

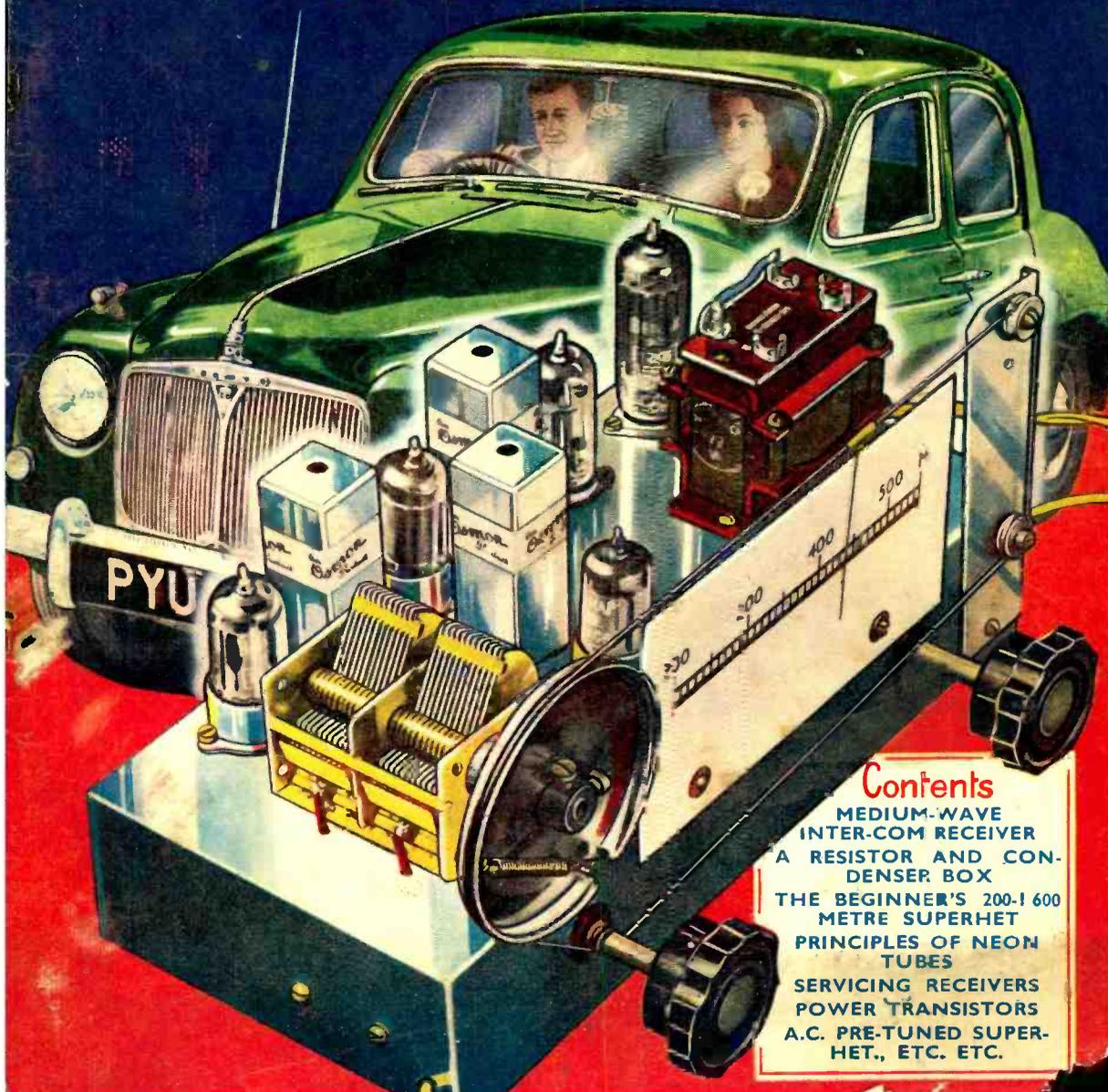
A VALVE-TRANSISTOR CAR RADIO

PRACTICAL 1/3

DECEMBER
1958

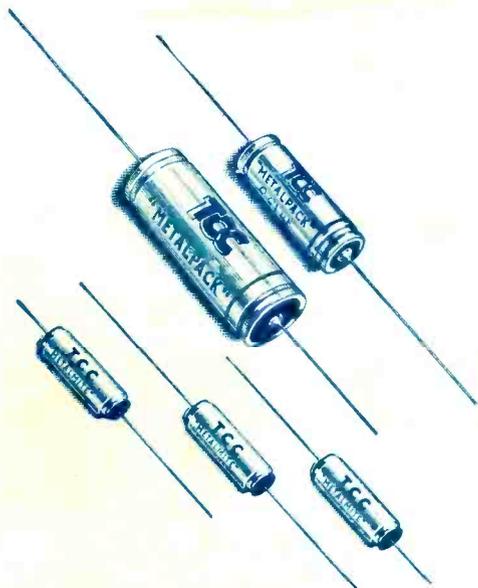
EDITOR: F.J. CAMM

WIRELESS



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MEDIUM-WAVE
INTER-COM RECEIVER
A RESISTOR AND CON-
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TUBES
SERVICING RECEIVERS
POWER TRANSISTORS
A.C. PRE-TUNED SUPER-
HET., ETC. ETC.



CONDENSERS

Here are two ranges representative of the wide variety of T.C.C. condensers available, for all possible electronic applications. Details on request.

'METALPACK'

These paper condensers have been developed for operation in high humidities and high temperatures. Their ability to withstand variations from -40 C. to +100 C. makes them the obvious choice for the most stringent conditions.

'METALMITE'

Set a new standard both for compactness and ability to withstand extreme tropical conditions: satisfactory insulation resistance is maintained after extensive tests at 100°C. and 100% humidity.

CONDENSER SPECIALISTS SINCE 1906

THE TELEGRAPH CONDENSER CO. LTD.

RADIO DIVISION North Acton • London W3 • Telephone: ACORN 0061

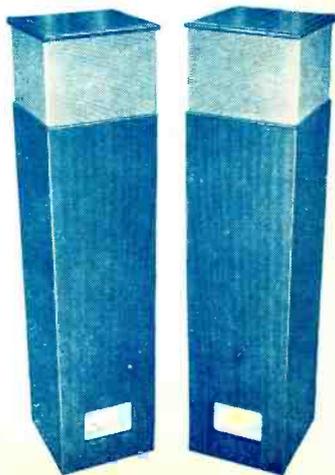


Stentorian

H.F. 1016. Very powerful magnet assembly, combines with the cambric cone to provide brilliant transient response when mounted in a bass reflex cabinet. 10" Die-cast Chassis - 16,000 gauss magnet 10 watts handling capacity - Patented Stentorian Cambric Cone - Universal Impedance Speech Coil (instantaneous matching at 3, 7.5 and 15 ohms) - 30-15,000 c.p.s. frequency response - 35 c.p.s. bass resonance. £8 (INC. P.T.)

COLUMN LOUDSPEAKERS

Primarily intended for Stereo reproduction, the floor area occupied being much smaller than that taken by two conventional cabinet speakers of similar performance. Columns have 360° diffusion by means of a dome mounted above the speaker. One unit may be used for monaural sound and a second added later for Stereo. Full details on request.



HIGH FIDELITY AT REALISTIC COST

WHITELEY ELECTRICAL RADIO CO. LTD • MANSFIELD • NOTTS

BUILD YOUR OWN TAPE RECORDER

The TRUVOX way

Take 1 Truvox Mk. III or Mk. IV Tape Deck (available from 23 gns.), and 1 Truvox Type "K" Amplifier (available from 19 gns.), add 1 loudspeaker and cabinet and you not only have the thrill of owning a tape recorder that is well up to semi-professional standards, but the added satisfaction of having built it to suit, exactly, your own requirements.

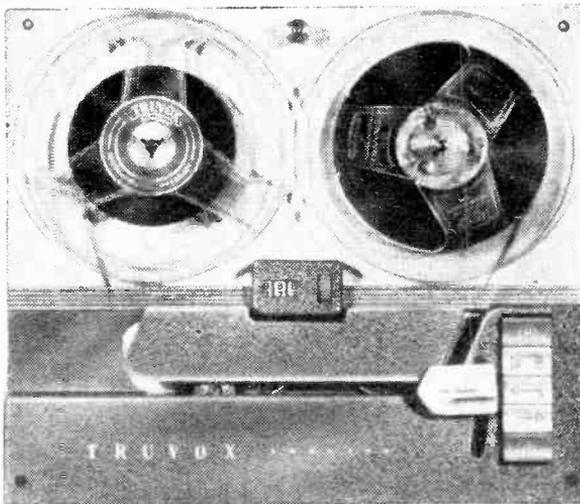
You can build your own amplifier from the circuitry supplied FREE with each Tape Deck.

GO STEREO WITH TRUVOX

Truvox Tape Decks can be supplied fitted with a stereophonic head at an extra charge. Add a second loudspeaker and amplifier and you'll have all the thrill of stereophony in your own home.

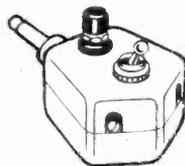
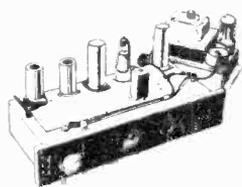
TRUVOX TAPE RECORDER COMPONENTS ARE AVAILABLE AT YOUR LOCAL STOCKISTS—SEND FOR FULL TECHNICAL DETAILS.

TRUVOX LIMITED
 NEASDEN LANE, LONDON, N.W.10. Telephone: Gladstone 6455.



TRUVOX Tape Deck Mk. IV.

TRUVOX TYPE "K" Amplifier accurately matched to Truvox Tape Decks.



TRUVOX Radio Jack for direct radio reception and programme recording.



TRUVOX Stereophonic Head for replay of pre-recorded stereophonic tapes.

R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS
 6 v. 1 amp 19/9
 6 v. or 12 v. 1 amp 27/9
 6 v. 2 amps 29/9
 6 v. or 12 v. 2 amps 38/9
 6 v. or 12 v. 4 amps 56/9
 Above ready for use. With mains and output leads. Carr. 3/6.

SELENIUM RECTIFIERS F.W. BRIDGE TYPES
 6/12 v. 1 a. 4.11 L.T. Types H.W. 17/1
 6/12 v. 2 a. 9/9 6/12 v. 1 a. H.W. 2/9
 6/12 v. 3 a. 11/9
 H.T. Types H.W. BATTERY CHARGER KIT
 6/12 v. 4 a. 14/9 150 v. 40 mA. 3/9
 6/12 v. 6 a. 19/9 250 v. 50 mA. 5/9
 6/12 v. 10 a. 25/9 250 v. 80 mA. 7/9
 6/12 v. 15 a. 35/9 250 v. 250 mA. 11/9

BATTERY CHARGER KITS
 Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, vent ventilated steel case. Fuses, Fuse-holders, Grommets, panels and circuit. Carr. 2/9 extra.
 6 v. or 12 v. 1 amp 22/9
 As above, with Ammeter 32/9
 6 v. 2 amps 25/9
 6 v. or 12 v. 2 amps 31/6
 6 v. or 12 v. 2 amps, inclusive of Ammeter 41/6
 6 v. or 12 v. 4 amps 53/9

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

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



Assembled 6 v. or 12 v. 4 amps.
 Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finished. Fused 75/- and ready for use with Carr. 4/6 mains and output leads. Credit Terms: Deposit 14/11 and 5 monthly payments 14/11.

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

Interleaved and Impregnated. Primaries 200-230-250 v. 50 ccs. Screened
TOP SHROUDED DROP THROUGH
 250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 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. 23/9
 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 23/9
 350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 23/9
 350-0-350 v. 100 mA. 6.3 v. 4 a. 5 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. 80 mA. 6.3 v. 2 a. 5 v. 2 a. 17/6
 Midjet type 21-3-3in. 17/6
 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 for RL355 conversion 31/2
 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 300-0-300 v. 130 mA. 6.3 v. 4 a. 6.3 v. 1 a. 26/9
 for Mullard 510 Amplifier 35/9
 350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 33/9
 350-0-350 v. 150 mA. 6.3 v. 2 a. 6.3 v. 2 a. 5 v. 3 a. 35/9
 425-0-425 v. 200 mA. 6.3 v. 4 a. C.T. 6.3 v. 4 a. C.T. 5 v. 3 a. Suitable Williamson Amplifier, etc. 49/9

FILAMENT TRANSFORMERS
 All with 200-250 v. 50 ccs. 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 23 v. 1.5 a. 17/6.

CHARGER TRANSFORMERS
 All with 200-230-250 v. 50 ccs Primaries:
 0-9-15 v. 1 a. 11/9; 0-9-15 v. 3 a. 16/9;
 0-9-15 v. 5 a. 19/9; 0-9-15 v. 6 a. 23/9.

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

OUTPUT TRANSFORMERS
 Midjet Battery Pentode 66:1 for 354, etc. 3/9
 Small Pentode, 5,000 Ω to 3 Ω 3/9
 Small Pentode 7,800 Ω to 3 Ω 3/9
 Standard Pentode 5,000 Ω to 3 Ω 4/9
 Standard Pentode, 7,800 Ω to 3 Ω 4/9
 10,000 Ω to 3 Ω 4/9
 Push-Pull 10-12 watts 6V6 to 3 Ω or 15 Ω 15/9
 Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15 Ω 16/9
 Push-Pull EL84 to 3 or 15 Ω 16/9
 Push-Pull 15-18 watts, 6L6, KT66 22/9
 Push-Pull for Mullard 510 Ultra Linear 29/9
 Push-Pull 20 watts sectionally wound 6L6, KT66, etc., to 3 to 15 Ω 47/9

ELIMINATOR TRANSFORMERS
 Primaries 200-250 v. 50 ccs.
 12 v. 40 mA. 5-0-5 v. 1 a. 15/9
 90 v. 15 mA. 4-0-4 v. 500 mA. 9/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 v. and 90 v. This includes latest low consumption types.



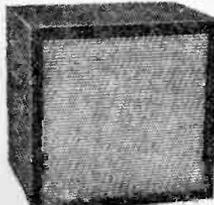
Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. 90 v. and 60 v., 40 mA. and 2 v. 0.4 a. to 1 amp. Fully smoothed. Thereby replacing both H.T. batteries and L.T. 2 v. accumulators. When connected to A.C. mains supply 200-250 v. 50 ccs. **SUITABLE FOR ALL BATTERY RECEIVER** normally using 2 v. accumulator.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

Complete kit with diagrams, 39/9. or ready to use, 46/9.

STEREOPHONIC EQUIPMENT AT SPECIAL PRICES

(a) Linear L33 Stereo Amplifier, 26.19.6; (b) Star Galaxy Auto-Changer fitted Turn-over head for Stereo. Long Playing and Standard Records, 28.19.8, carr. 4/6; (c) Matched 12in. P.M. Speakers in polished Walnut finished wood cabinets, 28.15.0 per pair; (d) Cabinet Speakers, illustrated below, 49.19.0 pair; (e) Matched High Flux 8in. P.M. Speakers in polished Walnut veneered Cabinets, 23.19.0 pair; (f) Matched 6in. R.A. P.M. Speakers in polished veneered Walnut cabinet, 23.10.0 pair. or (a), (b) and (c) 19 gns., carr. 15/-; (a), (b) and (d) 22 gns., carr. 15/-; (a), (b) and (e) 18 gns., carr. 15/-; (a), (b) and (f) 17 gns., carr. 15/-.

12in. 10 WATT HIGH QUALITY LOUD-SPEAKERS IN POLISHED WALNUT FINISHED CABINET
 Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only 24.19.6 Carr. 5/-. Terms: Deposit 11/- and 9 monthly payments of 11/-.



D.C. SUPPLY KIT. 12 v. 1 a. consisting of partially drilled metal case, mains trans., F.W. Bridge Rectifier. 2 fuse-holders and fuses. Change Direction switch, variable Speed regulator and circuit. For 200-250 v. A.C. mains. Suitable Electric Trains, etc. Limited number available at 29/9.

ACOS CRYSTAL MIKE INSERTS. Approx. 1in. square. Fly lead connections. Only 5.11 each. Brand New. Round type approx. 1 1/2in. diam. Equipment tested, 4/11 each.

STAR GALAXY 4-SPEED MIXER AUTO-CHANGER. A precision manufactured unit with a motor which virtually eliminates "wow" and rumble. Fitted pick-up with dual sapphire tipped stylus. For 200-250 v. A.C. mains. Limited Stocks. Only Brand New, cartoned. Carr. 4/6 **£4-19-6**

PORTABLE CABINETS. High Quality Finish. Rexine covered. Attractive design. Inside measurements 17in. x 12 1/2in. x 8 1/2in. high. Clearance above base-board 5 1/2in. Below 2 1/2in., 69/9 each.

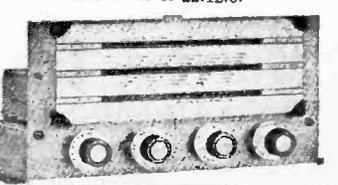
SPECIAL OFFER. Above cabinet, LG3 Amplifier, Star Changer and 6in. P.M. Speaker. 11 GNS. Carr. 7/6.

THE SKYFOUR T.R.F. RECEIVER. A design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion audio bend detector. Power pentode output. Valve line-up 6K7, SP81, 6V6G. Selectivity and quality are well up to standard, and simplicity of construction is a special feature. Point-to-Point wiring diagrams, instructions and parts lists, 1/8. Maximum building costs 24.19.6, inc. attractive Brown or Cream Bakelite or Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

AM/FM RADIOGRAM
 By leading manufacturer Brand New. Cartoned with guarantee. 4 wavebands including V. H.F. Auto-changes at 3 speeds. Hi-fi duo-point sapphire stylus pick-up. 29.5 Gns. For 200-250 v. A.C. mains. Limited stocks at a fraction of normal price. Credit Terms. Deposit 28.19.6 and 9 monthly payments of 3 gns. Carr. 10/-.

COMPLETE AUTO-CHANGER RECORD PLAYERS. 4-SPEED. By well-known manufacturer. Hi-fi crystal pick-up. Matched amplifier and speaker. Attractive, well-finished rexine covered. For 200-250 v. A.C. mains. Brand New. Cartoned. Limited number. List price well over **15 Gns.** Carr. 10/-.

AM/FM RADIOGRAM CHASSIS HIGH QUALITY 6-3 WATT PUSH-PULL OUTPUT
 For 200-250 v. Mains. Long wave, Medium, F.M. and Gram. Complete with 8 B.V.A. valves. Guaranteed 12 months. Only 22 GNS. Or Deposit 22.12.0 and 9 monthly payments of 2.12.0.

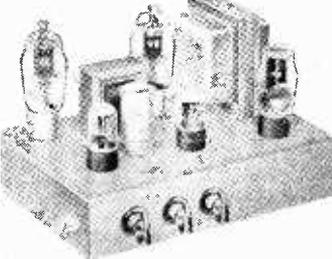


R.S.C. A8 ULTRA LINEAR 12 WATT AMPLIFIER

High-Fidelity Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages, high sensitivity, includes 5 valves (30/ 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.c.s. 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. 1.5a. For supply of a RADIO FEEDER UNIT. Size approx. 12.9-in. For A.C. mains 200-250 v. 50 c.s. 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/-. If required louvre metal cover with 2

£7-15-0



carrying handles can be supplied for 18/9. Additional input sockets, with associate Vol. control so that two different inputs such as Gram and Mike or Tape and Radio can be mixed, can be provided for 13/- extra. Guaranteed 12 months. TERMS on assembled two input model: DEPOSIT 25/6 and nine monthly payments, 25/6. HIGH FIDELITY MICROPHONES and SPEAKERS in stock. Keep cash prices or credit terms if supplied with amplifier.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response 3 db., 30-30,000 c.c.s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used, EF66, EF86, ECC83, 807, 807, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRIPED BASS, etc. For standard or long-playing records, OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and Mike can be mixed. Amplifier operates on 200-250 v. 50 c.c.s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built, with 12 months' guarantee for £13.19.6. TERMS: DEPOSIT 36/9 and 9 monthly payments of 31/9.

11 GNS.

Carr. 10/- supplied for 18/9. The amplifier can be supplied, factory built, with 12 months' guarantee for £13.19.6. TERMS: DEPOSIT 36/9 and 9 monthly payments of 31/9.

COLLARO R454 3-SPEED AUTO-CHANGERS with Studio pick-up. Brand new. For 110 v. to 220-250 v. A.C. mains. Price with 110 v. to 220-250 v. Auto Trans. only £5 19.6. Carr. 5/6.

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio Pick-up. Latest model. Brand new. Cartoned. For 110 v. 50 c.p.s. A.C. mains. Our price £7 19.6. Carr. 5/6.

COLLARO 4-SPEED SINGLE PLAYER with separate pick-up, as fitted R457. For 200-250 v. A.C. mains. £4/10/0. Post 3/9.

PICK-UP ARMS complete with Hi-Fi turnover crystal head. Acos GP54. Limited number brand new, perfect, at approx. half price. Only 35/9.

L63 MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with above or any other single or auto change units. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Overall size 6 1/4 x 4 1/2 in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 55/9.

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

LINEAR L45 MINIATURE 4.5 WATT QUALITY AMPLIFIER. Suitable for use with Collaro, B.S.R. or any other record playing unit, and most microphones. Negative feedback 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c.c.s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5-7in. high. Output for 2-3 ohm speaker. Guaranteed for 12 months. Only £5 19/6. Send S.A.E. for illustrated leaflet. Credit Terms: deposit 22/6 and 5 monthly payments of 22/6.

LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER. For 200-250 v. A.C. mains. Valves ECC83, ECC93, EL84, EL84, E281 miniature Mullard. Self-contained complete Tone Control stages, and separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets are provided. Output Matchings for 3 and 15 ohm. speakers. Only 12 GNS. or Deposit 26/9 plus 10/- carr. and 9 monthly payments of 26/9. Send S.A.E. for leaflet.

LINEAR STEREOPHONIC 1-3 3+3 WATT AMPLIFIER

Output 6 watts when not used with stereo head. For 200-250 v. 50 c.p.s. A.C. mains. Ganged controls, Volume and Tone. Outputs matched by preset balance control. For use with 2 matched 3 ohm speakers. Only requires connecting to Pick-up speakers and mains point. Sensitivity 150 m.v. Supplied with guarantee and instructions.

7 GNS.

R.S.C. 4.5 WATT AS HIGH-GAIN AMPLIFIER

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



LINEAR LT45 HIGH QUALITY TAPE DECK AMPLIFIER. With "built in" power pack and output Ready for stage. For Tape Decks. Use ONLY with High or Low Impedance. Playback and Erase Heads, such as Lane, Truvox, Collaro, Brennel, Carr. 7/6 etc. For A.C. Mains 230-250 v. 50 c.c.s. Linear frequency response of 1/3 db. 50-11,000 c.c.s. Negative feedback equalisation. Illustrated leaflet 6d.

12 GNS.

Terms: C.W.O. or C.O.D. No C.O.D. under £1. All goods supplied subject to terms and guarantee as detailed in current catalogue. Open 9 to 5.30; Sats. until 1 p.m. Catalogue 6d. Trade supplied. S.A.E. with £5.

LINEAR 50 WATT HIGH FIDELITY AMPLIFIER.

Sensitivity 25 millivolts for full output. Suitable for any kind of microphone or pick-up. Output matchings for 3 and 15 ohm speakers. Brand New. Guaranteed 12 months. For 200-250 v. A.C. mains. Only 19 gns. Carr. 15/- or Deposit 3 gns. and 9 monthly payments of 42/3. Twin handed cover available at 25/-. Send S.A.E. for descriptive leaflet.

RTG 12in. SUPER HI-FI 25 LOUD-SPEAKER UNIT.

With mechanical damping device. A 25 watt 15 ohm precision built moving coil unit with 17,000 line Alcomax magnet. Frequency range 25-20,000 c.p.s. Designed to provide life-like reproduction in large halls, theatres, cinemas, etc. Only 42 gns. or Deposit 28/9 and 9 monthly payments of 28/9. R.S.C.A. 20 WATT RE-ENTRANT SPEAKERS, 15 ohms matching. For Outdoor work. Only 3 GNS. P.M. SPEAKERS. All 3 ohm, suitable for use with L.G3, L45, A5 or A7 amplifiers. Ellin. Goodmans, 17/9. 7 x 4in. Elliptical 5in. 19.9. 6in. Goodmans, 17/9. 8in. Rola, 19/9. 10in. R.A., 27/9. 10 x 6in. Elliptical Goodmans, 29/9. 12in. Plessey, 29/11. 10in. W.B. Stentorian 3 or 15 ohms type HF1012 10 watts, hi-fidelity type. Recommended for use with our A8 Amplifier, £4/10/9. 12in. Plessey 3 ohms 10 watts (12,000 lines), 59/6.

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

ACOS HGF59 Hi-Fi Crystal Cartridges. (Turnover type with sapphire stylus.) Standard replacement to Garvard and B.S.R. Only 19/9.

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

For 230-250 v. 50 c.c.s. Mains input. Appearance and Specification, with exception of output wattage, as A5. Complete kit with diagrams. £9/15/-. Assembled 22/6 extra. Carr. 3/6.

Post 19 extra under £2; 2/9 extra under £5.

RADIO SUPPLY CO. (LEEDS) LTD. Mail Orders to 29/31 Moorfield Rd., Leeds 12. Callers to Maude St. (Opp. Parish Church School) Leeds 2.

BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS

38 CHALCOT ROAD, LONDON, N.W.1

Nearest Underground Station, Chalk Farm.

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EXPRESS SERVICE!!!

PHONE OR WIRE THAT URGENT ORDER FOR IMMEDIATE DESPATCH C.O.D. ALL POST ORDERS ARE CLEARED SAME DAY AS RECEIVED.

ANY PARCEL UP TO £10 INSURED AGAINST DAMAGE IN TRANSIT FOR ONLY 6d. EXTRA. ORDERS OVER £10 INSURED FREE.

0Z4	6/-	6AQ5	8/6	6L18	13/-	12AH8	10/6	35L6GT	9/6	DAF91	8/-	ECC91	5/6	FW4/500	PCL83	11/6	UBC41	10/-	
1A3	3/-	6AT8	8/6	6N7	8/-	12AT6	10/6	35W4	8/6	DAF96	10/-	ECC80	13/6	10/-	PEN40DD	10/6	UBF80	9/6	
1A5	6/-	6AU6	10/6	6Q7G	10/-	12AT7	8/-	35Z3	10/6	DF33	11/-	ECCF82	13/6	GZ30	10/6	UBF89	10/6		
1CS	12/6	6B4G	6/6	6Q7GT	11/-	12AU7	7/6	35Z4	7/6	DF91	6/6	ECH35	9/6	G232	12/6	PEN45	25/6	UCB85	10/6
1D6	10/6	6B7	10/6	6R7G	10/-	12AX7	10/-	35Z5GT	9/-	DF96	10/-	ECH42	9/6	G234	14/-	PEN46	7/6	UCH42	11/-
1H5GT	11/-	6B8G	4/6	6SA7G	8/6	12BA6	9/-	41MTL	8/-	DH63(C)	10/-	ECH81	9/-	H30	5/-	PL81	16/-	UCH81	11/6
1L4	6/6	6B8GTM	5/-	6SC7G	10/6	12BE6	10/-	50C5	12/6	10/-	ECL80	14/-	H63	12/6	PL82	10/-	UCL82	15/6	
1LD5	5/-	6BA6	7/6	6SG7GT	8/-	12EI	30/-	50L6GT	9/6	DH63(M)	10/-	ECL82	12/6	HABC80	10/6	PL83	11/6	UF41	9/-
1LN5	5/-	6BE6	7/6	6SH7GT	8/-	12J5GT	4/6	61SPT	15/-	17/6	EF36	6/-	13/6	PM28	12/6	UF80	10/6		
1NS	11/-	6B16	7/6	6S7GT	10/6	12J7GT	10/6	72	4/6	DH76	7/6	EF37A	8/-	HK90	10/6	PM12	6/6	UF85	10/6
1R5	8/-	6BR7	11/6	6SK7GT	8/-	12K7GT	7/6	77	7/6	DH77	8/6	EF39	6/-	HL23	10/6	PM12M	6/6	UF89	10/6
1S5	8/-	6BW6	9/6	6SL7GT	8/-	12K8GT	14/-	78	8/6	DK91	8/-	EF40	15/-	HL41	12/6	PY80	8/-	UL41	10/6
1T4	6/6	6BW7	8/-	6SN7GT	7/6	12Q7GT	7/6	80	9/-	DK92	10/6	EF41	9/6	HL133DD	10/6	PY81	9/-	UL46	15/-
1U5	10/-	6BX6	8/-	6SQ7GT	9/-	12SA7	8/6	83V	12/6	DK96	10/6	EF42	12/6	10/6	PY82	9/-	UL84	11/6	
2A7	10/6	6C4	7/-	6SS7GT	8/-	12SC7	8/6	85A2	15/6	DL2	15/-	EF50(A)	7/-	HVR2	20/-	PY83	9/6	UY41	8/6
2D13C	7/6	6C5	6/6	6U4GT	14/-	12SG7	8/6	90AG	32/6	DL33	9/6	EF50(E)	5/-	HVR2A	6/-	QP21	7/6	UY85	10/6
2X2	4/6	6C6	6/6	6U5G	7/6	12SH7	8/6	150B2	15/6	DL66	15/-	EF54	5/-	KF35	8/6	QP25	15/-	V1507	5/-
3A4	7/6	6C8	12/6	6U7G	8/6	12SJ7	8/6	220P	10/6	DL92	7/6	EF73	10/6	KL35	8/6	QS150/15	15/-	VLS492A	£3
3A5	12/6	6C9	12/6	6V6G	7/-	12SK7	8/6	807	7/6	DL94	9/-	EF80	8/-	KT2	5/-	10/6	VMP4G	15/-	
3B7	12/6	6C10	12/6	6V6GTG	8/-	12SQ7	8/6	956	3/6	DL96	10/6	EF85	7/6	KT33C	10/6	QVO4/7	15/-	VP2(7)	12/6
3D6	5/-	6CH6	12/6	6X4	7/-	12SR7	8/6	1203	7/6	DL510	10/6	EF86	17/6	KT44	15/-	R2	10/6	VP4(7)	12/6
3Q4	7/6	6D6	6/6	6X5GT	6/6	12Y4	10/6	4033L	12/6	DM70	8/6	EF89	10/6	KT63	7/6	R12	12/6	VP13C	7/-
3Q5GT	9/6	6E5	12/6	6Z4/84	12/6	14R7	10/6	5763	12/6	EB0F	20/-	EF91	7/6	KTW61	8/-	SD6	12/7	VP41	6/6
3S4	7/6	6F6G	7/-	6Z5	12/6	19AQ5	11/-	7193	5/6	EASO	2/-	EF92	5/6	KTW62	8/-	SP4(7)	15/-	VR105/30	9/-
3V4	9/-	6F6GTM	8/-	6/30L2	10/-	19H1	10/6	7475	7/6	EAT6	9/6	EL32	5/6	KTW63	8/-	SP41	3/6	9/-	9/-
4D1	7/6	6F8	12/6	7A7	12/6	20D1	16/-	9002	5/6	EABC80	9/6	EL34	17/6	KTZ41	12/6	SP42	12/6	VR150/30	9/-
5R4GY	17/6	6F12	7/6	7B7	8/6	25L6GT	10/-	9006	6/6	EAC91	7/6	EL41	11/-	KTZ63	10/6	SP61	3/6	9/-	9/-
5U4G	8/6	6F13	12/6	7C5	8/-	25Y5	10/6	AC6PEN	7/6	EAF42	10/6	EL42	11/6	L63	6/6	SU61	10/6	9/6	9/6
5V4G	11/6	6F17	12/6	7C6	8/-	25Y5G	10/6	AC/HL/	5/6	EB34	2/6	EL81	15/-	LNI52	14/6	TP22	15/6	VT501	5/6
5X4G	12/6	6F32	10/6	7H7	8/-	25Z5	10/6	DDD	15/-	EB41	8/6	EL84	10/6	LZ319	9/6	TT15	20/6	W76	7/6
5Y3G	8/-	6F33	7/6	7R7	12/6	25Z4G	10/6	AC/PA	8/-	EB91	6/6	EL91	5/-	MH4	7/6	U16	12/6	W81M	6/6
5Y3GT	8/6	6G6	6/6	7S7	10/6	25Z6G	10/6	AC/VP1	15/-	EB33	7/6	EL95	10/6	MHLD6	12/6	UI8/20	10/6	X61	12/6
5Y4	12/6	6H6GTG	3/-	7V7	8/6	28D7	7/-	AL60	10/6	EB41	10/6	EM34	10/6	ML4	12/6	U22	8/6	X63	10/6
5Z3	12/6	6H6M	3/6	7Y4	8/-	32	7/6	AP4	3/6	EBF80	10/6	EM80	10/6	ML6	6/6	U26	14/6	X65	12/6
5Z4G	10/6	6J5G	5/-	8D2	3/6	30C1	9/-	ATP4	5/6	EBF89	9/6	EM81	10/6	MSP4(7)	15/-	U31	10/6	X66	12/6
5Z4GT	12/6	6J5GTG	5/6	8D3	3/6	30F5	8/6	AZ31	10/6	EC52	5/6	EN31	34/9	MJ14	10/6	U43	10/6	XD(1.5)	6/6
6A8	10/6	6J5GTM	6/6	9D2	4/-	30FL1	10/6	BL63	7/6	EC54	6/6	EY51	10/6	OA7	5/6	U45	10/6	XFG1	7/6
6AB7	8/-	6J6	5/6	10C1	15/6	30L1	9/-	CK506	4/6	EC70	12/6	(Small)	10/6	OA71	5/6	U50	8/6	XFY12	6/6
6AB8	14/6	6J7G	6/6	10F1	19/6	30P12	12/6	CK523	4/6	ECC31	15/-	EY51	10/6	OC72	3/6	U52	8/6	XHF(1.5)	6/6
6AC7	4/6	6J7GT	10/6	10F9	11/6	30P16	10/6	CV63	10/6	ECC32	10/6	(Large)	12/6	Pe1	3/6	U76	7/6	9/6	9/6
6AG5	6/6	6K6GT	8/-	10F18	12/6	30PL1	12/6	CV85	12/6	ECC33	8/6	EY84	17/6	Pe15	10/6	U78	7/6	15/6	15/6
6AJ8	9/-	6K7G	5/-	10LD3	8/6	31	7/6	CV271	10/6	ECC35	8/6	EY86	14/6	PABC80	15/-	U251	15/6	Y63	7/6
6AK5	8/-	6K7GT	6/6	10LD11	14/9	33A/158M	30/-	CV428	30/-	ECC81	8/6	EZ35	6/6	PCC84	9/6	U404	10/6	Z63	10/6
6AK8	9/-	6K8G	8/-	10P3	17/6	DI	3/-	ECC82	7/6	EZ40	8/-	PCC85	12/6	UABC80	10/6	Z66	20/6		
6AL5	6/6	6K8GTG	8/6	11E3	15/-	D42	10/6	ECC83	10/6	EZ41	10/6	PCF80	9/6	10/6	Z77	7/6			
6AM5	5/-	11/-	12A6	6/6	35/51	D77	6/6	ECC84	10/6	EZ80	9/6	PCF82	12/6	10/6	Z719	8/-			
6AM6	7/6	6L6G	9/6	12AH7	8/-	35A5	11/-	DAC32	11/-	ECC85	9/6	EZ81	9/6	PCL82	12/6	UB41	12/7	Z729	17/6

VOLUME CONTROLS

All with long spindle and double-pole switch.

10K.	25K.	50K.	100K.
1/2 meg.	1/2 meg.	1 meg.	2 meg.

4/6 each.

Standard Can.

32 x 32 mfd., 450 V.	5/9
64 x 120 mfd., 350 V.	8/3
60 x 250 mfd., 275 V.	9/6
100 x 400 mfd., 275 V.	12/6
100 mfd., 275 V.	2/6
200 mfd., 275 V.	3/6
100 x 200 mfd., 275 V.	6/6

ELECTROLYTIC CONDENSERS

Wire-ended Tubular		1/9
8 mfd., 450 V.		2/9
16 mfd., 450 V.		3/9
32 mfd., 450 V.		3/9
8 x 8 mfd., 450 V.		3/9
16 x 16 mfd., 450 V.		4/9
32 x 32 mfd., 350 V.		3/9
8 x 16 mfd., 450 V.		4/-

NEW METAL RECTIFIERS, FULLY GUARANTEED

DRM1B	15/4	RM-2	7/6	W6	3/6	14A97	25/-	14B261	11/6	16RE 2-1-3-1	8/6
DRM2B	16/2	RM-3	9/6	WX3	3/6	14A100	27/-	14RA 1-2-8-2	19/-	18RA 1-1-3-1	4/6
DRM3B	23/3	RM-4	18/-	WX4	3/6	14A124	28/-	14RA 1-2-8-3	23/6	18RA 1-1-16-1	6/6
RM-O	7/11	RM-5	24/-	WX6	3/6	14A163	38/-	16RC 1-1-16-1	8/6	18RA 1-2-8-1	11/-
RM-1	7/-	W4	3/6	14A86	18/-	14B130	35/-	16RD 2-2-8-1	12/-	18RD 2-2-8-1	15/-

Hivac miniature valve list or Metal rectifier technical leaflet free on receipt of S.A.E.

TERMS OF BUSINESS:—CASH WITH ORDER OR C.O.D. ONLY. POST/PACKING CHARGES 6d. PER ITEM; ORDERS VALUE £3 OR MORE POST FREE. C.O.D. 2/6 EXTRA. WE ARE OPEN FOR PERSONAL SHOPPERS MON.-FRI. 8.30-5.30. SATS. 8.30-1 P.M.

ALL VALVES NEW, BOXED AND SUBJECT TO MAKERS' FULL PERIOD GUARANTEE. FIRST GRADE GOODS ONLY, NO SECONDS OR REJECTS. LATEST CATALOGUE OF OVER 1,000 DIFFERENT VALVES, INCLUDING MANY SCARCE TYPES, WITH FULL TERMS OF BUSINESS, PRICE 3d., PLUS 2d. POST.

PLEASE ENQUIRE FOR ANY VALVE NOT LISTED. 3d. STAMP, PLEASE.



The Popular "fidelity" TAPE RECORDER

for truly "Hi-Fi" Recordings

THEY INCORPORATE

- Choice of the latest COLLARO TRANSCRIBTOR DECK
- The NEW TRUVOX MK. IV DECK
- The model HF/TR3 "fidelity" AMPLIFIER. (Described below.)
- ROLA CELESTION 10in. x 6 P.M. Speaker
- 1,200 reel E.M.I. tape.
- ACOS Crystal Microphone.

PRICE INCORPORATING

COLLARO DECK MK. IV CREDIT SALE. Dep. £2.8.6 and 9 monthly payments of £4.10.8. H.P. TERMS. Dep. £18.10.0 and 12 monthly payments of £3.0.6.

PRICE WITH TRUVOX DECK INCORPORATING REV. COUNTER. CREDIT SALE. Dep. £13.2.6 and 9 monthly payments of £4.16.3.

H.P. TERMS. Dep. £17.10.0 and 12 monthly payments of £3.4.2.

BEFORE CHOOSING YOUR TAPE RECORDER YOU SHOULD HEAR THIS MODEL—TRULY "HI-FI" RECORDINGS ARE OBTAINABLE and it is comparable to much higher-priced Recorders. Alternatively send S.A.E. for ILLUSTRATED LEAFLET.

(plus £1.10.0 carriage and insurance, of which £1 is refunded on return of Packing Case.)

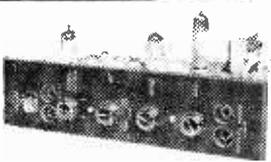
THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING

3 SPEED TREBLE EQUALISATION by means of the latest MULLARD POT CORE INDUCTOR.

PRICE FOR COMPLETE KIT OF PARTS. **£12.15.0**

PRICE FULLY ASSEMBLED & TESTED **£16.10.0**



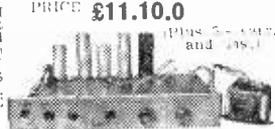
CREDIT SALE. Deposit £4.2.6 and 9 monthly payments of £1.10.3. HIRE PURCHASE. Deposit £5.10.0 and 12 monthly payments of £1.0.2.

A very high quality Amplifier based on the very successful TYPE "A" design completed in the MULLARD LABORATORIES. ONLY NEW HIGH GRADE COMPONENTS are incorporated including MULLARD VALVES and GILSON OUTPUT TRANSFORMER. Other features are—Magic Eye Recording hand indicator—Effective Tone Control—Monitoring and Extension Speaker Sockets—Has own Power Supply and can be used as independent Amplifier for direct reproduction of Gram Records or from Radio Tuner. Overall size 11in. x 8in. x 6in. Can be supplied for use with Truvox—Collaro—Lane—Ernst or Motek Decks. Please specify which Send S.A.E. for leaflet or 1 to the complete Assembly Manual.

STERN'S TAPE PRE-AMPLIFIER & ERASE UNIT

STERN'S MODEL HF TR3—A completely assembled Pre-amplifier with own Power Supply. Can be supplied correctly matched for use with Truvox or Collaro Decks and incorporates Recording Level Indicator and Monitoring facilities. Please send S.A.E. with any enquiry.

IF YOU HAVE A HIGH QUALITY AUDIO AMPLIFIER (such as our Mullard 5-10 and associate 2-valve Pre-amplifier) and wish to add full TAPE facilities—ALL YOU NEED IS—THE ABOVE H.F. TR3.P. UNIT together with a TAPE DECK.



WE OFFER YOU . . . (a) THE HF TR3.P. PRE-AMPLIFIER together with the COLLARO MK. IV TAPE DECK (4 in. reel). PRICE . . . £32.10.0 CREDIT . . . deposit £8.2.6 and 9 monthly payments of £2.19.7 . . . H.P. . . . deposit £10.16.8 and 12 monthly payments of £1.9.9. (b) THE HF TR3.P. together with the TRUVOX MK. IV DECK (Incorp. Precision Rev. Counter). PRICE £38.0.0 CREDIT . . . deposit £9.10.0 and 9 monthly payments of £3.8.8 . . . H.P. . . . deposit £12.18.4 and 12 monthly payments of £2.6.6. **NOTE.** Messrs. Collaro when supplying the MK IV Deck do not wire up the Deck Switches . . . we will do this at a charge of £1.0.0 or supply a Wiring Diagram to the Home Constructor.

HOME CONSTRUCTORS

WE MAKE SPECIAL PRICES FOR COMBINED ORDERS

(a) THE COLLARO MK IV DECK (SEE NOTE) and the HF TR3 AMPLIFIER (Assembled and Tested). **CASH £36.0.0**

CREDIT SALE. Deposit £9.0.0 and 9 months of £3.6.0. HIRE PURCHASE. Deposit £12.0.0 and 12 months of £2.4.0. (b) Precisely as in (a) above but HF TR3 AMPLIFIER supplied as COMPLETE KIT OF PARTS. **PRICE £32.10.0**

(c) THE TRUVOX MK. IV DECK and the HF TR3 AMPLIFIER (Assembled and Tested). **CASH £38.10.0**

CREDIT SALE. Deposit £9.19.6 and 9 months of £3.10.7. HIRE PURCHASE. Deposit £12.16.8 and 12 months of £2.7.1. (d) Precisely as in (c) above but HF TR3 AMPLIFIER supplied as COMPLETE KIT OF PARTS. **CASH PRICE £35.0.0**

(e) TRUVOX MK. IV DECK (Incorp. Precision Rev. Counter) and the HF TR3 AMPLIFIER. Assembled and Tested. **CASH PRICE £41.10.0**

CREDIT SALE. Deposit £10.7.6 and 9 monthly payments of £3.16.1. HIRE PURCHASE. Deposit £13.16.8 and 12 monthly payments of £2.10.9.

(f) Precisely as in (c) above but HF TR3 AMPLIFIER supplied as COMPLETE KIT OF PARTS. **CASH PRICE £38.0.0**

(g) THE PORTABLE CASE—ACOS CRYSTAL MICROPHONE—ROLA 10 x 6 SPEAKER and 1,200 ft. reel PLASTIC TAPE. **ALL FOR £9.0.0**

CARRIAGE and Insurance on any above is 10/- extra. Note.—Messrs. Collaro supply the Transcripator with the Deck Switches unwired. We will complete this wiring at £1.0.0 charge or alternatively supply a Wiring Diagram with Deck. TERMS ARE NOT AVAILABLE WHEN KIT OF PARTS IS SUPPLIED.

TAPE EQUIPMENT IN STOCK

- COLLARO MK. IV TRANSCRIBTOR DECK. **£24.0.0** CREDIT SALE, deposit £6.0.0 and 9 monthly payments of £2.4.0. HIRE PURCHASE, deposit £8.0.0 and 12 monthly payments of £1.9.4.
 - TRUVOX MK. IV TAPE DECK **£27.6.0** CREDIT SALE, deposit £6.17.0 and 9 monthly payments of £2.10.0. HIRE PURCHASE, deposit £9.2.0 and 12 monthly payments of £1.13.4.
 - TRUVOX MK. IV DECK (incorporating Precision Rev. Counter). CREDIT SALE, deposit £7.12.3 and 9 monthly payments of £2.15.10. HIRE PURCHASE, deposit £10.3.4 and 12 monthly payments of £1.17.3.
 - PORTABLE CARRYING CASE (as illustrated), accommodates HF TR3 Amplifier and available for Truvox or Collaro Decks **£5.0.0**
 - High Output ACOS CRYSTAL MICROPHONE **£1.15.0**
 - 10in. x 6in. P.M. LOUDSPEAKER **£1.10.0**
 - 7in. x 4in. P.M. LOUDSPEAKER **16.9 and 19.6**
 - 1,200 ft. reels E.M.I. or SCOTCHBOY TAPE. **£1.15.0**
- We also have a special line good quality Plastic Tape, 1,200 ft reels at 2/-.

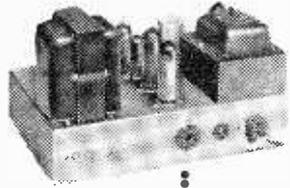
Please send S.A.E. with all correspondence.

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

**AMPLIFIERS
PRE-AMPLIFIERS
FOR THE "HI-FI" ENTHUSIAST**

**MULLARD DESIGNS FOR
THE
HOME CONSTRUCTOR**

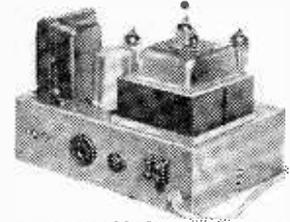
**THE VERY
POPULAR
MULLARD
"5-10" MAIN
AMPLIFIER**



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



**THE NEW
MULLARD 3-3
MAIN
AMPLIFIER**



Please enclose S.A.E. if ILLUSTRATED and DESCRIPTIVE LEAFLETS are required: the ASSEMBLY MANUALS, containing Practical Drawings, etc., are available at 1/6 each.

SPECIAL PRICE REDUCTIONS . . .

(a) The COMPLETE KIT OF PARTS to build both the "3-3" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT . . . **£12.10.0**
 (b) The COMPLETE KIT OF PARTS to build the "5-10" MAIN AMPLIFIER and the 2-STAGE PRE-AMPLIFIER-CONTROL UNIT . . . **£15.15.0**
 PRICES FOR THE "5-10" ARE SUBJECT TO £16.0 EXTRA IF THE PARTRIDGE TRANSFORMER IS REQUIRED.

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

COMPLETE KIT OF PARTS **£10.0.0** Alternatively we supply ASSEMBLED & TESTED **£11.10.0** (Carriage & Insurance 5/- extra.)

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

A completely new design employing two EF86 valves, and in particular designed to operate with the Mullard range of Power Amplifiers, but also perfectly suitable for other makes, etc.

- Equalisation for the latest R.T.A.A. characteristics.
- Input for variable reluctance. • Magnetic Pick-Ups.
- Input for Crystal Pick-Ups. • Input for Tape replay.
- (a) Direct from High Impedance Tape Head.
- (b) From a Tape Amplifier or Pre-amplifier.
- Sensitive Microphone Channel.
- Wide range Bass and TREBLE Controls.
- Attractive Perspex front control panel.
- Our Kit is strictly to MULLARD'S SPECIFICATION.

COMPLETE KIT OF PARTS **£6.6.0** Alternatively we supply ASSEMBLED & TESTED **£8.0.0** (Carriage & Insurance 5/- extra.)

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

COMPLETE KIT OF PARTS **£7.0.0** Alternatively we supply ASSEMBLED & TESTED **£8.0.0** (Carriage & Insurance 5/- extra.)

Only NEW HIGH GRADE COMPONENTS and MULLARD VALVES are supplied with these Kits—

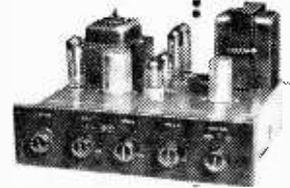
(a) The "3-3" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED . . . **£15.0.0**

CREDIT : DEPOSIT £3.15.0 & 9 Monthly Payments of £1.7.6. H.P. : DEPOSIT £5.0.0 & 12 Monthly Payments of 18.4.

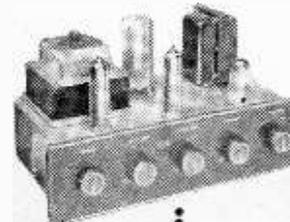
(b) The "5-10" and the 2-STAGE PRE-AMPLIFIER both ASSEMBLED and TESTED . . . **£18.18.0**

CREDIT : DEPOSIT £4.15.0 & 9 Monthly Payments of £1.14.7. H.P. : DEPOSIT £8.6.0 & 12 Monthly Payments of £13.1. When ordering include an extra 7/6 to cover Carriage and Insurance.

**THE NEW
COMPLETE
MULLARD 5-10
AMPLIFIER**



**THE NEW
COMPLETE
MULLARD 3-3**



Designed for a simple domestic installation with Genuine High Quality reproduction up to a maximum of 10 watts. Separate BASS and TREBLE Controls are incorporated with switched inputs for 78 and L.P. Records plus Radio Tuning Unit.

We incorporate SPECIFIED COMPONENTS and NEW MULLARD VALVES. We also give the purchaser the choice of two of the best ULTRA-LINEAR OUTPUT TRANSFORMERS made—first the latest by PARMEKO LTD., and also the latest by PARTRIDGE (£1.6.0 extra). We also supply the PARMEKO MAINS TRANSFORMER, and this has extra power available to supply a Radio Tuning Unit. The Control Unit can easily be detached from the Amplifier Chassis for use in a remote position.

COMPLETE KIT OF PARTS (PARMEKO Transformer) **£11.10.0** Alternatively we supply ASSEMBLED and TESTED **£13.10.0**

Credit Sale : Dep. £3.7.6 and 9 Monthly Payments of £1.4.11. H.P. Terms: Dep. £4.10.0 and 12 Monthly Payments of 16.8. Send S.A.E. for ILLUSTRATED LEAFLET or 1/6 for the COMPLETE ASSEMBLY MANUAL.

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION

COMPLETE KIT OF PARTS **£7.10.0** Alternatively supplied ASSEMBLED and FULLY TESTED and FULLY TESTED (plus 6/6 carriage and insurance) **£8.19.6**

Developed from the very popular 3-valve 3-watt Amplifier designed in the Mullard Laboratories. Our kit is complete to MULLARD'S SPECIFICATION including supply of specified components, Mullard valves and a PARMEKO OUTPUT TRANSFORMER. Send S.A.E. for leaflet or 1/6 for ASSEMBLY MANUAL.

STERN RADIO LTD.

STERN'S FOR STEREO

OUR POPULAR MULLARD MAIN AMPLIFIERS ARE RECOMMENDED FOR USE WITH THE

THE "STEREO EIGHT" PRE-AMPLIFIER
£23.20
(Carr. & Ins. 5/- extra.)



DULCI STEREO PREAMPLIFIERS
THE "STEREO TWO" PREAMPLIFIER
£9.90
(Carr. & Ins. 5/- extra.)

Both Preamplifiers can be supplied to correctly operate with our very popular MULLARD "3-3" and "5-10" MAIN AMPLIFIERS (described opposite). For Stereo reproduction TWO Main Amplifiers are necessary, one for normal "Hi-Fi" reproduction the "Stereo Eight" and the "Stereo Two" are perfectly suitable to operate with ONE Main Amplifier and the second Main Amplifier can then be added at any time, thus transforming a standard "Hi-Fi" installation over to Stereo.

FULLY DESCRIPTIVE LEAFLETS ARE AVAILABLE. ENCLOSE S.A.E. WE OFFER

- (a) The "Stereo Two" with one "3-3" MULLARD MAIN AMPLIFIER **£17.00**
- (b) The "Stereo Two" with two "3-3" MULLARD MAIN AMPLIFIERS **£24.10.0**
(This provides Stereo reproduction of max. 6 watts output and is an ideal Home Installation.)
- (c) The "Stereo Two" with one "5-10" MULLARD MAIN AMPLIFIER **£20.10.0**
- (d) The "Stereo Two" with two "5-10" MULLARD MAIN AMPLIFIERS **£31.10.0**
- (e) The "Stereo Eight" with two "5-10" MULLARD MAIN AMPLIFIERS **£44.10.0**
(This provides for up to 20 watts output.)
- (f) The above (e) with one MULLARD "5-10"

OTHER STEREO EQUIPMENT AVAILABLE:

GRAM UNITS fitted with Stereo Cartridge by ... GARRARD-COLLARO LENC0-B.S.R.

These include Autochangers, Single Record Playing and Transcription Units.

STEREO CARTRIDGES and PICK UPS by ... B.J.-GARRARD-COLLARO-LENC0-B.S.R.
(Please enclose S.A.E. with any inquiry.)

DULCI TWIN POWER AMPLIFIER S.P.44 **£12.12.0**
HIRE PURCHASE AND CREDIT SALE TERMS ARE AVAILABLE

RECORD PLAYERS

THE VERY LATEST MODELS ARE IN STOCK

MANY AT REDUCED PRICES!!!

TRANSCRIPTION UNITS-AUTOCHANGERS, SINGLE RECORD PLAYERS.

Send S.A.E. for ILLUSTRATED STOCK LIST.

A FEW CASH BARGAINS

- The UAB BSR MONARCH 4 SPEED "MINER" AUTOCHANGER. Entirely complete with Crystal Pick Up **£6.19.6**
- The latest COLLARO 4 SPEED AUTO-CHANGER-Complete with the studio "O" Pick Up. (Also available with the low gain Studio "P" Pick Up for £8.15.) **£7.19.6**
- The latest COLLARO 4 SPEED SINGLE RECORD PLAYER complete with Studio "O" Pick Up **£6.19.6**
- The COLLARO or BSR "JUNIOR" 4 SPEED SINGLE RECORD PLAYER, complete with separate Crystal Pick Up (This high output Crystal Pick Up is available separately for £1.12.6.) **£4.10.0**



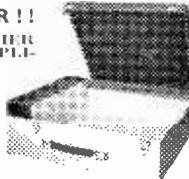
A SPECIAL CASH ONLY OFFER!!

This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER.

ALL FOR ONLY **£8.7.6** (plus 7/6 carr. & ins.)

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

- WE ALSO SUPPLY SEPARATELY-
 - (a) The 2-Stage (plus 7/6 carr. & ins.) Rectifier AMPLIFIER **£4.2.6**
 - (b) The PORTABLE CARRYING CASE **£3.17.6**
- (c) P.M. SPEAKER **18/9**



CAR BATTERY CHARGER

WE offer a COMPLETE KIT OF PARTS FOR ONLY **£2.15.0**

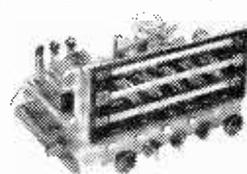
EASY-TO-FOLLOW ASSEMBLY INSTRUCTIONS ARE INCLUDED.

Will charge 6 or 12 volt Batteries at max. 21 amps. The design incorporates Ballast Resistor and Fuse, and we supply complete with Metal Box container.

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

TO MODERNISE YOUR OLD RADIOGRAM

THE NEW ARMSTRONG "JUBILEE"



A.M./F.M. RADIOGRAM CLASSIS

PRICE **£30.9.0**

(Plus 7/6 carr. and ins.)
CREDIT SALE: Deposit £7.12.3, 9 Months at £9.15.0.
HIRE PURCHASE: Deposit £10.3.4, 12 Months at £1.17.3.
Messrs. Armstrong have

always been associated with very high-class equipment, and this chassis is undoubtedly one of the best they have ever produced.

MAIN FEATURES

- 6 watts push-pull output with negative feedback.
- 9 valves and 2 diodes.
- Full F.M. band (87-108 mc/s) plus medium and long waves.
- Automatic frequency control on F.M.
- Adjustable Ferrite rod aerial on A.M. bands.
- Tape playback and record facilities.
- Two compensated pick-up inputs.
- Frequency response 30-22,000 cps. ± 2 dB.
- Separate wide-range bass and treble controls.
- Output impedance for 3-, 7½- and 15-ohm SPEAKERS.
- Tuning indicator.
- Provision for booster unit for low output pick-ups.
- A polished brass dial escutcheon and veneered fascia board is available.
- Size of chassis 12in. x 8in. x 7in. high.

DULCI MODEL H4

A.M./F.M. RADIOGRAM CLASSIS



A 4-waveband Receiver designed for first-rate reproduction of Radio and Gram.

PRICE **£24.6.6**

(Plus 7/6 carr. and ins.)
CREDIT TERMS: Deposit £6.2.0 and 9 Monthly Payments of £2.4.7.

H.P. TERMS: Deposit £8.2.2. and 12 Monthly Payments of £1.9.9.

BRIEF SPECIFICATION

- Covers Short, Medium, Long and F.M. wavebands.
- Employs full A.V.C.
- The latest 6-valve line-up.
- For 3- or 15-ohm P.M. speakers.
- "Magic Eye" tuning indicator.
- Excellent tone range up to 4 watts output.
- Internal aerial for local stations.
- Overall size 12in. x 8in. x 7in. high
- A Good Quality Chassis and well recommended.

STERN'S MK. II fidelity

F.M. TUNING UNIT

PRICE **£15.0.0**

(Plus 5/- carr. and ins.)

CREDIT SALE: Deposit

£3.15.0 and 9 Monthly

Payments of £1.7.6.

HIRE PURCHASE: Deposit

£5.0.0. and 12 Monthly Payments of 18/4.

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP comprising ECC85, 2 type EF85s (or EF86s), 6M54 Tuning Indicator, plus 2 type O.A.798 Germanium Diodes. A new first-class Tuner. Very attractively presented and comparable to many offered at much higher prices. Power consumption is only 15 amps at 6.3 volts and 25 ma at 250 volts.

HOME CONSTRUCTORS! YOU CAN BUILD THIS

TUNING UNIT FOR ONLY £11.0.0 (Plus 5/- carr. & ins.)

Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6. This contains easily followed PRACTICAL DIAGRAMS together with relative instructions.



HOME CONSTRUCTORS

A RANGE OF "EASY TO ASSEMBLE" PREFABRICATED CABINETS

Designed by the W.B. "STENTORIAN" COMPANY for "Hi-Fi" Loudspeaker systems or to accommodate high-quality equipment.

The acoustically designed Bass Reflex Cabinets containing the very successful "Stentorian" Speakers give really first-class reproduction and are well recommended.

Models are also available to accommodate high-quality



Amplifiers, Preamplifiers, Tuning Units, Record Players, etc. All models are very easily assembled, in fact only a screwdriver is required. Fully illustrated leaflets are available, including complete specifications of the various STENTORIAN LOUSPEAKERS. Please enclose S.A.E.

IMPORTANT ANNOUNCEMENT

THE PEMBRIDGE COLLEGE OF ELECTRONICS

34A Hereford Road, London, W.2.

Mr. J. B. McMillan, M.A., B.Sc., who will remain as the Director of studies of the E.M.I. College of Electronics until August 1959, is founding the new Pembridge College and is taking over from E.M.I. the above premises specially built in 1956 for College purposes.

The new College will conduct from September 1959 as one of its activities full-time One-Year courses in Radio and Television similar to those at present run by the E.M.I. College. Courses will commence in January, April and September of each year, the first course commencing on 8th September 1959.

Students wishing to commence this type of course in January or April 1959, should enrol now with the E.M.I. College of Electronics, 10 Pembridge Square, London, W.2. and transfer for the completion of their course to the Pembridge College of Electronics at the end of July 1959, when the E.M.I. College of Electronics will cease to exist.

Details of the Pembridge College courses and admission forms may be obtained from:

The Principal

**THE PEMBRIDGE COLLEGE OF ELECTRONICS
34A HEREFORD ROAD, LONDON, W.2.**

IA A

THE E.M.I. COLLEGE OF ELECTRONICS

ONE-YEAR COURSES IN THE PRINCIPLES AND PRACTICE OF RADIO AND TELEVISION

To satisfy the large demand for its One-Year course, the E.M.I. College of Electronics proposes to commence courses of this nature on 6th January 1959 and 14th April 1959, in spite of the fact that the College will cease to function on 29th July 1959.

Any student wishing to continue his course after 29th July 1959, will be offered the opportunity of so doing at a new College which is being created by the present Director of Studies of the E.M.I. College and other members of the present staff. The intended name of the new College is the Pembridge College of Electronics with premises at 34A Hereford Road, London, W.2.

Details and enrolment forms may be obtained from:

The Principal

**THE E.M.I. COLLEGE OF ELECTRONICS
10 PEMBRIDGE SQUARE, LONDON, W.2. BAYswater 5131/2**

IA/B

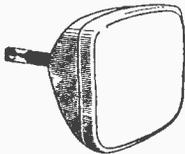
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EXPRESS DESPATCH SERVICE

Phone to confirm tube in stock. Send Telegraph Money Order. On receipt of same, tube despatched Passenger Train same day.



REGITTERED IMPROVED VACUUM T.V. TUBES

17in., £7.10.0.
14in., £5.10.0.

12 MONTHS' GUARANTEE

Our 12 months' guarantee (6 months' full replacement, 6 months' progressive) illustrates our wholehearted confidence in the tubes we offer. We sell many hundreds a week throughout the country and have done so for the past 7 years. Many of them go to the Trade, i.e. to Insurance Companies, Renters and Retailers who are thoroughly satisfied with our supplies. Remember they also hold a 10 days' money back guarantee.

9in., 10in., 14in., 15in. and 16in. round tubes. Our special offer of these sizes, £5. 12in. T.V. tubes, £6. Three months' guarantee on round tubes. Ins. carr. 5/6.

14in. RECTANGULAR T.V. TUBES with burns, 30/- Ideal as a standby or testing purposes. Carriage 10/-.

Sound and Vision Strip, 25/6

Superhet. Tested I.F.s 10.5 Mc/s sound, 15 Mc/s vision. Eight valve bases (6-6F1s and 2-6D2s not included). Size 8½in. x 5in. x 4½in. high. Post & packing 2/6. The Turret Tuner plugs directly into this chassis. (State channel required.)

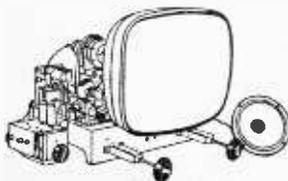
SOUND AND VISION STRIP, 10/6. Superhet. Complete vision strip. Less valves. Not tested, drawings free. Postage 2/6.

POWER PACK AND AMPLIFIER, 19/6. Output stage 6V6 with O.P. trans. Smoothed H.T. 350 v. 250 mA., 6.3 v. at 5 A., 22 v. at 3 A., 6.3 v. at 4 A., centre tapped. Less valves. Free drawings. Ins. carr. 5/6.

POWER PACK AND AMPLIFIER, 19/6. Output stage PEN 45, O.P. trans. choke. Smoothed H.T. 325 v. at 250 mA., 4 v. at 5 A., 6.3 v. at 5 A., 4 v. at 5 A., centre tapped. Less valves. Carr. 5/6.

TIMEBASE, 4/9. Complete, including scanning coils, focus unit, etc. Less valves. Post and packing 2/6.

17in. T.V. CHASSIS, TUBE & SPEAKER, £19.19.6

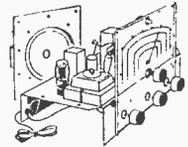


17in. Rectangular Tube on modified chassis. Supplied as single channel chassis covering B.B.C. channels 1-5, or incorporating Turret Tuner which can be added as an extra, at our special price to chassis purchasers 50/-, giving choice of any 2 channels (B.B.C. and I.T.A.). Extra channels can be supplied at 7/6 each. Chassis size 12in.

x 14½in. x 11in. less valves. Similar chassis are used by well-known companies because of their stability and reliability. With tube and speaker, £19.19.6. With all valves, £25.19.6. Complete and working with Turret Tuner, £28.9.6. 12 months' guarantee on the tube, 3 months' guarantee on the valves and chassis. Ins. carr. (incl. tube), 25/-.

Super Chassis, 99/6

5-valve superhet chassis including Bin. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four w/bands with position for gram., p.u. and extension speaker. A.C. Ins. carr. 5/6.



Extension Speakers, 29/9

Fitted with Bin. P.M. speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms). Switch and flex included. Unrepeatable at this price. Money back if not completely satisfied. Ins. carr. 3/6.

The evenings are short and dark but there are still jobs which must be done. No reason why you shouldn't continue to enjoy that radio programme if you fit up one of our Bin. P.M. Speakers, 8/9. With O.P. Transformer fitted, 10/- Post 2/9.

Electric Converter Heater, 99/6

Is your house warm enough? A converter heater will eliminate those cold spots, and at an economical price too! A.C./D.C. Switched for 1 or 2 kW. Illuminated grille. Size 26in. x 18in. x 7½in. deep. Ins. carr. 10/6.



Heater Transformers 12/9

0-200-250 v. Primary 12 v. heater ½ amp. Post and packing 1/9.

HEATER TRANSFORMERS, 3/9. 1-2 Ratio auto trans. 2 v. at 1.4 amp. primary, 4 v. secondary. Post and packing 1/9.

MAINS TRANSFORMERS, 12/9. 350-0-350 v. 250 mA. 6v. at 5 amp., 6 v. at 5 amp. 4 v. at 4 amp. 22 v. at 6 amp. extra winding for 2 v. or 4 v. tubes. Prim. 200-250 v. 50 cycles. Postage and packing 3/9.

MAINS POWER TRANS., 12/9. 350-0-350 v. 250 mA. 6 v. heater at 5 amp. 4 v. centre tapped. Drop through type. Prim. 200-250 v. (4½in. x 5in. x 5in.) Post 3/9.

MAINS TRANS., 3/9. 350-0-350 v. at 80 mA., 12 v. at 1.5 amp. 4 v. at 2 amp. Primary 100-120-200-250 v. Fully shrouded. Post and packing 2/9.

MAINS TRANS., 5/9. 280-0-280 v. 80 mA. 6 v. 4 v. heaters. 200-250 v. prim. Post 2/3.

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110 v. or 6 v. (special adaptor for 200/240 v. 10/- extra). Automatic solder feed. Including a 20ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 2/9.



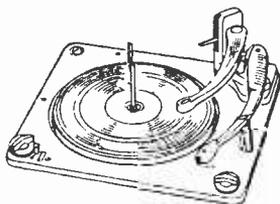
Bargains For Record Player Enthusiasts

Record Player Cabinet 39/6



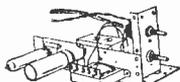
Amazing offer. Latest contemporary style rexine-covered cabinet in 2-tone colour scheme. Hinged, clipped lid, carrying handle. Space available for all modern amplifiers and auto-changers, etc. Store-soiled. Carr. & Ins. 4/6.

Collaro 4 Speed Autochanger £7/19/6



Type RC457 incorporating auto and manual control complete with studio crystal p.u. and sapphire stylus. P. P. & Ins. 5/6.

AMPLIFIERS



PORTABLE AMPLIFIER MARK D.1. 59/6

Brand new. Latest design with printed circuit. Dimensions 7 x 2½ x 5in. A.C. only. Mains isolated. 2.3 watts output. Incorporating EL84 high gain output valve. Volume and tone controls. P. & P. 3/6.

PORTABLE AMPLIFIER MARK D.2. 79/6

Printed circuit. Latest design. Dimensions 7 x 2½ x 5in. A.C. only. Mains isolated. 3.4 watts output. Incorporating the latest ECL82 triode pentode output valve, giving higher undistorted output. Volume and tone controls. P. P. 3/6.

PORTABLE AMPLIFIER MARK D.3. 89/6

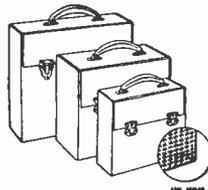
De Luxe Model. Printed circuit, latest design. Dimensions 7 x 2½ x 5in. A.C. only. Mains isolated 3.4 watts output. Incorporating the latest ECL82 triode pentode output valve giving higher undistorted output. Volume, treble and bass control. P. & P. 3/6.

PORTABLE AMPLIFIER MARK D.4. 69/6



Brand new. By famous manufacturer. Especially built for portable record players. Dimensions 4½ x 3½ x 4in. A.C. only. 2 valves; EL84 as high gain output valve, EZ80 as rectifier. Volume and tone controls. P. & P. 3/6.

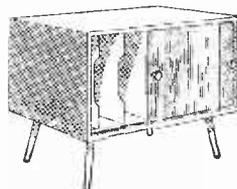
Record Presentation Cases



Beautifully made. Rexine covered in various colours. Hinged top for easy access to records. Plated clip fasteners. Strong modern case covered in hard-wearing washable rexine, or leatherette. Quick reference number index. Carry all your records including very expensive long players safely to parties and record sessions.

RECORD SIZE	Number of records held	Price
12in.	40	46/-
12in.	25	32/6
7in.	40	32/6
7in.	25	31/-

P. P. & Ins. 2/6.



Record Cabinets £3/15/0

No more piles of records—bad for them and an eyesore to you. We are delighted to be able to offer this attractive record cabinet at such a remarkably low price. It is reed fronted and wood partitioned for easy classification and filing. It will take 200-300 records in an upright position. The overall size is 24 x 24 x 15in., and the legs are detachable if you so wish. The design is modern and it is space saving because it will serve a dual purpose being ideal also as a T.V., Radio or Record Player stand. Complete sand papered finish ready for staining, French polishing, painting, etc. P. P. & Ins. 5/-.

Televox Telephone Amplifiers 89/6

Invaluable in a noisy office or workshop. 3 valves UY41; UF41; UL41. 3in. speaker and a suction type vibration microphone. A.C./D.C. only. Size of amplifier 7 x 11 x 3in. Fits any type of telephone. P. P. & Ins. 4/6.



STEREOPHONIC AMPLIFIER £7.19.6

(12 months guarantee). Beautifully made for portable stereophonic record players. Latest design with printed circuit. Dimensions 3 x 5½ x 9½in. A.C. only. Mains isolated. Each amplifier gives 3.4 watt output. Incorporating ECL82 triode pentode valves. Tone, Volume and Balance Controls. Complete and ready to fit. Knobs 3/6 per set extra. P. P. & Ins. 4/6.

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931A PHOTO MULTIPLIER CELL. Complete with associated video amplifier employing 3-6AC7, 1-6V6, complete strip, only 60/-. P. & P. 2/6.

No. 18 TRANS/RECEIVER. A portable self-contained Transmitter/Receiver for Telephone and C.W. Range approx. 10 miles. Frequency 6-9 Mc/s (50-33.3 metres). Valve line-up: 3 ARP-12, 1 AR-8, 1 ATP4. Complete with aerial, H.T. and L.T. meter. Weight 20 lb., size 8 x 10 x 17 in. Only 60/-. Carr. 10/-.

AMERICAN ROTARY CONVERTOR. With cooling fan. Input 12 v. D.C. Output 250 v. at 90 mA. Completely suppressed. Ideal for running car radio, electric shaver, etc., from battery. Only 17/6. P. & P. 3/6.

WIRELESS SET No. 19. Complete station comprising Transmitter/Receiver 2-8 Mc/s. 12 v. Supply unit, Aerial, Variometer, control box, headphones, microphone and all leads, circuit and instruction book. £9. Carr. 20/-.

R.F. UNITS. Type 25. 40/50 Mc/s with circuit, 8/6. Type 26. 50/65 Mc/s with circuit, 20/-. P. & P. 3/6 on each.

MICROPHONES, BRAND NEW. Throat, magnetic, 4/6; No. 8 carbon with switch, 6/6; No. 7 moving coil, 8/6.

HEADPHONES, BRAND NEW. U.S.A. lightweight, Type H.S.30, 15/-; Low resistance 120 ohms, 6/6. P. & P. 1/6 on each.

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

TELEPHONE HANDSET. Brand new, 12/6. P. & P. 1/-.

I.F. TRANSFORMERS. 465 kc/s. 7/6 pair. P. & P. 1/-.

SPECIAL VALVES. 813, 70/-; 829, 30/-; 832, 35/-; 866A, 13/6.

PLESSEY SPEAKERS. 7in. x 4in. elliptical 3 ohms, 5in. circular 3 ohms, 14/6 ea. P. & P. 1/6.

CRYSTAL MIC INSERTS. Postage stamp size, 3/6.

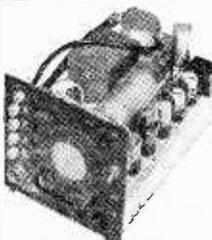
BUILD A POCKET RADIO with this latest deaf aid complete with crystal mike, on/off and volume controls, subminiature valves, etc., internal batteries. only 5x2 1/2 x 1 1/2 in., beautifully styled, offered complete with pocket radio conversion details at the ridiculous price of 80/-.



3" SCOPE INDICATOR

B.C.929A. Complete with 3BP1 tube, shield and holder. 7 valves. Panel controls: Vert. shift, horiz. shift, focus, brilliance and 3 position sweep. Brand new with conversion circuit to oscilloscope.

65/- Carr. 7/6.



WALKIE/TALKIE SET

Consisting of transreceiver covering 7.4-9 Mc/s. range up to 10 miles, complete with 5 valves, headphones, microphone, junction box, aerial and circuit.

ONLY 60/- EACH P. & P. 4/- **TWO FOR £6** POST FREE.



Yes, it's true! With this complete Infra-red night driving installation you can see at night and in fog, yet the operator cannot be seen. Comprises adjustable long-vision binoculars, 12 v. power pack, control unit, connecting cables. Can be assembled within minutes. Government acquisition £200. Brand new, boxed. **£6.10.0** Carr. 10/-.

VIBRATOR PACKS

12 v. input, 300 v. output at 150 mA. consist of 12 v. vibrator, 4 metal rectifiers, choice of smoothing condensers. 25/- Carr. 7/6.

6 v. input, 230 v. output at 100 mA., complete with 4-pin vibrator, OZ4 rectifier. Fully smoothed. 25/- Carr. 5/-.

TEST SET 16/APN



A very fine instrument offered at only

Used for alignment, and calibration of Altimeters. Has internal vibrator supply, Audio Generator 60-1,200 cycles, cavity tuned wavemeter 400-460 Mc/s. Complete with 6 valves, 1 mA. Meter and all cables. In wooden case.

60/- Carr. 10/-.

PORTABLE AMPLIFIER

PRINTED CIRCUIT. Size 6 1/2 in. wide, 2 1/2 in. deep, 3 in. high. Will suit all crystal pick-ups. Output 3 watts. Uses UCL82 output, UY85 rectifier. Volume and tone controls. With circuit diagram.

7in. x 4in. elliptical speaker for above, 14/6. **45/-**

AERIAL VARIOMETERS.

These magnificent instruments will enable you to receive maximum signal strength on all Short Wave receivers. Precision calibrated control. Complete with connection details. 12/6 P. & P. 2/6.

COMMUNICATION RECEIVER R155. This magnificent receiver covers 5 ranges: 75-200 kc/s, 200-500 kc/s, 600-1,500 kc/s, 3-7.5 Mc/s, 7.5-18.5 Mc/s. Fully tested before despatch. Complete with circuit and instruction booklet, £8.10.0. Carrage 10/-.

LEAD ACID ACCUMULATORS (non-spillable). 2 volts 16 A.H. Ideal for 6 volts and 12 volts supply. Brand new, original cartons. Size 4in. x 7in. x 2in. 5/6 each. P. & P. 1/6. 3 for 15/- P. & P. 3/6. 6 for 27/6. P. & P. 5/-.

WHEATSTONE BRIDGE. Consisting of four stud switches: 0-210 ohms. Galvanometer centre zero F.S.D. 2.5 mA. Ranges easily extended. Housed in oak cabinet 16 x 7 1/2 x 6in. Complete with instructions, 22/6. P. & P. 2/6.

RECEIVER I143A. Ideal for conversion to 2 metres or Wrotham. Valves: 4-EF50, 1-EL32, 2-EF39, 1-EBC33, 1-EA50. Complete. Only 20/-. P. & P. 3/6.

METERS. 0-1 mA. 2in. square, 22/6. 500 micro-amp. 2in. circular, calibrated 0-15 and 0-600 volts, 17/6. 1 amp. H.F. 2in. circular, 5/6. P. & P. 1/6 on each.

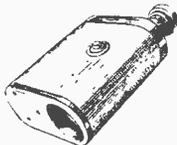
BUILD AN F.M. TUNER with this **MINIATURE 373 I.F. STRIP 9.72 MC/S.** Complete with 6 valves. 3 EF91, 2 EF92, 1 EB91, F.T.s, etc., supplied with circuit and complete conversion to F.M. Tuner details. The best buy of the year, 40/-, with valves; 12/6, less valves. P. & P. 2/6.

ARMOUR RECORDING WIRE. U.S.A. top quality on original reels. Length 3,700 yds. 8/6. P. & P. 1/6.

12 v. SUPPLY UNIT. Output 150 v. at 65 mA. and 40 v. at 35 mA. Brand new. Only 12/6. P. & P. 3/6.

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

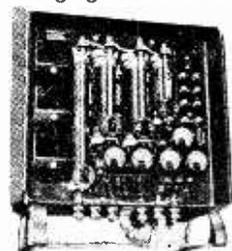
INFRA RED MONOCULAR. Ideal for night viewing, etc. Complete with push-button zomboni pile power unit and focus lens. Brand new in beautiful leather carrying case. Originally cost Govt. £43. OUR PRICE 17/6. P. & P. 2/6.



32a, COPTIC STREET, LONDON, W.C.1.
AND
87, TOTTENHAM CT. RD., LONDON, W.1

All post orders and correspondence to:
(Dept. 'P') 32a, Coptic Street, London, W.C.1.

Charging Switchboard



Offered at about one-twentieth of original cost. This is an ex-Government switchboard. It contains three reverse current relays, one voltmeter, one main ammeter, two secondary ammeters and three variable resistors for controlling circuits. These are original cases. Price £2/15-. Carr. 10-.

Novelty Radio

Completely wired tunable medium and long wave, originally intended for B7G valves and external batteries but could easily be converted for transistors with internal batteries, 6.35 valves and speaker. otherwise complete. 15-. plus 16 postage.

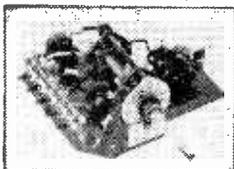


Thermostats



Useful for the control of appliances such as convectors, bluepots, vulcanisers, hot plates, etc. Adjustable to operate over temperature range 50-550 deg. F., fitted with heavy silver contacts. 8/6. Other types: 11 amp. 3/6; 5 amp. 8/6; 2 amp. QMB. 5/6; 15 amp. QMB. 15-. 15 amp. encased wall mounting type. 29/6.

Coil Pack Snip

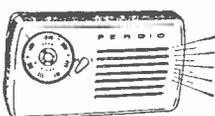


Covers the Medium Waveband 200-550 metres and two short wavebands 35-120 metres and 13-42 metres. for 465 k.c. I.F. Extremely well made, supplied complete with diagram of connections. Only 9/6. plus 16 post and insurance.

Yaxley Switches

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

The Perdio PR4



Ready made pocket transistor radio, the Perdio PR4—an excellent little receiver which will slip into the pocket or handbag, will receive long and medium wavebands and will give enjoyable programmes in any part of the country. Uses printed circuitry and latest type transistors, good volume. all assembled—ready to work. Price £13 13 0 or £1 down and 27 weekly payments of 10/-.

Black & Decker D500



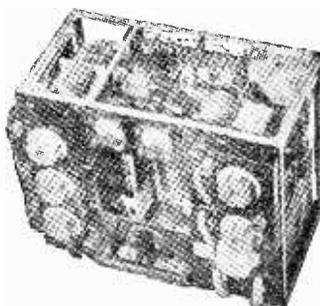
New, heavy duty motor develops terrific power—normal chuck with geared key grip—side handle for additional stability—indispensable tool for any workshop. Takes up to 1 drills, also is power unit for polishing, sawing and turning, etc., etc. Price £6 19 6 or 10/- deposit and 14 weekly payments of 10-.

A Mobile Receiver Transmitter Station

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



Famous Transmitter Virtually Given Away



The famous R1154—unused but slightly soiled and not tested. Covers 200-500 kc s., 3.5-5 Mc s and 5.5-10 Mc s. Has unique "click stop" mechanism (7 stops) and permits selected frequency to be held, returned to, etc. Hartley oscillator, power amplifier, keying and speech. Wonderful breakdown value meters, relays, switches. Complete with valves—real bargain at 29/6, plus 10/- carriage.

FOR ADDRESSES SEE NEXT TWO PAGES

All for less than the price of the cabinet



Fine walnut veneered, table receiver cabinet complete with metal chassis, three colour glass scale, back plate and scale mounts, as illustrated but less knobs. Offered at less than the price of the cabinet, namely 39/6 plus 5/- carriage and insurance.

Hi-Fi Snip Infinite Wall Baffle

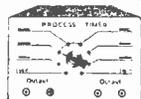
Nicely veneered and polished. Corner fitting (attaches to picture rail). Takes up no floor space. Gives really fantastic results with only low-priced 8in speaker. Fitting for tweeter. Only 45/- each, carriage and insurance 3/6.

Avo Prodclips



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

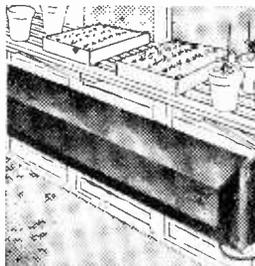
Process Timer for 15/-



Make a time delay switch to work off mains (A.C. or D.C.), all the parts (less case).

Price 15-, post and ins. 2/6.

Instantus Heater



Convector heater. Made from heavy gauge sheet steel (galvanised). For greenhouse, workshop, aviary, etc. 500 watt. £1.12.6; 1,000 watt. £2.10.0. 1,000 watt with wired but separate thermostat. £3.17.6. 2K watt free standing or wall mounting. £3.19.6; 2K watt with built-in thermostat. £4.19.6. Carriage and insurance 5/- per heater. ALL ARE GUARANTEED FOR 5 YEARS.

Yours for 10/- down and 17 weekly payments of 10/- or cash price £8.10.0



The latest, most up-to-date Record Player made by the famous B.S.R. Company. Using Hi-Fi Crystal Pick Up and fitted with every modern device. Definitely a record changer which will give years of trouble-free music. Not surplus but the current model. Price £9.10.0 or Terms.

Speaker Bargain



12in. Hi-Fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 32.6. plus 3.6 post and insurance.



Tube Tester and Re-Activator

We can supply all the main components for making this unit which will not only test Cathode Ray Tubes but also will re-activate them, supplied complete with full instructions. Price £3. plus 2.6 post and ins.

Unused and Boxed Valves

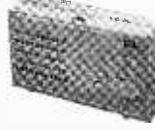
024	9/-	6D6	6/6	7B5	12.6
1A4	9/-	6F5	9/6	7C7	12.6
1A6	9/-	6F6	7/6	7D5	9.6
1F7	12.6	6F7	12.6	7D3	9.6
1L18	8.6	6F8	9/6	7H7	8/-
1LA6	8.6	6F32	10.6	7K8	12.6
1N56	3.6	6G6	7.6	7R7	10/-
1LD5	3.6	6H6	2.6	7S7	10/-
1T4	2.6	6J5	5.6	12H6	8.6
1R5	7.6	6J7	6/-	12SH7	8.6
1S5	7.6	6K6	7/-	12SJ7	8.6
1T5	8/-	6K7	5/-	12SK7	8.6
2A6	12.6	6L5	9/-	25B5	12.6
2A6	12.6	6L6	9/-	26	10/-
2A7	12.6	6L7	10.7	27	10/-
2D13C	5/-	6N7	8.6	28D7	3.6
2X2	4.6	6R7	9/-	31	7.6
3A4	7/-	687	9/-	32E	7.6
3D6	5/-	6SA7	8/-	34	12.6
3Q4	7.6	6SC7	8/-	39.44	10/-
4D1	2.6	6SH7	6.6	41E	9.6
5U4	8/-	6SJ7	8.6	42	8.6
5Z3	12/-	6SK7	6.6	43	10/-
5Z4	9.6	6SL7	8/-	57	10/-
6A6	12.6	6SN7	7.6	58	10/-
6AG5	6.6	6SO7	9/-	71	9.6
6AC7	6.6	6SS7	9/-	75	12.6
6A8	10/-	6T7	12.6	77	8/-
6B1	5/-	6U5	8.6	83	12.6
6B7	10.6	6V6	8.6	84	8.6
6B9	4/-	6X5	7.6	807	6.6
6BQ6	12.6	6Y6	9/-	954	3.6
6C4	6.6	6Z5	15.6	1625	10.6
6C6	6.6	7A2	12.6	805	8.6
6C8	5/-	7A7	9.6	913	9.0-

The Inductor 80



80 w. 5ft. fluorescent fitting with a 5-year guarantee—latest type (choke) control gear—absolutely quiet in operation—all steel batten type construction stove enamelled white—suitable for direct mounting or for suspending. Will last a lifetime. Type A 230-240 v. Price 39/6. Type B, variable for 200-250 v., price 45/- carriage and insurance up to 150 miles 5/6; up to 250 miles 7/6. Tubes, latest type which give more light for same electricity, daylight or natural to your choice. 14.6 each—no extra carriage if ordered with fitting.

The TRANSIDYNE SUPERHET



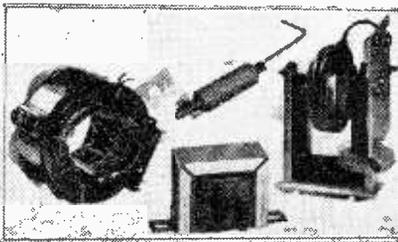
Including six transistors. T.C.C. printed circuit, ferrite rod aerial, cabinet, speaker and all parts for medium and long wave operation—only £11.19.6. or with Pype Goldtop transistors. £12.19.6.



Gram into Tape Recorder

Convert your Record Player or Radiogram into a Tape Recorder. Can be fitted in a few seconds and then you have immediately all the facilities afforded by a normal Tape Recorder, i.e. record, playback, erase, rewind, etc. As illustrated, but less pre-amp. only £7.10.0, or 10/- down and 16 weekly payments of 10/- With pre-amp £13.2.6 or £1 down and 26 weekly payments of 10/- Non callers please add 5/- carriage and insurance. We regret that in the Nov. issue the price of the Gram Deck was shown as £7.10.0 with pre-amp. This should have read less pre-amp. The pre-amp. is extra price £5.12.6. We apologise for any inconvenience caused.

FOUR ITEMS FOR PRICE OF ONE



Set of modern T.V. parts suitable for modernising old television or for a new one. For wide angle 14in. or 17in. tubes comprises: (1) Line output E.H.T. transformer. (2) 700 scanning coils on ferrite yokes. (3) Width control with ferrite core. (4) Frame output transformer. (5) Circuit diagram of a modern television. Offer at the price of the Line output transformer only, namely, 57.6. plus 2.6 post and insurance.

Wireless Set 19—30/-



Transmitter receiver contains £20-£30 worth of spare parts. Complete and in good condition less valves and meter. Price 30/- plus 5/-.

Motor Snip



Miniature motor 2 1/2in. long x 1 1/2in. diameter, laminated poles and armature, separate winding for reversing. Operates off 20-30 v. D.C. or off A.C. mains through stepdown transformer. Original cost at least £3 each. Snip price for one month only 6.6. plus 1.6 postage and insurance.



Somweave

This really lovely loud-speaker fabric we offer at half price namely 7.6 per yard. 48in. wide. This is also very suitable for covering plain wooden cases for portables.

For Your Lab.

Resistance substitution boxes are great time savers and you really cannot have too many of them, here then, is an opportunity to acquire these at a very low rate. Our R.S. kit available for only 8.6. plus 1/6 postage, comprises a 50 w. precision variable resistor, 0-100 K., six 2.3 watt fixed resistors, one 6-position switch, one pointer knob and one ordinary knob and instructions. This unit when made up will give an infinite variability over the range 100 ohm to 2 meg.

14in. T.V. CABINET



14in. T.V. cabinet of the latest styling—beautifully veneered and polished—limited quantity, sale price 19.6 each. Carriage and packing 3.6 extra. Masks 10/- extra.

RI155 for Spares



These are less valves but otherwise reasonably complete—ideal for spares—prices £2 to £4 depending on condition—carriage 7.6.

ELECTRONIC PRECISION EQUIPMENT LTD.

66, GROVE ROAD, EASTBOURNE, SUSSEX

This is the correct address for post orders, and for prompt attention please mark your envelope Dept. 7.

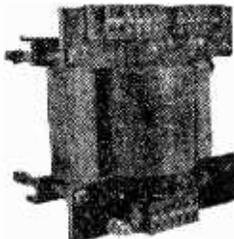
Also add enough for postage.

Making a Solder Gun



A 7-second solder gun of the type costing £3-64 was described in "Practical Mechanics". Only two essential parts are required—(a) the transformer and (b) the push switch. These we can supply at 13/6, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

500 Watt Step Down Transformer



With output tapped from 110 v.-155 v. in 3 volt steps, massive transformer which will withstand considerable overloading. Price £45.-, plus 5/- carriage (up to 250 miles).

Morganita Potentiometers

Single and 2 gang types available, standard size with good length spindle all new and boxed. Single types, 1- each, values available: 5K., 10K., 25K., 50K., 100K., 250K., 1 meg., 2 meg. Gang type, 3- each—values available: 5K., 5 K., 100K., 100K., 1 meg., 1 meg., 2 meg., 2 meg.



Miniature Microphone

American made, Dynamic type, real bargain at 1/6.



Cabinet Snip



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

Build this 17in. T.V. in an evening

Undoubtedly the most up-to-date television for the home constructor. You can build it in an evening and the set when finished will be equal to a factory made equivalent.

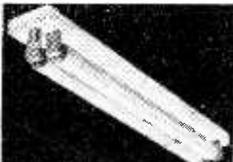
- All miniature valves, and metal rectifier.
- 12-channel turret tuner.
- Multivibrator time bases.
- Ferroxcube E.H.T. and scan coils.

The building cost (less tube) is only £29.10.0, plus 10/- carriage and insurance. Or £5 down and 28 weekly payments of £1. All parts guaranteed twelve months.

Full information and data free with parts or available separately, price 3/6.

This Month's Snip

Stereo Amplifier outfit comprising 7 watt twin channel amplifier for A.C. mains working and two 8in. P.M. Speakers on veneered and polished corner baffles. Whole outfit giving really terrific reproduction and amazing 3D effects. £14 complete, plus carriage and insurance. Or £1 down and 29 weekly payments of 10/-.



Fluorescent Lighting

Complete lighting fittings. Built-in ballast and on-off switch, enamelled white and smelted white and flamed white. Ideal kitchen, workshop—anywhere. Twin approximately 2 1/2 ft. 27in. long complete with two 20W. tubes 39/6. Single 40 approximately 4ft. long complete with one 40W tube 39/6. Inductor 80 approximately 5ft. long complete with one 80W tube 59/6. Carriage & insurance up to 150 miles 5/6, up to 250 miles. 7/6.

Adapt Your Gram for Stereo

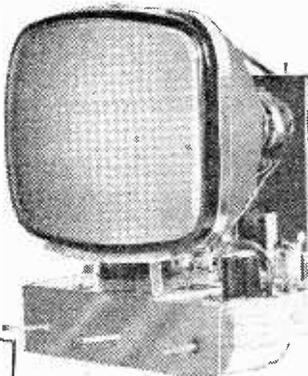
Cartridges for adapting existing record players for stereo—available £2.15.0 each—please state make or player when ordering.

Portable Stereo Amplifier.—7 watts (31 watts each channel) with four controls as follows: Ganged tone control, ganged volume control, balance control and operational switch giving one amplifier for monaural records, both amplifiers for monaural records, i.e., increased output, and both amplifiers for stereo. For A.C. mains only, chassis size 12in. x 3in. x 5 1/2 in. Price £8, plus 3/6 post and ins. Contemporary designed fabric covered portable cabinet to hold this amplifier, speaker and motor or records £4.10.0, plus 3/6 post & insurance.

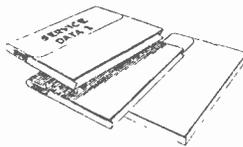
Saturn Spin Drier



A Spin Drier will not only make Washing Day much less of a burden but will also prevent that damp atmosphere created by wet clothes drying indoors. The Spin Drier illustrated is the famous Saturn which although quite small actually holds as much washing as the larger floor standing type. The big advantage of the Saturn is that it can be stood on the draining board, rinsed washing from the sink is put into it and the water spun out back into the sink, no mess, no special emptying and, being light, it can easily be put into a cupboard or stood on a shelf. Your Wife or Mother will be really pleased with one of these. Price £21.17.6, or £1 deposit and 22 weekly payments of £1 each.



T.V. Service Sheets



150 sheets covering the most popular post-war Televisions by leading makers—Cosor, Ekco, Ferguson, Pye, etc. £11.0.0 post free.



TV Masks
Latest type grey crystallate.
11in. 10" 17in. 12"
Plus 1 post.

Record Player



Fitted with latest 4-speed auto-changers which will take the new stereo cartridge—Hi-gain hi-fi amplifier with three controls—ultra modern cabinets with I.C.I. coverings. Price £17.17.0, or £3 deposit and 32 weekly payments of 10/-. Carriage and insurance 7/6—non auto models from £10.10.0.

For convenience of callers all items advertised may be obtained from the following companies.

Electronics (Ruislip) Ltd.,

42-46, Windmill Hill, Ruislip, Middx.
Phone: RUISLIP 5790
Half day, Wednesday.

Electronics (Croydon) Ltd.,

266, London Road, Croydon.
Phone: CRO 6558
Half day, Wednesday.

Electronics (Finsbury Park) Ltd.,

29, Stroud Green Rd., Finsbury Park, N.4.
Phone: ARCHWAY 1019
Half day, Thursday

Constructors

at last a show for you

Radio Society of Great Britain

RADIO HOBBIES EXHIBITION

ROYAL HORTICULTURAL OLD HALL
VINCENT SQUARE, S.W.1.

Wed. Nov. 26th to Sat. 29th

11 a.m. to 9 p.m. Admission 2/-

Official opening by

AIR MARSHAL SIR RAYMUND G. HART K.B.E., C.B., M.C., M.I.E.E.
Controller of Engineering and Equipment Air Ministry

Show will feature:

HOME CONSTRUCTION—DO IT YOURSELF—KITS OF PARTS
FOR BUILDING—RECEIVERS, TRANSMITTERS, TELEVISION,
TEST GEAR, HI-FI AMPLIFIERS, CONVERTERS, TRANSISTOR
EQUIPMENT, TAPE RECORDERS, AERIALS.

HOMEBUILT LIVE AMATEUR RADIO STATION TALKING TO
THE WORLD—TECHNICAL BOOK DISPLAY.

FIRST DISPLAY OF MODERN COLOUR TELEVISION

WIN a £400 World Famous **RACAL** Communication Receiver

Show this advertisement at entrance for free entry form.

PRIZES FOR HOME CONSTRUCTED EQUIPMENT SHOWN

Details from : P. A. THOROGOOD, G4KD. 35 Gibbs Green, Edgware, Middx.
Telephone : MUSEum 3450

PREMIER RADIO COMPANY

Tel.: AMBassador 4033

B. H. MORRIS & CO. (RADIO) LTD.

Tel.: MUS. 3451

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



The "Petite" PORTABLE

MAY BE BUILT FOR
£7.7.0

Plus p. & p. 3-

Batteries Extra, H.T. 10 - (Type B126 or equiv.) or equivalent, L.T. 1.6 (type AD35) or equivalent.

★ Size only 3in. x 8in. 1 1/2in.

★ Instruction book 1.6.

PREMIER BATTERY ELIMINATOR, housed in two containers which are approx. the same size as AD35 and B126 Batteries. Kit 37.6 plus 2/- p. & p.

These two receivers use the latest type circuitry and are fitted into attractive cabinets 12in. x 6 1/2in. x 5 1/2in. in either walnut or Ivory bakelite or wood (1/- extra). Individual instruction books 1/- each, post free.

The "Petite" PORTABLE & REPRODUCER

MAY BE BUILT FOR 13 GNS plus 5/- p.p.

Batteries Extra. H.T. 10 - (Type B126 or equiv.) : L.T. 993, 3.6. 45 r.p.m. Single Record Player ... £5. 5.0 (including P.T.)

"Petite" Components £5.18.0 Cabinet £2.10.0

★ Size 10 1/2in. x 9 1/2in. x 6in.

★ Weight, including Batteries, 7 lb.

★ 45 r.p.m. Single Record Player complete with pick-up.

★ 6 volt Battery operated.

★ Incorporates Pick-up Head protection dome and automatic stylus cleaning brush.

★ Overall size 7 1/2in. x 6in. only.

★ Made by well-known British manufacturer.

★ Automatic Stop/Start.

★ Completely Battery operated.



★ Attractive two-tone rexine covered case.

★ Construction simplicity itself.

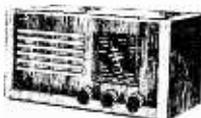
★ Components available separately if required.

★ Instruction book. 1.6.

2 BAND T.R.F.

MAY BE BUILT FOR **£5.10.0**

Plus 3 - p. & p.



3 BAND SUPERHET

MAY BE BUILT FOR **£7.7.0**

Plus 3 - p. & p.

PREMIER Portable STEREO AMPLIFIERS

THE PREMIER STANDARD STEREO PORTABLE

2 Premier 1 valve 21 watt Amplifiers £5 19.6. plus pka. and post 4.6.

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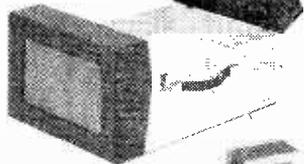
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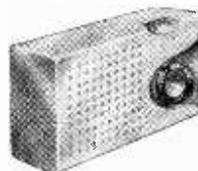
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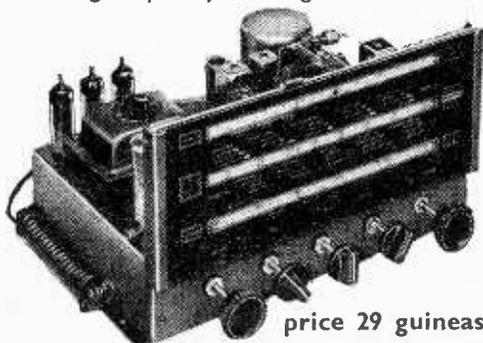
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PRACTICAL WIRELESS

EVERY MONTH

VOL. XXXIV, No. 624, DECEMBER 1958

EDITOR : F. J. CAMM

26th YEAR
OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

Editorial and Advertisement Offices :
PRACTICAL WIRELESS

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

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ANOTHER DEATH RAY SCARE

THE high-power radio stations being built in Britain as part of the NATO Defence Network, gave rise to a report suggesting that these five stations might produce a death ray danger to residents in their areas, because they will concentrate their transmissions along certain lines. This suggestion is, of course, sensational rot, so much of which appears in the daily papers in connection with every new scientific development, and we are astonished that "science editors" of such newspapers allow such statements to appear in print.

The Ministry of Defence was quick to publish a rebuttal. It stated that it has been known for years that there is a very slight hazard from the use of some new radio techniques, but even this slight risk can be avoided by elementary precautions. An area of only about 40 yards in front of the reflection cone will be fenced off and that area is the limit of the risk of radiation. There is no question of surrounding homesteads having to be evacuated. The Ministry says that it is not true that the beams impose a danger as much as a mile away. It is equally untrue to suggest that they are concerned with so-called death ray experiments. Any fencing off of a larger area will be for security reasons only.

Radiation from radio beams can cause internal burning, but only if an individual stands close enough to the transmitter.

WALKIE-TALKIES—TRX LICENCE REQUIRED

THERE is a common belief amongst purchasers of Government surplus transmitting equipment, especially walkie-talkie sets, that they may be used without a licence. As a Government official pointed out in last month's issue, a transmitting licence is necessary under Section 1 of the Wireless Telegraphy Act, 1949, which says "No person shall establish or use any station for wireless telegraphy nor install or use any apparatus for wireless telegraphy without a licence granted by the Post Master General." In the majority of cases the equipment is such that a licence could not be granted.

THE "P.W." AND "P.T." FILM SHOW

THERE is still time for readers to apply for free tickets for the P.W. and P.T. Film Show, at the Caxton Hall, Westminster, S.W.1, which is being arranged by this journal in conjunction with Messrs. Mullard, Ltd.

Admission is by ticket only, and applications for tickets will be dealt with in strict rotation. We are inviting as guests members of the Institute of Practical Radio Engineers and members of that Institute should apply to the Secretary for tickets and not to us. It will be an entirely different show from last year's. The films deal with the principles of the transistor and the manufacture of junction transistors, with a final film entitled "The Conquest of the Atom" in colour. There will be an interval for refreshments which are provided free. I shall take the chair at 7.30 p.m., on January 22nd, 1959. Mark applications for tickets "Caxton Hall," in the top left-hand corner.—F. J. C.

Our next issue, dated January, will be published on December 5th

ROUND THE WORLD OF WIRELESS

Broadcast Receiving Licences

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

Region	Total
London Postal	1,022,449
Home Counties	1,026,709
Midland	757,159
North Eastern	941,051
North Western	721,130
South Western	629,479
Wales and Border Counties	392,795

Total England and Wales	5,490,772
Scotland	670,252
Northern Ireland	177,452

Grand Total ... 6,338,476
The total for England and Wales in last month's issue was shown as 553,393. This should have read 5,553,393.

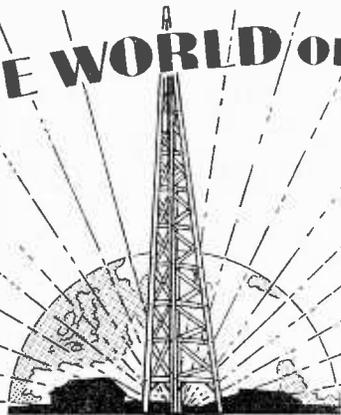
"Easy-to-Fit" Car Radio

OF interest at the recent Motor Show was an "Easy-to-Fit" car radio consisting of a compact single unit suitable for installation in most makes of car. It will appeal to the handyman-motorist who, using only ordinary hand tools, can fit it for himself.

Stereophonic Tests

THE BBC are carrying out more stereophonic sound tests at fortnightly intervals between 10.15 and 11.15 a.m. on alternate Saturdays. The first was on October 18th.

The Network Three transmitters, both medium-wave and V.H.F., are being used for one channel and the BBC television sound transmitters for the other. Later it is hoped to carry out experiments in stereophonic sound transmissions using a single transmitter instead of two as at present. To hear these tests a television receiver and a medium or V.H.F. receiver are required. The loudspeakers of the two receivers should be 6ft. to 8ft. apart and the listener should be equidistant from each.



By "QUESTOR"

College to Close

IN pursuance of their domestic policy in regard to the recruitment of senior technologists and technicians, the Directors of E.M.I. have announced that the activities of their College of Electronics at 10, Pembridge Square, London, W.2, including their four-year, three-year and one-year courses, will cease at the end of July, 1959.

High-speed Electronic Computer

A NEW "all British" high-speed electronic computer, which when completed will be

capable of scanning the entire information contained in the Encyclopædia Britannica in less than four minutes, is now in an advanced stage of construction at the main Hayes factory of E.M.I. Electronics Ltd.

Round-the-world Telephone Cable

THE construction of a round-the-world Commonwealth telephone cable was considered at the Commonwealth Trade and Economic Conference in Montreal recently. It was envisaged that its provision would be based on capital contributions from all Commonwealth countries and that the new cable could be operated on a self-supporting financial basis.

Experts estimated that the total length of a round-the-world telephone cable of this nature would be about 27,000 nautical miles or nearly 30,000 nautical miles if the trans-Atlantic crossing is included. The construction cost was estimated at £88m.



A holiday moment with a portable by the bridge, Meikleour, Perthshire.

Exhibition of Valves

AN exhibition of specialised valves and tubes for radar and microwave communications equipment was recently held by the Government and Industrial Valve Division of Mullard Limited, at the Electronic Centre, Mullard House.

Despatches of Radio Receivers

DESPATCHES of radio receivers during July, 1957, were up by 3 per cent. on the two-year average (1956 and 1957) for the month and 13 per cent. down on July, 1957, according to the monthly estimates of the British Radio Equipment Manufacturers' Association.

New V.H.F. Station on the Air

THE BBC's new V.H.F. sound broadcasting station, which has been built on the same site as the BBC television station at Rosemarkie, near Inverness, is now in service.

It radiates the Scottish Home Service on 94.0 Mc/s, the Light Programme on 89.6 Mc/s, and the Third Programme and Network Three on 91.8 Mc/s, each with an effective radiated power of 6 kW. The transmissions are horizontally polarised.

New Speech System

AT the new Altitude Test Plant of Rolls-Royce Ltd., Derby, where some of the world's most powerful pure-jet and turbo-prop engines are produced, the noise difficulty has been studied and in collaboration with Communication Systems Ltd, a special amplified speech system has now been developed.

By employing a special handset, consisting of padded earphones and a larynx microphone, and a wall-mounted control box fitted with a volume control, instructions can be passed quickly and accurately between the control engineer and personnel responsible for making adjustments to engines under test.

Despatches of Radio Receivers

DESPATCHES of radio receivers during July, 1957, were up by 3 per cent. on the

two-year average (1956 and 1957) for the month and 13 per cent. down on July, 1957, according to the monthly estimates of the British Equipment Manufacturers' Association. Radiograms at 9,000 were 31 per cent. down on the average for the two previous years and 36 per cent. down on July, 1957.

Manufacture of Silicon Rectifiers

THE Plessey Company Limited announces that an important licensing agreement covering the manufacture in Britain of silicon rectifiers for military, commercial and industrial uses—including missile systems, computers and television sets—has been concluded with one of America's leading silicon rectifier manufacturers. General Instruments Corporation, of New Jersey,

Mobile V.H.F. Schemes

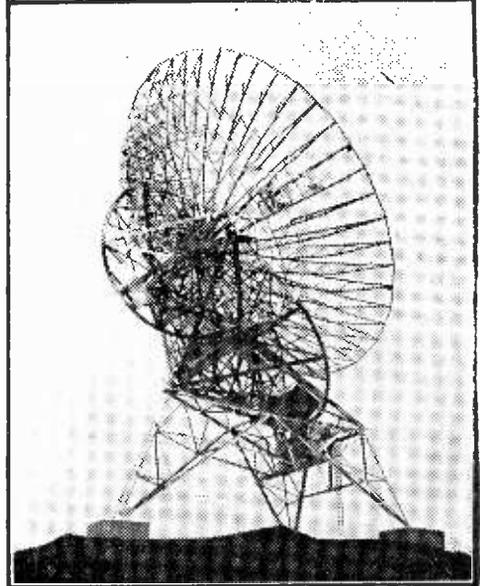
THE United States Air Force have recently awarded a contract to British Communications Corporation Limited for the installation and maintenance of a series of comprehensive mobile V.H.F. schemes covering U.S.A.F. bases in Eastern England. The equipment to be used is the BBC standard Type 69, 5 watt mobile transmitter/receiver, and the standard Type 311/201, 15 watt fixed station equipment.

Our Query Rules

A REMINDER that the coupon cut from page 3 of the cover and a stamped and addressed envelope must be enclosed with every technical query. We are receiving so many letters from non-readers that we must insist upon strict compliance with this rule.

Polypole Coupler Systems

BRITISH INSULATED CABLES LIMITED have introduced polypole coupler systems to provide the equipment designer with everything necessary for the reliable inter-



Model of radio aerial to be built in California by the United States Army.

connection of electronic and similar types of equipment.

Exploration of Space

THE illustration on this page shows a model of the radio aerial to be built by the Army's jet propulsion laboratory for use in the expanding exploration of space by the United States Army. The radio receiver will be capable by 1960 of communicating with space vehicles at great distances from the earth. It will be erected at Camp Irwin, California, near Barstow.

Change of Address

ST A A R ELECTRONICS LTD., have now moved to 2, Princes Row, Buckingham Palace Road, London, S.W.1.

P.W. Caxton Hall Film Show

January 22nd, 1959, at 7.30

Apply for your Free Ticket now to "Caxton Hall," Practical Wireless, Tower House, Southampton Street, London, W.C.2.

THE BEGINNER'S SUPERHET

THIS RECEIVER TUNES 200-1,600 METRES IN A SINGLE BAND

By F. G. Rayer

THOUGH this receiver can give good results as it stands, sensitivity and power can be increased by additions to the circuit. These modifications are quite straightforward, and will overcome limitations arising from the simplicity of the receiver. The original circuit is shown in Fig. 1, and can readily be built without a practical wiring plan, if required. It tunes about 200 to 1,600 metres in a single band, and employs a power pentode acting as anode-bend detector.

directly operating the speaker through the usual output transformer.

Diode Detector

Adding a crystal diode as detector will increase volume, and a circuit for this is shown in Fig. 2. A cheap surplus valve such as the 6H6 may also be employed, an extra octal holder being provided for this. In each case the primary wiring

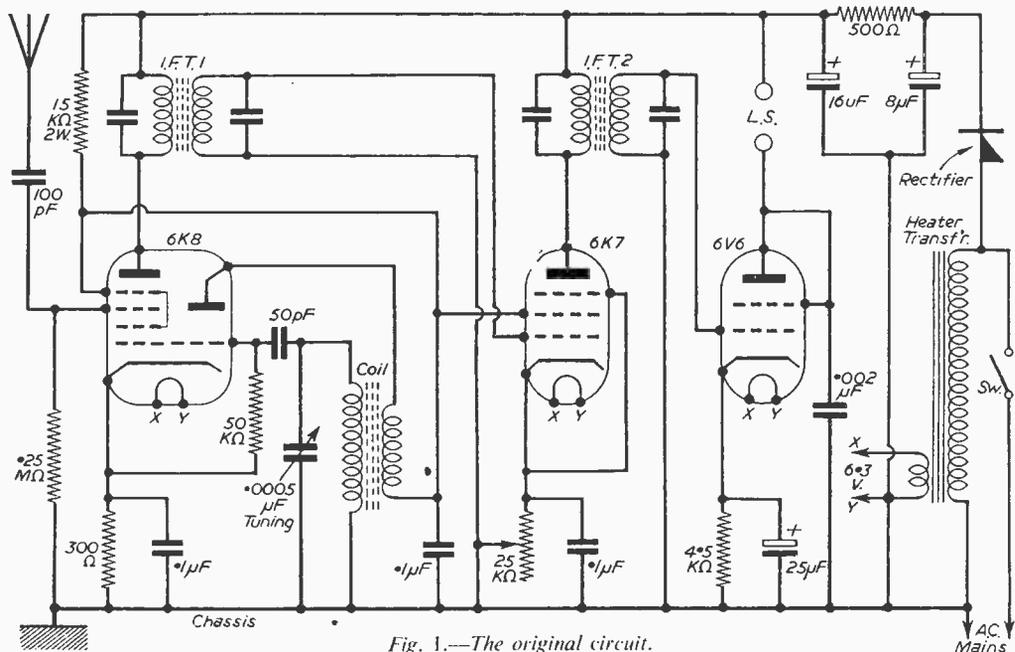


Fig. 1.—The original circuit.

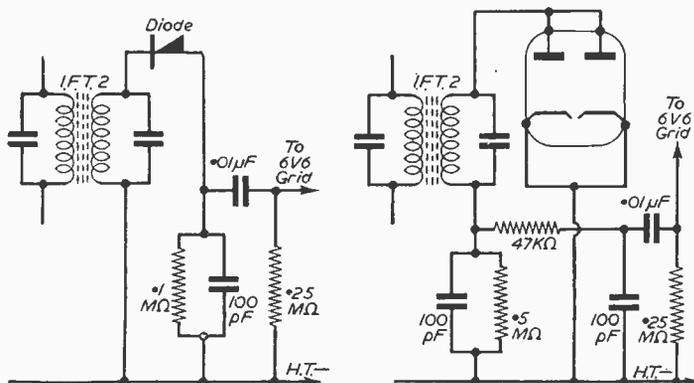


Fig. 2.—Diode or double-diode detector.

of the second I.F. transformer is unchanged, remaining as in Fig. 1. The secondary is re-connected as shown, the extra components being diode load, coupling condenser and output valve grid leak, with one 100 pF by-pass condenser for the crystal diode and a filter circuit for the valve detector.

The cathode bias resistor of the 6V6 must now be changed to approximately 270 ohms, as the valve operates as L.F. amplifier. A useful increase in power is obtained. It is also possible to take the 6V6 screen grid directly to

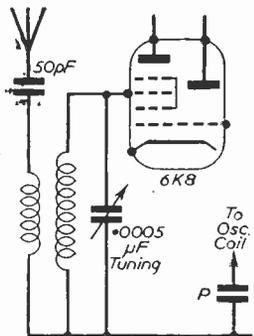
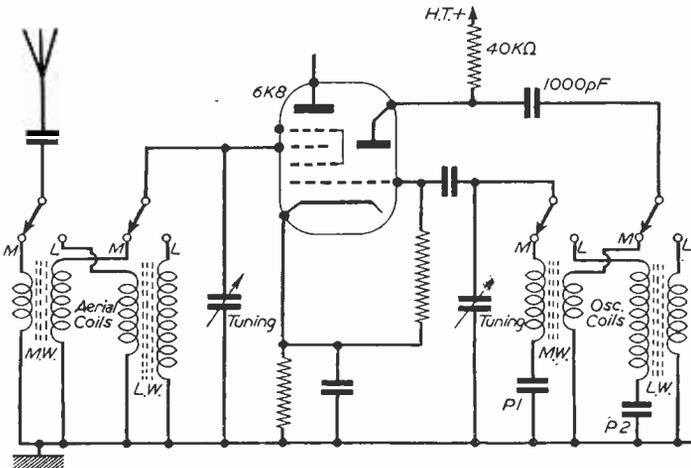


Fig. 3.—(Above) Tuning the aerial circuit.

Fig. 4.—(Right) Dual-wave coil with switching.



the H.T. positive line, instead of using the valve as a triode, and this further increases volume. Instability is likely if this change is made with the valve acting as detector, as in the original circuit in Fig. 1.

Aerial Tuning

If it is desired to tune medium waves only, a medium wave aerial coil can be used instead of the .25 megohm leak, as in Fig. 3. One section of a two-gang variable condenser is used to tune this coil, and the modification will give a good increase in sensitivity and reduce interference from unwanted stations.

It is best to fit a pair of ready-made coils, to avoid ganging difficulties. Medium wave aerial and oscillator coils are available from many advertisers, with tag wiring data. The oscillator coil is no longer returned directly to the earth line, but has the padder "P" inserted. This is essential. The correct value is given by the coil maker and is usually 500 pF.

If the gang condenser has trimmers, adjust these for best volume. If not, wire a 50 pF trimmer in parallel with each section. The trimmers should be set fairly near the low wavelength end of the band, and the coil cores should be adjusted fairly near the high end of the wave-band, this also being for maximum volume.

With tuned aerial circuit and diode or double-diode valve detector, the receiver can give a very good performance.

If long waves are also required, wavechange switching is now necessary, and a circuit for this is shown in Fig. 4. A four-pole, two-way switch selects medium wave or

long-wave coils, as necessary. "P1" is the medium wave oscillator coil padder, already mentioned, and "P2" is the long-wave padder, usually of 150 pF. Other parts of the circuit remain unchanged, except that the oscillator anode now has its own 40 K resistor, with a 1,000 pF coupling condenser to the switch and oscillator coils.

D.D.T. Stage and A.V.C.

To make the receiver the equivalent of many popular superhets, a double-diode triode valve, such as the 6Q7, may be employed, to provide detection, additional L.F. amplification and auto-

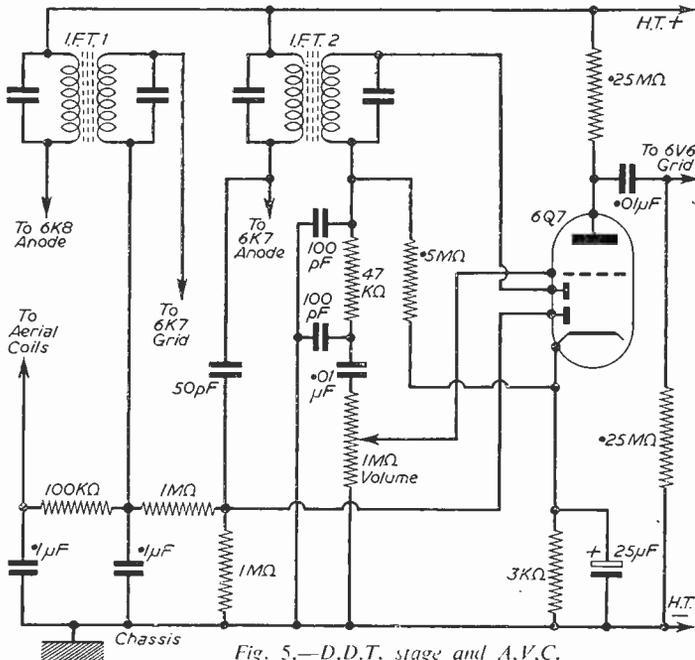


Fig. 5.—D.D.T. stage and A.V.C.

matic volume control. A circuit for this appears in Fig. 5.

One diode is used for detection exactly as with the valve in Fig. 2. A 1 megohm volume control is provided for the triode section of the 6Q7, the 25 K ohm volume control in Fig. 1 being removed. The triode section of the valve is coupled to the 6V6, and will provide a considerable increase in volume. The remaining diode in the 6Q7 is coupled to the 6K7 anode by means of a 50 pF condenser, and rectifies part of the signal, for use as bias. This bias is applied to the 6K7 and 6K8 valves through a resistor network, with .1 μ F decoupling condensers. This automatically reduces gain with powerful signals, and helps to compensate for the fading experienced with distant stations.

Improved Smoothing

If the 500 ohm resistor in Fig. 1 is replaced by a 60 mA smoothing choke, this will reduce hum. In view of the extra amplification obtained when the 6Q7 is added, this modification is well worth while. Hum may be brought to a very low level indeed if the 6Q7 anode circuit is decoupled. To do this, disconnect the .25 megohm resistor from H.T. positive and take it to a 8 μ F or 16 μ F 250 v. or 350 v. condenser. Add a 33 K ohm resistor from the condenser to

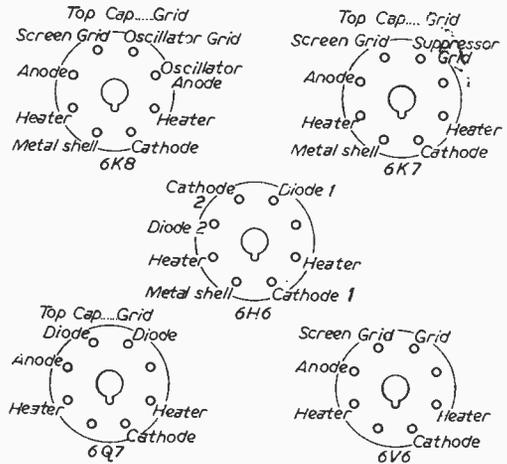


Fig. 6.—Showing the valve base connections.

H.T. positive, and wire the negative condenser tag to chassis. The 6Q7 grid lead should also be run through screened brading, the brading being connected to the chassis.

Connections for the valves are shown in Fig. 6, the valveholders being viewed from below.

Stereophonic Sound on Radio

THE NEW E.M.I. SYSTEM

FOLLOWING the recent announcement that the BBC are studying methods of transmitting stereophonic sound over a single radio channel, it has been disclosed by Electric and Musical Industries Ltd. that the BBC will be collaborating with them during the next few months in tests of a system invented by E.M.I.

Object of Stereo

In stereo the aim is to reproduce sounds in such a way that the listener is aware of the direction from which each sound comes, and thus feels that he is himself present at the performance. Basically E.M.I.'s Percival system—which has successfully undergone preliminary transmission tests at Hayes—involves separating the sound programme from the directional information at the transmitting end. At the receiving end the directional signal, by operating on the programme signal, produces the stereophonic effect through two loudspeakers.

Since only a very narrow band is required for the directional information, virtually all the bandwidth remains available for the programme itself. Furthermore, the range of the transmitter is not appreciably reduced, as it is in other single channel stereo systems.

Percival System

The Percival system is fully compatible, i.e., a listener with an ordinary standard set can receive a normal quality transmission at the same time as his neighbour with a stereo receiver is listening to the same programme in stereo. The stereo

receiver itself is only slightly more complex than an ordinary radio set, while at the broadcasting end all that is required is a single additional unit used in conjunction with a standard transmitter.

It is believed that this is the only fully compatible single channel stereo system in the world which does not involve either modifications to the transmitter or loss of range.

Should the BBC after further tests decide to adopt the system, it is envisaged that suitable receiving sets may be on sale to the public in about a year's time.

PRACTICAL TELEVISION

CHIEF CONTENTS OF NOVEMBER ISSUE NOW ON SALE, 1/3.

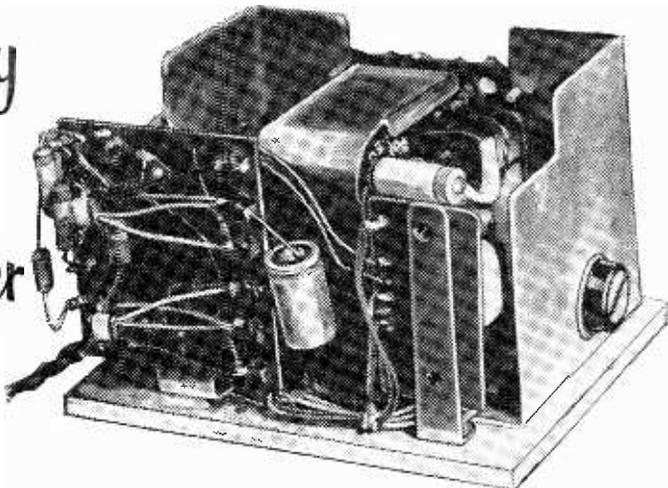
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BIG SCREEN TV: WILL IT COME?
VISION AND ELECTRONIC RECORDING
APPARATUS
TELEVISION IN THE SOUTH
WIDESCAN TELEVISION
BBC TELEVISION TRANSLATOR

A High Quality Transistor Power Amplifier

THE COOLING FINS

(Concluded from page 690 of the
November issue)

By A. J. Short



FURTHER details of the output stage concerning the cooling fins for the transistors and the output transformer are as follow:

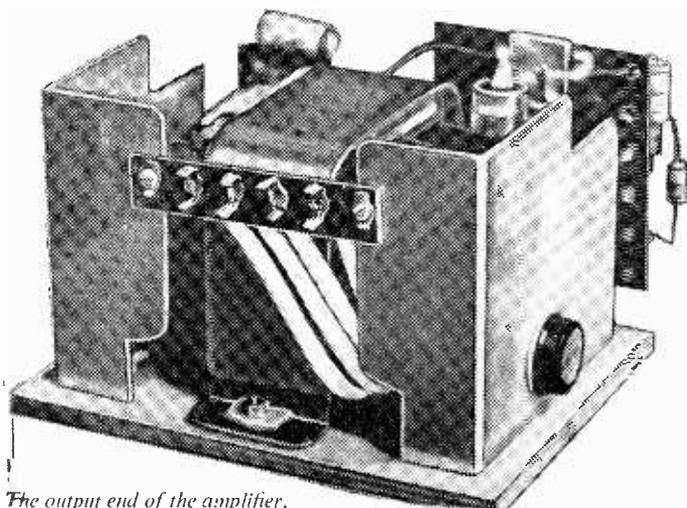
(b) *Cooling Fins.*—The heat generated by the dissipation of the output power transistors is dispersed by means of cooling fins of 16 gauge aluminium. These fins also serve the purpose of heat sinks to absorb heat during moments of peak dissipation for dispersal during the intervening periods. It is, therefore, important that a thinner gauge of aluminium is not employed. By the foregoing methods thermal runaway is avoided. The cooling fins in this design serve also as supports for the transistors and connections for the transistor collectors. The area of the fin limits the maximum permissible dissipation of the transistor and in this case an area of 19 sq. in. gives a maximum permissible collector dissipation of 6 watts per transistor. The large area employed in the design was partly to enable larger drive to be applied to the output stage than are possible from the present driver stage

and partly to ensure a large safety margin for trouble free running.

(c) *The Output Transformer.*—The importance of a high quality output transformer is as great in a transistor amplifier as it is in a valve amplifier and although any appropriate commercial output transformer may be employed, the design of a high quality transformer suitable for home construction at relatively low cost is particularly recommended and is included hereunder. This design employs grain orientated silicon strip steel "C" type cores manufactured by The English Electric Co. Ltd. of Liverpool. Two loops, type HWR 40/24/5, being required, and the windings consist of 200 turns of No. 21 s.w.g. enamelled copper wire (half pound) for each half of the primary, and wire for the secondary according to the table on page 690 (November).

The Primary

Each half of the primary is divided into two halves connected as in Fig. 4 and the secondary is in three sections surrounding and between the two halves of each half of the primary. In this way maximum coupling is obtained between the windings and leakage inductance is kept low. Internal capacity in a transistor output transformer is not as important as with valves, as the impedances involved are so low. All windings should be made in the same direction and each layer is covered with Sellotape before adding the next layer. Care must be taken when the windings are connected to ensure that no portion of a winding has become accidentally reversed or loss of power and severe distortion will result. The transformer is intended to operate with powers of up to 40 watts under high quality conditions and so may be used with these power transistors



The output end of the amplifier.

under conditions of high power drive and at higher voltages.

The former is constructed from stiff cardboard and heavily shellaced before use. During winding the sides should be supported by plywood sideplates to ensure rigidity. On assembly the core is inserted and clamped firmly into place as the transformer is mounted.

Should the constructor wish to make use of a commercial transformer the minimum desirable requirements are:

Primary inductance: Not less than 0.2 Henry each half.

Primary resistance: Not more than 2 ohms each half.

Secondary resistance: Minimum possible.

Construction

The amplifier is mounted on a 6 in. \times 5 in. board of five-ply wood, as shown. This should be well varnished before use as the cooling fins of the power transistors are bolted directly on to it and it is wise to ensure a reasonable degree of insulation between fin and board in case of subsequent dampness. In the same way the bolt holes through the board should have varnish run through to provide similar sealing of the wood and insulation. At least two coats of varnish are recommended. Bolt heads on the underside are countersunk and insulated with a hard setting wax. The cooling fins for the transistors should be cut for bending and the edges smoothed with a file. The holes for mounting the transistors should next be drilled and the surface of the fin on which the transistor will rest should be carefully smoothed with a block and very fine sandpaper to ensure the best possible contact between the two surfaces. Care should be taken when mounting the fins to see that they do not come into contact with any other part of the amplifier.

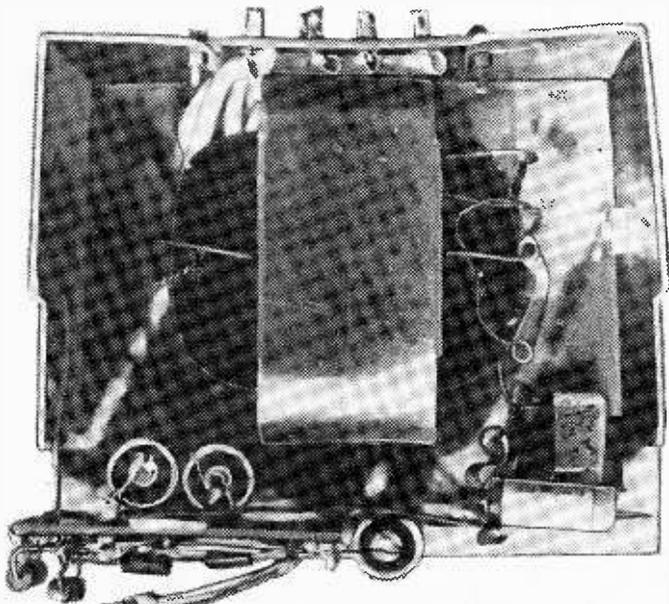
The two sub-chassis are next constructed; they have been made separate in order that alternative driver units can be fitted; they should be wired in accordance with the diagram. Care should be taken to ensure that the outside case of the two condensers mounted on the rear of the driver sub-chassis do not come into contact with one another. This can be done by wrapping each condenser in two layers of Sellotape before fitting. Other points to be particularly watched in wiring are: the polarity of electrolytic condensers, keeping heat from the transistors, and making sure that the transistors are connected right way round. Remember that the "common earth" is *positive*.

Testing

When wiring has been completed and checked the amplifier may be connected to a 12 v. supply;

it is a wise precaution on the first test to connect the supply via a 0.1 amp torch bulb which will light or blow if some major mistake in wiring has occurred and possibly save some of the components from destruction. If all appears well at this stage voltage measurements may be made with a high resistance voltmeter at the points indicated in the theoretical diagram.

On the initial tests the negative feedback circuits should be disconnected at the points marked "A." When the amplifier is working satisfactorily in this way the negative feedback circuits may be connected in and the amplifier tested again. A loud continuous howl will generally indicate that the feedback is being taken from the wrong side of the output transformer, and "hissing" of the loud notes indicates that the negative feedback is excessive and the values of the feedback resistors should be increased. This can easily occur if the transistors or other



View from above showing the spacing between the cooling fins and the output transformer to allow adequate air circulation.

components used happen to be near the edge of the tolerance of the production spread.

The output stage may be used with alternative driver stages by inserting the signal to the bases of the output transistors via isolating condensers at the points marked "X" (Fig. 1). When used in this manner the secondary of the interstage transformer is used as an A.F. choke. The size of the coupling condensers used will depend on the amount of power being applied to drive the stage, remembering that 40 mA of A.F. drive are required for every 10 watts of output power. (A condenser of 100 mfd. has a reactance of approximately 30 ohms at 50 c/s.)

A suitable container for the amplifier should be selected or constructed which will give adequate ventilation for the output stage.



Power Transistors

DESIGN CONSIDERATIONS FOR HEAT SINKS

By F. G. Rayer

TRANSISTORS capable of providing a large power output are now available, and means of maintaining thermal stability must be employed unless the power handled is kept considerably below the maximum permissible. With many circuits, an increase in transistor temperature causes a rise in current, which in turn further increases temperature. If not checked, this can destroy the transistor. The heat sink prevents such a breakdown by dissipating heat and maintaining the transistor temperature within safe limits.

Two power transistors for the output stages of large receivers or amplifiers are shown in Fig. 1. The makers list the V15 as suitable for a 6 v. supply, and the V30 for a 12 v. supply, the peak collector voltages being -15 v. and -30 v., respectively. The OC16 is suitable for -14 v. Lower voltages can, of course, be used, with reduced output. The transistors have a threaded rod forming the collector connection which allows a firm clamped joint with the heat sink.

A transistor of the V30 type is shown in Fig. 2, with a 0 B.A. nut holding a tag for the collector connection. Projections passing through clearance holes provide base and emitter wiring points. Operation is similar to that of small transistors, except for considerations arising from the increased power, and from the fact that collector and heat sink may be at different potentials.

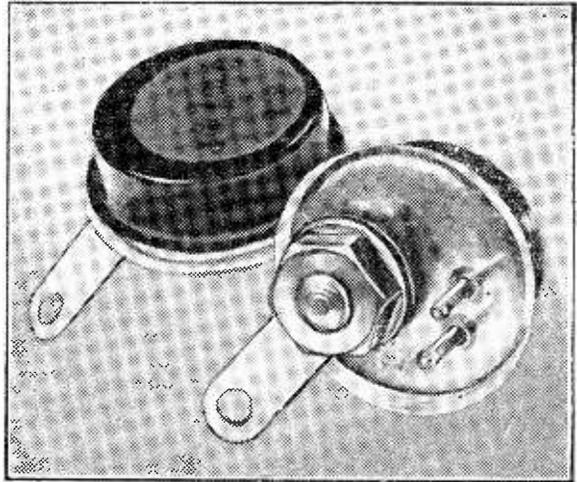


Fig. 2.—Two V30 transistors.

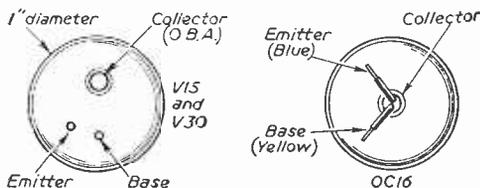


Fig. 1.—Two types of power transistors showing the connections.

Heat Sinks

The heat sink consists of a large area of metal, preferably with high thermal conductivity, which

keeps temperature down by radiation and air cooling. For a given area, the sink is most efficient when the transistor is mounted centrally, but central mounting is not essential and may not suit a convenient layout of other components.

Aluminium is suitable and easy to work, the sheet being of 14 s.w.g. or similar material. Additional thickness will improve dissipation of heat. Blackening is also helpful, but not by means of enamel or other material which acts as an insulator between metal and air. Cooling is improved by having the sheet vertical, so that convection maintains a good air circulation.

Heat Sink as Chassis

The heat sink may act as a chassis upon which other parts are mounted, and when the collector is not at chassis potential thin mica washers are used for insulation, as in Fig. 3. For the V15 and V30, the makers list a maximum collector power dissipation of only 1 watt at 25 degrees C. ambient temperature, with the transistor alone in free air. With the transistor clamped directly to 9 sq. in. of 16 s.w.g. aluminium this is increased to 4 watts. The interposition of mica washers between transistor and sink reduces this to 2 watts. With 50 sq. in. the dissipation is 10 watts; direct contact with 16 s.w.g. aluminium again being provided.

For the OC16, listed dissipations range from 2.9 watts with mica washers and mounting on a 4in. × 7in. plate (28 sq. in.), up to 16 watts when a thin tin-plated lead washer is used

between base and sink, and the latter is of 1 sq. ft. area. The 16 watts dissipation is with an ambient temperature of 25 degrees C. and falls to 6.5 watts with an ambient temperature of 55

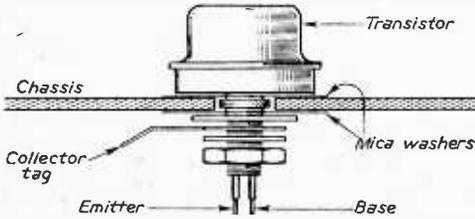


Fig. 3.—Insulating the transistor from the heat sink.

degrees C. The importance of adequate cooling is clear. The dissipation with 4in. X 7in. sink increases to nearly 7 watts when the ambient temperature does not rise above 25 degrees C.

When making the heat sink, the holes for the transistor should be carefully drilled so that the plate is not distorted, and all roughness should be cleaned away with a file to obtain the best possible contact between transistor and metal. For small equipment, the transistor can be mounted directly on the plate, which is insulated from the chassis as in Fig. 4. Clearance holes for emitter and base should be free of burr, and short pieces of insulated sleeving may be added to avoid any chance of a short circuit here. As mentioned, a 3in. X 3in. plate would permit up to 4 watts collector dissipation with the V15 or V30.

Building an Amplifier

When building an amplifier for a large output, the heat sink should be made of generous size, or a careful watch should be kept on temperature and transistor current when first trying the equipment. This test should be as long in duration as any period of continuous running likely to be required.

A larger area of heat sink may often be obtained by adopting a layout such as that in Fig. 5, which makes good use of the space available in compact portable equipment. With long periods of running, adequate ventilation becomes important. If it proves necessary to reduce dissipation, because of overheating, this can most simply be done by lowering the voltage applied

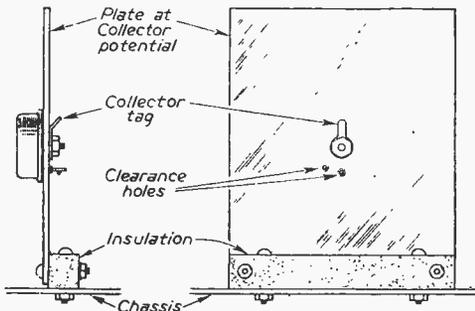


Fig. 4.—Mounting the transistor in small equipment.

to the transistor. For many purposes, ample power output can be obtained without any danger of exceeding the maximum ratings.

Choice of Heat Sink Material

One of the best materials for heat sinks is copper, because of its high thermal conductivity. However, mild steel and aluminium are among the most common materials used for chassis, and these are, therefore, recommended.

Size, Shape and Surface of Heat Sinks

As already mentioned, the size and shape of the heat sink will depend to a large extent on the particular application.

For best results the heat sink should be:

- (i) As large as possible (with a minimum thickness of 1/16in. for aluminium).
- (ii) Shaped and mounted in such a way as to promote cooling by convection. For instance, the

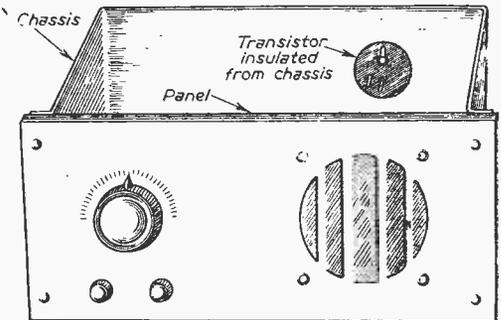


Fig. 5.—Layout when a large heat sink is required.

folding of a plane sheet into a chimney shape would aid the loss of heat by convection. This will, however, impede cooling by radiation. Slightly better efficiency is also achieved if the heat sink is mounted vertically instead of horizontally.

(iii) Blackened to assist cooling by radiation. Blackening improves the efficiency of the heat sink considerably. These sinks may be blackened with a thin coat of matt black cellulose paint. There may be differences in the effectiveness of different blackening methods, but these have not been investigated.

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Edited by F. J. CAMM

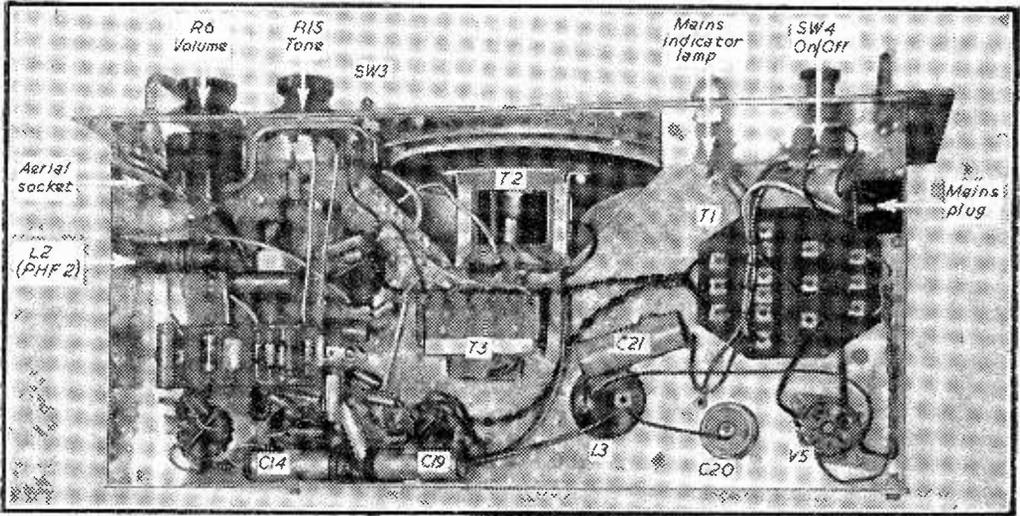
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Medium-wave T.R.F. Inter-com. Receiver

By M. A. Hammond

A UNIT FOR ROOM-TO-ROOM COMMUNICATION



The underside view.

THE need for some form of communication between workshop and house resulted in the construction of the unit described here. It will be apparent that, apart from filling this rôle, it is also a useful stand-by receiver, or can be quickly set up to provide a baby alarm, not to mention a means of communication between bedroom and kitchen, or any other room, if one is unfortunate enough to be confined to bed and

requiring the services of someone downstairs. For the prototype, an existing receiver built by the writer some years ago, was modified and having proved satisfactory, a re-design was embarked upon with the inter-com "built in."

The Circuit

In view of the cheapness and availability of the valves in particular, the circuit consists of an

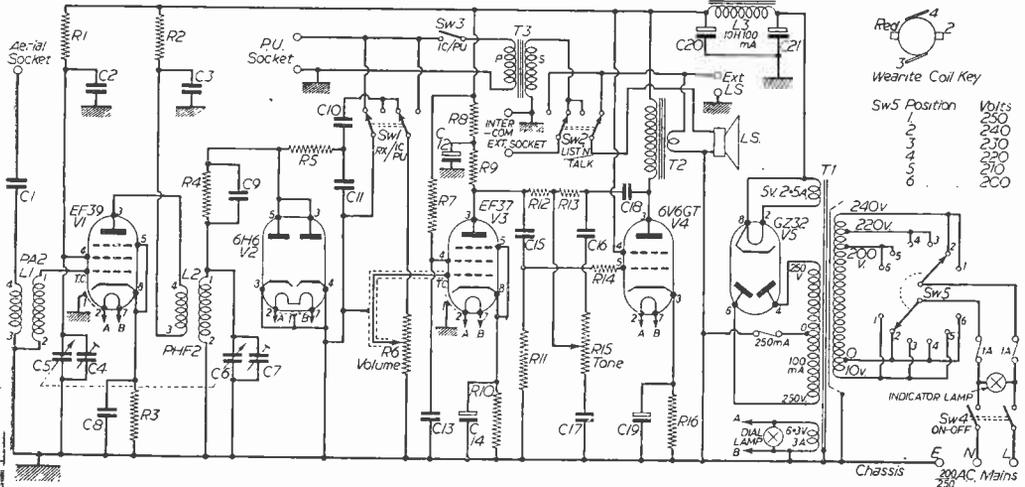


Fig. 1.—The circuit diagram.

LIST OF COMPONENTS

R1—82 K Ω $\frac{1}{2}$ w.
 R2—10 K Ω $\frac{1}{2}$ w.
 R3—330 Ω $\frac{1}{2}$ w.
 R4—250 K Ω $\frac{1}{2}$ w.
 R5—47 K Ω $\frac{1}{2}$ w.
 R6—1 M Ω log. pot.
 R7—390 K Ω $\frac{1}{2}$ w.
 R8—10 K μ $\frac{1}{2}$ w.
 R9—220 K Ω $\frac{1}{2}$ w.
 R10—3.3 K Ω $\frac{1}{2}$ w.
 R11—680 K Ω $\frac{1}{2}$ w.
 R12—1 M Ω $\frac{1}{2}$ w.
 R13—270 K Ω $\frac{1}{2}$ w.
 R14—47 K Ω $\frac{1}{2}$ w.
 R15—1 M Ω pot.
 R16—220 Ω $\frac{1}{2}$ w.

C1—200 pF (mica).
 C2—9.1 μ F 350 v.
 C3—0.1 μ F 350 v.
 C4—69 pF trimmer.
 C5—500 pF } Ganzed
 C6—500 pF } variable

C7—60 pF trimmer.
 C8—.01 μ F 350 v.
 C9—100 pF.
 C10—.01 μ F 350 v.
 C11—100 pF.
 C12—2 μ F 350 v.
 C13—0.1 μ F 350 v.
 C14—50 μ F 50 v.
 C15—.02 μ F 350 v.
 C16—.001 μ F 350 v.
 C17—.001 μ F 350 v.
 C18—.001 μ F 350 v.
 C19—50 μ F 12 v.
 C20—32 μ F 450 v.
 C21—16 μ F 450 v.

V1—EF39.
 V2—6H6.
 V3—EF36, EF37, or
 EF37A.
 V4—6V6GT.
 V5—GZ32.

SW1—D.P.C.O. toggle.
 SW2—D.P.C.O. toggle.
 SW3—S.P. toggle.
 SW4—D.P. toggle or rotary.
 *SW5—2-pole 6-position rotary.
 T1—250-0-250 v. @ 100 mA., 5 v. @ 2.5 A.,
 6.3 v. @ 3 A.

T2—To match 6V6 output.
 T3—Universal type output :
 2 P.M. speakers, size as required.
 3 2-way flush sockets (Painton Miniature).

* Mains plug and socket (Bulgin, 3-pin).
 Wander plug and socket.

L1—Coil PA2 (Wearite).
 L2—Coil PHF2 (Wearite).
 L3—Smoothing choke 10 H, 100 mA.
 2 1 A. fuses and holders (Belling-Lee).
 250 mA. fuse and holder (Belling-Lee).
 Slow-motion drive, S3 to 1 (Plessey Type A).
 Dial lamp 8 v., 2 A. M.E.S. and holder.
 Tag boards, clips, etc., to suit.

* Mains indicator lamp and holder.

* Optional.

EF39 for R.F., 6H6 detector feeding into an EF36, EF37, or EF37A A.F. stage with 6V6 output. The circuit is, of course, T.R.F. for simplicity and medium wave only is catered for, the output incorporating tone control (R15) and negative feed-back (Fig. 1). The pick-up facilities not mentioned before, increase the versatility of the unit.

Double Pole Changeover Switch

The inter-com section is simplicity itself, using only a double pole changeover switch and another output transformer serving as a microphone transformer, the speakers, of course, being used as microphones. All the switching is at the receiver end, which means that the operator can always be assured of the last word. When used as a baby alarm with the appropriate extension, this

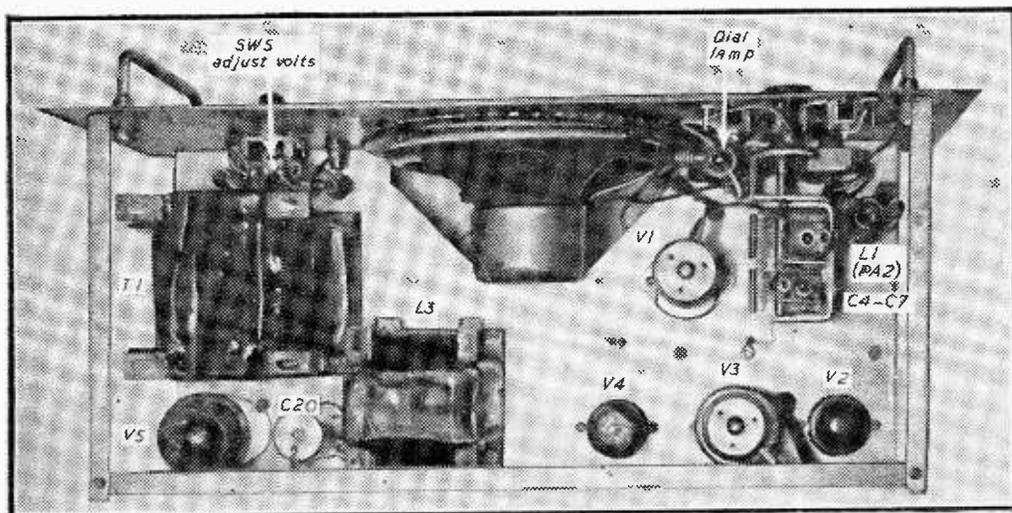
arrangement has a distinct advantage in so much that the child, assuming he or she were capable, could not switch his or her end out and wonder where the soothing remarks had disappeared to.

Isolating Switch

An inter-com isolating switch SW3 is fitted between the primary of the mic. transformer T3 and change-over switch SW1, as shown in Fig. 1, to prevent this winding being directly across the pick-up should a gram unit be plugged in. A single pole switch will suffice, the other end of the primary being earthy in common with one switch of the pick-up socket.

Extension Loudspeaker

An additional socket was fitted for an extension L/S as it will be appreciated that should one



The top view.

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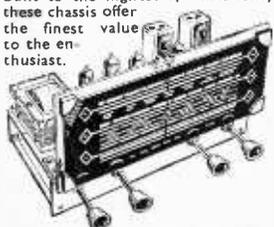
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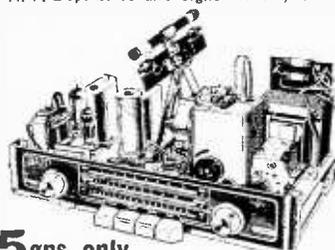
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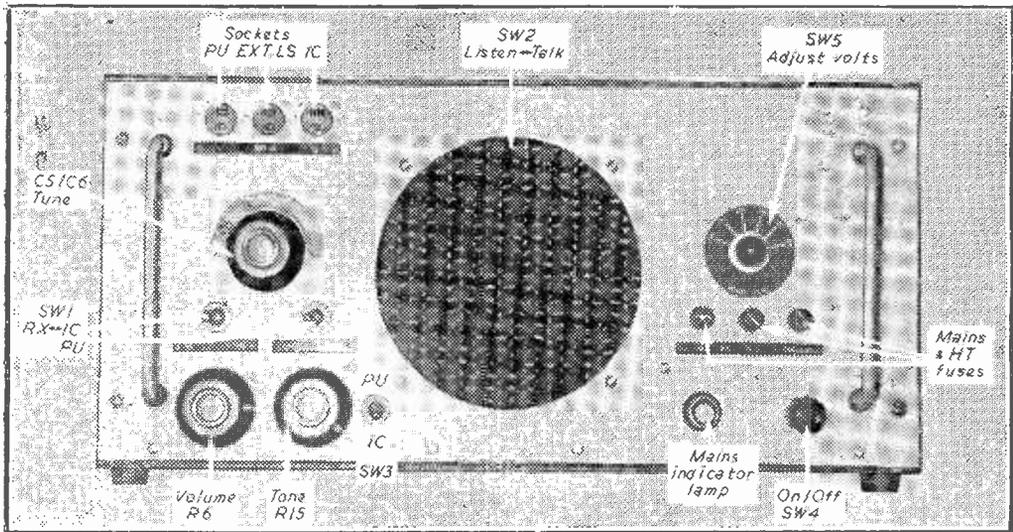
A Comprehensive Introduction!

FREQUENCY - MODULATED RADIO

by K. R. Sturley, Ph.D., M.I.E.E.
 Head of B.B.C. Engineering Training Dept.

THIS book provides a comprehensive introduction to the theory, design, construction and servicing of F.M. receivers for the reception of the B.B.C. V.H.F. Service. Deals with various stages of the F.M. receiver, aerials, test equipment, etc., and will provide valuable information for the radio technician, the serious enthusiast as well as background details for service engineers. The main emphasis is on reception, but information is also given on transmission. 100 illustrations and **15s. FROM ALL BOOKSELLERS**

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Showing the front view.

wish to transmit a radio programme via the inter-com wiring, this could be done by simply transferring the inter-com line plug from the IC socket to the extension I/S socket. This requirement could also be achieved by the method shown in the operating table, but would involve a further speaker for reception at the receiver end. This arrangement, of course, is not the normal function of the unit and is only mentioned out of interest, the extension I/S socket being fully employed if necessary when the unit is acting as a normal receiver.

Universal Type Transformer

A universal type transformer was found to be

best for T3 and various tappings tried for best results according to the speaker used in the receiver, in this case, a Rola 6in., and the performance of the inter-com. An optimum setting for the volume control R6 was found on using the inter-com, and duly marked on the front panel.

The inter-com extension consists of another speaker and appropriate length of twin cable, or, as the writer has used, co-axial screened cable, using the screen as the earthy connection. With this arrangement no trouble is experienced through the inter-com extension cable being lashed to the same line that carries the mains from the house to the workshop in the garden.

TABLE 1

SW1 Position	SW2 Position	SW3 Position	Use Socket	Operation.
RX	Listen	I.C.	Ext. L.S. if req.	Normal radio reception.
RX	Talk	I.C.	I.C.	Radio reception relayed on inter-com, extension speaker only.
*			Ext. L.S.	Radio reception relayed on inter-com, extension speaker and additional extension speaker at receiver end.
I.C./P.U.	Listen	I.C.	I.C.	Communication from inter-com, extension speaker heard only.
I.C./P.U.	Talk	I.C.	I.C.	Communication to inter-com, extension speaker.
I.C./P.U.	Listen	P.U.	P.U.	Gram unit reception on receiver.

* Not regarded as normal function of unit—see text.

With the switches and sockets suitably labelled, the operations are tabulated for guidance until one is familiar with the procedure (see table 1).

The receiver layout is not critical and it is not proposed to give a drilling diagram in so much that components to hand vary with different constructors, rendering modifications in drilling should the constructor not have the precise component available.

It will be noted

from the photographs that the writer has incorporated various refinements at the power supply end, such as adjustable mains voltage switching, a mains plug instead of lead out cable and a mains indicator lamp in addition to the dial lamp. These, of course, are not essential

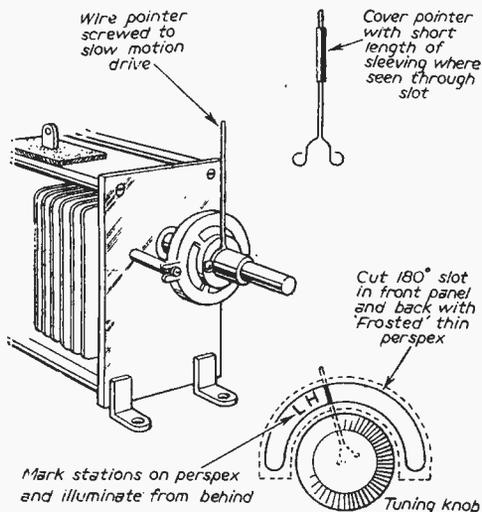


Fig. 2.—Simple dial tuning.

although shown on the circuit, and any suitable power supply may be substituted according to the particular whim of the constructor. It is, however, advisable to incorporate mains and H.T. fuses—although these are frequently omitted by constructors.

Housing the Unit

This particular unit was housed in an ex U.S. Army case suitably ventilated, with a new front panel and chassis, and utilising simple dial tuning as shown in Figs. 2 and 3. Care is required in wiring the switches and it is best to use a colour

system of one's own choosing to avoid wiring confusion and possible wrong connections.

On completion of unit, the wiring should, of course, be checked before switching on, although the writer resorts to carefully marking a circuit as he wires and never checking afterwards (touch wood—no accidents yet!) and the receiver aligned in the normal way, leaving the inter-com until last and making any final adjustments to the universal transformer T3 on test. One final interesting point—should one install a mic. transformer with an extremely high ratio, startling results can be obtained on the inter-com—a tap running will sound like Niagara Falls and a small object dropped gives the impression of the house falling down, unless the volume control R6 is turned right down.

There are many variations that could be applied

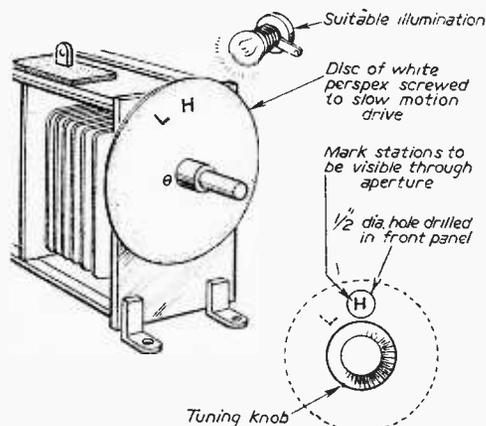


Fig. 3.—An alternative method of tuning.

to this basically simple unit, such as voice operated relays and automatic switching of the inter-com, apart from a more modern form of receiver, using miniature valves and covering all waves, but I leave this to the potential constructor who delights in elaborations.

Catalogues Received

Stereophonic Equipment

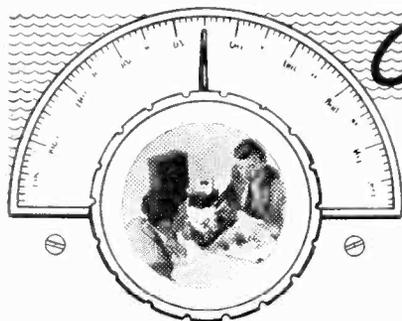
THE DULCI CO., LTD., Villiers Road, Willesden, N.W.2, have recently produced an illustrated pamphlet of their stereophonic equipment. Details are given of their "Stereo Eight" which is a twin channel amplifier, the "Stereo Two" which is a control unit for stereo and monaural high-fidelity reproduction in the home and their twin power amplifier Model SP44.

Radio Frequency Measurement Techniques

A NEW Note on Applied Science dealing with signal generators, attenuators, voltmeters and ammeters at radio frequencies, has been produced in booklet form by the Department of

Scientific and Industrial Research, Charles House, 5-11, Regent Street, London, S.W.1.

Twenty years or so ago, instruments designed to give a signal of known amplitude were known as standard signal generators. The word standard, which was meant to refer to the signal rather than to the generator, has now been dropped from most of the catalogues. The voltage values are usually engraved on the scales of the instruments, but it is obvious that these scales must be checked if the instruments are to serve as authentic standards or suppliers of known voltages. The present pamphlet explains the procedures which have been adopted for calibrating such instruments. It has also some useful information on the calibration of attenuators and on the study of the behaviour of voltmeters and ammeters at radio frequencies.



On Your Wavelength

BY THERMION

Bad Language

MR. E. WELLS writes from South Australia to add force to my campaign against sloppy English and wrong pronunciation of English words. He says that our language is badly misused in Australia, even by the daily newspapers. He deplors the dropping of capital initial letters in proper nouns (i.e., peter smith), and so do I.

He says that the radio programmes in Australia are very poor and are broken up indiscriminately by advertisements. He thinks that England is backward with printed and transistorised circuits, which have been common in Australia for a long time, even among constructors.

He further asks why it is that circuits using transistors always aim to produce miniature sets. "Is it," he asks, "because they cannot compare with equivalent valve sets in the matter of quality of reproduction?" His idea of a portable set is one having good quality reproduction yet light enough to carry around—one not requiring an external aerial nor H.T. batteries, big mains transformers and chokes.

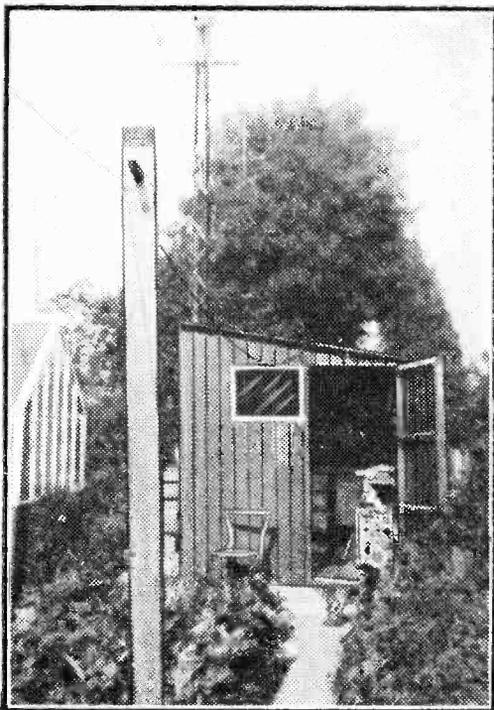
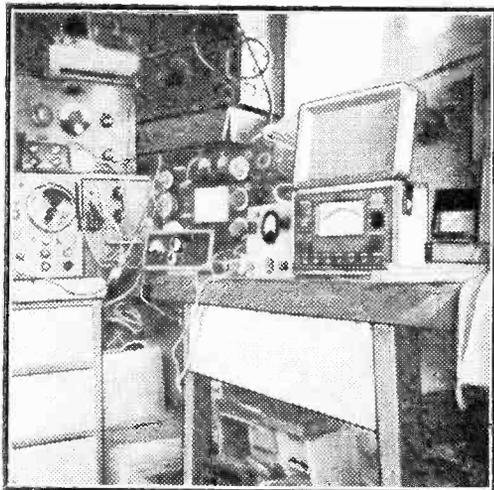
The use of transistors has brought a demand for midget sets because so many other midget components such as condensers, resistors, loud-

speakers and transformers had been produced and the one remaining item requiring reduction in its physical dimensions was the valve. In my view, transistors have a long way to go, before a set incorporating them can equal in quality that obtainable from a receiver using valves.

Apart from the question of midget portables, however, the overall size of a wireless set was overdue for reduction. For years wireless components have been made far too large. The general tendency has been for smaller sizes of components and this, coupled with transistors, should enable us to market really small domestic receivers.

Photographs of Shacks

ELSEWHERE in this issue is a page of photographs of readers' shacks, sent in response to my request, and I publish two further pictures below. The letters accompanying them have been most interesting and nostalgic, and I am surprised at the number of readers who own transmitters. The S.W. fans are, of course, in the majority and most of them sit up until the early hours of the morning listening to the ham as well as the professional short-wave broadcasts.

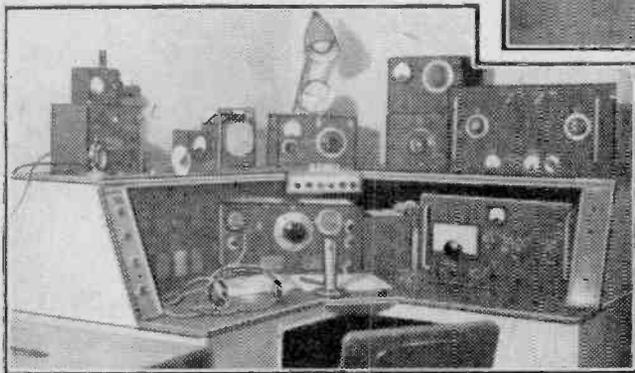


Two views of Mr. J. B. Mawber's shack.

Readers' Radio Dens

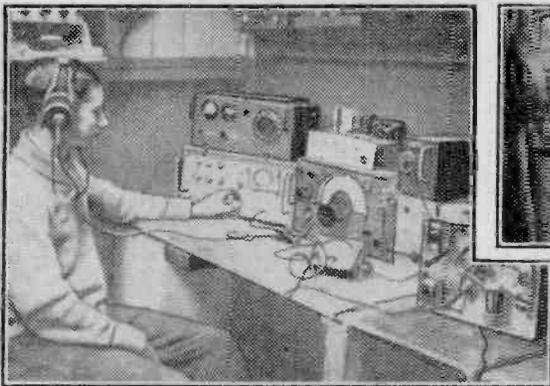
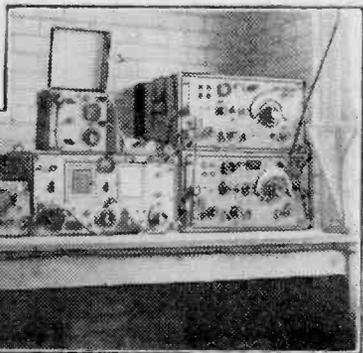


(Above).—A. J. Potgieten, Transvaal, South Africa. (Z.S.6.A.R.E.)

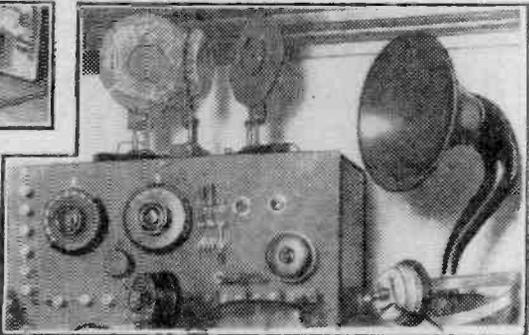


(Left).—QTH of E. H. Trowell (G2HKU), Sheerness.

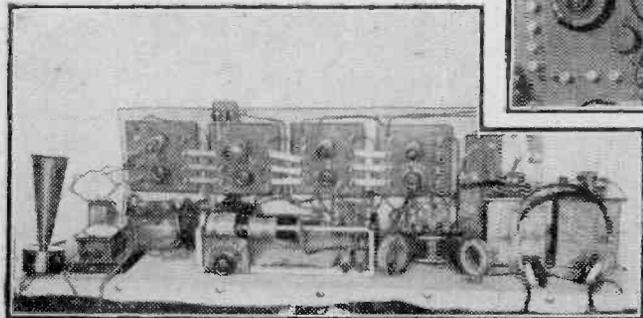
(Below).—The well-equipped den of Mr. T. V. Coe.



(Above).—Rig of Mr. L. Johnson, Burnley, Lancs.



(Above).—An older receiver owned by Mr. J. S. Bauchop, of Glasgow.



(Left).—This receiver belongs to Mr. L. J. Short, of Falmouth, Cornwall.

I am afraid that I do very little short-wave listening nowadays as the programmes I was interested in are now subject to political jamming, especially by Russia. Their propaganda programmes injected with Russian venom began to nauseate me. It seems a great pity from their point of view that they do not employ announcers who can speak English. As you know, announcements are made alternately by a man and a woman and each speaks with a strong Yankee accent. Everybody becomes everybody. Americaneese is not English.

Script Writers—Give Them Credit

MOST entertainers today employ script writers, some more than one. The list of credits seldom mentions this mainspring of the programme, and the actors who utter their words and gags get the credit for it, when in point of fact they are only human parrots; practically anyone can learn off a script and give an air of spontaneity to it, creating the impression that the quick-fire gags are spontaneous. You remember that rhyme about actors and actresses? :

Empty shells from eight till ten,

Filled with the wit of other men.

The script writer is more important than the entertainer who utters his words.

That is not to say that some of the gags are not corny. Ted Kavanagh made Tommy Handley, whom I understand without a script was not a funny man at all. The best comedian is usually the spontaneous comedian who composes his own scripts and does not travel under false colours. However, factory-made jokes are the order of the day and from the listeners' point of view: no one cares who supplies them.

Stereophonic Sound

IF the opinions of my radio friends and of readers who write to me on the subject mean anything at all, stereo sound receivers are in for a thin time. Most people admit that it is possible to improve even a high-priced quality receiver, but the difference made by stereo as compared with the cost means to many people that the changeover is not worth while. There is very little wrong with reproduction of commercial receivers today. Certainly not sufficient to warrant scrapping existing sets and buying the latest toy. Acoustics of the room in which the set is installed play a great part in stereophony, and so does the auditory nerve of the listener. Very few people have hearing of perfect pitch and fewer still are able to detect the difference between stereophony and the reproduction of a good-quality receiver.

R.S.G.B. Exhibition

THE R.S.G.B. has organised a Radio Hobbies Exhibition to be held at the Royal Horticultural Old Hall, Vincent Square, London, S.W.1, on November 26-29th, 1958. The committee has invited members all over the country to submit for display equipment of every type, from gadgets to complete transmitters and receivers. A silver plaque will again be presented in connection with the Constructors' Competition, and prizes valued at £10 and £5 will be awarded in connection with

equipment exhibited by members living outside Region 7. Offers to do stand duty at the exhibition should be sent to Mr. G. W. Norris, 134, Meads Lane, Ilford, Essex.

This is an exhibition which should appeal to all practical constructors. It is bound to be attended by large numbers of the old school and for that reason alone I shall spend some time there.

The R.S.G.B. through the years has done an excellent job on the amateur transmitting side and I am wondering whether the time is not now right for them to admit by examination radio enthusiasts who are not necessarily amateur transmitters.

International Amateur Radio Union

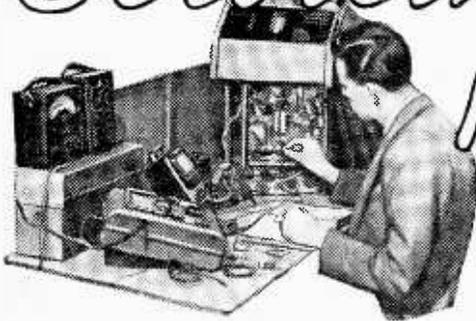
SOCIETIES which are members of the International Amateur Radio Union (and I gather that there are over 50 of them) are annually invited to supply certain statistical data, and some of the information provided is most interesting. For example, from the figures now before me, it appears from the 1957 return that there are 237,500 licensed amateurs in the 33 member countries. Some member societies did not make a return, so it is safe to assume that there are at least 300,000 such stations. America claims 182,000. No doubt, many of these stations are inactive, but the figures do show that there are more amateur stations than professional in existence throughout the world.

The Song Writers' Vocabulary

A READER suggests that to be a successful song writer the only mental equipment you require is a vocabulary of about 50 words. It is obvious that you do not require a knowledge of music, and that you will be writing for singers who cannot sing and have no knowledge of music either, and for a bobby-soxer teddy-boy crooning public. You hear better singing outside a public house than is put on by these highly-paid, sob-voiced singers. Above, love, true, blue, devotion, ocean, are obvious first words in the vocabulary. If you wish to become a highly-paid singer, you must learn to mispronounce all of the words giving them a negro cum-Yankee pronunciation, as I have indicated earlier on. Here is a gem I heard the other evening, from a well known singer: "She sad she woodner murry merr till the rast of the world wer dad." This type of singer is largely responsible for the decline of the music hall. Screaming neurotic youths and girls fill the theatre for a short time, while their favourite lounge lizard sobs his heart out on the stage. As a result, the more mature set of the music-hall-going public packed it up, because too much programme time was given to the idol.

Fortunately, these singers have a short stage life, but others come along and fill the gap. The BBC has a public duty to take these people off the air and to force these youngsters to follow a useful occupation. Their influence is entirely debasing. I witnessed two evenings ago thirty people walk out of a variety theatre the moment one of these crooners came on the stage. It was obviously an organised protest and more people should do it.

Servicing Radio Receivers



COSSOR TRANSISTORISED PORTABLE MODEL 546

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

THIS model is truly representative of the style of portables of the future. Instead of using the low-consumption all-dry type of battery valves as are employed in portables of less contemporary design, the Cossor 546 features six transistors and printed circuits. The set is energised by six Ever-Ready type LPU2 batteries and a full 300 mW of audio is applied to the 7in. X 4in. elliptical high-flux loudspeaker, which provides adequate acoustic power for normal domestic use, and for use in the car, at picnics and almost all other places where portables would prove of value.

Valve-type Portables

One of the major disadvantages of valve-type portables, when subjected to everyday use, is the high battery cost, and this applies even to receivers which use the economy type of valve. Such receivers, therefore, usually serve as a "second set" which can be used at odd times away from home or in the bedroom when the occasion demands. Portable sets incorporating

a mains section (battery-mains models), however, are sometimes used on the mains as everyday receivers, but this practice may also prove rather expensive in terms of valve replacements and may be frustrating during the winter time when voltage cuts cause failure of the oscillator section.

The coming of the transistorised portable alters the outlook considerably, since, as with the Cossor, the running cost of this type of set compares favourably with that of a small mains-operated receiver.

The receiver is housed in a small wood cabinet which is covered with "Lionide" material. It is superhet and the six transistors are arranged in the circuit as follows: OC44 self-oscillating frequency-changer; OC45 first I.F. amplifier; OC45 second I.F. amplifier; OC71 audio driver; two OC72 push-pull output. A type OA70 or OA79 germanium diode is used as the detector.

A Ferrodyne rod aerial is contained in the cabinet, and adequate signal pick-up is secured without an external aerial. The receiver covers both the long and medium wavebands and an I.F. of 470 kc/s is used.

(Continued on page 797)

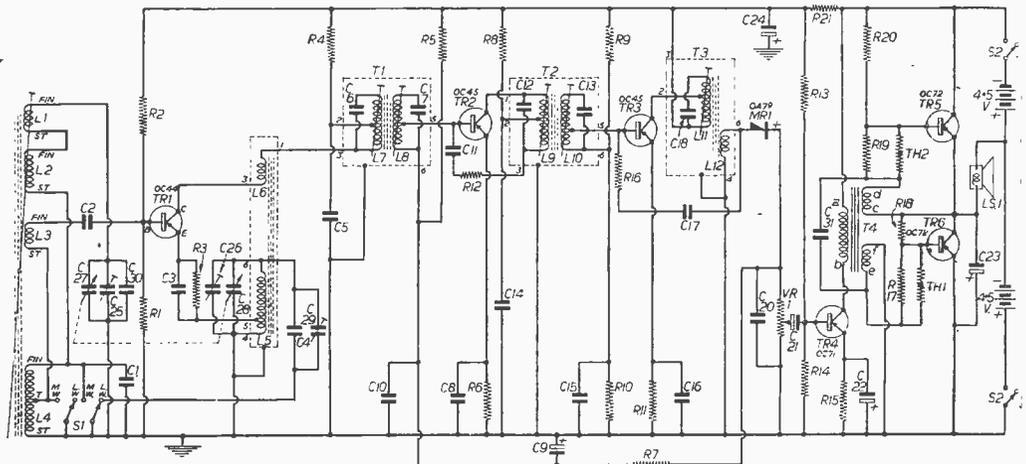
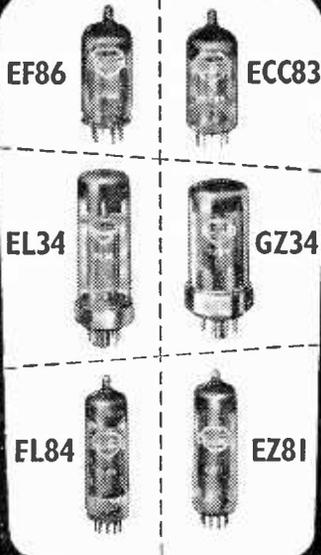


Fig. 1.—Circuit diagram of Cossor Model 546.

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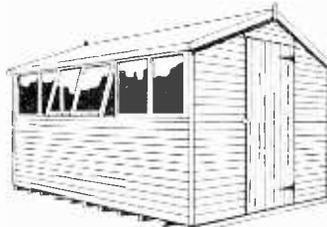
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The Circuit

The complete circuit of the receiver is given in Fig. 1. Transistor TR1 is the self-oscillating frequency-changer, and the oscillator coils are L5 and L6. They are tightly coupled and feedback takes place between the collector circuit winding and L5, the transistor in this case being arranged in the common-base mode. Capacitor C28 is the oscillator tuning capacitor, while C26 is the M.W. trimmer and C29 the L.W. trimmer. It will be seen that on the L.W. position C29 is connected in shunt with the oscillator coil L5, and this in itself decreases the oscillator frequency to embrace the L.W. band. Padding capacitors are not used because the vanes of the tuning capacitor are shaped specially to avoid tracking error.

The Aerial

The Ferrrodyne aerial consists of the three windings L1, L2 and L4 arranged for optimum response, on a ferrite rod. The M.W. section is L1 and L2 in series and the L.W. section is L4. In order to obtain maximum signal transfer from the aerial circuit to the low impedance base circuit of TR1, a coupling winding L3 is incorporated on the aerial which is connected to a suitable tap on the L.W. winding; on M.W. the coupling is achieved between L1 and L3, these two coils being interwound.

On the M.W. position, switch S1 short-circuits L4 and returns the "cold" end of L3 to chassis. C27 is the aerial tuning section of the gang and C25 is the aerial trimmer.

The 470 kc/s I.F. signal is developed across the windings of T1. Tappings are arranged on the windings to match into the collector circuit of TR1 and the base circuit of TR2. The oscillator circuit of TR1 is stabilised by the potential divider, R1 and R2, and the 1k resistor R3 in the emitter circuit. The collector circuit is decoupled by R4 and C5.

The I.F. stages comprising TR2 and TR3 are wired in the common-emitter mode. Neutralisation is achieved by C11 and R12 in TR2 circuit and C17 and R16 in TR3 circuit, this being necessary to avoid regeneration as the result of the base-collector capacitance of the transistors. This, of course, is comparable to the effect of the grid-anode capacitance of a triode, when connected to tuned circuits in the earthed-cathode mode.

In the Corsor circuit the tuned I.F. couplings are arranged to avoid the necessity of altering the neutralising component values when changing a transistor. It is usually a tedious process to select a neutralising capacitor of the exact value required by the transistor.

Resistors R6 and R11 stabilise the emitter currents and excessive degeneration is avoided by the bypass capacitors C8 and C16. The amplified I.F. signals are demodulated by the detector diode, MR1; the volume control, VR1 forming the A.F. load. The D.C. component of the signal is carried through R7 to the base circuit of TR2, and this controls the collector current and the gain of the stage. Decoupling is by C9 and C10, and since the top of R7 is connected to the base current stabilising resistor R5, the detector diode is biased in the forward direction towards the bend of its characteristic curve. This increases the detection efficiency.

The A.F. signals across VR1 are fed to the base of TR4 through the coupling capacitor C21. TR4 is also connected in the common-emitter mode, the emitter current being stabilised by R15 and the base operating point by R13 and R14. The bypass capacitor C22 is of a high value to prevent degeneration of the low audio frequencies.

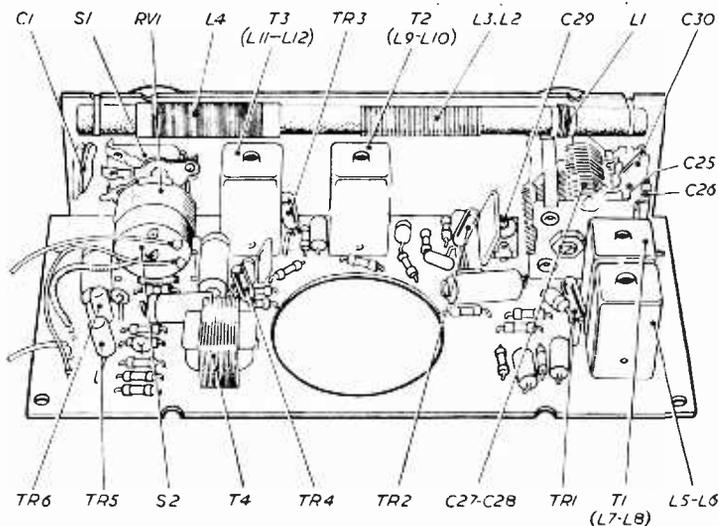


Fig. 2.—A general view of the component layout.

The output transistors, TR5 and TR6, operate in class "B" push-pull, or nearly so, since the transistors are biased by resistors R17, R18 and R19, R20 so that slight conduction occurs even under conditions of no signal, a practice which eliminates switching distortion as the transistors conduct on alternate half cycles of signal. Thermistors TH1 and TH2 stabilise the output stage from the aspect of temperature variation and thus hold the bias current constant.

The only A.F. transformer used in the set is that which serves to couple the driver transistor to the output transistors, transformer T4 in the circuit diagram. The output stage is coupled direct to the loudspeaker which has a 30 ohm speech coil. This set-up is known as a "single-ended push-pull" stage, which, it will be recalled, was fully described in the June, 1958, issue of PRACTICAL WIRELESS, when the Corsor Model 544 transistorised record player was dealt with.

LIST OF COMPONENTS

R1—22 K Ω .	R19—220 Ω .	C16—.04 μ F.
R2—100 K Ω .	R20—4.7 K Ω .	C17—30 pF.
R3—1 K Ω .	R21—1 K Ω .	C18—200 pF.
R4—470 Ω .	C1—180 pF.	C20—.01 μ F.
R5—82 K Ω .	C2—.04 μ F.	C21—8 μ F.
R6—220 Ω .	C3—.01 μ F.	C22—50 μ F.
R7—4.7 K Ω .	C4—350 pF.	C23—1 μ F.
R8—220 Ω .	C5—.01 μ F.	C24—50 μ F.
R9—27 K Ω .	C6—400 pF.	C25—
R10—3.3 K Ω .	C7—200 pF.	C26—
R11—470 Ω .	C8—.04 μ F.	C27—
R12—10 K Ω .	C9—32 μ F.	C28—
R13—27 K Ω .	C10—.01 μ F.	C29—
R14—6.8 K Ω .	C11—6.4 pF.	C30—10 pF.
R15—390 Ω .	C12—400 pF.	C31—.01 μ F.
R16—2.2 K Ω .	C13—200 pF.	On Later Models:
R17—220 Ω .	C14—.01 μ F.	C20 is .04 μ F.
R18—4.7 K Ω .	C15—.04 μ F.	C23 is 4 μ F.

} variable

Servicing Notes

Servicing should always be performed with an instrument of fairly high resistance, since a low resistance meter will severely disturb the operating conditions of the transistors. Even if this does not destroy the transistor, a true voltage reading will not be secured, so there is little point in making the test.

It is not good policy to remove a component or transistor from the circuit while the supply is connected and the receiver switched on. If a current test is called for, the appropriate circuit should be broken and the current meter inserted with the supply disconnected. The supply can then be switched on and the current test made, after which the set should be switched off before the meter is disconnected.

Current and Voltage Readings

The total current taken from the battery of the Cossor 546 depends upon the audio power supplied to the loudspeaker. Under quiescent conditions the total current from a 9 volt battery should be in the region of 7.5 mA, this in part being made up of the collector current of the output transistors, which should not differ by more than 0.1 mA from 2 mA for each. At 10 mW output the total current should increase to 13.5 mA, to 32 mA at 100 mW and 54 mA at 300 mW (full power). It can clearly be seen that battery economy can be effected by keeping the volume turned down or, at least, by not operating the set above the level required for comfortable listening.

Currents and voltages pertaining to the first four transistors are given below, where V_c is the collector voltage, V_e the emitter voltage and I_c the collector current.

TR1:— V_c : —5.4 to —5.5 volts; V_e : —0.7 to 0.92 volt; I_c : 0.77 mA to 0.82 mA. Alignment on the setting of the waveband switch and the tuning capacitor.

TR2:— V_c : —5.65 volts; V_e : —0.17 volt; I_c : 0.78 mA under conditions of no signal.

TR3:— V_c : —5.65 volts; V_e : —0.42 volt; I_c : 0.9 mA.

TR4:— V_c : —8.8 volts; V_e : 1.0 volt; I_c : 2.4 mA.

When replacing components in proximity to the

detector circuit, the wiring should be disturbed as little as possible and the components should be located as near as possible in the positions of the originals. Failure to observe these precautions may result in instability or whistles owing to harmonics of the I.F. being fed back to the ferrite rod aerial system.

Low-frequency instability and distortion may occur when the batteries are nearly at the end of their useful life, but this trouble will be aggravated by an open-circuit or low value of C24.

Alignment

A signal from a suitable generator modulated at 30 per cent. with an A.F. signal is desirable for circuit alignment (Fig. 2). Tuning indication is best obtained either from an output meter having an impedance of 30 ohms and connected across the loudspeaker terminals, with the loudspeaker disconnected, or from an A.C. voltmeter connected across the loudspeaker. The applied signal should at all times be kept at a level which does not produce more than 50 mW of audio (1.2 volts A.C.) so as to avoid alignment error owing to the action of the A.G.C.

For I.F. alignment, the signal is connected between pin 5 of T2 and chassis, remembering that this corresponds to H.T. positive. With the tuning gang at maximum capacitance, the volume control at maximum, and the waveband switch set to the L.W. position, the core in T3 should be adjusted for maximum output. The signal is next connected to pin 5 of T1 and the cores in the bottom and top, in that order, of T2 adjusted for maximum output. It is important to note that the cores tune the transformer correctly only in the outer tuning positions. Finally, the signal should be transferred to the base connection of TR1 and the bottom and top cores, in that order, of T1 adjusted for maximum output. To finish off, the cores of T2 and T1 should again be adjusted for maximum response and then all cores should be sealed with soft wax.

For M.W. alignment, the signal should be coupled to the set by placing the generator lead close to the ferrite rod aerial. The set should be switched to M.W. and the tuning pointer adjusted to the "M" mark on the tuning scale. Trimmer C25 should be screwed in without over-tightening and the signal generator tuned to 575 kc/s. The core of L5 should then be adjusted for maximum output.

The receiver should be returned to the "M" mark at the other end of the scale (the minimum capacitance end), and the generator set to 1,450 kc/s. C26 and C25, in that order, should be adjusted for maximum output.

The receiver and signal generator should again be returned to 575 kc/s (this corresponds to the "M" mark on the tuning scale near the minimum capacitance position of the gang), and L5 and L1 adjusted for maximum output. The operations should be repeated for optimum results.

For L.W. alignment, the signal generator should be tuned to 260 kc/s and the receiver to the "L" mark on the tuning scale. C29 and L4 position on the ferrite rod should then be adjusted for maximum output. The operation should be repeated for optimum results.

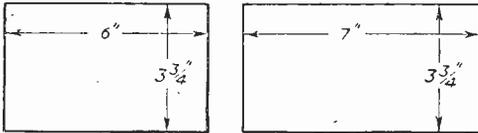
A Resistor and Condenser Box

FOR CHECKING SUSPECT PARTS BY SUBSTITUTION

By J Hillman

THIS is a compact box containing a number of resistors and capacitors which can be selected by means of a switch. They can be used to check any suspect resistors or capacitors in a radio or TV set. The range of values is quite wide as a series parallel switch allows many combinations to be obtained. The ranges are: capacitance 100 pF to 700 pF in 100 pF

and mark off in pencil right round the box then cut out the hardboard along this pencil line. This is better than attempting to measure the size as the box may not be square and the top would not be as good a fit. Now nail and glue the top on then mark off the holes as shown in Fig. 5 and drill as shown. Now fit the two 12-way switches.

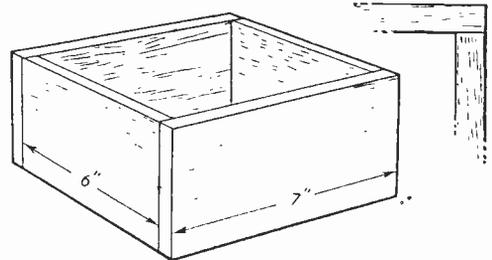


Figs. 1 and 2.—Details of wooden pieces.

steps: .001 to .007 in .001 steps; .01 to .07 in .01 steps; .1, .25, .35, .5, 16 μ F 450 v.; 50 μ F 50v.; 100 μ F 450 v.; 200 μ F 350 v. Resistance 0-500 ohms; 0.5 k. ohms; 0-50 k. ohms; 0.1 M ohms. Also the 1 M ohm pot can be used to substitute for a volume control. The box itself is also useful as a support for a chassis or C.R.T. when it is out on the bench for servicing.

Construction

The box is made of wood in preference to metal as it can then be used right up against a chassis without any danger of it causing shorts. First make up two pieces of wood as Fig. 1 then two as Fig. 2. Next glue and nail the four pieces together as Fig. 3 using a simple butt joint and placing the shorter pieces inside the longer ones. The joint appears as Fig. 4. Now place a piece of hardboard on the top of the completed box



Figs. 3 and 4.—Showing how to nail the pieces together, and making the joint.

the four pots and the toggle switch and the four sockets, enlarging the holes where necessary with a round file. The box should now look like Fig. 6 viewed from inside.

Wire up the four pots, the S3 switch and the moving pole of S1 and S2 first. Now start on S2 and wire in the condensers joining their common ends to the common ends of the pots and to S2 negative. Wire up in a similar manner the other switch S1, leaving the two large condensers until last. These condensers are secured to the side of the box with half-round brackets. Now label the controls as Fig. 7, this can be done by typing out the labels and then cutting them out

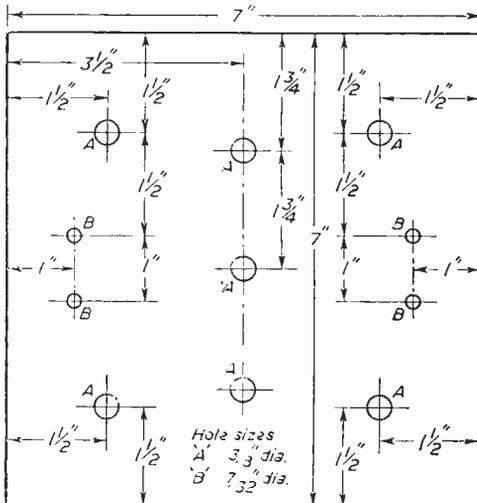


Fig. 5.—Marking and drilling the holes.

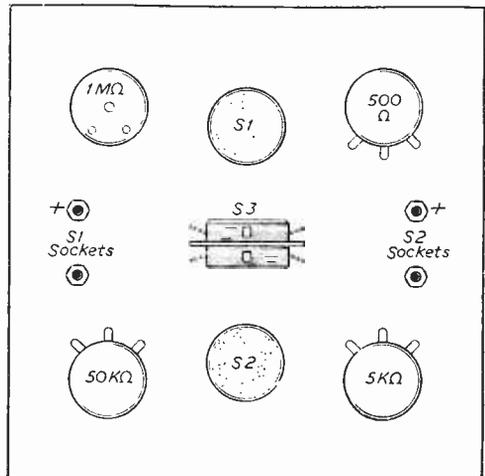


Fig. 6.—The box viewed from inside.

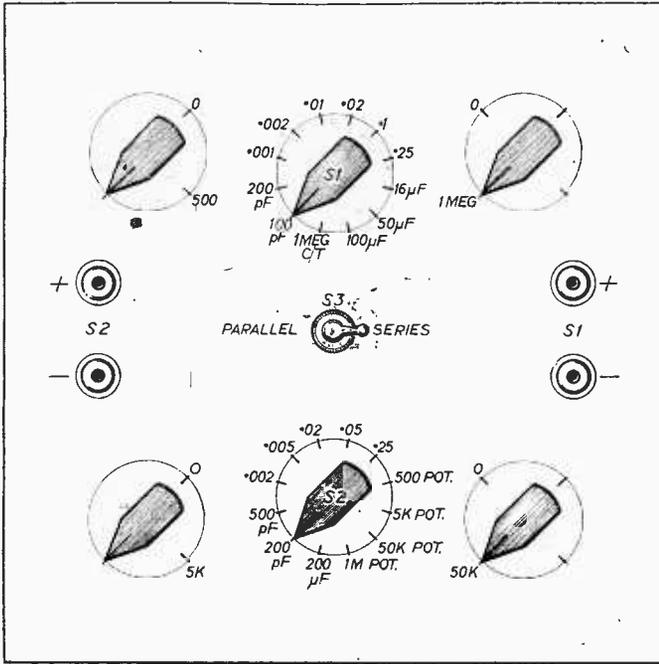


Fig. 7.—Showing how to label the controls.

and sticking them in their appropriate places. Finally, make up three leads as Fig. 8.

Operation

For resistor substitution simply select the required range on S2 and adjust the pot to the required value. The pots can be calibrated by means of an ohmmeter if desired and their values marked in on a scale for future reference as shown in Fig. 7. Two of the leads, as Fig. 8, are plugged into S2 pos. and neg. sockets, and the crocodile clips are then connected to the resistor in the set, this resistor having been disconnected at one end. For capacitors a similar operation



Fig. 8.—Details of the leads.

is carried out except for certain values. For 100 pF S1 is used and the S1 sockets, whilst for 200 pF S1 or S2 may be used. 300 pF is obtained by putting S1 to 100 pF, S2 to 200 pF and S3 to parallel, using either S1 or S2 sockets. 400 pF is obtained using S1 on 200 pF and S2 on 200 pF S3 still in parallel position. 500 pF is obtained using S2 on 500 pF and S3 in series position. For .001 and .002 S3 is in series position and S1 and S2 are used respectively, whilst for .003 S1 is set to .001, S2 to .002 and S3 to parallel, this is the same for .01, .02 and .03. For .004 S1 is put to .002 and S2 to .002 with S3 in parallel, similarly for .04 using .02 and .02. For .005 and .05 S2 is set to the required value with

COMPONENTS LIST

- 1—100 μ F mica condenser 500 v.
- 2—200 μ F mica condenser.
- 1—500 μ F mica condenser.
- 1—.001 μ F ceramic condenser.
- 2—.002 μ F ceramic condenser.
- 1—.005 μ F ceramic condenser.
- 1—.01 μ F 1 kv. tubular condenser.
- 2—.02 μ F 500 v. tubular condenser.
- 1—.05 μ F 500 v. tubular condenser.
- 1—.1 μ F 500 v. tubular condenser.
- 2—.25 μ F 500 v. tubular condenser.
- 6—Pointer knobs.
- 1—16 μ F 450 v. electrolytic.
- 1—50 μ F 50 v. electrolytic.
- 1—100 μ F 450 v. electrolytic.
- 1—200 μ F 350 v. electrolytic.
- 1—500 ohm W W Pot.
- 1—5 k ohm W W Pot.
- 1—50 k ohm W W Pot.
- 1—1 meg. carbon Pot.
- 1—DPT toggle switch.
- 4—wander plug sockets.
- 3—wander plugs.
- 2—1-pole 12-way switches.
- 26in. of 4in. \times 7/8in. timber.
- 2 pieces 7in. \times 7/8in. hardboard.
- 1 yd. connecting wire.
- 2—half-round brackets.
- Screws and nails to suit.

S3 in series, as is .1, .25, whilst for .35 S1 is set to .1 and S2 to .25 with S3 in parallel and for .5 S1 is set to .25, S2 to .25 and S3 to parallel. Care must be taken to get the polarity right when using the 16, 50, 100 and 200 μ F capacitors.

The final circuit is shown in Fig. 9.

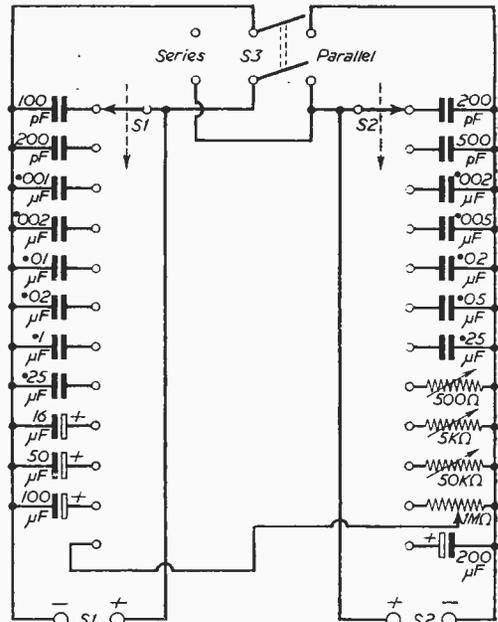
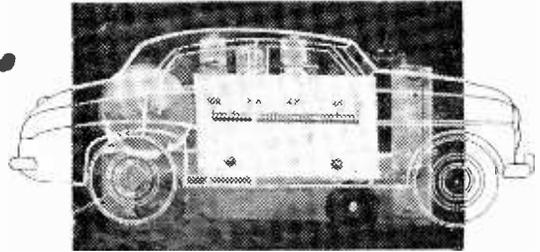


Fig. 9.—The final circuit.

A 12v. Valve-Transistor Car Radio...

THE FIRST PART OF THIS ARTICLE DEALS WITH THE CONSTRUCTION OF THE VALVE SECTION

By R. Morgan



THIS receiver uses a range of valves designed to operate with a 12-volt high tension supply, so that no means of stepping up the vehicle battery voltage is required. This avoids the usual vibrator circuit, and also reduces the current drawn from the accumulator. By employing a transistor output stage, sufficient volume may be obtained without any need for high voltages.

The Circuit

The circuit for the valve section is shown in Fig. 1 and the 12v. heaters are intended to be operated directly from the 12 v. vehicle accumulator. The output valve heater takes .45 amp., with .15 amp. for each of the other valves, making only just over 1 amp. in all. Tuning is for M.W. only, but a L.W. band can easily be provided if reception of the Light Programme on 1.500 metres is required. Two I.F. stages are used, in the interests of sensitivity, A.V.C. being applied to the first stage. A normal double-diode-triode stage is followed by a special output triode in which the first grid is intended to aid the initial impetus of the electron flow, the second grid being used as a control grid. This valve is rated as giving 35 mW. output with 12.6 v. applied

to anode and space charge grid, and acts as driver for the transistor output stage.

It is important to adhere fairly closely to component values, especially as grid rectification provides bias for all but the first I.F. amplifier. The 19 K. D.D.T. cathode resistor is not intended to produce bias, but an A.V.C. delay voltage, and it is important to see that the triode section grid leak in this stage is returned to cathode and not chassis.

For smoothing, two large capacity condensers and a low resistance choke are used. The degree of smoothing which is considered sufficient depends, to some extent, on the vehicle and on personal opinion. Worn dynamo brushes and a dirty commutator can contribute considerably to the noise introduced from the vehicle's battery circuit.

Chassis Layout

The congested, cramped layout sometimes adopted in car radio sets makes construction more difficult, and a small, conventional chassis design has been adopted. A chassis about 9in. X 4½in. X 2in. deep will easily accommodate all parts, and the completed receiver is only about 4½in. deep overall, including valves, tuning drive

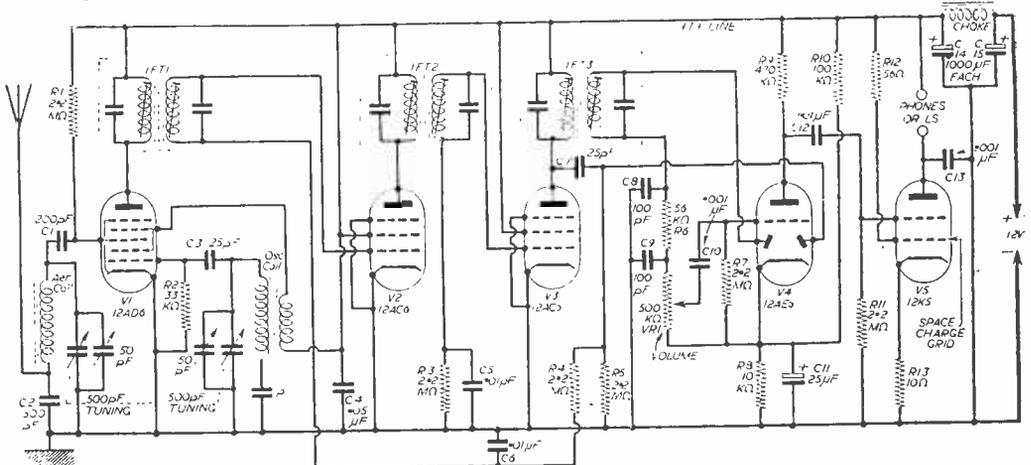


Fig. 1.—The circuit diagram for the valve section of the receiver.

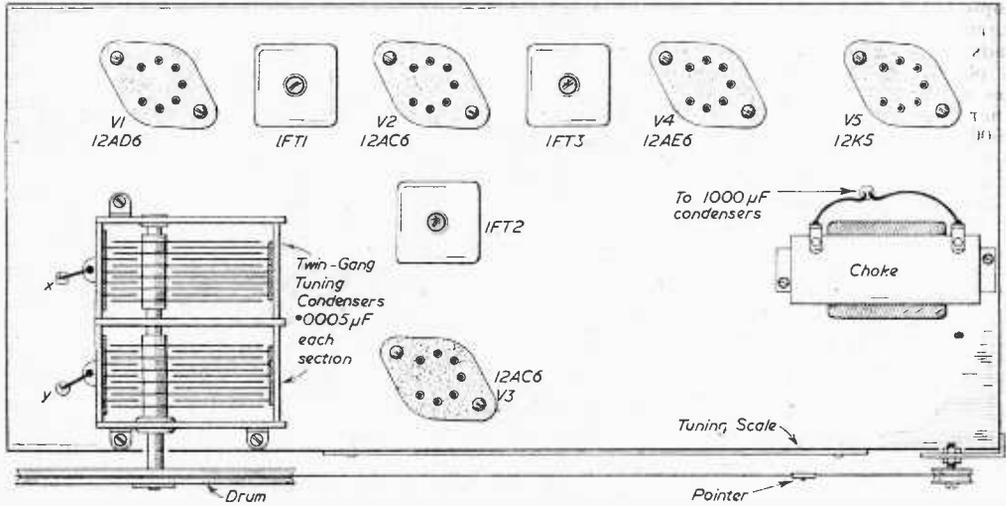


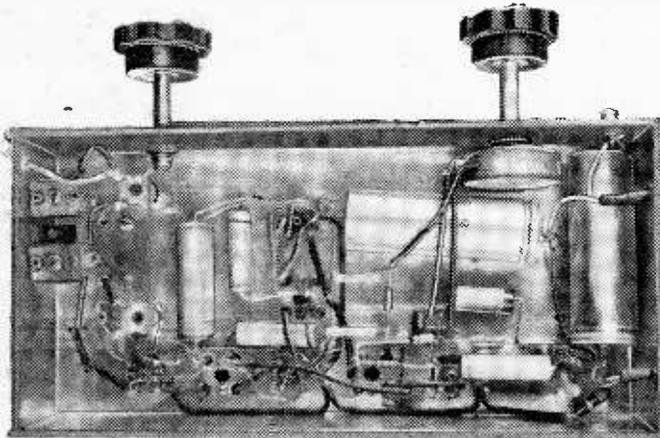
Fig. 2.—The layout of the parts on the chassis.

and scale. Therefore, accommodation should not give much difficulty.

Fig. 2 shows the chassis layout. The tuning condenser is screwed down so that the spindle projects sufficiently for the drum to clear the front runner. The valveholders require $\frac{3}{8}$ in. dia. holes, and $\frac{1}{4}$ in. dia. holes can be used to clear the I.F. transformer leads. A central hole is also necessary under each transformer, so that the cores can be reached. The chassis punches pro-

formers. The valveholders should also be located as indicated.

The coils are mounted by pushing their clips into holes in the chassis, or by securing these clips to the chassis with short 6 B.A. bolts. The associated pair of trimmers may be bolted to the side of the chassis. Drilling is best finished before any parts are mounted to avoid possible damage and to prevent fragments of metal lodging between valveholder tags or elsewhere.



View of the underside of the chassis.

duced by the component supplier will prove very convenient for making these holes.

Components and wiring under the chassis are shown in Fig. 3. The I.F. transformers must be correctly located so that the anode connections agree with the positions shown. Other wiring here will then be correct with the specified trans-

Wiring

Only a few leads pass through the chassis. Referring to Fig. 3, "X" is taken to the rear set of fixed plates of the tuning condenser and "Y" to the front set. Two other leads pass from the 1,000 μ F smoothing condensers to the choke. Battery and output leads pass through the side runner; rubber grommets or insulating tape being added to avoid shorts owing to fraying of the wire.

Valve base connections are shown from the underside in Fig. 4. It is important to note that the 12AD6, 2.2 megohms grid leak is returned to the H.T. positive line, not to the chassis. On the 12K5 valveholder, two of the tags must be

wired together to form the space-charge grid connection.

Heater wiring may be done first; points marked with the positive sign in Fig. 3 being joined together. Coils and I.F. transformers may best follow. Anode and grid connections must be short, direct, and clear of each other, or the I.F.

amplifier section may oscillate when aligned. Points marked "MC" are taken to the chassis. Leads being soldered to 6 B.A. tags tightly bolted in place. Bare connecting wire between these tags will provide a convenient earthing point for other circuits, as in Fig. 3. The 25 μ F and 1.000 μ F condensers have to be wired in the correct polarity, as indicated. With the by-pass condensers it is usual to take the wire at the marked end, or outside foil connection, to chassis. Other small condensers and all resistors may be wired in either way round, leads being cut to suit.

The padder "P" is 470 pF for the M.W. band. For L.W., in addition, a 3-pole 2-way rotary switch would be necessary to switch aerial and oscillator coils, and the L.W. oscillator coil must then have its own 150 pF padder. Wrong padder values will make alignment difficult or impossible.

It is necessary to see that valveholder tags do not short to one another, or to the chassis, and that the I.F. transformer leads are clear of the chassis and insulated with sleeving.

Tuning Drive

A piece of stout aluminium is bolted vertically at the right of the chassis and carries two pulleys pivoted on bolts held by lock nuts. The driving cord passes round these pulleys and round the tuning control spindle and drum, as in Fig. 5. One complete turn is necessary round the spindle to provide sufficient grip. The cord is also taken right round the drum, and the ends knotted together so that the spring will maintain tension. This gives a smooth, reliable drive.

The pointer movement is equal to one-half of the circumference of the drum, or approximately 4.4in. with the 2 $\frac{3}{4}$ in. diameter drum. The pointer is a straight piece of tinned-copper wire soldered

to a small piece of brass or tin clipped to the cord. A scale can easily be drawn up and bolted to the front of the chassis, as in Fig. 5.

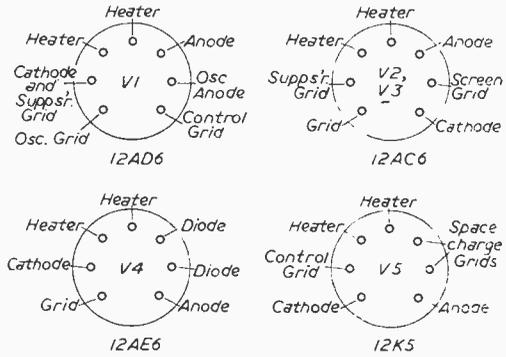


Fig. 4.—Valve base connections (from the underside).

being equally divided from 200 to 550 metres, or having stations marked as they are tuned in.

Testing and Alignment

The valve section described is best dealt with alone, as no changes to alignment would be necessary when connecting up the transistor output stage. The leads marked "T" in Fig. 3 may be taken to a speaker transformer, a ratio of about 18 : 1 or 20 : 1 being best for a 2-3 ohms speaker. However, as this ratio is rather low it may be noted that a much higher ratio will give good enough results for the purpose in view. It is also possible to use 'phones instead, provided they can carry the required current, which is about 35 mA with no signal, falling

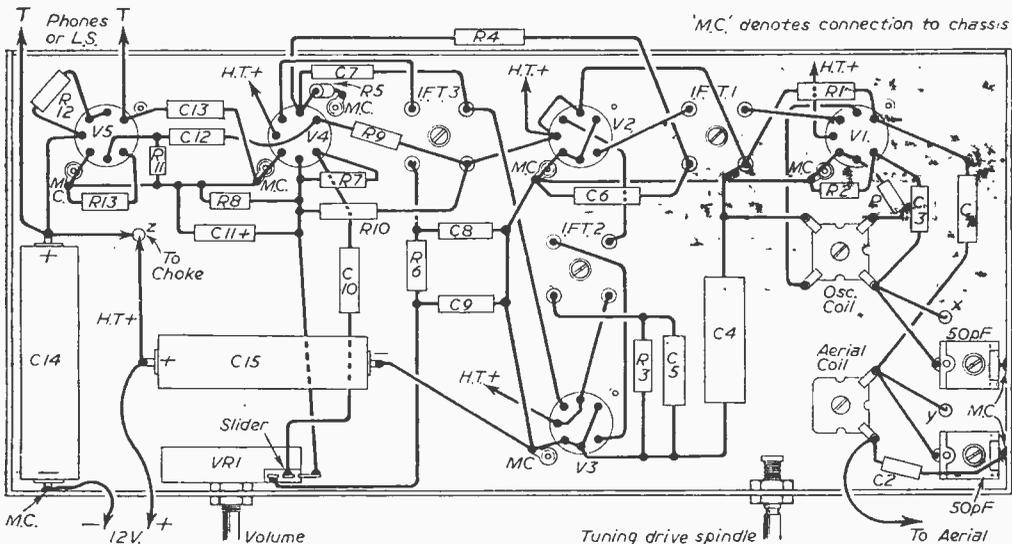


Fig. 3.—Wiring diagram for the valve section.

to approximately 8 mA with maximum signal strength. If the 'phones are not suitable for this, a resistor may be used as anode load, with a condenser of about $.1 \mu\text{F}$ to $1 \mu\text{F}$ in series with the 'phones. The resistor will have to be fairly low in value to avoid excessive voltage drop, 500 ohms being suitable.

It must be noted that the output obtained from the circuit does not equal that achieved with valves operating with a 250 v. H.T. supply. This is only to be expected. The power output of the driver is 35 mW. This is, of course, not sufficient for good volume with a speaker, but it is enough to operate the transistor output stage. If a speaker is used with the 12K5 alone, and best results are required, the transformer should have a low primary resistance and provide a load of 800 ohms.

With an aerial connected and valves warmed up, it should be possible to tune in the local station. The I.F. transformer cores are then carefully adjusted for maximum volume. A length of ebonite rod filed to a suitable shape is most satisfactory for this and for adjusting the coil cores. If a signal generator is available, a modulated 465 kc/s signal can be applied to the 12AD6 anode. After provisional alignment, the generator output lead can be placed near the anode connection, without actually being in contact with it, and a final check of alignment made. When no further improvement is possible, the I.F. circuits can be left.

With the aerial and oscillator coils, the cores

are adjusted at a fairly high wavelength (say, 450 to 500 m.) and the trimmers are adjusted at a low wavelength (say, 225 to 250 m.). The position of the coil cores will much influence dial readings towards the high wavelength end of the scale, while the trimmers have most influence on lower wavelengths. This can be used to bring dial readings into co-incidence with stations received. As the oscillator coil has most influence on tuning, it is best to tune in a station correctly, then adjust the aerial coil for best volume. When no further improvement in volume is possible, alignment is finished.

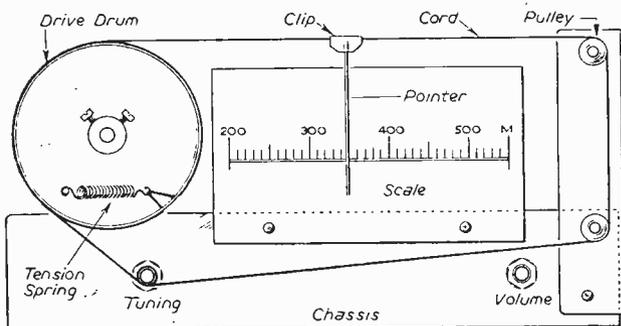


Fig. 5.—The dial and cord drive.

Final alignment of the aerial coil should be with the actual aerial and lead-in fitted in the vehicle. It will then take into account stray capacity, which will depend upon these.

The type of aerial will considerably influence reception, and an efficient aerial is not easily provided on a vehicle. The best signal pick-up will be achieved with an aerial which is as high as possible, reasonably long and removed from chassis, bodywork, or other metal surfaces. A roof or wing aerial will usually be satisfactory. A wire under the car can give enough volume in some areas, but an interior wire is almost useless in saloons owing to the screening.

If the aerial is clear of the ignition system and other electrical equipment, direct pick-up of interference will be reduced. The usual suppressors will be necessary and must be added.

The lead-in should also be well clear of electrical circuits. If not, it must be screened. Screening will usually be necessary when the receiver is fitted in the front of the vehicle. Whether or not interference is being picked up by the lead-in or aerial can easily be found by disconnecting these in turn from the receiver. Direct pick-up can be almost prevented by using a metal cabinet. An accumulator supply with positive connected to vehicle chassis is usual, so that receiver and vehicle must not be in contact.

An on/off switch has to be included in one battery lead, and this can be at the speaker position, or in the receiver, whichever is more convenient. The choke must be of very low resistance and does not seem easily obtainable. The secondary of an output transformer of fairly generous size may be used here, or a choke can be wound with 16 s.w.g. or similar wire.

(To be continued)

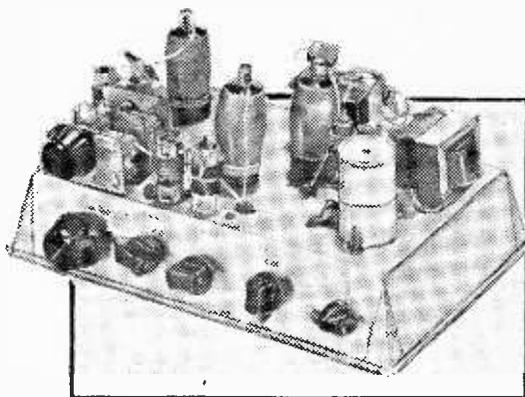
COMPONENT LIST—VALVE SECTION

- 3 \times I.F. transformers, miniature, 465 kc/s—Osмор.
- 1 \times .0005 μF 2-gang tuning condenser with drive, drum, etc.—Jackson.
- 2 \times 50 pF trimmers.—Cyldon.
- Type QO8/SM (sub-miniature) M.W. battery osc. coil.—Osмор.
- Padder condenser for QO8/SM—470 pF.
- Type QA5/SM (sub-miniature) M.W. aerial coil.—Osмор.
- Padder condenser for QA5/SM—2,500 pF.
- Resistors :
- 1 each 10 K, 33 K, 56 K, 100 K, 470 K— $\frac{1}{2}$ watt.—Dubilier.
- 6 \times 2.2 megohms— $\frac{1}{2}$ watt.—Dubilier.
- 1 each 10 ohms, 56 ohms— $\frac{1}{2}$ watt.—Dubilier.
- 1 \times 500 K potentiometer.—Egen.
- Fixed condensers :
- 1 each 200 pF, 500 pF.
- 2 each 25 pF, 100 pF, .001 μF , 1,000 μF .
- 1 \times .05 μF , 25 μF .
- 3 \times .01 μF .
- Chassis.
- Control knobs, etc.
- For L.W. operation the coils required are QO9/SM and QA6/SM; a 3-pole 2-way rotary switch is also required.
- Valves : 2 \times 12AC6 ; 1 each 12AD6, 12AE6, 12K5.
- Valveholders—5 \times B7G.
- All of the above components are available from Osмор Radio Products Ltd., 418, Brighton Road, South Croydon, Surrey.

A Beginner's CONSTRUCTIONAL COURSE-III

7.—HOW TO DIAGNOSE FAULTS IN THE SET

By E. V. King



IN the last article we concluded with methods of checking the speaker and further information is given below.

4. Check on resistance range that pins 1 and 5 (on 6V6 pins 1 and 7) are earthing properly.

5. You may check the valve as follows. If all above are O.K. by putting a meter on current range in the H.T. lead to TR2. If low then valve emission is low (unless R9 has increased in value). If high R9 or C11 are probably faulty.

Readers should note that the meter used for the 400 ohm columns in the charts was the Avometer No. 1 and that the new Multiminor has a resistance of 10,000 ohms per volt. With the Multiminor all readings will be the same, except for pin 4 (the screen) of each valve, which will read higher.

Speaker Gives Slight Hum but No Signals

Preliminary Tests.

1. Touch top cap V3 with lead removed. Loud hum from speaker shows that V3 and associated circuit are O.K.

2. Replace connector to top cap. Try again. Hum, with less volume should be heard. If not then C14/R10 are at fault (on 6V6 for T.C. read pin 5).

By the way, a check on the goodness of C14 can be carried out by doing test 5 under Valve 3 check and while doing it unsoldering C14 from V2 anode. No difference at all should be shown in the static current readings. If there is a difference, even of 1mA replace C14.

3. If no results after above two tests then check on Valve 3 as shown above.

Valve 2 check.

1. Verify that finger on V3 grid gives speaker response.

2. Replace grid lead to V3 and remove lead to V2 T.C. Touch with the finger. Loud hum shows that V2 is live. Remove finger and move it about in the air $\frac{1}{2}$ in. away from T.C. Hum and/or squeal should vary as the finger is moved. If it does V2 is O.K. If not V2 or its circuit is faulty. Note we have not tested tuned circuit yet. Replace top cap before continuing.

3. Check H.T. at pin 7. If low check H.T. supply as stated.

4. Check H.T. at junction R6 and C9. If low suspect C9.

5. Check H.T. at pin 3. If nil check H.T. is arriving at Z. PHF1. If it is then one of the

PHF coils is faulty. If not lead to R6/C9 is shorting or open circuit.

6. Check H.T. at pin 4. If low or high R7 or C10 is faulty.

7. Check bias at pin 2. If high R12 is open circuit, if low C17 is faulty (or valve is to blame).

8. Current check is not very satisfactory in the detector circuit but it should be approximately as on the chart. Readings with and without a signal will vary somewhat. Put the meter on current range in series with the lead from R12 to chassis, i.e., unsolder R12 from its tag. If current is high suspect wrong values or a faulty C17. If low suspect wrong values or a faulty valve. Test by substitution.

9. Place head phones between top cap and earth. Removing the lead formerly thereon. Speak into them. If sound comes from speaker, though distorted, all is well. If not, if above tests are O.K., valve is faulty.

Valve 2 tuned circuit check.

1. Verify that phone check on V2 T.C. is O.K.

2. Place a long aerial on red of PHF2. Tune. No signal shows coils or associated connections on the secondary sides (red to "X") are faulty.

3. Remove aerial and place it on Y of PHF2. Tune. No signal shows that the coil wiring on the primary sides is faulty ("Y" to "Z").

4. Remove V1. Place aerial carefully in pin 3 socket. You should get reception. If not lead from pin 3 to PHF coils is faulty. Replace the valve in its sockets.

Valve 1 Check

1. Scrape the top cap of this valve with a piece of wire. Crackles should be heard in the speaker. If not V1 circuit or valve is faulty. Keep volume on full, but not oscillating.

2. Remove top cap connector. Place aerial on top cap. Tune in. Loud hum should be present as modulation on the local stations. If not V1 or V1 circuit is to blame (as distinct from V1 tuned circuit).

3. If loud modulation hum is present but radio does not operate then the P.A. coils and associated wiring are at fault.

4. If loud modulation hum is not present, R2 being full on, of course, then check voltages on valve.

Mains used		240 v. A.C. Mains						200 v. A.C. Mains					
Valve circuit		Anode Bend Circuit as Fig. 23			Leaky Grid Circuit as Figs. 22 or 35			Anode Bend as Fig. 23			Leaky Grid Circuit as Figs. 22 or 35		
Test Points as under	Meter used	1,000Ω		400Ω		1,000Ω		400Ω		1,000Ω		400Ω	
		Range	Reading	Range	Reading	Range	Reading	Range	Reading	Range	Reading	Range	Reading
Junction R6 C9 (V2, H.T.)	...	D.C. 500 v.	225 v.	D.C. 500 v.	225 v.	D.C. 500 v.	225 v.	D.C. 500 v.	180 v.	D.C. 500 v.	180 v.	D.C. 500 v.	180 v.
Pin 7 (Main H.T.)	...	500 v.	280 v.	500 v.	280 v.	500 v.	280 v.	500 v.	195 v.	500 v.	195 v.	500 v.	195 v.
Pin 2	...	5 v.	1.5 v.	5 v.	No test	5 v.	1.2 v.	5 v.	5 v.	No test	5 v.	No test	No test
Pin 3	...	500 v.	50 v.	500 v.	10 v.	500 v.	35 v.	500 v.	20 v.	500 v.	12 v.	500 v.	10 v.
Pin 4	...	500 v.	75 v.	500 v.	40 v.	500 v.	65 v.	500 v.	30 v.	500 v.	30 v.	500 v.	25 v.
Pin 8	...	A.C. 25 v.	4/6 v.	A.C. 25 v.	6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	4/6 v.
Anode Current	...	1 mA	.3 mA	1 mA	.5 mA	1 mA	.5 mA	1 mA	.25 mA	1 mA	.25 mA	1 mA	.4 mA

THE TABLE ABOVE GIVES TEST FIGURES FOR V2 (52 and 53 in "Radio" Position) THE TABLE BELOW SHOWS TEST FIGURES FOR V3

Mains Used		240 v. A.C. Mains						200 v. A.C. Mains					
Valve Used		SP41/61			6V6			SP41/61			6V6		
Test Points as under	Meter Used	1,000Ω		400Ω		1,000Ω		400Ω		1,000Ω		400Ω	
		Range	Reading	Range	Reading	Range	Reading	Range	Reading	Range	Reading	Range	Reading
Main H.T. pin 7 (6 on 6V6)	...	D.C. 500 v.	240 v.	D.C. 500 v.	225 v.	D.C. 500 v.	225 v.	D.C. 500 v.	195 v.	D.C. 500 v.	195 v.	D.C. 500 v.	190 v.
Pin 2 (8 on 6V6)	...	5 v.	3.5 v.	5 v.	24 v.	5 v.	24 v.	5 v.	3.2 v.	5 v.	3.2 v.	5 v.	18 v.
Pin 3 (3 on 6V6)	...	500 v.	215 v.	500 v.	215 v.	500 v.	215 v.	500 v.	190 v.	500 v.	190 v.	500 v.	180 v.
Pin 4 (4 on 6V6)	...	500 v.	240 v.	500 v.	225 v.	500 v.	225 v.	500 v.	195 v.	500 v.	195 v.	500 v.	190 v.
Pin 8 (2 on 6V6)	...	A.C. 25 v.	4/6 v.	A.C. 25 v.	6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	4/6 v.	A.C. 25 v.	6 v.
Anode Current	...	10 mA	7.5 mA	10 mA	30 mA	10 mA	30 mA	10 mA	6 mA	10 mA	6 mA	100 mA	24 mA

5. Check voltage on pin 3 (volume control on full).

6. Check voltage on pin 5 (this will vary according to value of R3, see text). Suspect R2, R3, C4, C2.

7. Check bias on pin 2. If wrong suspect R1, C3.

8. Put meter on current range and in lead from Y on PHF2 to junction R5 and C8. If reading high then suspect R1, C3. If low and above tests O.K. suspect valve. Test by substitution.

It is hoped that the beginner will now feel quite confident that not only has he been able to build a good serviceable receiver but that he can service it with some degree of skill. The beginner should try to work out why voltage variations could be caused by the components suggested above. The author makes no pretence that the above fault-finding system is *absolutely* fault proof. He doubts if there is such a system anyway, especially as intermittent and distortion troubles difficult to find without a good technical knowledge.

There is no better aid to good fault-finding than a good brain and a thorough understanding of the receiver under consideration. If you have made the receiver you should have both aids at your disposal.

The receiver may be placed in a wooden or plastic cabinet but not a metal one. A short picture-rail aerial will do for ordinary use so the receiver makes a small convenient bedroom receiver, but some of the author's friends have these operating in their living-rooms and find them very useful. Those who like Luxembourg can receive it well, but with some fading (no A.V.C. is fitted and is not really practical on this type of receiver). The author has sometimes been given a very old radio for servicing invariably one refused by the servicing department of a local shop. Usually, on brief investigation the author has to agree with the shop that it is not worth while replacing valves, switches, etc. The author usually suggests to the owner that he could build this T.R.F. receiver in the cabinet on the chassis for a few pounds. The tuning gang is used. The H.T. supply is used with new electrolytics. The speaker is used, with suitable arrangements if it is mains energised. The straight T.R.F. using three SP61s or 41s (the latter usually, as old sets are of 4 volt types), is built in using the old valve holes. Not one complaint has come along, so readers may consider this idea when confronted with similar problems (where cash is the main consideration).

The wiring of the receiver may be tidied up somewhat. For instance, to help the beginner main H.T. was taken

from pin 7 of V2 to the other valves. It is neater and uses less wire to take H.T. from C13 to V3, then to V2 and on to V1. It is also possible and good policy to make pin 7 of each valve the decoupled H.T. point in lieu of the main H.T. point. If you feel confident, rearrange R5/R6/C8/C9 accordingly. If in doubt leave well alone. In a similar way you may now take the filament line to V3, then to V2 and finally to V1. Long untidy wires are again eliminated. The last prototype was altered in this way.

Suggested Faults for the beginner to find by systematic search.

1. Mains lead to MR1 unsoldered.
2. One end of R11 unsoldered.
3. R7 unsoldered from pin 4 V2.
4. Lead from R2 to pin 4 V1 unsoldered.
5. C16, shorted with a fine piece of wire.
6. R6 disconnected at one end.
7. Lead from pin 3 V1 disconnected from "Y" on PHF2.
8. Lead from S1 to chassis unsoldered from chassis.

9. R5 unsoldered at one end.
10. Filament transformer unsoldered from earth on one side.
11. PHF2 "X's" disconnected from PHF1 "Red.i"
12. PA2 "Z" disconnected from PA1 "Y."

Components Required for Modifications

Fuses and fuse holders to suit, see text.

Warning lamp, 4 or 6 volts, 3 watts, and suitable holder, or

Baby Neon lamp, 90 volts, with suitable holder (G. R. Products, 22, Runnymede Ave., Bristol).

If leaky grid detector is fitted then gram/radio switch is required, the type being rotary, 3-pole, 3-way with insulated operating knob; also 1 400 ohm $\frac{1}{2}$ resistor and 1 20 v. 12 or 25 mfd. condenser.

If a 6V6 is fitted you require:

1 6V6 valve, metal or glass will do.

1 International Octal holder. Paxolin is cheap and suitable.

1 400 ohm 2 watt resistor (R9).

If internal volume control is fitted for "gram" a suitable value is given in the text.

Transmitting Topics

FURTHER NOTES ON MODULATION

Re my article in the March issue, it is as well to mention that the old trick of applying negative feedback to the driver stage is a great help in providing good drive. The loss in gain in the driver should be remembered, however, and unless adequate gain is available from the speech amplifier, a little extra pre-amplifier gain must be provided. With the circuit values of Fig. 5, the loss in gain is about three to one, so one should have about 10 db. reserve gain in the speech amplifier. Generally reserve gain of this order is available.

A further point that is mentioned to prevent readers being confused, is that some of the figures quoted for 807 power outputs and load impedances, and those calculated for conditions short of the maximum figure may not agree with some published figures. There is a good reason for this. Firstly the handbook figure for the full 120 watt output at 750 volts is not quoted by British makers. This is because the British figures refer only to Service high reliability continuous running conditions, and not to the American peak ratings for "Intermittent Commercial and Amateur Services."

A further reason why power output and impedances may not agree at reduced voltages with the makers' figures is that the ratings, outputs and impedances calculated by the method described gives the amateur the maximum power output at low voltages. The maker's conditions at lower voltages are often designed to give quite low distortion, and in some cases are a compromise between Class AB2 and Class A operation, in that the zero signal standing current is increased over its value for Class AB2 operation, so that distortion is lowered and anode current swing is reduced. This is a help in conventional

audio amplifier design. For the amateur, however, the full power conditions are those of interest. For this reason bias conditions may be adjusted so that some 60 to 80 mA standing anode current is drawn by Class AB2 807s. Those skilled at juggling with load lines and characteristic curves might find, for example, that a little extra power might be achieved by biasing down to 25 mA or less standing current. However, while zero-bias triode connected 807s take only some 15 mA standing current, this is a condition best avoided with Class AB2 807s, owing to the greater demands upon power pack regulation, and the power increase obtainable is only a few per cent.

We might sum up briefly by saying that provided the impedance values are recalculated we can obtain good audio output from a modulator even at reduced anode voltages. The calculation of available power and required load impedance applies to all types of Class AB2 and Class B modulators, although the popular 807 has been used as an example throughout. Where power pack regulation is poor, in some cases by operating at a high anode voltage and restricting the anode current swing, preferably with the appropriate alteration of load impedance the current swing may be reduced in cases where the full audio power is not required. Readers are warned, of course, that the anode voltage for power output calculation is the voltage to which the H.T. line has sagged at full signal output and not the higher value when no signal is applied. Generally if the H.T. volts have sagged by 10 per cent. from the expected figure, a 10 per cent. loss of audio power results.

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TRANSISTORS

in Practice—conclusion

No. 11.—“SINGLE-ENDED” PUSH-PULL CIRCUIT

THE circuit shown in Fig. 8 is of a practical unit built to test out the theory given in the previous issue. The circuit is identical with Fig. 7 except that now the load is shown as a speaker and component values are marked. The speaker has to have a speech coil higher than those generally in use and actually an impedance of 35 ohms is used. This speaker is available from the W.B. range and is one of the miniatures developed for transistor circuits. It is an elliptical unit in a frame of overall size 2 11/16in. X 1 27/32in. Special mention of the required speech coil should be made, however, because otherwise a unit with the more usual 3 ohms coil will be supplied and that will not suit the present design. The transistors used to drive the speaker are Mullard OC72, and these should be obtained as a matched pair. The drive transformer, TFR, is available from the Belclere Company in Oxford and has the type number GX2078; this component has a ratio of 7:1 plus 1. The present design does not include a driver stage, but to show the constructor how to use it Fig. 8 gives also the circuit of a simple first stage using a Mullard OC71. This could be the end stage of the audio amplifier designs dealt with in detail in the previous series, it being necessary

only to remove the coupling transformer used for the earlier designs and substitute the one contained in the present work. The OC71 stage given in Fig. 8 will require the addition of the necessary input components to match the source of signal if there is to be no transistor before it.

The method of construction is very simple. The transformer is simply turned upside down and a soldering tag strip with four tags plus earth is bolted to each mounting hole of the transformer with the tags inside the bolt holes. This will be seen from the wiring diagram given in Fig. 9. The four secondary leads are connected to the appropriate tags first as indicated.

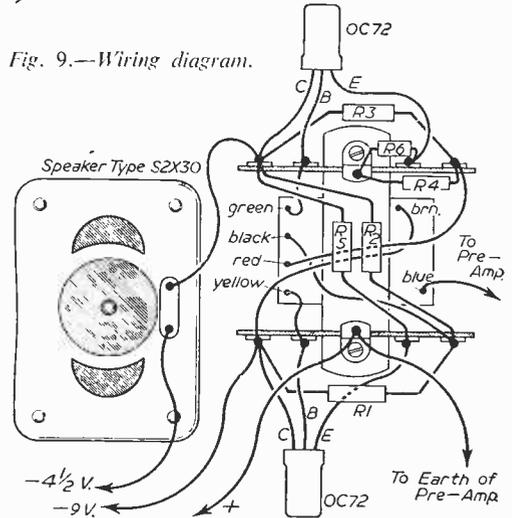


Fig. 9.—Wiring diagram.

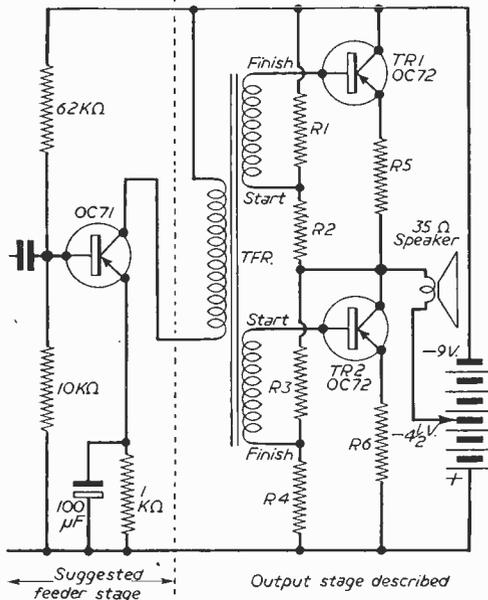
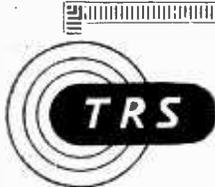


Fig. 8.—Circuit diagram showing connection to preceding stage.

these being colour coded for identification. They are connected to give inputs of opposite phase to the two bases. The brown lead, being the start of the primary winding, goes to the battery negative tag and the blue one is left free to take the input signal. A lead from one of the earth tags goes also to the earth line of preceding circuits. The various resistors are then wired in—there are no capacitors. Note that only one side of the speaker is connected to the tags; the other side goes direct to the 4½ volts point of the battery. The transistors are the last items to be soldered on to the tags and as this unit in its present form is only experimental the full length of leads of the OC72s is left on and these stand vertically upwards from the tags. To test this unit a 9-volt battery of the type once used for grid bias purposes (and presumably still used because they are still available) was used.

COMPONENT LIST FOR FIG. 8	
R1, R3—2.7 KΩ (or 6.8 KΩ and 4.7 KΩ in parallel)	} Dubilier ½ watt
R2, R4—100Ω	
R5, R6—5Ω (or two 10Ω in parallel)	
TR1, TR2—OC72 (Mullard).	
TFR—GX2078 (Belclere).	
SPEAKER—35Ω speech coil (W.B. type S.2 x 3).	

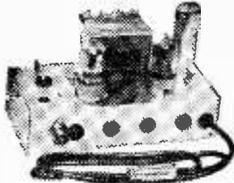


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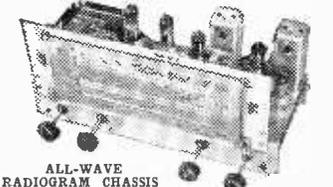
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5Z4	9 6	1E18 10 6
6AT6	8 6	1EAC80 9 6
6E7	6 6	1E18 11 6
6K8	8 6	1EBC41 10 6
6N7	8 6	1EAC83 9 6
6NS7	8 6	1EBC84 12 6
6V6	7 6	1ECP80 12 6
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6AG5	6	26	11	TP22	12
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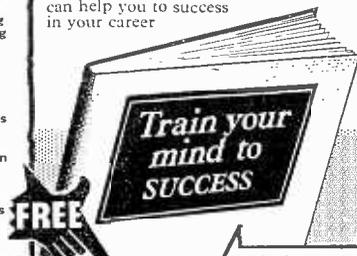
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A.C. PRE-TUNED SUPERHET

This Sensitive Receiver has Switched Tuning of One L.W. and Four M.W. Stations
By F. G. Rayer

PRE-SET receivers appear to have a wide popularity, and the superhet type of circuit has much to recommend it under present-day listening conditions. The circuit described here provides for the automatic selection of five stations, a rotary switch being employed. Such switches are readily obtainable (which may not always be the case with push-button types) and are in some ways easier to fit and wire.

The circuit, shown in Fig. 1, has one or two points worth noting. "Potted" aerial coils are used, with bottom-end coupling and an aerial filter circuit which isolates the aerial and prevents modulation hum of the type caused by faulty insulation of the aerial wire. This coil circuit is simple and selective. The frequency changer and I.F. stage follow usual design. All the valves are of the octal type and very readily obtainable. As no further A.F. amplification is required, a double-diode is used for detection and A.V.C. This was preferred to the use of a double-diode-pentode, in view of the cost of the latter and the difficulty sometimes experienced in obtaining it. A delay voltage is applied to the A.V.C. cathode. Without this, the A.V.C. action is too powerful and all stations are much reduced in volume.

A separate control is used for volume, as this has advantages in preset receivers. The on/off switch is also employed as a simple tone control. A valve rectifier is used as less hum is experienced with this type, with a given amount of smoothing, than with metal rectifiers. A .01 μ F condenser reduces the possibility of modulation hum here.

and hum on all stations is almost inaudible, even during silent periods.

All valves have 6.3 v. heaters, operated in parallel from a 6.3 v. transformer. This avoids the heat of a mains-dropper and the adjusting of this component which would be required if 25 v. .3 amp. output and rectifier valves were used for a .3 amp. heater chain.

Layout

The chassis is 6in. \times 10in. \times 2in. deep, and the positions of the major components will become apparent from Fig. 2. All the valveholder keyways should be situated as illustrated, to avoid wiring difficulty or errors.

The 8 plus 16 μ F condenser tags project through clearance holes and must on no account touch the chassis. A pair of $\frac{1}{4}$ in. holes under each I.F. transformer allows leads to pass through from these.

The selector switch requires five poles, and wiring is simplified if single-pole wafers are used, so that there are five separate wafers. One wafer can then be employed for each circuit position. Switches of this kind may be purchased new, and are also offered cheaply by various advertisers of ex-service equipment. One "way" or position is required for each station. The switch illustrated has six positions, one being unused. Unrequired tags may be left disconnected if a smaller number of pre-selected stations is required; or the tags can be wired to a gang condenser, for manual tuning, as will be explained.

This switch is fixed to a support bolted to the

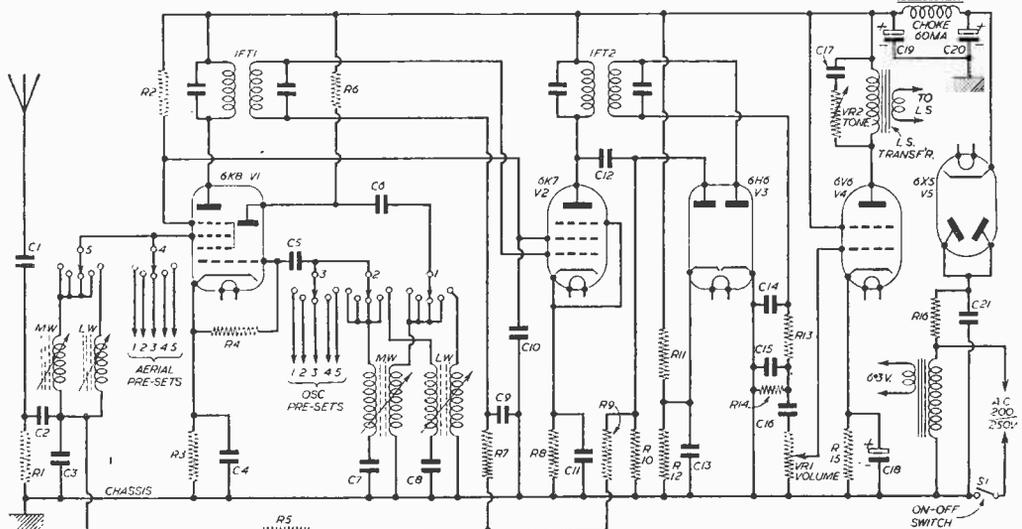


Fig. 1.—The circuit of the receiver.

front of the chassis and to a rear bracket, which also helps to support the preset condenser assembly. If the specified coils are used, the tag wiring will be as shown in Fig. 2. In case of difficulty, or when using other coils, the coil-maker's data and diagrams should be followed.

Selector Switch

Reference to Figs. 2 and 3 will clarify connections to this item. Wafer 1 is concerned with switching the anode circuit of the oscillator, and is wired to the 2,000 pF coupling condenser. In four positions the M.W. oscillator coil feedback winding is in circuit, the remaining position transferring to the L.W. coil. The second wafer switches the oscillator grid circuit in exactly the same way.

When wiring, it is helpful to connect the presets systematically, so that the pair in circuit at any switch position, is at once apparent. The left-hand one of each pair is for aerial tuning, and the right-hand one for the oscillator. Capacity effects, especially with a metal screw driver, will be much reduced if the top plate, in each case, is in the earth side of the circuit. All these tags are wired together, and to chassis.

The capacities given in Fig. 4 are most generally suitable, but in a few cases one or more of the condensers may require modification. For example, the $2 \times .005 \mu\text{F}$ condenser for the MW4 position is for the high-wavelength Third Programme. If the low-wavelength station is best received, 100 pF or 50 pF condensers will

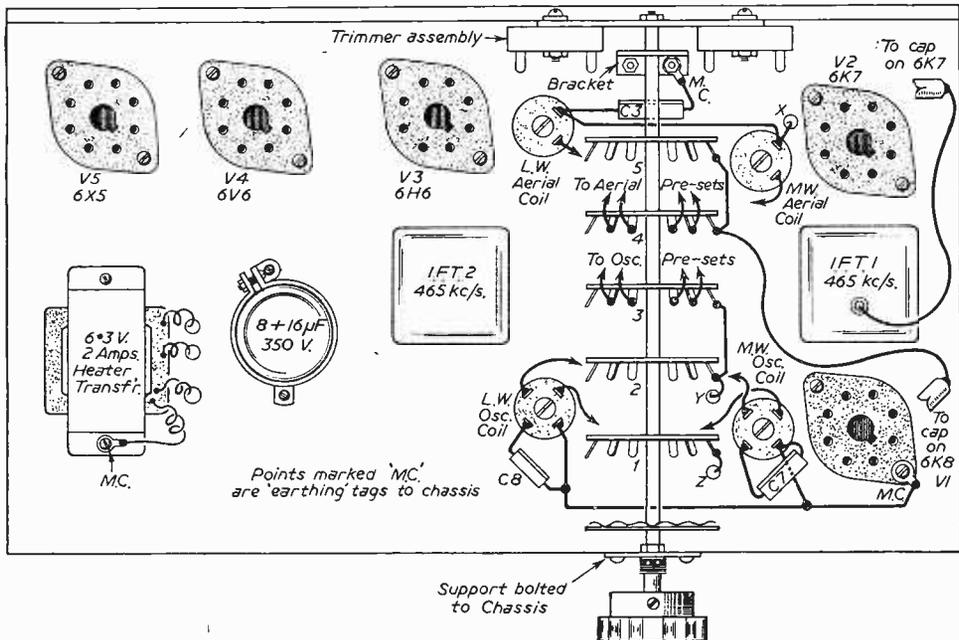


Fig. 2.—The layout on top of the chassis.

Wafer 3 selects, in turn, any one of the five preset oscillator tuning condensers.

The fourth wafer is employed for the aerial coil presets, while wafer No. 5 selects the M.W. aerial coil in four positions, and the L.W. coil in the last position. If Figs. 2 and 3 are studied these points should be immediately clear. If any doubt is felt about wiring, it is suggested the M.W. coils, with one twin preset, be wired up first and the receiver got into working condition. The other presets and L.W. coils can then be wired to the remaining switch tags.

The presets themselves are fitted at the back of the set, as shown in Fig. 4. Two strips, mounted vertically, support the larger condensers, which are bolted behind. A further strip across the top holds these rigid, and is in turn bolted to the bracket holding the back of the selector switch. The two small postage-stamp type trimmers are bolted to the top strip.

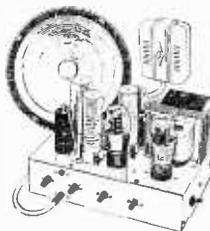
be necessary. Tuning throughout the whole of the band is not possible with $.0005 \mu\text{F}$ presets, because of their high minimum capacity. That is why smaller capacities are used for lower wavelength stations.

Underchassis Wiring

The primary of the first I.F. transformer is wired to 6K8 anode and H.T. positive. The secondary of this transformer is wired to the junction of the 100 K resistor and $.1 \mu\text{F}$ condenser, as shown. The remaining secondary lead issues from the top of the screening can, and is taken to the top cap of the 6K7.

In the second position, the transformer primary is wired to 6K7 anode and H.T. positive. The secondary is wired to the one diode of the 6H6, as shown, and to the junction of 50 pF condenser and 47 K resistor. It is essential none

(Continued on page 815)



**8-WATT AMPLIFIER
COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER**

A.C. mains 100-250 v. Size 10 1/2 in. x 6 1/2 in. x 2 1/2 in. Incorporating 6 valves, H.F. pen., 2 triodes, 2 output p.n.s., and rectifier. For use with all makes and types of pick-up and mike. Negative feed back. Two inputs, mike and gram., and controls for same. Separate controls for Bass and Treble lit. For use with Std. or L.P. records, musical instruments such as Guitars, etc.

Plus P. & P. 7 s. £4.19.6
Or 35 - dep. + P. & P. 7 s. and 3 monthly payments of 25 -

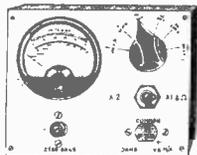
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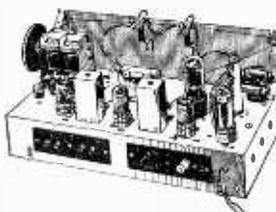
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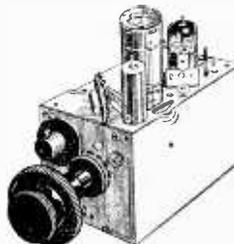
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TUNER**

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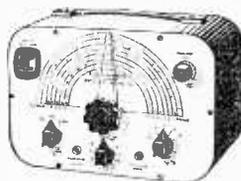


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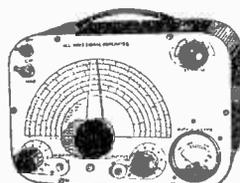


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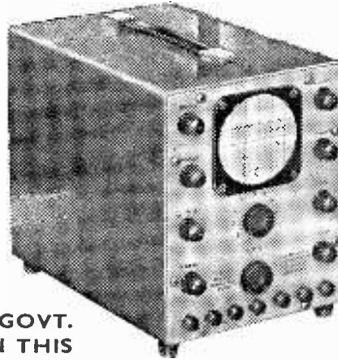
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of the transformer connections be confused or wrongly made.

All other points are perfectly straightforward. Connections marked "MC" are wired to the

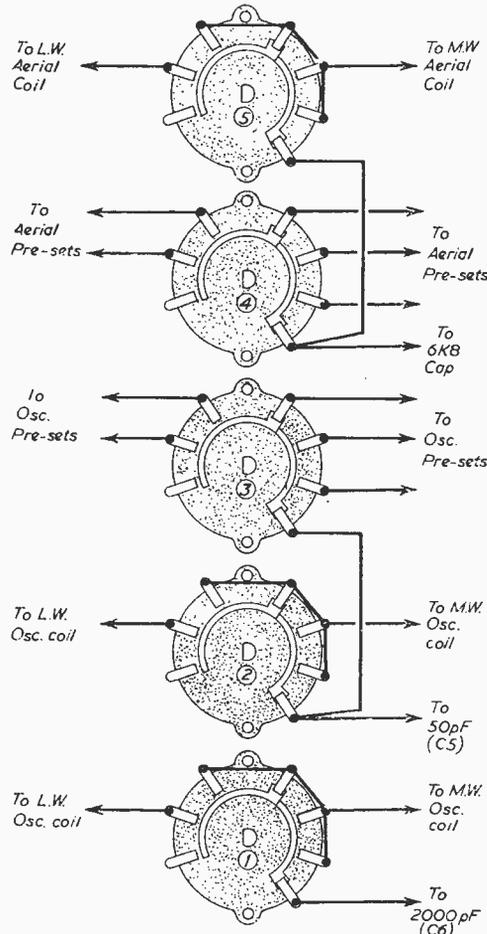


Fig. 3.—Wiring of the wafers of the selector switch.

chassis. In the case of the rectifier valveholder, two spare tags, marked "X," are used to anchor the mains leads. The lead, also marked "X," from the .01 μ F condenser passes through the chassis to the "earth" end of the coils as shown in Fig. 2.

Connections should be reasonably short and direct, and no bare joints, etc., should touch the chassis or other points in the set. Any wire of about 22 or 20 s.w.g. is suitable for wiring. Tinned-copper wire solders most readily, and an insulated sleeving can be slipped over where necessary.

If the filament transformer has various input points, for 200 to 250 v. mains, the tags or leads for the appropriate mains voltage are chosen. Unused leads should not touch the chassis or

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- 60 mA smoothing choke.
- 2 .465 kc s. I.F. transformers.
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- Condensers: 4 of 50 pF mica; 2 of .01 μ F, .05 μ F, .001 μ F, 750 v., and .01 μ F, 750 v., 5 of .1 μ F, 350 v., 2,000 pF, 8 plus 16 μ F, 350 v., 50 μ F, 50 v. bias condenser.
- 50-60 mA output transformer, ratio 45:1 for 2-3 ohm speaker.

other points, and may be bound with tape. The underneath wiring plan and alignment details will be described next month.

(To be continued)

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C1—.001 μ F (750 v.w.)	C21—.01 μ F (750 v.w.)
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C3—2,500 pF	R2—30K Ω
C4—.1 μ F	R3—300 Ω
C5—50 pF	R4—47K Ω
C6—2,000 pF	R5—100K Ω
C7—470 pF	R6—33K Ω
C8—150 pF	R7—100K Ω
C9—.1 μ F	R8—300 Ω
C10—.1 μ F	R9—1M Ω
C11—.1 μ F	R10—1M Ω
C12—50 pF	R11—100K Ω (1 w.)
C13—.1 μ F	R12—10K Ω
C14—50 pF	R13—47K Ω
C15—50 pF	R14—.5M Ω
C16—.01 μ F	R15—240 Ω (1 w.)
C17—.05 μ F	R16—100 Ω (1 w.)
C18—50 μ F	VR1—.25M Ω
C19—16 μ F	VR2—25K Ω
C20—8 μ F	

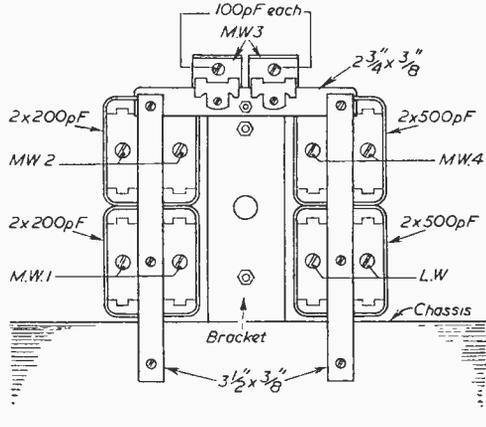


Fig. 4.—Mounting of the station trimmers.

Principles of Neon Tubes

TO-DAY THEY ARE USED IN MANY RADIO AND ELECTRONIC CIRCUITS

By E. G. Bulley

THE radio experimenter and constructor will find that neon devices are today being used in many radio and electronic circuits. Such devices are developments from the conventional neon lamp.

A neon device has two or more electrodes which are usually made from Swedish iron although nickel is sometimes used. The electrodes may be of various shapes; likewise the spacing between them and the gas pressure are also design parameters. The electrodes are sealed into a glass envelope and during the evacuation process this is filled with neon.

Operation of Neon Tubes

To appreciate the action of the neon, consider such a device which has two electrodes. By applying a voltage between these electrodes,

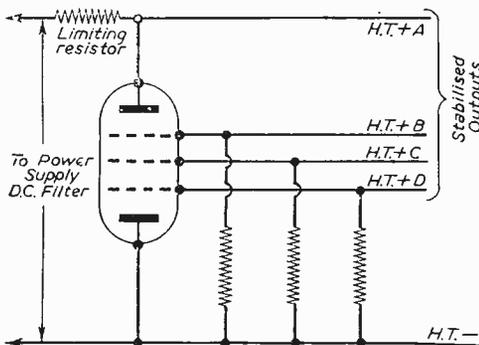


Fig. 1.—Circuit for obtaining several stabilised voltages.

nothing occurs until the voltage is sufficient to cause ionisation. This is a cumulative action which produces a glow discharge and is easily recognised by its reddish colour. When a discharge occurs, a current commences to flow through the device. Ionisation will not occur until the critical striking voltage has been reached.

Limiting Resistors

A neon device must have a suitable resistance in series with it and the voltage supply, otherwise, when the striking voltage is reached, it would be destroyed. The inclusion of the resistor limits the discharge current. The device has a characteristic similar to that of an ordinary electric arc, namely one of negative resistance.

Many neon lamps are fitted with a resistor within the base, enabling them to be operated directly from the mains supply. But for purposes such as voltage stabilisation, the resistor is separate from the device.

Voltage Stabilisation

Many neon devices are used today for voltage stabilisation, and are designed specifically for this purpose. One early type was known as the "Stabilovolt." This device had many electrodes so arranged that different stabilised voltages could be obtained from the one tube.

A basic circuit for such a device is shown in Fig. 1. The different stabilised voltages obtainable are represented by A, B, C and D. The advantages of the "Stabilovolt" are evident.

Other types of neons are available for voltage stabilisation. Many of these have only two electrodes. External resistors are necessary when incorporating these in any circuit, to limit the flow of current. The value of the resistor is dependent upon the maximum supply voltage as well as upon the ratio of the current through the load to the operating current of the neon tube. When calculating the value of the resistor, it should be ascertained that the value found will not cause the neon to be extinguished when the voltage across the tube falls to its minimum value. The maximum load current that can be stabilised is determined by the minimum and maximum values of the supply voltage.

It is, however, possible to operate two or more of this type of stabiliser in parallel in order to handle more load current.

Care must be taken to ensure that a resistor is included in series with each tube. This practice, although permissible, is not to be recommended as the stabilisation characteristic is affected.

A Basic Circuit

A basic circuit illustrating the use of a single neon stabiliser is shown in Fig. 2. The D.C. voltage output from the filter varies with the output current. As the voltage increases, the current through the limiting resistor and the neon tube increases, but the voltage across the neon tube remains constant from its striking point onwards to very nearly its maximum current rating. The current through the neon tube increases and the voltage drop across the limiting resistor also increases resulting in reduction of the D.C. supply voltage. Likewise, if the supply voltage reduces

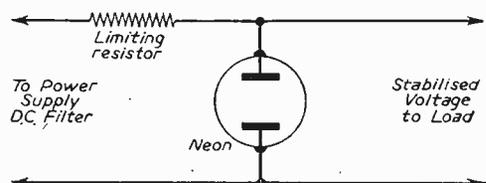


Fig. 2.—Basic circuit for a single neon stabiliser.

(Continued on page 820)



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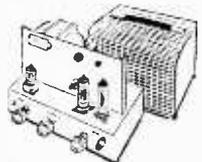
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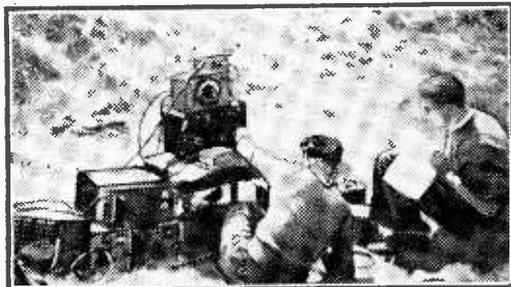
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Crystal Palace & District Radio Club Field Day.

WEST LANCES. RADIO SOCIETY

Hon. Sec.: A. Crighton, 77, Myers Road West, Crosby, Lancs.
DURING the recent 21st anniversary celebrations of the Borough of Crosby, the Rotary Club organised a "Crosby at Leisure" Exhibition.

The Society set up a "Top Band" transmitter in the Exhibition Hall, using a member's call sign, G3, IZT A (Mr. K. Coates), and 40 contacts were made, including three very interesting ones, with mobiles.

Recently the Society has acquired new accommodation at "Colonsay," Crosby Road South, the garden of which offers scope for the erection of a new antenna, which will spur on the reconstruction of the Club's transmitter.

During the last few months quite a few new members have enrolled, mainly schoolboys and young men.

A programme of Morse practice, lectures and, possibly, film shows is being prepared, commencing with "An Introduction to Receiver Alignment" by G3.FZG, and, later, practical demonstrations on the recently acquired equipment.

"Construction Nights" for the younger members and a "Panel" to discuss set questions are other interesting items to be arranged.

RADAR & ELECTRONICS ASSOCIATION

STUDENT Section at the Norwood Technical College, Room 214, Knight's Hill, London, S.E.27, at 7 p.m.
 1958

November 14th.—Operational use of Radio Aids for Navigation. Lt.-Commander R. B. Michell, D.F.C., F.I.N.

December 12th.—The Manufacture of Magnetrons and Klystrons. D. W. L. White, B.Sc. Eng.

1959
 January 9th.—"Television Wire Broadcasting." K. A. Russell, B.Sc., A.M.I.E.E.

February 13th.—Trends and Developments in Marine Radar. March 13th.—Radar Data Handling. Dr. L. C. Payne.

April 10th.—"A Modern British Marine Radar" (The B.T.H. 601 "Escort").

At the Royal Society of Arts, John Adam Street, London W.C.2, at 7 p.m.

1959
 January 26th.—"Zeta" "Nuclear Power and Fusion." Dr. D. W. Fry.

March 2nd.—Being arranged.

April 6th.—"Thermonuclear Research." Dr. T. F. Allibone, F.R.S.

May 22nd.—Annual Dinner, Connaught Rooms, Gt. Queen Street, London, W.C.

THE SLADE RADIO SOCIETY

Headquarters: The Church House, High Street, Erdington, Birmingham, 23.

Programme: Fourth Quarter, 1958

November 7th.—"Electronics in the Hospital," by Mr. R. Lightwood of the Department of Surgery, Queen Elizabeth Hospital, Birmingham.

November 21st.—Annual General Meeting.

December 5th.—Hi-Fi Demonstration (including Stereophonic) by Messrs. Altobass Ltd., Leicester.

December 19th.—"Fun and Games," presented by Messrs. L. H. Blackwell and G. L. Turner (Members).

The Club Station (G3JBN) at The Church House is available for the use of members for constructional purposes. Instructional Morse classes are held on every Tuesday and Thursday, at 7.45 p.m. Slow Morse transmissions are radiated on the air each Monday evening from Station G3AJJ on 1.9 Mc.s., at 8 p.m.

Visitors to the Society's meetings, which commence at 7.45 p.m. prompt, and to the Club Station, are cordially welcome.

Full particulars of the Society and its activities may be obtained from the Honorary Secretary, Mr. C. N. Smart, 110, Woolmore Road, Erdington, Birmingham, 23.

NEWS FROM THE CLUBS

HALIFAX & DISTRICT AMATEUR RADIO SOCIETY

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

AT the monthly meeting on October 7th, 1958, held at the Sportsman Inn, Ogdens, a very good attendance of members and friends heard a lecture by the Chairman, Mr. H. Makin (G3FDC), whose subject was "Receiver Construction."

Mr. Arthur Robinson (G3MDW) received from the Halifax Boy Scout Association "The Thanks Badge" for organising the local amateur station in last May's "Jamboree on the Air."

BURTON-ON-TRENT & DISTRICT RADIO SOCIETY

Hon. Sec.: D. J. Brown (G3CNT), The Old Vicarage, Newborough, Burton-on-Trent, Staffs.

OFFICIAL meetings are held on the second Wednesday of each month at 7.30 p.m. in the Club Room, Stapenhill Institute, Stapenhill Road, Burton-on-Trent, and there is an informal weekly "Club Night" also on Wednesdays intervening. The Club has its own "rig" and will shortly be operating on top band and 80 under its own call-sign.

The following programme has been arranged for November:—
 Wednesday, November 12th.—Judging of entries in the Tom Spencer "Constructor's Cup" Competition for home-built gear.

Friday, November 21st.—The Annual Dinner, 7.30 p.m. at the Station Hotel (next to Railway Station), Burton-on-Trent, tickets ten shillings each, available from the Secretary. Friends are cordially invited.

Sunday, November 30th.—A further D F Contest will be held, starting from the Swan Hotel, Trent Bridge, at 2 p.m. and finishing at 5 p.m. Tea and a Junk Sale will follow at The Royal Oak, Barton-under-Needwood. Friends from out of town are invited to participate and should please notify the Secretary a week in advance if they would like tea.

New faces are always welcomed at the Club.

TORBAY AMATEUR RADIO SOCIETY

Hon. Sec.: Geo. Western (G3LFL), 118, Salisbury Avenue, Barton, Torquay.

THE main topic under discussion by the twenty members who attended the October meeting was the progressive step taken by securing premises for our new Club Headquarters. All were appreciative of the fact that for the first time in our club's history, it would now be possible to practice construction and repair work and also a school for instruction for the R.A.F. could be brought into being.

The speaker was our President, W. Sodenham (G5SY), whose subject, "Transmission and Reception of U.H.F.," was very well received. Next month, the same speaker will continue with "Miniature Antennae for U.H.F." This will take place on Saturday, November 8th 1958, at the Y.M.C.A., Torquay, 7.20 p.m.

BRADFORD AMATEUR RADIO SOCIETY

Hon. Sec.: David M. Pratt, G3KEP, 27, Woodlands Grove, Cottingley, Bingley.

THE new session began with a lecture by D. G. Enoch (G3KLZ) on "Fault Finding Made Easy" on September 9th. P. J. Barowitz (G3LZW) will give a lecture and demonstration on "High Quality Sound Reproduction" on September 23rd, and on October 7th, there will be a lecture on "V.H.F. Equipment" by D. Skirrow (G3GFD).

The Society is again arranging a course for the Radio Amateurs' Examination at the Bradford Institute of Technology. Further details of this may be obtained from the Principal of the Institute. Meetings of the Society are held at 7.30 p.m. on alternate Tuesdays at Cambridge House, 66, Little Horton Lane, Bradford, 5. Morse Classes are held by arrangement before meetings. We welcome to our meetings all interested in radio and/or television.

Nov. 18 Communications receiver design and construction. H. Makin (G3FDC).

Dec. 2, Social evening.

Dec. 16, Resistor capacity bridges. A. R. Bailey, M.Sc. (G3JBN).

Dec. 30, Film show by courtesy of Mullard Ltd., and R.S.G.B.

CLIFTON AMATEUR RADIO SOCIETY

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

AT the Annual General Meeting held on September 12th the following were elected to serve as club officers for 1958-59: W. A. Martin (G3FVG), chairman; N. E. Moore, hon. treasurer; C. H. Bullivant (G3DIC), hon. secretary; E. Godsmark (G3IWL), R. Poppi, senior committee members; R. Schilling, junior committee member.

The Club Championship Cup and the Direction Finding Shield have been won this year by C. Hatfull (G3HZI). The Transmitting Field Day Trophy has been won by C. Bullivant (G3DIC).

(Continued on page 820)

Nine members of the Society are taking classes for the Radio Amateurs' Examination.

Meetings are held every Friday at 7.30 p.m. at the clubrooms, 225, New Cross Road, London, S.E.14. Details of membership can be obtained upon application to the Hon. Secretary.

SPEN VALLEY AMATEUR RADIO SOCIETY

THE season opened on September 17th with the Annual General Meeting. Officials elected:

President and treasurer: Mr. L. A. Metcalfe; vice-president and social secretary: Mr. J. J. Rose; secretary: Mr. N. Pride; committee: Mr. F. Varley (G2FCP), Mr. R. Tipping, Mr. J. Buckley.

Programme:

Nov. 11th (Tuesday).—Mullard Meeting and Film Show. St. Georges Hall, Bradford.

Nov. 26th.—Crystal Microphones. G. N. Newman, N.S.F., Keighley.

Dec. 10th.—High Fidelity Sound Reproduction. A. E. Falkus, B.Sc., Fane Electronics, Batley.

Jan. 7th.—Film Show.

Jan. 21st.—Bridge Circuits. S. Marsden.

Jan. 24th.—Annual Dinner. Kingsway Cafe, Dewsbury.

Feb. 4th.—Modern Methods of Record Reproduction. J. W. Thornes, Ltd., Dewsbury.

FEDERATION OF BRITISH TAPE RECORDING CLUBS

Hon. Sec.: R. Penfold, 48, Holbrook Lane, Coventry.

JUST recently, and especially during the first part of this year, a number of tape recorder owners have been gathering together in their towns, cities and districts in order to form local Tape Recording Clubs.

The purpose behind this activity is one of common interest and assistance. Tape recorder owners can meet with others under the auspices of a club and can enjoy not only a friendly social atmosphere but also the fruits of other enthusiasts' experiences in the two-fold field of recorder technique and recorder use.

BURY RADIO SOCIETY

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

THE Bury Radio Society holds its meetings on the second Tuesday of each month at the George Hotel, Kay Gardens, Bury.

Forthcoming meetings:

Nov. 11th.—Lecture on "Single Side Band." by Mr. R. Hammond (G2IG).

Dec. 9th.—A.G.M.

In addition to these meetings a class on "Radio Theory" is held every Tuesday at the George Hotel. These classes are intended to assist those preparing to take the Radio Amateurs' Exam.

COVENTRY AMATEUR RADIO SOCIETY

Hon. Sec.: A. Noakes (G2FTK), 4, Baron's Field Road, Coventry.

Monday, November 10th: "Radio Theory," by V. A. Dalkin, B.Sc.

Friday, November 14th: Annual Dinner, Fletchamstead Hotel.

Monday, November 17th: Lecture, by W. Grimbaldeston (G6WH).

Monday, November 24th: Social evening.

Monday, December 1st: Committee meeting.

Monday, December 8th: Open meeting.

Monday, December 15th: Junk Sale.

All meetings at 9, Queens' Road, Coventry at 7.30 p.m. In addition Morse classes are held every Tuesday at 7.30 p.m. G2FTK and the club room is open every Friday when club members are engaged on constructional work. The society recently had a resounding win in the annual all-band MARS CARS contest.

AT the Annual General Meeting of the Society, held on September 22nd, 1958, the following officers and committee were elected:

President: H. Chater (G2LU).

Vice-President: L. W. Gardner (G5GR).

Chairman: D. W. Harris (G3RF).

Vice-Chairman: P. H. Hawkes (G3LNO).

Secretary: A. Noakes (G2FTK).

Treasurer: J. Faldon.

Committee: A. Clements, H. Drinkwater, T. Saxton (G3LJR), K. Lines (G3FOH), A. Whitley (G3CZS), P. Yardley.

TEES-SIDE AMATEUR RADIO CLUB

Hon. Sec.: A. L. Taylor (G3JMO), 12 Endsleigh Drive, Middlesbrough, Yorks. Tel. 86933.

THE club recently had a lecture by Brian Wilson (G3LX9) on measurement of liquid and material levels in vessels, etc., by capacity changes effected in electronic circuits. Some small equipment was shown. These methods give remote indication of contents levels, warnings of full or empty bins, and so on at remote points, or on containers which are not readily inspected.

We had a tape from the Radio Society of Great Britain on Aerials which was loaned, complete with associated charts. This is one of the valuable services given by the Society.

On October 10th, Frequency Checking was discussed by A. L. Taylor (G3JMO), who showed how a 500 kc s crystal plus a chain of multivibrators could perform many functions in the shack, such as calibrating the receiver, stabilising the V.F.O., driving a clock, calibrating a scope and setting the Tx on as near the "band edge" as may be desired. A magic eye display unit to ensure band edge warning was explained, plus one or two circuits for harmonic amplification and a constant volume 800 c/s filter was discussed (no insertion loss).

We shall join the West Hartlepool Club for their pie supper on Monday, November 24th.

LONDON SHORT WAVE CLUB

Hon. Sec.: K. R. Piper (G3LOO), 2, Catherina Terrace, Stockwell, S.W.8.

THE London Shortwave Club is being reformed. Meetings will be held at the Battersea Men's Institute, the club forming part of the Institute's activities.

Meetings will be held weekly on Friday evenings, and as members will be members of the Institute, they will be able if they wish to take part in other of the Institute's activities. These include: elementary radio, advanced radio and R.A.E. course (at Honeywell school).

There will be no addition to the L.C.C. fee.

A full programme has been planned, to include a wide variety of lectures and demonstration sessions, and the club station will be available and active.

Interested persons should write to the above address in the first instance, so that some idea can be obtained as to the amount of interest in this proposal and an early informal preliminary meeting arranged.

PRINCIPLES OF NEON TUBES

(Continued from page 816)

in value then the current through the neon is decreased, which in turn reduces the voltage drop across the resistor resulting in an increase in the D.C. output voltage.

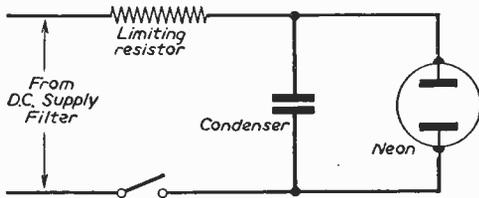


Fig. 3.—Circuit for a neon relaxation oscillator.

Other neon devices are available, one such that is manufactured in this country by Mullard is what is termed a voltage reference tube. Such

tubes provide a voltage reference which is accurate within very fine limits.

Neon lamps are today used as indicators and are to be found in much amateur and professionally built equipment.

An interesting application is the neon relaxation oscillator. A basic circuit for such an oscillator is shown in Fig. 3 and this produces a saw-tooth waveform. The neon tube provides the discharge path for the condenser.

A glass tube filled with neon at a specified pressure and containing no electrodes whatsoever, is often used to indicate the presence of R.F. especially at amateur transmitting stations.

The reader will find experiments with neon devices both interesting and fascinating. Many are still available on the surplus market, but the base can be removed from a conventional neon lamp and the limiting resistor cut out of circuit to provide a neon suitable for experimental purposes.

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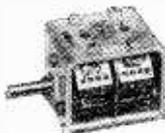
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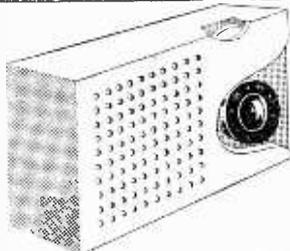
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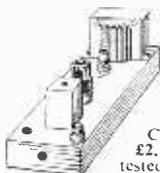


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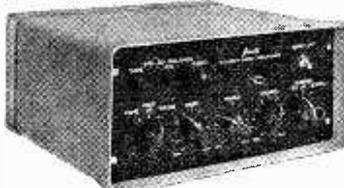
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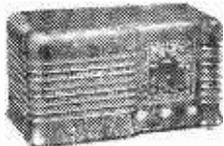
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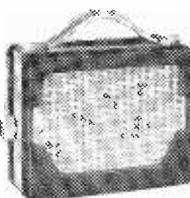
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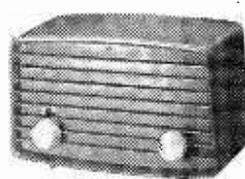
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TRANSRECEIVERS. Type "38" (Walkie-Talkie) complete with 5 valves, etc. New condition, untested by us, but serviceable, no guarantee. 22/5 each.

ATTACHMENTS for Type "38" Transreceivers. ALL BRAND NEW. PHONES, 15/6; THROAT MICROPHONES, 4/6; JUNCTION BOXES, 2/6; AERIALS, No. 1, 2/6; No. 2, 5/-; WEBBING, 4/-; HAVERSACKS, 5/-; VALVES, A.R.P.12, 4/6; A.T.P.4, 3/6. Set of FIVE VALVES, 19/- the set.

TRANSRECEIVERS. Type "18" Mark III. Two Units (Receiver and Sender). Six Valves. Micrometer, etc. Metal Case, Un-tested. No guarantee, but COMPLETE..... £2 18s. 6d.

ATTACHMENTS for "18" Transreceivers. ALL BRAND NEW. HEADPHONES, 15/6; HAND MICROPHONE, 12/6; AERIALS, 5/-; SET OF 6 VALVES, 30/-.

RESISTANCES. 100 Assorted useful values. New wire end, 12/6

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REMOTE CONTACTOR. For use with above. 7/6

MORSE TAPPERS. Midget Type, 2/9. Standard, 3/6. Heavy Type on Base, 5/6. ALL BRAND NEW.

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MAGNETS. Strong Bar Type. 2" x 1/2". 1/6 each.

PACKARD-BELL AMPLIFIERS. Complete BRAND NEW with Valves; Relay, etc., etc. 17/6 each.

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100, 250, 1,000V. (25kV. by
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Ohms 5%.

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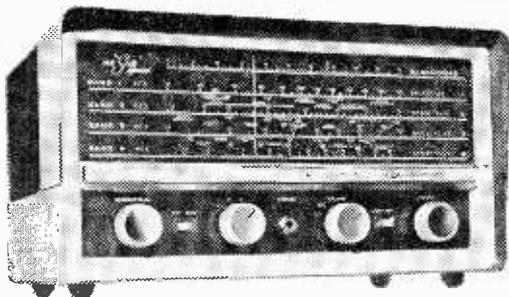
Telephone: Slough 21381 Cables: Taylins, Slough



News from the Trade

NEW SHORT-WAVE RECEIVER

THE rewarding result of lengthy research and intensive effort, the all-new NC-60 Special has been introduced by the National Company. This special short-wave receiver is described as "the first, all-new, low-priced short-wave receiver



A new low-priced short-wave receiver.

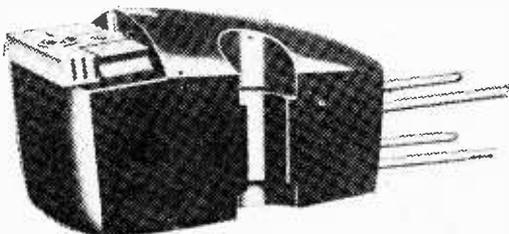
in more than ten years." The NC-60 Special covers .54 to 31 Mc/s in four bands and features full electrical bandspread on all frequencies; separate general coverage and bandspread tuning capacitors for each band; front panel phone output jack and a large, well-lighted dial scale with standard broadcast, amateur, aircraft, marine, WWV, CD and foreign shortwave frequencies clearly indicated.

The modern cabinet, finished in two-tone black and grey enamel, and measuring 7½ in. high by 8½ in. deep by 13¼ in. wide, is the work of Peter Quay Yang, noted industrial designer.

PICKERING'S NEW STANTON STEREO-FLUXVALVE CARTRIDGE

AFTER intensive development and testing, the superior features of the well-known "Fluxvalve" have been incorporated into this new stereo pickup—the Model 371 Stanton 45 × 45 Stereo-Fluxvalve Cartridge.

The Stanton 45 × 45 plays all microgroove records, either monophonic or stereophonic, equally well and automatically, without fuss or bother. Of truly miniature design, it will fit into all tone arms with standard ½ in. mounting centres. Performance assures a response flat within 2 db over the entire stereo recording range with complete absence of spurious resonance. This obviates



The Stanton Stereo-Fluxvalve Cartridge.

any possibility of groove-wall breakdown, thereby prolonging the "mint" condition of both record and stylus. Supplied with a .7 mil precision-polished diamond stylus, mounted in Pickering's exclusive "T-Guard" stylus assembly. Ideal for record changers, players and transcription tone arms using a stylus force from 4 to 6 grams for proper tracking.

The Stanton 45 × 45 Stereo-Fluxvalve has two balanced signal outputs for connection to the low mag outputs of a stereo-preamplifier (they may be connected in parallel for use with a conventional single-channel preamplifier). Output level is sufficient for all preamplifiers; no need to employ a transformer or other gain device. Exclusive "magnetic-discriminator" provides inter-channel isolation with negligible cross-talk.

Complete details and prices are available from Ad. Auriema, Inc., 85, Broad Street, New York 4, N.Y.

TURNER INTRODUCES NEW MULTI-USE MICROPHONE

THE addition of a new multi-use microphone, the 200 Series, to its line of microphones has been announced by The Turner Company.

According to the announcement, the new 200 Series is engineered to function as a hand, stand, desk or lavalier mike. This multi-use design feature allows dealers to fill a wider variety of orders from a smaller stock of microphones.

The 200 Series is available as a crystal, dynamic or ceramic. It can be used for broadcast, TV, public address, recording and amateur communications. The mike is die-cast zinc alloy with satin chrome finish, complete with 12ft. quality cable.

CALL SIGN TAGS

KAR KEE TAGS, 116, Commercial Road, Totton, Southampton, Hants, have for some considerable time been making key tags which take the form of the registration number plate of a car for owners to attach to the ignition keys.



Call sign tags for key rings.

They are now catering for the amateur radio enthusiast by making similar tags stamped with call signs similar to that shown in the illustration. They can be carried on a key ring or screwed on to the set. The tags cost 4s. each plus postage.

THE WONDERGRAM

CAMP BIRD INDUSTRIES LTD., Camp Bird House, Dover Street, London, W.1, have solved the problem of playing records without the need for a turntable. They have produced a battery-operated record player that plays all sizes

of record, and can be held in the palm of the hand.

It has two speeds, 33½ and 45 r.p.m., and selects the right speed automatically. There is nothing to switch, adjust or turn. The motor is of the permanent magnet type with centrifugal electric governor, which maintains constant speed between 6 and 4 volts, allowing for voltage drop.



The Wondergram.

The amplifier is of the three transistor type—single-ended push-pull Class B (no output transformer) for maximum efficiency. It has a ceramic pick-up, with matching transformer, the needle being sapphire tipped (semi-permanent).

The Wondergram measures 8½ in. × 4½ in. × 1½ in. and weighs 2 lb. It costs 14 guineas.

SPEAKER PRODUCTION

GOODMANS INDUSTRIES, LTD., Axiom Works, Wembley, Middlesex, inform us that they have ceased production of the Midax 400. This decision has been made because of the increasing popularity and demand for the Midax 650, mid-range pressure driven horn unit.

FIXED PROD VOLTAGE TESTER

A NEW fixed prod voltage tester has been introduced by the electrical equipment division of the Martindale Electric Co. Ltd., Westmorland Road, N.W.9. It will be of particular interest to linesmen and maintenance electricians, especially in works where there are mixed voltages.

STENTORIAN HIGH FIDELITY PRODUCTS

THE comprehensive range of Stentorian high fidelity products obtainable at a reasonable cost has been improved and extended. There is now a range of loudspeakers varying in size from 1½ in. in diameter to 18 in. in diameter and these units are available with a variety of cone constructions, speech coil impedances and magnet strengths to suit all requirements. Of particular interest are a 2½ in. loudspeaker with a rigid plastic chassis for portable equipment use and an 8 in. loudspeaker with 17,000 gauss magnet for

horn loading operation. The 10 in. and 12 in. range has been extended to include units with magnets of 16,000 gauss and the cone tweeter range now includes a medium priced unit of 3½ in. diameter.

Stereophonic reproduction requirements are met by a range of special cabinet speakers. The two sizes of column loudspeakers are already familiar and to these have been added a corner stereo reproducer, the special feature of which is a mechanically adjustable mid-range reproducer. The well-known range of breakdown cabinets is still available and has been augmented by the Prelude Major and the Prelude Horn Loaded cabinets supplied in fully assembled form.—Whiteley Electrical Radio Co. Ltd., Victoria Street, Mansfield, Notts.

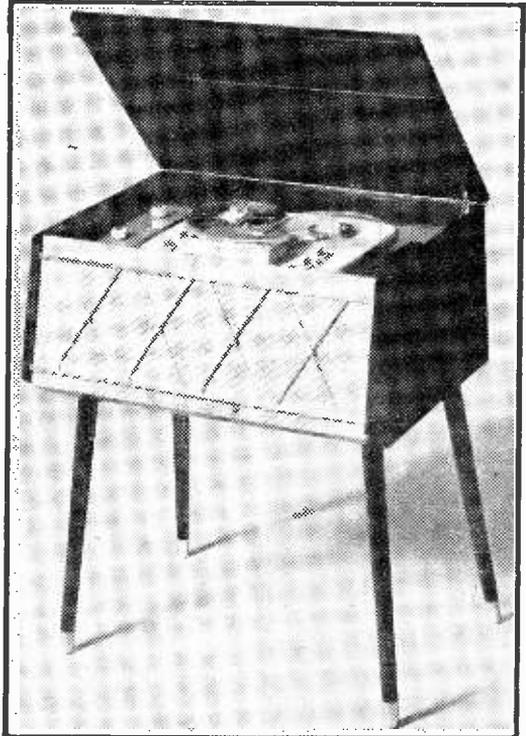
VERITONE VENUS

THE new Veritone tape recorder is fitted into an acoustically designed box finished in rich sapele mahogany with silk frontpiece and gilt fittings.

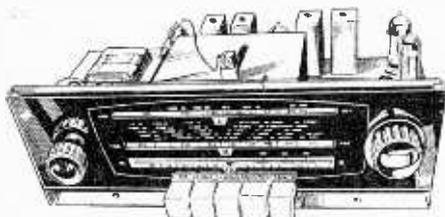
Separate record and playback amplifiers give facilities for playback (as distinct from monitoring) while recording and superimposing. Echo effects are also possible.

CHANGE OF ADDRESS

STAAR ELECTRONICS LTD., have now moved to 2, Princes Row, Buckingham Palace Road, S.W.1.



The new Veritone tape recorder.

WONDERFUL OFFER OF A.M.-F.M. CHASSIS AT £14 (P. & P. 10/-)

Why buy a F.M. Tuner at the same price? Tapped input 220-225 v. and 226-250 v. A.C. ONLY. Chassis size 15" x 6 $\frac{3}{4}$ " x 5 $\frac{1}{2}$ " high. New manufacture. Dial 14 $\frac{1}{2}$ " x 4" in gold, red and deep brown. Pick-up, Extension Speaker, Ac., E. and Dipole sockets. Five "piano" push buttons—OF, L.W., M.W., F.M. and Gram. Aligned and tested. With all valves. Covers 1,000-1,900 M.; 200-500 M.; 88-99 Mc's. Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85. Speaker & Cabinet to fit, polished, with back, 70". 10" x 6" ELLIPTICAL SPEAKER, 20".

TERMS:—(Chassis) £5 down + carr. and 5 Monthly Payments of 38/-, or with Cabinet and Speaker £6 down + carr. and 6 Monthly Payments of £2.

HIGH GAIN I.T.A. CONVERTER ONLY £4.7.6.
(3/- p. & p.)

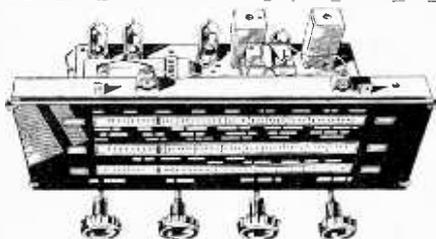
All areas, all sets except Philips' with only twin feeder input. Internal power pack; direct switching I.T.A. to B.B.C. NO ALTERATION TO YOUR SET. Fitted in 10 mins. Valves ECC81; fine tuner.

GENERAL PURPOSE AMPLIFIER using 6K6 and two 6K7 valves. Rexine carrying cabinet 13" high x 12" x 5". Two inputs, 4 controls. Vol. (1st input); vol. (2nd input); treble tone; base tone. 200-250 v. A.C. double-wound transformer; 3 w. from 8" speaker; metal rectifier. Bargain price of £4.15.0 (5/- carr.). Brand New, as are all goods offered by us.

BATTERY CHARGER, 1 amp. 6 v. and 12 v., £2.

EXPANDED METAL ALUM. GRILLES. 24" x 18" Only 5/- (p. & p. any quantity). 24" x 12 $\frac{1}{2}$ ", 3/9. (post 2/- any quantity).

ADMIRALTY TIMEBASE UNIT (unused) in cast box. 10 valves: 6 EF50 and 1 each VR54, VR92, VU120 and 5Z4G. Resistors (36), potentiometers (8), block condensers (4), etc. etc. New condition in original waterproof transit case. Only 52.6. Plus 7.6 carr.



OFFER OF RADIOGRAM CHASSIS. Chassis 13" x 7 $\frac{1}{2}$ " x 8" high. Covers 800-2,000 M.; 190-550 M.; 18-55 M. Mains trans. 200/210; 220/230 v.; 240/250 v. A.C.; Gram. socket and Aer. and Ea.; with o.p. trans.; 4 knobs: On-off/Tone; Vol.; W.ch.; Tune. With new Mullard valves: ECH81; EBF80; EF41; EL41; EZ40. Dial 13" x 5". ONLY £7.15.0 (7/6 p. and p.). Fully guaranteed.

LOUDSPEAKERS—VERY SPECIAL OFFER!—Rola 10,000 line (2-3 ohm), 3 $\frac{1}{2}$ " square, 15/- (1/-); 8" x 5" Celestion elliptical 20/- (1/6); 6 $\frac{1}{2}$ " circ. 14/6 (1/6); 5" circ. 13/- (1/6); 5 $\frac{1}{2}$ " with trans. 15/- (1/6); all 2-3 ohm. (p. & p. in brackets). BRAND NEW.

GLADSTONE RADIO

25. Wordsworth Road, Worthing, Sussex. Tel.: 235, and 3, Church Road, Redfield, Bristol. Tel.: 51207

AUTOMATIC RECORD CHANGERS COLLAR CONQUEST with manual play also. Turnover crystal pick-up, 4-speed, A.C. mains 200-250 v., see illus. ALSO Collar single player AC1554, 4-speed, turnover crystal pick-up with "T" head, £6.16.6 (3/6 p. & p.).



£8.15.0 5/- p. & p.

AERIALS. I.T.A. for clipping to existing mast 1" to 2" dia. or for wall mounting (state which), 3-element, 27" - 5-cl., 35/-; 9-cl., 55/-; combined single B.B.C. and 4-cl. I.T.A. with chimney lashings, 75/-; FM Aerials single dipole room mtg., 17/6; ditto loft mtg., 20/-; "H" with chimney lashings, 65/-. Co-axial low loss cable 8d. yard or 20 yds. 12/6, all these items carriage paid.

GRAMOPHONE AMPLIFIER with 5in. SPEAKER. On Fabric-covered Baffle 12 $\frac{1}{2}$ " x 5". Mains and Output Transformers, Metal Rectifier, ECL82 Valve. Tone and Volume Controls. On-off switch. Plenty of Volume. Fully Guaranteed. Two Knobs supplied. Ready to play. ONLY 69/- (Post 3/-).

BUILD YOUR OWN RECORD PLAYER AT COST OF £8.2.0. Rexine cabinet to take above amplifier, 42/- (post 3/6); B.S.R. Regent 3-speed single player to fit cabinet, 60/- (post 3/6); all items supplied separately. Carr. on all 3 items ordered together, 4.6. Completed player as above, £9.15.6 (carr. 4/6).

We regret that complete stock of UNIC shavers has been sold, but more expected in time for Christmas. (See Nov., P. Wireless.)

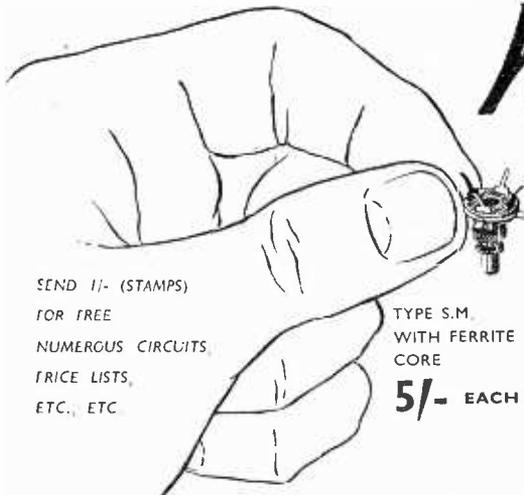
BATTERY ELIMINATOR. Converts your Battery Set to Mains. For 4 Low Consumption Valves (DK96 range). 90 v. 15 ma. and 1.4 v. 250 ma., 42/6 (2/6 post). 200-250 v. A.C. Size 5 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ " x 2".

Send 6d. (stamps will do) for our illustrated catalogue of the above items and others.

Posted Orders to Worthing, please. Delivery by return.

Terms:—One-third down and balance plus 7/6 in four equal monthly payments. Postage with down payment. (C.O.D. 2/- extra.)

SEE SPECIAL TERMS FOR AM/FM CHASSIS.



SEND 1/- (STAMPS)
FOR FREE
NUMEROUS CIRCUITS
PRICE LISTS,
ETC., ETC.

TYPE S.M.
WITH FERRITE
CORE

5/- EACH

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**SUB-MINIATURE
HIGH Q COIL
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for **SUPERHET—T.R.F.—
TRANSISTOR CIRCUITS**

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Dept. P.W. 29, 418, BRIGHTON ROAD, SOUTH CROYDON,
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Sound, Sonomeg, Tru-
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Radio Centre Ltd.

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Telephone : MUSeum 6667

Programme Pointers

OUR CRITIC, MAURICE REEVE, REVIEWS SOME RECENT PROGRAMMES

Oliver Cromwell

IT is three hundred years since the death of Oliver Cromwell, one of the very greatest men in our national history. So one would expect a celebration programme on the radio. Those who like serious subjects treated seriously were not disappointed with *Oliver Cromwell, A Conversation*, written by Maurice Cranston and produced by Douglas Cleverdon.

The conversation took place between four other great men, contemporaries of Oliver, namely, Hobbes (Felix Aylmer), Marvell (Marius Goring), Evelyn (Hugh Burdon) and Aubrey (Robert Eddison). Bernard Miles contributed the voice of the Lord Protector. I enjoyed every minute of it. Each actor spoke his lines perfectly, and they contained many ideas on what Oliver might have done if he had been alive in more recent times.

A Debate

A well-arranged debate on the disturbances in Notting Hill and Nottingham, followed by further discussion of the problem in *At Home and Abroad*, was put on as a special feature and substituted for the advertised programme. Some alarming facts were revealed. They were discussed dispassionately and objectively, and the opinions of local residents were heard. It was most interesting and informative.

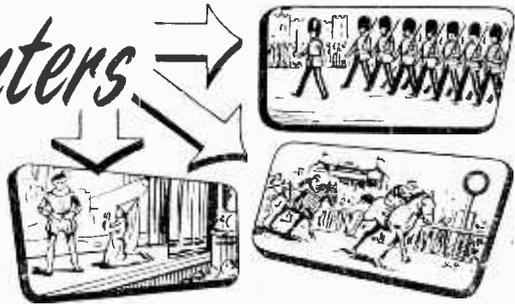
Out and About

It is a pity that the Saturday afternoon programme *Out and About* cannot keep more closely to its advertised timings. This too often presumes that the finish of a certain event will be wanted by a majority of listeners instead of what the *Radio Times* gives out. Cricket was a particular sufferer all through the summer to the advantage of Wimbledon tennis and athletic meetings in particular. Some fans may be glad, of course, but it seems more than likely that an annoyed listener will be created for every happy one.

Ivor Novello

The decision to give two separate hours to *The Ivor Novello Story* no doubt accurately assesses the popularity of the late maestro. That he was a "genius of the theatre" only prompts the questions "What theatre?" and "What is genius?" Let us rather say he was a purveyor of melodic sentiments, and lyrics that charmed all who heard them and gave limitless pleasure to very many thousands.

As radio entertainment *The Ivor Novello Story* was excellent material, all the old tunes



were there and all the old memories. The laudatory remarks of friends—on which this series is largely based—were there, too; and good it is to know that memories are not always as short as they seem.

Ted Kavanagh

The death of Ted Kavanagh removed the best wisecrack script writer radio has ever had. Only one or two others can claim the right to be even mentioned in the same breath. As with the Chaplin comedies in filmland, the best of the Itma programmes marked a high water line which radio comedy had not reached before and has not reached since.

Anthony Hopkins

To those with even just a little knowledge of the standard classics of music, Anthony Hopkins' Sunday afternoon dissections are, with those of Edward Sackville-West, the best now before the public. He has, to a greater degree even than Sir Walford Davies had, the ability to show us the smallest parts of a piece of music just as if they were concrete things. Four-thirty on a Sunday afternoon is an appointment well worth keeping.

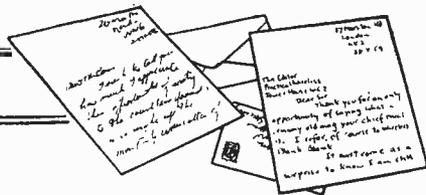
Desert Island Discs

Our music critic indulged recently in some strictures on the *Desert Island Discs* programmes. One felt that he took them a little too seriously and not sufficiently as the entertainment they undoubtedly are meant to be. After all, the idea behind the series can only be another way of asking people what their favourite works are and their preferences for various styles of entertainment. There is no need to make a mountain out of a molehill. I have, however, often been surprised at some of the interviewees' choices to the extent of wondering whether they were "put up jobs." Some degree of control is bound to be exercised to avoid certain famous works of universal appeal being chosen with too great a frequency.

Beyond Our Ken

"Advice to a water diviner—leave well alone," was another "joke" which failed to make me revise my original opinion of the Kenneth Horne show *Beyond Our Ken*. Another warned him, on walking into a tent, not to do so as he might "be arrested for loitering with intent!" If this sort of thing is beyond our ken, it is also beyond us to know how it can be put over every week.

Open to Discussion



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

Circuit Wanted

SIR.—Can any of your readers suggest a circuit employing two Eddystone coils, say, one aerial and one anode. I wish to use up a twin set.—V. J. R. (Staffs).

No Long Waves

SIR.—In reply to Mr. M. A. Bushell (November issue), long waves are a necessity in many parts of the country, especially in hilly areas where no local transmitter exists. The M.W. signal is greatly attenuated owing to local conditions, and the L.W. may be the only usable waveband, for instance, for the Light Programme. Manufacturers therefore cater for largest sales.—C. J. JONES (Coatbridge).

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.

Stereo Gramophones

SIR.—Concerning the Marquis of Donegall's paragraph on stereo gramophones (November, 1958, issue, page 733), the word "stereogram" is already in the Shorter Oxford Dictionary which defines it as "A diagram representing a solid object on a plane," or as equivalent to "stereograph," the pair of pictures used in a stereoscope. These two uses of the word, which dates back to 1866, are in accord with the "solid drawing" meaning of its Greek elements. Unfortunately, this cannot be said of the new usage which Decca have applied to "stereogram," which is presumably a contraction of "stereogramophone." I suggest that "stereophone" would have been preferable, although even this word has probably been used for something else in the past. (It is not in the Shorter Oxford Dictionary).—E. R. WOOD (London, S.W.1).

Electronic Organ

SIR.—I was particularly interested in Mr. Woodcock's organ as described in the August issue, for in the winter of 1929-30 I built a very similar type from a reed organ. I had heard, for the first time, the harmonica played through a microphone and amplifier and was struck by the volume and depth of tone produced, so I really experimented to amplify a small reed organ for use in a medium sized hall, with a choir. I should say a small harmonium, for in a reed organ the notes are operated by drawing air through the reeds, whereas the harmonium has bellows and an air chamber and is capable of producing a good sustained note while the reed, American, organ

is not. For microphones I used two small balanced armature loudspeakers, one at the extreme bass and the other in the treble, and they worked very well. In fact this little organ was quite successful, and if we had not got the much boosted Hi-Fi amplifiers of to-day, it was possible to build quite a good one even then. (See my article "Amplifier Progress," May, 1957, PRACTICAL WIRELESS.) Volume and quality were good, so much so that I added tone changes, etc., the speakers were one 14in. mains energised, moving coil and one horn type, a straight horn 6ft. long! There were snags, one being that although I lined the reed chamber with felt an inch thick and had an elaborate silencer for the air escape, the reeds could still be heard when the amplifier was switched off, this was an amplified and not an electronic organ. So later I made every reed one plate of a condenser microphone and an adjustable stud the other. The capacity change due to the vibrating reed produced the frequency together with a certain amount of overtone from the reed. I have never found the oscillating valve type of organ produce the same quality.

Perhaps the foregoing will give other readers ideas.—R. H. COWMAN (Thetford).

Service Frequencies

SIR.—Many newcomers (and regular SWLs) do not know the frequencies (S.W. and V.H.F. and U.S.W.) covering other than entertainment, news, etc., broadcasts. Perhaps you could indicate in your columns the approximate frequencies used by Aviation, Police, Fire, etc., services.—D. O'BRIEN (Dublin).

[For many reasons it is undesirable to make these public.—Ed.]

Speaker Enclosure

SIR.—I, too, built the speaker enclosure designed by Arthur Adams. I would, however, suggest to our friend from Hove (September issue) that if he wishes to hear all that his enclosure is capable of, he should follow my lead and place a Stentorian HF1214 in the bottom as the bass speaker and in the top chamber, facing forward, a Stentorian T816, with a 1,500 cross-over unit.

I placed two LPH65's wired in series through

(Continued on page 831)

C.R.T. ISOLATION TRANSFORMER
 Type A. Low leakage windings. Optional 25% and 50% boost on secondary. 2 v. or 4 v. or 6.3 v. or 10.8 v. or 13.3 v. with mains primaries ... 12.6.
 Type B. Mains input. Multi Output 2, 4, 5.5, 7.5, 10 and 13 volts. Boost 25% and 50%. Low capacity ... 21.-
 Type C. Low capacity transformer for 2 volt Tubes with falling emission. Mains Primary. Output 2-21-23-25 volts at 2 amps, 17.6.

TRIMMERS, Ceramic. 30, 50, 70 pf. 8d. 100 pf. 150 pf. 1.3 250 pf. 1.6 500 pf. 750 pf. 1.8.
 RESISTORS. Preferred values. 10 ohms to 10 meg. 1 w. 4d. 1 w. 6d. 1 w. 8d. 2 w. 1.-
 HIGH STABILITY. 1 w. 1p. 2 - Preferred values. 100 Ω to 10 meg. Ditto, 5p. 100 Ω to 23 meg. 0.8d. 5 watt } WIRE-WOUND RESISTORS (1.3
 10 watt } 25 ohms-10,000 ohms (1.6
 15 watt } (2
 5,000 ohms-50,000 ohms. 5 w. 1.9 10 w. 2.3.

12/6 PURETONE RECORDING TAPE
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 DITTO, 250-0-250 ... 22.6
 DITTO, 250-0-250 ... 22.6
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 SMALL. 250-0-250, 50 mA., 6.3 v. 3A., 17.6
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6D6	7 6 12BE6	10 6 EBF92	5 6 1U642	10.6
6D6	7 6 12K7	8 6 EBF22	5 6 1P41	10.6
6D6	8 6 12Q7	8 6 EBF40	10 6 1U41	10.6
6D6	8 6 12A17	9 6 EBF50	12 6 1U41	10.6
6D6	7 6 12Z4	9 6 EBF40	10 6 1U42	10.6
6L7	8 6 80	10 6 EBF80	9 6 V105	8.6
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 465 Kc a Slug Tuning Miniature Can. 2 1/2in. x 1 1/2in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.
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2 450 v. 2.3	8 + 8 200 v. 4.6	16 + 16 450 v. 5.6
4 450 v. 2 -	16 + 16 300 v. 5.6	25 + 25 450 v. 5.6
6 450 v. 2.3	30 - 2.3	30 - 25 350 v. 4.6
8 500 v. 2.6	CAN TYPES	32 + 32 450 v. 6.6
16 450v. 3.6	Clips	50 + 50 350 v. 7.6
16 500v. 4 -	16 500 v. 4 -	60 + 100 250 v. 11.6
32 450v. 5.6	32 450 v. 4 -	60 + 200 275 v. 12.6
25 25 v. 1.9	64 250 v. 5 -	100 + 200 350 v. 12.6
50 25 v. 2 -	50 12 v. 3 -	1,000 - 1,000 6 v. 5.6
50 50 v. 2 - 1.8	16 450 v. 5 -	

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGE. K2 25 2 kV. 5 -; K3 40 1.2 kV. 7 -; K5 45 2.5 kV. 6.6; K5 50 1 kV. 8 -; K3 100 5 kV. 14.6; 50 p.p.s. voltage, 50% of above.
MAINS VOLTAGE INDICATOR 300 v. 85 mA., 7.6.
CONTACT COOLED 250 v. 50 mA., 7.6; 90 mA., 8.6; 85 mA., 9.6. 148A1-28-27.6.
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FERRITE ROD AERIALS. M.W. 8; M & L. 12.6.
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FERRITE ROD 7in. x 3 1/2in. dia., 2.6.

JASON F.M. TUNER COIL SET, 98 - H.F. coil, aerial coil, Oscillator coil, two I.F. trans. 107 Mcs. Ratio Detector and heater choke. Circuit book using our 6AM6, 2.6.
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WAVECHANGING SWITCHES
 2 v. 4-way, 2 water long spindle ... 8.6
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 2 p. 6-way, 4 v. 2-way, 4 p. 3-way long spindle ... 3.6
 3 p. 4-way, or 1 p. 12-way long spindle ... 3.8
VALVE HOLDERS. Fax. Int. Oct. 4d. EBF50, D450, 6d. D12A, CRT. 1.3. Eng. and Amer. 4, 5, 7, 8 and 9 pin. 1.-
MOULDED MAZDA and Oct. 6d. 17.6, B4A, B84, B9A, 9d. B7G with csn., 1.6. B9A, C and 2.6. CERAMIC EBF50, B7A, B9A, Int. Oct. 1.-. B7G with csn., 1.9.

EXCLUSIVE OFFER OF THE R.107

THE ARMY'S FINEST COMMUNICATIONS RECEIVER

Just purchased from the Ministry of Supply, this magnificent 9 valve 3 Wave-band receiver gives World Wide Reception over a coverage of 1.2-17.0 Mc/s (18-25 metres), taking in several important Amateur Bands, Shipping Band and part of the Medium Wave-band, including the B.B.C. Light Programme, sensitivity is 1 micro-volt on CW, and 2-6 micro-volts on RT. The controls include a Bandwidth Switch ("Wide" or "Narrow"), choice of A.V.C. and B.F.O. Audio Filter, R.F. Gain, Aerial Trimmer. Has built-in Output Stage with Internal Speaker, which can be switched out to use Headphones. Uses normal international Octal Valves. Incorporates A.C. Mains Power Unit for 100-250 volts and Vibrator Pack for 12 volts D.C. In Grey Metal Case size 24" x 13" x 17". In brand new condition. Thoroughly checked and aerial tested before despatch.

COMPLETE. READY TO SWITCH ON. £13.10.0. (Carriage 20 - England and Wales, rest of U.K. extra.) Or for callers only, we still have some of the used receivers previously advertised at £8.19.6.

TRAWLER BAND R1155s.

The latest version of this famous Communications Receiver to be released by the Air Ministry. Covers 5 wave ranges: 18.5-7.5 Mc/s., 7.5-3.0 Mc/s., 3.0-1.5 Mc/s., 1.5 Mc/s-600 Kc/s., 500-200 Kc/s. As used by Coastal Command, Air-Sea Rescue Launches, etc. All sets thoroughly tested and in perfect working order before despatch, and on demonstration to callers. Have had slight use, but are in excellent condition. ONLY £19 19 6. "B" Models also available. As above but instead of 3.0-1.5 Mc/s. band has 200-75 Kc/s. coverage. ONLY £7 19 6.

A.C. MAINS POWER PACK OUTPUT STAGE, in black metal case, enabling the receiver to be operated immediately, by just plugging in, without any modification. Can be supplied as follows: WITH built-in 6in. P.M. speaker, £5 5 -, LESS speaker, £4 10 -. With 8in. P.M. speaker, £6 10 -. DEDUCT 10 - IF PURCHASING RECEIVER AND POWER PACK TOGETHER.

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Made for Anti-Aircraft Command and just released by Ministry of Supply. Manufactured by A. C. Cossor in 1952, this is a First Grade L.F. Oscilloscope incorporating a Hard Valve Time Base, with existing speeds of 1.5-40 milliseconds, but is easily converted at a cost of a few shillings to produce speeds of 3 cycles per second to 30 Kc/s. Has High Class Amplifier with Fine and Coarse gain controls, plus Brightness and Focus controls, and X and Y shifts. Conservatively rated Mains Power Pack is for nominal 115 v. and 250 v. input, and is adequately fuse protected in all circuits. Tube employed is 2In. AC910. Will make up into an ideal workshop or servicing oscilloscope. Has grey and black engraved front panel size 19in. x 7in., depth of unit being 12in. In heavy steel transit case, in which it can be used, or removed for standard 19in. rack mounting. Complete with leads and suggested modification data. BRAND NEW. ONLY £12 10 - (carriage 15/-).

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Manufactured for the Admiralty in 1952 by Burndept, this utilises 4 valves, 1 each 5Z4G - 6V6G - 6J7G - 6J5G, and high quality components such as "C" Core Transformers and Black Paper Smoothing Condensers. Has A.C. Mains Pack for nominal 110-250 volts. Provision for 600 ohms or High Impedance Input, and has Output to 600 ohms Line. For normal use only requires Changing Output Transformer. Can be used for Speech or Music, giving High Quality Reproduction. Output approximately 4 watts. Enclosed in metal case, and designed for Standard 19in. Rack Mounting, having grey front panel size 19in. x 7in., with Chromium Handles. All connections to rear panel, front having "On Off" Switch, Gain Control, Indicator Light, Fuses and Valve Inspection Panel. BRAND NEW IN MAKER'S PACKING. ONLY £4 9 6 (carriage 10/6).

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Ferrite Slab Aerials Type FS2. Designed for Long and Medium Wave reception with transistor portable superhet receivers. Slab size 5 1/2 in. x 3 in. x 5/32 in. Complete with fixing brackets, 13/6.
Combined Oscillator and 1st I.F. transformer Type OT1. 13/16 in. sq. x 1 1/4 in. I.F. Frequency 315 Kc/s., 11/6.
2nd I.F. Transformer (315 Kc/s.) Type TT2. 5/-.
3rd I.F. Transformer (315 Kc/s.) Type TT3. 5/-.
I.F. Transformers enclosed in iron dust pots with slug tuning.
Push Pull Interstage Transformer Type TT4. Ratio 1 : 1 C.T. Stack size 1 1/2 in. x 1 1/16 in. x 7/16 in., 8/6.
Push Pull Output Transformer Type TT5. Ratio 15 : 1 C.T. Size as TT4. Matched to 3 ohm speaker, 8/-.
MINIATURE RANGE.—For pocket receivers.

Ferrite Slab Aerial Type FS3. Medium Wave only. With fixing grommets. Size 3 in. x 3 in. x 5/32 in., 7/6.
Oscillator Coil Type X08. Medium Wavs only. Overall size 1 in. dia. x 1 in. Enclosed in Ferrite pots, 5/-.
I.F. Transformer Type XT6. Suitable for 1st and 2nd I.F. 455 Kc/s. Size 3/4 in. sq. x 1 1/16 in., 10/-.
I.F. Transformer Type XT7. Designed for 3rd I.F.T. or detector I.F.T. 455 Kc/s. Size as XT6, 10/-.
Push Pull Interstage Transformer Type TT9. Ratio 1 : 1 C.T. Radiometal Core. Size 3 in. x 3 in. x 13/32 in., 12/6.
Push Pull Output Transformer Type TT10. Ratio 8 : 1 C.T. Matched to 3 ohm speaker. Size as TT9, 12/6.
Practical and Theoretical circuits enclosed with each Repanco Transistor Component.

JUST RELEASED. "THE MAJOR-7" a new portable transistor receiver. Size 9 in. x 7 in. x 4 in. Send 1/9 P.O. for instructions.

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a 4 μ F condenser to face upward through a large fret in the top of the upper compartment. The whole effect is to make the sound appear in the room instead of in the enclosure.—D. G. WADE (Newcastle).

Car Radio Interference

SIR.—In his article on the suppression of car radio interference (October, 1958), Mr. F. C. Palmer mentions that the "S.W." on an ignition coil represents "secondary winding." This is incorrect, the secondary winding being connected between the case of the coil (earth) and the distributor lead. The "SW" terminal (meaning switch) is connected via the ignition switch to the battery.—J. R. M. YEOMAN (Somerset).

Long Waveband—Is It Wanted?

SIR.—I was surprised at the statement made by M. A. Bushell of Gravesend, in your November issue, to the effect that there is no programme value in the long waveband that cannot be obtained on M.W. Surely he must be aware that in certain parts of the country the Light Programme is practically unobtainable on 247 metres and is subject to fading and interference in other areas, as is the case locally.—G. FOOKS (Bridport).

SIR.—I have read the comments of M. A. Bushell (Gravesend), on the subject of No Long Waves in "Open to Discussion" PRACTICAL WIRELESS, November, 1958.

It may interest Mr. Bushell and others, to know that thousands of people in the West Country and probably elsewhere, are unable to receive the Light Programme except from the long waveband transmitter on 1,500 metres.

Radio receivers manufactured in this country, and published designs, which do not include the long waveband are of little interest to the large number of people who have to rely on the long waveband for full BBC coverage.—S. E. ADDIS (Minehead).

Beginner's Constructional Course

SIR.—May I congratulate you and Mr. King on your "Beginner's Constructional Course." The instructions are simplicity itself to follow. I constructed the 3-valve receiver progressively, as Mr. King does, and obtained excellent results each time.

The 1-valve receiver, early in the morning and tuned to the BBC European service, had enough power to work a speaker. When using a balanced armature earpiece the speech could be heard 10ft. away. I was even more amazed at the sensitivity of the 3-valver, as it operated the loudspeaker at good volume with only 6in. of wire for the aerial. Even at midday it requires only a few feet to work it. Have any other readers experienced such good results?—M. J. REDMAN (Brighton).

The R.F.24 Coverage

SIR.—With reference to the letter of D. Jones of Wales (September issue), the R.F.24 has

switched tuning centred on five frequencies between 20 and 30 Mc/s.

- These are:
- Switch position No. 1 22.0 Mc/s.
 - Switch position No. 2 22.9 Mc/s.
 - Switch position No. 3 25.3 Mc/s.
 - Switch position No. 4 27.3 Mc/s.
 - Switch position No. 5 29.7 Mc/s.

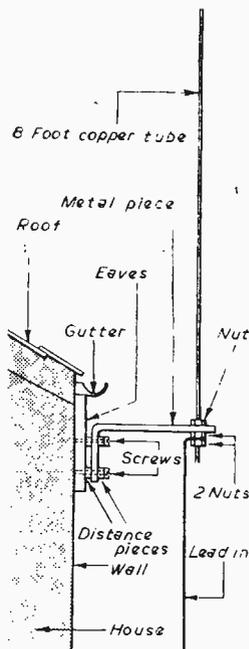
This converter is designed to be used with an I.F. of 7.5 Mc/s.—J. C. CARMICHAEL (Ayrshire).

Making an Outside Aerial

SIR.—The appended sketch shows a simple and efficient aerial I recently made. The material required is:

- One piece of copper tubing 8ft. \times $\frac{1}{2}$ in., 1 piece of metal 14in. \times 1in. \times $\frac{1}{2}$ in. (approx.), 4 distance pieces (rubber, etc.), 2 screws, 3 nuts.

Take the piece of metal and bend to shape, then bore three holes $\frac{1}{4}$ in. dia., two to take the screws to fix to the eaves and one hole to take the copper tubing. Cut threads on one end of tubing and thread on a nut, then slip through the metal and put on second nut. Mark position on the eaves and, with the distance pieces in position, screw on. All that remains to be done is to connect the lead-in and put on the remaining nut and you are ready for receiving.—I. STILL (Aberdeen).



Details of the aerial designed by Mr. I. Still.

Ex-Service Reference Numbers

SIR.—I would like to know if any of your readers could supply me with lists of data of ex-service reference numbers, together with their representations of components, etc. As an example, I would like to know the value of an ex-W.D. volume control (Reference No. 10c/8676). I have a lot of components marked like the above, but no values or identifications as to what they are. I would appreciate data, etc.—IAN HETHERINGTON (Sheffield).

"Car Radio Interference"

SIR.—I should like to point out an error in Mr. F. C. Palmer's article on "Car Radio Interference Suppression" in the October issue. He states that the letters S.W. on the ignition coil represent the "secondary winding." This is not so; it represents "switch" and is connected

to the ignition switch. Therefore on no account must a 150 v. working condenser be connected to the secondary as there is usually about 10,000 volts on this terminal.

I have been taking your magazine regularly now for 10 years—since I was 12 years old.—D. D. REED (Malvern).

Novice Tickets

SIR.—From time to time we read in PRACTICAL WIRELESS articles about novice tickets, some are for a low power rig licence, some are against the novice using a rig of any sort. I fail to see why it is not necessary to pass an examination if one wishes to indulge in radio control, but as soon as we suggest using a 1-valve TX for C.W. or phone even on V.H.F. bands, we are told you will have to pass the R.A.E., etc. I should like to receive suggestions from all those interested in novice radio. If there is sufficient response, it might be possible to form a club in Birmingham.—L. J. BECHETI (Birmingham).

Ideas for Circuits

SIR.—I am most interested in a battery portable radio. It should have a loudspeaker: the signal strength on local BBC stations should be reasonable but, above all, I must have quality.

I am not a crank over small size: I think that miniature receivers are made so small that the accent is on the "miniature" rather than on the "receiver." Neither am I interested in weight. What is the use of sacrificing all for weight, when the farthest it will be carried is a few yards? Also, what is the use of sacrificing all for battery life. I would rather have quality and short battery life than distortion and long battery life.

It seems that at times we are so technically blind that we fail to realise that our true object is accurate reproduction of sound.

Give me such a circuit and I shall be delighted. You can use transistors or printed circuits, but

let us have quality sound.—R. H. STEWART (Corby, Northants).

The Great Transistor Chaos

SIR.—The unenlightened remarks of M. M. Pritchett ("Open to Discussion," October issue), cannot be allowed to go unanswered. I would like to answer his letter point by point. First, of course, there is a lot of fuss made about the transistor. Without doubt it is the greatest single advance in electronics made since the invention of the thermionic valve and, therefore, a wireless magazine which did not freely "mention" them would nowadays appear almost as ridiculous as a motoring magazine which did not mention cars. Secondly, transistors are definitely not "delicate." As is borne out by two articles in the same issue as Mr. Pritchett's letter, they are very robust. Of course, one takes care not to overheat them, in the same way as one takes care not to drop a valve on to the floor, and one takes as much care not to reverse the supply voltages to a transistor as one takes not to apply H.T. to the heater of a valve. Thirdly, their price. If Mr. Pritchett had any experience of electronics, he would know that all such new components begin by being fairly expensive and gradually decrease in price as newer and better manufacturing techniques are evolved. Considering the high wastage rate during production and the conditions necessary for manufacture, it is my opinion that the current price of transistors (at least, germanium transistors) is reasonable. Fourthly, I cannot understand Mr. Pritchett's reference to "costly and complicated circuitry." The costly power supply unit is now unnecessary, and the stage-by-stage circuitry of transistorised equipment is only as complicated as one cares to make it. Certainly in many cases it can be made simpler than an equivalent valve circuit. Lastly, to Mr. Pritchett's biggest howler: "They save nothing as far as the amateur is concerned." It is obvious from this statement that his views cannot be seriously taken as being representative of the viewpoint of the genuine amateur. They are words which would never have been uttered by that happy band of pilgrims which pioneered the use of the higher radio frequencies. The transistor has opened up a vast new field for experiment which will, I am sure, be fully exploited by all radio enthusiasts worthy of the name.—P. R. WILLIAMS (Surbiton).

Correspondents Wanted

SIR.—I wish to correspond with amateurs who are of 16 years and who are interested in radio and television.—M. N. STUART (Sandbeck Hotel, West Cliff, Whitby, Yorks).

Information Required

SIR.—I wish to fit an "S" meter and B.F.O. to a P.C.R.2. I would be grateful if any reader could help.—JACK BROOKES (Blackpool).
[Any letters addressed to Mr. J. Brookes, care of these offices, address as given on page 775, will be forwarded to him.—Editor.]

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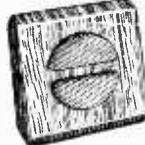
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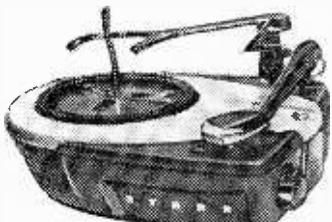
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6L7	5/-	83	7/6	6E85	7/-	8P4B	8/6
6K7	4/6	90T (BR)	3/6	6E80	6/6	8P61	2/6
6K7GT	5/6	EA50	1/6	6P91	6/6	C22	7/6
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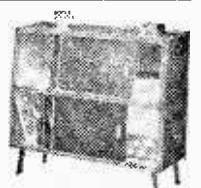
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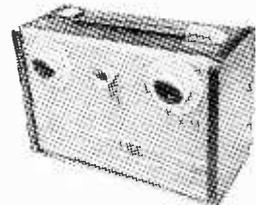
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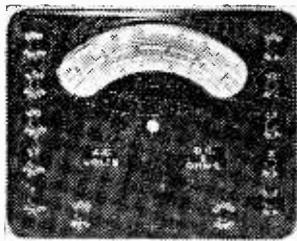
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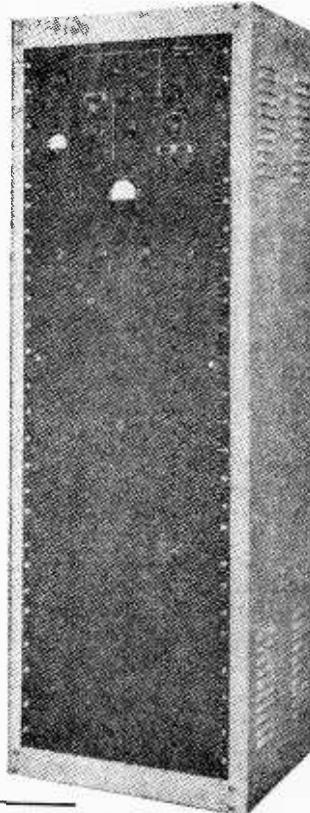
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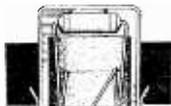
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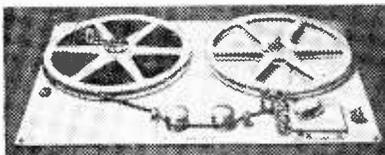
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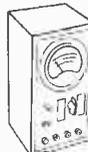
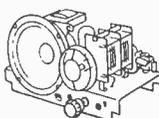
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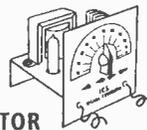
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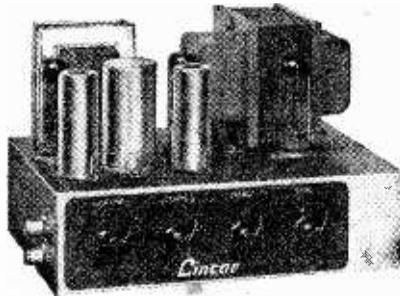
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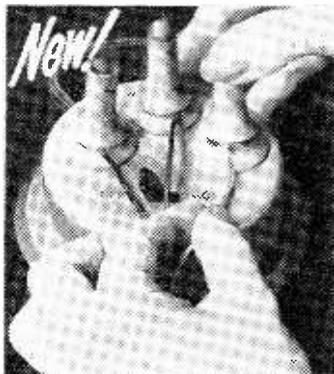
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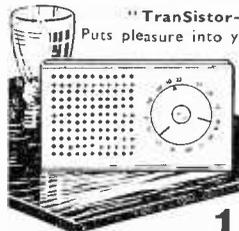
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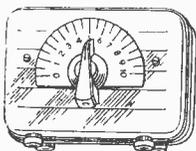
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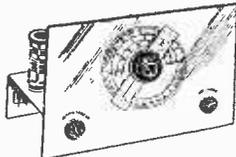
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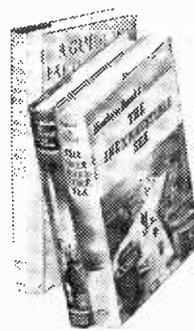
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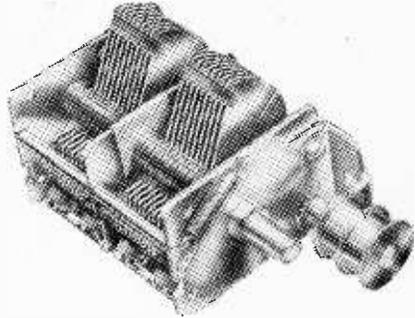
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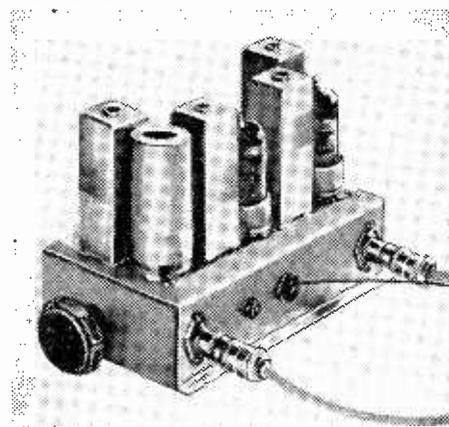
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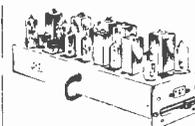
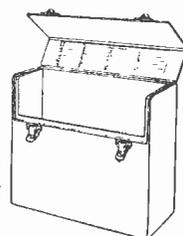
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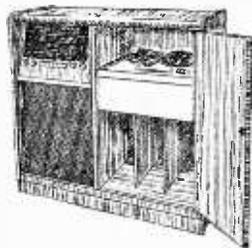
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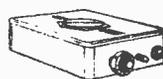
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The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	PW82*
F. J. Camm's "Sprite" Three (HF, Pen, D, Tet)	PW87*
3/6 each	
The All-dry Three ...	PW97*
Four-valve : 2/6 each	
Fury Four Super (SG, SG, D, Pen)	PW34C*

Mains Operated

Two-valve : 2/6 each	
Selectone A.C. Radiogram Two (D, Pow)...	PW19*
Three-valve : 4/- each	
A.C. Band-Pass 3 ...	PW99*
Four-valve : 2/6 each	
A.C. Fury Four (SG, SG, D, Pen)	PW20*
A.C. Hall - Mark (HF, Pen, D, Push Pull) ...	PW45*

SUPERHETS

Battery Sets : 2/6 each	
F. J. Camm's 2-valve Superhet	PW52*
Mains Operated : 4/- each	
"Coronet" A.C.4 ...	PW100*
AC/DC "Coronet" Four	PW101*

*No. of
Blueprint*

SHORT-WAVE SETS

Battery Operated	
One-valve : 2/6 each	
Simple S.W. One-valver	PW88*
Two-valve : 2/6 each	
Midget Short-wave Two (D, Pen)	PW38A*
Three-valve : 2/6 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*

MISCELLANEOUS

2/6 each	
S.W. Converter-Adapter (1 valve)	PW48A*
The P.W. 3-speed Autogram (2 sheets), 8/-	
The P.W. Monophonic Electronic Organ (2 sheets), 8/-	

TELEVISION

The "Argus" (6in. C.R. Tube), 3/-	
The "Simplex"	3/6*
The P.T. Band III Converter	1/6*

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 : 2/6	
B.B.C. Special One-valver	AW387*
Mains Operated	
Two-valve : 2/6 each	
Consoelectric Two (D, Pen), A.C.	AW403

SPECIAL NOTE

THESE blueprints are drawn full size. The issues contain descriptions of these sets are now at 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 Monthly. 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 : 2/6 each	
S.W. One-valver for American	AW429*
Two-valve : 2/6 each	
Ultra-short Battery Two (SG, det Pen)	WM402*
Four-valve : 3/6 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 : 3/6	
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	WM391*

MISCELLANEOUS

Enthusiast's Power Amplifier (10 Watts) (3/6)	WM387*
Listener's 5-watt A.C. Amplifier (3/6)	WM392*
De Luxe Concert A.C. Electrogram (2/6)	WM403*

QUERY COUPON

This coupon is available until Dec 31st 1958, and must accompany all Queries sent in accord with the notice on our "Open to Discussion" page. PRACTICAL WIRELESS, DEC. 1958.

MINOR

- ★ Variable tuning over medium waves.
- ★ 3-stage reflex circuit.
- ★ Highly sensitive.
- ★ Internal ferrite aerial.
- ★ Drilled chassis.
- ★ Long-life battery.
- ★ Complete constructional details.
- ★ Weight less than 2 ozs.
- ★ Size only 3 x 2 x 1/2 in.

Total cost including personal miniature phone, case, battery and complete circuit and layout diagrams, 52/6 post free. All components sold separately. Circuit and shopping list FREE. Call and Hear Demonstration Model.

MAJOR

- ★ 4-stage reflex circuit.
- ★ Variable tuning over medium waves.
- ★ Highly sensitive.
- ★ No aerial or earth.
- ★ Home, Light and Third Economical.
- ★ Drilled and mounted chassis.
- ★ Size 4 1/2 x 3 x 1 1/2 in.
- ★ Internal ferrite aerial.
- ★ Weight less than 4 ozs.
- ★ Complete layout diagram.
- ★ May be built in 1 hour.

All items can be supplied, including battery, case and personal phone, etc., for 72/6, post free. All components sold separately. Circuit and shopping list FREE. Call and Hear Demonstration Model.

COMPLETELY NEW STEP-BY-STEP LAYOUT DIAGRAMS**"THE TRANSISTOR-8"****Push-Pull Portable Superhet.**

This Portable 8 Transistor Superhet is tunable for both Medium and Long Waves and is comparable in performance to any equivalent Commercial Transistor Set. Call and Hear Demonstration Model.

STAR FEATURES

- ★ 8 good quality Transistors.
- ★ 250 Milliwatts Output Push-Pull.
- ★ Medium and Long Waves.
- ★ Internal Ferrite Rod Aerial.
- ★ Elliptical Speaker.
- ★ Drilled chassis 8 1/2 x 2 1/2 in.
- ★ Point-to-Point Wiring and Practical Layout.
- ★ Economical. Powered by 7 1/2 v. battery.
- ★ Highly sensitive.
- ★ Attractive lightweight contemporary case. In various colours.

Car Radio Conversion Components, 8/- extra. A.V.C. 5/9 extra. 325 mW. version, 40/- extra.

COMBINED PORTABLE/CAR RADIO

Two sets for the price of one.

We can supply all these items including Cabinet for £11.10.0. P.P. 2/6. All parts sold separately. Circuit diagram, and shopping list free.



Size: 8 x 7 x 3 1/2 in.
Weight: 4 lbs.

TELETRON "TRANSIDYNE" RECEIVER**Six Transistor Pocket Superhet.**

Size: 6 1/2 x 3 1/2 x 1 1/2 in.

- ★ TCC Printed Circuit.
- ★ Medium and long waves.
- ★ Powered by two No. 8 batteries.
- ★ Push-Pull output.
- ★ Moulded plastic case.
- ★ Rola 2 1/2 in. P.M. speaker.
- ★ Internal ferrite aerial.
- ★ Weight 20 ozs.
- ★ Complete layout instructions.
- ★ Easy to assemble.
- ★ (All components identified.)
- ★ THE BEST YET!

All components, including **NEW EDISWAN-MAZDA TRANSISTORS** cabinet, batteries, etc., can be supplied for £11.19.6, p.p. 2/6. All parts sold separately. Circuit and shopping list 9d.

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Complete with 6 valves, 2.6K8G, 2EF39, 6Q7G and 6V6G. Internal mains power pack and 6 v. vibrator pack. Built-in 6 in. speaker. B.F.O. and R.F. stage. I.F. freq. 2 Mc/s. Provision for phones and muting and 600 ohms. Input 100/250 v. A.C. or 6 v. D.C. All sets in new condition and air tested. £6.19.6. Carr. 15/6.

JUST PLUG IN AND SWITCH ON!

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3/4 in. Square	3/6
3/4 in. Round (Acos)	5/-
1 1/4 in. Round (Acos)	7/6
2 1/4 in. Round (Acos)	12/6

Moulded plastic hand mic. case suitable for any of above, only 2/6

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- ★ 5-valve superhet.
 - ★ Med., Long and Short wavebands, OR Med. and two Short Wavebands. (State preference.)
 - ★ 7 x 4 in. Elliptical speaker.
 - ★ Marconi Valves throughout.
 - ★ Size: 10 x 4 x 4 in.
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 - ★ 200 to 250 volts A.C. or D.C.
 - ★ Gram. position (for any type of pick-up).
 - ★ Tone Control.
 - ★ Brand New and Complete. £7.12.6, postage 7/6.
 - ★ Polished cabinet. 27/6; Super Rexine Cabinet, 37/6.
- NO WORK REQUIRED.**

STOP PRESS!

HITACHI POCKET TRANSISTOR RECEIVER (100 mW output).
6 TRANSISTOR SUPERHET £16.19.8 TAX PAID.
SIZE 4 1/2 x 2 1/2 x 1 1/2 in. WEIGHT 8 1/2 OZS. (leather case 15/-, battery 2/6).

COLOURS: IVORY, CORAL OR GREY (state colour required).

FULLY TUNABLE OVER MEDIUM WAVEBAND: OVER 20 SEPARATE STATIONS: NOT A TOY BUT A RADIO!

BRAUN POCKET TRANSISTOR RECEIVER (180 mW Output).
6 TRANSISTOR SUPERHET 19/6 GUINEAS TAX PAID (plastic case 15/-, battery 1/2)

FULLY TUNABLE OVER MEDIUM AND LONG WAVEBANDS, OVER 40 SEPARATE STATIONS ON MEDIUM WAVE AND 6 ON LONG WAVE.

BOTH MODELS MAY BE HEARD AT OUR PREMISES.

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