

6-VALVE TOP BAND TX.

PRACTICAL 1/6 WIRELESS

OCTOBER
1960



CONTENTS

RADIO SHOW REPORT
COMPREHENSIVE GUITAR
AMPLIFIER
H.F. ONE-VALVER
SIMPLE COMMUNICATIONS SYSTEM
MAINS DUAL-WAVE 2
ETC. ETC. ETC.



RADIO & TV TABLES

"NEWSTEAD" (as illustrated). This contemporary "Slimline" TV Table is finished in highly polished walnut veneer. Measures 19" x 13" x 20" high.

Price £3. 7. 6 (inc. P.T.)
"CHATSWORTH". Finished in highly polished walnut veneer. Measures 19" x 14" x 21" high.

Price £4. 0. 0 (inc. P.T.)
"WELBECK" (as illustrated) measures 20" x 20" x 20" and is fitted with self-adjusting gliders.

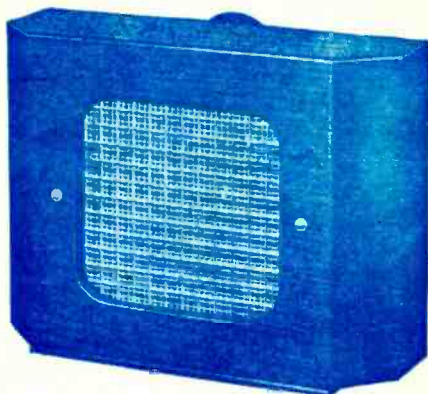
Price £3. 15. 0 (inc. P.T.)
"SHERWOOD" will accommodate the largest television receivers, measures 23" high x 25" wide x 22" deep.

Price £5. 5. 0 (inc. P.T.)
"SENIOR", of ample dimensions (18" x 24" x 25" high).

Price £4. 18. 9 (inc. P.T.)
All are supplied packed flat ready for instant assembly and with the exception of the Welbeck and the Chatsworth have easy running 2" castors.



*The symbol
of extra
High Quality*



Stentorian
EXTENTION SPEAKERS

These well designed speakers demonstrate the traditional Whiteley quality at really competitive prices. This range of extension speakers has finger-tip volume control, is superbly finished in polished walnut veneer and provides excellent reproduction.

WHITELEY ELECTRICAL RADIO CO. LTD.
MANSFIELD . NOTTS

WITH THE
EXCLUSIVE
FINGER-TIP
VOLUME
CONTROLS

'BUDE' 60/-
'BEDFORD' 72/-
'BRISTOL' 86/6

Prices include P.T.

ERSIN MULTICORE SOLDERS

for a first class joint every time

Ersin Multicore contains 5 cores of extra-active, non-corrosive Ersin Flux. Prevents oxidation and cleans surface oxides.

SIZE 1 CARTON
5/-

**HANDYMAN'S
CARTON**

Suitable for 200 average joints. **6d.**



Wherever precision soldering is essential, manufacturers, engineers and handymen rely on MULTICORE. There's a MULTICORE SOLDER just made for the job you have in hand. Here are some of them.

SAVBIT TYPE 1 ALLOY

A specially formulated alloy to reduce the wear of soldering iron bits. Contains 5 cores of non-corrosive Ersin Flux and is ideal for all soldering purposes.

SIZE 1 CARTON 5/-
Available in three specifications.



**HOME CONSTRUCTORS
2/6 PACK**

In addition to the well-known Home Constructors Pack (containing 19ft. of 18 s.w.g. 60/40 alloys) a similar pack is now available containing 40ft. of 22 s.w.g. 60/40 alloy especially suitable for printed circuits.



**BIB WIRE STRIPPER
AND CUTTER**

Strips insulation without nicking wire, cuts wire cleanly, splits extruding flex. **3/6 each**

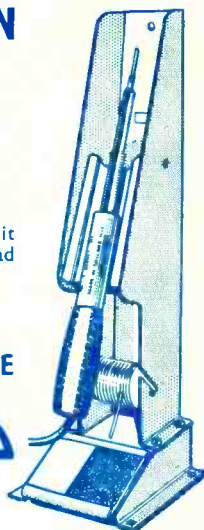


**SPECIAL FOR THE "HAMS"
RADIO STATION**

Illustrated

$\frac{1}{8}$ inch detachable bit soldering instrument
List No. 70

Combined Protective Unit with Wiper/Abrasion Pad and Solder Reel
List No. 700



Apply **SALES & SERVICE**

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(Regd. Trade Mark)

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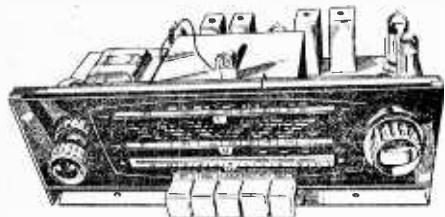
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MULTICORE SOLDERS LTD.,

MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS. (BOXMOOR 3636)

BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £13.6.8 (P. & P. 10/-)



Some dusty (but working) chassis at £10 (carr. 10/-). Tapped input 220-225 v. and 226-250 v. A.C. ONLY. Chassis size 15 x 6 1/2 x 5 1/2 in. high. New manufacturers. 12 mths. guarantee. Dial 1 1/2 x 4 in. in black and yellow. Pick-up. Extension Speaker. Ae., E., and Dipole sockets. Five "piano" push buttons—OFF L.W., M.W., F.M. and Gram. Aligned and tested. With all valves and O.P. Transformer. Tone Control Fitted. Covers 1,000—1,900 Mc.; 200-500 Mc.; 88-89 Mc/s. Valves E290 rect., ECH81, EF89, EABC80, EL84, ECC85. 10 x 6 in. ELLIPTICAL SPEAKER. 20/-, to purchasers of this chassis. Speaker and Cabinet to fit chassis (table model), 47/6.

TERMS:—(Chassis) £4.16.8 down +10/- carr. and 6 Monthly Payments of 30/-, or with Cabinet and Speaker £5.9.2 down and 7 Monthly Payments £1.12.2.

COSSOR/EMI 10in. TV tube type 108K. Brand new and boxed. ONLY 30/- (carr. 3/6).

BATTERY ELIMINATOR. Converts your Battery Set to Mains. For 4 Low Consumption Valves (96 range). 90 v. 15 mA. and 1.4 v. 125 mA. 42/6 (2/6 post). 200-250 v. A.C. Size 5 1/2 x 3 1/2 x 2 in. Also for 250 mA. 1.4 v. and 90 v. 15 mA at same price. Specify which, or give Valve line-up.

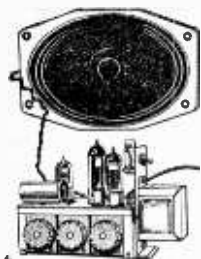
50 SILVERED MICA AND CERAMIC CONDENSERS, 10/- 50 RESISTORS, 5/-, ALL DIFFERENT VALUES, 21 TUBULAR CONDENSERS (7 values 0.001 to 0.1 mf), 4/6.

FULLY BUILT BATTERY OPERATED TRANSISTOR RECORD PLAYER FOR

£7.19.6 (3/6 P. & P.)

Cossor printed circuit 4-transistor amplifier; Garrard 45 r.p.m. battery player type BA1; speed control Cabinet size 11 x 9 x 5 1/2 in.; less than 8 1/2 lb. inc. batteries. Requires two Ever Ready AD28 batteries.

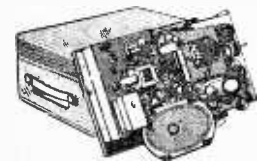
Complete kit £5.14.6 post paid.



3-VALVE AMPLIFIER (INC. RECT.). Capable of giving 6 watts. Mains and output transformers. Valves ECC83, EL84, and E280. 3 Controls, volume, bass and treble. On/Off switch. Fully guaranteed. Chassis size 6 1/2 x 3 x 2 1/2 in. 6 in. round or 7 x 4 in. elliptical speaker, state which. Not suitable for microphone input.

67/- (3/- p. & p.)

TAPE RECORDER ASSEMBLED TO B.S.R. MONARDECK



A QUALITY ARTICLE. Valves E730, ECC83, ECL82, DM70, Acos Crystal "mike", 850ft. Tape and extra spools. 3 1/2 in./sec. Mike and Radio inputs; Vol. on/off tone, Ext. I.S. and Monitor. Fast forward and reverse. Cannot be accidentally erased. Magic Eye Indicator. 7 x 4 in. Speaker. Four separate chassis assembled to base of 14 x 11 1/2 x 7 in.

the Monardeck to fit into cabinet of PRICE for Recorder and Deck Assembly, as above (without Cabinet), £16.10.0 (10/- p. & p.), Cabinet £3 (5/- carriage). Enquiries invited for any of the parts.

See additional advertisement on page 524

GLADSTONE RADIO 58A HIGH STREET, CAMBERLEY, SURREY. Tel. 22791
Also at 3 Church Road, Lawrence Hill, Bristol 5 and 247 New Road, Portsmouth, Hants.
Camberley closed Saturdays, Bristol and Portsmouth closed Wed., afternoons.

"READY TO USE" ITA CONVERTER



Separate gain controls. Valves PCF80 and PCC84. Switch position ITA (1)—ITA (2)—BBC. Bakelite moulded cabinet 8 1/2 x 4 x 6 in. £5.5.0. P. & P. 3/-.

LISTEN WITHOUT INTERFERENCE



Fully built V.H.F./F.M. Tuner for £5.10.0 (3 - post). Covers 88-98 Mc/sec. Wired, aligned and tested. 4 Mullard valves; for use up to 40 miles from transmitter. FRINGE MODEL for above this (5 valves), £6 (p. & p. 3/-). External H.T. and L.F. supplies reqd. for both of foregoing. BUT, a complete V.H.F. set, four valves, with mains transformer amplifier, rectifier and speaker (with above frequency coverage) can be supplied for ONLY £8.5.0 (4/- carr.). Cheap room dipole 10/-, 300 ohm twin feeder, 6d. yd. All with 12 months' guarantee.



GRAMOPHONE AMPLIFIER with 5in. SPEAKER. On Fabric-covered Baffle 12 1/2 x 5 in. 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. Useful for Stereo.

ONLY 57/-, post 3/-



BEREK BATTERY RADIO IN MAKER'S CARTON. Valves DK90, DF96, DAF96, DL96. Requires Ever Ready battery B108 or battery elim. for converting to mains operation—see adjacent item. Two Short Wavebands 2.5 to 7 Mc/s and 6.5 to 17 Mc/s. Cabinet 12 x 7 1/2 x 6 in. ONLY £5 (3/6 p. & p.). MW and SW £5.4.0 plus 2/6 p. & p.). Available as kit.

AUTOMATIC RECORD CHANGERS COLLAR CONQUEST with manual play also. 4-speed. A.C. mains 200-250 v., see illus.

£7.10.0 (5/- P. & P.)

B.S.R. UAS 4-speed auto-changer. £6.10.0 (5/- carr.) or with Stereo Head, £6.12.6 (5/- carr.).

All with Crystal Turnover Head.



ALL ITEMS GUARANTEED 12 MONTHS—B.V.A. VALVES

3 MONTHS
Send 6d (stamps will do) for our illustrated catalogue of the above items and others. All New Goods. Delivered 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 A.M./F.M. CHASSIS AND TAPE RECORDER.
Posted Orders to Camberley Please.

R.S.C. HI-FI TAPE RECORDER KIT

REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN HALF AN HOUR

The Recorder incorporates the Latest Collaro Studio Tape Transcriber. The Linear LT45X High Quality Tape Amplifier listed £12.12.0 High Flux P.M. Speaker listed 30/- empty Tape Spool, a Reel of Best Quality Tape listed 22/6 and a Handsome Portable carrying Cabinet finished in Two-tone covering, size 18 x 13 x 8in. high, listed £41.0.0. and circuit. Total cost if purchased individually approximately £40. Performance equal

to units in the £60-£80 class. Send S.A.E. for leaflet.

25 1 GNS. 2 Carr. 17/6

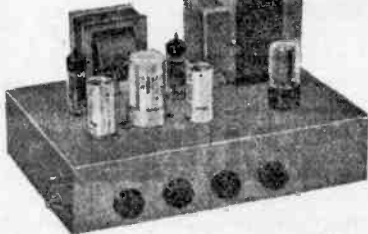
H.P. TERMS. Deposit £5.7.6 and 12 monthly payments 2 gns. Cash price if settled in 3 mths.

TELEVISION RECTIFIERS. 250v. 200mA. small size. Only 8 9es. **RE-ENTRANT SPEAKERS.** Tannoy, 8 watt, 7.5 ohms. Only 22/6 each. **Parmeko Horn Type,** 10 watt, 15 and 200 ohm matching. 59/6. R.C.A. 20 watt, 15 ohms or 200 ohms, 6 gns.

HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES

Two input sockets with associated controls allow mixing of "mike" and gram, as in A10. High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84. 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 "L" and "CUT."** Frequency response — 3 D.B. 30-30,000 c/c.s. Six negative feedback loops. Hum level 60 D.B. down. ONLY 23 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and 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. 30 mA. and 6.3 v. 1.5 A. For supply of a **RADIO FREQUENCY UNIT,** DEPOSIT 24/3, and 9 monthly payments of 24/3. Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.



Only **8 Gns.** Carr. 10/-

If required louvered metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS, DEPOSIT 24/3, and 9 monthly payments of 24/3.** Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.

R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER

A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts, suitable for all crystal stereo heads. Ganged Bass and Treble Controls give equal variation of "Hifi" and "cut". Provision is made for use as straight (monaural) 10 watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, EZ81. Outputs for 2-3 ohm speakers. Point-to-point wiring diagrams and instructions supplied. Send S.A.E. for leaflet.

8 Gns. Carr. 10/-

R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS

- 6 v. 1 amp. 19/9
 - 6 v. or 12 v. 1 amp. 29/9
 - 6 v. 2 amps. 29/9
 - 6 v. or 12 v. 2 amps. 33/9
 - 6 v. or 12 v. 3 amps. with ammeter. 59/9
- Above ready for use. With mains and output leads. Carr. 3/6.



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. Louvered steel case with stoved blue hammer finish. Fused **69/9** and ready for use with Carr. 5/- mains and output leads. **TERMS:** Deposit 13/3 and 5 monthly payments 13/3. Carr. 3/9.

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

BATTERY CHARGER KITS

- Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses, Fuse-holders, Grammet panels and circuit. Carr. 3/6 extra.
- 6 v. or 12 v. 1 amp. 24/9
 - 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. 42/9
 - 6 v. or 12 v. 4 amps. 53/9
 - 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector. 59/9.
- CHARGER AMMETERS.** 0-1.5 a., 0-3 a., 0-4 a., 0-7 a., 0-25 a., 0-60 a. 8/8.

HEAVY DUTY CHARGER KIT

612 v. 6 amps, variable output. Consisting of Mains Transformer 0-200-230-250 v. F.W. (Bridge) Selenium Rectifier; Ammeter. Multi-Position Switch with Knob; Panels. Plugs, Fuses, Fuseholder and circuit. 59/9. Carr. 4/8.

R.S.C. MAINS TRANSFORMERS

- Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s. Screened **TOP SHROUDED DIPOL THROCGH**
- 250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 a. 17/9
 - 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. 2 a. 6.3 v. 1 a. 19/9
 - 250-0-250 v. 100 mA. 6.3 v. 3.5 a. C.T. 22/9
 - 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
 - 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
 - 350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
 - 350-0-350 v. 100 mA. 6.3 v. 4 a. 4 a. C.T. 0-4.5 v. 3 a. 25/9
 - 350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 29/9
- FULLY SHROUDED UPRIGHT**
- 250-250 v. 60 mA. 6.3 v. 2 a. 5 v. 2 a. Midget type 21-3-31n. 17/11
 - 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 - 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 - 350-0-350 v. 130 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
 - for Mullard 510 Amplifier 35/9
 - 350-0-350 v. 150 mA. 6.3 v. 4 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. 49/9

FULLY GUARANTEED We can quote for special types singly or in any quantity

- FILAMENT TRANSFORMERS**
All with 200-250 v. 50 c/s. primaries 6.3 v. 1.5 a. 5/9; 6.3 v. 2 a. 7/6; 0-4-6.3 v. 2 a. 7/9; 12 v. 1 a. 7/11; 6.3 v. 3 a. 8/11; 6.3 v. 6 a. 17/6; 12 v. 1.5 a. twice. 17/6.
- OUTPUT TRANSFORMERS**
Midget Battery Pentode 66:1 for 35A. 6/2
- Small Pentode, 5000 Ω to 3 Ω 3/9
 - Small Pentode 7/8,000 Ω to 3 Ω 3/9
 - Standard Pentode 5,000 Ω to 3 Ω 5/6
 - Standard Pentode 7/8,000 Ω to 3 Ω 5/6
 - 10,000 Ω to 3 Ω 5/6
 - Push-Pull 10-12 watts 6V6 to 3 Ω or 15 Ω 18/9
 - Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15 Ω 18/9
 - Push-Pull EL84 to 3 or 15 Ω 18/9
 - 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 c/s. 15/9
- 120 v. 40 mA. 5-0-5 v. 1 a. 15/9
- 90 v. 15 mA. 4-0-4 v. 500 mA. 9/9

SMOOTHING CHOKES

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

CHARGER TRANSFORMERS

- All with 200-230-250 v. 50 c/s Primaries:
- 0-9-15 v. 1 a. 11/9; 0-9-15 v. 2 a. 14/9; 0-9-15 v. 3 a. 16/9; 0-9-15 v. 5 a. 19/6; 0-9-15 v. 6 a. 23/9.

AUTO (Step up/Step down) TRANS.

- 0-110/120-230/250 v. 50-80 watts. 13/9;
- 0-110/120-200/230/250 v. 150 watts 27/9.

MICROPHONE TRANSFORMERS

- 120:1 high grade, clamped. 6/8; 120:1 Potted, Mu-metal screened. 9/8.

R.S.C. A12 STEREOPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and point-to-point wiring diagrams supplied. Only good quality Carr. and pkg. 5/- components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

4 Gns.

STEREO EQUIPMENT OFFER. Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acos 70Ck Stereo head. Carr. 7/7 with sapphire stylus suitable most pick-ups.

PICK-UP ARMS complete with HI-FI turnover crystal head. Acos GP54. Limited number brand new, perfect, at approx. half price. Only 29/11.

ACOS CRYSTAL MICROPHONES. Mic40 stand or desk. Listed 45/-, Only 27/9 38-1 Stick types, listed 5 gns. Only 39/6

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response -3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF85, 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, STRING BASS, etc. For standard or long-play 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/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.

11 gns. Carr. 10/- TERMS: DEPOSIT 31/9 and 9 monthly payments of 31/9.

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

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 powered receivers requiring 1.4 v. and 90 v. This includes latest low consumption types. Complete kit with diagrams, 39/9. or ready to use, 46/9.



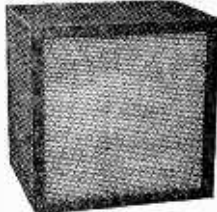
Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. and 90 v. and 50 v. 40 mA. and 2 v. 0.4 a. to lamp. fully smoothed. Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s. SUITABLE FOR ALL BATTERY RECEIVERS normally using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

R.S.C. 3-4 WATT A7 HIGH-GAIN AMPLIFIER For 200/250 v. 50 c/s. Mains input. Appearance and Specification, with exception of output wattage, as A5 amplifier. Complete Kit with diagrams, £3.15.0. Carr. 3/6.

R.S.C. BRADFORD, MANCHESTER AND LEEDS (Leeds) Ltd.

COLLARO JUNIOR 4-speed single player units and Hi-Fi crystal pick-up with turnover head, £3.19.6. B.S.R. UAS 4-SPEED) AUTO-CHANGERS with Stereo/Monaural pick-up head, £7.19.6. Carr. 5/- TERMS: C.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2. 2/9 extra under £5. Open 9 to 6. Weds. until 1 P.m. Trade supplied. S.A.E. with all enquiries. Mail Orders to 29-31 Moorfield Road, Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1. and 8-10 Brown Street (Market Street), Manchester 2, or 56 Morley Street (next to Majestic Ballroom), Bradford.

12in. 10 WATT HIGH QUALITY LOUD-SPEAKER IN POLISHED WALNUT FINISHED CABINET



Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only £4.19.6 Carr. 5/- Terms: Deposit 11/3 and 9 monthly payments of 11/3. 12in. 20 WATT HI-FI LOUD-SPEAKERS with HI-FI pre-amplifier. Size 18 x 18 x 18in. Finish as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 8/6.

R.S.C. 45 WATT A5 HIGH-GAIN AMPLIFIER



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 70db. down, 15db. of Negative feedback is used. H.T. or 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 £4.15.0, or assembled ready for use 25/- extra, plus 3/6 carr. or Deposit £2.6 and 5 monthly payments of 22/6 for assembled unit.

R.S.C. PORTABLE GUITAR AMPLIFIERS

Junior 5 watts High Quality Output. Separate Bass and Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v.. Twin inputs. High Flux 8in. Loudspeaker 'built-in'. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carrying handle. H.P. Terms. Deposit £1 and 9 monthly payments of £1. Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs. Used on two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12in. for Bass notes and a 7 x 4 in. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit £4.9 and 9 monthly payments of 34/9. £8-19-6 Carr. 7/6

15 Gns. All models for 200-250 v. Carr. 10/- A.C. mains.

SPECIAL TRANSISTOR OFFER. T81 Brimar. Brand new. Perfect. 3 for 10/9

AM/FM RADIOGRAM CHASSIS for 200-250 v. A.C. mains only. 3 wavebands. V.H.F., Medium and Long Built in Ferrite rod aerial. Attractive glass dial size 16in. long by 4in. high. Valve line up EF85, ECC81, ECC85, EAB00, EL84, EZ80. High quality output of up to 4 watts. Overall size 16in. x 4in. x 5in. Only £12.19.6. Carriage 10/-

PLISSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER (12,000 lines) with built-in tweeter (completely separate elliptical speaker with choke, condensers, etc.) providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rates 10 watts. Price only £5.17.6.

HI-FI CRYSTAL PICK-UP HEADS. (Turnover type with sapphire stylus). HGP59. Standard replacement for Garrard and B.S.R. B.S.R. Full-F, Garrard GC2, 19/9. B.S.R. Stereo/Monaural 39/11.

P.M. SPEAKERS. 2-3 ohm 2in. Perdio 21/9. 5in. 17/9. 8in. 16/9. 8in. 16/9. 8 x 5in. 25/9. 10in. 29/9. 10 x 12in. 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. TWEETERS. Plessey 30 19/9. 15n 25/9.

GLA MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Overall size 11 x 2 1/2 x 2 1/2 in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 59/6.

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). Delayed A.V.C. employed. The W.Ch. Sw. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-8-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration. 2/6. Total building cost £4.15.0. For descriptive leaflet send S.A.E.

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. For 200-250 v. 50 c.p.s. A.C. mains. Our price £6.19.6. Carr. 5/6

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NEW MULLARD AMPLIFIER BOOK.

HOW TO BUILD THE LATEST DESIGNS, 9/3d. post free.

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All with Long Spindle and Double-pole Switch, 4/6 each. 10K 25 K 50 K 100 K 1/4 mg. 1/2 mg. 1 meg. 2 meg

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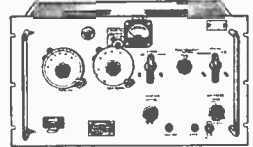
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POLICE - AIRCRAFT - HAM RECEIVER 1392

15 VALVE SUPERHET. Frequency 95-150 Mc/s (2 to 3 metres). Valve line up: 1st and 2nd R.F. amp. VR.136 (EF.54), 1st Local Oscillator VR.65 (SP.61), 2 Oscillator Multipliers VR.136 (EF.54), 3 I.F. Amp. VR.53 (EF.39), A.G.C. 6Q7, Output 6J5, Muting VR.92 (EA.50), Noise Limiter VR.92 (EA.50), B.F.O. 6J7, Mixer VR.136 (EF.54), De Mod. 6Q7. Slow motion tuning, normally crystal controlled, or tuneable over 95-150 Mc/s. Power supply required: 240-250 volts at 80 mA, 6.3 volts at 4 amps. Size 19 x 10 x 10in. Standard Rack Mounting.

PRICE COMPLETE
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£65.0
Carriage 15/-



LIGHT-WEIGHT HEAD-SET. These H.S. 30 phones are the smallest used by the U.S. Air Force 2500 Imp. using soft rubber miniature ear moulds for maximum music and voice reproduction of the finest quality. Supplied free is a small transformer unit with cord and plug which steps impedance up to 4,000Ω. ONLY 15/- P. & P. 2/6.

POCKET MULTI-METER. BRAND NEW. 2,500 Ω p.p.v. Multi range: 6/30/120/300/1,200 v. A.C., ditto D.C. 0-1K, 0-1 megohm; 400 Micro-A., 12 mA, 300 mA—0 to +64 db 5-ranges; 3in. x 4in. x 1in. Large clear dial. Leads supplied. Our Price 70/- p.&p. 2/6.

MICROPHONES. BRAND NEW. Throat magnetic 4/6; Throat carbon 3/6; No. 8 carbon with switch 8/6; No. 7 moving coil 6/6; Tannoy power mikes only 5/-. Crystal mike 22/6.

COSSOR OSCILLOSCOPE. A truly magnificent first grade L.F. oscilloscope incorporating a hard valve time base, speeds 1-5-40 milliseconds, easily extended for a few shillings to 3 c.p.s. to 30 k.c.s. speeds. Has high-class amplifier with fine and coarse gain controls. Brightness and focus controls, X and Y shifts. 115 v. and 230 v. Mains power pack fully fuse protected. Empyis 21in. tube ACE 10 size 19in. x 7in. x 12in. Only 20 in stock so first come first served. Genuinely cost £59 each, our price £12.10.0. Carr. 15/-.

MORSE CODE SET. High frequency buzzer. Provision for Headphones. Complete with morse code alphabet and battery. Only 10/6. P. & P. 1/6. Sensitive earphone 3/6 extra.

POCKET VOLT TEST METER. Two D.C. ranges: 0-250 v. and 0-25 v. Complete with test prods. and leather case. Very limited quantity. Only 12/6. P. & P. 1/6.



Complete station (as illus.) comprising: 19 Set, Supply Unit, Control Box, Headphones, Microphone, Morse Key, Variometer, Short Wave and V.H.F. Aerials and Bases and full set of leads. All for only £9. Carr. 25/-.

TWO TRANSISTOR POCKET RADIO with Miniature Speaker

Anyone can build it!

This powerful pocket radio gives reception over the entire broadcast band. Complete with all parts, including 2 transistors, exclusive ferrite rod, miniature speaker tuning condenser, plastic case, wiring diagram, and step by step instructions. Size 4 1/2 x 1 1/2 x 3ins. P. & P. 1/6. Battery 1/- extra. ONLY 27/6.



PORTABLE TRANS-RECEIVER SETS Consisting of trans receiver covering 7-9 Mc/s, range up to 10 miles, complete with 5 valves, headphones, microphone, junction box and 6ft. telescopic aerial. Only requires 120 v. and 3 v. dry battery.

ONLY **60/-** Per Set. P. & P. 4/- Batteries 20/- per Set.



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R.F. CONVERTERS R.F. 24 covers 20-30 Mc/s, switched tuning 22/6. R.F. 27 covers 65-85 Mc/s, variable tuning 29/6. Circuits supplied. P. & P. 3/6 on each.

VARIABLE TRANSFORMERS

Input voltage 230 v., continuously variable output from 0-230 v. These variable transformers are of advanced mechanical design offering long life, moderate temperature rise, high efficiency and linear output voltage. Direct-reading dial with large white numerals for accurate output voltage selections. Supplied complete. Model B.5 Current rating 5 amps. £9.00 Model B.10 Current rating 10 amps. £18.5.0 Model B.20 Current rating 20 amps. £32.10.0



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ACCUMULATORS. 2 volts 16 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc. 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/-.

T.C.S. RECEIVER. 1.5 to 12 Mc/s. 7-valve superhet, built like a dream. Panel controls: R.F. Gain, A.F. Gain, C.W. Pitch, band-switch, mod.-C.W. switch, power switch, ground and aerial posts, M.C. or crystal frequency switch, speaker jack, card holder to log 30 stations, hand vernier tuning knob turning a large etched calibrated plate behind half lined window, anti-backlash gears used. Used condition. £8.10.0. Carriage 15/-.

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PORTABLE TRANS-RECEIVER No. 18. A self-contained Trans/Receiver for Telephone and C.W. Range approx. 10 miles. Freq.: 6-9 Mc/s (50-33.3 metres). Valve line-up: 3 A1P-12, 2 AR-8, 1 ATP4. Complete with aerial, H.T. and L.T. meter and all accessories. Weight 2 lb. Size 8 x 10 x 17in. Only 80/- Carr. 10/-.

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

SPARE VALVE KIT Here's a gift for all 38 and 19 Set owners! Case containing 4 ARP12 & 1 ATP4 valves. Only 10/- P. & P. 2/6.



WIRELESS SET No. 19. MK. II.

This most famous Army Trans/Receiver covers 2-8 Mc/s. (150-37 metres) in two bands and 230-240 Mc/s. V.H.F. Has an intercom. amplifier. Designed for 12 and 24 volt operation. Uses a 6-valve superhet receiver, I.F. being 465 kcs., and a 6-volt transmitter designed for voice and C.W. operation. Incorporates test and tuning meter for voltages, aerial loading and current tests. Panel Controls: Frequency tuning, P.A. tuning, Gain control, M.C.W., C.W., R.T. switch. Het-tone, netting, off-on, Quench, aerial—A.V.C.—L.T.—H.T.—Drive tests. Supplied complete with 15 valves and instruction book.

SET ONLY **65/-** Carr. 10/-



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TAPE RECORDERS



All prices quoted provide for the COMPLETE RECORDER including CRYSTAL MICROPHONE and 1,200 ft. Spool of Tape.

There are no better value for money Tape Recorders on the market—if you can't call and hear them, send S.A.E. for fully descriptive leaflets.

Each Model incorporates the highly successful HF/TR3 Amplifier (described opposite) thus ensuring truly "Hi-Fi" record and playback facilities.

**BEFORE YOU BUY
—YOU SHOULD
HEAR THESE**

**RECORDERS. THEY ARE COMPARABLE
TO THE MUCH HIGHER-PRICED MODELS**

MODEL CR3/S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-speed Deck H.P. Terms: Deposit £7.18.0 and 12 months of £2.17.11 **£39.10.0**

MODEL CR3/T Incorporates the very popular 3-speed COLLARO Mk. IV "TRANSCRIPTOR" Deck which has both upper and lower tape tracks. H.P. Terms: Deposit £9.10.0 and 12 months of £3.9.8. **£47.10.0**

MODEL TR3/Mk. VI Incorporates the New £49.10.0 TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.

TAPE AMPLIFIERS and PRE-AMPLIFIERS PRESENTED FROM MULLARD DESIGNS

MODEL HF/G2A-D

A complete self-contained Tape Recorder chassis incorporating Loudspeaker and comprising the Model HF/G2A Amplifier connected to the Garrard Tape Deck. Operates at 3in./sec. speed and supplied fully tested and ready for immediate operation, designed for easy fixing into a portable case or cabinet, only four fixing screws being required. **£25.0.0** (Including a 4in. spool of Long Play Tape.) Terms, Dep. £5.0.0, 12 months £11.6.8.

Alternatively we offer Complete Kit of Parts to build the HF/G2A Amplifier with the ASSEMBLED AND TESTED GARRARD TAPE DECK for **£22.0.0**

Deposit £4.8.0, 12 months £11.2.3.

The Model HF/G2A is available separately for

(a) COMPLETE KIT OF PARTS **£11.0.0**

(b) ASSEMBLED **£12.15.0**

MODEL HF/TR3 TAPE AMPLIFIER

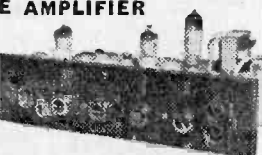
(Mullard Type "A" design)

A very high quality Amplifier incorporating 3-speed treble equalisation using the latest FERROXUBE POT CORE

INDUCTOR, FOR COLLARO-TRUVOX-BRENELL-WEARITE or MOTEK Tape Decks.

Has GILSEN Output Transformer includes separate Power Supply Unit.

KIT OF PARTS **£12.15.0**



OR ASSEMBLED **£16.10.0**
H.P. Deposit £3.6.6 and 12 months at £11.4.2.

FOR THE HOME CONSTRUCTOR

SPECIAL 'COMBINED ORDER' PRICES

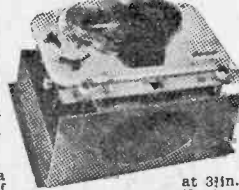
- (a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PRE-AMPLIFIER and Power Unit Assembled and Tested. **£29.10.0**
- (b) As above but TYPE "C" PRE-AMPLIFIER supplied as complete KIT OF PARTS. **£26.10.0**
- (c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PRE-AMPLIFIER and Power Unit assembled, tested. **£35.0.0**
- (d) As (c) but Type "C" as COMPLETE KIT OF PARTS. **£32.0.0**
- (e) The TRUVOX Mk. VI DECK and the assembled Type "C" Pre-amplifier and Power Unit. H.P. Deposit £3.0.0, and 12 months £2.18.8. **£40.0.0**
- (f) As above but Type "C" as complete KIT OF PARTS. **£36.10.0**
- (g) The BRENELL Mk. V DECK and the assembled Type "C" Pre-amplifier and Power Unit. H.P. Deposit £9.4.0, and 12 months £3.7.8. **£46.0.0**
- (h) As (g) but Type "C" as complete KIT OF PARTS. **£43.0.0**
- (i) THE WEARITE 4A DECK with TYPE "C" assembled and tested. H.P. Deposit £11.4.0, and 12 months £4.2.1. (Carriage and Insurance on above quotes 10% extra.) **£56.0.0**

ALL THE ABOVE CAN BE SUPPLIED IN A PORTABLE CASE FOR £5.10.0 extra. THUS FORMING A COMPLETE PORTABLE PRE-AMPLIFIER.

FULLY DESCRIPTIVE LEAFLETS ON ALL OF ABOVE ARE AVAILABLE—BUT PLEASE ENCLOSE S.A.E. AND STATE WHICH LEAFLET IS REQUIRED.

MODEL HF/G2P-D

THE IDEAL "LINK" TO ADD FULL TAPE RECORDING FACILITIES TO HIGH QUALITY HOME INSTALLATIONS. RADIOGRAMS, etc. Comprises the HF/G2P Tape Pre-amplifier fitted to the Garrard Tape Deck, operates at 3in./sec. speed, connects into the tape input channel or pick-up sockets of existing Amplifier or Chassis. COMPLETE WORKING UNIT, containing 4in. spool of Long Play Tape. PRICE **£23.15.0** Terms, Dep. £4.15.0, 12 months £11.4.10.



Alternatively we offer Complete Kit of Parts to build the HF/G2P Pre-amplifier with the ASSEMBLED AND TESTED GARRARD TAPE DECK for **£20.15.0**

separately for the ASSEMBLED AND TESTED GARRARD TAPE DECK for **£20.15.0**, 12 months £11.0.5.



PRICE **£29.15.0**

The Pre-amplifier Model HF/G2P is available separately for (a) Complete Kit of Parts **£9.10.0**, (b) Assembled **£11.5.0**.

MULLARD TYPE "C" TAPE PRE-AMPLIFIER—ERASE UNIT

The "Hi-Fi" link to add full tape recording facilities to High Fidelity home installations. Incorporates FERROXUBE POT

CORE PUSH FULL OSCILLATOR and 3-speed treble equalisation by FERROXUBE POT CORE INDUCTOR, FOR WEARITE-COLLARO-TRUVOX-BRENELL or MOTEK TAPE DECKS.

Includes separate power Supply Unit. OR ASSEMBLED KIT OF PARTS **£14.0.0**

H.P. Deposit £3.8.0 and 12 months £1.4.11

(Excluding power unit £11.15.0 and £14.10.0 respectively).



- (a) COMPLETE KIT to build the HF/TR3 Amplifier, together with the COLLARO "STUDIO" DECK, ASSEMBLED AND TESTED. **£25.10.0**
- (b) As above but with HF/TR3 supplied ASSEMBLED and TESTED. **£29.0.0**
- (c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK. H.P. Deposit £5.16.0, and 12 months £2.2.6. **£30.15.0**
- (d) As above but HF/TR3 supplied ASSEMBLED and TESTED. **£34.10.0**
- (e) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK. H.P. Deposit £7.0.0, and 12 months £2.10.5. **£36.0.0**
- (f) As above but HF/TR3 supplied ASSEMBLED and TESTED. **£39.10.0**
- (g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK. H.P. Deposit £7.18.0, and 12 months £2.17.11. **£41.10.0**
- (h) As above but HF/TR3 supplied ASSEMBLED and TESTED. **£45.0.0**
- (i) H.P. Deposit £9.0.0, and 12 months £3.6.0. **£55.0.0**
- (j) THE WEARITE 4A DECK with assembled and tested HF/TR3 Amplifier including WEARITE Head Lift Transformer. H.P. Deposit £11.0.0, and 12 months £4.0.8. **£56.0.0**
- Carriage and Insurance on each above is 10% extra. Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA/CELESTION 10 x 8in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1,200ft. SPOOL E.M.I. TAPE—ALL FOR £9.10.0. Carriage and Insurance 5% extra.

STERN RADIO LTD.

STERN'S MULLARD DESIGNS

Designed by MULLARD—presented by STERN'S strictly to specification

COMPLETE KIT OF PARTS— MULLARD "5-10" MAIN AMPLIFIER

For use with the MULLARD 2-valve pre-amplifier with which is undistorted power output of up to 10 watts is obtained. We supply SPECIFIED COMPONENTS AND NEW MULLARD VALVES, including PARMKO MAINS TRANSFORMER and choice of the latest Ultra-Linear PARMKO or the PARTRIDGE Output Transformer. PRICE COMPLETE KIT (PARMEKO Output Trans.) **£10.00**

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

ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, **£1.6.0 EXTRA**



MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE COMPLETE **£6.6.0** ASSEMBLED AND TESTED **£8.0.0**

KITS OF PARTS

Supplied strictly to MULLARD'S SPECIFICATION and incorporating:

- Equalisation for the latest R.I.A.A. characteristics.
- Input for Crystal Pick-ups, and variable reluctance magnetic types.
- Input (a) Direct from High Imp. Tape Head (b) From a Tape Amplifier or Pre-amplifier.
- Sensitive Microphone Channel. ● Wide range BASS and TREBLE Controls.



COMPLETE MULLARD "5-10" AMPLIFIER

The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Only Specified Components and new MULLARD VALVES are supplied including PARMKO MAINS TRANSFORMERS and choice of the latest PARMKO or PARTRIDGE ULTRA-Linear Output Transformers.

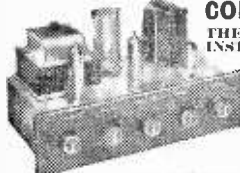
KIT OF PARTS **£11.10.0** OR ASSEMBLED and TESTED **£13.10.0**

HIRE PURCHASE (Assembled Amp. only). DEPOSIT **£2.14.0** 12 months at 19/10. ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. **£1.6.0 extra.**



COMPLETE MULLARD "3-3"

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT. COMPLETE KIT **£7.10.0** OR ASSEMBLED and TESTED **£8.19.6** (plus 6/6 carriage and insurance) H.P. Terms: Deposit **£2.0.0** and 8 Months at **£1.0.0**. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMKO OUTPUT TRANSFORMER.



STEREO "3-3" MAIN AMPLIFIER

Comprises two MULLARD 3-3 Main Amplifiers on one chassis. Operates with MULLARD STEREO PRE-AMPLIFIER. Output power 6 watts. Inputs for Crystal Pick-up and Radio Tuner.

KIT OF PARTS **£10.0.0** OR ASSEMBLED **£11.15.0**

COMPLETE STEREO AMPLIFIER

Meets the many requests for a low priced but good quality Stereophonic Amplifier. Output power is 4 watts and suitable for Crystal Pick-ups.

KIT OF PARTS **£8.10.0** OR ASSEMBLED **£10.10.0**

!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK, MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET
B.S.R. MONARCH A8 4-speed mixer Autochanger with Crystal Pick-up **£6.19.6**

THE NEW COLLARO MODEL RP594 4-speed Single Record Player. Studio Cartridge. **£9.18.9**

THE COLLARO "CONQUEST" 4-speed Autochanger Studio Pick-up. **£7.10.0**

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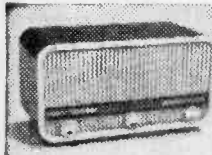
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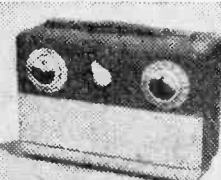


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37/6



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47/6



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29/6

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17/6

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39/6

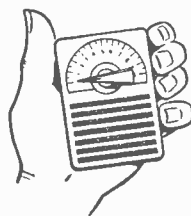
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3S4	8/-	6L6	7/6	12J7GT	9/6	88	12/6	DH77	8/3	EF93	7/6	KT44	13/6	PY80	8/6	UCL83	13/6	
3V4	9/-	6L18	12/6	12K7GT	8/6	78	12/6	DH107	13/6	EF95	15/6	KT55	22/6	PY81	7/6	UF41	9/-	
5R4GT	9/-	6L19	21/-	12K8GT	12/6	85A2	12/6	DH719	7/6	EL31	12/6	KT61	18/6	PY82	8/-	UF42	11/6	
5U4G	7/-	6L34	10/-	12Q7GT	8/6	150B2	12/6	DK91	9/-	EL32	5/6	KT63	8/6	PY83	8/6	UF80	9/6	
5V4	9/6	6/30L2	10/-	12S47	8/-	150B3	15/-	DK92	9/6	EL33	12/6	KT66	17/6	PZ30	18/6	UF85	9/-	
5Y3GT	8/6	6LD3	9/6	12SC7	8/-	185BT	32/-	DK96	10/-	EL35	12/6	KT71	9/-	QP25	14/6	UF89	8/6	
5Z3	10/-	6LD20	15/6	12SH7	8/6	303	7/6	DL33	9/-	EL37	18/6	KT74	12/6	QP230	17/6	UL41	9/-	
5Z4G	10/-	6N7GT	7/6	12SH7	4/-	304	7/6	DL35	12/6	EL38	23/9	KT76	12/6	QP21	12/6	UL44	24/6	
6A7	18/6	6M1	10/6	12S7	4/-	305	7/6	DL92	8/6	EL41	10/6	KT101	25/-	R10	21/6	UL46	21/-	
6A8	10/6	6M2	10/6	12SK7	8/-	328	7/6	DL94	9/-	EL42	10/6	KTW61	7/6	R19	19/6	UL84	9/6	
6ABB	9/-	6P1	17/6	12SQ7	11/6	329	7/6	DL96	9/6	EL81	14/9	KTW62	7/6	SD6	8/6	UU6	20/11	
6AJ8	9/6	6P25	19/6	12SN7	17/6	807	7/6	EA50	2/-	EL84	7/-	KTW63	7/6	SP4	14/6	UU7	15/-	
6AK5	8/-	6P28	26/-	12Z3	15/6	955	4/6	EAC90	7/-	EL85	10/6	KTZ41	8/-	SP42	3/6	UUB	26/-	
6AK8	7/6	6Q7GT	10/6	13D3	12/6	5763	7/6	EAC91	7/6	EL90	8/6	KTZ63	10/6	SP61	3/6	UY21	15/6	
6AL5	6/6	6SA7GT	7/6	14H7	12/6	9002	7/6	EAF42	10/-	EL91	5/-	L63	4/9	T41	22/6	UY41	7/6	
6AM1	4/9	6SG7	7/6	14R7	12/6	9003	7/6	EB41	7/6	EM80	10/-	LNJ309	15/-	TDD4	17/6	UY85	7/6	
6AM5	5/6	6SH7	6/6	14S7	21/-	AC4/PEN		EB81	10/-	EM81	10/-	LZ319	12/6	TDD13C		VP28	17/6	
6AN5	7/6	6S17	5/6	15A2	17/6	AC5/PEN	22/6	EB91	5/-	EY81	10/6	MH4	8/6			VP48	17/6	
6AQ5	8/3	6SK7	7/6	15D2	23/9	AC6	21/-	EBF80	9/6	EY84	10/6	MHD4	17/6	TH41	23/9	W17	8/6	
6AQB	9/3	6SL7GT	6/6	19AQ5	10/6	ACTP	32/-	EBF89	9/6	EY91	9/6	MHL	10/-	TP22	17/6	W76	7/-	
6AT6	8/3	6SN7GT	5/6	19B6G24	4/-	ACHL	12/6	EBL21	22/-	EZ35	7/6	MKT4 (57)		TP25	17/6	W81	5/-	
6AU6	10/6	6U4GT	11/6	20D1	12/6	AC/PEN		EBL31	21/6	EZ40	7/6	MS4B	17/6	U14	15/9	W142	9/-	
6B7	10/-	6U5	7/6	20D2	23/6	AC/PEN		EC90	9/6	EZ41	7/6	MSP4	17/6	U16	10/-	W719	7/6	
6B8	4/-	6U7	7/6	20F2	26/6	ACTH1	34/9	EC91	9/6	EZ80	7/6	MU14	9/-	U18,20	10/-	W727	7/6	
6BA6	7/6	6V6G	5/-	20L1	26/6	ACVPI	17/6	ECC31	10/-	EZ81	7/6	MX40	17/6	U22	10/-	X18	11/6	
6BE6	7/6	6V6GT	8/-	20P1	26/-	ACVP2	17/6	ECC32	10/-	EZ90	7/6	N18	8/-	U24	29/6	X61M	21/-	
6BG6G	21/-	6X4	5/-	20P3	23/-	ACVPI	17/6	ECC33	5/-	FC2	21/-	N19	8/-	U25	14/6	X65	23/9	
6BJ6	7/6	6X5GT	5/-	20P5	22/6	ACVPI	17/6	ECC34	15/-	FC13	17/6	N37	18/6	U26	12/6	X66	21/-	
6BR7	15/-	7C5	8/-	25L6GT	9/6	AC2/PEN	21/-	ECC35	8/6	FC13C	21/-	N78	17/6	U31	9/6	X78	21/-	
6BW6	6/6	7C6	8/-	25Y5	10/-	ECC40	21/-	ECC40	21/-	FW4,500		N108	18/-	U33	21/-	X79	21/-	
6BW7	6/6	7D5	15/-	25Z4	10/-	ECC81	8/-	ECC81	8/-	FW4,800		N142	9/6	U35	21/-	Y61	10/6	
6BX6	7/6	7D6	15/-	25Z6	10/6	ECC82	9/6	ECC82	9/6			N147	18/6	U37	25/-	Y63	9/-	
6BY7	7/6	7D8	15/-	27SU	17/6	ECC83	9/6	ECC83	9/6			N150	10/6	U45	21/-	Z21	12/6	
6C4	6/6	7H7	8/-	30	13/6	ECC84	9/6	ECC84	9/6	GZ30	10/6	N153	11/6	U47	21/-	Z63	7/6	
6C5GT	8/6	7K7	10/6	30C1	12/6	ECC85	9/6	ECC85	9/6	GZ32	11/6	N153	11/6	U50	8/6	Z66	19/6	
6C6	6/6	7Q7	11/6	30F5	11/6	ECC91	5/6	ECC91	5/6	GZ34	13/6	N329	10/-	U52	7/6	Z77	4/9	
6C9	12/6	7R7	12/-	30FL1	10/6	ECF80	12/6	ECF80	12/6	H30	5/6	N727	7/6	U76	7/6	Z152	8/6	
6C10	12/6	7S7	10/6	30L1	11/6	ECF82	12/6	ECF82	12/6	H63	9/6	N729	8/-	U78	7/6	Z179	7/6	
6CD6G	27/6	7Y4	7/6	30P4	22/-	ECH21	22/-	ECH21	22/-	HBC90	9/6	P2	10/-	U142	8/-	ZD152	9/6	
6D1	8/-	8D3	5/6	30PI2	11/6	ECH42	10/-	ECH42	10/-	HL92	6/6	PCC84	9/6	U145	15/-			
6D2	5/-	9BW6	14/9	30PI6	11/6	ECH35	9/-	ECH35	9/-	HL13DD	10/-	PCF80	10/6	U147	7/-			
6D3	15/-	10C1	18/-	30PL1	15/-	ECL80	9/-	ECL80	9/-	HL23	12/6	PCF82	9/6	U191	20/-			
						CBL1	17/6	CBL1	17/6									
						CBL31	21/-	CBL31	21/-									

METAL RECTIFIERS

RM1	6/-	18RA	1-1-8-1	4/6	16RE	2-1-8-1	8/6
RM2	8/-	18RA	1-1-16-1	6/6	18RA	1-2-8-1	11/-
RM3	9/-	16RC	1-1-16-1	88/6	14A86		17/-
RM4	16/6	14RA	1-2-8-2	18/-	14A97		23/6
RM5	22/-	14RA	1-2-8-3	21/-	14A100		24/-

CATHODE RAY TUBES

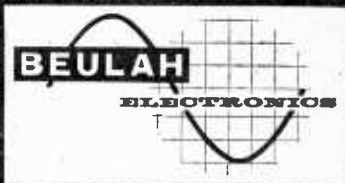
Type 43/69 £10.0.0

Type 36/44 £8.10.0

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ORDERS. POSTAGE 3d. PER VALVE.

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offer a highly competitive Range of

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MODEL 0-12U/F Laboratory 5" OSCILLOSCOPE

Here's an instrument to give laboratory service at less than utility 'scope price! The large flat screen ensures great accuracy and facilitates observation. An outstanding feature is the use of a patented sweep circuit of exceptional range which covers 10 c/s. to over 500 Kc/s in five steps, many times the sweep range of other 'scopes. Gold-plated printed-circuit. Large 5in. Flat Screen. Wide Band Amplifier for TV and F.M. Servicing. Vertical Bandwidth 3 c/s. to over 5 mc/s. Electronically stabilised power supply

£44 complete with 48-page Handbook plus carriage.

MODEL 0-12U (in Kit Form) £34. 15s.

MODEL V-7A/F VALVE VOLTMETER

Internationally Famous

Performance and professional appearance equal to many higher priced instruments. Gold-plated printed-circuit. High Input impedance (11 megohms). The V-7A measures A.C. volts (0-1.5, 5, 15, 50, 150, 500, 1,500) R.M.S. and A.C. volts (0-5, 14, 40, 140, 400, 1,400 and 4,000) pk-to-pk. D.C. volts (0-1.5, 5, 15, 50, 150, 500, 1,500). Ohms (with 10 ohms centre) X1, X10, X100, X1000, X10K, X100K and X1 megohm.



£19 complete with 32-page Handbook.

MODEL V-7A (in Kit Form) £13

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HEATHKIT SERIES

FACTORY ASSEMBLED!

FACTORY WIRED!

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MODEL AG-9U/F AUDIO SIGNAL GENERATOR

Wide Band (10 c/s. to 100 Kcs.). Less than 1% distortion (20 c/s.-20 Kc/s.). High grade 200 μ A f.s.d. meter with large scale for precision measurement. An invaluable instrument for hi-fi audio and many ultra-sonic and I.F. applications requiring an almost perfect sine-wave signal, without the necessity of expensive filters. The instrument has a very well-designed power supply which includes a double-wound mains transformer with a very effective smoothing circuit. Eight different switch selected voltage ranges covering from 0-0.003 f.s.d. to 0-10V. f.s.d.

£26. 3s. complete with 24-page Handbook

MODEL AG-9U (in Kit Form) £19. 3s. 0d.

MODEL O.S. 1/F New Low Priced Service OSCILLOSCOPE

This is an ideal light and compact portable 'scope for the serviceman, the overall dimensions being 5in. x 8in. x 14 1/2in. long at a weight of 10 1/2 lbs.

Specification

Time Base 10 c/s. to 100 K/c/s. and 50 c/s. sine wave sweep. X amp. Sensitivity 1 V/cm. at 1 Kc/s. Calibration 1 v., 10 v. and 50 v. peak to peak available on front panel. Valve Complement. 2-ECF80, 2-EF80, 1-ECC82, 1-EZ80, C.R. Tube 1-3AFP1 or equivalent (2 1/2in. dia.). Power Requirements, 200-250 volts, 40-60 c/s. A.C. 40 watt (fused).

£26. 7s. 6d. plus carriage

MODEL O.S.1 (in Kit Form) £18. 19s. 6d.



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Resistance/capacitance Bridge C-3U F.....	£13 2 6
MODEL C-3U (in Kit Form).....	£7 19 6
Audio Valve Millivoltmeter AV-3U/F.....	£19 19 6
MODEL AV-3U (in Kit Form).....	£13 18 6
Audio Wattmeter AW-1U/F.....	£19 19 0
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Electronic Switch S-3U/F.....	£15 15 0
MODEL S-3U (in Kit Form).....	£9 18 4

A.C./D.C. Multimeter Kit

Ranges: D.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000. A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000 D.C. milliamps 0-5, 0-100, 0-500. Ohms 0-50,000 with internal batteries. 0-500,000 with external batteries. Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, graduated scale and full instructions, price 19/6, plus 2/6 post and insurance.



TRANSISTORISED STETHIOSCOPE

Trace signal right through: Radio, T.V., Tape amplifier, Hi-Fi, etc.—simplest way to fault find—carry it like a fountain pen—all parts including transistor barrel crystal, everything except battery, 12/6 plus 1/6. Battery 6d.—data included or separately 1/6.



UNIQUE OPPORTUNITY TO BUILD FINE TRANSISTOR SET

Construct your own consisting of cabinet approx. size 41 x 31 x 1 1/2 in. with handle and embellishment as illustrated, turning dial, tuning condensers and easy to follow constructional data. Price 22/6 plus 2/6 post and insurance.



Now you can build a pocket transistor set as currently being sold at 17 gns. We can supply all necessary parts at highly competitive prices. Alternatively build your own circuit. Circuit diagram and constructional data supplied separately, 1/6.

Building A Scope



5in. oscilloscope tube American made Type No. 3FP7. Octal base 6.3 v. 0.6 amp heater, electrostatic deflection. Brand new and guaranteed, 15/- each, plus 1/6 post and insurance. Complete with circuit diagram.

"Dim and Full" Switch

Particularly useful for controlling photoflood lamps which have only a short life at full brilliance. This toggle switch has three positions; the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operation shots. Also useful for controlling night lights, heaters, etc., etc. Price 3/9 each, post 9d. Circuit diagram included.

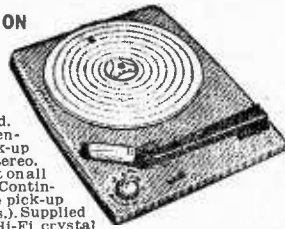
Morganite Potentiometers

Single and 2-gang types available. Standard size with good length spindle, all new and better. Single types, 1/- each, values available: 5K, 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg. 2-gang types, 2/- each—values available: 5K ± 5K, 10K ± 10K, 1 meg. ± 1 meg., 2 meg. ± 2 meg.



PHILIPS TRANSCRIPTION UNIT

Philips AG 2009 Record Player, 4 speed. Ideal for the enthusiast. Pick-up arm wired for stereo, fine adjustment on all four speeds. Continuously variable pick-up weight (2.12gms.). Supplied with Philips Hi-Fi crystal type AG5019 for micro-groove and 78 r.p.m. Frequency response 30-15,000 c/s. Pick-up lifting and lowering device, individually balanced heavy turntable. Muting switch. Can be used with any amplifier or radio set. Complete with monaural pick-up £10, 10.0, or 2 gns., deposit and 20 fortnightly payments of 10/-. Available also with stereo head, diamond or sapphire stylus. Prices on request.



The Taylor Meter Model 127A

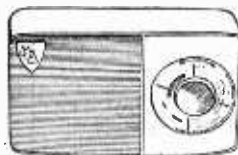


A pocket size meter but with a big scale and a sensitivity of 20,000 Ohms per volt D.C., therefore an ideal unit for television servicing — robustly made and complete with leads and prods—20 ranges as follows: D.C. current 50 micro-amps. to 1 Amp. D.C. voltages—0-1,000 volt in seven ranges (25 KV. with external probe, optional extra). Volts A.C.—0.2-500 in six ranges. Ohms—0-20 Ohm in three ranges (self-controlled).

Self-contained, 3 1/2 in. movement. Price £10 or 10/- deposit and 21 fortnightly payments of 10/-. Non-callers add 5/- carriage and insurance.

TRANSISTOR LOUDSPEAKER RADIOS

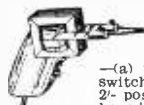
Results Guaranteed. Nothing can be more disappointing than to find that despite care in making up, your little radio just will not work. This is unlikely to happen with our kits, but if it does, send it in for service, we guarantee good results.



Two Models

Pocket 3 for strong signal areas, uses two transistors and one diode, price 27/6. Pocket 4 uses three transistors and one diode and has refinements for receiving weak stations, price 42/6. Every kit complete to last and bolt, with proper case, tuning condenser, and miniature loudspeaker. Our kits do not need external aerials, also they may be built in stages to car radio output. Post and insurance 2/6.

Making a Solder Gun



A 7-second solder gun of the type costing £3-£4 was described in "Practical Mechanics". Only two essential parts are required (a) the transformer and (b) the push switch. These we can supply at 11/6, 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.

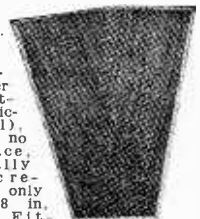
Component Storage Drawers

Stout board construction these drawers are ideal for small parts. Supplied complete with simple erection instructions—1/6 each or 12 drawers each 6 x 21 x 6 1/2 in., 13/6, post 2/-.



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-price 8 in. speaker fitting for tweeter. Only 45/- each, carriage and insurance 3/6.



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.

Yaxley Switches

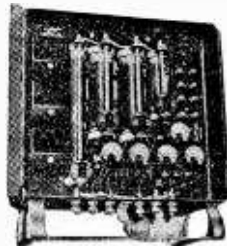
1 Pole 3 Way.....	1/6
1 Pole 5 Way.....	2/6
1 Pole 11 Way.....	2/6
1 Pole 12 Way.....	3/-
2 Pole 2 Way.....	2/6
2 Pole 4 Way.....	2/6
2 Pole 6 Way.....	2/6
2 Pole 12 Way.....	4/6
3 Pole 3 Way.....	1/6
3 Pole 6 Way.....	3/6
4 Pole 4 Way.....	3/-
6 Position Shorting.....	3/-
6 Pole 3 Way.....	2/6
6 Pole 3 Way.....	3/6
8 Pole 2 Way.....	2/6
8 Pole 3 Way.....	2/6
12 Pole 2 Way.....	2/-

Miniature Microphone

American made. Dynamic type, real bargain at 2/6, plus 6d. postage.



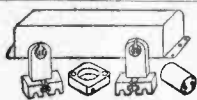
Charging Switchboard



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 £215.0, carr. 10/-.

Suppressor Condenser

Stop your drill or other appliances interfering with your or your neighbours' radio or television. Simple instructions given. 1.6 each. 12/- dozen.



Fluorescent Light Bargain
Kit of parts comprising: choke, two lamp holders, starter holder and starter, 40 watt, 18/6, 80 watt, 23/6. Plus 2/- post and insurance.

W.D. Circuit Details

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

A.1134	R.109
BC.348	HRO Receiver
BC.312	R28/ARC5
R.103A	R116/A
BC.342	RA.1B
RA.1B	AR88D
R.208	AN/APA-1
R.1155	78
R-1124A	76
R-1132A/R-1481	R.T.18
R-1147	CAY.46-AAM-
R-1124A	RADAR
R-1092	A.S.B.3
R-1355	Indicator 62A
B.C.1206-A/B	Indicator A.S.B.3
B.455-A (or-B)	Indicator 62
B.454-A (or-B)	Indicator 6K
B-456-M-A (or-B)	R.F. unit 24
Transmitter T1154	R.F. unit 25
Fifty-eight walkie talkie	R.F. unit 26
Frequency meter	R.F. unit 27
B.C.221	Wireless set No. 19
	Demobbed valves

Another Battery Charger Bargain
Components Would Cost More

Car Battery Charger—ready-made high output battery charger in stove enamelled sheet steel louvered case. New, complete and ready to work. Rated at 12 v. 5 amps, and variable rate selector for trickle charging, also a meter to show charging rate. Suitable for 230/250 A.C. mains. Special snip price of 65/-, plus 3/6 post and ins.



Motor Snip

Miniature motor 2 1/2 in. long x 1 1/2 in. 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 8/6, plus 1/6 postage and insurance.



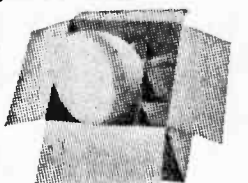
Transistor Set Cabinet

Very modern cream cabinet, size 5 1/2 x 3 x 1 1/2 in. with chrome handle, tuning knob and scale. Price 7/6, plus 1/6 postage and packing.

Re-gunned Tubes

We offer television tubes which have had new gun assemblies, new getters, new screens and have virtually been rebuilt as new.

12in. £4.19.6
14in. £5.9.6
17in. £5.19.6
Non-callers please add 10/- carriage and insurance.

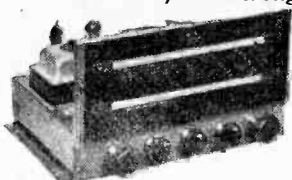


Cabinet Snip

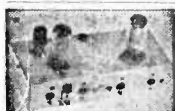


This fine cabinet as illustrated but less control board and knobs is available at a special snip price of 12/6, plus 3/6 post and insurance. Size is 13 1/2 x 9 x 4 in. and it is nicely covered in two tone I.C.I. fabric.

Fine Chassis by Armstrong



The AF208 handbuilt to the traditional Armstrong standard is ideal for building into a new set-up or for bringing that old favourite up to date.
FM 87-108 Mc/s. AM 187-570 mtrs, 5 watts output—15db neg. feedback—separate base and treble—2 compensated inputs (for pickup—frequency response 30-22 thousand C.P.S. Plus or minus 2 db. Tape, record and playback facilities. Price 22 kns. or H.P. terms on request.



Band III Converters

Suitable Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF80 valves, coils, fine tuner, contrast control, condensers and resistors. (Metal case available as an extra.) Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately, 1/6. Please send two more kits, the one you sent last week is performing magnificently. We receive this sort of letter every day of the week, so if you have hesitated because you thought our kits too cheap you need hesitate no longer.

SPECIAL THIS MONTH

Twin Twisted Lighting Flex—equivalent 14/36, rubber insulated, cotton covered, 12/6 per 100 yard coil.

Moving Coil Meters
0-500 microamp 2 1/2 in. flush 17/6
250-0-250 microamp 2 1/2 in. surface 97/6
750 microamp 2 1/2 in. surface 17/6
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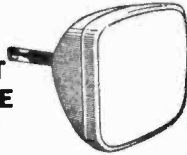
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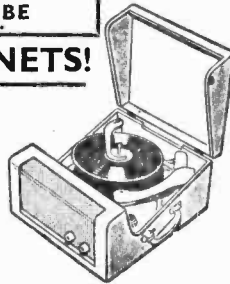
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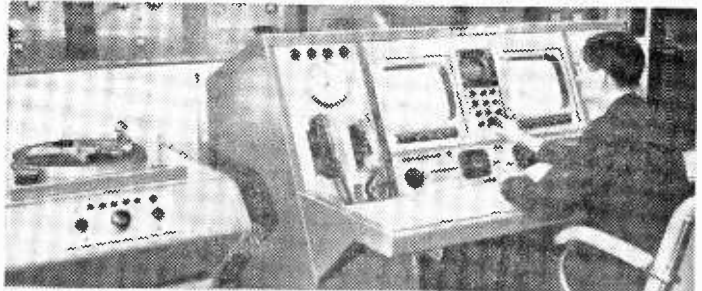
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AVO Multiminor with leather carrying case	£31. 9. 0	£2. 5. 0	12 of 17/-
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COLLARO STUDIO	£15.10. 0	£3. 2. 0	12 of £1. 2. 9

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 All components in stock for the Mullard Tape "C" Pre-Amplifier Kit. Fully detailed list available.

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ILLUSTRATED LISTS

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT. Any will be sent free upon request.

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We have full stocks of all components for the Mullard 510, Mullard 2 and 3 valve Pre-Amplifiers, GEC 912 Plus. Fully detailed list on any of these sent upon request.
 Instruction Manuals. Mullard. All Mullard Audio Circuits in "Circuits for Audio Amplifiers", 9/6. GEC 912, 4/6. All post free.

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GARRARD RC210 (GC8 PU)	£9.19. 6	£1.19. 6	12 of 15/-
GARRARD RC88	£26. 8. 0	£3. 6. 0	12 of £1.4.0
GARRARD RC98 (GC8 PU)	£21.8. 8	£3.15. 0	12 of £1.7.3
B.S.R. UA8 Monarch (TC8 PU)	£7. 5. 0	£1. 9. 0	6 of £1.2.8
B.S.R. UA14 Monarch (TC8 PU)	£28.18. 0	£1.15. 0	12 of 18/7
B.S.R. UA14 Monarch (TC88 Stereo/LP/78)	£29.18. 0	£1.18. 0	12 of 15/-
SINGLE RECORD PLAYERS			
GARRARD TA (GC8 PU)	£3.10. 0	£1.14. 0	12 of 13/-
B.S.R. TU9 (TC8 PU)	£4.10. 0	£1. 5. 0	3 of £1.5.0
COLLARO RP384 (O, P or T PU)	£28.18.11	£1.15.11	12 of 13/7
COLLARO RP394 (O, P or TPU)	£29.18. 9	£1.18. 9	12 of 15/-
E.M.I. (Acco Stereo PU)	£26.15. 0	£1. 7. 0	12 of 10/8
TRANSCRIPTION UNITS			
COLLARO 4F/200 (TX88 PU)	£28.13. 0	£3.15. 0	12 of £1.7.4
COLLARO 4F/200 Motor only	£23.18. 3	£2.15. 3	12 of £1.0.5
GARRARD 4HF (GC8 PU)	£28. 9. 9	£3.15. 9	12 of £1.7.0

Matched list of the above can be supplied for stereo working. See our Gramophone Equipment List for details.

JASON FM TUNER KITS

Three Jason F.M. Tuner kits with variable tuning are now available to the home constructor. Brief details are given here and our illustrated list is available free.
MOST IMPORTANT. We take great pains to see that every item needed is included in our kits and also that all items are entirely suitable in every way. This should be borne in mind when comparing prices.
 Hire Purchase Terms are available on any kit.
INSTRUCTION MANUALS. All our kits include the instruction manual, but this can be supplied separately if required. Data Publications booklet, describing FMT1, 2, and 3. 2/10; J.T.V.2, 3/10; Mercury 2, 3/10. All post free.

STANDARD TUNERS

FMT1. Supplied complete with a chassis-panel assembly fitted with a solid hammer finished panel and glass dial. Four EF91 valves are used and an external power supply is required. Complete kit £25.9.6. Power Pack kit £21.0.
FMT2. This is a new version of the FMT1 and is supplied with a complete cabinet-chassis assembly which can be mounted in a cabinet or stood on a shelf. The circuit employs four EF80 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply £27.17.6. Kit with power supply £29.16.0.

FRINGE TUNER

FMT3. This is a fringe tuner using the same cabinet assembly as the FMT2 described above. The tuner is fitted with variable AFC and uses five EF80 and one ECC91 valves. Kit less power supply £29.18.6. Kit with power supply £31.18.0.

F.M./TV SWITCHED TUNERS

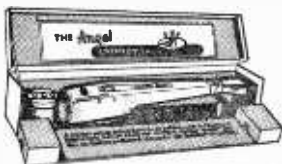
Kits for two new Jason F.M./TV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turret Tuner which gives switch positions for the three BBC Programmes as well as ABC and ITA TV Sound. A.F.C. is fitted to ensure freedom from drift.
JTV2. This tuner is complete with power supply in a cabinet which can be used either for shelf or cabinet mounting. Complete kit £14.14.0.
MERCURY 2. This is similar to the JTV2 but has no provision for a power supply. It is mounted on a small chassis with printed front panel and is intended for cabinet fixing. Complete kit £10.10.0.
IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

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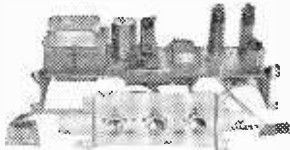
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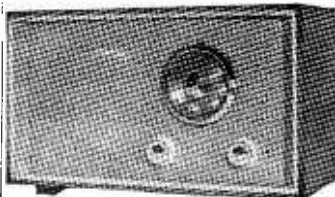


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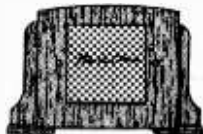
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- This instrument has to be seen and heard to be believed. Complete with ACOS Xtai Mike. **ONLY 18 gns.**

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Practical Wireless

VOL. XXXVI, No. 644, OCTOBER, 1960

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The Editor will be pleased to consider articles of a practical nature. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Owing to the rapid progress in the designs 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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P.W. "POCKET SUPERHET" —FREE BLUEPRINT

OUR technical staff have recently concluded the design of a 6-transistor receiver—the P.W. "Pocket Superhet"—and the first article describing the construction will appear next month. Each copy of the October issue will contain also a large blueprint (15in. x 24in.) which will be given away free, although the normal price is 5s. 0d. The blueprint contains the circuit diagram and large, detailed, chassis wiring diagrams as well as a complete list of parts required to build the set. The diagrams are extremely clear; the performance of the set excellent, and even the newcomer to radio-construction should be able to build the receiver with little difficulty. Miniature parts have been used throughout resulting in the small size of the receiver (5½in. x 3in. x 1½in.) which has also been made possible by very careful circuit design and layout.

It is an oft-voiced criticism of home-constructed equipment that the final "finish" is poor; this criticism will not be made of the P.W. "Pocket Superhet" for the October issue will also contain details of a special offer of a lightweight plastic case, a calibrated dial and a chrome-plated handle which will give the completed receiver a professional appearance. The demand for the October issue will be great; be sure to order your copy *now*.

COMMERCIAL RADIO

THE Government's recent announcement of the setting up of an inquiry into the future of sound and television broadcasting in this country has aroused speculation as to whether commercial radio will soon make its appearance. Mr. Reginald Bevins, Postmaster-General, said the terms of reference of the Broadcasting Committee were sufficiently wide to allow it to consider whether a third or other broadcasting organisation should be provided in addition to the BBC and ITA.

The terms of reference are: "To consider the future of the broadcasting services in U.K., and the dissemination by wire of broadcast and other programmes and the possibility of television for public showing; to advise on the services which should in future be provided in the U.K. by the BBC and the ITA; to recommend whether additional services should be provided by any other organisation; and to propose what financial and other conditions should apply to the conduct of all these services".

It is evident that the work of the Committee will, for the most part, be centred on the development of television broadcasting where many technical and economical factors have to be taken into account. Nevertheless, the future of sound broadcasting must be carefully considered; at present the BBC has a monopoly and it may be argued that the introduction of a commercial network would mean improved standards. The task of the Committee is difficult and two years are expected to elapse before its report appears; its publication will be awaited with interest.

Our next issue, dated November, will be published on October 7th

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of June, 1960, 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	774,356
Home Counties	727,259
Midland	535,015
North Eastern	590,943
North Western	499,424
South Western	435,471
Wales and Border Counties	261,786
Total England and Wales	3,825,254
Scotland	445,690
Northern Ireland	131,254
Grand Total	4,402,198

Budapest Industry Produces More

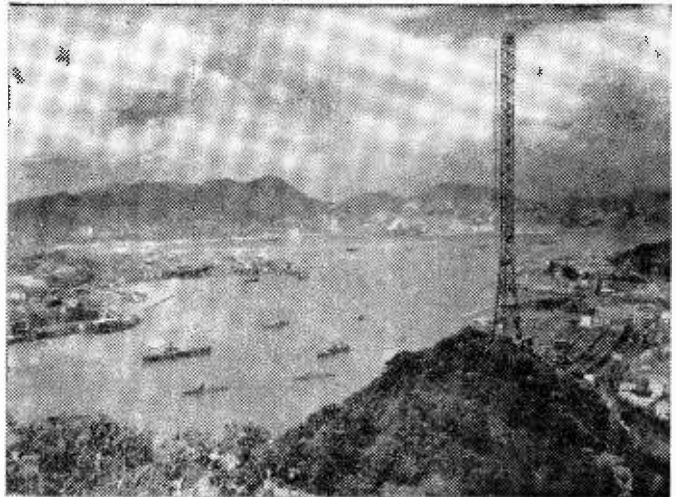
INDUSTRIAL output in Budapest has risen 15 per cent in the first four months of this year, compared to the corresponding period last year, according to the Hungarian capital's Central Statistics Office.

Almost half the increase came through an average rise of 7 per cent in productivity. In the instruments industry productivity went up by 12 per cent. Increased output in the chemical industry and the electrical machinery industry was especially significant, says the report.

Average monthly income for workers in the city is now 1,482 forints, compared to 1,450 forints twelve months ago.

Formation of Steelworks Automation Unit

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED and Davy-United Limited announced recently the formation of a jointly-financed Steelworks Automation Unit to apply new automatic control techniques to the processing both of steel and of non-ferrous metals. The problems involved in full automation in the steel and allied industries are too complex for any single existing manufacturing organisation to deal with adequately



Radio Hong Kong's new VHF/FM broadcasting station which went on the air recently uses four Marconi 5kW FM transmitters in two parallel pairs. This illustration is a view of Hong Kong harbour showing the 135ft tower on Mount Gough which supports the quadrant aerial.

within its own resources, and AEI has therefore allied with Davy-United to establish this combined unit, which has been specifically organised with such problems from the stage of the initial design study to the commissioning of a fully-operational production system in a plant.

The new Steelworks Automation Unit will undertake comprehensive automation projects which can be expected to offer considerable long-term benefits in improved productivity and economy of operation. Such projects will include the combination of advanced servo controls with computers to ensure optimum performance of rolling mills and associated plant.

The AEI/Davy-United Steelworks Automation Unit has its headquarters at Mill Road, Rugby, with representatives both at Davy-United Ltd., Sheffield, and at AEI Heavy Plant Division, Rugby.

New Hong Kong Station

RADIO HONG KONG'S new VHF/FM broadcasting station, which went on the air last month, uses four Marconi 5kW FM transmitters in two

parallel pairs to ensure the reliability required for unattended operation. The station, which is situated at Mount Gough, was planned, built and installed, and will be serviced by Cable and Wireless Ltd. on behalf of the Hong Kong Broadcasting Service.

The parallel pairs system was originally developed by Marconi's Wireless Telegraph Company Ltd. for use on remote transmitter stations, not easily accessible other than on foot.

Two transmitters in parallel are used on each programme instead of the more usual use of a main and a lower power standby transmitter. Should one transmitter fail, then the other continues to radiate the programme at quarter power without the break which occurs while the stand-by is switched on. This also obviates the need for equipment to change over to the stand-by transmitter.

New Ekco Electronics Factory

WORK has already started in the partly completed Ekco Electronics Works, Ashington Road, Rochford, Essex. Production of the specialised equipment

marketed by Ekco Electronics Ltd. has been transferred from Ekco Works, Southend-on-Sea, and the Electronics Installation and Service Department have moved into the new factory. Production of radar and associated equipment will be transferred from Malmesbury (Wilts.) to the new works, thus centralising the whole electronics production enterprise at Rochford.

The total area of the first stage of the factory is about 44,500 sq ft, and work is already in progress on the next stage on the 13-acre site.

"Talking" Books for the Blind

A BRITISH development in tape recording and play-back techniques will give the blind of this country the most advanced talking book machines in the world.

Talking books—books read aloud by specially selected readers recorded on long-playing gramophone records—have for many years played an important role in the lives of the blind, especially the elderly and the bed-ridden. The current membership of the library is in excess of 6,500, and the circulation figure for the last financial year was well over two million individual discs.

Now the service is to be radically improved by the introduction of tape recording and a revolutionary type of play-back machine which possesses a number of basic advantages over the present disc reproducer.

The result of almost twenty-five years' research and development by the R.N.I.B. and St. Dunstan's, this machine has been designed to be, in operation, the very essence of simplicity. Amplifier, loudspeaker and drive mechanism are housed in one compact case, controls have been reduced to one ON/OFF—VOLUME switch and one START/STOP lever and facilities have been incorporated for headphone listening when required.

Philips, Italy, all set for 17th Olympiad

PHILIPS s.p.a., the Italian branch of the international electrical concern, is playing a big part in the arrangements now under way for the opening of the 17th Olympiad in Rome next month.

In the Olympic Village—home of the contestants and HQ of the Press—200 radio sets and 150 TV sets with 21-inch screens have been installed to enable athletes and Press to follow every detail of the Games. This should prove a popular service, for quite often several events will be taking place at the same time in as many different locations.

In the medical centre will be a working range of Philips X-ray and electro-medical appliances.

The company's P.A. equipment—a complete installation already exists in the main Olympic Stadium—will relay results and announcements.

Philips will also floodlight the Colosseum and the Trinita dei Monti. About 400 sodium lamps will be used for the lighting of the Colosseum alone.

Radio Magazine for Denmark

THE Danish State Broadcasting Company is planning to publish Denmark's first radio magazine. It is expected to appear at the beginning of 1961.

British Equipment Used at U.S. Democratic Convention

PERSONAL paging equipment manufactured by the British Multitone Electric Company Limited, and supplied by the Company's Canadian subsidiary,

was installed at the request of the Democratic National Committee at their recent Convention at Los Angeles. The pocket receivers were carried by Democratic officials and delegates, TV, network and News service personnel. These enabled individuals to be called immediately at any time during crucial moments of the proceedings and at any place in or near the huge sports arena.

The Multitone pocket receivers, each of which operates on its own frequency, weigh only 5oz. and standard equipment enables up to 400 individuals to be contacted from one central transmitter.

Reliability in Electronics

A W.S. 12-channel VHF Telemetry Transmitter was found on the beach by a holidaymaker five weeks after the aircraft, in which it has been installed, had crashed into the sea. The impact of the crash evidently threw the transmitter out of its seating, but despite this and its subsequent five weeks in the sea water, it was found on test to be up to full performance specification, and only superficially damaged.

The transmitter, in the same state as when it was recovered on the beach, is being displayed by W.S. Electronics Limited at the Farnborough Air Show.

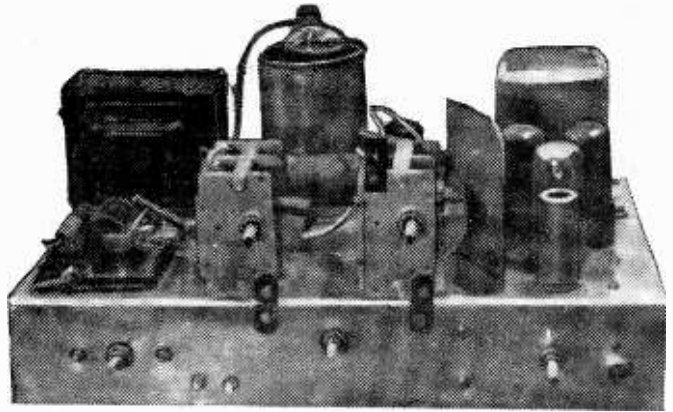


One of the new gadgets shown by the Canadian Army during a press visit to Camp Gagetown, New Brunswick, was a helmet with built-in radio receiver which has its aerial running over the helmet as seen on the left in the illustration. A conventional helmet may be seen on the right.

Six-Valve Top-Band Tx

10 WATT UNIT WITH "ANODE AND SCREEN" MODULATION

By R. Dowling



The completed transmitter.

THIS transmitter is designed for use in the amateur "top band"—that is, the band extending from 1.8Mc/s to 2Mc/s. The maximum input power to the power amplifier permitted by the G.P.O. on this band is 10W, and accordingly this represents the maximum input power of the transmitter described.

The transmitter was built primarily for telephony operation and it was decided at the outset that "high-level" (i.e. anode and screen) modulation should be employed. This method is generally considered more satisfactory than efficiency

modulation systems, and certainly has the advantage of requiring no elaborate or tricky setting-up procedure.

The R.F. Section

The R.F. section of the transmitter is extremely simple, and consists of a 615 triode as a Clapp variable-frequency oscillator feeding an 807 tetrode power amplifier (Fig. 1). The variable condenser controlling the V.F.O. frequency is fitted with a "Muirhead" type of slow-motion drive, as found on the well-known RF26 and RF27 units.

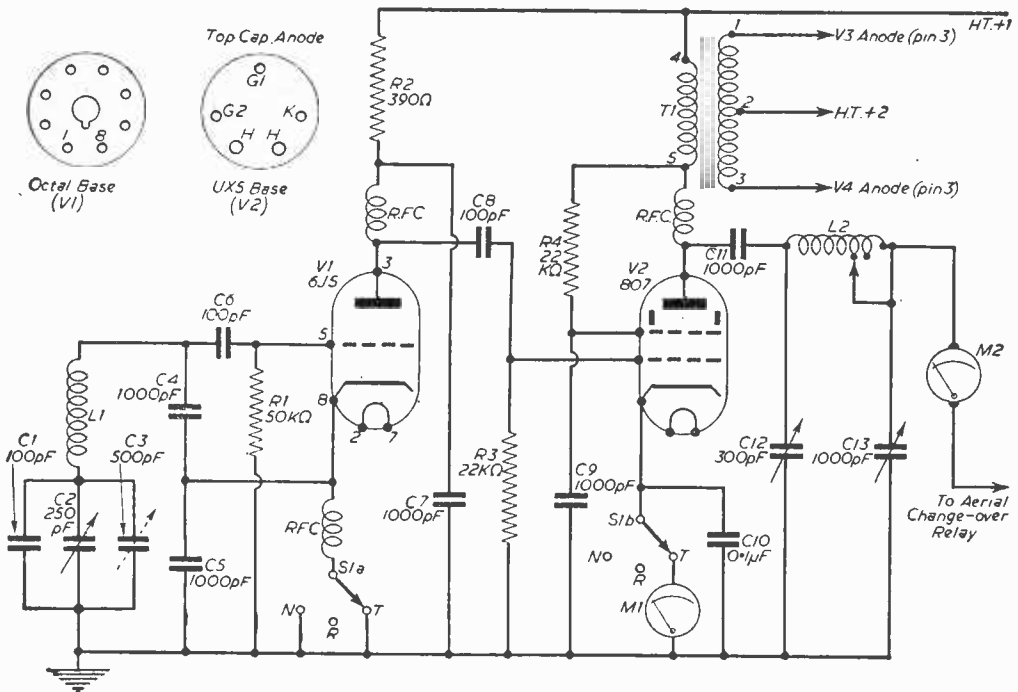


Fig. 1.—The V.F.O. and power amplifier.

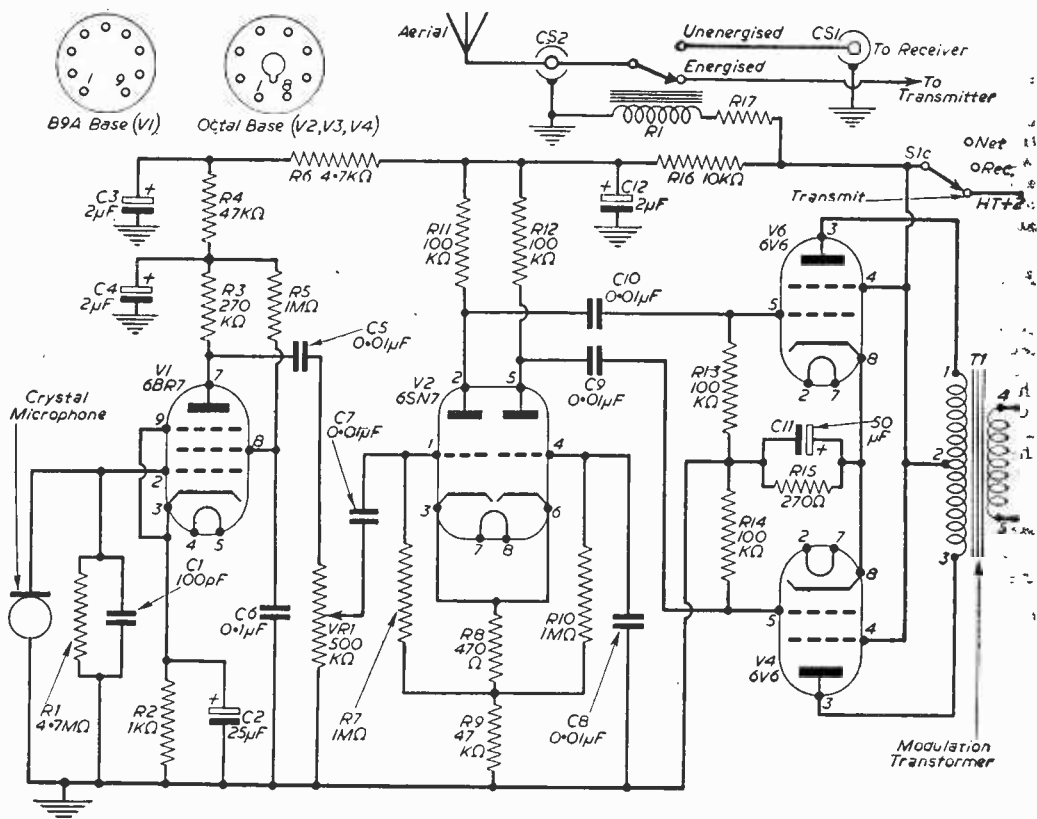


Fig. 2.—Circuit of the modulator.

It will be seen from the circuit diagram that the method used to match the output of the transmitter to the aerial system is the versatile "π-section". If difficulty is experienced in obtaining the 1000pF variable condenser required on top-band for aerial loading, a quite satisfactory alternative is a broadcast type 500pF twin-gang condenser with the two sections wired in parallel. This method was, in fact, used by the writer in the design shown here. By means of the π-section it will be found possible to match the output of the transmitter into almost any type of aerial; the exact method of tuning up is given later in the article under the heading "operating details."

The Modulator

The modulator employs a total of four valves (Fig. 2). The first valve (6BR7) is the pre-amplifier; the input circuit of this valve is designed for a crystal microphone. A crystal microphone is a

high impedance device, and consequently no matching transformer is required between the microphone and pre-amplifier grid circuit.

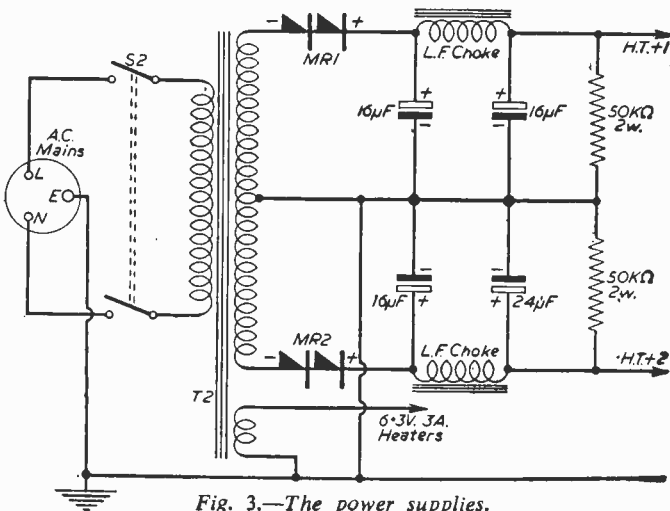


Fig. 3.—The power supplies.

The output of the 6BR7 is fed to the 6SN7 double-triode phase-splitter, which in turn feeds the grids of the 6V6 push-pull output valves. These are arranged to operate in class AB1: the common cathode resistor of 270Ω gives the cathode a bias of about 17V with respect to grid. The modulation transformer used in the equipment shown here was an ex-Government type, having a primary anode-to-anode impedance of $6,000\Omega$ and a secondary impedance also of $6,000\Omega$. However, any similar transformer should prove quite suitable.

Power Supplies

Separately smoothed power supplies are used for powering the R.F. section and the modulator section, as a precaution against frequency modulation of the carrier. Half-wave rectification is used; this makes it possible to use a single mains transformer having 300-0-300V and 6·3V windings arranged as shown in Fig. 3. The rectifiers used in the original were miniature contact-cooled types which performed very satisfactorily in operation.

Aerial Change-over

Aerial change-over is accomplished by means of the relay R1. This is a high impedance relay

($2,000\Omega$) and is energised from the modulator H.T. line via a suitable dropping resistor. Thus, when the function switch is in the "net" or "receive" positions the relay is unenergised and the aerial goes to the receiver. In the "transmit" position, H.T. is applied to the modulator H.T. line and the relay switches the aerial across to the transmitter.

Construction

The size of chassis used for the original transmitter was 14in. x 8in. The most suitable gauge of aluminium to use is 16s.w.g.; any lighter gauge tends to afford too little rigidity, and difficulty will be experienced in making the V.F.O. stable.

It is suggested that the power supply section be built first of all, since this will have to be completed in any case before the modulator or R.F. stage can be tested. No difficulty should be experienced in making the power supply section work satisfactorily, provided that good quality components are used. This applies particularly to the electrolytic smoothing condensers; "surplus" condensers are best avoided unless they have been rigorously tested. Good quality insulated sleeving should be used on all connecting wires and leads.

(To be continued)

PARTS LIST FOR FIG. 1.

Resistors:

R1 50k $\frac{1}{2}$ W. R3 22k $\frac{1}{2}$ W.
R2 390 Ω $\frac{1}{2}$ W. R4 22k 1W.

Capacitors:

C1 100pF. C10 0·1 μ F (350VW).
C2 250pF Var. C11 1,000pF*
C3 500pF pre-set. C12 300pF Var. (or
C4 1000pF* twin-gang 150pF with
C5 1,000pF* sections ganged).
C6 100pF. C13 1,000pF Var. (or
C7 1,000pF. twin-gang 500pF with
C8 100pF. sections ganged).
C9 1,000pF.

(C4, 5 and 11 are silvered mica).

Miscellaneous:

L1 42 turns 22s.w.g. enamelled wire, close-wound on lin. dia. former.
L2 80 turns, 24s.w.g. cotton-covered wire, close-wound on lin. dia. former; tapped at 40, 50, 60, 70 turns. (The various tapings should be tried until satisfactory loading is achieved.)
T1 Modulation transformer (see text).
One I.O. valveholder. V2 807.
One UX5 valveholder. S1 (a), (b)—function
M1 50mA f.s.d. meter. switch (see text).
M2 500mA f.s.d. R.F. REC All 2·5mH R.F.
meter. chokes.
V1 6J5.

PARTS LIST FOR FIG. 2.

Resistors:

R1 4·7M $\frac{1}{2}$ W. R6 4·7k $\frac{1}{2}$ W.
R2 1k $\frac{1}{2}$ W. R7 1M $\frac{1}{2}$ W.
R3 270k 1W. R8 470 Ω $\frac{1}{2}$ W.
R4 47k $\frac{1}{2}$ W. R9 47k $\frac{1}{2}$ W.
R5 1M $\frac{1}{2}$ W. R10 1M $\frac{1}{2}$ W.

R11 100k $\frac{1}{2}$ W. R15 270 Ω 3W.
R12 100k $\frac{1}{2}$ W. R16 10k 1W.
R13 100k $\frac{1}{2}$ W. R17 see text.
R14 100k $\frac{1}{2}$ W. VR1 500k Var.

(R11, 12 and 13 are of 5 per cent tolerance)

Capacitors:

C1 100pF. C7 0·01 μ F 350VW.
C2 25 μ F 12VW. C8 0·01 μ F 350VW.
C3 2 μ F 350VW. C9 0·01 μ F 350VW.
C4 2 μ F 350VW. C10 0·01 μ F 350VW.
C5 0·01 μ F 350VW. C11 50 μ F 50VW.
C6 0·1 μ F 350VW. C12 2 μ F 350VW.

Miscellaneous:

Microphone socket (coax or jack type).
CS1 } coax output
CS2 } sockets.
T1 Modulation transformer, Collins type 7R3.
One B9A valveholder.
Three I.O. valveholders.
Two three-way tag strips.
Two coaxial sockets.
S1 (c) function switch (see text).
R1 Aerial change-over relay (high impedance).

PARTS LIST FOR FIG. 3.

S2 Double-pole double-throw switch.
T2 Mains transformer: 300-0-300V 100mA;
6·3V 3A.
MR1 Contact-cooled (or selenium) rectifier;
300V 60mA.
MR2 As MR1 but 300V 100mA rating.
Three 16 μ F capacitors (electrolytic), 450VW.
One 24 μ F capacitor (electrolytic), 450VW.
Two 5H L.F. chokes.
Two 50k (or 47k) 2W resistors.

Resonant Capacity Checker

THE "UNKNOWN" CONDENSER IS USED TO TUNE AN R.F. OSCILLATOR

By J. Gray

THE bridge method of determining capacity is well known, and is used for both large and small condensers. When small capacities only are to be determined there is a generally less known method which can give results to a high degree of accuracy. This requires adjusting a tuned circuit to resonance with a signal of fixed frequency, adding the unknown condenser, and noting what shift in capacity is required to restore resonance. By this means the readings obtained can very nearly equal the accuracy with which the instrument is calibrated. For normal purposes, readings from about 2pF to 400pF or 500pF will be useful, and can be directly shown upon two scales. One scale covers about 2pF to 45pF, with an accuracy of reading against calibrations of about 1pF. The other scale covers about 50pF to 450pF.

A capacity tester of this kind is intended primarily for condensers used in radio frequency parts of a circuit. That is, the capacity range of trimmers, or small variable condensers, the value of small fixed condensers such as are used in tuned circuits, and low stray capacities such as may arise in switching circuits, valveholders and wiring, etc.

Battery or Mains

For dry battery running, the circuit in Fig. 1 is satisfactory. Small 22½V and 1½V batteries will have a very long life. The whole unit can be constructed in any convenient case.

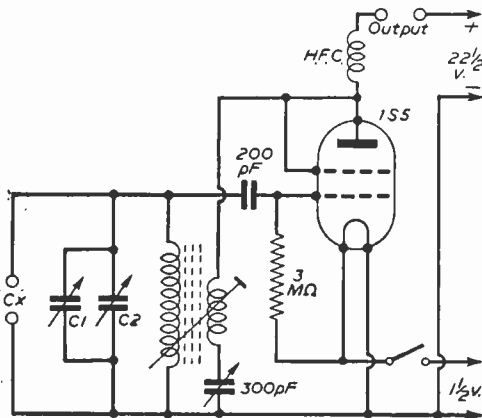


Fig. 1.—A battery circuit.



A completed unit.

If A.C. mains operation is preferred, the circuit in Fig. 2 will be found suitable. It should be noted that the 12-6V heater transformer also provides H.T. through a small rectifier. For smoothing, C3 and C4 can be any 25V or similar electrolytics, as high voltage condensers are not needed. There is little point in providing an increased H.T. voltage. Practically any 13V or 12-6V valve will be satisfactory. As phones are used to listen to the heterodyne note it is absolutely essential that the unit is isolated from the mains, and preferably earthed. No mains switch need be included, as it can be plugged into the supply as required.

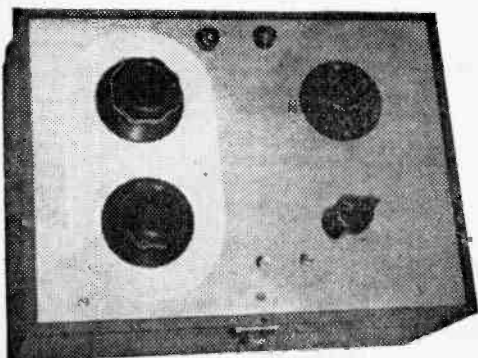
For the ranges mentioned, C1 is 50pF, and C2 is 500pF. Air dielectric condensers of good quality are necessary. Those with semi-circular plates giving changes of capacity proportional to angular movement, are most suitable. Other condensers are satisfactory, but markings will be less uniform.

The unknown condenser Cx is joined to two terminals. These are best on an insulated panel, to avoid capacity between the condenser, or its leads, and a metal panel.

When the circuit is to be resonated against the output of a signal generator, the coil can be of any inductance covering about 500kc/s to 100kc/s with a parallel capacity of about 500pF. In many parts of the country resonance may be checked against the 200kc/s Light Programme, and a signal generator is then unnecessary. In this instance, the coil can best have an adjustable core, so that resonance at 200kc/s can be achieved with C1 fully closed, and C2 nearly closed. An ordinary long wave coil with reaction is suitable, turns being removed until resonance is obtained.

Calibration

For direct calibration, a few ceramic or silver mica condensers of low tolerance and known value



Another view of the capacity checker.

are required. Ceramic condensers can be obtained to a tolerance of 0.25pF. Silver mica condensers can have a tolerance of 2 per cent. It is unlikely that there will ever be any need for readings to a higher accuracy than this.

It will be remembered that condensers can be combined in series or parallel, to obtain other values. For example, two of 100pF in parallel will be 200pF, while two of 100pF in series will be 50pF. This will help in obtaining other check points.

With phones connected and sufficient reaction to provide a heterodyne note, the unit is tuned to zero beat with the signal generator, C1 being at maximum capacity, and C2 just below this, as in Fig. 3. Condensers of small value, up to about 45pF are then joined across the terminals. In each case C1 will have to be opened to obtain zero beat, and the capacity is marked on the scale. The negative sign is used because the calibration is effectively in terms of decreasing capacity. After closing C1 to restore resonance, C2 is similarly calibrated values up to about 450pF being used. The positions of intermediate marks can be estimated, after obtaining as many actual calibration

marks as possible. Markings towards the extreme maximum or minimum capacity settings must be obtained by calibration, as the change in capacity will not be uniform here.

Measuring Unknowns

To find an unknown capacity, first check that resonance is obtained with the signal generator or broadcast station, with the two variable condensers. Provided the circuit is resonated at the generator frequency, as shown by the absence of a note in the phones, the readings of C1 will not be influenced by the setting of C2. For example, if the coil is made to operate on 250kc/s, and the generator is not tuned exactly to this frequency, this will have no effect on the readings of C1, provided C2 is adjusted to resonance with no condenser connected.

When measuring values which will fall on the scale of C2, it is simplest to set the C2 dial, then tune the signal generator for resonance. It is only

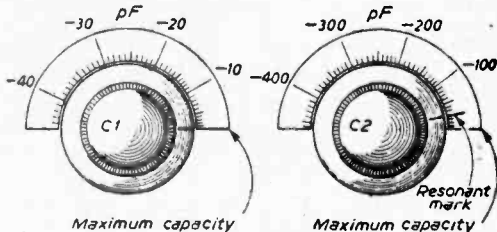


Fig. 3.—Capacity dials.

necessary that the dial upon which measurement is to be made should be at the correct resonant mark, before connecting the unknown condenser.

All values are simply read directly off the appropriate scale, the negative sign being ignored.

If test leads are necessary, these should be short. The earth lead is connected, and the other lead placed in its position and the capacity measured. The free lead should then be attached to the wiring or other stray capacity to be measured, taking care not to alter the test lead positions unduly. The difference in readings is then the required capacity.

Accuracy

It will be realised that the accuracy of readings depends on the accuracy of calibration, and upon C1 and C2 being unchanged. A case is thus necessary to give protection, and avoid dust on the condenser plates. Condensers C1 and C2 should also be of high quality, if possible, rigidly wired, and clear of batteries or other items which may move.

The scales on the capacity dials will be linear if the condensers used give capacity changes proportional to angular movement but even with non-linear condensers, it will be possible to estimate values of capacity between scale markings.

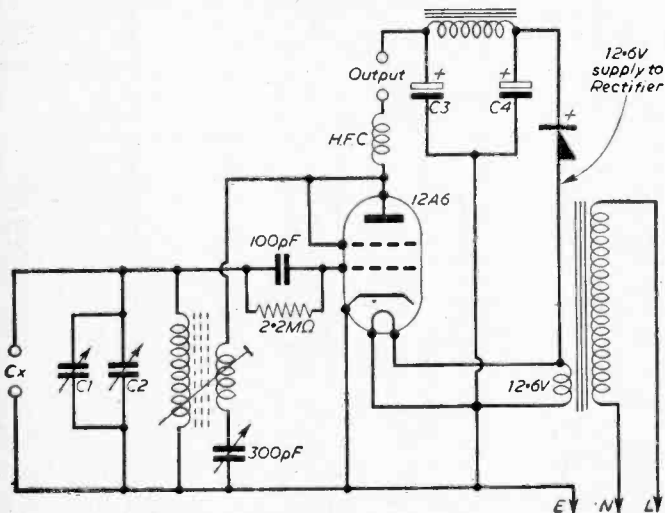


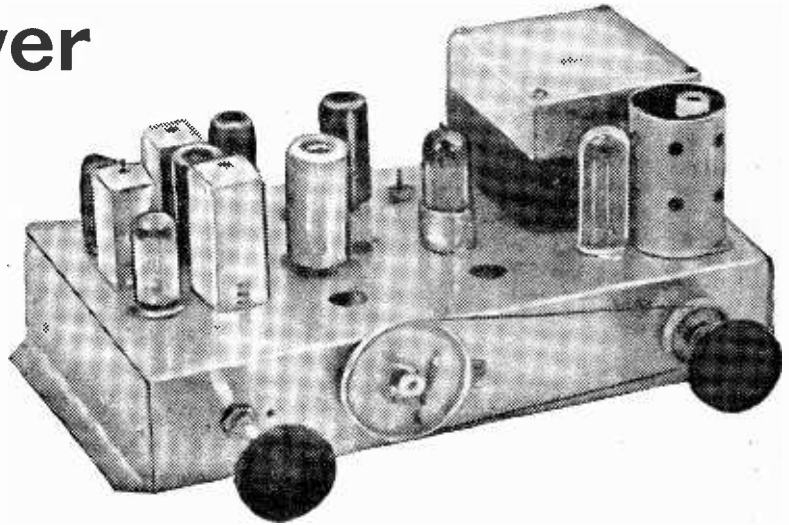
Fig. 2.—A circuit for A.C. mains.

Low Drift V.H.F. Receiver

CHASSIS AND WIRING DETAILS

By E. H. Berny

(Continued from page 419 of the September issue)



THE type of aerial required for this receiver will depend on local reception conditions and on the number of I.F. stages used. A "picture rail" aerial can be formed from a length of flat twin p.v.c. flex by parting the conductors at one end for a length of 2ft 6in. and extending them horizontally

along a picture rail to form a simple dipole 5ft long, the remainder of the flex being used as a down lead to the receiver.

A dipole with reflector for fitting in a loft is easily made from a length of timber and some pieces of metal tube of $\frac{1}{4}$ in. or $\frac{3}{16}$ in. diameter as shown in Fig. 10. It is quite satisfactory to lay this upon the rafters and no special mounting arrangements are necessary. The dipole should of course be sited perpendicular to the direction of the transmission and the downlead should be ordinary 80 Ω co-axial. The magnitude of the signal obtained depends almost entirely on the height of the dipole above the ground.

Tuning Indicator

For general purpose listening it is satisfactory to tune the receiver by ear, the operation being carried out not for the greatest volume but for freedom from distortion. For critical listening, however, it may be preferred to employ a tuning indicator and this can easily be added if desired. The EM34 is a suitable valve, having a double display requiring only 5V for zero shadow angle on the more sensitive side. Fig. 11 shows how it should be connected. It will be convenient to fit the valve with its holder and associated resistors, except R33, at the end of about 12in. of flexible four core cable, the other end being taken into the

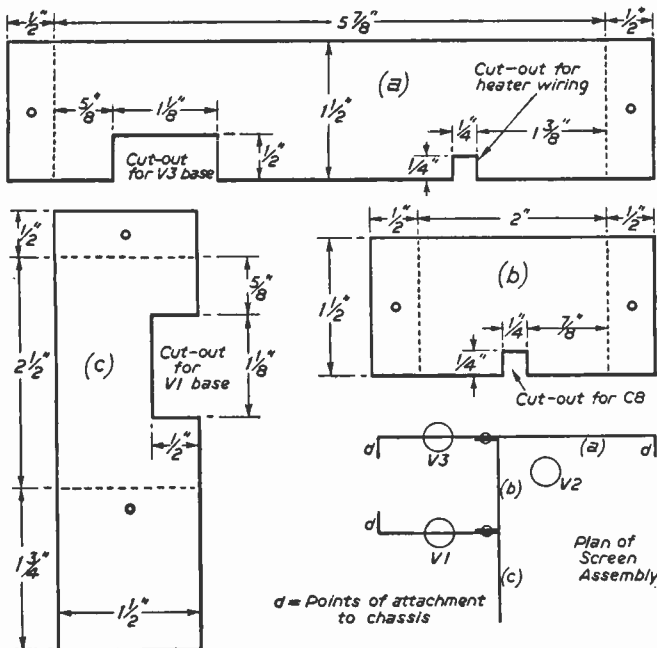


Fig. 4.—Dimensions and assembly of the screens.

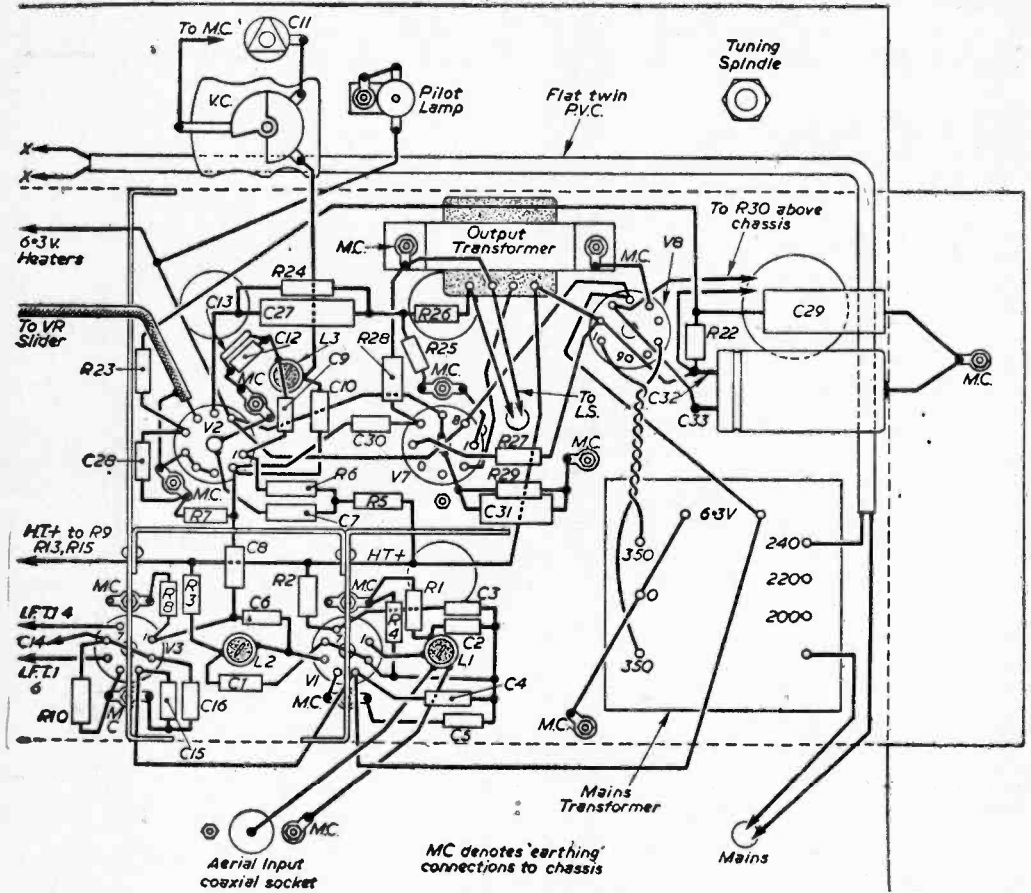


Fig. 5.—Wiring diagram (see also Figs. 6 and 7).

chassis and connected appropriately. The indicator can then be fitted in any desired position in the cabinet. Resistor R33 should be mounted close up to the negative end of C26.

A more exact indication can be obtained, using practically any type of "magic eye" by connecting its control grid to the junction of C23 and R21. The voltage at this point is zero when the receiver is exactly in tune and the valve must be arranged as a null point indicator. First connect the control grid to earth and insert a 50k wire wound potentiometer between cathode and earth as in Fig. 11; adjust the slider for zero shadow angle in the indicator. The effective resistance between cathode and earth may now be measured and the potentiometer replaced by a fixed resistor of the same value. Transfer the grid to the control point, omitting R33. There will be dimming of the display due to loss of volts between target and cathode but serviceable brilliance will be obtainable with most valves.

I.F. Alignment

The receiver can be aligned without instruments if necessary but the preferred method requires an

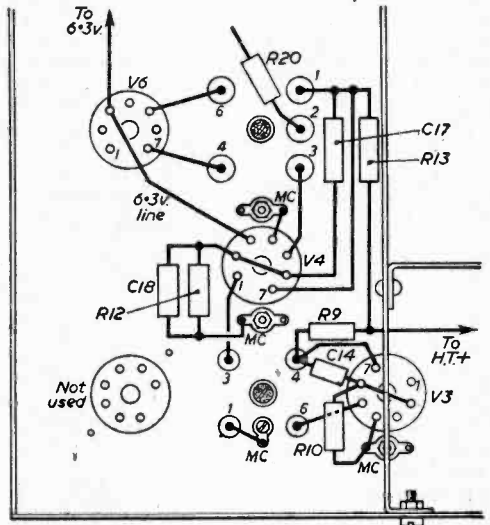


Fig. 6.—Wiring of single stage I.F. amplifier.

AM signal generator and a valve or high resistance voltmeter—20,000 Ω /V for preference.

When the receiver is first switched on, a check should be made to see that the correct voltages appear at all the valve electrodes and that the negative feedback circuit is correctly connected. This check should be made outside TV viewing hours if possible as with incorrect voltages or connections it is possible to fall into neighbourly disfavour by causing patterning on Band III television. If all is well connect the meter on the 10V range across C26 and inject an unmodulated signal at 10.7Mc/s at the grid of V4. Adjust the primary (top core) of the detector transformer and both cores of the IFT2 for maximum reading on the meter. This signal from the generator should be reduced progressively as the circuits come into line so that the meter shows no more than about 5V. Transfer the generator to the grid of V3 and adjust both cores of IFT1. Now connect the meter between earth and the junction of C23 and R21 (point Z in the circuit diagram) and adjust the bottom core of the detector transformer for zero reading. This adjustment will affect the tuning of the primary which should be retuned for maximum; only a slight adjustment should be necessary. The acceptance bandwidth of the I.F. amplifier should now be checked by moving the generator slowly over the range 10.4 to 11Mc/s, with injection at V3 grid and the meter between point Z and earth. A maximum voltage should be observed at 10.6, zero at 10.7 and a maximum of reverse polarity at 10.8Mc/s. Check that the two maxima are of equal magnitude and equidistant from zero.

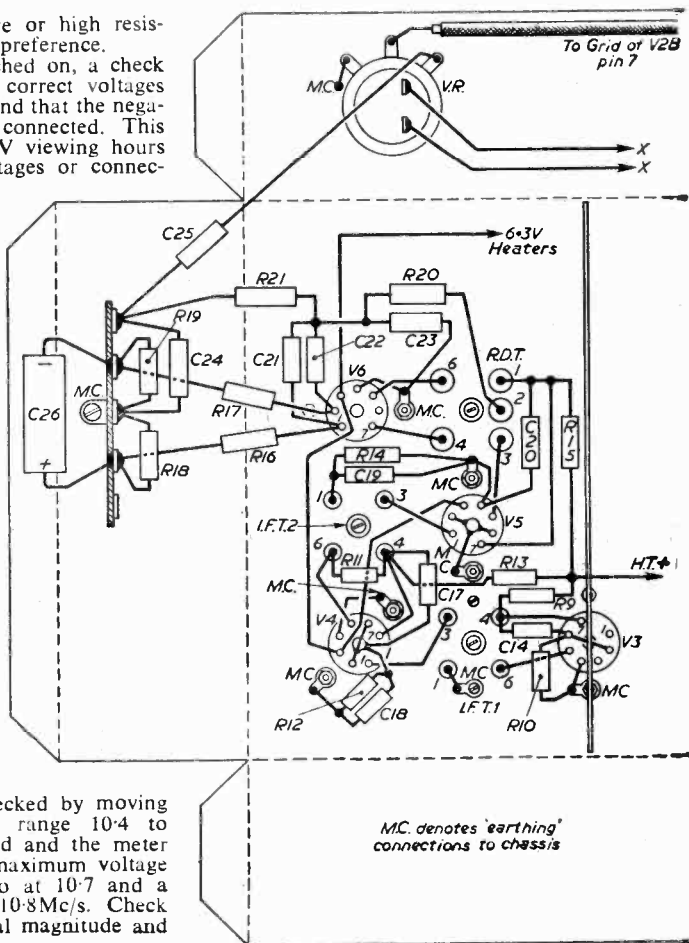


Fig. 7.—Wiring of two-stage I.F. amplifier and ratio detector.

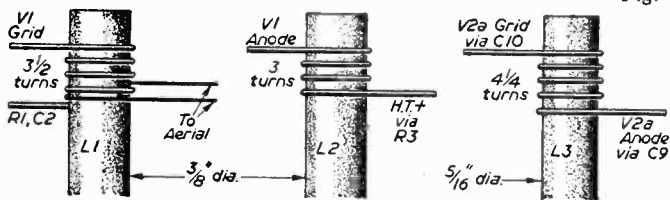


Fig. 8.—Coil winding details.

position between the two maxima that must be found.

Oscillator Tuning

The oscillator tuning may be adjusted with a signal generator or on a BBC transmission; the latter is perhaps easier. Commence with C11 at about half

If there is only one I.F. stage, signal injection should commence at V3 grid.

When manipulating the bottom core of RDT, it should be noted that the two maxima and centre zero occur over a relatively small portion of its travel and that if the correct position is overrun, further core movement will have no observable effect. It is the zero

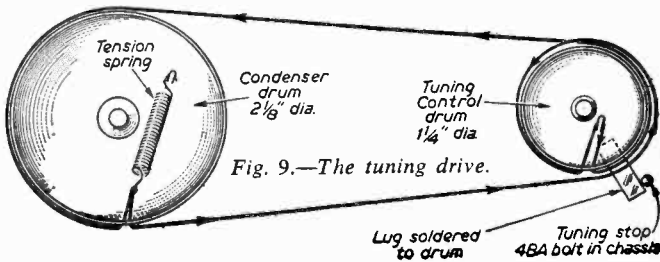


Fig. 9.—The tuning drive.

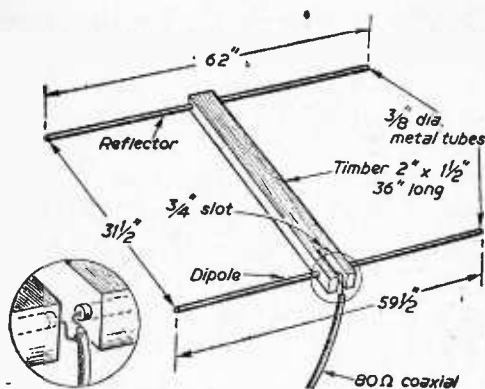


Fig. 10.—Simple loft aerial.

capacity, VC about 10deg open and the core of L3 fully engaged. Connect an aerial, advance the volume control and withdraw the core of L3 very slowly till the lowest frequency transmission to be received (normally the Light programme) is heard. Check by reference to the

published programme that it is in fact this transmission. Rotate VC and check its range: if insufficient, it can be increased by unscrewing C11 a little and if this pushes the Light programme off the lower end of the range, it can be brought back by screwing in the core of L3. If the range is too great, the reverse procedure applies. Adjust finally so that all the stations to be received are distributed neatly within the tuning range.

R.F. Stage

Select a transmission about the centre of the tuning range and adjust the cores of L1 and L2 for maximum reading on the meter connected across C26. The transmission must be attenuated in some way for this operation so that the meter reading does not exceed about 5V; alternatively, a signal from the generator can be used.

Drift Test

The oscillator should now be checked for long term drift. Place the receiver on the bench, right side up and raised $\frac{1}{4}$ in. from the surface to allow ventilation below the chassis so that operating conditions are simulated. Connect the meter across C26 and switch on. After 15 minutes, tune accurately to a transmission; examine after one

(Continued on page 518)

COMPONENTS LIST FOR FIGS. 1 AND 2 LAST MONTH.

Resistors: (all $\frac{1}{2}$ W unless otherwise stated)

R1—47k.	R18—10k 10 per cent.
R2—4.7k.	R19—10k 10 per cent.
R3—1k.	R20—68 Ω .
R4—150 Ω .	R21—27k.
R5—4.7k.	R22—47k.
R6—10k.	R23—0.22M.
R7—22k.	R24—3.3k.
R8—1k.	R25—22 Ω .
R9—4.7k.	R26—330 Ω .
R10—150 Ω .	R27—470 Ω .
R11—47k.	R28—0.47M.
R12—150 Ω .	R29—360 Ω , 1W.
R13—4.7k.	R30—2.5k, 10W.
R14—47k.	R31—1M.
R15—47k.	R32—1M.
R16—1k 10 per cent.	R33—1M.
R17—1.5k 10 per cent.	VR—1M with switch.

Capacitors:

C1—1,000pF ceramic.
C2—1,000pF ceramic.
C3—1,000pF ceramic.
C4—1,000pF ceramic.
C5—1,000pF ceramic.
C6—47pF ceramic.
C7—2,000pF ceramic.
C8—2.2pF ceramic (see text).
C9—300pF ceramic.
C10—22pF ceramic.
C11—3/30pF air spaced trimmer.
C12—8.2pF ceramic, N. 750K \pm 0.5pF.
C13—15pF silver mica \pm 0.5pF.
C14—0.01 μ F ceramic or non-inductive paper.
C15—2,000pF ceramic.
C16—2,000pF ceramic.
C17—0.01 μ F ceramic or non-inductive paper.
C18—0.01 μ F tubular ceramic.
C19—47pF mica or ceramic.
C20—0.001 μ F ceramic/non-inductive paper.

C21—300pF mica or ceramic.
C22—300pF mica or ceramic.
C23—300pF mica or ceramic.
C24—2,000pF ceramic.
C25—0.01 μ F paper.
C26—8 μ F electrolytic, wire ended.
C27—25 μ F 25VW electrolytic.
C28—47pF ceramic.
C29—8 μ F electrolytic, 500VW.
C30—0.01 μ F paper.
C31—25 μ F 25VW electrolytic.
C32—
C33—
VC—Tuning capacitor 3-15pF. (Jackson type C804).

Valves:

V1 EF91—B7G Base with screen.
V2 ECC81—low-loss, ceramic, B9A Base with screen.
V3 EF91—B7G Base with screen.
V4 EF91—B7G Base with screen.
V5 EF91—B7G Base.
V6 EB91—B7G Base.
V7 EL42—B8A Base.
V8 EZ80—B9A Base.

Transformers:

IFT1, IFT2—10.7Mc/s I.F. transformers. (Denco).
RDT—10.7Mc/s ratio detector transformer. (Denco).
OPT—Output transformer 9,000 Ω : 3 Ω .
Power—Input 200-240V. Output 350-0-350V 80mA, 6.3V, 0.3A.

Coil Formers:

L1, L2— $\frac{1}{8}$ in. diameter, $\frac{1}{2}$ in. dust core.
L3— $\frac{1}{8}$ in. diameter, $\frac{1}{2}$ in. dust core.

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Tuning range 88-108 Mc/s. For your convenience this is available in two units sold separately as follows: Tuner Unit (FMT-4U) with 10.7 Mc/s I.F. output £3.2.0, inc. P.T.). I.F. Amplifier (FMA-4U) complete with cabinet and valves (£10.10.6).
Total £13.12.6



F.M. TUNER

HI-FI 16W. STEREO AMPLIFIER Model S-88

10mV. basic sensitivity (2 mV. available, £1 extra). Ganged controls. Stereo/Monaural gram. radio and tape recorder input. Push-button selection. Two-tone grey metal cabinet. £25.5.6



S.33

6-TRANSISTOR PORTABLE Model UXR-1

Pre-aligned I.F. transformers, printed circuit, 7 x 4in. high-flux speaker. Real hide case. £14.18.6



S-88

DUAL-WAVE TRANSISTOR RADIO UJR-1

This sensitive headphone set is a fine introduction to electronics for any youngster. £2.16.6



DX-40

RES.-CAP. BRIDGE Model C-3U

Measures capacity 10pF to 1,000µF resistance 100Ω to 5 MΩ and power factor. 5-450 v. test voltages. With safety switch. £7.19.6



UXR-1

AUDIO SIGNAL GENERATOR Model AG-9U

10 c/s to 100 kc/s. switch selected. Distortion less than 0.1% 10 v. sine wave output metered in volts and dB's. £19.3.0

VALVE VOLTMETER Model V-7A

Measures volts to 1,500 (D.C. and R.M.S.) and 4,000 pk. to pk. Res 0.1Ω to 1,000 MΩ. D.C. input impd. 11MΩ. Complete with test prods, leads and standardising battery. £13.0.0



OS-1

Portable 2 3/4" SERVICE 'SCOPE Model OS-1

Compact portable 'scope ideal for servicing and general work. Y amplifier sensitivity 10 mV/cm; response ± 3 dB 10 c/s-2.5 Mc/s. Time base 15 c/s-150 kc/s. Printed circuit. Case 7 1/2 x 4 1/2 x 12 1/2 in. long. Wt. only 10 1/2 lb. £18.19.6



SSU-1

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Has wide-band amplifiers, essential for TV servicing, F.M. alignment, etc. Vertical freq. response 3 c/s. to over 5 Mc/s. without extra switching. T/B covers 10 c/s to 500 kc/s. in 5 ranges. £34.15.0

NEW MODELS include:

Grid Dip Meter, GD-1U, £9.19.6

Transistorised Grid Dip Meter, £9.18.6

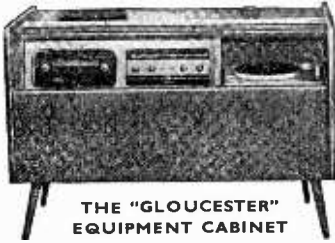
Tape Amplifier—

Mono (TA-1M) £16.14.0

Stereo (TA-1S) £22.4.0

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3 watts per channel, 0.3% distortion at 2.5 w/chnl. 20dB N.F.B. Inputs for Radio (or Tape) and Gram., Stereo or Monaural, ganged controls. £11.8.0 Sensitivity 100 mV.

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4-speed A.C. motor. Ronette Stereo/Mono pick-up. Complete with plinth. £12.10.0

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Ducted-port bass reflex cabinet "in the white". Twin speakers. With legs £11.12.6. £10.5.6

"HAM" TRANSMITTER Model DX-40U

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Covers all amateur bands from 160-10 metres. Self-contained including Power Supply Modulator and V.F.O. £78.10.0

"GLOUCESTER" EQUIPMENT CABINET

46 1/2 x 30 x 21 in. deep. Mk.1 houses Record Player, Stereo Amplifier, F.M. Tuner, records, etc. Mk.11 will house a Tape Deck in addition. Left in the white for finish to personal taste. Mk. 1 ... £15.18.6 Mk. 11 ... £17.8.6

"COTSWOLD" HI-FI SPEAKER SYSTEM KIT

Acoustically designed enclosure "in the white", 26 x 23 x 15 1/2 in., housing a 12in. bass speaker with 2in. speech coil, elliptical middle speaker and pressure unit to cover the full frequency range of 30-20,000 c/s. Complete with speakers, cross-over unit level control, etc. £19.18.6

COMPLETE MATCHED STEREO OUTFIT

Includes record player, amplifier and twin speaker systems (pedestal speaker legs optional £42.10.0 £2.14.0 extra).

"CHEPSTOW" EQUIPMENT CABINET

Ideal cabinet for small rooms or armchair operation. Houses Record Player, F.M. Tuner and Stereo Amplifier. £10.10.0

SINGLE CHANNEL AMPLIFIER, MA-12

10-12 watt Hi-Fi amplifier. Extremely low distortion and wide frequency range. £9.19.6

STEREO CONTROL UNIT, USC-1

Luxury model with press-button inputs to suit any pick-up or tuner and most tape-heads. Output 1.3 v. R.M.S. per channel. Printed circuit construction. £17.19.6

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Ideal for boosting tape-head output and low output pick-ups (e.g. £5.19.6 Decca ffs).

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Prices include free delivery UK Deferred Terms available on orders over £10

Please send me FREE CATALOGUE (Yes/No).....

Full details of model(s).....

NAME

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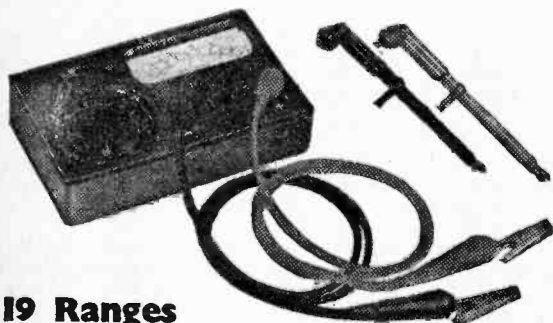
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0-25 V.	0-250 V.
0-100 V.	0-1000 V.
0-250 V.	
0-1000 V.	
D.C. Current	
0-100μA	
0-1mA	
0-10mA	
0-100mA	
0-1A	
Resistance	
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Medium and Long Waves. Four first grade EDISWAN TRANSISTORS, XA104, XB113, XC101, XC101. High gain Ferrite rod aerial. 3in. High Flux Moving Coil speaker. Performance as Transigen Three but with extra stage for speaker output. Case as PP5. Complete kit, with 4½ volt battery, £5.3.6. Post, etc., 2/6. Data 2/6.

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(Case as PP5.) (Medium, Long Waves and Trawler Band.) Fitted Super High Gain Ferrite Rod Aerial. R.F. Stage, EDISWAN TRANSISTORS. On test: tuned in Home, Light, Third, Radio Luxembourg, A.F.N. and many others at good listening level. The Prototype was tested at approximately 50 miles from nearest transmitter. Complete Kit, with super dynamic miniature earpiece, 79/6, p.p. 2/6. With B.A. rep. 75/-, if reception conditions warrant, a small speaker may be fitted under red speaker grille.



"RECO" SENSITONE THREE (5 stage reflex) Medium and Long Wave

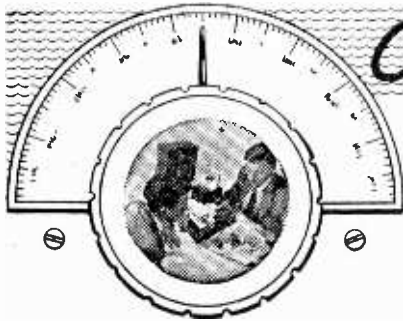
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On Your Wavelength

BY THERMION

Image Intensification

NO doubt many radio enthusiasts saw the picture on BBC TV of specimens under the electron microscope at very large magnification.

A deal of research was necessary before the technique finally proved possible, however. Normally, the electron microscope can be viewed only in the dark by one person at a time.

One method to eliminate viewing in the dark is to transfer the image electronically to cathode ray tubes remote from the microscope and if possible to intensify the image; the problems involved in doing this have been discussed for many years. The operation of the new intensifier relies on the increase in the conductivity of selenium which occurs when it is bombarded by high energy electrons. The efficacy of the intensifier was clear from the excellent TV pictures, and, no doubt, it will now be possible to employ closed-circuit television with electron microscopes where large audiences are involved.

Aerial Masts

MOST listeners to radio and many who view television tend, I find, to take the technical side for granted. I was therefore particularly interested to come across details of the construction of aerial masts. Since the construction of the Sutton Coldfield television mast ten years ago the BICC Group have provided most of the high masts and towers for BBC and ITA networks. One of the latest in this sequence, a 750ft stayed steel mast weighing 215 tons overall, commands an impressive view of the English Channel from the cliffs at Hougham nr. Dover.

The mast has a triangular cross section, each side measuring 6ft 6in. with solid round steel legs braced together by steel angle lattice work. The mast is carried on a steel pedestal which rests on a 22ft square concrete block foundation. A 2in. diameter steel ball recessed into the bearing surface provides registration.

Steel wire stays with a tensile strength of 110/120 tons per square inch provide the requisite support, adequate allowance being made for the most severe weather con-

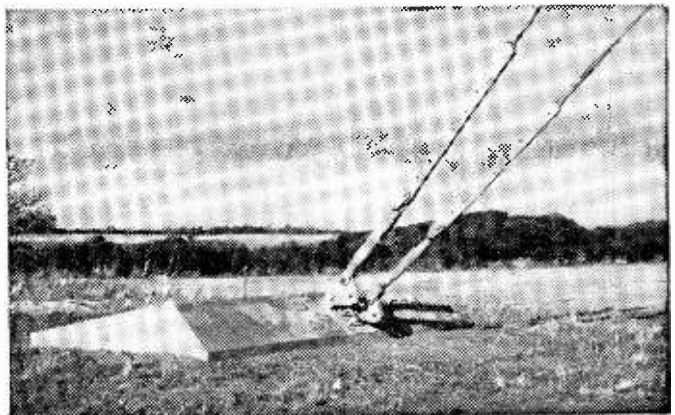
ditions. They are anchored to concrete blocks varying between 19 and 73cu yd in volume. The heaviest individual stay weighs 2½ tons and had to be lifted to a height of 650ft.

F.M. Results

Most constructors—some very technically minded—do not seem to realise that poor results on F.M. may often be attributed to a poor aerial system.

Curious effects sometimes occur due to reflection. In one case which I investigated, "ghosting" was only present at certain times. Investigation eventually proved this to be caused by the rise and fall of a nearby gas reservoir. When the reservoir was fully charged signal reflection occurred from near the top, which of course, disappeared completely when some of the gas was discharged and the height of the reservoir decreased. The opposite effect occurred in another case. It was found that the reflected signal was being used, and as the reservoir decreased in height so the signal became fainter and eventually disappeared until the reservoir was recharged with gas!

There is no simple solution. Nothing can be done in the set itself to cure the trouble, and in extreme cases it is often necessary to sample the signal conditions around the area in which the aerial can be erected until the best conditions are found. A highly directional aerial is essential, and if virtually zero pickup from the side of the aerial is a necessary factor, then two three- or four-element arrays may need to be mounted side-by-side spaced by about half wavelength and connected together via a coaxial transformer or similar arrangement. Certainly in a "difficult" location, some experimenting with the position of the aerial is worth while.



One of the concrete blocks anchoring two stays in the ITV mast at Hougham.

RADIO SHOW 1960

A review of some of the products shown at Earls Court this year

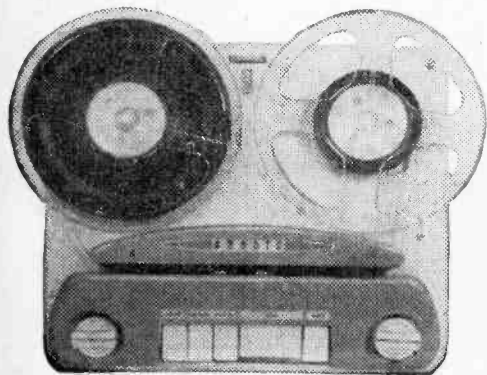
BELLING & LEE LTD.
STAND NO. 63

Distribution equipment was one of the main features on this stand. This equipment has been installed successfully in many locations throughout the country to provide radio and television signals to towns, villages, housing estates, schools, etc. The "Belling-Lee" main distribution station is assembled from standard basic units to meet individual requirements and is enclosed in a stove-enamelled case. It operates either directly from the mains power supply or via a 50-64V supply superimposed upon the coaxial line.

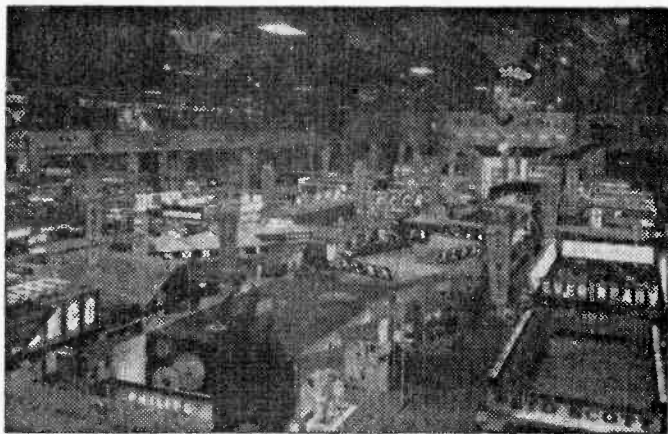
A range of aerials and accessories for radio, television, and VHF/FM was also exhibited.

A. F. BULGIN & CO. LTD. **STAND NO. 66**

A large range of new and established products was to be seen on this stand, many lines having originated from last year's show. The Technical staff were on hand to give visitors information concerning the component range and other exhibits. Among the many new components to be seen were the Multi-Legend Multi-Lamp Signal Fittings. These are for use for panel-mounting, having a number of internal I.E.S. lamp sockets and adjustable light-barriers with a choice of legends, digits, and characters in a full choice of colours for successive or together lighting.



The Collaro tape transcriber.



A view of the stands at last year's Show.

BRIMAR ELECTRONICS LTD. **STAND NO. 104**

On this stand was exhibited a comprehensive range of valves and low H.T. valves for car radios, with a wide range of types suitable for AM/FM radio receivers and hi-fi sound systems. A selection of cathode ray tubes suitable for domestic and industrial applications was also on display.

COLLARO LTD. **STAND NO. 38**

On this stand was shown a range of gramophone units and tape equipment. In the tape deck field the "Studio" deck was again featured. In its latest form this deck is a single direction twin-track machine operating at speeds of 1 $\frac{1}{2}$, 3 $\frac{1}{2}$ and 7 $\frac{1}{2}$ in./sec. Space is provided so that a third head for monitoring or stereo can be fitted. The latest addition to the range of record reproducing equipment was displayed, namely the "Studio" C60 record changer. This is a four speed automatic record changer which will play any size record from seven inches to twelve inches. The motor is of a new design and is a true four pole variety. Also on show was the Collaro transcription unit TRP594.

DAYSTROM LTD. **STAND NO. 112**

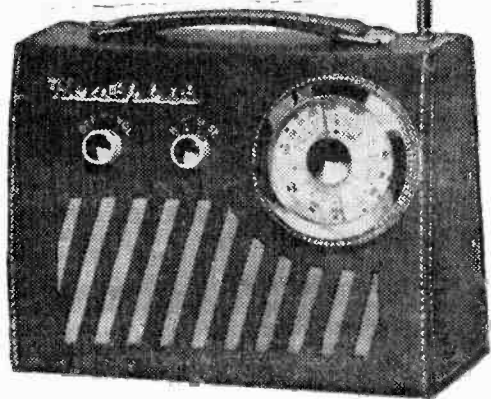
The Daystrom stand this year displayed several new models, on show for the first time. Of special interest to amateur constructors was a grid dip meter Model GD91U. This can be used for checking the resonant frequency of tuned circuits without removing components. The new Heathkit model was a four-wave seven transistor portable, Model RSW-1. This set operates on short, medium and "trawler" wavebands and has a dual-aerial system consisting of an internal ferrite rod type for medium and "trawler" bands and an integral telescopic aerial for the two short wave bands.

DYNATRON RADIO LTD. STAND NO. 52

As in previous years, Dynatron exhibited a wide range of radiograms, record players and tape recorders. Among the new additions was the Oxford RG17. This radiogram reproduces stereo and monophonic records of all sizes and speeds. A 9-transistor portable radiogram which reproduces records of all sizes and speeds, the Safari RG23 will provide music wherever you are. Three high quality transistor radios were displayed and the first tape recorder to be introduced in the Dynatron range, the Cordova.

A. H. HUNT (CAPACITORS) LTD. STAND NO. 49

On this stand were all types of miniature and standard capacitors for all radio, television, electronic and electrical industrial applications. This firm also exhibited a new condenser using as a dielectric metallised paper with a special film in working voltages

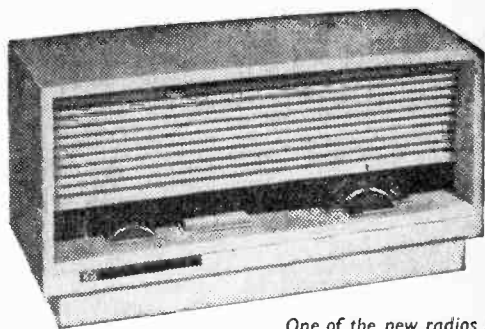


The Heathkit seven transistor portable Model RSW-1. (Daystrom Ltd.)

up to 1,000 D.C. at temperatures from (-40) deg C to (+100) deg C. A number of special types of condenser for horizontal and vertical mounting on printed circuit board was also of interest to visitors.

KOLSTER-BRANDES LTD. STAND NO. 22

A large range of radiograms, record players, tape recorders and television sets was shown on this stand. Among the new radio models shown were the Gavotte RN10 and the Romance light-weight transistor portable with car sockets, push button controls and a high sensitivity speaker, Model RP21. A new stereophonic radiogram the Barcarolle RG20 was displayed and this model incorporated twin speakers and piano-key controls. A portable tape recorder model, RT20, has a 4-stage amplifier magic eye record level indicator and wide range tone control. It also has a wide frequency response.



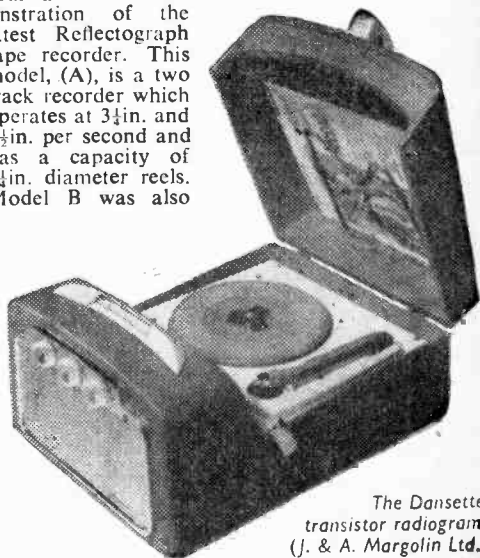
One of the new radios by Kolster-Brandes Ltd., the Gavotte RN10.

J. & A. MARGOLIN LTD. STAND NO. 44

Among the many products on this stand was the new Dansette Transistor Radiogram, model TRG. This is a fully transistorised and battery operated model. The radio unit comprises of six transistors and one diode, with push-pull output at 600mW. It has a 5in. speaker with a high gauss magnet. Record players for every purpose were on show, ranging from battery operated transistorised models for use out of doors or in caravans to the more conventional mains operated units with higher outputs. Also among the exhibits on this stand were a mono radiogram and two transistorised portable radios.

MULTICORE SOLDERS LTD. AND MULTIMUSIC LTD. STAND NO. 7J

Visitors to this combined stand were able to hear a stereo demonstration of the latest Reflectograph tape recorder. This model, (A), is a two track recorder which operates at 3½in. and 7½in. per second and has a capacity of 8½in. diameter reels. Model B was also



The Dansette transistor radiogram. (J. & A. Margolin Ltd.)

on show; this has all the features of Model A but is a four-track instrument providing a playing time at $3\frac{1}{2}$ in./sec of 12 hours 48mins. This model does not take stereo recordings, but by the addition of an external amplifier, will reproduce any $\frac{1}{2}$ -track or $\frac{1}{4}$ -track pre-recorded stereo tape. Both models A and B incorporate a new Multimusic tape deck.

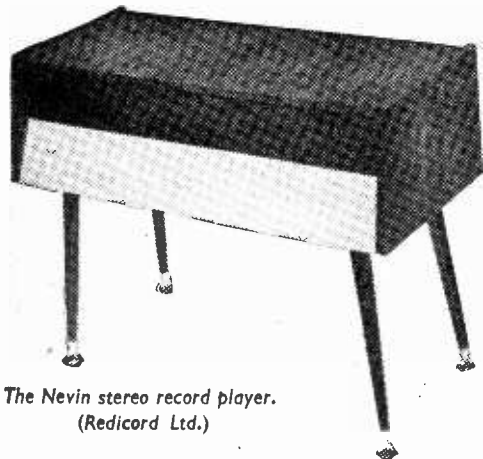
A new Multicore accessory shown for the first time was the Bib tape recording kit. This incorporates the already established Bib recording tape splicer complete with a supply of extra cutters. Among the other Multicore products displayed was the Ersin Multicore 5-core solder in standard alloys and gauges.

REDICORD LTD. STAND NO. 123

Record players were the main feature of this stand. Among those displayed was the Nevin stereo record player, which is an ideal unit for a small flat. A Garrard magazine tape deck can be fitted as a combined unit. "The Calypso" battery transistor record player proved popular with teenagers. This is a lightweight portable with a zipp wrap-around case finished in bright red, black or white. A portable tape recorder, the "Reditape", using the latest Garrard magazine tape deck with a French-designed amplifier also proved popular.

TAPE RECORDERS (ELECTRONICS) LTD. STAND NO. 3

The Tape Recorder Centre, as this stand was known exhibited a comprehensive range of Sound tape recorders and accessories for every type of pocket. The popular "Sound Studio" and "Sound Prince" were shown with new features and four-track, de luxe versions of both models were available for maximum tape economy. The "Sound Master" is a new three-speed, four-track tape recorder which comprises a full high fidelity reproducing equipment with separate record and playback amplifiers. The stand was visited by many prominent personalities during the Show. A four-track version of the "Studio", the sound "Studio De Luxe" was also displayed on the stand.



*The Nevin stereo record player.
(Redicord Ltd.)*



*A four-track version of the "Studio", the sound "Studio De Luxe".
(Tape Recorders [Electronics] Ltd.)*

THE TELEGRAPH CONDENSER CO. LTD. STAND NO. 42

The T.C.C. exhibit was a selection of new and established products, emphasis being on the progress made in the development of new condensers, printed circuits and ceramics over the past year. For equipments meeting with extremes of temperature conditions an extensive range of tantalum-anode electrolytics were shown. The Ceramic Division of the Company was represented by a display of formers, tubes, plates and rods, stand-off and lead-through insulators and terminals, hermetic seals, and an extensive range of fuses. Several types of printed circuits were on show on the stand and miniature paper tubulars suitable for hearing aids and transistor assemblies were in both metal clad and wax protected constructions.

WHITELEY ELECTRICAL RADIO CO. LTD. STANDS NOS. 69 & 304

A range of Stentorian high fidelity products was displayed and demonstrated on the Whiteley stands. This range of loudspeaker was available with a variety of cone constructions. The Radio Sonde as used by the British and many foreign meteorological offices was featured together with a display of equipment manufactured for the Post Office and Services Departments. In the Audio Hall, stand 18, high quality sound reproducing equipment could be heard.

Exhibitors at the Radio Show

	Stand No.		Stand No.
A.E.I. Sound Equipment Ltd., Crown House, Aldwych, W.C.2	308	Gainsborough Tape Recorders, 189 Northcote Road, Battersea, S.W.11	301
Admiralty, Dept. of C.N.I., West Block (Ground), S.W.1	407	Garrard Engineering and Manufacturing Co. Ltd., Newcastle Street, Swindon, Wilts.	56
Aerialite Ltd., Castle Works, Stalybridge, Cheshire	13	General Electric Co. Ltd., Magnet House, Kingsway, W.C.2	32 and 322
Air Ministry, Lacon House, Theobalds Road, W.C.1	406	General Post Office, Headquarters Buildings, St. Martins-le-Grand, E.C.1	403
Alan-Markovits Ltd., Emblem House, Sussex Road, Hove	115	Goodmans Industries Ltd., Axiom Works, Wembley, Middlesex	220 and 316
Alba (Radio and Television) Ltd., 52/70 Tabernacle Street, E.C.2	16 and 306	Gramophone Co. Ltd., Hayes, Middlesex	42 and 323
Amplion Ltd., 175/185 Cricklewood Lane, N.W.2	54	Greater London Fund for the Blind, 2 Wyndham Place, W.1	414
Antiference Ltd., Bicستر Road, Aylesbury, Bucks.	17	Hacker Radio Ltd., Norreys Drive, Cox Green, Maidenhead, Berks.	113
Argosy Radiovision Ltd., Eastern Avenue West, Romford, Essex	61	Hobday Ltd., Christopher, 98/102 Broadway, Leigh-on-Sea, Essex	221
Associated British Tape Recording Clubs Ltd., 7/8 Norfolk Street, Strand, W.C.2	412	Home Maintenance Ltd., Blyth Road, Hayes, Middlesex	118
Associated Electrical Industries Ltd., 155 Charing Cross Road, W.C.2	21	Hunt (Capacitors) Ltd., A. H., Bendon Valley, Garratt Lane, S.W.18	49
Associated Television Ltd., A.T.V. House, 17 Great Cumberland Place, W.1	74	Iliffe and Sons Ltd. (Wireless World/Electronic Technology), Dorset House, Stamford Street, S.E.1	204
Barclays Bank Ltd., 54 Lombard Street, E.C.3	203	Independent Television Authority, 14 Princes Gate, S.W.7	74
Belling and Lee Ltd., Great Cambridge Road, Enfield, Middx.	63	J-Beam Aerials Ltd., Westonia, Weston Favell, Northampton	5
Bernards (Publishers) Ltd., The Grampians, Western Gate, W.6	125	Keith Prowse and Co. Ltd., 90 New Bond Street, W.1	1
Bowmaker Ltd., Bowmaker House, Lansdowne, Bourne-mouth, Hants.	216	Kerry's (Great Britain) Ltd., Warton Road, Stratford, E.15	19
Brenell Engineering Co. Ltd., 1a Doughty Street, W.C.1	311	Kolster-Brandes Ltd., Footscray, Sidcup, Kent	22
British Broadcasting Corporation, Broadcasting House, W.1	408, 409 and 410	Labgear Ltd., Willow Place, Cambridge	25
British Radio Corporation Ltd. ("His Master's Voice"), 105 Judd Street, W.C.1	33	Le Great and Co., 58 Fairfield Street, S.W.18	122
British Radio Corporation Ltd. (Marconiphone), 105 Judd Street, W.C.1	47	Lee Products (Great Britain) Ltd., Elpico House, Longford Street, N.W.1	55
Brimar Electronics Ltd., Footscray, Sidcup, Kent	104	Linguaphone Institute Ltd., Linguaphone House, 207/9 Regent Street, W.1	109
Bulgin and Co. Ltd., A.F., By-Pass Road, Barking, Essex	66	Lloyds Bank Ltd., 71 Lombard Street, E.C.3	4
Bush Radio Ltd., Power Road, Chiswick, W.4	51 and 60	Lustraphone Ltd., St. George's Works, Regents Park Road, N.W.1	309
Casian Ltd., 37 Grafton House, Golden Square, W.1	219	McMichael Radio Ltd., Langley Park, Slough, Bucks.	53
Cathode Ray Tubes Ltd., 758/760 Bristol Road, Selly Oak, Birmingham	30	Margolin Ltd., J. and A., 112/116 Old Street, E.C.1	44
Charterhouse Credit Co. Ltd., Surrey House, Scarbrook Road, Croydon, Surrey	8	Markovits, I., Premier House, 8 Golden Square, W.1	120
Chorlton and Co. Ltd., L., 5 Church Street, Prescott, Lancs.	217	Martins Bank Ltd., 68 Lombard Street, E.C.3	105
Cole Ltd., E. K., Ekco Works, Southend-on-Sea, Essex	58	Mercantile Credit Co. Ltd., Argyll House, 246/250 Regent Street, W.1	208
Collaro Ltd., Ripple Works, By-Pass Road, Barking, Essex	38	Merryfield Ltd., Andrew, 29/31 Wrights Lane, Kensington, W.8	314
Co-operative Wholesale Society Ltd., 1 Balloon Street, Manchester 4	7	Macropolitan Police, New Scotland Yard, S.W.1	402
Cosmocord Ltd., Acos Works, Eleanor Cross Road, Waltham Cross, Herts.	310	Midland Bank Ltd., Poultry, E.C.2	12
Cossor Radio and Television Ltd., 71 Endell Street, W.C.2	57	Mullard Ltd., Mullard House, Torrington Place, W.C.1	40
Daystrom Ltd., Bristol Road, Gloucester	112	Multicore Solders Ltd., Multicore Works, Hemel Hempstead, Herts.	71
Decca Record Co Ltd. (Radio and Television), Ingate Place, Queenstown Road, Battersea, S.W.8	35 and 303	Murphy Radio Ltd., Welwyn Garden City, Herts.	23
Design Furniture Ltd., Carnwath Road, Fulham, S.W.6	103	National Provincial Bank Ltd., 15 Bishopsgate, E.C.2	101
Domain Products Ltd., Domain Works, Barnby Street, N.W.1	214	Newnes Ltd., Geo. (Practical Wireless/Television), Tower House, Southampton Street, W.C.2	117
Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Road, N. Acton, W.3	62	Nottingham Electronic Valve Co. Ltd., Kenrick Street, Netherfield, Nottingham	218
Dynatron Radio Ltd., St. Peter's Road, Furze Platt, Maidenhead, Berks.	52 and 313	Odham Press Ltd. (Electrical and Radio Trading), 96 Long Acre, W.C.2	111
E.M.I. Records Ltd., E.M.I. House, Manchester Square, W.1	65	Perdio Ltd., Perdio House, Bonhill Street, E.C.2	41
E.M.I. Sales and Service Ltd., Hayes, Middx.	24	Perth Radios Ltd., Marten House, 39/47 East Road, N.1	205
Econasign Co. Ltd., 19/21 Palace Street, S.W.1	121	Peto Scott Electrical Instruments Ltd., Addlestone Road, Weybridge, Surrey	27
Electric Audio Reproducers Ltd., The Square, Isleworth, Middx.	319	Philco (Overseas) Ltd., 30/32 Grays Inn Road, W.C.1	45
Elizabethan (Tape Recorders) Ltd., Bridge Close, Old Church Road, Romford, Essex	26	Philips Electrical Ltd., Century House, Shaftesbury Avenue, W.C.2	10 and 320
Emerson Electronics Ltd., Brent Crescent, North Circular Road, N.W.10	50	Pilot Radio and Television Ltd., Television House, Eastcote, Ruislip, Middlesex	11
Ever Ready Co. (Great Britain) Ltd., Hercules Place, Holloway, N.7	307	Petrie Ltd., 21 Noel Street, W.1	108
Expert Gramophones Ltd., 78 Balham High Road, S.W.12	34	Plessey Co. Ltd., Vicarage Lane, Ilford, Essex	73
Ferguson Radio Corporation Ltd., Thorn House, Upper St. Martin's Lane, W.C.2	39 and 324	Practical Wireless	117
Ferranti Radio and Television Ltd., 41/47 Old Street, E.C.1	48	Practical Television	117
Fidelity Radio Ltd., 11 Blechynden Street, W.11	20	Print and Press Services Ltd. (Tape Recording and Hi-Fi Mag.), 7 Tudor Street, E.C.4	321
Field and Co. Ltd., N. and S. B., (Record Housing), Brook Road, Wood Green, N.22	116		
Fountain Press (prop. British Periodicals Ltd.), 46/47 Chancery Lane, W.C.2	124		

	Stand No.		Stand No.
Radio and Allied Industries Ltd. (Sobell), Langley Park, Slough, Bucks.	64	Tape Recorders (Electronics) Ltd., 784/788 High Road, Tottenham, N.17.	3
Radio Gramophone Dev. Co. Ltd., Eastern Avenue West, Mawneys, Romford, Essex.	29	Telegraph Condenser Co. Ltd., Wales Farm Road, North Acton, W.3.	42
Radio Society of Great Britain, New Ruskin House, Little Russell Street, W.C.1.	411	Teleng Ltd., Teleng Works, Church Road, Harold Wood, Essex.	107
Radio and Television Retailers' Association (R.T.R.A.) Ltd., 15/17 Godge Street, W.1.	201	Telerection Ltd., Antenna Works, Weymouth, Dorset.	28
Regentone Radio and Television Ltd., Eastern Avenue West, Mawneys, Romford, Essex.	59	Telesurance Ltd., 14 Windmill Street, W.1.	9
Redicord Ltd., 46/47 Frith Street, W.1.	123	Territorial Army (65th Signal Regiment), 79/85 Worship Street, E.C.2.	413
REPS (Tape Recorders) Ltd., 118 Park Road North, South Acton, W.3.	305	Trader Publishing Co. Ltd. (Wireless and Electrical Trader), Dorset House, Stamford Street, S.E.1.	110
Roberts' Radio Co. Ltd., Creek Road, East Molesey, Surrey	70	Tricity Finance Corporation Ltd., Great Cambridge Road, Enfield, Middlesex.	36
Rola Celestion Ltd., Ferry Works, Summer Road, Thames Ditton, Surrey.	213 and 312	Trix Electrical Co. Ltd., 1/5 Maple Place, Tottenham Court Road, W.1.	37
Rose Projects Incorporated, Station Approach, Bourne End, Bucks.	119	Truvox Ltd., Neasden Lane, N.W.10.	317
Seicol Products Ltd. (Gala Records), 114/116 Charing Cross Road, W.C.2.	202	Ultra Radio and Television Ltd., Television House, Eastcote, Ruislip, Middlesex.	15
Slingsby Ltd., H. C., 89/97 Kingsway, W.C.2.	31	Valradio Ltd., Browells Lane, Feltham, Middlesex.	114
Sloss, Andrew, Ben Nevis Works, Belmont Site, Stranraer, Scotland.	102	Vulcan Finance Facilities Ltd., Lombard House, Great Charles Street, Birmingham 3.	207
Southgate Tubular Products Ltd., 148 Chase Side, Southgate, N.14.	210	Walter Instruments Ltd., Garth Road, Morden, Surrey.	72
Standard Telephones and Cables Ltd., Connaught House, 63 Aldwych, W.C.2.	14	Westminster Bank Ltd., Post Office Court, 10 Lombard Street, E.C.3.	18
Star Newspaper Co. Ltd., 12/22 Bouverie Street, E.C.4.	404	Wireless for the Bedridden Society, 55a Welbeck Street, W.1.	67
Stella Radio and Television Ltd., Astra House, 121/123 Shaftesbury Avenue, W.C.2.	6	Whiteley Electrical Radio Co. Ltd., Radio Works, Victoria Street, Mansfield, Notts.	69 and 304
Southern Television Ltd., The Southern Television Centre, Northam, Southampton.	74	Walsey Electronics Ltd., Cray Avenue, St. Mary Cray, Orpington, Kent.	43
Symphony Amplifiers Ltd., 16 King's College Road, N.W.3.	302		

Short-wave Listeners' Log — 2

PRACTICALLY every short wave or all-wave receiver will cover some of the Amateur Bands, and there is a good deal of interesting activity on these frequencies. As a guide to tuning, the approximate wavelengths and frequencies of the most popular Amateur Bands are as follows:

166 — 150m	1.8 — 2.0Mc/s
86 — 80m	3.5 — 3.8Mc/s
42.8 — 41m	7.0 — 7.3Mc/s
21.4 — 21m	14.0 — 14.35Mc/s
14.3 — 14m	21.0 — 21.45Mc/s
10.7 — 10m	28.0 — 30.0Mc/s

These bands are usually referred to in broad terms, either by frequency or wavelength. For example, as 80, 40, or 20m bands, and so on. The 160m band is also called "Top Band". With this in mind, the bands can usually be easily identified, even on simple home-constructed receivers, especially as they are well spaced. References to the band or frequency used are often made by the amateurs who are working.

For most interesting listening, the characteristics of the various bands should be kept in mind. The 160m band is usually best for fairly short range, or ground wave communication. Amateurs are also limited to 10W, here, but quite long distances are occasionally worked, despite this. The 80m band is extremely popular for medium range work, and is often very busy. On 40, some locals can often be heard, and there is the possibility of distant (Dx) reception. For general Dx work, the 20m band is popular. Many USA and other overseas amateurs run considerable power on this band, and a fair number of Dx catches can often be made. The 15m band (actually 21 —

21.45Mc/s) and 10m band are virtually dead at some times of day, but offer extreme Dx reception when conditions are favourable.

Activity is usually strongest at week ends. Early on a Sunday morning, until afternoon, the 80m band is usually very busy, with 160 and 40 also in use. Later in the day, 20 and 15 are likely to become more active. The 40m band suffers bad interference from commercial stations, especially towards late afternoon and evening. Because of this, amateurs may be heard using the band early, when it is clear.

For an easy attempt at Dx reception, attention can be given to the 20m band. Due to the time difference of far countries, real Dx will occasionally be heard in these bands when there is little local activity.

Long distance reception is not usual on 160 or 80, but these bands generally offer the best chance of hearing Amateurs within a range of a few hundred miles. Some use 100 or 150W on bands other than 160, and are able to provide very strong signals. Any attempt to receive unusual or distant stations is most likely to be successful if listening is confined to weak signals. With a home-built or uncalibrated receiver, it is wise to note down the limits on the various bands, when they are tuned in. The bands can then be found easily again, and long range Dx can be listened for at times when there is little crowding or interference from local transmitters.

The English language is extensively used by Amateurs all over the world, and as a result quite an extensive log of stations can soon be compiled. Conditions vary according to time of day and season, but a quick check over the bands will soon show what to expect.



PORTABLE TRANSISTOR Record Player BARGAIN OFFER

- ★ 6v. operation (2E/R Type 800 Batts.)
- ★ 1 watt Push Pull Output
- ★ 4 Latest G.E.C. Transistors
- ★ Garrard Fidelity Gram. Unit



Size: 11 x 8 1/2 x 6 in.
Colour: 2 Tone Red/White with Polka Dot relief. Alternative Blue/Eawn with Polka Dot relief.

CABINET incl. Motor Board and 7 x 4 in. Speaker, £11.19.6. Carr. 2/6.

GARRARD BA1 Gram. Unit, 45 r.p.m., £2.19.6. Carr. 2/6.

RECORD PLAYER BARGAINS

All brand new latest 4-speed Models—fully guaranteed.

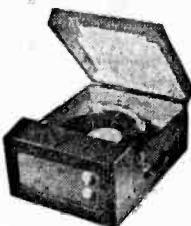
SINGLE PLAYERS—B.S.R. (TU9) with FUL-FI, P.U. 90/-; Collaro Junior with latest GP 67-12 Xtal, 90/-; Garrard TA Mk.2 with GCS Head, £7.19.6; Garrard 4HF Transcription Unit, £18, carr. 3/6.

AUTO CHANGERS—B.S.R. (UA8), £6.19.6; UA8 Stereo, £7.19.6; UA14, £7.19.6; Collaro Conquest, £7.19.6; Garrard RC121/4D Mk.2, 91 gns., carr. 4/6.

GARRARD RC210 4-speed Autochanger Model with latest features and GCS Plug-in Head only 10 gns., carr. 4/6. This model just released.

E.M.L.—4-speed Single Player with Auto Stop-Start Dual Turnover Cartridge for Stereo and Monaural L.P. and 78—Bargain Buy at £6.19.6, carr. 3/6.

RECORD PLAYER CABINETS



Contemporary styled, rexine covered cabinet in two-tone fawn and brown, or mottled red with white polka dot. Size 18 1/2 x 13 1/2 in. 9 in., fitted with all accessories, including baffle board and anodised metal feet. Space available for all modern amplifiers and auto changers, as above, etc. Uncut record player mounting board 14 x 13 in. supplied. Cabinet Price £3.3.0. Carr. and Ins. 3/6.

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Two stage ECL82 with vol. and neg. feedback. Tone controls A.C. 200/250 v. with double-wound Mains trans. Complete with knobs, etc., ready wired to fit above cabinet, £2.17.6. P. & P. 1/-; 8 in. Speaker and matching trans. 22/-, P. & P. 1/6.

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EMI 1st grade. Brand new sealed boxes.
Standard Long Play
3in., 175ft. .. 7/- .. 260ft. .. 9/-
5in., 600ft. .. 19/- .. 850ft. .. 25/-
5 1/2in., 850ft. .. 25/- .. 1,200ft. .. 31/6
7in., 1,200ft. .. 31/6 .. 1,800ft. .. 45/-
SPECIAL PURCHASE: 8mm tape, new, boxed: 3in. 3/-; 5in. 3/6; 5 1/2in. 4/-; 7in. 4/6.

SPECIAL PURCHASE: Famous manufacturers 1st grade tape in sealed white boxes.
Standard Long Play
5in., 800ft. .. 15/- .. 850ft. .. 19/6
5 1/2in., 850ft. .. 16/6 .. 1,200ft. .. 22/6
7in., 1,200ft. .. 21/- .. 1,800ft. .. 32/6
Plastic Tape Reels, special offer. Manufacturers' surplus. 3in. 2/8; 5in. 3/-; 5 1/2in. 3/3; 7in. 3/6.

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New improved types, low capacity, small size and tag terminated, A.C. 200/250 v. Secondaries 270, +25%, +50%, 1000Ω, for 2 v., 4 v., 6.3 v., 12.6 v. and 25 v. tubes. EA Type 12/8 each. P. & P. 1/6.

Complete RECORD PLAYER KIT

3 UNITS Bargain Price
£7.19.6 Carr. 4/-

Send*for full details now

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1F5, 185 7/6	ECL80 10/6	E261 7/6
354, 3V4 7/6	ECL82 10/6	MU14 9/-
6Z4 10/6	EF80 8/-	PC94 9/6
DAF96 9/-	EF86 12/6	PCF80 9/6
DF96 9/-	EF91 5/-	PC143 12/6
DK06 9/-	EL41 9/6	P151 12/6
DL96 9/-	EL84 8/6	P182 9/6
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REDUCED PRICES		GEO	
Mazda	Mullard		
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XA104 18/-	OC44 22/6	Newmarket	
XB192 10/-	OC45 21/-	'Goldtop'	
XC101 10/8	OC16 49/6	V15/10P 15/-	

Germanium Diodes, OA70 2/8, GEX34 4/-, GD4 3/6

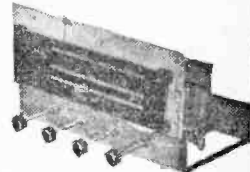
RE-GUNNED TV TUBES

New Reduced Prices
New Heater, Cathode and Gun Assembly fitted to all tubes. Reconditioned virtually as new. Now 12 months' guarantee on highest stands—as used by our own Service Dept.
12in. £5. 14in. £5.10.0. 17in. £6.
Mullard and Mazda types ex-stock Carr. and Ins. 10/-
10/- Part Exchange allowance on your old tube.

7 VALVE AM/FM RADIOGRAM CHASSIS

Valve Line-up: ECC85, ECH81, EF89, EABC80, EL84, EM81, EZ80.

Three Waveband and Switched Gram position. Med 200-500 m., Long 1,000-2,000 m., VHF/FM 88-95 Mc/s. Philips Continental Tuning insert with permeability tuning on FM and combined AM/FM IF transformers, 400 kc/s and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction are of a very high standard. Chassis size 13 1/2 x 6 1/2 in. Height 7 1/2 in. Edge Illuminated glass dial 1 1/2 x 3 1/2 in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation.



Aligned and tested ready for use. £13.10.0. Carr. & Ins. 5/-
Complete with 4 Knobs—walnut or ivory to choice. Indoor FM Aerial, 3/6 extra.
Three ohm P.M. speaker only required. Recommended quality speakers.
10in. Rola (Heavy Duty) 30/- 8in. Goodman special cons. 21/6. Post & Pkg. 1/6.
As previously announced fresh supplies are now being received, but we regret some slight delay may be experienced in fulfilling orders for this popular item.

ONLY A FEW ITEMS ARE LISTED FROM OUR COMPREHENSIVE STOCK
WRITE NOW FOR FULL BARGAIN LISTS, 3d.



RADIO COMPONENT SPECIALISTS

70 Brigstock Road, Thornton Heath, Surrey

Phone: THO 2188. Hours 9 a.m.—6 p.m. 1 p.m. Wed. Open all day Saturday. By Thornton Heath Station.

Terms: C.W.O. or C.O.D. post and packing up to 1 lb. 7d.; 1 lb. 1/1; 3lb. 1/6; 5lb. 2/-; 10lb. 2/9

THE LINEAR LI/10

A 10-WATT HIGH FIDELITY ULTRA LINEAR AMPLIFIER WITH INTEGRAL PRE-AMP

Full advantage has been taken of latest component miniaturisation developments to produce a 10-watt Hi-Fi push-pull amplifier incorporating tone control pre-amplifier stages within the measurements of $9 \times 7 \times 5$ ins. In addition two high impedance input sockets are provided for microphone and gram., etc. With selector switch and vol. control, five B.V.A. valves are employed ECC83, ECC83, EL84, EL84, EZ81. H.T. and L.T. power supply point is included for a radio tuner.

FREQUENCY RESPONSE

± 1 d.b., 30-20,000 c.p.s.

MAXIMUM POWER OUTPUT

In excess of 14 watts.

SENSITIVITY

L.P. 220 m.v. for 10 watts. 78 r.p.m. 220 m.v. for 10 watts. Radio/Microphone 40 m.v. for 10 watts.

TREBLE LIFT CONTROL

+ 10 d.b. to -22 d.b. at 12,000 c.p.s.

BASS CONTROL

+14 d.b. to -10 d.b. at 50 c.p.s.

HUM LEVEL

Referred to maximum output and including integral pre-amp.—70 d.b.

NEGATIVE FEEDBACK

21 d.b. in main loop.



HARMONIC DISTORTION Less than 0.1% measured at 8 watts at 1000 c.p.s. Weight 10 lbs. Power consumption 90 watts. For 200-230-250 v. 50 c.p.s. A.C. mains. Outputs for 3- and 15-ohm speakers. Chassis finish stoved Gold hammer.

HIGHEST QUALITY! Retail Price

MAXIMUM RELIABILITY! AT A PRICE YOU CAN AFFORD.

13 GNS.

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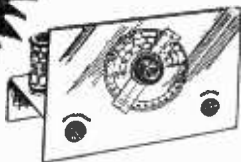
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Radio Construction for the Beginner

THE FIRST OF A NEW SERIES

By D. B. Kidd

THE use of so-called "breadboard" circuits by experienced constructors is too well known to need comment. However, no one seems to have gone to the trouble of explaining their uses to the beginner. This is presumably because he is expected to drift into the practice sooner or later after going through the mill of routine construction using solder, metal chassis, etc.

Mechanical Joints

In terms of valve radio, this attitude is perhaps understandable, since wood is an indifferent insulator at the high voltages used, but in terms of transistor (solid state) radio, the objections no longer hold and, provided certain precautions are taken, mechanical contacts at the voltages commonly used for transistor radio are almost as efficient as soldered connections. While efficient soldering ensures a first-class electrical joint, poor soldering will often hide a bad connection and so turn mere failure into insoluble mystery.

If the beginner can be guaranteed some success from the start, he may persevere long enough to learn the knack of good electrical soldering and so enter the ranks of enthusiastic constructors.

Aims of the Series

The present article has been written with this aim in view, and the others which are scheduled to follow it as a series will be along the same lines. It will be assumed that the beginner has a strictly limited supply of both tools and money, so the articles will also fulfil (to the best of the writer's ability) the following conditions.

(a) Each construction will be a logical advance on the one before it.

(b) No mathematics will be employed except where it cannot be avoided.

(c) Components, materials, etc., will be of the least possible number and cost.

(d) All components used for one circuit will be usable in the circuits which follow, unless it is found impossible to do so by the author.

(e) No soldered junctions will be used.

The illustration (Fig. 1) shows most of the materials required for Constructions Number One, which is a simple crystal set.

The Breadboard

The term "breadboard" means, of course, any wooden board on which improvised circuitry is arranged with the minimum of

soldered connections, but the one proposed will be, for a variety of reasons, not far off the size of a real breadboard.

The reader will therefore have to look around for the first requirement—a piece of wood, between $\frac{1}{4}$ in. and $\frac{1}{2}$ in. thick, from which a rectangle roughly 7 in. x 11 in. can be cut. Some latitude may be allowed here but the reader should regard 6 in. x 10 in. as a minimum if he intends to follow the series right through. There is no need to pay a great deal for the wood. However, it is wise to ensure that the wood chosen is sound, not split, warped, or badly knotted. It should be reasonably soft wood, exhibiting a straight grain.

Hardboard

The next requirement is a piece of ordinary 3/16 in. hardboard (or plywood of similar thickness) from which a rectangle roughly 7 in. x 5 in. can be cut. The size is not really very important, but it will be an advantage if the length of the hardboard equals the width of the wood, as in the above case.

All the angles should be checked to ensure that true rectangles are obtained, and also that the sides of the wood are at right-angles to the main faces. The hardboard is to be fastened to one side of the board to form a simple "panel" (see Fig. 2).

A medium glasspaper should now be applied to the edges of the hardboard to remove saw-burrs,



Fig. 1.—Most of the materials which will be required for constructing the crystal set to be described next month are seen here.

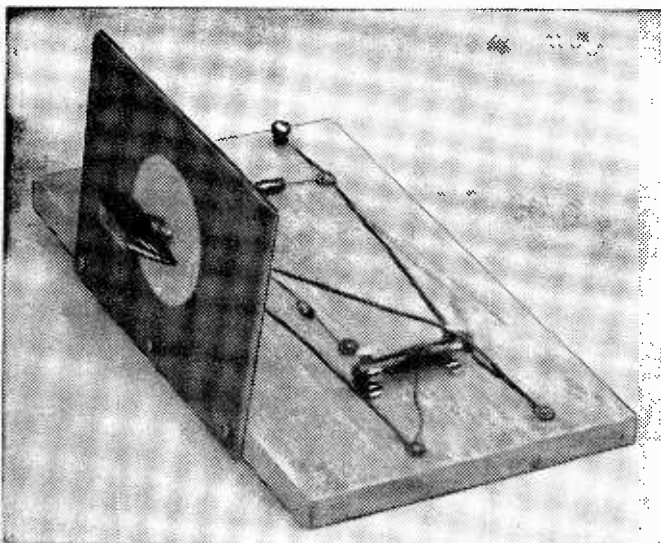


Fig. 2.—The crystal set constructed on the "breadboard."

and the same more vigorously, to all faces of the wood to obtain a thoroughly clean effect. Lastly, the better of the two main surfaces of the wood is selected and given a final treatment with fine glass-paper until a flat, smooth finish is obtained. This surface must be kept uppermost when fitting the hardboard panel.

The panel is fixed by means of two or three brass woodscrews and as these are to provide most of the electrical contacts as well, the reader will require a few dozen of them, together with the same number of small brass washers. It is important that brass screws and washers should be used; steel ones are most unlikely to prove satisfactory.

For the first circuit to be tried, the panel requires to be fitted centrally on one of the long sides of the completed breadboard (see Fig. 2). The screws will need to be "started" in the hardboard since it has a tough surface. Anything with a sharp steel point will do for this job. Two, or at the most, three, screws are sufficient to fix the panel, a brass washer being slipped on to each one before tightening up to prevent damage by the screw-head to the hardboard.

The reader is now ready to start on the first project—a simple crystal receiver, without, it is hoped, having to spend too much money.

Materials

- 1 A few yards of standard gauge p.v.c. covered connecting wire, solid rather than stranded.
- 2 Two spring tool-clips, with the two small wood-screws provided ($\frac{3}{4}$ in. in height).
- 3 One fixed capacitor of $0.01\mu\text{F}$.
- 4 One variable condenser of $0.0005\mu\text{F}$ (solid dielectric type rather than air-spaced).
- 5 One germanium diode.

6 A piece of ferrite rod, at least $1\frac{1}{2}$ in. long after any broken edges have been ground smooth again.

7 Two ounces of enamelled coil-wire, about 34s.w.g.

8 A pair of high-impedance headphones, fitted with two wander plugs.

9 Two small hexagonal sockets for the wander plugs, one red and one black (these may be obtained from some large stores).

10 A few square inches of the very fine glass-paper, called "flour" grade by the iron-mongers.

11 One knob, preferably of the pointer type, to fit a $\frac{1}{4}$ in. spindle.

With the above materials to hand, the reader is in a position to commence the first construction.

(To be continued)

ANNIVERSARY LECTURE

THE first of the Ultra Anniversary Lectures is to be given in the Recital Room of the Royal Festival Hall on September 14th. The speaker is Professor Arthur Porter, M.Sc., Ph.D., who is Dean of Engineering at the University of Saskatchewan.

Professor Porter's subject on September 14th will be "The Evolution of Instrumentation" and he will interpret the term "instrumentation" in a comprehensive way, as the measurement, manipulation and control of physical variables, with particular emphasis on control system technology.

A brief history of instrumentation will show how the developments of automatic control systems on the one hand, and analogue and digital computers on the other, have converged until the present, when many complex processes involve completely integrated controllers involving human operators, computers, automatic regulators and servomechanisms.

Some consideration will be given to the methodology of information theory and its application to control system technology. Since the problem of how to utilize information most effectively has profound implications and the real need for information is to predict the future, the applications of this concept to the control of processes will be considered. The method of prediction through the application of physical (or mathematical) models will be discussed with special reference to automatic controllers and in this context the basic significance of feedback will be illustrated.

A limited number of tickets for this lecture is available from the Public Relations Officer of Ultra Electric (Holdings) Ltd., at Western Avenue, Acton, W.3., and anyone interested in taking this opportunity of hearing Professor Porter should make written application to the above address.

Comprehensive Guitar Amplifier

A COMPLETE UNIT WITH TREMOLO, ETC.

By B. L. Phillips

THE unit to be described has been expressly designed for use with electric guitars, electric string bass or similar musical instruments. It is essentially a high gain, high power amplifier with its own power supply, and has an added refinement only normally found in expensive commercial amplifiers of this type; namely an electronic tremolo or vibrato unit. The circuit is in two sections, one being the power pack and power output stages, the second is the vibrato unit and pre-amplifier stages. These two items are on separate chassis, and are interconnected by a plug and socket arrangement. The pre-amplifier chassis carries all the volume and vibrato controls, input jacks and switches and is really the "control" panel. This is mounted somewhere on the cabinet top for easy access, whilst the power chassis can be mounted conveniently on the cabinet floor. The choice of cabinet is left to the constructor, but some details of cabinet mountings are given in the text as a guide.

Common Housing

As is normal with all amplifiers used with musical instruments, the loudspeaker is housed in the same cabinet as the amplifiers. The maximum power output is in the region of 15W peak, so a good 10in. or 12in. speaker is essential. Two 8in. speakers of a similar type can be used together, or even one 8in. singly, but a small speaker will not do true justice to the complete equipment and is easily overloaded. The unit may be used with a high impedance microphone, but it is emphasised here again that the response of the amplifier is really adjusted for guitar, etc., and is not intended for quality music or speech reproduction. The bandwidth required for amplifying the electric guitar is much narrower than that required for speech or music, and the true tone of the plucked guitar string is achieved by using a relatively narrow band amplifier. Further information will be given later.

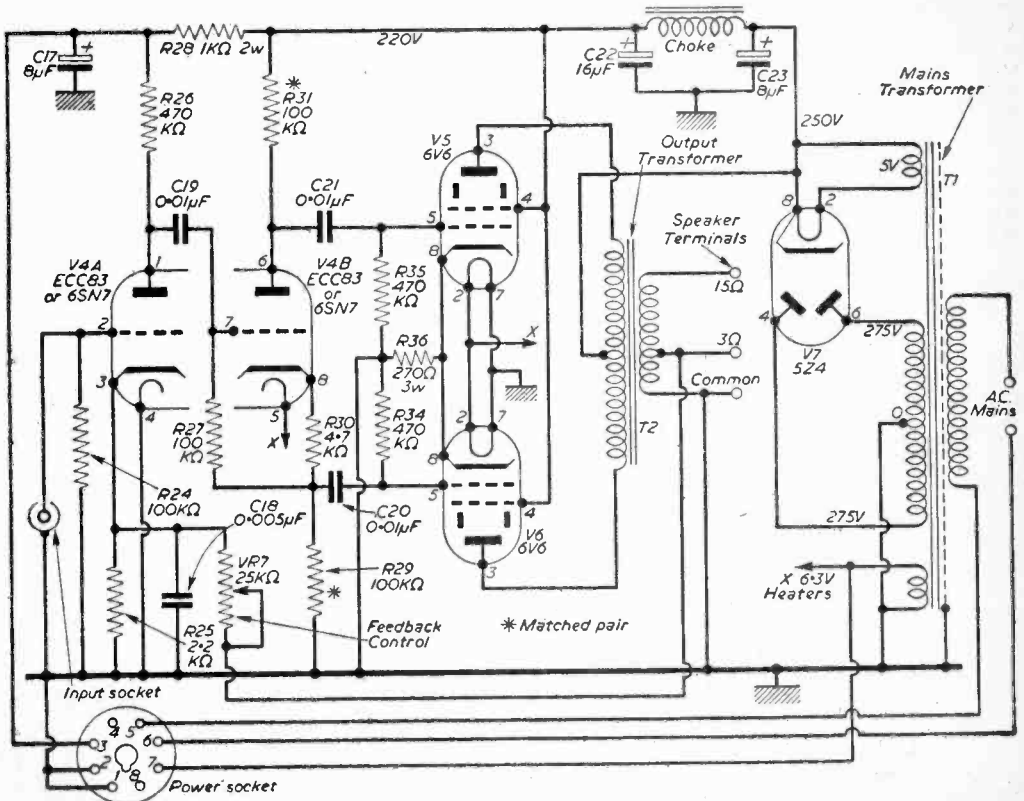


Fig. 1.—Circuit of the power unit and output stages.

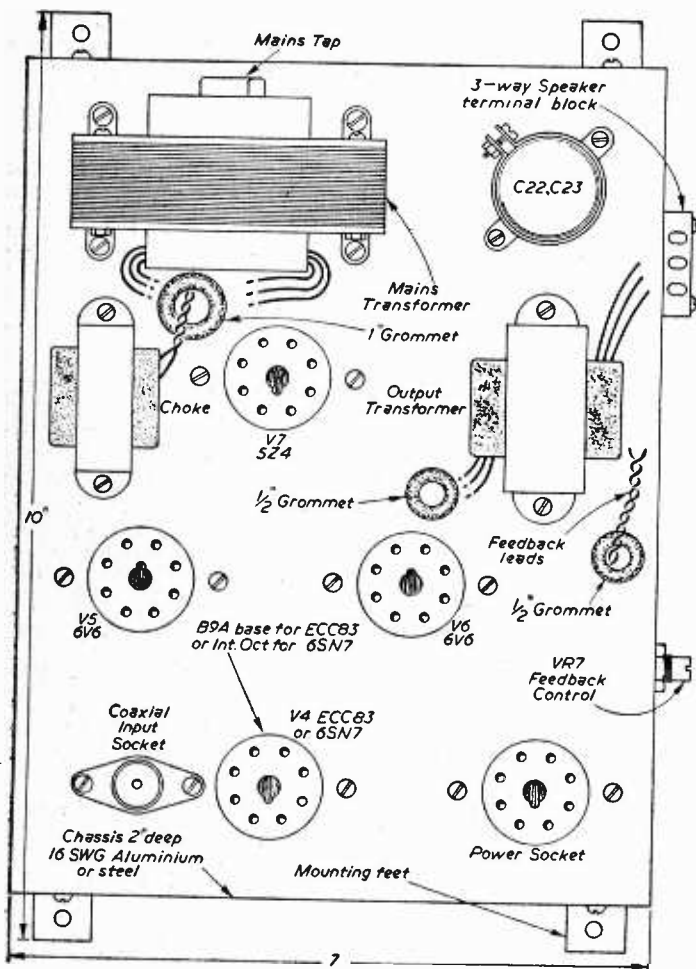


Fig. 2.—Plan view of the power chassis.

The Power Chassis

The circuit diagram is given in Fig. 1 and consists of the mains transformer, rectifier and smoothing circuits, the two output valves and transformer, and the driver and phase inverter stages. Wiring is in no way critical, except that the output anode leads must be as short as possible, and as far away from the input as possible. It will be noticed that either the B9A based ECC83 or octal based 6SN7 may be used in the driver/phase inverter position; results being the same for either type. All the octal bases require a 1½ in. hole, the B9A base being ¾ in. diameter. Figs. 2 and 3 gives the general layout of main components above and below the chassis. A tag-strip having two earthed mounting tags and a minimum of five connecting tags is used to support the small components associated with the input stages. Wiring here is in no way critical, and any convenient under-chassis layout may be used. The feedback control and speaker output terminations are mounted on one wall of the chassis, which is

2 in. deep. Four mounting feet are shown for fixing the chassis down to the cabinet base, but if a ready-made chassis with "lattice" fixing holes is available these may be used instead.

It is suggested that this chassis be made up first, then the following checks can be made for correct operation.

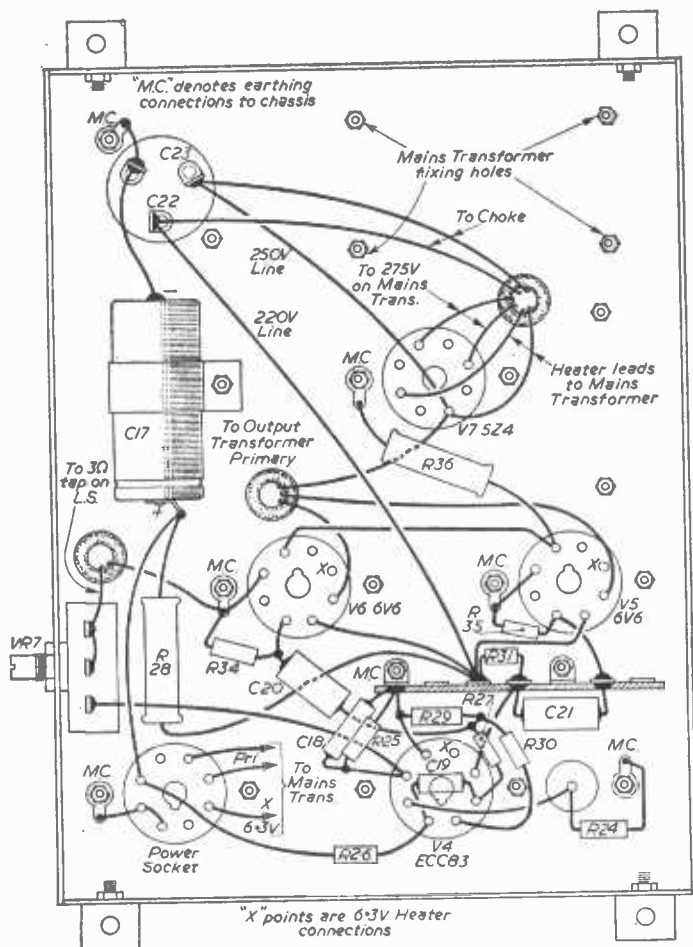
Tests

Insert the valves and short the mains switch leads on the power socket (pins 5 and 6). Leave the earth and feedback leads off the speaker output terminations, connect a speaker of 3Ω impedance to the 3Ω output tags. Switch on and allow to warm up for a few seconds. After quick checks for obvious faults, touching the input socket tags. Switch on and allow to warm up for a few seconds. After quick checks for obvious faults, touching the input socket tags. Switch on and allow to warm up for a few seconds. After quick checks for obvious faults, touching the input socket tags. Switch on and allow to warm up for a few seconds. After quick checks for obvious faults, touching the input socket tags.

Note: If the speaker is of 15Ω impedance, then the feedback leads will go across this 15Ω output. Further details of adjustment are given later. Finally, check the heater and high tension voltages if possible; they should be within 20 per cent of those on the diagram. One last word on this unit: the 0.005μF capacitor across the feedback line and chassis is essential and must not be omitted. It corrects for phase shift at ultrasonic frequencies and makes certain that the feedback is negative at all frequencies in the pass-band of the amplifier.

The Pre-amplifier & Vibrato Chassis

This unit consists of the audio pre-amplifiers to bring the guitar input up to a level suitable for feeding the main output stages, and the vibrato oscillator and mixer stages for the "tremolo" effect. The two amplifier stages are quite conventional and do not require any explaining. Some additional negative current feedback is employed on the final stage by not having the cathode resistor bypassed. The tone control circuit is a simple top-cut type and is placed between the two stages. The three volume controls are in parallel across the grid of the first amplifier, resistive stoppers of 100k each are employed to avoid undue interaction of one input on another. Wiring in all these stages should be as short as possible, and only one earth tag used for all earthy connections at each stage.



It is best to use the B9A based valves as specified in this unit, because of their compact size, but as stated earlier, if a constructor has a number of 6SN7's to hand, these may be used, but the chassis size will have to be increased. If 6SN7's are used a matching pentode for the vibrato unit is the 6K7 metal.

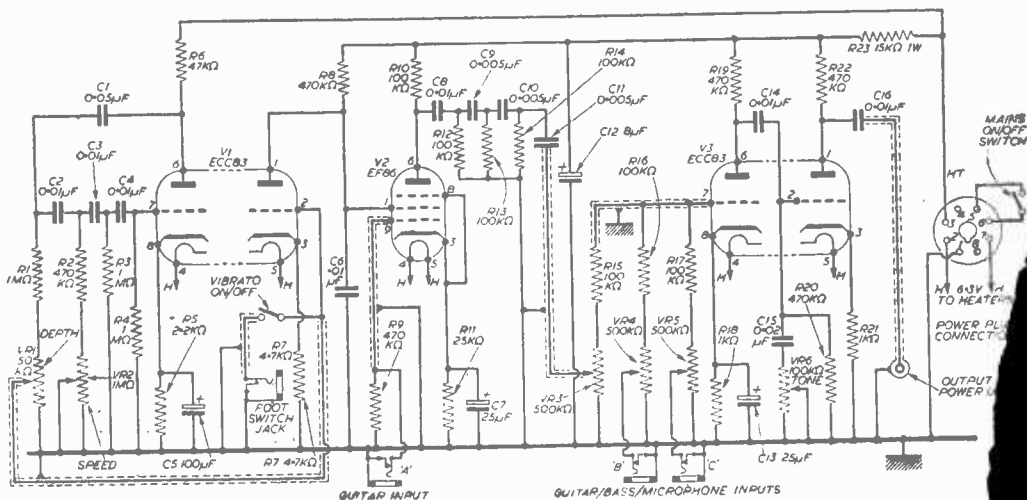
Tremolo Oscillator

This is a high gain triode, with the feedback taken from anode to grid via a phase changing network of capacitors and resistors. The oscillator develops a sine-wave output, the frequency of which depends upon the capacity/resistance ratio; thus one resistor in the feedback chain is made variable and governs the frequency of the output (which governs the "speed" of the tremolo effect). To avoid interaction between the oscillator and external connections, a buffer amplifying stage is placed between it and the mixer pentode. As the oscillator output is high, little gain is needed from this amplifier, hence heavy current feedback is used in the cathode circuit, and the output from the oscillator is taken from a low potential point across a 50k potentiometer.

(To be continued)

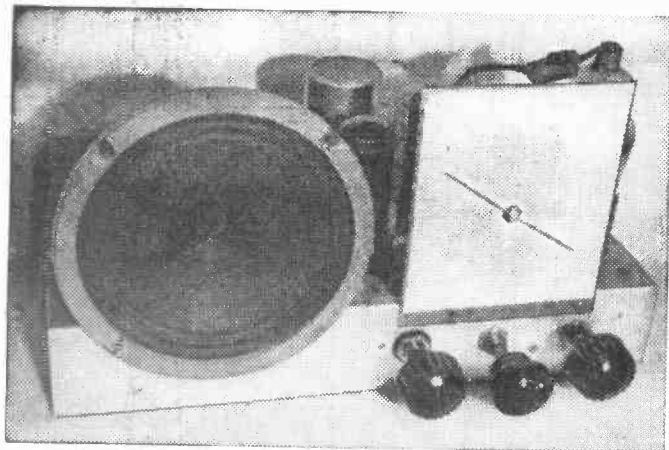
Fig. 3.—Underchassis wiring of the power unit.

Fig. 4 (below).—Circuit of the pre-amplifier and the vibrato unit.



Mains D

A T.R.F. CIRCUIT
SELECTIVITY AND



The completed receiver.

THIS receiver tunes long and medium waves and is particularly suitable for beginners, as construction and wiring are very straightforward, and no aligning of tuned circuits is required. The two valves are available at very low cost, and the complete receiver can be built at small expense, but nevertheless gives good results.

The Circuit

The circuit is shown in Fig. 1. A dust-cored dual-wave coil gives best results with the simplest form of wavechange switching. Reaction is con-

trolled by adjusting the detector screen grid voltage, this being adopted instead of a variable reaction condenser in order that the mains on/off switch can be operated as well with the single knob. The 8D2 and 12A6 valve heaters receive current from a 12.6V transformer. The actual combined heater consumption of these valves is only 0.35A, so a dial light may be added, if desired, without overloading the 0.5A transformer secondary. A 1A or 1A transformer is equally suitable. If 6.3V valves such as the 6J7 are to hand, these can be used instead of the 8D2, being equivalent except for the base and heater rating. Similarly, a 6V6 or other 6.3V valve can then be used in the output stage. A 6.3V transformer is then necessary, and the output valve cathode bias resistor should be modified to suit. 270Ω being used for the 6V6 type, but, if valves and heater transformer are to be purchased,

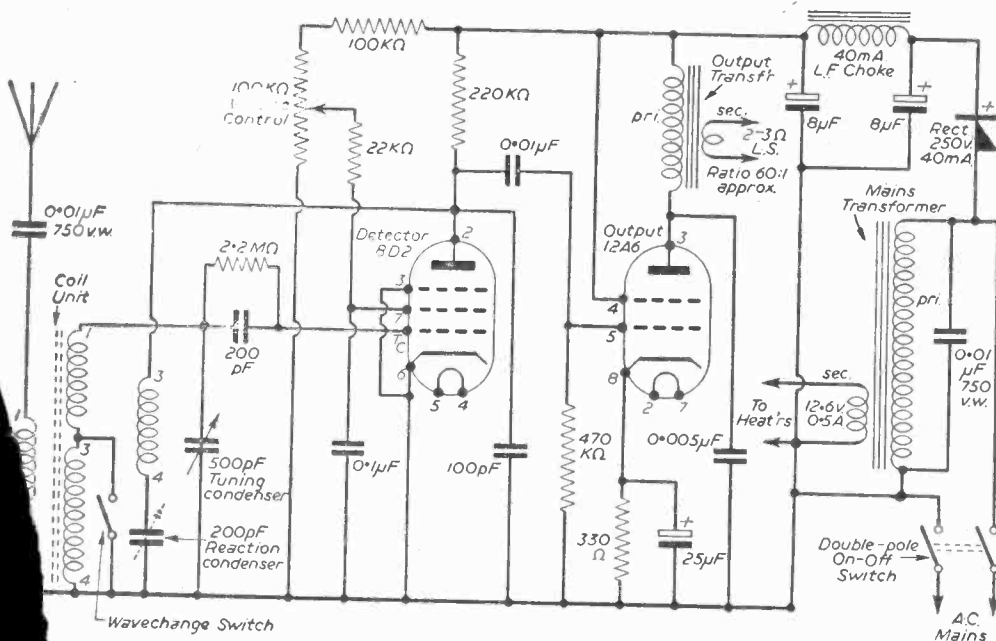


Fig. 1.—The circuit diagram of the receiver.

Dual-wave 2

WITH REACTION TO IMPROVE SENSITIVITY

By F. Gee

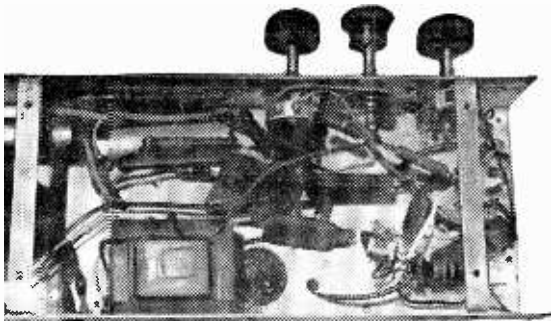
building cost will be reduced by using the 8D2 and 12A6.

The type of smoothing choke, and current rating of the choke and rectifier, are of little importance, provided they can handle at least 40mA. A 45mA or 60mA choke or rectifier would thus be suitable. If smoothing condensers of larger capacity are to hand, they can be used, and it is not necessary that both these components be of the same capacity. A combined condenser (such as 8 plus 16μF) is equally suitable.

The mains voltage isolating condenser in series with the aerial should be of high voltage rating, as must the condenser in parallel with the mains

COMPONENTS LIST

8D2 valve British 7-pin holder.
 12A6 valve. Octal holder.
 QR11D (Osmor) coil, or other dual-wave coil with aerial coupling and reaction.
 500pF air-spaced tuning condenser. Drum, cord, drive and spring.
 100k potentiometer with 2-pole switch.
 Fixed condensers: 100pF, 200pF, 0.005μF, 0.01μF 250VW, 25μF 25VW, two 8μF 350VW or similar, 0.1μF 250VW, two 0.01μF 750VW.
 12.6V ½A or similar mains transformer
 5in permanent magnet speaker with mains pentode output transformer.
 250V 40mA or similar rectifier.
 40mA or similar smoothing choke.
 Resistors: 330Ω 1W, 22k ½W 100k ¼W, 220k 1W, 470k or ½M ¼W, 2.2M ¼W.
 Single-pole wavechange switch.
 Three control knobs.
 200pF pre-set condenser



The underchassis wiring.

transformer primary. A leakage resistance of even several megohms in the 0.01μF coupling condenser between valves will allow a positive voltage to reach the 12A6 control grid, and upset proper working. For these reasons, three high quality mica 0.01μF condensers are recommended for these circuit positions.

Preparing the Chassis

A chassis about 10½in. x 4½in. with 2in. runners will be convenient. The parts can usually be arranged to fit a ready-drilled surplus chassis. If the chassis is undrilled, the valveholder holes can be made with a washer cutter, valveholder punch or cutter, or by drilling rings of small holes, and cleaning up with a half-round file.

A metal dial plate about 3½in. x 4½in. is bolted to the front runner of the chassis. A clearance hole for the tuning condenser spindle is drilled in

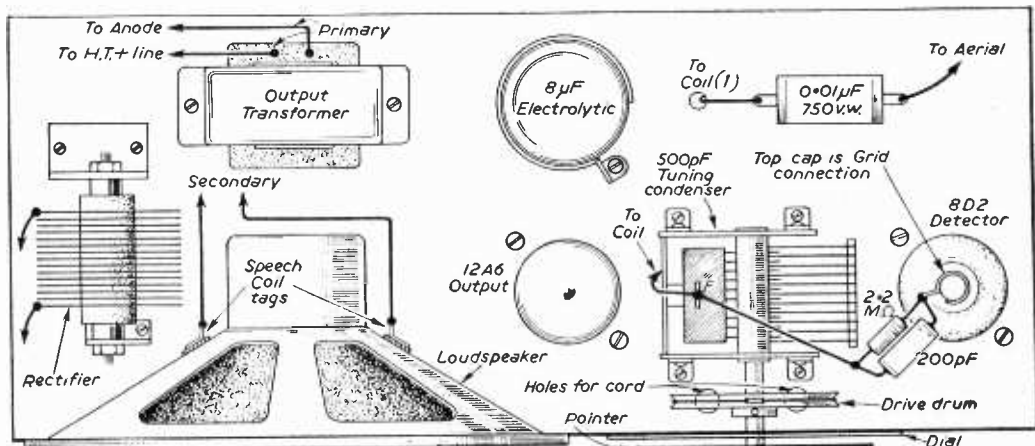


Fig. 2.—The above-chassis layout.

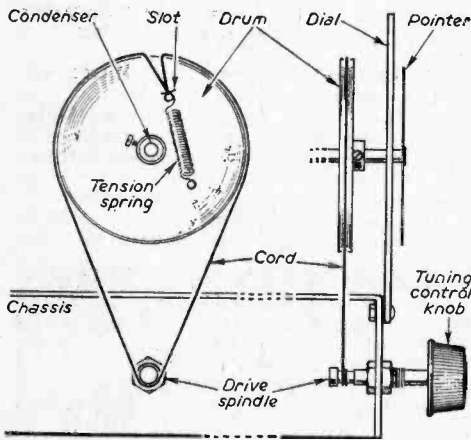


Fig. 3.—The tuning drive.

this plate at the correct height. The condenser is bolted down by means of small brackets, as shown in Fig. 2, the spindle projecting to take the pointer. The way in which the drive is arranged will be clear from Fig. 3. The bush holding the tuning control knob spindle is fixed to the front runner directly below the condenser spindle. Two clearance holes are then drilled for the cord, as shown in Figs. 2 and 3. The dial should be removed, and the drum is placed on the condenser spindle, its slot being at the top, with the condenser half closed. A length of nylon or other drive cord is then given a full turn round the spindle, taken up through the chassis, and round the drum. The ends pass through the slot, and are tied to the spring, which is under tension. The drive should work smoothly and easily, without the cord fouling the chassis, and the full 180deg movement of the condenser should be possible. If not, loosen

the drum set-screw to adjust it as required. The loudspeaker is also bolted to the front of the chassis, a small section being cut out to accommodate the frame here. If a little extra height is unimportant, the speaker can be attached by means of brackets, and an aperture in the chassis will then not be required. Parts above the chassis are located approximately as in Fig. 2. The rectifier fins are vertical (to assist air circulation); metal brackets being cut to hold it in this position. When wiring to the

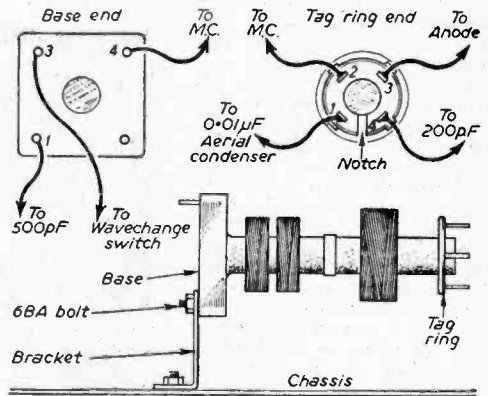


Fig. 5.—Tuning coil connections.

rectifier, assure that the positive end goes to the smoothing choke, and negative to the 0.01µF condenser and mains switch. Leads pass from the speaker speech coil tags to the secondary of the output transformer. If the transformer has wire ends, take these directly to the speaker tags. The secondary is of low resistance, and the actual ends of the winding may issue from the bobbin, ready for soldering to the

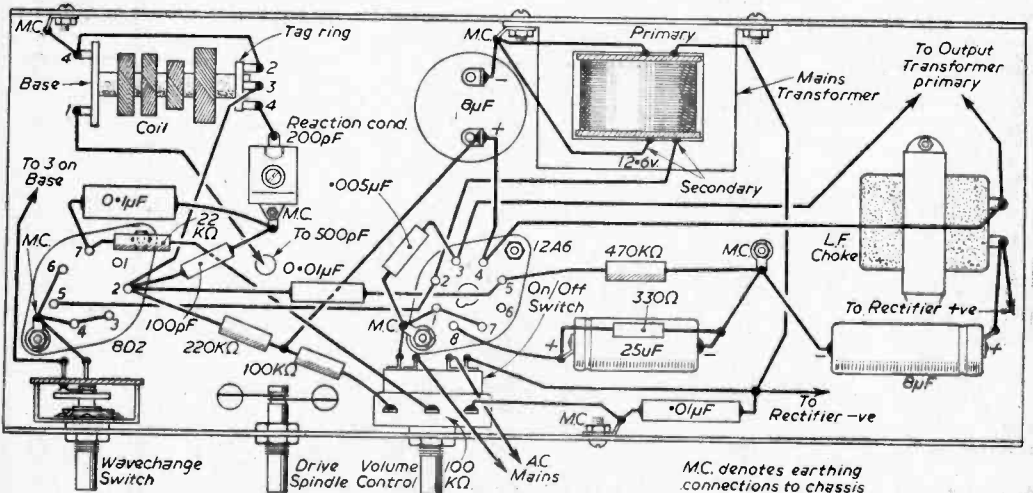


Fig. 4.—Underchassis wiring diagram.

speaker. The primary is of thin wire, and primary connections may be taken to tags on the transformer, or to thin, insulated flexible leads. The receiver cannot work if the transformer is wrongly connected.

Under the Chassis

Wiring and components below the chassis are shown in Fig. 4, points marked "M.C." being soldered to tags bolted in place. The mains leads should be of good quality twin flex. They run against the chassis, and out through a rubber grommet fitted in a hole in the back runner. It is best to use two-colour flex, and take the chassis side of the circuit to mains neutral, drawing current from a 3-pin plug. This will reduce chances of modulation hum, and also prevent the chassis being connected to the live main.

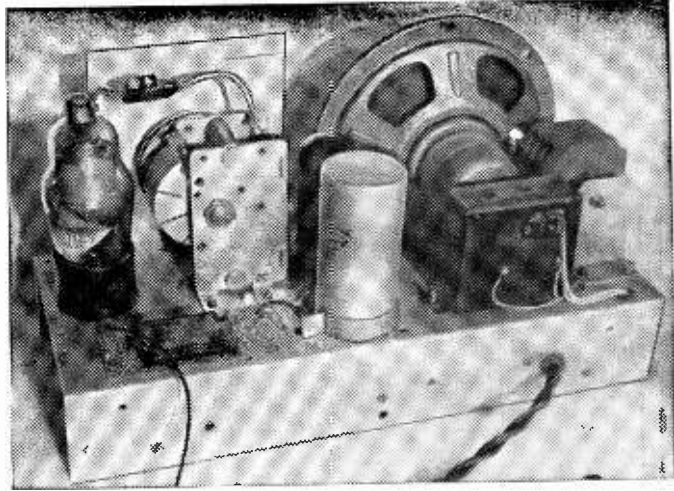
Connections should be reasonably short and direct, and it is wise to use insulated sleeving on all the leads. Note that the three large condensers have their negative tags taken to chassis.

The 200pF pre-set condenser has one tag bolted to the chassis, the condenser being raised so that it is not shorted. The second tag of this condenser is wired to point (4) at the tag ring end of the tuning coil.

The coil is best left off until other wiring is completed, and it is mounted clear of the chassis by means of a small bracket as shown in Fig. 5. At this end of the coil four pins project—(1) (3) (4) and (6). A lead from the fixed plates of the tuning condenser passes down through the chassis to pin 1, as shown

in Fig. 4. The pin marked 3 goes to the wavechange switch, and pin 4 to the chassis but pin 6 is not used.

At the other end of the coil is a tag ring, and this is wired as shown in Figs. 4 and 5. The connection from point 1 to the 0.01μF aerial condenser passes through the chassis. A short throw-out aerial consisting of about 6ft of thin insulated flex can be soldered to the second tag of this condenser, or a lead can be attached to a socket, so that an aerial can be applied. The actual aerial connection must be carefully insulated from the



Rear view of the receiver.

chassis, and the condenser must not be omitted because it is intended to keep mains voltages out of the aerial.

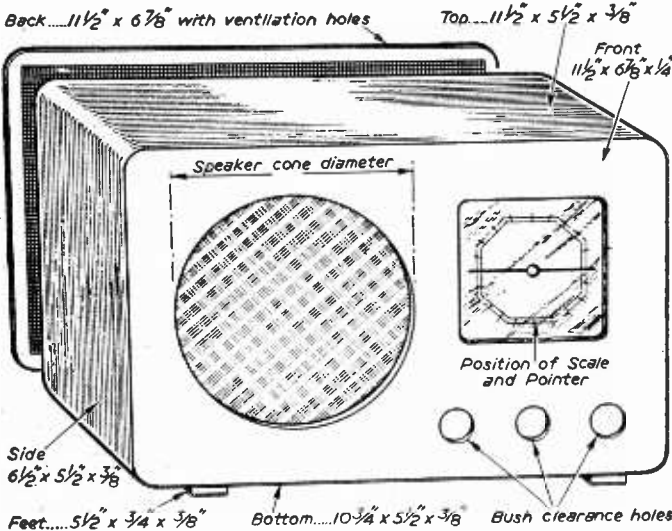


Fig. 6.—Making a cabinet.

Adjustments

The actual wavelengths covered depend, to some extent, on the position of the coil core, which can be adjusted from each end by means of a small screwdriver or insulated tool. If a metal blade is used, withdraw this after each adjustment. A coverage of about 200m to 550m on the M.W. band will be most useful, and the core position has most influence towards the high wavelength end of the band.

When the 100k potentiometer is rotated clockwise, sensitivity increases, being at maximum a little way in advance of full rotation. It is only necessary to adjust the 200pF pre-set condenser, using an insulated tool, until smooth reaction is obtained over each tuning range. If satisfactory reaction

(Continued on page 546)

An H.F. One Valver

SHORTWAVE, WORLD-WIDE,
RECEPTION

By I. Macdonald

RECENTLY I have been experimenting with one and two valve circuits for H.F. work. The main intention was to build a reliable low powered battery portable for the 15m band. After trying many circuits, already designed for the purpose, it was decided to try one of home design. The circuit finally decided upon was that which is now to be described.

Plans for an extra stage were developed. However, when the results of the 3D6 were heard, it was thought that this second stage would be undesir-

able. This assumption was proved to be correct, as the performance of the first stage is more than sufficient for the purpose. Stations from all parts of the globe have been detected on it. As an example a Russian broadcast station was received at strength six to seven with no form of aerial in circuit. Also, many amateur CW stations have been heard at all times of the day and night.

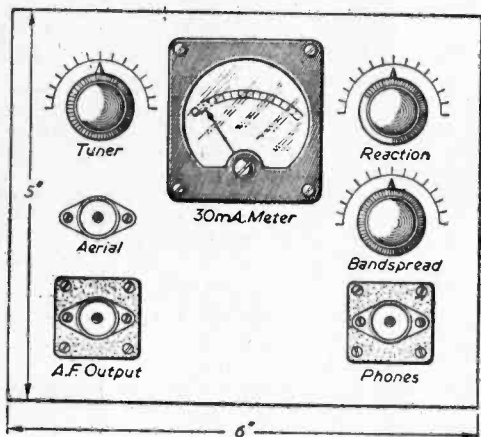


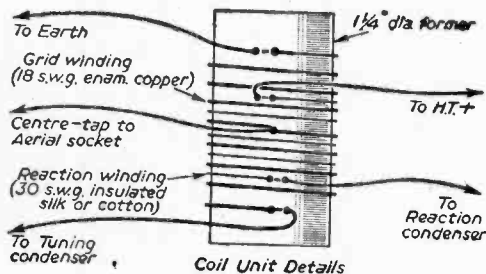
Fig. 1.—The front panel.

able. This assumption was proved to be correct, as the performance of the first stage is more than sufficient for the purpose. Stations from all parts of the globe have been detected on it. As an example a Russian broadcast station was received at strength six to seven with no form of aerial in circuit. Also, many amateur CW stations have been heard at all times of the day and night.

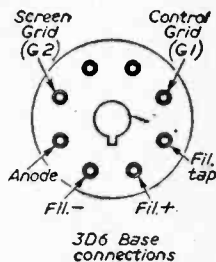
Coil

The coil L1 is home made. Many commercial organisations manufacture suitable types that would work equally well. The description is for the benefit of those who wish to wind one of their own.

A former 1½ in. in diameter and approximately 2 in. long is required. It may be made of porcelain or cardboard or any good stiff insulating material.



Coil Unit Details



3D6 Base connections

Fig. 2 (left)—Coil details.

Fig. 3 (right)—Valve base connections.

The Valve

The 3D6 is basically an A.F. tetrode with a centre-tapped filament at 1.4V per section. In this circuit, it has been modified to be used as an R.F. triode. The screen grid has been strapped to the anode to form a common electrode which will serve as a triode anode. This valve requires an H.T. of between 90 and 120V. The chosen H.T. will depend on the volume of sound required by the listener. It is suggested that a filament voltage of 3 be used. This of course means that the tapped filament is eliminated. Pins 1 and 8 are the filament connections. A key to the other pin connections is shown in Fig. 3.

Leaky Grid System

A leaky grid system is employed. This being an old favourite of many enthusiasts. It is also a very reliable and inexpensive detector circuit.

The grid capacitor is 200pF in value and must not be less than 100VW for perfect safety. The grid leak resistor is between 2 and 2.5M ΩW.

Reaction Circuit

The reaction circuit employed is commonly known as "anode reaction". It consists of a 0.0003μF solid dielectric variable capacitor in series with a coil, specially wound on the main coil former. If this coil is connected the wrong way round the set may not function; instead a permanent hum may be heard. In this case, all that is required, is to reverse the coil connections.

The 30mA meter is connected in series with the anode of the 3D6. This meter is of great assistance when controlling the reaction. When too

much reaction is used, the meter may read as high as 20mA, or more, depending on the emissive state of the valve. For stable T.R.F. listening with this circuit the meter should read 2mA to 2.5mA. This is the required H.T. current used by the 3D6 while operating under these conditions. If the

Audio Output

The A.F. output is obtained from the anode of the valve. The use of the U.S.W. choke will help to eliminate unwanted noises. The output is powerful enough to operate outdoors and a small loudspeaker may be used as an alternative to headphones. The primary of the loudspeaker transformer is connected in series with the choke instead of the 'phones. The use of a speaker will reduce sensitivity to a small extent but this factor is compensated by better tone.

As seen from Fig. 4, provision for a future audio stage is made by including an extra coaxial socket in the construction. This socket is the A.F. output socket.

A piece of Paxolin lin. is used as a base for the 'phones output socket. The screen of the coaxial cable in this case goes straight to the free end of the choke. The H.T. cable is terminated at a suitable point inside the chassis and the centre of the 'phones coaxial is soldered to this terminal. This wiring allows the H.T. positive to flow to the choke through the 'phones directly. When the 'phones are unplugged then no current will flow in the H.T. line. This eliminates the use of an H.T. switch. No provision is made for

a switch in the L.T. circuit, the L.T. being switched when the 3V cell is disconnected.

Power Requirements

A suitable source of pure D.C. will be required to operate this circuit. Many types of surplus

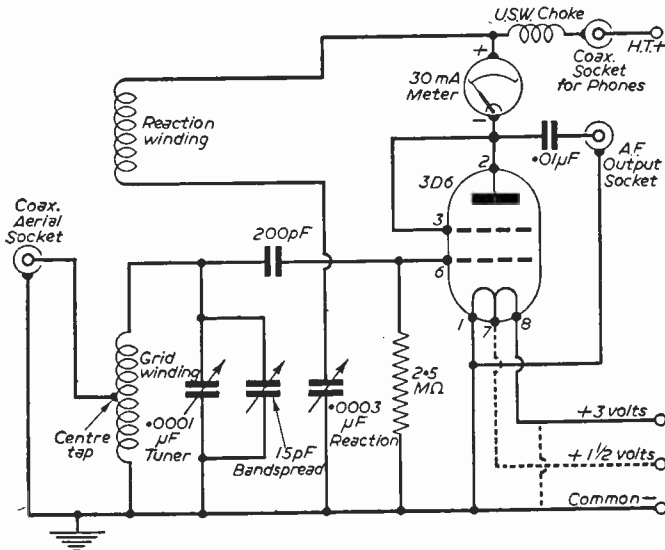


Fig. 4.—The circuit diagram.

meter does not read at all or reads below 1.75mA, then the reaction is too low and should be increased until the meter reads the correct current. This fact can also indicate that no voltage is reaching the anode owing to a component failure.

Battery Failure

The use of the meter will be of great value. Therefore, it is recommended that you should include it in the circuit. Constructors may tend not to use it as it means extra expense. A 30mA meter is quite inexpensive and will add to the appearance of the instrument.

Tuning Controls

The tuning capacitor is a 0.0001μF of the solid dielectric variety also. A 15pF air-spaced capacitor is wired in parallel to act as a bandspread condenser. Great care should be exercised when purchasing the latter. You may discover to your dismay that the moving vanes are loose and erratic. This factor will produce poor tuning as well as noisy conditions. Always ensure that the moving vanes of such a capacitor are tight and sound before purchasing.

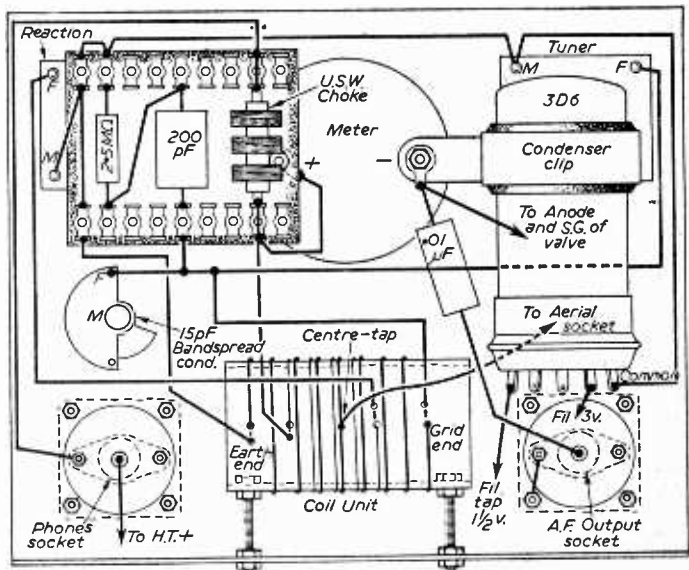


Fig. 5.—The wiring diagram.

"battery" eliminators are sold today. These devices although saving the operator much future expense, cause extra maintenance troubles. For those constructors who already possess an eliminator, the required potentials are as follow: H.T. 90-120V; LT 3-1½V, this depends on the filament circuit preferred. Many battery manufacturers supply combined H.T.-L.T. batteries which would make the set entirely portable. Your local dealer will be only too pleased to answer your battery requirements and will supply your needs at reasonable cost.

Construction

As the circuit is very small and simple, few details of construction are really required. The cabinet used is 6in. x 5in. x 2½in deep. It is cut from 18s.w.g. sheet aluminium. A brief idea of the required dimensions will be seen in Fig. 1. It was felt that full description was quite unnecessary as most constructors will prefer to use a cabinet design of their own in any case.

At convenient spaces on the front panel, three tag mounting strips should be fixed. The wiring of the components is not very critical. The only factor to bear in mind is to keep all wiring as short as possible. A suggested layout for wires is shown in Fig. 5.

COMPONENTS LIST.

1—3D6 valve.	1—15pF air-spaced variable capacitor.
1—Condenser Clip.	1—Coil (see text and Fig. 2).
1—30mA 2in. meter.	1—U.S.W. choke.
1—0.0003μF variable capacitor.	1—2 to 2.5M ½W resistor.
2—Coaxial sockets.	1—200pF fixed capacitor 100VW.
1—B8G valve base.	1—0.001μF 250VW. Dielectric variable capacitor.
Cabinet, nuts, bolts, solder, wire, etc.	

Low Drift V.H.F. Receiver

(Continued from page 496)

hour to check that the tuning has been maintained. If it has not, note carefully whether the correction required to bring the set into tune is an increase or a reduction in the capacity of VC. If a reduction is required, the negative co-efficient in the parallel

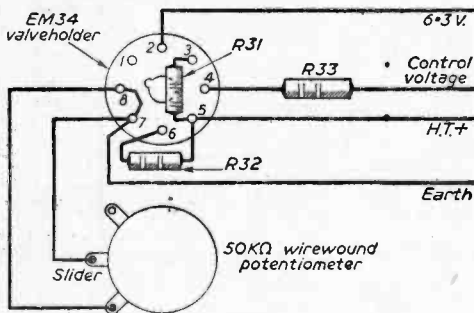


Fig. 11.—Wiring of EM34 tuning indicator.

combination C12, C13 must be increased; if the correction is positive it must be reduced. Any alteration in the value of C12 must be balanced by an alteration in C13 (zero co-efficient) so that the total capacity of the combination remains between 20 and 24pF. The adjustment is not as critical as it sounds and if the receiver is built as specified, the values given in the circuit diagram should be satisfactory.

Alignment Without Instruments

The set can be aligned fairly easily without instruments. If this is to be done, it is advisable to use pre-tuned I.F. and detector transformers, and it will be necessary to fit, temporarily at least, a sensitive tuning indicator such as 6E5 or EM34 for use in place of the high resistance or valve volt-

meter. It should be arranged as previously described with a 50k potentiometer in the cathode circuit and the control grid cable should be fitted with a crocodile clip. Clip the control grid cable to the negative end of C26 and set the cathode potentiometer for maximum shadow angle. Connect a good aerial and proceed as for adjustment of oscillator tuning. Select the strongest transmission that can be found and after checking that it is in fact a BBC transmission, adjust the cores of the I.F. transformers and the top core of RDT for maximum response as shown on the indicator. Now clip the grid to earth and adjust the potentiometer for zero shadow angle. If an EM34 is being used, this means zero on the more sensitive side of the display. Transfer the indicator grid to point Z and adjust the bottom core of RDT for zero output. Re-adjust the top core for maximum response as previously described.

Tests

An approximate acceptance bandwidth test can now be carried out. With the indicator adjusted for zero angle and the grid connected to point Z, tune the receiver slowly "through" a transmission. The two maxima will be observed as equal and opposite deflections of the display each side of the centre zero.

With pre-tuned transformers, the adjustments required will be limited to those necessary to counteract differences in circuit stray capacitances and will be slight. Without pre-tuning, the operation is more difficult but may be achieved satisfactorily within close range of a transmitter or at a greater distance if the receiver has two I.F. stages. The procedure is, the same but the transmission when first received will probably be weak and distorted and will have to be tuned carefully by ear till it is strong enough to show on the tuning indicator. Move the transformer cores each a little at a time and do not make any large movement of any that does not increase the signal. There will be no guarantee of course, that the intermediate frequency finally arrived at is correct, but it is not likely to be far out and the error should not affect the performance of the receiver.

(To be continued)

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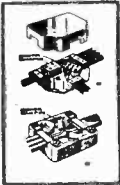
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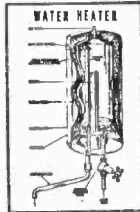
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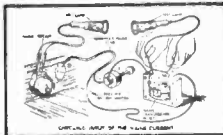
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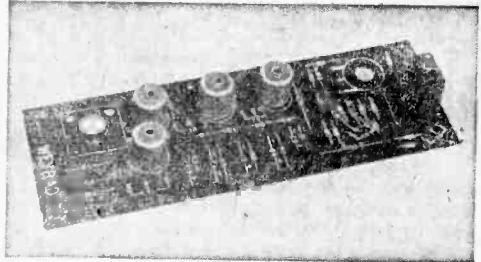
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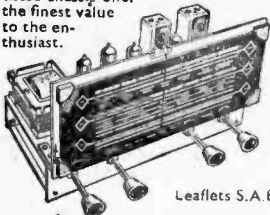
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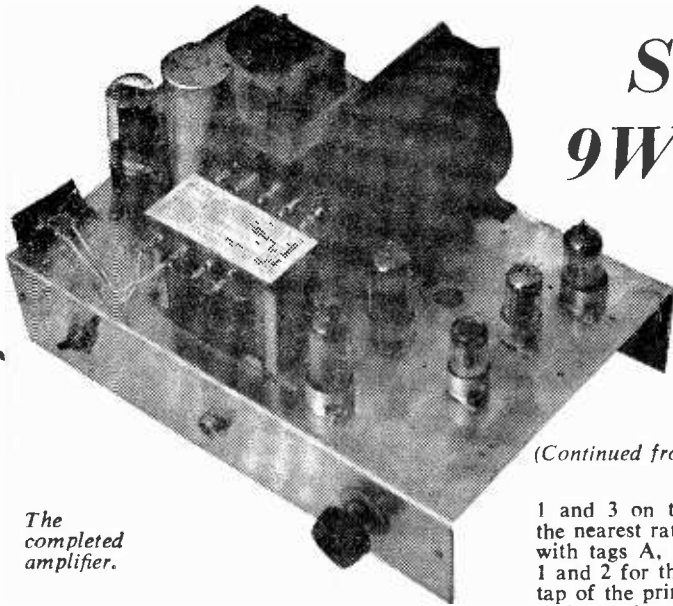
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The completed amplifier.

Six Valve 9W Amplifier

A VERSATILE, HIGH
OUTPUT, CIRCUIT

By F. G. Rayer

(Continued from page 394 of the September issue)

THE smoothing chokes used for the amplifier should be of generous current carrying capacity and surplus chokes can be obtained at low cost. The actual inductance of the choke is of no importance, provided it is several Henrys. It must be rated to carry 120mA or more. With a 300V transformer, the choke should not be more than about 80Ω to 100Ω resistance. With a 350V transformer it can be about 400Ω.

Output Transformer

The specified transformer is suitable for outputs up to 10W, and provides a large number of optional ratios, to suit 2/3Ω, 7½Ω, and 15Ω speakers. The anode-to-anode load required is approximately 10,000Ω. With a 15Ω speaker, the nearest ratio is 27:1, obtained by using tags A, C and E on the primary, and 3 and 4 on the secondary. For a 7½Ω speaker, the nearest ratio is 35:1, requiring the use of tags A, C and E on the primary, and

1 and 3 on the secondary. For a 2/3Ω speaker, the nearest ratio is 50:1, and this will be obtained with tags A, C and E used for the primary, and 1 and 2 for the secondary. In all cases the centre-tap of the primary is wired to the 16μF condenser, and equal ratios each side to the output valve anodes. The secondary tags are connected to the output sockets provided for loudspeaker connecting purposes.

Surplus or other output transformers can be used, provided they can carry a minimum of 60mA in each half of the primary, and are of a suitable ratio for the speaker. Very small transformers cannot be used because their rating would be too low.

Amplifier Cover

To make the cover, two wooden ends are cut from ¼in. to ½in. wood, as shown in Fig. 4. Each is the same width as the chassis, and about 8in. high. If the chassis has end runners, the wooden ends are screwed to these from inside. If not, they are screwed to the smaller pieces of wood mentioned, which in turn fit inside the chassis ends.

A piece of perforated metal about 24in. long, and wide enough to overlap the wooden ends, has

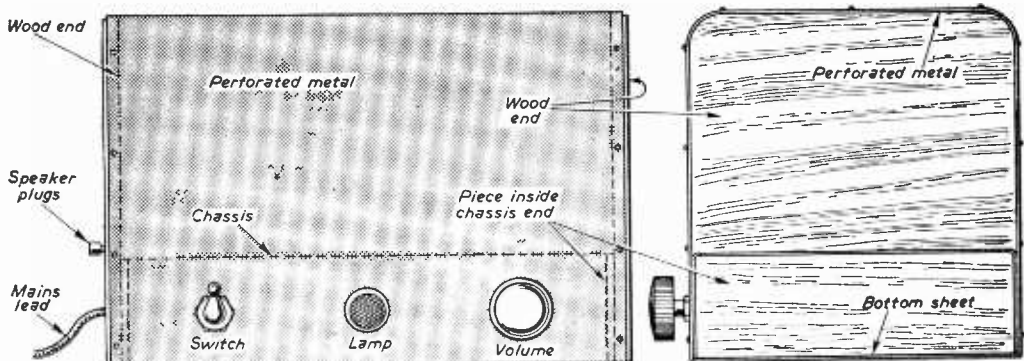


Fig. 4.—The case of the amplifier.

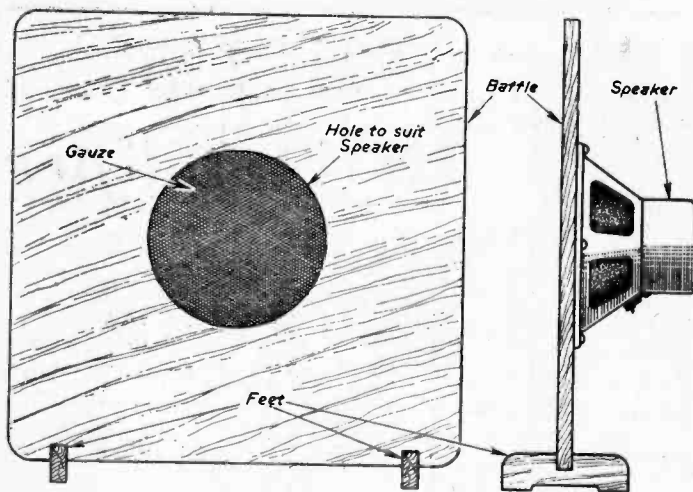


Fig. 5.—A baffle for the loudspeaker.

holes cut to clear switch, lamp holder bush, and volume control bush. The nuts are then removed from these items, so that they can be used to clamp the perforated metal to the front of the chassis.

The metal is then taken up, across the top, and down the back, being drawn tight and fixed with small screws. Small holes are needed to clear the input socket and terminal. A metal sheet is cut to cover the bottom of the chassis, and screwed to the wood.

Clearance holes are bored opposite the speaker sockets. A hole is also required for the mains lead. The amplifier can be serviced, if necessary, by merely removing the perforated metal, the wooden ends serving as rests so that it can be placed in an inverted position.

If a 3-pin plug is to be used for supplies, wire the amplifier chassis to earth, using the large pin for this. The switch should be in the red lead. When current is drawn from a 2-pin plug, the chassis is *not* wired to either mains lead.

Speaker

Various forms of cabinet can be used, and it is not proposed to cover the construction of these here. If no such cabinet is available, it is possible to use a flat baffle of the kind shown in Fig. 5. This consists of a single stout board, mounted on feet large enough to prevent it tipping over.

It will be remembered that small speaker units will be unable to handle the full output of the amplifier, so that it is necessary to use a model rated to handle at least 9W. The cone diameter is measured, and the hole in the baffle is cut out to agree with this. The speaker is then firmly screwed to the board, gauze being used to protect the cone.

The actual size of the baffle is in no way critical, except that a large baffle will give better bass response. However, a baffle 24in. x 24in. will be satisfactory for general purposes, and this size is illustrated. The board should be thick—at least $\frac{1}{2}$ in. minimum. If plywood is used it must

be free from loose pieces which would cause buzzing noises. This trouble is not likely unless the baffle has been allowed to become damp.

It is in order to use two or more speakers, with a cross-over circuit to obtain improved frequency response or to mount the speaker off-centre so that the distance from it to the edges of the baffle is unequal in each direction.

Using the Equipment

With a microphone or similar unit, sound from the loudspeaker must not reach the microphone with any strength, or howling will be caused. The minimum distance between loudspeaker and microphone depends on the volume control setting, the degree to which the microphone is directive, and other points, but can easily be

found by experiment if necessary.

The lead carrying the input to the amplifier must be screened, the screening being connected to chassis. This can be arranged by any of the methods already described. A single, screened lead is frequently employed, the braiding acting as the second conductor, or earthed return.

The input impedance of the amplifier is 100k, this giving reduced susceptibility to hum, etc., compared with extremely high impedances. Moving coil microphones require the usual matching transformer, as they are of low impedance.

Pocket Transistor T.R.F.

FROM correspondence which we are receiving, it is evident that some readers are experiencing difficulty in obtaining the materials for the tuning coils used in the above receiver (which was described in the July and August issues). These coils are wound on ferrite pot-core assemblies, Type 9A, obtainable from Denco (Clacton) Ltd., 357/9, Old Road, Clacton-on-Sea, Essex. The windings are of 5/47 Litz wire which can be obtained from Post Radio Supplies, 33, Bourne Gardens, London, E.4.

Miniature transistor I.F. coils differ from these coils in the number of turns used, but they may be used for experiments with inductive tuning.

Advertisement Price

THE three-speed Transistor Record Player advertised by Lasky's Radio on page 332 of the August issue was priced at £19 19s. 6d.; readers should note that this price should have been £9 19s. 6d.

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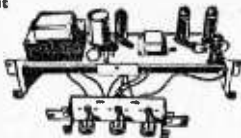
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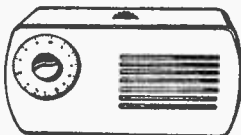
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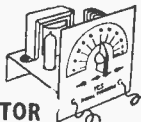
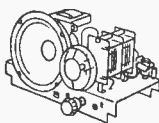
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A THREE VALVE, THREE STATION CIRCUIT

By P. Rushen

THE equipment described here was designed primarily to meet the communications requirements of a local establishment.

It was required to provide an easily operated two-way communication system between an office and two other points within the same building. A call system was also required which would enable the "Master station" to call either or both of the subsidiary stations. As an additional facility, two-way communication between the two subsidiary stations was made possible, with the "Master station" being able to "listen in" to the conversation if so required.

The Master Unit

Except for the speakers and operating switches of each sub-unit, the entire system is contained within the Master unit (Fig 1). The mains transformer T3 should be capable of giving, in conjunction with V3, a D.C. line voltage of approximately 220 at a D.C. load current of 55mA, and a 6.3 filament supply of 2A. The output transformer T2 is required to match the output valve, in this case an EL84, into a 3Ω voice coil load. A turns ratio of approximately 45:1 would be suitable here.

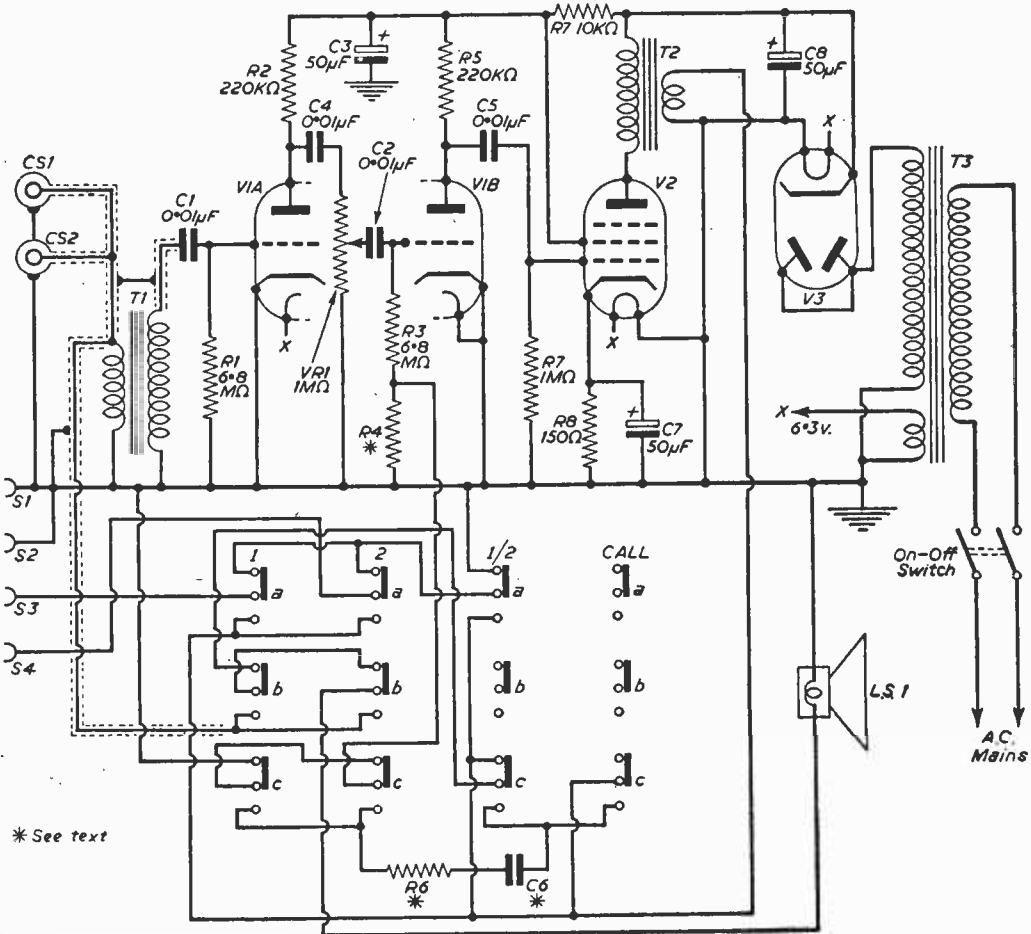


Fig. 1.—Circuit of the master unit.

The input transformer T1 in the original unit had a ratio of 75:1, but a ratio no higher than that necessary to produce an adequate output is all that is required for this purpose. A good bass response is not required and a high inductance

unscreened "banana" type. CS1 and 1¹, CS2 and 2¹ are coaxial screened types.

The Speak/Listen switches on the sub-units connect the loudspeaker to the output transformer in the Listen position and to the input transformer in the Speak position. The switches are non-latching spring loaded, with return to the Listen position. The screening shown is essential and orientation of the input transformer will almost certainly be necessary, in fact it may be found necessary either to screen the transformer completely or have it as a separate unit, well removed from the main unit and any other mains wiring adjacent to it.

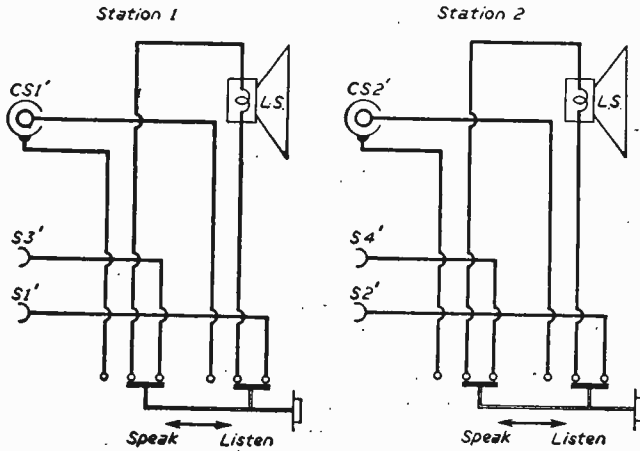


Fig. 2.—Slave unit circuitry.

secondary will give "hum" trouble. An alternative method of connection for the input transformer is shown in Fig. 4. For a transformer ratio of 45:1, Rx should be about 3,300Ω and Ry chosen for optimum output with minimum hum.

Control Switch

A four-section "press button" or "piano key" type switch is required. Although the full requirement of the unit only partly fills a four-button, three-pole changeover type, it is likely that the four switches will have at least three changeovers on each and they are therefore shown as such, with the sections not in use unconnected. Only the key 1/2 is a latching one, keys 1, 2, and Call are non-latching. Key 1/2 is released when either key 1 or 2 is operated. The Call key is non-releasing. A simple modification can usually be made to any full latching switch to produce the required arrangement.

Speaker LS1 and the speakers of Stations 1 and 2 can be any type of moving-coil loudspeaker, although small ones are recommended for convenience. For sound-balance and consistent "Call" operation, similar speech-coil impedances are desirable although not essential.

Sockets S1, 2, 3 and 4 on the Master unit and S1¹, 2¹, 3¹ and 4¹ on the sub-units are of the single

tone. It will be seen that R4 is short-circuited (via 1c and 2c,) a precautionary measure, taken to avoid both the possibility of accidental "calls" and that of unwanted feedback across R4 during operation. The "Call" button, operated by itself thus has no effect.

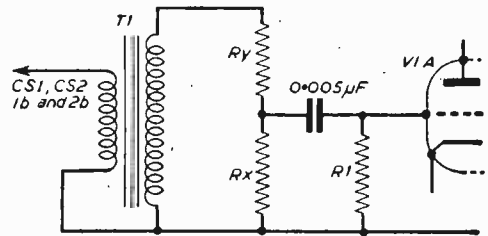


Fig. 4.—Alternative connections for the input transformer.

To call a sub-station, the operator presses the appropriate key or button and "Call" button together, release them both and awaits a reply.

Key 1/2

This is a latching key and when latched enables stations 1 and 2 to communicate with each other via the Master unit. The Master unit operator can listen in to this two-way conversation by pressing the "Call" button, which will now connect his loudspeaker to the output transformer via "Call" c, 1/2c, 1b and 2b.

Key 1

This is the Master unit operator's switch for communication with Station 1. It is non-latching and connects LS1 alternately to the output trans-

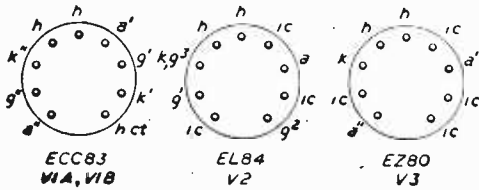


Fig. 3.—Valve base details.

(Continued on page 542)

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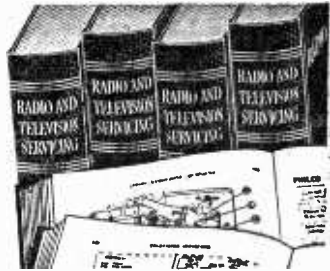
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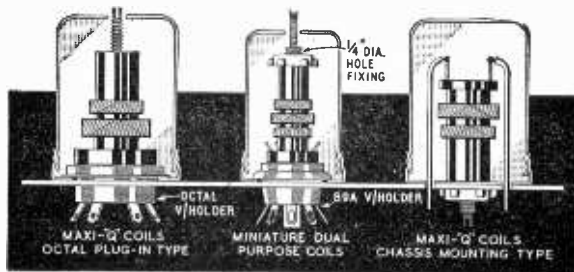
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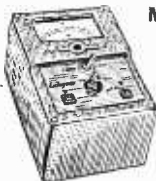
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Circuit diagram 1/6 (supplied free with Kit).



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A NOVEL, FOUR-VALVE
CIRCUIT DESIGN

By J. Severn

(Continued from page 434
September issue)

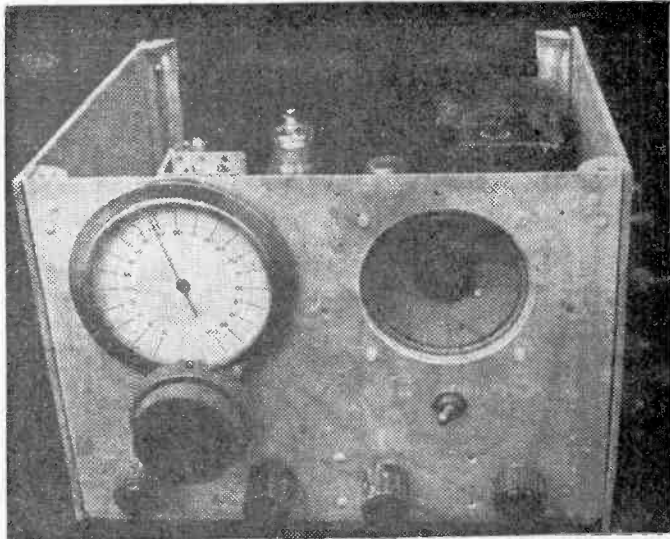
THE coils used in this unit can easily be home constructed.

One coil is shown in Fig. 4, and all are similar, except for the number of turns. Four-pin plug-in coils can be used, with a holder to match. These are available in 6-ribbed type, and have a diameter of approximately 1½ in. over the ribs. There is some latitude in the size and type of formers, gauge of wire, and exact number of turns used, and changes need not reduce efficiency, as the coils do not have to gang with others.

Referring to Fig. 4, (1) is the top of the tuned winding, (2) is a tapping on this winding, and (3) is the earthed end of the tuned winding. Lead (4) is the beginning of the aerial coupling winding, which ends at lead (3). Approximately ¼ in. clear space is left between tuned windings and aerial coupling, on each coil. All the leads are taken directly down to the pins, and soldered at the tips. Each coil is made in the same way, so that any can be inserted in the holder.

Coil Winding Details

The exact coverage, especially with the very small coils, will depend somewhat upon wiring. However, coils made as follows will usually be satisfactory. If necessary, turns may be added to



The completed unit.

any coil to increase the wavelength tunable, or removed to reduce the minimum wavelength.

Approximately 13-30m. 7 turns 20s.w.g. spaced about 6 turns/in., tap ¼ turn from (3). Coupling 4 turns 28s.w.g.

Approximately 30-60m. 16 turns 24s.w.g. spaced about 10 turns/in., tap ¼ turn from (3). Coupling, 8 turns 28s.w.g.

Approximately 60-100m. 30 turns 24s.w.g. side by side, tap 1 turn from (3). Coupling, 15 turns 30s.w.g.

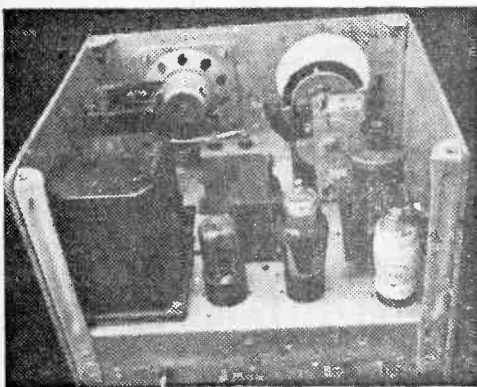
Approximately 100-200m. 55 turns 24s.w.g. side by side, tap 1½ turns from (3). Coupling, 25 turns 32s.w.g.

If a 10m coil is required, this will need approximately 3½ turns of 18s.w.g., occupying about 1 in. winding space, with tap about ¼ turn from (3), and 2 turns of 28s.w.g. for coupling. To secure best results, as many turns as possible should be used, provided the 10m band can be covered. It may also be necessary to experiment with the position of the cathode tap.

Dust Cores

Coils for use above 200m can best be made by taking a miniature dust-cored coil, with aerial coupling, and adding two or three turns of fine wire, to obtain a tapping point. The junction between existing winding and additional turns will furnish the cathode tap, and the end of the additional turns will be point (3). The turns should be on top of the existing winding, or very near it, and in the same direction, so that they can be regarded as a continuation of the winding. As most such coils are wound with Litz it is very difficult to tap the actual winding itself. These coils will fit inside short wave plug-in formers. The actual bands covered may be adjusted initially, if necessary, by modifying the position of the core.

An air-cored coil for wavelengths above 200m can be made by winding 100 turns of 32s.w.g. enamelled wire on a former like those used for



Rear view of the unit.

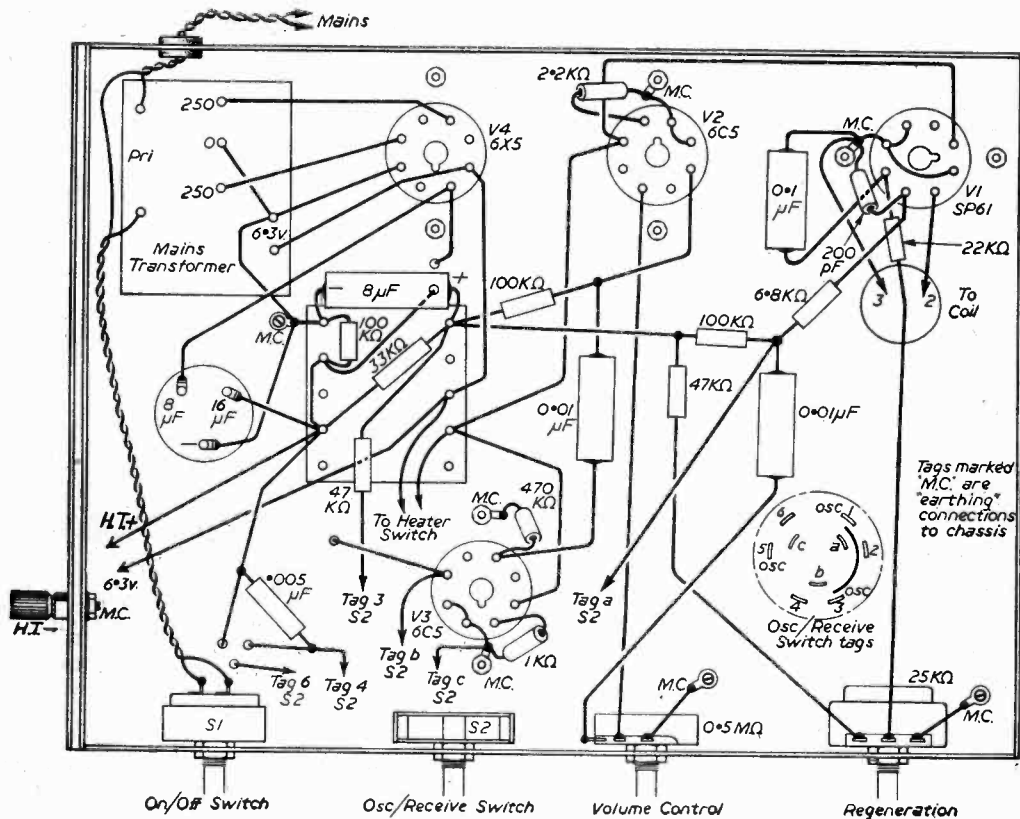


Fig. 3.—The wiring plan.

the S.W. coils, with tap $1\frac{1}{2}$ turns from (3), and 40 turns of 36s.w.g. for coupling. But for these wavebands dust-cored coils are recommended.

Aerial, Etc.

If other than a short wire is used for the aerial, a small pre-set or fixed condenser should be joined in series with it, at the aerial terminal shown in Fig. 2 (last month). A 100pF or 50pF pre-set is most suitable, as its capacity can be adjusted to suit the aerial.

For reception, put the oscillate/receive switch in the appropriate position, and ensure that the heater switch is closed. The regeneration control should give a smooth build up of sensitivity, until oscillation begins, with all coils. If not, the positions of the cathode taps may require modifying, to suit the SP61 actually in use. If oscillation is generally weak or absent, this valve may be in poor condition. Correct regeneration is essential for long range reception.

To test for oscillation, set the switch to oscillate, and loosely couple a receiver to the coil circuit. A test lead can be used, or a lead from the receiver aerial socket can be placed near the coil, or looped round the aerial terminal. Adjustment of the equipment as explained will then allow the modulated R.F. signal to be tuned in.

Calibration points should be drawn up for the

coils. This can be achieved by using the equipment as receiver and generator. Stations tuned in will give direct calibration points. If the switch is then set to oscillate, the generated signal will be heard on a receiver. Leaving the generator/receiver tuning untouched, the receiver

is tuned to lower wavelength, until the 2nd harmonic is heard on twice the frequency, or half the wavelength, of the original signal. Then receiver tuning is then left, and the generator tuning is adjusted until its fundamental is heard on the receiver. This gives a calibration point at twice the frequency (or half the wavelength) of the original station. By repeating this procedure, calibration points throughout the ranges of the coils can soon be found.

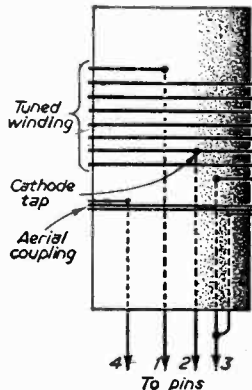
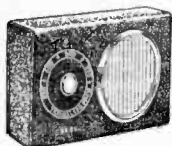


Fig. 4.—Details of the plug-in coils.

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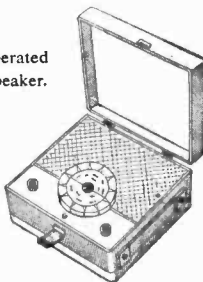
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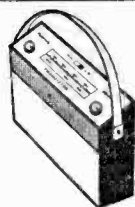
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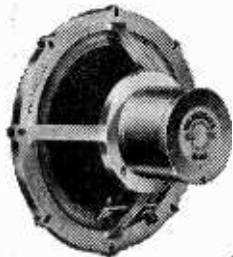
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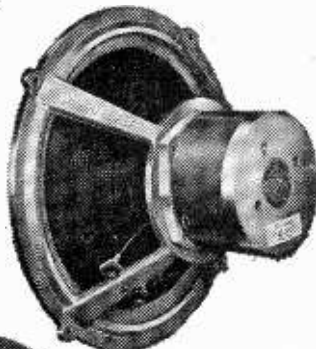
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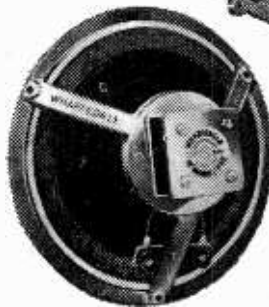


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Inexpensive P.A. Equipment

COMPLETE CONSTRUCTIONAL INFORMATION

By V. E. Holley

(Continued from page 397, September issue)

As mentioned in the previous article a very satisfactory mike can be made cheaply from one of the crystal inserts available on the surplus market.

Procedure: Cut pieces of thin plywood to size 6in. x 3in., sufficient in number to make a stack 1in. high and, with a fretsaw, cut them to the shapes and sizes shown in Fig. 7 (given last month). Take the first piece of ply, cover the hole with a circular piece of thin perforated zinc $2\frac{1}{2}$ in. in diameter and place the second piece of ply on top. Stick the two together with resin glue and, when it is dry, add the third and subsequent layers of ply except the last. When all are glued together, the insert can be fitted into the case thus formed. The front outer rim should be bedded on to three or four small pieces of sponge rubber and the back of the insert should then be slightly below the level of the surrounding wood. Fit the switch and the coaxial socket in the positions shown and wire up with small diameter screened wire. It is important to ensure that the screening is as thorough and complete as possible. The switch should be of the sliding type and should be wired so that in the "off" position it short circuits the microphone, thus silencing the amplifier.

The mike can now be tested on the amplifier and if all is well, a piece of thin sponge rubber sheet should be laid on the back of the insert and the back of the case glued in position. It is unlikely that the case will ever need to be re-opened but if the constructor dislikes such finality, the back can be secured with small brass screws.

Finishing

First fit a circular piece of cardboard into the opening at the front of the mike to prevent the entry of foreign matter. Round off all the corners of the case and make everything smooth with glass-paper. Wood dye of any desired colour may now be rubbed in and the final finish can be produced by the application of clear varnish. Two or three coats will be required with a light rub down between each. The result is a robust and serviceable instrument of reasonable appearance which will withstand rough handling or accidental falls without damage.



The completed equipment in its case.

Cables

The microphone cable must be efficiently screened. The resistance is unimportant but there must not be too much capacity between the conductors or there will be a loss of the higher frequencies when long runs are used. Coaxial cable of 80Ω impedance is ideal though not quite so easy to handle as some of the more flexible kinds of screened cables.

Pre-Amplifier

As stated last month, no pre-amplification is necessary for many purposes. When it is, as for instance in concert work, it is usually obtained from the mixer and pre-amplifier unit incorporated in the record player to be described. There are occasions, however, when it is unnecessary or inconvenient to use the record player and a small battery powered pre-amplifier may be constructed. This is completely self-contained and arranged so that it can be connected on the "magic box" principle in any mike cable where it will give a gain of 40 times. It is particularly useful for such occasions as providing amplification for an after-dinner speaker, where it will usually be necessary to employ a long cable and to station the operator at the main amplifier. The speaker too, is liable to be at a greater distance from the microphone than usual, so that additional gain is essential. If the pre-amp is used within a few feet of the mike, it will boost the signal well above the level of any extraneous noises which may be picked up later on in the cable.

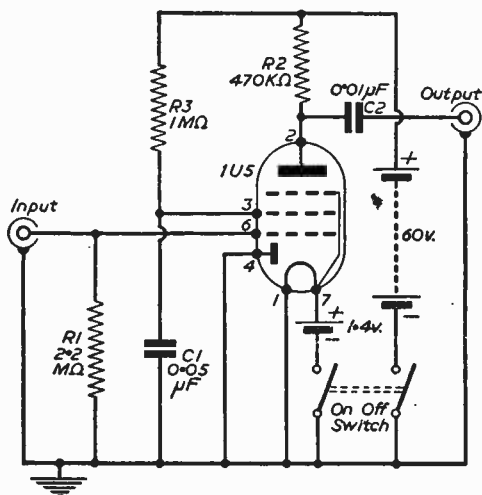


Fig. 8.—Circuit of the battery pre-amp.

Circuit

The very simple circuit is given in Fig. 8. The valve which is a 1U5 is very suitable for this purpose, having an internal structure specially designed to avoid microphony; the pre-amp can thus be handled or moved when in use without interference to the signal. The H.T. current drain is $160\mu\text{A}$ which is supplied by two 30V deaf-aid batteries in series. They have a useful life of about 60h before the voltage falls to 45, when they should be renewed. They have a very good life, too, especially if the pre-amp is kept in a dry place at room temperature when not in use. Filament current is supplied by a single cell; its working life is only 10 to 12h, but as replacement is quick, cheap and easy, it has not been thought worthwhile to accommodate anything larger.

Construction

The unit is constructed in a box made of 18s.w.g. aluminium to the measurements given in Fig. 9. No attempt has been made at miniaturisation and all components with the exception of the H.T. battery are standard. The shelf on which the valve is mounted is secured by two self-tapping screws through the sides of the case and all the wiring can be done before it is fitted. Input and output are indicated appropriately by flush and surface mounted coaxial sockets respectively. Note that the centre connection of the output socket is cut short. The heat of soldering to the remaining stub will soften the polythene and a plug should be inserted in the socket to prevent displacement. The switch may be any double pole component of suitable physical size. The valve should be packed on either side with pieces of sponge rubber so that it will not be dislodged if the amplifier is accidentally dropped or knocked. The H.T. battery compartment is formed from a piece of aluminium cut to the measurements given in Fig. 9 and riveted to the bottom of the case. It is best to place the batteries in position before locating the point of attachment so that a reasonably tight fit can be obtained to

prevent them from moving about in-use. The side of the compartment adjacent to the battery terminals should be wrapped with insulating tape before fitting. Fig. 10 shows the layout in detail.

When assembly is complete, the box should be placed face downwards on a sheet of 18s.w.g. aluminium and a lid marked out. This should be given a "turn-down" all round of $\frac{1}{8}$ in. and it can then be secured to the box with self-tapping screws. One at each side will be sufficient.

Battery Connections

To ensure noise-free operation, the connections to the H.T. batteries should be soldered. The filament cell will need more frequent replacement and it is convenient to have contact connections. For the positive, thin cardboard about 3in. x $1\frac{1}{2}$ in. should be folded double and a piece of thin brass or tinplate threaded through slits cut in one thickness as shown in Fig. 10. The two thicknesses can then be glued together to retain the brass strip firmly and the whole cemented into the amplifier

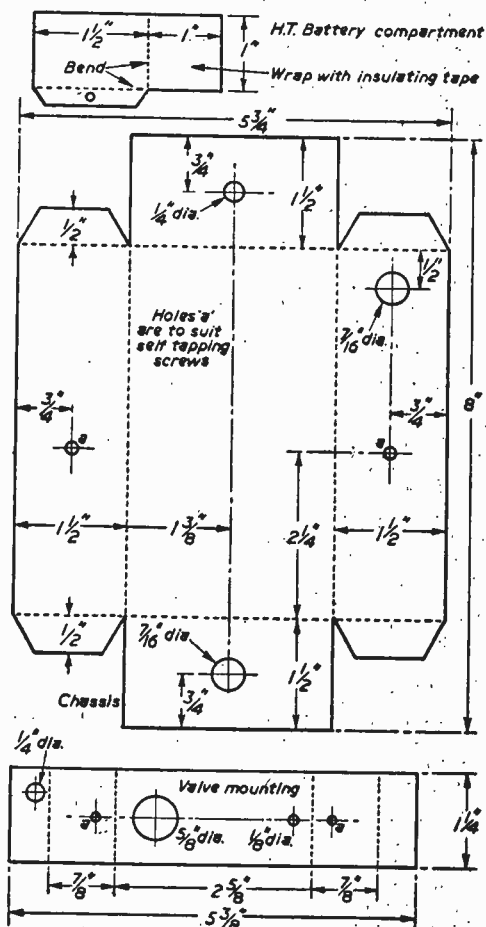


Fig. 9.—Details of the pre-amp housing.



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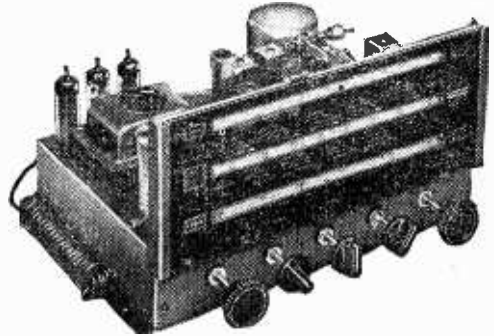
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6/12 v. 4 a... 12/3	250 v. 80 m.a. .. 5/11
6/12 v. 6 a... 15/3	250 v. 250 m.a. .. 12/9
6/12 v. 10 a... 25/9	CONTACT COOLED
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case as shown. For the negative connection, cut a piece of brass or tinfoil to the shape shown and slide it under the cardboard casing at the bottom of the cell, making a soldered connection to the exposed end. Withdrawal will be facilitated if the end has a turn-up of about $\frac{1}{8}$ in.

Operation

The pre-amplifier is quite capable of continuous operation and can be left switched on as long as the main amplifier is working. It can, of course, be switched on and off as required if it is desired to conserve the batteries, but if this is done the volume control on the main amplifier must first be turned down or the operation of the switch will produce loud noises.

The increased gain now available is more than can be used and opportunity can be taken to improve the quality of the results by applying maximum negative feedback. Even with this reduction of gain, however, care must be taken to avoid acoustic feedback or "howl". The microphone, the construction of which has been described, is markedly directional and provided it is kept a few feet behind the loud speakers and the latter do not face a large reflecting surface, trouble will not normally be encountered. It is advisable when

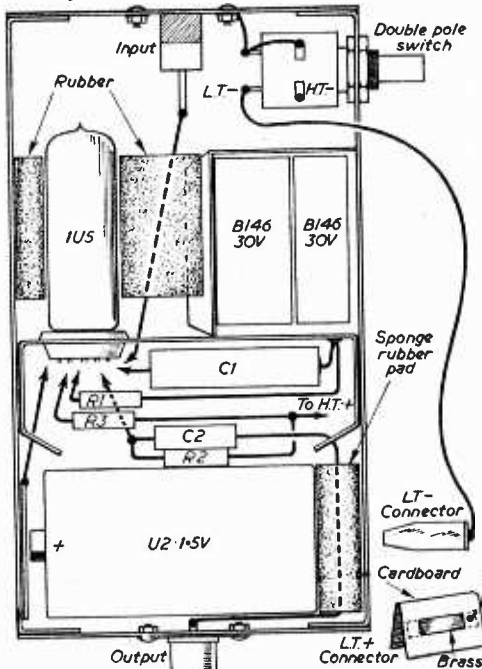


Fig. 10.—Layout of pre-amp.

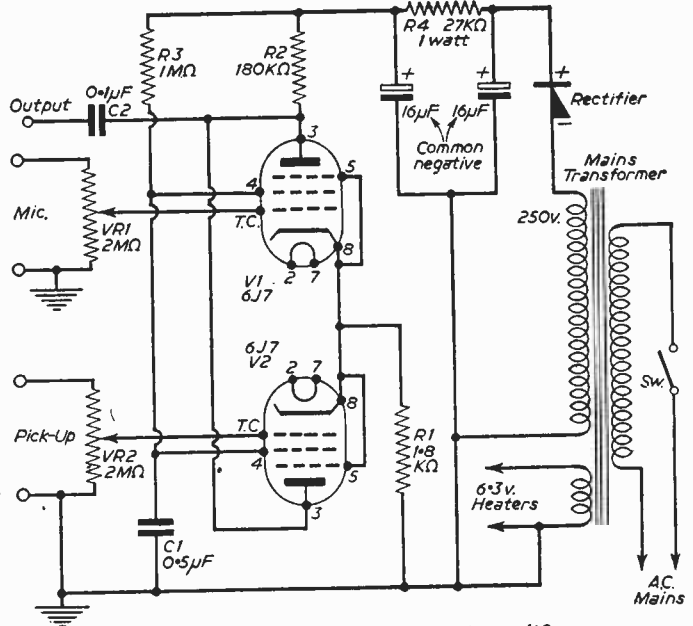


Fig. 11.—Circuit of the mixer and amplifier.

installing the equipment to test for acoustic feedback with the room or hall empty. If it is then satisfactory, it can safely be assumed that all will be well when the audience is present.

To provide music for dancing, etc., a record player must be added to the equipment and as speech facilities will be required concurrently with music, a mixer unit must be provided. For convenience of portability and to minimise the number of cables required, the mixer and pre-amp, with its own power supply, is fitted inside the player and provision is made also for the power supply to the main amplifier. The mixer and pre-amplifier will first be described.

Circuit

The circuit is given in Fig. 11. It will be seen that the two inputs are completely isolated and the setting of one control can have no effect upon the other. The two valves, which are of the metal type, work into a common anode load but as the anode resistance of the 6J7 is very high (about 3M) no isolating resistors are required between them. The gain of 120 times obtainable with this circuit is unnecessarily high and it is therefore reduced to half by omitting the usual cathode by-pass capacitor. This also improves the linearity of the stage.

Each of the 2M volume controls is fitted with a mains switch; that on the music control makes the supply to the motor so that at the end of a record, the volume can be turned down and the motor stopped. The other controls the power supply to the mixer unit and remains "on" all the time the equipment is in operation. This means of course that the resistance in the grid circuit of V1 cannot, in operation, be reduced to zero; but what remains is insignificant and no break-through of speech on music will be experienced.

(To be continued)

Club News

REPORTS OF CURRENT ACTIVITIES

MITCHAM AND DISTRICT RADIO SOCIETY

Hon. Sec.: M. Pharaoh, G3LCH, "The Cannons", Madeira Road, Mitcham.

This year it is hoped to run a multi-operator station for both the phone and CW sections of the CQ DX contest. The CW section will be used as an NFD Operator Trial. It is also hoped by this means to find First and Second Operator teams for next year's NFD. The station will probably be under the call of G3LCH although this is not yet definite.

The Club call sign, G3OCT, was put on the air at the Mitcham Horticultural Society's summer show on July 16th. Equipment was lent by G3LCH and G3OCA for the H.F.-band station. A 2m station was also run by G3LSP/A.

SLADE RADIO SOCIETY

Hon. Sec.: Charles N. Smart, The Church House, High Street, Edrington, Birmingham 23.

On August 12th the club paid an informal visit to the Birmingham office of Airmec Ltd. to view a selection of modern electronic instruments. An informal discussion was held on August 26th, the subjects discussed being the club station and direction finding contests.

Future Events:

September 9th—"Transistor Applications" by Mr. J. A. Chandler and Mr. Wates of Associated Electrical Industries (Rugby) Ltd.

September 23rd—A display of members' apparatus to be judged for the Enterprise Trophy and the Craftsman's Cup.

SOUTH YORKSHIRE AMATEUR RADIO SOCIETY

Hon. Sec.: W. Farrar, Highbury Avenue, Bessacarr, Doncaster.

Meetings are now held on the second and fourth Thursdays of each calendar month. On July 28th, Cliff Staff, G3KPW, gave a talk on "Single Sideband". Morse practice is radiated on Sunday 9.30 a.m., Wednesday 9.30 p.m. and Friday at 8.00 p.m., on or about 1980kc/s.

Future Events:

September 22nd—A formal meeting.

October 27th—Annual Dinner.

SPEN VALLEY AMATEUR RADIO SOCIETY

Hon. Sec.: N. Pridem, 100 Raikes Lane, Birstall, near Leeds.

With the opening of the 1960/61 session the club have acquired new headquarters at The Labour Rooms, Railway Street, Cleckheaton.

The annual general meeting was held on July 6th.

Future Events:

September 14th—Modern methods of Radio communication.

September 28th—An evening of Music.

October 11th—Mullard Film Show.

October 12th—Visit to Trinity Works.

October 26th—Two Metre Technique.

November 9th—A visit to the BBC Studios, Leeds.

November 23rd—Receivers for F.M.

December 7th—Film Show.

WEST MIDDLESEX TAPE RECORDING CLUB

Hon. Sec.: H. E. Saunders, 20 Nightingale Road, Hampton, Middlesex.

A sale of tape recording gear was held at St. George's Hall, Lancaster Road, Southall on July 28th when over £30 was raised for auxiliary gear. An outdoor meeting was held on August 21st when the club visited Whipsnade Zoo. It is proposed to hold a Club Dinner or Supper early in October in the locality instead of in Town.

WIRRAL AMATEUR RADIO SOCIETY

40 Hamilton Square, Birkenhead.

On July 15th the Junior Section held a meeting and at 7.45 p.m. G2AMV gave a lecture on his equipment "G2AMV/M and /P". A lecture on 2m was given on August 5th and on August 19th an outside lecturer was entertained at the club.

WORTHING AND DISTRICT AMATEUR RADIO CLUB

Hon. Sec.: P. J. Robinson, G3KHF/T, 46 Hillview Road, Worthing, Sussex.

The club meets regularly on the second Monday of each month at 8 p.m. at the Adult Education Centre, Union Place, Worthing.

Future Events:

September 12th—Annual General Meeting.

COURSES OF INSTRUCTION, ETC.

BRADFORD TECHNICAL COLLEGE

Central Hall, Bradford 5.

A course of lectures in preparation for the City and Guilds or London Institute's Radio Amateurs' Examination will be held

during the forthcoming session on Wednesday evenings from 7 to 9 p.m. The lecturer will be D. M. Pratt, G3KEP. Further information and details of registration may be obtained from the General Office at the above address.

GRAFTON RADIO SOCIETY

Hon. Sec.: A. W. H. Wennell, Montem School, Hornsey Road, Holloway, N.7.

The club have again made arrangements with the L.C.C. Evening Institutes at Holloway for courses for the Radio Amateur's Examination and Morse for beginners to be held at the above school. Classes will be held on Mondays with repeat lectures on Tuesdays and Wednesdays. The course will commence on September 26th from 7 to 9 p.m. Enrolment will be on each evening of the week September 19th to 23rd between 7.30 and 9 p.m.

MANCHESTER EDUCATION COMMITTEE

Openshaw Technical College, Whitworth Street, Openshaw.

Classes for the R.A.E. examinations, written and Morse, have been arranged for first year and second year candidates, the latter being for those pupils who have passed part or all of the R.A.E. requirements. During this class constructional work may be carried out and the equipment tested, checked and calibrated under the college call sign.

RADIO SOCIETY OF GREAT BRITAIN

East London Branch.

28 Morgan Crescent, Theydon Bois, near Epping, Essex.

The following classes have been arranged for the coming session. Radio Amateur's Examination Course: Wednesday 7.15 to 9.15 p.m. This is an 8-month course for those intending to take the examination. Morse and Codes of Practice: Monday 7.30 to 9.30 p.m. This is a 6-month course for those who wish to learn Morse up to G.P.O. requirements for an amateur licence. These classes will be held at The Ilford Literary Institute, High School for Girls, Cranbrook Road, Ilford, Essex. The fees are 30s. for the R.A.E. course, 20s. for Morse and Codes of Practice and 35s. for both courses. Enrolments will be held from September 5th to 8th between 7 and 8.30 p.m. All correspondence should be addressed to Mr. C. H. L. Edwards at the above address.

An invitation is extended by this branch of the society for those interested to attend a lecture to be given by Capt. P. P. Eckersley entitled "Radio from the Beginning". This lecture will be held at the Town Hall, Ilford on Sunday, October 9th at 3 p.m.

READING AMATEUR RADIO CLUB

Hon. Sec.: G3EJA, "Peacehaven", 9 Holybrook Road, Reading.

The club has arranged with the local technical college to hold a course of lectures on amateur radio for the City and Guilds Examination. The lectures will be held at the E. P. Collier Evening Institute, Swansea Road, Reading on Wednesday evenings from 7 p.m. to 9 p.m. commencing the week beginning September 26th. Fees for the course will be, for those under 18 years of age, 10s., 18 to 21 years, 20s., and over 21 years, 35s.

WEMBLEY EVENING INSTITUTE

Copland School, High Road, Wembley.

Classes will be held on Mondays, Morse Practice from 7 p.m. to 8 p.m. and Radio Theory from 8 p.m. to 9 p.m. Enrolment will be held from September 12th to September 15th between 7.15 and 9.15 p.m. and classes will commence the following week.

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Devoted to Mechanics, Science and Invention.

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5 watt - 1/3 WIRE-WOUND RESISTORS - 1/3 10 watt - 2/3 25 ohms-10,000 ohms - 1/6 15 watt - 2/6

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Table with columns: Long Play 7in. reel, 1,200ft, Spare; 5in. reel, 1,200ft, Plastic; 5in. reel, 850ft, Reels; 3in. reel, 225ft, 7/6 3/- ea.

"Instant" Bulk Tape Eraser and Head Sander. 200/250 v. A.C., 27/6. Leaflet S.A.E.

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RANGE VALVES KIT PRICE £6. 6. 0. Carr. 4/-

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A.C. 200/250 v. 4-way switch; Short-Medium-Long-Gram. A.V.C. and Negative feedback 5 watts. Chassis 1 1/2 x 5 1/2 x 2 1/2in. Glass dial, horizontal or vertical wording, size 10in. x 4 1/2in. Aligned and calibrated. Isolated chassis. £9.10.0 Carr. & Ins. 4/6.

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ALUMINIUM CHASSIS. 18 s.w.g. un drilled. With 7 sides, riveted corners and lattice fixing holes. 2in. sides, 7 x 4in., 4/6; 9 x 7in., 5/6; 11 x 7in., 8/6; 13 x 9in., 8/6; 14 x 11in., 10/6; 15 x 14in., 12/6; 18 x 16 x 3in., 16/6.

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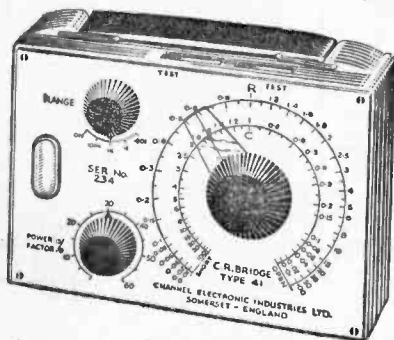
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- ★ Up to 20 Mc/s on fundamentals.
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- ★ Capacitance 5 μF to 20 μF.
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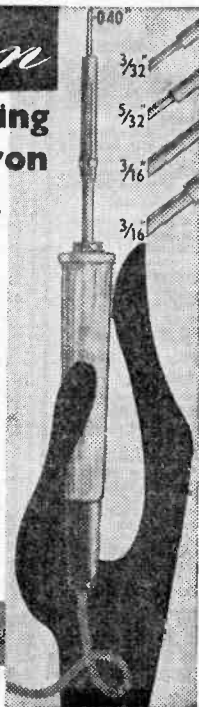
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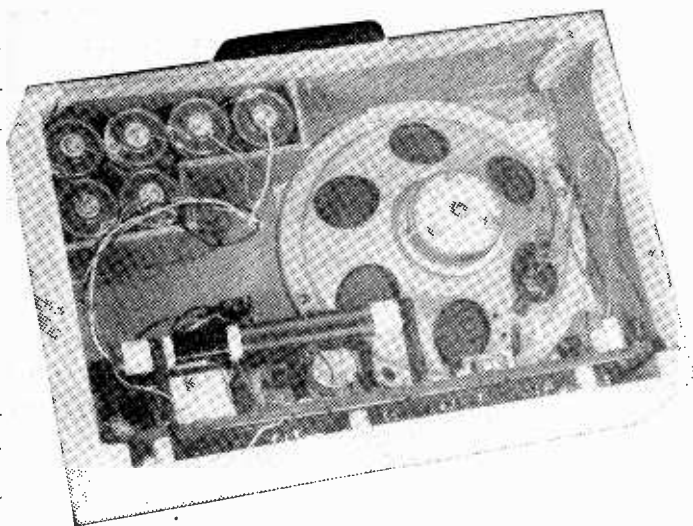
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Four Transistor T.R.F. Receiver

MODIFICATIONS TO GIVE INCREASED R.F. GAIN

By D. Saull

(This receiver was described in our June Issue)

THE "Four Transistor T.R.F." receiver, a simple circuit for the beginner, described in the June issue, although possessing the quality of good selectivity and adequate volume in areas of average signal strength, may, in areas of poor signal strength not give sufficient audio output for comfortable listening.

Less Selectivity

Increased R.F. gain, at the expense of selectivity, and therefore greater audio output may be achieved by the modifications suggested in this article. As the tuning when using the original circuitry is sharp, it is felt that a little less selectivity for an increase in audio output might be an advantage in some reception areas.

Referring to the equivalent circuit in Fig. 1, R represents the input resistance of the first A.F. transistor reflected into the primary winding of the detector transformer. For good selectivity the tuned circuit must have a high value of Q, that is to say, the ratio of the reactive power to the real power must be large.

$$Q = \frac{\text{Reactive power}}{\text{Power dissipated}} = \frac{E^2/2\pi fL}{E^2/R} = \frac{2\pi fL}{R}$$

Therefore $2\pi fL$ should be large compared with R.

The forward resistance of the detecting diode is low and may, in this consideration, be ignored. The number of turns on the primary winding of the detector coil is 103 and the number on the secondary winding is 20. The turns ratio of this R.F. transformer is therefore $103/20 = 5:1$ (approximately).

Reflected Resistance

The resistance value reflected into the primary from the secondary circuit is in consequence multiplied by 5^2 , i.e. 25 times, and so the low resistance input to the first A.F. transistor is thus multiplied 25 times before it effectively appears connected across the second tuned circuit of the receiver. It does not damp the tuned circuit, keeping the Q high and the selectivity good.

Unfortunately, the 5:1 ratio of the R.F. transformer reduces the signal voltage appearing across

the tuned circuit by a factor of 5 in the secondary winding.

A compromise must thus be found between the signal level appearing across the secondary of the detector or R.F. transformer and the Q of the circuit. Putting this another way, a compromise between signal magnitude and selectivity is required.

Coils

Having understood our problem, the ultimate solution may simply be found by trial and error method with the following suggested circuit modifications, which call for rewinding the detector coil shown in Fig. 5 on page 146 of the June issue.

Rewind the coil with 103 turns as before but bring out a tap at the end of the second layer (50 turns) and also at the end of the third layer (75 turns). The taps may be brought out by twisting a loop in the wire and continuing winding. The circuit should now be modified to that shown in Fig. 2.

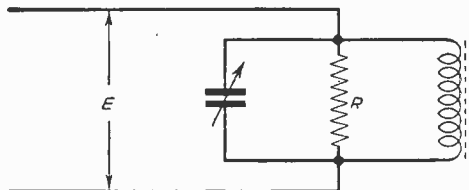


Fig. 1.—Equivalent of the input circuit.

The original secondary winding is now not required, and tap (a), (b) or (c) of the new coil may be used to obtain the best results. This arrangement gives the following turns ratios and the multiples of resistance appearing across the tuned circuit owing to the transistor input resistance, for respective taps:—

- Tap (a) 1:1 ratio—Transistor input resistance multiplied by 1.
- Tap (b) 1.4:1 ratio—Transistor input resistance multiplied by 2.
- Tap (c) 2:1 ratio—Transistor input resistance multiplied by 4.

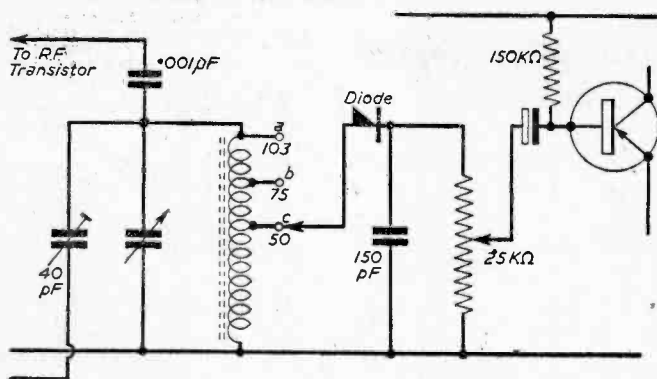


Fig. 2.—The modified input circuit.

Some readers have complained that, upon completing the construction of the receiver and switching on, only a loud hissing noise is heard at various positions of the tuning capacitor. This is caused by the reaction (40pF) capacitor being turned too fully inwards. It should first be set fully out and slowly screwed in until the signal is the loudest.

Capacitors

It is worth mentioning that "surplus" electrolytic capacitors may sometimes have a low capacity value, resulting in loss of volume. It is advisable to keep a spare capacitor, known to be in good condition, to use to check a suspected component. This may be done by holding, or clipping, the good capacitor across the suspected one. This particularly applies to the emitter and base bypass capacitors.

For the reader who is not too happy on the subject of reflected impedances and impedance matching in connection with transformers, the following explanation is offered.

The power into the primary and the power out of the secondary of a transformer must be equal (except for small losses). Considering the transformer in Fig. 3 with a turns ratio of N —i.e., N times more turns on one winding than on the other winding—and a resistance of $R\Omega$ with E volts across it in the smaller winding, looking into the

larger winding, there will be $(E \times N)$ volts across it and some effective impedance Z .

Now power = E^2/R watts, so the power in the smaller winding will be E^2/R watts and the power in the larger winding will be $(E \times N)^2/Z = E^2 \times N^2/Z$ watts. We have already said that both windings must carry the same power, therefore $E^2 N^2/Z = E^2/R$ (dividing both sides by E^2)

$$N^2/Z = 1/R \text{ (cross multiplying)}$$

$$Z = N^2 R$$

Or taking some practical figures for an example, let $N = 2$, $R = 100\Omega$ and $E = 10V$.

$$\text{Power in small winding} = E^2/R = 100/100 = 1W.$$

$$\text{Power in large winding} = (EN)^2/Z = (10 \times 2)^2/Z = 400/Z \text{ watts.}$$

The power in both windings must be equal, therefore

$$400/Z \text{ watts} = 1 \text{ watt}$$

$$\text{and, } Z = 400\Omega$$

or straight from our derived formula

$$Z = N^2 R = 2 \times 2 \times 100 = 400\Omega$$

Thus by using a 2:1 ratio transformer, with 100Ω resistance in the secondary winding, from the primary it looks like 400Ω —the square of the turns ratio of the transformer. This property has an important practical use when we require to connect the impedance in one circuit to a different impedance in another circuit.

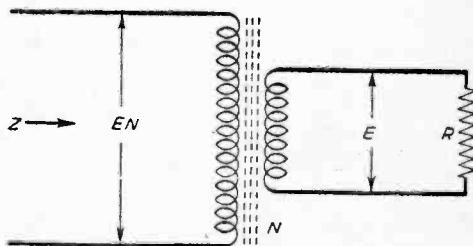


Fig. 3.—Simple transformer circuit.

SIMPLE COMMUNICATIONS SYSTEM

(Continued from page 526)

former via 2b, 1b, and 1/2c in the normal Listen position and to the input transformer via 2b when the key is pressed, S3 is connected to the output transformer via 1a and the "Call" circuit unearthed and completed by 1c.

Key 2

This enables the operator to communicate with Station 2. Like key 1 it is non-latching and in the Listen position completes the connection of LS1 to the output transformer. When the key is pressed LS1 is connected to the input transformer via 2b, S4 is connected to the output transformer via 2a,

and the "Call" circuit is unearthed and completed by 2c.

Points Worthy of Note

It may be necessary to have a capacitor across R4 to produce the right "Call" note. The value of this capacitor will best be found by trial and error in conjunction with R6 and C6.

Care should be taken to isolate the output transformer connections from all input circuitry, H.T. and anode connections to the primary may need to be screened and, for stability, the connections may be better one way round than the other.

Note.—Connecting cables CS1 to CS1' and CS2 to CS2' should be of the screened variety. All other inter-unit connections may be unscreened.

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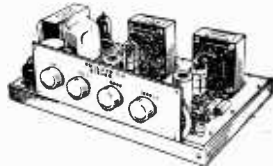
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15 v.	300 v.	1.5 amp.	7.5 amps.
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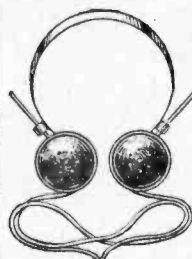
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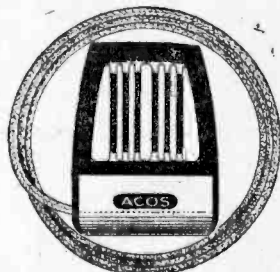
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Letters to the Editor

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

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.

TRANSISTORS v. VALVES

SIR.—I feel I should protest against what Mr. D. J. L. of Kenton (July issue) says about the wrong class of reader, because I think I must be one of these.

Transistors open up a new field of construction for the beginner and I believe that there will, in the future, be two distinct classes of radio enthusiast—valve and transistor—both getting the same enjoyment out of a wonderful hobby. I suppose what Mr. D. J. L. meant by the wrong class was the fellows with limited knowledge of radio theory. Well let me tell him that we get as much enjoyment out of the hobby as he and his followers, and we do not envy them their knowledge.—T. DONACHIE (Eire).

STEREOPHONIC SOUND

SIR.—I have been interested in your articles on the above subject, and Mr. Richins' letter in the August issue. I, too, after having spent a large sum on equipment, have come to the conclusion that stereo is a waste of money.

One big drawback which I found was that there are many records which I hear on the radio and which I would like, but when I go to buy them I find that they are available only on mono discs. I would buy the disc if it were stereo, but after building the equipment I do not feel disposed to spend much on a disc if it is mono. Then again, radio is still one channel only, so that the amount of pleasure one can get from stereo is very limited.

Finally, as Mr. Hill says, why bother when the acoustics of the average room do not do full justice to it.—F. H. BARRINGTON (Hackney).

SIMPLE TRANSISTOR AMPLIFIERS

SIR.—I was very interested in the article under the above title in the June issue. After trying out some of the arrangements I have to point out one or two mistakes which occurred, as other readers may have been disappointed with their results. In Fig. 2 the collector load is shown as 470k. This is much too high and I found 4.7k was just about right. I even tried 3.9k which was hardly any different in results. In Fig. 4 the same slip also occurs, and I did drop this to 2.2k but as 4.7k also works here I assume that it was a draughting error and the decimal point was overlooked. Thank you for a very interesting monthly, and I only wish it were weekly.—F. R. TIMMINS (Eastbourne).

CROSS-OVER NETWORKS

SIR.—I recently came across a scheme which I do not seem to have read in your pages, and I would have thought it most important for beginners like myself. Cross-over networks for two loudspeakers are complicated and expensive, either to buy outright, or to make up and this idea dispenses with the large chokes, using in their place just one single fixed condenser. In the circuit which I was given an ordinary 2 μ F condenser was joined between the tweeter and the fitted speaker and it worked astoundingly well. Could not a table be prepared showing the cross-over frequencies with different capacities, as it seemed that when I used three or four 2 μ F condensers in parallel it gave a much lower cross-over and the top was much brighter.—R. JAMES (Liverpool).

INFORMATION SOUGHT

SIR.—I have recently experimented with one or two organ circuits, which I found in an old publication, and as there seems to be a dearth of such information, I would be glad if any reader could help me to find out two or three small details. I notice that most American electronic organs now use "sustaining" pedals, and I am interested to know what system is used, whilst "reverberation" also seems to be popular in the U.S.A. and I am told that this does not now use the mechanical system, but purely electronic. Perhaps we could have some information on these topics.—D. E. WORSLEY (N.W.).

LOUDSPEAKER DESIGN

SIR.—With reference to Mr. H. Pickering's article "Loudspeaker Design", PRACTICAL WIRELESS, August 1960, may I pass a few comments?

I do not presume to know anything more about speakers than Mr. Pickering but I do know that every day of the week there are highly trained, skilled, and fully qualified engineers whose sole job is to investigate and to experiment with various types, makes, and designs of speakers and speaker components. To further their experiments and investigations, thousands of pounds are being spent by the bigger manufacturers of various types of loudspeakers and it is often we see new types advertised. To read through Mr. Pickering's letter, one can but assume that he has never heard of such devices as the electrostatic loudspeaker. No, I'm afraid Mr. Pickering does not read the advertisements often enough, else he would see that the majority of loudspeaker manufacturers can now supply a customer with practically any desired type of speaker.

I suggest that Mr. Pickering should go to his local radio store and look around at the stock of speakers and I'm sure his eyes will be opened.—B. HALLAHAN (Cork).

COMPONENT

SIR,—I have recently become interested in radio as a hobby, but I have one everlasting complaint with component manufacturers. This is that while certain switch combinations are common, others are unobtainable. I have been constructing a multimeter from a 0.1mA meter, and while doing so, I have found it almost impossible to find the ratios which I want.

I would be pleased if the manufacturers brought out a full range of all combinations up to, say, 2 pole 20 way.

When talking to friends about this point, I found that I was by no means alone. They, and I, have had to buy switches which were not the actual combinations wanted, and sometimes found difficulty in using them.

I am sure that manufacturers would be quickly repaid for their trouble in producing these other combinations.—**M. BULLEN** (Eastleigh).

INTERFERENCE

SIR,—I agree with Mr. M. Reynolds (March issue), there should be a world conference as soon as possible for it will be madness to even try to get an uninterfered station on medium waves.

I recently tuned to a medium wave station on 208m but got three other stations of which not one was mine.

Some years ago there was a conference in which various stations were allotted certain frequencies, but this only stopped interference for two or three

years. What is the use of a conference if that is all it does? I should like to hear from any other people who agree with me.—**R. PARSONS** (Nun-eaton).

CRYSTAL SET RECEPTION

SIR,—On June 24 I picked up Radio Moscow on my crystal set. A few days later I heard Radio Moscow again, and also Prague Radio.

I would like to know if it is an unusual occurrence to receive radio signals on such a set from these distances.—**D. J. CONNOLLY** (Edinburgh 15).

NO. 19 SET

SIR,—With reference to Mr. Jackson's letter in the July issue of **PRACTICAL WIRELESS**, I recently purchased a No. 19 Mark II set. This has only two switches under the P.A. tuning dial and no R.F. gain control.

I have now removed the P.A. tuning completely, wiring a short-wave R.F.C. (removed from an old television tuner) between the grid of the first R.F. valve (6K7) and earth, connecting the aerial through a coaxial socket to the grid. The result, besides the ease of tuning, is increased sensitivity (and selectivity) and decreased noise level, this was possible to do as I have stripped the transmitter right out. In the place of the old P.A. tuning dial I have put a 200:1 slow motion tuning drive coupled to a two-gang 300pF tuning condenser, intended for use with a converter shortly to be built. — **G. C. GODDARD** (Wallington).

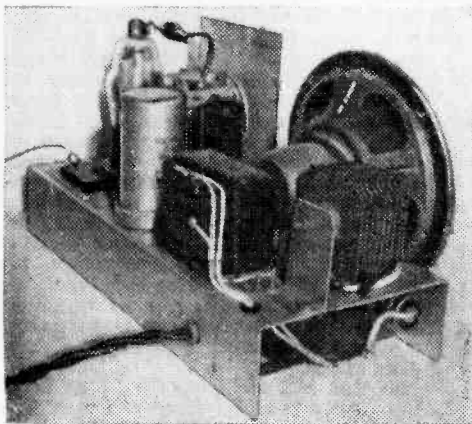
MAINS DUAL-WAVE 2

(Continued from page 515)

cannot be achieved, reverse connections to (3) and (4) at the end of the coil attached to the tag ring. The coil core positions will also influence reaction, but none of the adjustments is in any way critical. As there is only one tuned circuit, no loss of efficiency arises if the wavelength coverage is incorrect.

Cabinet and Safety

With circuits of this type, the chassis is common to one mains lead when the receiver is switched



Another view of the receiver.

on. For this reason, it is wise to use a 3-pin plug, and take the chassis side of the circuit to mains neutral, as already mentioned.

If the receiver is operated from an adaptor or reversible 2-pin plug, it may be so connected that the chassis goes to the "live" main, which is at about 250V above earth. In these circumstances, an earth-return shock may be experienced if the chassis, or any metal item in contact with it, is touched. For this reason it is wise to include the receiver in an insulated cabinet, with a back. The cabinet should have an aperture covered with silk, for the loudspeaker. A further aperture should be positioned in front of the tuning scale, glass or other transparent material being held in place behind this by means of clips or adhesive. The tuning scale can be marked up with wavelengths, or stations.

When the receiver is inserted, the spindles and bushes fit into clearance holes in the cabinet front. Knobs should be chosen to cover the spindles and bushes completely. If the spindles are too long, they should be sawn shorter to suit. Flats may be filed on the spindles, and push-on-knobs used. If the knobs are held with grub screws it is considered good practice to fill the screw holes with wax or other insulating compound.

Cabinets suitable for receivers of this kind are available from time to time. Pleasing cabinets of simple design can also be constructed, if preferred, and Fig. 6 shows how one can be made. With the dimensions given, the cabinet will take a receiver 10½ in. x 6 in. x 5 in. If the chassis or speaker is larger than those given, the cabinet dimensions should, of course, be increased accordingly.

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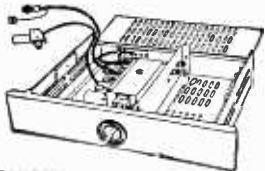
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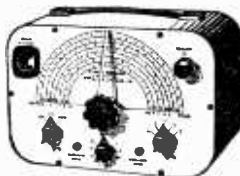
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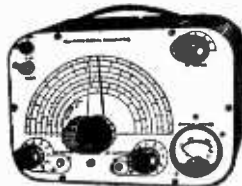


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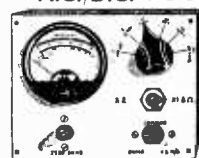
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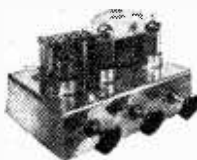
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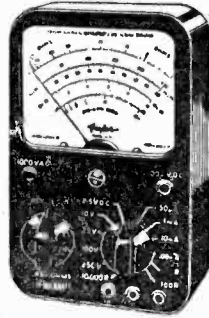
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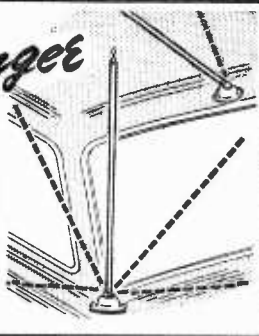
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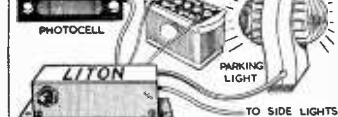
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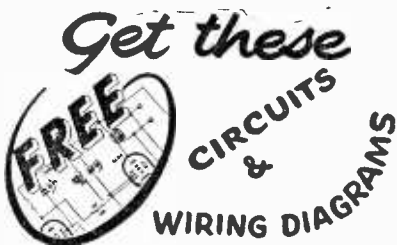
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 XB102, 7/6; XC101, 25/- pr.; XA131, 250 Mc/s, 35/-; XC141, (replaces OC16) 30/-; XA103, 12/6; XA104, 15/-; SB078, 7/6; SB305, 15/-; SB231, 15/-; OC44, 19/6; OC45, 18/6; OC71, 10/-; OC76, 15/-; OC75, 15/-; OC72 prs., 30/-; V15/10P, 15/-; V15/20P, 25/-; Red Spot, 3/6; White Spot, 5/-.

COMPLETE LIST FREE ON REQUEST

★ SPECIAL OFFER ★

Matched set of Mullard Driver and Output Transistors, OC78D and 2—OC78. Giving 400mW, very high quality. 37/6. P.P. 9d.

CRYSTAL MICROPHONES

- (1) ACOS 39-1 Stick Microphone with Stand and Screened Lead 35/6, P.P. 1/6
- (2) MIC 40 Desk Microphone with Fold-away Stand and Screened Cable 25/-, P.P. 1/6
- (2) MIC 45 New Style Hand Microphone with Screened Lead. Very sensitive 39/6, P.P. 1/6

PERSONAL EARPHONES

ALL MAGNETIC and GUARANTEED

- ★ Single Personal Earphone, medium impedance, as used on Major-2 and 3 etc. Complete with lead and earcup. 12/6, P.P. 6d.
- ★ Single Personal Earphone, low impedance, fitted with lead and sub-miniature Jack Plug..... 19/6, P.P. 6d.
- ★ Jack Sockets, 4/-; with Circuit Breaker Switch, 5/-
- ★ Medium Impedance Earphone, with lead fitted with Jack Plug 19/6, P.P. 6d.
- ★ Very High Impedance version for Perdio, etc..... 22/6, P.P. 6d.

HENRY'S (RADIO) LTD.

Opposite Edgware Road Tube Station, PADDINGTON 1008/9.

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Practical Wireless

BLUEPRINT

SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, an asterisk in the list below denotes that constructional details are available free with the blue print.

The index letters which precede the Blueprint Number indicate the periodical in which the description appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to

PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2.

SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Title	Number	Price
CRYSTAL SETS		
Junior Crystal Set	PW94*	2/-
Dual-wave Crystal Diode	PW95*	2/6

STRAIGHT SETS		
Battery Operated		
Modern One-valver	PW96*	2/6
All-dry Three	PW97*	3/6
Modern Two-valver	PW98*	3/6

SUPERHETS		
Mains Operated		
A.C. Band-pass Three	PW99*	4/-
A.C. Coronet-4	PW100*	4/-
A.C./D.C. Coronet	PW101*	4/-

MISCELLANEOUS		
The PW 3-speed Autogram	—*	8/-
The PW Monophonic Electronic Organ	—	8/-

TELEVISION		
The PT Band III converter	—*	1/6

Title	Number	Price
A.C. Fury Four	PW20*	2/6
Experimenter's Short Wave	PW30a*	2/6
Midget Short Wave Two	PW38a*	2/6
Band-Spread Three (Battery)	PW68*	2/6
Crystal Receiver	PW71*	2/-
Signet Two (Battery)	PW76*	2/6
Simple S.W. One-valver	PW88*	2/6
Pyramid One-valver	PW93*	2/5

BBC Special One-valver	AW387*	2/6
Short-Wave Two	AW429*	2/6
Short-Wave World Beater	AW436*	3/6

Standard Four Valve S.W.	WM383*	3/6
Enthusiast's Power Amplifier	WM387*	3/6
Standard Four Valve	WM391*	3/6
Listener's 5-Watt Amplifier	WM392*	3/6

QUERY COUPON

This coupon is available until 7th October, 1960, and must accompany all queries in accordance with the notice on our "Open to Discussion" page.

PRACTICAL WIRELESS, OCTOBER, 1960

"CONTINENTAL-6" COMBINED PORTABLE/CAR RADIO

★ ★ EQUALLY SENSITIVE ON MEDIUM AND LONG WAVE BANDS ★ ★

SPECIFICATION

- 425mW Push-Pull Output
- 6 "Top-Grade" Ediswan Transistors
- New Type Printed Circuit with all Components Marked
- Full Medium and Long Wave Tuning
- High "Q" Internal Ferrite Aerial
- Car Radio Adaptation AVC
- Slow Motion Fingertip Aiding
- "Hi-Fi" Quality Speaker
- Size $9\frac{1}{2} \times 7\frac{1}{2} \times 3\frac{1}{2}$ in. Weight $4\frac{1}{2}$ lb.

ALL COMPONENTS AVAILABLE SEPARATELY

Wherever you are

"First Class in every way"



ALL THE CONTINENTAL AND LOCAL STATIONS AT YOUR FINGERTIPS

CALL FOR DEMONSTRATION

★ STEP BY STEP FULLY ILLUSTRATED INSTRUCTIONS

★ ALL COMPONENTS GUARANTEED

Total Cost of all Components

£11.10.0 P.P. 3/6

including Cabinet, Battery Transistors, Car Radio, AVC and all necessary items.

★ SIMPLE TO CONSTRUCT

★ NO TECHNICAL KNOWLEDGE REQUIRED

★ WORTH DOUBLE WHEN BUILT

★ EXCELLENT RESULTS ANYWHERE

DESCRIPTIVE LEAFLET FREE ON REQUEST

★ NO EXTERNAL AERIAL OR EARTH—NO REACTION CONTROLS ★

★ COMPLETE STATION SEPARATION — EASY AS A B C TO BUILD AND A THRILL TO USE ★

MAJOR—2 (Two-Transistor Pocket Radio)

IDEAL FOR BEGINNERS



All components sold separately

- ★ 4-stage reflex
- ★ Medium wave; tunable
- ★ Very sensitive
- ★ No aerial or earth
- ★ Complete layout
- ★ Over 6 months on one battery
- ★ $4\frac{1}{2} \times 3 \times 1\frac{1}{2}$ in.
- ★ Weight only 4 oz.
- ★ Personal phone included

TOTAL COST **69/6** P.P. 1/6. NEW BOOKLET FREE

RECEPTION GUARANTEED ANYWHERE!

★ ★ NOT TOYS BUT REAL WORKING RADIOS! ★ ★

MAJOR—3 (Three-Transistor Pocket Radio)



(As described in R.C., Sept. '59)

- ★ 5-stage Reflex Circuit
- ★ No Aerial or Earth
- ★ Miniature Volume Control
- ★ 3 Ediswan Transistors
- ★ Medium Wave Tuning
- ★ Size $4\frac{1}{2} \times 3 \times 1\frac{1}{2}$ in.
- ★ Personal phone included

TOTAL COST **87/6** P.P. 1/6. NEW BOOKLET FREE

FANTASTIC OUTPUT, TERRIFIC RECEPTION GUARANTEED ANYWHERE

3-TRANSISTOR HEARING AID
High-gain circuit with built-in crystal microphone and battery. Includes miniature earphone. Size $3 \times 2 \times \frac{1}{2}$ in. All components, 89/6. P.P. 1/-.

RF, IF AND AUDIO SIGNAL TRACER
Ideal signal peaker or quick fault-finder for receivers, amplifiers, etc. Size $4\frac{1}{2} \times 3 \times 1\frac{1}{2}$ in. All components, with 'phones, 37/6. P.P. 1/6. Less 'phones, 32/6. P.P. 1/6.

250mW PUSH-PULL OUTPUT AMPLIFIER

For use with any 2, 3 or 4 transistor, earpiece or headphone radio to give room-filling volume on 3in. speaker. All components, including 2 Ediswan transistors, speaker, battery, special input socket to take earpiece plug, cabinet, etc., 59/6. P.P. 1/6. Ideal for use with Major-2 or Major-3.

RF AND IF SIGNAL GENERATOR
450kc/s to 3 Mc/s output. Ideal for alignment or fault-finding for all types of transistor radios. All components, 25/- P.P. 1/-.

TRANSISTORS

Fully guaranteed. Red Spot 3/6, White Spot 5/-. Free list and data of 50 types on request.

" PRACTICAL TRANSISTOR CIRCUITS "

Contains 14 circuits with diagrams for the home constructor. 1st edition, 2/-, post free.

WE ARE ABLE TO SUPPLY MOST OF THE COMPONENTS USED ON CIRCUITS PUBLISHED IN THIS AND OTHER MAGAZINES AND BOOKLETS. WHERE THE EXACT ITEM IS NOT STOCKED WE CAN RECOMMEND A SUITABLE SUBSTITUTE IF AVAILABLE.

2 WATT OUTPUT TRANSISTOR AMPLIFIER

For connection to any battery portable to give up to 2W output. Works from 12V battery. Ideal for car radio use. Size $4\frac{1}{2} \times 3 \times 2\frac{1}{2}$ in., uses power transistor. All components (less speaker), 52/6. P.P. 2/- Ideal for use with Continental 6, etc.

CRYSTAL MICROPHONES

Acos 39-1. Stick microphone with screened cable and stand, 39/6. P.P. 1/6.
Acos 40. Desk microphone with fold away stand and lead, 25/- P.P. 1/6.
Acos 45. New type hand microphone with screened lead, 39/6. P.P. 1/6.

TELESCOPIC CHROME AERIALS

(1) 7 sections, 3ft. 6in. open, 6in. closed, with clips, 12/6. P.P. 1/-.
(2) 9 sections, 5ft. 4in. open, 8in. closed, with clips, 17/6. P.P. 1/-.

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