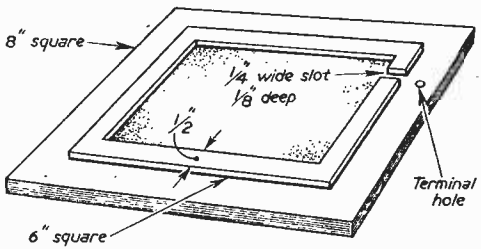
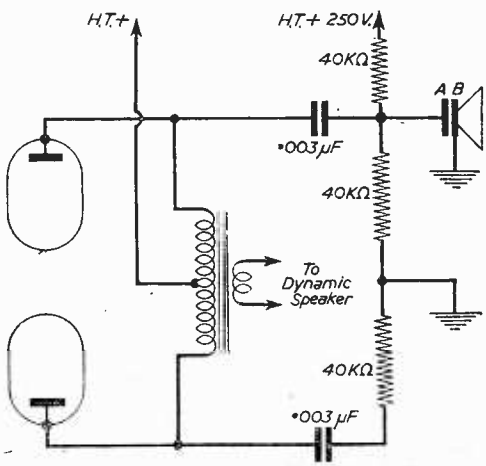


Fig. 2.—Further constructional details.

by nut and washer as shown in Fig. 2. Polythene may be used as a protection to the conducting strip where it might contact the perforated zinc plate.

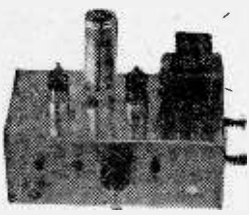
Next lay the zinc, with paper and foil-electrode side downwards, on to the foil conducting strip, but before securing the zinc to the frame, test the insulation between the zinc and the electrodes with an AVO and a 300 volt D.C. supply. If the insulation is satisfactory, secure the zinc plate to the frame at its edges with wood screws or nuts and bolts. Take a lead from the zinc plate, either from a solder connection to one of its corners, or from the bottom of a nut and bolt securing it to the frame. This together with a lead from the terminal already fixed are the two leads of the speaker.

(Concluded on page 642)



A = Terminal connection of Electrostatic Speaker
B = Zinc plate connection

Fig. 3.—How to wire the speaker in circuit.



BAND 3 T/V CONVERTER—185 Mc/s - 199 Mc/s

Suitable for London, Birmingham and Northern Transmissions

£2-5-0 post free.

A highly successful unit (*W/World* circuit), incorporating variable oscillator tuning, Midget BVA valves, etc. Chassis size 7 x 4 x 2½in. Thousands already in use. Suitable for most types of T.V sets. TRF or Superhet. Kit of parts 45/-, Blueprint 1/6, Power pack kit 30/-, Switch kit (Band 1—Band 3 Ae switching), 6/6—all Post Free. Wiring and aligning of above 20/- extra.

Full range of Band 3 aerials in stock. Adaptors from 7/6 per set. Indoor dipoles, 6/6. Outdoor with cables, 13/9. Band 1—Band 3 cross-over, filter unit, 7/6. Variable attenuators 6 db—36 db, 7/6. BBC Break-through Filter, suitable for BBC pattern rejector, 8/6.

Volume Controls

Log. radios, 10,000 ohms—2 Megohms. Long spindles. 1 year guarantee. Midget Ediswan type. No. Sw. S.P. Sw. D.P. Sw.
3/- 4/- 4/9
Linear Ratio, 10,000 ohms — 2 Megohms. Less switch, 4/- each.
Coax plugs, 1/2. Coax sockets, 1/-. Couplers 1/3. Outlet boxes, 4/6.

80 ohm CABLE COAX

STANDARD ¼in. diam. Polythene insulated.
GRADE "A" ONLY
8d. yd.
SPECIAL — Semi-air spaced polythene. 80 ohm **Coax** ¼in. diam. Stranded core. Losses cut 50%.
9d. yd.

TWIN FEEDER, 80 ohms, 6d. yd.; 300 ohms, 8d. yd.
TWIN SCREEN FEEDER, 80 ohms, 1/3 yd.
50 OHM COAX CABLE 8d. per yd., ⅜in. dia.
TRIMMERS, Ceramic, 4 pf.—70 pf., 9d. 100 pf.. 150 pf., 1/3; 250 pf., 1/6; 600 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/3 each.
RESISTORS– Pref. values 10 ohms 10 megohms.

CARBON		WIRE-WOUND	
20% Type. ½ w., 3d.;		5w.	25 ohms— 1/3
1 w., 5d.; 1 w., 6d.;		10w.	10,000 ⎫ 1/6
2w ., 9d.		15w.	ohms 2/-
10% Type. ½ w., 9d.;		5w.	15,000— 1/9
5% Type. ½ w., 1/-;			33,000
1% Hi-Stab. ½ w., 2/-.		10w.	ohms 2/3

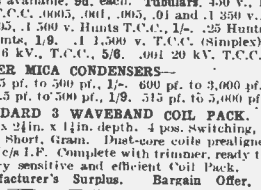
3w. LAB COLVERN, Etc. Standard Size Pots. 2¼in. Spindle. High Grade. All Values. 100 ohms to 50 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track 50 K. to 2 Meg., 3/-.

WIRE-WOUND POTS– Pre-Set Min. T.V. Type. Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track **W/W EXT. SPEAKER CONTROL**, 10 Ω, 3/-.

CONDENSERS. –Mica or S. Mica. All pref. values. 3 pf. to 680 pf., 6d. ea. Ceramic types. 2.2 pf.-5,000 pf. as available. 9d. each. **Tubulars**. 450 v., Hunts and T.C.C. .0005, .001, .005, .01 and .1 350 v., 9d. .02, .05, .1 500 v. Hunts T.C.C., 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1 1,500 v. T.C.C. (Simplex), 3/6. .001, 6 kV., T.C.C., 5/6. .001 20 kV. T.C.C., 9/6.

SILVER MICA CONDENSERS—
10% 5 pf. to 500 pf., 1/-. 600 pf. to 3,000 pf., 1/3. 1% 1.5 pf. to 500 pf., 1/9. 515 pf. to 5,000 pf., 2/-.

STANDARD 3 WAVEBAND COIL PACK. Size 2¼in. x 2¼in. x 1¼in. depth. 4 pos. Switching, Long, Med., Short, Gram. Dust-core coils prealigned for 465 Kc/s I.F. Complete with trimmer, ready to use. A very sensitive and efficient Coil Pack.
Manufacturer's Surplus. Bargain Offer, 27/6.



3 VALVE AMPLIFIER

With variable Tone and Volume controls. 3 Midget B.V.A. valves. 4 watts output. Neg. feedback. Chassis isolated from Mains. A.C. 200-250 v. A quality amplifier at an economical price. **PRICE 23/19.6.** Carr. 2/6. Wired and tested, 15/- extra. Blueprint, circuit and instr. 1/6 (free with kit).

ALL WAVE RADIOGRAM CHASSIS
3 WAVEBANDS, 5 VALVES

S.W. 16 m.—50 m.
M.W. 200 m.—550 m.
L.W. 800 m.—2,000 m.
LATEST MIDGET B.V.A. SERIES

Brand new and guar. A.C. 200/250 v. 4 pos. W/C sw. Short-Medium-Long-Gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 13½ x 5½ x 2½in. Dia. 1din. x 4½in. Hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.**
Chassis isolated from mains. **BARGAIN PRICE £9.15.0**
Carr. and ins., 4/6.
8 or 10in. speakers to match.

7 Valve De Luxe, push-pull version, 7 watt output, £12.10.0. Carr. & ins., 5/-.

BARGAIN VALUE IN AUTO CHANGERS

3 speed auto change mixers for 7in., 10in. & 12in. records. Lightweight Xtal P.U. with turnover Duo-point sapphire stylus for Hi-Fi reproduction. Latest models—Modern styling. All brand new, boxed and guar. A.C. 200/250 v. only.
PLESSEY, £8/10/-. BSR MONARCH, 8½ gns.
GARRARD RC110, £8/19/6. COLLARO RC54, £10/10/-. All suitable for above Radiogram chassis.

ALUMINIUM CHASSIS.—**18 s.w.g. Plain, undrilled, folded 4 sides and riveted corners lattice fixing holes. Strong and soundly constructed with 2½in. sides. 7in. x 4in., 4/6; 9in. x 6in., 5/9; 11in. x 7in., 6/9; 13in. x 9in., 8/6; 14in. x 11in., 10/6; and 18in. x 16in. x 3in., 16/6.**
SPECIAL OFFER.—Goodmans 12in. P.M. Speaker Audiom 50, Brand new, boxed and guar. FEW ONLY. £4/10/-. Carr. 3/-.
BRIMISTORS.—CZ1 for .3a heater chains. 3/6. CZ2 for, 15 a., or .2 a., 2/6. CZ5 (Pilot Lamp) 1/6.

VALVES

NEW BOXED				ALL GUARANTEED	
1R5, 1T4	7/6	DAF96	9/-	ECH81	12/6	EZ40	10/-
1S5, 1S4	7/6	DF96	9/-	ECL80	12/6	EZ80	11/-
3S4, 3V4	8/-	DK96	9/-	EF41	10/6	MU14	8/6
5Z4	8/6	DL96	9/-	EF50	10/-	PCC84	12/6
6AT6	8/6	EA50	2/-	EF50		PCF80	12/6
6CH6	10/6	EB91	7/6	Equip.	5/6	PCF82	12/6
6H6M	3/6	EBC41	10/6	EF80	10/6	PCL83	12/6
6K7	6/6	EBC33	8/6	EF85	10/6	PL81	12/6
6K8	9/-	ECC83	12/6	EF86	13/6	PL82	10/-
6Q7	8/6	ECC84	13/6	EF89	10/6	PL83	12/6
6S7	9/-	ECC85	13/6	EF91	8/6	PY80	11/-
6V6	7/6	ECF80	12/6	EL41	11/6	PY81	12/6
6X4	8/6	ECF82	13/6	EL84	12/6	PY82	10/-
6X5	8/-	ECH42	10/6	EY51	12/6	U25	12/6

and hundreds of others at Bargain Prices.
SPECIAL PRICE PER SET.
1R5, 1T4, 1S5 and 3S4 or 3V4 ... ... 27/6
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35/-
SPEAKER FRET.—Expanded Bronze anodised metal 8in. x 8in., 2/3; 12in. x 8in., 3/-; 12in. x 12in., 4/3; 12in. x 16in., 6/-; 24in. x 12in., 8/6, etc.

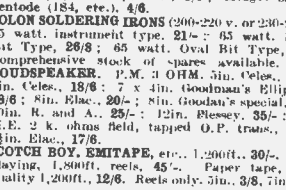
ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends			
25/25 v., 50/12 v.	1/9	32+32/350 v. B.E.C.	5/6
50/50 v., 4/500 v.	2/-	Can Types, Clips, 3d. ea.	
100/25 v. 2/450 v.	2/-	8+8/450 v. T.C.C.	4/6
8/450 v. B.E.C.	2/3	8+16/450 v. Hunts	5/-
8/500 v. Dub.	2/6	16+16+8/350 v.	5/6
8+8,500 v. Dub.	4/6	16+16/450 v. T.C.C.	5/6
8+16 450 v. T.C.C.	5/-	16+32/350 v. B.E.C.	5/-
16/450 v. B.E.C.	3/6	32/350 v. Dub.	4/-
16/500 v. Dub.	4/-	32+32/450 v. T.C.C.	6/6
16+16/450 v. T.C.C.	5/6	60 350 v. T.C.C.	6/6
32/350 v. Dub.	4/-	60+100/350 v.	11/6
32/500 v. Dub.	5/-	60+250/275 v.	12/6
50+50/350 v. B.E.C.	6/6	100+200/275 v.	12/6
		6,000 mfd. 6 v.	3/9

I.F. TRANSFORMERS—465 kc/s

Brand new ex-manufacturer's midget I.F.T., size 2¼in. x ¾in. x ¾in., dust core tuning. Litz wound coils, High Q. Bargain offer, 7/6 pair.

MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.**—250 v., 60 ma. F.W. sec., 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. sec. Htrs., 21/-, etc. **C.R.T. HTR. ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25, 2 v., 4 v., 6 v. or 13 v., 10/6 ea. Ditto with mains primaries 200/250 v., 12/6. Special, to order. **SPECIAL TYPES.**—To designers spec. Viewmaster. 35/-; Mullard Amp., 35/-; Oaram. 912, 35/-. **HEATER TRANSF.**—Prim. 220/250 v., 6.3 v. 1½a. or 4 v. 2 a., or 12 v. .75 or 16 v. .5 a., 7/6; 6.3 v. 3 a. or 5 v. 6 a., 16/6. **L.F. CHOKES.**—10 H. 65 ma., 5/-; 15 H. 100 ma., 10/6; 10 H., 120 ma., 10/6; 20 H. 150 ma., 15/6; Simplex, 10/6; Soundmaster, 10/6. **OUTPUT TRANSF.**—Standard pentode, 4/6; ditto tapped prim., 4/9; small pentode, 3/9; Midget battery pentode (1R4, etc.), 4/6.
SOLON SOLDERING IRONS (200-220 v. or 230-250 v.) 25 watt instrument type, 21/-; 65 watt. Pencil Bit Type, 26/8; 65 watt. Oval Bit Type, 25/-. Comprehensive stock of spares available.
LOUDSPEAKER. P.M. 3 OHM. 5in. Celes., 17/6; 6in. Celes., 18/6; 7 x 4in. Goodman's Elliptical, 18/6; 8in. Elac., 20/-; 8in. Goodman's special, 21/6; 10in. R. and A., 25/-; 12in. Plessey, 35/-; 8in. M.E. 2 k. ohms field, tapped O.P. trans., 24/6; 3½in. Elac., 17/6.
SCOTCH BOY, EMITAPE, etc., 1,200ft., 30/-. Long playing, 1,800ft. reels, 45/-. Paper tape, good quality 1,200ft., 12/6. Reels only. 5in., 3/8, 7in., 4/3.



F.M. TUNER-UNIT (87 mc/s—105 mc/s), by Jason. —As tested and approved by Radio Constructor. Complete Kit of parts to build this modern highly successful unit, drilled chassis and J.B. dial, coils and cans, 4 B.V.A. miniature valves and all components, etc., for only £6/10/0, post free. **SUPERIOR** TYPE GLASS DIAL (as illustrated)—Calibrated in Mc/s and edge lit by 2 pilot lamps, 12/6 extra. Illustrated handbook with full details 2/- post free.

TRS RADIO COMPONENT SPECIALISTS (Est. 1946)

70 BRIGSTOCK ROAD, THORNTON HEATH, SURREY (THO 2188)

50 yards Thornton Heath Station. Buses 130A, 133, 159, 166 & 190

Listed above are only a few items from our very large stock.

Send 3d. stamps today for Complete Bargain list.

Hours : 9 a.m.—6 p.m. 1 p.m. Wed. OPEN ALL DAY SAT.

Terms C.W.O. or C.O.D. Kindly make cheques, P.O.s, etc., payable to T.R.S. Post Packing up to 1lb. 7d., 1lb., 1/1; 2lb., 1/6; 3lb., 2/-; 10lb., 3/9

Automatic Switching for a Tape Recorder

A SIMPLE ADDITION TO SWITCH OFF THE RADIO OR AMPLIFIER WHEN A RECORDING HAS BEEN MADE

By C. Call

IF your tape recorder has a trip switch arranged to switch off the capstan motor when the end of the tape is reached, here is a simple modification to extend the usefulness of your machine.

Many home recordists use their machines to record radio programmes for subsequent re-play. Once the machine has been set up it can be left to record unattended and; when the tape has completely run through, the motor will switch itself off. A disadvantage is that the amplifier and also the radio receiver still remain on, unless some form of remote control or time switch is used to control these as well.

The alterations proposed here involve the addition of a small relay wired in conjunction with the existing stop-switch and arranged so as to switch everything off, if required, when the end of the tape is reached.

The illustration shows the relay as fitted in a Ferrograph Model "2A" recorder. In this machine a solenoid holds the operating lever in the on position, and to stop the capstan this solenoid is shorted out. With reference to the wiring diagram given it can be seen that the connections to this solenoid are broken and the coil of the new relay is wired in series. Note, however, that the leads from the trip-switch must short out solenoid and relay.

The solenoid is normally energised by the H.T. current of the amplifier and so the relay, when the amplifier is on, will also be energised and its contacts will be closed. (In the case of the solenoid, the armature plate is so far away from the coil that the magnetic attraction is too weak to pull it in by itself. It has, therefore, to be operated to the on position manually and will then hold until released by the breaking of the magnetic field.)

The relay has two make contacts. One of these is wired in parallel with the existing mains on/off switch. The other is taken to a socket on the back and is used for remote switching of the receiver.

In operation, once the apparatus has been set up and the recording started, the mains switch is placed in the off position, thus transferring control to the relay contacts and, when the end of the tape is reached, everything is automatically switched off.

A minor complication arises with this modification in that, when the instrument is to be switched off in the ordinary course of events, the new relay will still hold it on. The procedure is, of course, to operate the trip switch manually at the same time.

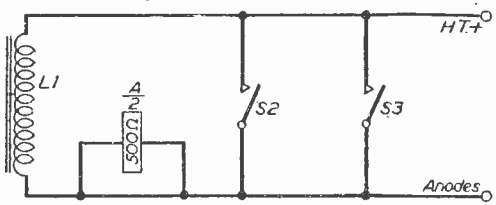
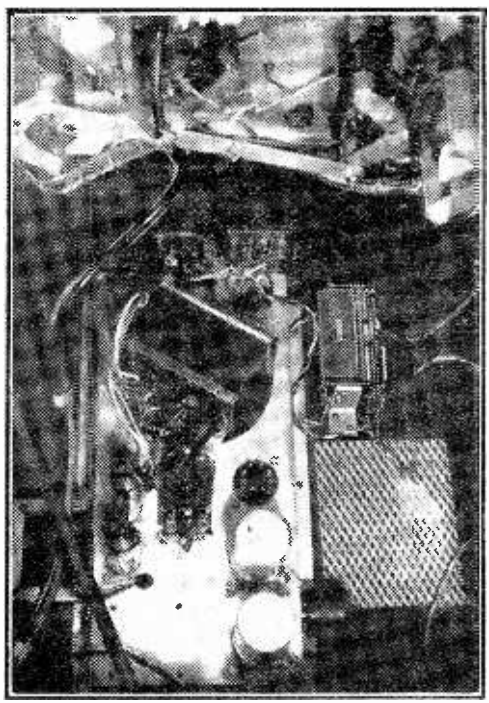


Fig. 1.—The resistance of the relay should be as low as possible consistent with reliable operation. A value of 500 ohms was found suitable, and a P.O. type relay having this value can be readily obtained on the surplus market.



The Relay in position at the right of the Power Chassis.

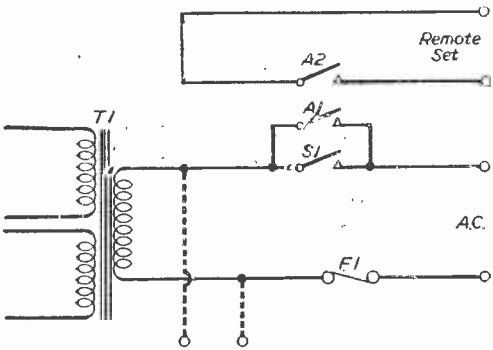


Fig. 2.—The dotted connections show an alternative method of feeding a receiver. In this case the relay need have only one make contact.

Programme Pointers

Our Critic, Maurice Reeve, Reviews Some Recent Programmes

IT is not often that a world première of a play by a famous dramatist is given over the air. But that was the honour accorded J. B. Priestley's "End Game at the Dolphin" in "Saturday Night Theatre." It aroused much interest and speculation, but there must have been disappointment in many cases.

Built round a slight story of a woman who runs a Cornish coast hotel for herself and a few friends, with complications between the lady and another, both of whom were at one time interested in the same gentleman, the piece could stand comparison with Shaw's "In Good King Charles's Golden Days," with the latter taking all the honours. Each is more of a conversation piece—the similarities begin and end here—but whereas in the Shaw comedy the philosophical wisecracks and the master's inventiveness and verbal jugglery pour out in a ceaseless flow (it was Shaw's last "great" play), in the Priestley play they are much rarer, less spontaneous and too tied up in the contrived plot.

It was far from being vintage Priestley. Valerie Taylor and Peggy Thorpe-Bates played the two chief women with splendid ill-will towards each other. And Eric Anderson made an excellent barman, Marlborough. Norman Wynne, Manning Wilson, Nancy Nevinson, Dorothy Holmes-Gore, Alan McClelland, Beatrice Kane, Monica Gray, Laidman Browne and John Gabriel completed the cast.

Valentine Dyall, as Charles the Second in the Shaw play, gave the part exactly the right touch of cynical yet shrewd wisdom, coupled with endearing romanticism, as the lover of goodness knows how many what we, today, might refer to as "pieces"—not to mention the "little woman" at home. Eric Anderson was again excellent as Newton. Duncan McIntyre foretold his future imbecility as James the Second perfectly. Malcolm Hayes was effective as Godfrey Kneller, Dorothy Holmes-Gore as the little woman, Queen Catherine. Stephen Jack as George Fox, Elsa Palmer as Mrs. Basham and Nancy Nevinson as Sally. Dora Bryan, Belle Chrystall and Peggy Thorpe-Bates were all that a king could possibly require when not in his counting-house counting out his money.

Weekly Feature

"Curiouser and Curiouser": an anthology of Anglo-American off-beat humour, compiled and compered by David Climie. This is a new weekly feature programme, which promises to be very interesting and amusing. It started off with delightful excerpts from "Hucklebeery Finn" and "Nicholas Nickleby," and included a bizarre grand guignol kind of reading of an American husband wheedling and cajoling his wife into the coal cellar with intent to murder her. The excellent performers were Spike Milligan, Pearl Carr, Miriam Karlin, Georgia Brown, Ronan O'Casey and David Jacobs. Duty and truth compel me to note its one blemish—some truly abominable "music" by Stanley Myers, with additional abominations by Alfred Ralston. But then, all BBC "feature" music deserves a volume of criticism to itself!

The programme offers endless possibilities for a first-class feature, with unlimited sources for good script writers. But oh, that music!

"The King of Friday's Men," a stage play, by Michael G. Mulloy, adapted for radio by the author (Third), was a grand helping of Irish stew—if Mr. Mulloy will permit the use, as a metaphor, of something we English are very partial to. Full of Irish wit, sentiment and eighteenth century morals, its eccentric characters and rich situations held us in a grip that was a welcome change from the recent past. Briefly, the story told of the now defunct "droits de signeur" and the efforts of a fair Colleen to thwart them. The shillelaghs cracked and the begorras were rasped out. I thoroughly enjoyed it.

"These Foolish Things," another new weekly feature, presents a difficulty, apparent in the first two numbers of it I listened to. If it can be overcome it should establish itself. Under the skilful direction of Roy Plumley, an everyday occurrence or familiar, noise is reproduced, whereupon each member of the panel tells of an experience he has lived through of which it reminds him. These reminiscences varied greatly in quality, interest and amusement when I heard them. If they can be kept on an average high plane, then all should be well.

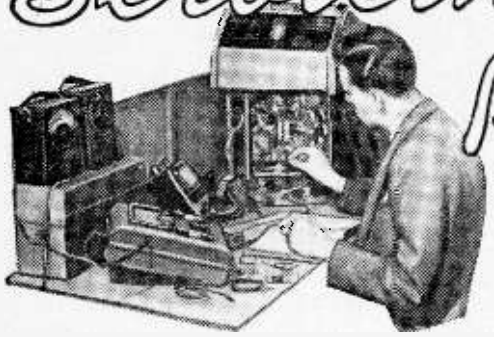
Panel Games

"What Do You Know?" now three years old, has developed into what is probably the best of the panel games based on question and answer. It is expertly directed by Franklin Engleman, who imparts to his job just the right dash of professorial discipline, tempered with entertaining sang-froid. It is amusing to watch the luck that the various contestants experience; one gets bowled over by a question on a subject of which he is abysmally ignorant, whilst the next finds himself "right up his own street." Each probably wishes he were in the other's shoes, just as I, listening, keep saying to myself, alternately, "I wish they'd asked me that one" and "I'm glad I'm not there!" This was particularly evident when "the brain of Britain" was found.

The Waters

Elsie and Doris Waters' weekly feature, "Floggits," is rather like an extension to half an hour of their famous, and justly popular, eight or 10 minutes variety turn. There doesn't seem much more in it than that.

Servicing Radio Receivers



MARCONIPHONE MODEL T24DAB

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

THIS model is an A.C./D.C. mains all-dry battery portable housed in a suitcase type of cabinet. It features a four-valve superhet circuit of high sensitivity and inbuilt frame aerials. For operation on mains it accommodates inputs between 195-255 volts, and for battery operation requires five 1.5 volt U2 cells in series (giving 7.5 volts) for L.T. and a 90 volt layer-type battery (Ever Ready " Batermax " Type B126) for H.T.

The wave range coverage is medium-wave (M.W.) 185-565 metres and long-wave (L.W.) 1,000-2,000 metres. The valve sequence is as follows : Marconi X17—frequency changer ; Marconi W17—I.F. amplifier ; Marconi ZD17—detector, automatic gain control (A.G.C.) and audio-frequency (A.F.) amplifier ; Marconi N18—output.

The Aerial and Frequency Changer Sections

As can be seen from the complete circuit of the receiver at Fig. 1, the frame—or loop—aerials are represented by coils L1 and L2. With the wave-change switch set at L.W. both aerials are in series in the signal grid circuit of V1, and the circuit is tuned over the band by C1 section of the tuning gang. With the switch in the M.W. position, section L2 is short-circuited and L1 acts as the M.W. aerial coil. Trimmer T1 serves for adjustment of the L.W. aerial coil.

The oscillator grid coils, L3 (M.W.) and L5 (L.W.), are tuned by C2 section of the gang. S2 section of the wavechange switch shorts out L5 on M.W. M.W. trimming is provided for by T2, while T3 serves the same function on L.W. Coil L4 is the oscillator feed-back—or reaction—winding and is common for both bands. The intermediate frequency is developed in the anode circuit of V1 across the first I.F. transformer (I.F.T.1).

There are several faults which may develop in the first stage. A common one is low emission of the valve itself. The symptom is complete failure of the receiver so far as signal pick up is concerned, though the receiver generally appears quite lively and exhibits the usual effects of microphony on gently tapping V2 or V3. Failure may not occur immediately the receiver is switched on ; signals may be received for a short while and then suddenly cut off. The effect may be aggravated by a faulty H.T. rectifier on mains (causing a reduction of H.T. line voltage), or on battery operation by a worn or exhausted 7.5 volt supply. The effect, of course, is due to failure of the local oscillator.

A similar symptom may be caused by an increase in the value of the 15 K. oscillator feed resistor, or low value of one of the associated capacitors. A worn or dirty wavechange switch may also prevent oscillation, but this can generally be proved conclusively by carefully adjusting the switch to secure temporarily a good contact—the receiver will then burst into life. The application of a few drops of good quality switch cleaner often solves this problem without any difficulty, but if the trouble is caused by badly worn contacts it is necessary to change the switch. This is of a special type—catering also for battery/mains changeover—and should, therefore, be obtained from the manufacturer via a dealer.

The I.F. Stage

The intermediate frequency on this model is 360 kc/s. The signal across the secondary of the first I.F. transformer is passed to the control grid of V2 for amplification, the amplified I.F. signal being developed across the second I.F. transformer.

Apart from trouble developing in the fixed tuning capacitors across the windings of the I.F. transformers, little goes wrong in the I.F. section.

Low gain has been known to have been caused by open-circuit of the 0.1 μF screen grid decoupling capacitor, but this is not a general happening. Nevertheless, for low overall sensitivity both this capacitor and the 22 K. screen feed resistor should be checked, as also should the I.F. transformer tuning capacitors.

If the tuning capacitors are suspected, it is generally necessary to substitute the complete I.F. transformer assembly, as the capacitors are integral with the moulding of the former. It should be mentioned that these components also tend to become intermittently defective, giving rise to intermittent loss of volume and crackling. When the capacitors have failed completely it will be found impossible to peak the I.F. transformers at the correct I.F.

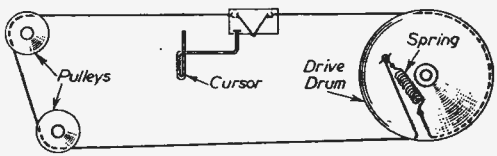


Fig. 4. — Drive cord details.

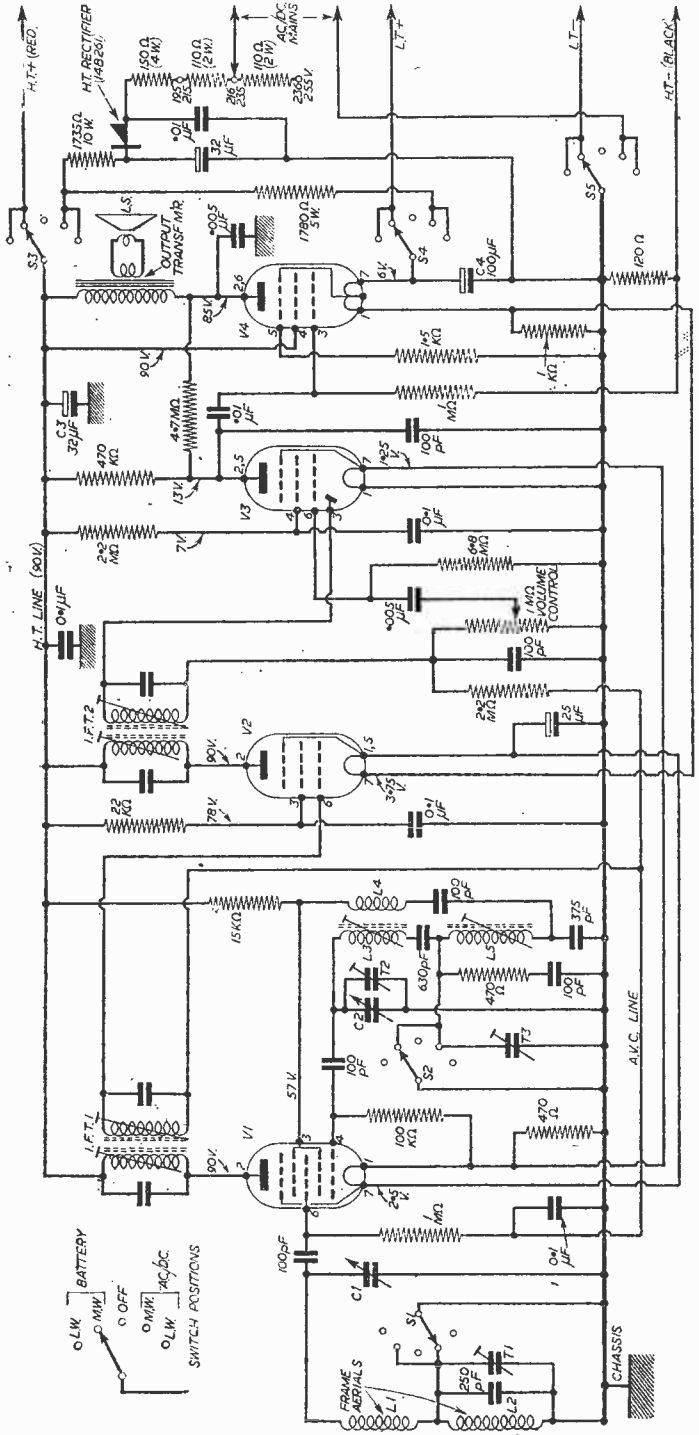


Fig. 1.—Circuit diagram of the Marconiphone T24D.4B

The Detector, A.G.C. and A.F. Stage

The amplifier I.F. is presented to the diode in V3 for demodulation. The volume control acts as the detector load, and the required level of A.F. is conveyed, via a coupling capacitor, to the signal grid of the pentode section of V3. The pentode section amplifies the A.F. which is developed across the anode load resistor (470 K.).

The D.C. potential at the top of the volume control has a magnitude, negative with respect to chassis, which depends on the strength of the signal. It is used, therefore, as an A.G.C. bias, and is fed back, through the 2.2 megohm filter resistor, to the grid circuits of V1 and V2. The gain of these valves thus depends on the strength of the signal—if it is weak then the gain increases correspondingly and, conversely, if it is strong then the gain decreases. This is, of course, a normal A.G.C. action.

Trouble in this section is generally focused on the screen and anode resistors of V3. If these go high in value weak output and distortion often results. V3 itself may develop microphony causing "ringing" when the cabinet is jarred or on loud reproduction. This nearly always necessitates valve replacement, though low L.T. voltage often aggravates the effect with valves which have been in use for any length of time.

The Output Stage

The signal at the anode of V3 is passed by way of the 0.01 μF coupling capacitor to the control grid of the output valve V4. In the anode circuit of this valve is produced the power for operating the loudspeaker.

A frequent fault here, giving rise to low volume and excessive distortion, is a leak in the 0.01 μF coupling capacitor. It is absolutely essential that a component having a very high insulation is used in this position. A slight positive voltage on the control grid of V4 will, of course, quickly coun-

(*Continued on page 637*)

teract the negative bias and cause the grid to go positive with respect to its filament. The 4.7 megohm resistor between the anode of V3 and the anode of V4 introduces a small degree of negative feedback. Bias for the output valve is developed across the 120-ohm resistor situated in series with the H.T. negative lead.

The Power Circuits

On mains H.T. voltage is supplied by the 14B261 H.T. rectifier in a half-wave circuit. The 1,735-ohm 10-watt resistor, in conjunction with the electrolytic capacitors, smooths the H.T. voltage, while the 1,780-ohm 5-watt resistor serves as a voltage dropper for the valve filaments, which are series connected. A voltage selecting resistor is connected in series with the mains supply at the input side of the rectifier.

A Modification

At one time, on early models, the 100 μF electrolytic C4 was connected between pin 1 of V4 and chassis. It was found, however, that the surge current of C4 flowing through V4 filament when switching on often resulted in its premature failure. This was overcome by connecting C4 to pin 7 of V4, illustrated on the circuit at Fig. 1. This modification should be carried out on all former receivers of this range and at the same time a 25 μF 12-volt electrolytic should be added between pin 1 of V2 and chassis.

Alignment

The I.F. stages should be aligned first by applying a modulated 360 kc/s (833.2 m.) signal, via 0.1 μF capacitors—one in each lead of the generator—between pin 6 of V2 and chassis and adjusting the primary (Fig. 2) of I.F.T.2 for maximum output. The signal should then be altered to 362 kc/s (828.7 m.) and the secondary (Fig. 3) of I.F.T.2 adjusted for maximum output.

After transferring the signal, still through a capacitor, to the white lead on the frame aerial tag panel, the primary (Fig. 2) of I.F.T.1 should be adjusted at 360 kc/s for maximum output. The secondary (Fig. 3) should be adjusted at 362 kc/s for maximum output. The input signal should always be kept as low as possible consistent with usable deflection on the output meter.

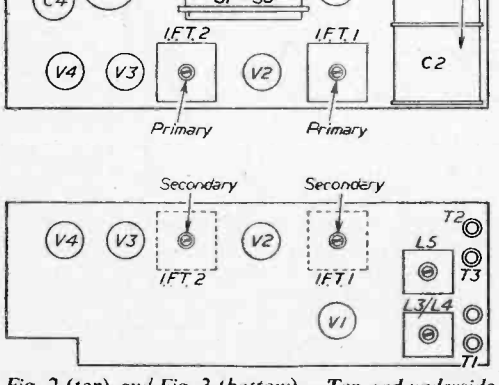


Fig. 2 (top) and Fig. 3 (bottom).—Top and underside views of the chassis.

R.F. Alignment

Check the position of the tuning pointer in relation to the scale and adjust if necessary. With the gang at maximum capacitance the pointer should be arranged to coincide with the 2,000-metre mark on the scale.

A signal must be injected either inductively by connecting a loop across the output leads of the generator and setting it up about 2 ft. away from the set or capacitively by draping the "live" generator lead in proximity to the cabinet. On no account must a direct connection be made to the frame aerials as this will tend to detune them and give rise to false alignment.

Adjust generator to 600 kc/s, modulated, and the receiver to 500 metres. Adjust L3 (Fig. 3) for maximum output. Adjust generator to 1,500 kc/s and receiver to 200 metres. Adjust T2 (Fig. 3) for maximum output. These operations should be repeated until optimum tracking over the medium waveband is secured.

Tune the generator to 300 kc/s, still modulated, and the receiver to 1,000 metres. Adjust T3 (Fig. 3) for maximum output. Tune the generator to 160 kc/s and the receiver to 1,875 metres. Adjust L5 (Fig. 3) for maximum output. Tune generator to 210 kc/s and receiver to 1,429 metres. Adjust T1 (Fig. 3) for maximum output. Repeat as above.

General

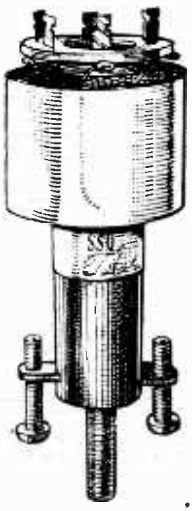
Valve, coil and trimmer positions are shown in Figs. 2 and 3, while in Fig. 4 are shown details of the cord drive. Nylon or fishing line is suitable for cord replacement; a length of approximately 20in. is required. The lead from the output side of the H.T. rectifier may, if pulled tight, short on to the fins of the rectifier and cause damage to associated resistors. This should be watched out for during servicing.

News from the Trade

TELETRON SUPERSONIC OSCILLATOR COIL

THE careful filtering of H.T. supplies and the use of humdingers, etc., in the L.T. supply to tape recorder amplifiers often fail to remove residual 50 cycle hum, which. in many cases. may be due to induction between heater and grid of the pre-amplifier valve.

The new teletron coil, type SSO, is designed to overcome this problem by providing a heater supply to the pre-amplifier valve at supersonic frequency, and also supplying record and erase bias from a single oscillator valve with excellent waveform and regulation. Each coil is adjusted during test by means of the iron dust core to a nominal inductance of 9MH. The price is 15s. each.—The Teletron Co., Ltd., 266, Nightingale Road, London, N.9.



Teletron SSO coil.

WALL EDUCATIONAL CHARTS

A VALUABLE set of three wall charts has been issued by Educational Productions, Ltd. These show, in clear diagrammatic form, the basic principles of electronics and of radio. The first chart deals with amplification, showing the movement of electrons and the operation of the valve as an amplifier. This is followed by charts on reception, the valve as a detector and oscillator and the principles of a typical superhet receiver.

These charts (measuring 19in. by 24in.) have been published in collaboration with the E.M.I. Institute, through whose kind generosity they are available to schools in this country *at the purely nominal cost of* 3s., and as such they are really outstanding value.—Educational Productions, Ltd., East Ardsley, Wakefield, Yorks.

PHILIPS HIGH FIDELITY LOUDSPEAKERS

TWO high fidelity loudspeakers (8in. type 9710 and 12in. type 9762)—the first in a new range—have been introduced by Philips Electrical Ltd. These are each available in two versions—single cone (/00) and dual cone (M). The prices are :

9710/00	£6.2.6 (tax paid).
9710/M	£6.12.6 (tax paid).
9762/00	£10.0.0.
9762M	£10.10.0.

These loudspeakers have been designed to meet the needs of those who require true high fidelity units which provide a wide frequency range, excellent transient response and adequate power handling capabilities under normal domestic conditions.

A number of special design points are incorporated. The air gap is long, so that even at the greatest amplitudes the coil is completely enclosed in a homogeneous magnetic field. The cones are extended rearwards to the apex, which fits into a conical recess giving excellent air damping. A copper ring is inserted in the air gap and this keeps the voice coil impedance constant over the entire frequency range. The resonance frequency of these loudspeakers is very low, resulting in an extremely straight low note response curve. "Ticonal" steel is used for the magnets. This material makes possible high flux densities from modest sized magnets.

The dual cone M versions of these loudspeakers are claimed to cover the entire audible range. A smaller cone of stiffer material is attached to the main cone; this increases the high frequency response. It is claimed that greatly improved diffusion of sound is achieved by this design. The small cone acts as a diffuser for frequencies below 10 kc/s. generated by the large cone; likewise the large cone reflects frequencies above 10 kc/s produced by the small cone.

Technical Specification

	9710 (8in.)	9762 (12in.)
Power handling capacity	10 watts	20 watts
Voice coil impedance ...	7 ohms	7 ohms
Cone resonance	50 cycles	45 cycles
Efficiency...	4.5% at 400 cycles	14% at 400 cycles
Flux density	8,000 gauss	11,000 gauss
Total magnetic flux ...	97,000 Maxwells	134,000 Maxwells
Magnetic weight... ...	428 gram	1,075 gram

THE "FLEXTIDY"

NOT only experimenters but also many normal domestic users often find that some piece of apparatus is fitted with an unduly long flex, and, when it is required near-by, the unwanted length of flex trails on the floor or, apart from looking untidy, becomes dangerous due to twisted loops, etc. These troubles may be overcome in a simple manner by winding the unwanted length of flex round a strip of material, and a neat device is available from F. E. Conway and is illustrated below. Made in transparent

The neat Flextidy

plastic material its hooked ends enable flex to be wrapped round it and held firmly, unwrapping as required. The price is 7½d.—F. E. Conway, 3, Mayfair Road, Marton, Blackpool.

NEW 4-WAY SELECTOR

A NEW miniaturised 4-way voltage selector, type BMVS/4, developed from the B9A (Noval) Valveholder, is announced by the McMurdo Instrument Co., Ltd.

The socket is a standard moulded B9A Valveholder in which certain contacts are omitted. The moulded plug is engraved with the appropriate mains voltage figures and is captive to the socket so that it cannot be completely disengaged.—McMurdo Instrument Co., Ltd., Victoria Works, Ashtead, Surrey.

Open to Discussion

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

A 3½in. Oscilloscope

SIR,—The writer was interested in the comments on the push-pull amplifier for the 3½in. scope made in a letter by R. Tring in the September issue. Certainly Mr. Tring is correct in a part of what he says—the circuit of the first section can certainly be regarded as a cathode follower with an anode load. However, I do not agree that a cathode follower with an anode load will behave in the same manner as a normal cathode follower. The circuit can be taken as roughly a parallel with an amplifier valve with an unbypassed bias resistor. Certainly if a further resistance is, in the case of a single valve, added between the cathode bias resistor and earth, the gain of the circuit will be reduced until it is just slightly under unity—as in the case of a concertina phase split circuit. However, in this case we are coupling in another valve, so what happens is that the current from the cathode circuit of the second valve offsets a part of the current from the first section. If the impedance of the cathode circuit were to approach infinity, as in the case of a long-tailed pair where a pentode is used for the coupling resistor, one half of the voltage fed to the grid of the first section is developed across the cathode load; thus only one half of the input voltage to the grid of the first half actually appears between grid and cathode. The other half appears between grid and cathode of the second section. Thus with an infinite impedance in the cathode circuit the output is perfectly balanced. The circuit used was a forerunner of the long-tailed pair, and was responsible for its development, and the near approach to perfection is obtained when the value of the coupling resistor is 10 or more times that of the cathode bias resistor. The method suggested for obtaining bias can certainly be used, and where the amplifier is to be directly coupled to the deflector plate is to be thoroughly recommended, but not for any other application, as the circuit drift is liable to set the bias on the two sections so that they are widely different. This would give rise to severe distortion—unless, of course, the balance was carefully set.—JAMES S. KENDALL (Birmingham).

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.

I.F. Frequencies

SIR,—Reference the letter from M. C. Sykes, in your August, 1956, issue.

In the listed frequencies he queries the R1155A I.F. as 280-650 kc/s.

I believe that the correct I.F. for this receiver is 562 kc/s, the B.F.O. operating on 281 kc/s, half of the I.F.—R. L. EDGINTON (ZC4GF) (B.F.P.O. 53).

F.M. Results

SIR,—Recently my wife and I were able to listen, on headphones, uninterruptedly to the opera from Glyndebourne via the BBC's V.H.F. service while a thunderstorm was in progress of sufficient severity to damage houses in the vicinity.

Perhaps it is because I am an ex-wireless operator, but it seems to me that thus to scotch radio's greatest bugbear and to make possible interference-free listening in conditions hitherto thought to be intolerably disagreeable and even dangerous, is the greatest advance in domestic wireless reception ever made. Indeed, I find the A.M. rejection properties of a correctly functioning ratio detector quite uncanny. An unsuppressed hair-dryer running in the next room creates a roar when off tune which is rendered inaudible by simply tuning to one of the Wrotham V.H.F. transmissions. [*Suppress it! Ed.*]

I do not think that at present the quality of the V.H.F. transmissions is noticeably better than can be got on medium waves with a receiver *which makes no concessions to the selectivity problem.* But where I live the Third programme, for example, cannot be listened to with pleasure on such a receiver.

In their present state of development F.M. receivers are undoubtedly very difficult to make and adjust, and I would hazard the guess that it is because the home constructor has not so far been able to be the bearer of glad tidings in connection with V.H.F. to the extent that he always has been with other developments in radio that V.H.F. is not yet being taken up to the extent that its merits warrant.—THOS. B. SANDERS (Ilford).

SIR,—Regarding "F.M. Results," by G. Prentis, of Elstree, September, 1956, "Open to Discussion,"

I, for one, have heard good transmissions of F.M., but in Germany. I have just returned after 2½ years, and I can say that over there I only listened to A.M. transmissions, while the F.M. stations transmitted a programme not of my choice.

I am waiting for England to cover all areas on the F.M. side of radio, as my position or location in England is very poor for receiving F.M. I, too, have tried to pull the BBC transmissions through the interference of cars mainly on the receiver I operated in Germany. Whatever the aerial I used in Germany, longwire, short whip, a tap off the earth lines, bed frame and a length of welding rod, I still received very good F.M.; but over here in England I have tried two, three, and four element beams, folded dipoles, plus others, and I receive very poor results, but no fade, my receiver being a push-button wave change, and

separate tuning for F.M. and L.M.S. I can change over to compare transmissions, granted a vast quality, because of the distance in transmitters. I say, if G. Prentis waits a little time, he, too, will hear the amazingly clear transmissions, when one can hear music, talks and other programmes, clear from Q.R.M. I'm waiting and experimenting till the day I can listen to good, clear F.M., also waiting for a law to make motorists fit suppressors and other Q.R.M. makers.—Cpl. RICK GILL (Wallasey).

National Amateurs' Association

SIR,—As a regular reader of "Thermion's" page in your excellent magazine, I should like to pass some comment on his article under the heading of "A National Amateurs' Association."

I fully agree that the listener is not catered for to the extent that the licence holder is, but most listeners start off as such as a stepping stone to getting a licence. The reason, in my opinion, for the dropping off in transmitting is not due to loss of interest, but mainly the technical and morse examination. Would it not be possible for a novice licence, even if the power allowed was only 2 or 3 watts?

Perhaps if the R.S.G.B. proposed this, or a similar idea, to the powers that be and got this concession they may find a vast increase in membership. What are other readers' opinions on this?—H. F. BARKER (Reading).

Modifying R1155—A Warning

SIR,—In the article by K. A. Brook on modifying the R1155 comms. receiver, September issue, readers should be warned of the following. He states V3 and V4 are EF39 and V5 and V6 EBC33. If these valves are inserted in the receiver and the screening cans fitted it will be found that a dead short to earth of the H.T. supply will follow. Even if the screening cans are not fitted it will be found that all that comes out of the receiver is a loud hiss. The reason is that both the EF39 and EBC33 are metalfised valves—that is, they have a metal coating sprayed on their outers to act as a shield; this coating is connected to pin one of the valve base, which is normally earthed. It will be found in the R1155 that pin one on all the valve bases is used as a tag point for the H.T., consequently this puts H.T. on the coating of the valve, and if perchance the metal screening can comes into contact with the valve a short takes place. It will also be found that if one tries to withdraw one of these valves with the receiver switched on he will receive the full H.T., a most unpleasant experience. Assuming that a short has not taken place it will be found that the inter-electrode capacities of the valves are altered by this metal coating, and in the writer's case caused the I.F.'s to go into oscillation, hence the loud hiss.

The remedy is simple. Take a sharp knife and scrape off the metal coating (it comes away quite easily), finish off by applying Brasso or metal polish to the glass envelope and polish clean. Only then are the EF39 and EBC33 valves substitutes.—JOHN COULMAN (GM3HJC) (Edinburgh).

Radio Amateurs' Examination

SIR,—Grafton Radio Society announce that they have again made arrangements with the Islington L.C.C. Men's Evening Institutes for an official course of instruction for the Radio Amateurs' Examination to be held this winter at Grafton School, Eburne Road, Holloway, London, N.7 (one minute from the "Nag's Head"). The class will meet on Monday evenings for radio theory 7-9 o'clock, morse 9-10 o'clock, under the direction of Messrs. S. H. Iles (G3BWQ) and L. Barber, commencing on Monday, September 24th.

Application in the first instance should be made to the Grafton Radio Society, Hon. Secretary, A. W. H. Wennell (G2CJN) at 145, Uxendon Hill, Wembley Park, Middlesex.—A. W. H. WENNELL (G2CJN) (Wembley Park).

AN ELECTROSTATIC SPEAKER

(*Continued from page 626*)

The method of using the speaker is as follows (deviations in the value of the resistors and condensers may be tried), the values given allow a cross-over of about 7,000 cycles.

A=terminal connection of electrostatic speaker.
B=zinc plate connection.

Refinements to the speaker consist of curving the assembly so as to obtain greater diffusion, or fitting diffuser grilles to it.

The assembly is so light that it can be fitted to most speaker enclosures; it is necessary, however, to keep the leads to this speaker as short as possible.

Do not enamel or treat the zinc plate after assembly. Such action may cause the dielectric to adhere to the underside of the zinc. It is better to cover the zinc with speaker fabric.

Experimenters may proceed further with this type of speaker. The one described here represents the author's most successful model to date. Two or more speakers may be used in parallel to create spacial sound distribution.

RECEIVERS & COMPONENTS

T.V. UNIT CHASSIS.—Sound and Vision Strip, **27/6.** S/het complete v/strip. 10 valve holders (EF91, etc.), less valves: free drawing, post 2/6. Time Base, **10/6.** Containing scanning coil, focus unit, line trans., etc.: free drawing, post 3/6. Power Pack and Amplifier, **29/6.** Mains E.H.T. 5kV. 325v. 250mA. smoothed H.T. heaters. 6v at 5 amp., 4v at 5 amp., 4v. at 5 amp.: centre tapped: free drawing, ins., carr. 5/6; S. output PEN45. P. Pack and Amp., **22/6.** Output stage 6V6 with O.P. trans., 3 ohms matching; choke, smoothed H.T. 350v, 250mA. 6.3 v at 5 amp., 22v at 3 amp., 6.3v at 4 amp., and 4v centre tapped; less valves; ins., carr. 5/6. P. Pack and Amp., **22/6.** Output stage PEN45; O.P. trans.; choke; smoothed H.T. 325v at 250mA; 4v at 5 amp., 6.3v at 5 amp., 4v at 5 amp.; centre tapped: less valves; ins., carr. 5/-. O.P. Transformers, **1/3.** Standard 2-5 ohms. Why not keep a few on the shelf at this very cheap price? Post 9d. or 6 for 2/-. Coil Packs, **3/9.** 3 w/band, complete with 2 gang cond.; pair 465 I.Fs and dial (similar drawing free): post 2/3. Mains Transformers, **5/9,** 350-0-350v. 4 + 4v htrs.: 200-250v prim.; post 2/3. Mains Trans., **3/9,** 350-0-350v, 4 + 12v htrs.; 100-250v prim.; post 2/3. Mains Trans., **5/9,** 6v. 5v, heaters; 350-0-350v. 200-250v prim.; post 2/3. DUKE & CO., 621, Romford Rd., Manor Pk., London, E.12. (GRA. 6677.)

UNIVERSAL AVOMINOR. £7; Homelab Sig. Generator. **£5;** home-built Bradley Scope, **£11;** all practically unused: **£22** o.n.o. the lot. H. BINGHAM. 70, Chelverton Rd., London, S.W.15.

MAKING YOUR OWN? Telescopes. Enlargers, Projectors, or, in fact, anything using lenses. Then get our booklets "How to use Ex-Gov. Lenses & Prisms," price **2/6** ea. Comprehensive lists of optical, radio and scientific equipment free for s.a.e. H. W. ENGLISH, Rayleigh Rd., Hutton, Brentwood, Essex.

OSMOR would like you to have Free Practical Wiring Diagrams of the latest published circuits with full lists of components required. Send 7½d. (stamps) to OSMOR RADIO PRODUCTS LTD., 418, Brighton Rd., S'th, Croydon. (Croydon 5148.) (See advert., page 631.)

AMERICAN RADIO Plans and Devices. Now available. Hundreds of new and startling devices you can make. Only designs of this type available in UK. Receivers, walkie-talkies, amplifiers, recorders, magic eye alarms, etc., etc. Full lists, data, illustrations. Free for stamp. Send to-day.—A.P.S. (PW), Sedgeford, King's Lynn.

LOUDSPEAKERS repaired promptly. MODEL LOUDSPEAKER SERVICE, Bullingdon Rd., Oxford.

WANTED, odd Coils and Manual for R-1082. T. BROSNAN. 53, Bulfin Rd., Dublin, Eire.

ENGRAVING.—Amateurs and trade surplus can be undertaken by getting in touch with A. G. ENGRAVING, now at 292, Earlsfield Rd., London, S.W.18. (BAT 9897.) (Engravers to well-known makers of Electronic Equipment used by the Aircraft Industry, A.W.R.E., etc.)

RATES: 5/6 per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., Strand, London, W.C.2.

ELECTROLYTICS, capacity, voltage, size, type of mounting, price, post paid. 1,000 + 1,000, 6v, 1 x 3, clip, **3/3;** 1,000 + 2,000, 6v, 1 x 3, **3/9;** 100, 12v, ⅜ x 1½, tag, **1/9;** 500, 12v, ¾ x 1¾, W/E, **2/-;** 2,000, 12v, 1⅜ x 2, W/E, **3/6;** 10, 25v, ½ x 1¼, W/E, **1/3;** 25, 25v, ⅝ x 1⅜, W/E, **1/3;** 50, 25v, ⅝ x 1⅜, W/E, **1/9;** 100, 25v, ¾ x 1¾, W/E, **2/-;** 1,000, 25v, 1 x 3, clip, **4/-;** 2,000, 25v, 1⅜ x 4½, **5/6;** 5,000, 25v, 1⅜ x 4½, clip, **6/6;** 500, 50v, 1 x 3, clip, **3/9;** 2,500, 50v, 1⅜ x 4½, clip, **6/6;** 5, 150v, ⅜ x 1¼, W/E, **1/3;** 8, 150v, ⅝ x 1¾, tag, **1/3;** 40 + 40, 1 x 2, clip, **2/9;** 200, 250v, 1⅜ x 3, clip, **3/6;** 100, 275/350v, 1⅜ x 3, clip, **3/-;** 16 + 16, 275v, 1 x 2, clip, **3/-;** 32 + 32 + 8, 1⅜ x 2, clip, **4/3;** 16 + 8 + 4, 1 x 2, lug, **3/-;** 200 + 250 + 250, 275v, 2 x 4½, clip, **8/6;** 60 + 250, 275/350v, 1⅜ x 4½, clip, **6/3;** 16 + 16 + 8, 350/425v, 1⅜ x 2, lug, **4/3;** 32 + 32 + 8, 350/425v, 1⅜ x 3, clip, **5/-;** 16 + 16, 350v, 1 x 2, clip, **3/6;** 32 + 32, 350v, 1⅜ x 2, clip, **4/-;** 2, 350v, ⅝ x 2, tag, **1/-;** 100, 350/425v, 1⅜ x 3, clip, **4/-;** 50 + 50, 350/425v, 1⅜ x 3, clip, **4/6;** 100 + 200, 350v, 1⅜ x 4½, clip, **7/6;** 8, 450v, 1 x 2, clip, **1/9;** 20 + 10, 450v, 1 x 3, clip, **4/-;** 8 + 8, 500v, 1⅜ x 2, clip, **4/-;** Photoflash Types, 1,000 mf, 200v, 1⅜ x 4½, clip, **12/6;** 1,500 mf, 275v, 2½ x 4½, clip, **19/6;** all ali cans, some with sleeves, all voltages, wkg., surge where marked, new stock, guaranteed. Television Chassis, cadmium plated steel, size 13 x 13 x 2¼in., complete with 13 valveholders (9B9A Pax, 1-B9A Cer., 2-B7G Cer., 1-Int. Oct. Amph.), 20 various tag strips, cut away for metal rec., line trans., etc., **9/11** each, post paid; front and rear tube mounts to fit above chassis, **3/-** pair, post paid. P.M. focus Magnets, wide angle, tetrode tube, fully adjustable **9/11,** post paid. Scanning Coils, wide angle, with mounting lugs, **19/6,** post paid. Vision I.F.s (2nd, 3rd and 4th), freq. 34 mc/s, slug tuned, size 13/16 x 13/16 x 2¼in. can, set of 3, **5/6,** post paid. Mains trans., 250-0-250v. 120mA. 6.3v. 2.5A, 6.3v, 0.6A. Pri. 0-110-125-150-205-225-245v, **17/-,** post paid. 100Ω W/W Pots, 3w. 1in. spindle, **2/6.** 8 mf, 600/750v, Paper Conds., 4 x 2in. x 4½, **6/6.** RADIO CLEARANCE LIMITED, 27, Tottenham Court Road, London, W.1. (Telephone: Museum 9188.)

SERVICE MANUALS/SHEETS. Tel/Radio for hire, sale and wanted. S.A.E. enquiries. W. J. GILBERT (P.W.), 24, Frithville Gardens, London, W.12.

SERVICE SHEETS, Radio, TV, 4,000 Models. Lists **1/-.** Enquiries s.a.e. TELRAY, 11, Maudland Bk., Preston.

FOR SALE, 2 VCR 97 Chassis, P.T. 12in. Chassis, valves, etc. Call at 11, Newall Ave., Sandbach, Ches., after 7 o'clock.

SEND TO-DAY for our stock list of T.V. and Radio Bargains, C.R.T.s, Valves, Speakers and all Components. We are the cheapest people in the trade. All goods sold by us are guaranteed. VIDEO ELECTRONICS (LONDON) LTD., Dept. P.W., 16/22, Bacon Street, London, E.1.

COSSOR 343 Ganging Oscillator. Pye PCR2, converted to AC mains. Box No. 278, c/o PRACTICAL WIRELESS.

EX. AIR MINISTRY Identification Units, type RDF No. 1, ZC. 13312, all as new, **32/6** each unit; carr paid. All steel chassis in steel case, with controls on front panel only, measurements, 11in. x 7in. x 12in., weight 25lbs. Each unit contains many useful components and the following valves: 1 5Z4G, 1 VR54, 5 VR65, 2 VR66, 3 VR92, 1 CV63, and 1 VR137. From: J. A. B. JACOBSEN LIMITED, 22, Ritherdon Rd., Balham, London, S.W.17.

ALL TYPES of unused Valves required for cash. State quantity, etc. HERMES RADIO, Glazebury, nr. Manchester.

B.S.R. Monarch 3-speed Autochange Units, new, in maker's sealed carton, guarantee, complete with instructions, template, suspension springs, **£9/15/-;** carriage paid: immediate delivery. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

TELEVISION, 9in. Models, **£6/10/-;** 12in. Models, **£15;** all makes working; carriage paid. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23.

SEVERAL EARLY MODELS 9in. Television, complete and mostly working, **£5/5/-** each; carriage paid. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

BILLHEADS VALUE! 8 x 5 Blue ruled, 100 **7/6,** 250 **15/6,** 500 **22/6;** p. and p. 2/-; s.a.e. sample to: TAYLOR (Printer), 147, George Rd., Erdington, B'ham, 23.

PANL, the air-drying black crackle paint, **3/6** per 1/8th pt. can. G. A. MILLER, 8, Kenton Park Cres., Kenton, Middx.

ALL TYPES of new radio valves wanted, small or large quantities; cash payments. R. H. S. LTD. (W), 155, Swan Arcade, Bradford, 1.

OSMOR NEWS. F.M. Switch-tuned Coilpack. Circuits and full information available shortly on request. OSMOR RADIO PRODUCTS LTD., 418, Brighton Road, S. Croydon.

IF YOU READ P.W., you should also read our New 60-page Catalogue, **1/-,** post free. It's packed with every component required to service radios and T.Vs, 1,000's of Service Sheets and Manuals. Sale or Hire. Stamp with enquiries. M. FOY, 6, Wykebeck Gardens, Leeds, 9.

THE HIWAYMAN. A new super Portable Radio for the home constructor: all-dry 4-valve superhet with Ferrite rod aerial, easy wiring diagrams and instructions, **1/6** (post 3d.). RADIO EXPERIMENTAL PRODUCTS LTD., 33, Much Park St., Coventry.

MIDDLESBROUGH. Largest stocks on N.-East coast. Radio, TV components, FM Kits, Gram Cabinets, Tape Decks, Leak Amplifiers, Valves, etc. Callers only. PALMERS, 106, Newport Road. (Phone: 3096.)

GUARANTEED TELEVISION, 12in. models, first-class picture, 5-channel, **£30** each; carriage paid. THE GRAMOPHONE SHOP, 19-21, Brockley Rise, Forest Hill, S.E.23.

TAN IN 24 HOURS.—Super-tonic Sunray Lamps, ultra-violet infra-red combined: automatic exposure; controlled emission; all mains; listed **£7/10/-,** our price **80/-.** S.A.E. brochure. Dept. 14. SCIENTIFIC PRODUCTS, Cleveleys, Lancs.

THE NEW COLLARO automatic twin track, 3-speed 'Tape Deck (no amplifier) is available at PHOTO-OPTIX (LONDON) LTD., The Tape Recorder Specialists, at **19 gns.** 73-75. Praed St., London, W.2. (PAD. 2891.)

AMERICAN MAGAZINES. Year's subscription "Audio" **35/-**, "High Fidelity" **50/-**. Specimen copies 4/- and 5/- each. Catalogue free. WILLEN LTD. (Dept. 40), 9, Drapers Gardens, London, E.C.2.

FOR SALE

CAR CIGARETTE LIGHTERS, 6 or 12 volt, **7/6,** post free. WHITSAM ELECTRICAL PRODUCTS, 18, Woodrow Close, Perivale, Middlesex.

VALVES

WANTED, Valves, EY51, ECL80, KT61, 6U4GT, PL81, 35Z4, etc., etc., prompt cash. WM. CARVIS LTD., 103, North Street, Leeds, 7.

ALL TYPES of Valves required for cash. State quantity and condition. RADIO FACILITIES LTD., 38, Chalcot Road, N.W.1. (PRImrose 9090.)

SITUATIONS VACANT

CHIEF TECHNICIAN required by POSTS AND TELEGRAPHS DEPARTMENT, NIGERIA FEDERAL GOVERNMENT for one tour of 12 to 24 months in first instance either (a) with prospect of permanency salary scale (including Inducement Addition) £1,014 rising to £1,284 a year or (b) on temporary terms salary scale (including Inducement Addition) £1,170 rising to £1,488 a year with gratuity at rate of £150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards children's passages and grant up to £150 annually towards maintenance in U.K. Liberal leave on full salary. Candidates must have had wide practical experience of modern radio technique and equipment, in particular V.H.F. equipment and preferably also V.H.F. multichannel equipment. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/41905/PU.

NEW BOOKS

Correcting T.V. Picture Faults, by J. Cura. 3/6, postage 4d.

Radio Laboratory Handbook, by Scroggie 25/-, postage 1/3.

Guide to Broadcasting Stations, new edition by "Wireless World." 2/6, postage 4d.

Radio Valve Data, by "Wireless World," new edition, 4/6, postage 6d.

Amateur Radio Call Book, by R. S. G. B., 2/6, postage 4d.

Beginner's Guide to Radio, by Camm. 7/6, postage 6d.

Sound Reproduction, by Briggs. 17/6, postage 1/-.

A. R. R. L. Handbook 1956, 30/-, postage 1/6.

UNIVERSAL BOOK CO.

12, Little Newport Street, London, W.C.2

(adjoining Lisle Street)

F M and H I-F I Components

DENCO F.M. TUNER	circuits	1s. 6d.
RADIO CONST'TR. F.M.		2s. 0d.
MULLARD AMPLIFIERS	,,	3s. 6d.
G.E.C. 912 PLUS AMPLIFIER	,,	4s. 0d.
G.E.C. F.M. PLUS TUNER	,,	2s. 6d.

Separate price lists available on request to

J. T. FILMER MAYPOLE ESTATE, BEXLEY, KENT.

Tel. Bexleyheath 7267.

RADIO TECHNICIANS IN CIVIL AVIATION. A number of appointments are available for interesting work providing and maintaining aeronautical telecommunications and electronic navigational aids at aerodromes and radio stations in various parts of the United Kingdom. Applications are invited from men aged 19 or over who have a fundamental knowledge of radio or radar with some practical experience. Training courses are provided to give familiarity with the types of equipment used. Salary £561/10/- age 25 (subject to a practical test) to £671. The rates are somewhat lower in the Provinces and for those below age 25. Prospects of permanent pensionable posts for those who qualify. Opportunities for promotion to Telecommunications Technical Officer are good for those who obtain the O.N.C. in Electrical Engineering or certain City and Guilds Certificates. The maximum salaries of Telecommunications Technical Officers are Grade III £790, Grade II £925, Grade I £1,160. Apply to the MINISTRY OF TRANSPORT AND CIVIL AVIATION (ES31/RT), Berkeley Square House, London, W.1, or any Employment Exchange (quoting Order No. Westminster 5788).

EDUCATIONAL

BUILD YOUR OWN T/V and learn about its operation, maintenance and servicing. Qualified engineer-tutor available whilst you are learning and building. Free Brochure from E.M.I. INSTITUTES, Dept. PW58, London, W.4. (Associated with H.M.V.)

THE WIRELESS SCHOOL. Day, Evening and "Radiocerts" Postal Courses; s.a.e. for prospectus. THE DIRECTOR, 21, Manor Gardens, London, N.7.

A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, etc., on "no pass—no fee" terms; over 95% successes. For details of exams. and courses in all branches of engineering, building, etc., write for 144-page handbook, free. B.I.E.T., (Dept. 242B), 29, Wright's Lane, London, W.8.

CITY AND GUILDS (Electrical, etc.) on "no pass—no fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook—free and post free. B.I.E.T. (Dept. 242A), 29, Wright's Lane, London, W.8.

ASTRAL RADIO PRODUCTS

'HOME RADIO,' 32 page illustrated booklet. Simple wiring instructions for Crystal Set, 1, 2, 3 Valvers. 2/-, post 3d. **TRF COILS.** Specified for 'Bedside Push-button 4,' 'All Dry 3 Band, 3,' 'Push-button 4,' etc., 6/6 pr., post 6d. Push-button Unit with modification data 7/-. **DUAL WAVE IF Coil.** Specified for 'Summer All Dry Portable,' 'Modern 1 Valver,' 'Modern 2 Valver.' **'B 7 G Battery Miniature,'** etc., 4/3, post 3d. **IFT'S Miniature,** 1" x 1½" x 2½" in cans. Extra high 'Q.' Special offer, **8/6** pr., post 6d. **K COILS.** 'AC. B'pass 3,' 3/3 each, post 6d. **FRAME AERIALS.** M.W., 5'-, post 4d. **H.F. CHOKE** (Osmor Q.C.1), 6/9, post 4d. **Crystal Set Coils,** L. & M.W., 2'6, post 3d.

82, Centurion Road, Brighton

TRANSFORMERS

Singly or in quantity for radio and T.V.

PROMPT DELIVERY

H. W. FORREST (Transformers) **Ltd.**

Shirley, Solihull, Warwickshire

EST. 30 years SHI 2483

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the Hobby Enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds, R.T.E.B., and other Professional examinations. Train with the college operated by Britain's largest Electronics organisation. Moderate fees. Write to E.M.I. INSTITUTES, Dept. PW28, London, W.4.

WIRELESS.—Day and Evening Class instruction for P.M.G. Certificate of Proficiency and Amateur Wireless Licence. Morse instruction only if required, also postal courses. Apply BST., LTD., 179, Clapham Rd., London, S.W.9.

T/V and RADIO.—A.M.Brit.I.R.E., City and Guilds, R.T.E.B. Cert., etc., on "no pass—no fee" terms. Over 95% successes. Details of exams. and home training courses in all branches of radio and T/V; write for 144-page handbook free. B.I.E.T. (Dept. 242G), 29, Wright's Lane, London, W.8.

MERCHANT NAVY Wireless School. Overseas House, Brooks' Bar, M/cr 16.

WIRELESS. See the world as a Radio Officer in the Merchant Navy; short training period; low fees; scholarships, etc., available. Boarding and Day students. Stamp for prospectus. WIRELESS COLLEGE, Colwyn Bay.

INCORPORATED Practical Radio Engineers home study courses of Radio and TV Engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text is free. "The Practical Radio Engineer" journal, sample copy 2/-. 6,000 Alignment Peaks for Superhets, 5/9. Membership and Entry Conditions booklet, 1/-. All post free from the SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

THERE IS a national shortage of Mercantile Radio Officers. Why not make Communications your career? You can be assured of a sea-going appointment after qualifying at THE SCHOOL OF MARINE RADIO AND RADAR (A.S.T.), Hamble, Southampton. For details apply Commandant, quoting A.12.

VALVES — Guaranteed

CV51	6/-	PCC84	11/-	6AU6	7/6	6X5	7/6
DAF91	6/6	PY81	10/-	6B8	6/-	7H7	7/6
DF91	7/6	TT11	4/-	6BA6	8/-	8D2	4/6
EA50	2/-	VU111	3/6	6BE6	7/-	8D3	7/-
EBC33	7/6	W77	5/-	6BH6	7/6	9D2	6/-
ECC83	8/-	OZ4	5/-	6BS7	7/6	9D6	5/-
ECL80		1S5	6/6	6BW6	6/6	12AH8	9/-
	11/-	1T4	6/6	6C5	6 -	12AX7	7/6
EF39	5/6	1U5	6/6	6CH6	7/-	12BA6	7/6
EF39	7/-	3D6	4/6	6F12	7/-	12BE6	7/6
EF50	5/-	3S4	8/6	6J5	6/-	12BH7	7/6
EF50(Red)		3V4	8/-	6K7G	4/6	12J7	8/6
	6/-	4D1	4/-	6K7M	6/-	12K7	8/-
EF55	9/-	6A8	7/6	6SA7	8/-	15D2	5/-
EF91	7/-	6AK6	7/6	6U7	6/6	35L6	8/6
EL32	6/-	6AM6	7/-	6V6	7/-	50C5	8/6
EY51	12/-	6QA5	7/6	6X4	6/6	50L6	8/6

Postage 6d. extra. (Also all components)

TELEKIT SUPPLY

104, High Street, Beckenham, Kent

Phone: BEC 3720.

ANNAKIN'S LATEST BARGAINS

Power Unit No. 173. 12-24 v. In. 120 v. 60.ma. Out. Vibrator, 2 selenium Rectifiers, double smoothed, **12/6** ea.

Power Unit No. 296. 12 v. In. 200 v. 50 m.a. 13 v. 1.8A. Out. Motor Generator, smoothing (less VS.110A). **14/6** ea.

Recr. 1355 complete with all valves. **25 -. VR.65, 1·4.**

All above carr. free. Money Back Guarantee.

25, ASHFIELD PLACE, OTLEY, YORKS

Practical Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS

No. of Blueprint

CRYSTAL SETS

1/6d. each
1937 Crystal Receiver ... PW71*
The "Junior" Crystal Set PW94*

2s. each
Dual-Wave "Crystal Diode" PW95*

STRAIGHT SETS

Battery Operated

One-valve : 2s. each
The "Pyramid" One-valver (HF Pen) ... PW93*
The Modern One-valver PW96*

Two-valve : 2s. each
The Signet Two (D & LF) PW76*

3s. each
Modern Two-valver (two band receiver) ... PW98*

Three-valve : 2s. each
Summit Three (HF Pen. D Pen) PW37*
The "Rapide" Straight 3 (D, 2 LF (RC & Trans)) PW82*
F. J. Camm's "Sprite" Three (HF, Pen. D, Tet) PW87*

3s. each
The All-dry Three ... PW97*

Four-valve : 2s. each.
Fury Four Super (SG, SG, D, Pen) ... PW34C*

Mains Operated

Two-valve : 2s. each.
Selectone A.C. Radiogram Two (D, Pow) ... PW19*

Three-valve : 3s. 6d. each.
A.C. Band-Pass 3 ... PW99*

Four-valve : 2s. each.
A.C. Fury Four (SG, SG, D, Pen) PW20*
A.C. Hall-Mark (HF Pen. D, Push Pull) ... PW45*

SUPERHETS

Battery Sets : 2s. each.
F. J. Camm's 2-valve Superhet PW52*

Mains Operated : 3s. 6d. each.
"Coronet" A.C.4 ... PW100*
AC/DC "Coronet" Four PW101*

No. of Blueprint

SHORT-WAVE SETS

Battery Operated

One-valve : 2s. each.
Simple S.W. One-valver PW88*

Two-valve : 2s. each.
Midget Short-wave Two (D, Pen) PW38A*

Three-valve : 2s. each.
Experimenter's Short-wave Three (SG, D, Pow) PW30A*
The Prefect 3 (D, 2 LF (RC and Trans)) ... PW63*
The Band-spread S.W. Three (HF, Pen. D, (Pen), Pen) PW68*

PORTABLES

1s. 6d.
The "Mini-Four" All-dry (4-valve superhet) *

MISCELLANEOUS

2s. each.
S.W. Converter-Adapter (1 valve) PW48A*
The P.W. 3-speed Autogram ... ...(2 sheets). 7s. 6d.*
The P.W. Monophonic Electronic Organ (2 sheets), 7s. 6d.

TELEVISION

The "Argus" (6in. C.R. Tube). 2/6*
The "Super-Visor" (3 sheets). 7/6*
The "Simplex" ... 3/-*
The P.T. Band III Converter 1/-*

All the following blueprints, as well as the PRACTICAL WIRELESS numbers below 94 are pre-war designs, kept in circulation for those amateurs who wish to utilise old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

AMATEUR WIRELESS AND WIRELESS MAGAZINE

STRAIGHT SETS

Battery Operated

One-valve : 2s.
B.B.C. Special One-valver AW387*

Mains Operated

Two-valve : 2s. each.
Consoelectric Two (D, Pen), A.C. AW403

SPECIAL NOTE

THESE blueprints are drawn full size. The issue containing descriptions of these sets are now out of print, but an asterisk denotes that constructional details are available, free with the blueprint.

The index letters which precede the Blueprint Number indicate the periodical in which the description appears. Thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

No. of Blueprint

SHORT-WAVE SETS

Battery Operated

One-valve : 2s. each.
S.W. One-valver for American AW429*

Two-valve : 2s. each.
Ultra-short Battery Two (SG, det Pen) ... WM402*

Four-valve : 3s. each.
A.W. Short Wave World-beater (HF Pen, D, RC, Trans) AW436*
Standard Four-valver Short-waver (SG, D, LF, P) WM383*

Mains Operated

Four-valve : 3s.
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) WM391*

MISCELLANEOUS

Enthusiast's Power Amplifier (10 Watts) (3/-) WM387*
Listener's 5-watt A.C. Amplifier (3/-) ... WM392*
De Luxe Concert A.C. Electrogram (2/-) ... WM403*

QUERY COUPON

This coupon is available until Nov. 6th, 1956 and must accompany all Queries, sent in accord with the notice on our "Open to Discussion" page. PRACTICAL WIRELESS, Nov 1956.

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage, for one year: Inland 18s., Abroad 16s. 6d. (Canada 16s.) Registered at the General Post Office for the Canadian Magazine Post.