POCKET SUPERHET BLUEPRINT INSIDE !

PRACTICAL WIRELESS

1/6

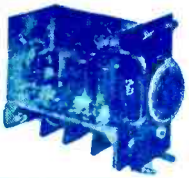
NOVEMBER 1960

FREE BLUEPRINT for this pocket **TRANSISTOR RADIO**

PLUS PRIVILEGE PRICE OFFER

SPECIALLY DESIGNED

LIGHTWEIGHT CASE AND DIAL



R.F. UNIT CONVERTORS

Undoubtedly the most useful Govt. surplus units ever released. The R.F. units will extend the frequency range of your receiver to enable you to receive amateur, TV and V.H.F. stations.

R.F.24 Frequency 20-30 Mc/s. switched tuning, complete with 3 valves and circuit. **22/6** P.& P. 3/6

R.F.25 Frequency 40-50 Mc/s. switched tuning, complete with 3 valves and circuit. **8/6** P. & P. 3/6

R.F.27 Frequency 65-85 Mc/s. slow motion illuminated tuning, complete with 3 valves and circuit. **29/6** P. & P. 3/6

HI-FI HEADPHONES These miniature Hi-Fi phones use high quality permanent magnetic speakers with regulated voice coil. The soft rubber ear moulds give correct spacing for optimum acoustic load. Each unit has a built-in miniature Hi-Fi transformer to ensure the finest music and voice reproduction. Supplied free is a small transformer unit which steps impedance up to 4000 ohms. Only 15/-. P. & P. 2/6.

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

HOOVER ROTARY TRANSFORMERS 12 v. input, 500 v. output at 65 mA, or 6v input, 250 output at 75 mA.

Only 10/6 EACH P. & P. 2/-.

POCKET MULTI-METER. BRAND NEW. 2,500 o.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 —00 to +64 db 5 ranges; 3in. x 4¼in. x 1¼in. Large clear dial. Leads supplied. Our Price 70/-, p.&p. 2/6.

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

PRECISION 1% RESISTORS Manufactured by Electrothermal, we offer the following values: 100K, 400K, 500K, all ±1% 1 watt. 1/9 each; 20/- per dozen.

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.

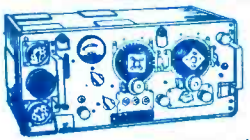
NEW!

SUPER MINIATURE EARPHONE FOR TRANSISTOR CIRCUITS

Here is a really sensitive dynamic earphone of exceptionally fine quality. This lightweight miniature earpiece is convenient and comfortable to wear. The practically invisible cord is connected to the earphone. Provides clear reproduction of music as well as speech. Fully Guaranteed and supplied complete with transparent ear insert, 3 feet cord, subminiature plug and socket.

Model CR.5 Crystal Earpiece, high imp. .. 8/- P.&P.
Model MR.4 Magnetic Earpiece, low imp. .. 7/- 1/-

WIRELESS SET No. 19 MK. II



Incorporates "A" Set —TX/RX covering 2-8 Mc/s (37.5-150 metres). "B" Set—VHF TX/RX covering 230-240 Mc/s. (1.2-1.3 metres) and intercom amplifier. Complete with 15 valves. 500 microamp check and tuning meter, circuit and instruction book. In used condition. 65/-. Carr. 10/-.

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 ARP-12, 2 AR-8, 1 ATP4. Complete with aerial. H.T. and L.T. meter and all accessories. Weight 20 lbs. Size 8 x 10 x 17in. Only 80/-. Carr. 10/-.

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 4¼ x 3 x 1¼ins. **ONLY 27/6.** P.&P. 1/6. Battery 1/- extra.

SPARE VALVE KIT. Here's a gift for all 38 and 18 Set owners! Case containing 4 ARP12 & 1 ATP4 valves. Only 10/-. P. & P. 2/6.

U.S.A. WHIP AERIALS. 12ft. 12/6. P. & P. 2/6.

1 mA METER, 2in. round, 17/6. P. & P. 1/6.

CRYSTAL DIODES 6/- per doz. P. & P. 1/-.

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/-.

PRINTED CIRCUIT KIT. Easily and quickly you can make miniature professional printed circuits. Complete with illustrated manual. 19/6. P. & P. 1/6.

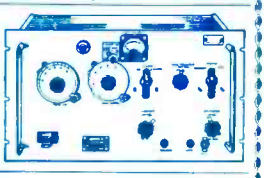
CONTROL BOX-B.C.602. Complete push-button control box. 4 position and on/off with dual coloured indicators for instant channel check. In black crackle case 5¼in. x 3¼in. x 1¼in. Bargain price, 5/- each. P. & P. 1/6. Two for 8/-. P. & P 2/6

VARIABLE TRANSFORMERS Input voltage 230 v. continuously variable output from 0-260 v. Supplied complete. Model B.5 Current rating 5 amps. **£9.** Model B.10 Current rating 10 amps. **£18.5.0** Model B.20. Current rating 20 amps. **£32.10.0** ALL FULLY GUARANTEED.

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. Mutine 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 10in. Standard Rack Mounting.

PRICE COMPLETE ONLY **£6.5.0** Carriage 15/-



Relda Radio

Callers: 87 TOTTENHAM COURT ROAD, LONDON, W.1
Mail Orders: (DEPT. P), 32a COPTIC STREET, LONDON, W.C.1
Telephone: MUSeum 9607

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

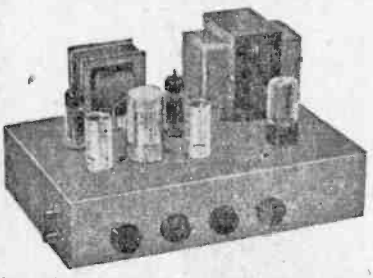
REALISM AT INCREDIBLY LOW COST, CAN BE ASSEMBLED IN HALF AN HOUR The Recorder incorporates the Latest Collaro Studio Tape Transcriptor. The Linear LT45X High Quality Tape Amplifier listed £12.12.0, High Flux P.M. Speaker listed 30/-, empty Tape Spool, a Reel of Best Quality Tape listed 22/6, and a Handsome Portable carrying Cabinet finished in Two-tone covering, size 18 x 13 x 9in. high, listed £4.10.0, and circuit. Total cost if purchased individually approximately **£40**. Performance equal to units in the £60-£80 class. S.A.E. for leaflet.

25½ GNS. Carr. 7/6

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

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, 5Y3. High Quality sectionally wound output transformer specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut." Frequency response — 3 D.B. 30-30,000 c/cs. 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 FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-250 v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis if fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/- (Or factory built 45/- extra).

If required louvred 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 "lift" 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

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

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. 38/9
6 v. or 12 v. 3 amps. with ammeter 59/9

Above ready for use. With mains and output leads. Carr. 3/6.

HEAVY DUTY CHARGER KIT

6/12 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. 4/6.

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

ASSEMBLED CHARGER

6 v. or 12 v. 2 amps.

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

BATTERY CHARGER KITS

Consisting of Mains Transformer. F.W. Bridge, Metal Rectifier, well ventilated steel case. Fuses. Fuse-holders. Grommets, 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. 8/9.

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

We can quote for special types singly or in any quantity.

Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s. Screened TOP SHROUDED DROP THROUGH

250-0-250 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a.. 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 2½-3-3in. 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. 100 mA, 6.3 v. 4 a, 5 v. 3 a.. 26/9
300-0-300 v. 130 mA, 6.3 v. 4 a, 6.3 v. 1 a, for Mullard 510 Amplifier 35/9
350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a.. 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

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 3S4, etc. 3/9
Small Pentode, 5,000Ω to 3Ω 3/9
Small Pentode 7/8,000Ω to 3Ω .. 3/9
Standard Pentode 5,000Ω to 3Ω .. 5/6
Standard Pentode 7/8,000Ω to 3Ω .. 5/6
10,000Ω to 3Ω 5/6
Push-Pull 10-12 watts 6V6 to 3Ω or 15Ω 18/9
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15Ω 19/9
Push-Pull EL84 to 3 or 15Ω 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 15Ω .. 47/9

ELIMINATOR TRANSFORMERS

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

SMOOTHING CHOKES

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

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries; 0-9-15 v. 1½ 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, 6/9; 120:1 Potted. Mu-metal screened, 9/9.

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 T/O Stereo head with sapphire stylus suitable most pick-ups. **£6.19.6** Carr. 7/7

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.** 39-1 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, EF86, ECC83, 807, 807, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that **ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE.** The unit is designed for **CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS,** etc. For use with Electronic **ORGAN, GUITAR, STRING BASS,** etc. For standard or long-playing records. **OUTPUT SOCKET PROVIDES** L.T. and H.T. for a **RADIO FEEDER UNIT** An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/cs. 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.**

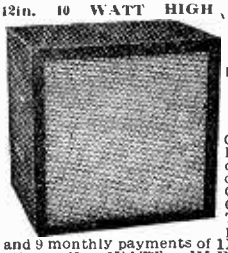
11 gns. Carr. 10/-

TERMS: DEPOSIT 31/9 and 9 monthly payments of **31/9.**

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER. Suitable for use with any record playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/cs. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 7-5-5½in. high. Guaranteed for 12 months. Only **£5.19.6.** Send S.A.E. for illustrated leaflet. Terms. Deposit **22/6** and 5 monthly payments of **22/6.**

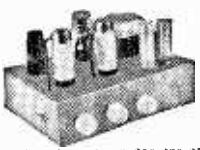
12in. 10 WATT HIGH QUALITY LOUDSPEAKER IN POLISHED WALNUT FINISHED CABINET



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 LOUDSPEAKERS IN CABINETS. 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. 4-5 WATT A5 HIGH-GAIN AMPLIFIER



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. 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 200-230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use 25/- extra, plus 3/6 carr.: or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit

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. **£8-19-6** Carr. 7/6

Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that 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 m. eliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit **34/9** and 9 monthly payments of **34/9.** Both models for 200-250 v. A.C. mains. **15 gns.** Carr. 10/-

SPECIAL TRANSISTOR OFFER. TS1 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, ECH81, ECC85, EABC80, EL84, EZ80. High quality output of up to 4 watts. Overall size 16½in. x 4½in. x 5½in. Only **£12.19.6.** Carriage 10/-.

PLESSEY 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. Ful-fi, Garrard GC2, **19/9.** B.S.R. Stereo/Monaural **39/11.**

P.M. SPEAKERS. 2-3 ohm. 2½in. Perdio **21/9.** 5in., **17/9.** 6½in., **16/9.** 8in., **19/9.** 8 x 5in. **25/9.** 10in. **26/9.** 10 x 6in. **29/9.** 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 3Ω **19/9,** 15Ω **25/9.**

GL3A 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. Over-all size 11½ x 2½ x 2½in. 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. 9-6-7 in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustrations, **2/6.** Total building cost **£4.15.0.** For descriptive leaflet send S.A.E.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. **Suitable for all battery portable receivers requiring 1.4 v. and 90 v.** This includes latest low consumption types.

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

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

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.

COLLARO JUNIOR 4-speed single player units and Hi-Fi crystal pick-up with turnover head, **£3.19.6.**

B.S.R. UA8 4-SPEED AUTOCHANGERS with Stereo/Monaural pick-up head. **£7.19.6.** Carr. 5/-.

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.

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.

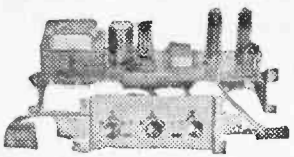
R.S.C. (Leeds) Ltd.

BRADFORD, MANCHESTER and LEEDS

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.

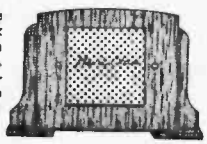
HARVERSON SURPLUS CO. LTD.

MONAURAL AMPLIFIER



This amplifier as illustrated, made by a leading manufacturer. Mullard valves—ECC83, EL84 x EL84, EZ80. Bass Treble and Volume on remote panel. Elegant Knobs. OUR PRICE one month only £4.16.6 plus P. & P. 3/6.

EXTENSION SPEAKER



An attractive cabinet 8 x 6 x 2in. fitted with 3 ohm 5in. speaker complete with lead, a few only. **19/6** P. & P. 2/6.

STEREOPHONIC AMPLIFIER £5.10.0

Complete with 2 Loudspeakers

Plus 4/6 P.& P.

This is a compact amplifier embodying the latest features and giving a high standard of reproduction, with ample volume. Supplied complete with valves (ECL82, ECL82, EZ80), panel, knobs, etc., and two specially selected 3Ω matched loudspeakers. We only have a few, and we will never be able to repeat this offer at such a low price! Don't risk disappointment! Order now!

1/6 H.P. MOTOR

140 Watt (Approx. 1/6 H.P.). Series wound, 220/250 volt 50 cycle motor. Off load 14,000 rev/min. on load 8,500 rev/min. Ideal small saw, sewing machine, etc. post free. **30/-**

P. & P. 3/-

TRANSISTOR

TRANSISTOR by leading manufacturer. First Grade Equivalent OC44. For one month only, the first 100 customers 8/6 post free. 6 for 50/-

RECTIFIERS FOR BATTERY CHARGERS

12 v. 1 amp.	4/3	12 v. 4 amp.	12/6
12 v. 2 amp.	7/-	12 v. 5 amp.	14/6
12 v. 3 amp.	10/-	P. & P. 6d.	

CONDENSER/RESISTOR PARCEL

50 mixed P.F. Condensers and 50 mixed Resistors. An assortment of useful values. All popular sizes—all new—a must for the serviceman and constructor. **ONLY 10/-.** P. & P. 1/-.

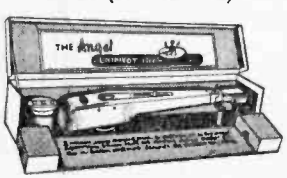
YOU ARE INVITED!

Spend a day browsing around our premises at **83 HIGH ST., MERTON, S.W.19** (*one minute South Wimbledon Tube*).

We have a wealth of components, valves, chassis, tape decks, autochangers, amplifiers, F.M. tuners, record players, tape recorders, cabinets, and a whole host of other things we just don't have the space to describe. Please come and look for yourself. We will be pleased to see you, and there's no obligation to buy.

BARGAINS IN GRAM & TAPE EQUIPMENT

THE WORLD FAMOUS E.M.I. ANGEL TRANSCRIPTION P.U. (Model 17A)



A Pick-up for the connoisseur originally priced at £17.10.0. The last remaining few offered at **£4.10.0** Plus P. & P 5/-

PICK-UP CARTRIDGE BARGAINS

STUDIO P...	17/6
ACOS HIGH G.	17/6
E.U. POWER POINT ...	12/6
RONETTE	18/6
G.C.Z.	16/6

P. & P. 1/-

RECORD CHANGERS

GARRARD	RC 98 Mk. 4H. 4-speed autochange	£16.10. 0
	RC 120/D Mk.2 ,, ,,	£9. 0. 0
	RC 120 Mk.4D ,, ,,	£9. 0. 0
	RC 120 Mk.4H ,, ,,	£9. 0. 0
	RC 121 Mk.1 ,, ,,	£11.0. 6
	RC 121 Mk.4H ,, ,,	£11.0. 6
	RC 121/40 Mk.2 ,, ,,	£11.0. 6
COLLARO	RC 54 4-speed autochanger ...	£6.19. 6
	RC 594 ,, ,, ...	£7.19. 6
	Conquest ,, ,, ...	£6.12. 6
	Challenger ,, ,, ...	£7.19.6
B.S.R.	Monarch UA8 4 speed autochange	£6.19. 6
	TU8 4-speed single player less pick up	£2.10. 0

NOTE: Any of the above with Stereo Cartridge and Fittings, 16/- extra. Carriage and ins. on each of above 5/- extra.

TAPE DECKS

LATEST B.S.R. MONARDECK (single speed) 3¾in. per sec., simple control, uses 5¾in. spools..... **£9.19.6** plus 5/6 carriage and insurance (tapes extra).

COLLARO STUDIO DECK piano key controls, pause control, space for additional head, uses 7in. spools, with counter..... **£14** plus 6/- carriage and insurance (tapes extra).

WE HAVE A LARGE RANGE OF READY-BUILT RECORD PLAYERS AND TAPE RECORDERS (BOTH STEREO AND MONAURAL) AT BARGAIN PRICES

83 HIGH STREET, MERTON, S.W.19

CHErrywood 3985/6/7

MIDGET GRAM AMPLIFIER READY-BUILT with Speaker

A 2½ watt gram amplifier, fitted with bass, treble, and vol./on-off controls. Supplied complete with 6 x 4in. 3 Ω speaker, valves (UY85, UF89, UL84), knobs, etc., all mounted on an attractive baffle board, size 10½ x 7½ins.

OUR PRICE ONLY **49/-** P. & P. 3/-

HARVERSON T.R.F. EASY FOUR KIT

All parts and theoretical wiring diagram only.

OUR PRICE **£4.0.0.** Plus P. & P. 3/6.

HARVERSON SUPERHET 4 KIT

A medium and long wave superhet, incorporating two I.F. stages, modern B9 valves (UCH81, UBF89, UCL83, U785), built-in ferrite rod aerial. All you need supplied, from theoretical wiring diagram to last nut and bolt (main components ready mounted), including an attractive contemporary styled cream plastic cabinet with gold trimmings. Size 11½ x 4½ x 6½in. PRICE **£6.12.6.** Post 3/6

AM/FM RADIOGRAM CHASSIS

★ By famous manufacturer. ★ 220/250 volts A.C. ★ Coverage 1000-1900 m, 200-500 m, 88-98 Mc/s. ★ Tuned by 5 "Piano Keys"—Off, LW, MW, FM and Gram. ★ Sockets for P.U., Ae, E, Extn. Spkr. and Dipole. ★ Tuning and tone controls fitted. ★ Valves, ECH81, EF89, EABC80, EL84, ECC85 and EZ80.

50 Only at ridiculous price of 12 gns. plus 8/6 P. & P.

TAPE RECORDER

★ CONTEMPORARY Red and White Tygan Cabinet. Size 13½ x 14½ x 9½ inches.
★ B.S.R. DECK.
★ MAGIC EYE tuning.
★ INPUTS for RADIO and MIKE.
★ VOLUME and TONE Controls.

This instrument has to be seen and heard to be believed.

Complete with ACOS Xtal Mike. ONLY 18 gns. P. & P. 8/6

GUARANTEED VALVES ★ NEW and BOXED ★ PROMPT DISPATCH ★ POST 6d. per Valve extra

ACHLDDD	9/2	EBC41	8/9	EF91	5/6	KLL32	8/-	PL81	11/9	U76	7/6	VU111	2/3	5Z4M	9/6	6K8G	7/-	7B6	9/9	12K8GT	13/-	30PL1	11/9
		EBF80	9/-	EF91(BVA)		KT2	4/6	PL82	8/-	U191	10/6	W21	11/9	6A7	10/6	6K6GT	6/6	7B7	8/-	12Q7GT	7/-	35L6GT	9/3
AC/P	7/-	EBF89	9/-		8/6	KT24	4/6	PL83	11/-	U339	11/9	W76	7/-	6A8G	8/6	6K7GT	5/6	7B8	5/6	12SG7	7/-	25Y5	9/3
AC/P4	7/-	EBL21	22/-	EL32	4/3	KT32	9/3	PX25	11/9	U403	15/6	W77	8/-	6AC7	6/-	6K8GT	9/9	7C5	7/6	12SH7	5/6	35W4	7/-
AC5PEN		EBL31	22/-	EL33	13/-	KT33C	8/-	PY80	7/-	U404	10/6	W729	9/9	6AG5	5/3	6K25	18/6	7C6	7/6	12SH7	5/6	35Z4GT	7/6
DD	25/9	EC31	7/-	EL38	24/6	KT36	28/-	PY81	8/-	U801	28/-	X22	16/9	6AK5	6/-	6L6	7/6	7H7	8/6	12SN7	7/6	35Z3	15/6
AC6PEN	6/-	EC81	7/6	EL41	9/6	KT55	10/3	PY82	6/6	UABC80	9/6	X41C	16/9	6AL5	6/-	6L6G	7/6	7H7	8/6	12SL7GT		35Z5GT	8/6
ACVP1/5	9/3	ECC82	7/-	EL42	9/6	KT61	9/6	PY83	8/-	UAF42	8/9	X101M	11/6	6AM5	11/9	6L6M	9/-	7Q7	8/6	12SL7GT		50C5	10/9
ATP4	3/3	ECC83	9/3	EL81	15/6	KT63	7/-	PZ30	18/6	UBC41	8/6	Y63	8/6	6AM6	4/6	6L7G	7/-	7S7	9/-		14/-	50CD6G	
AZ1	9/3	ECC84	9/3	EL84	8/6	KT66	18/-	PEN4DD		UBF80	8/9	Z21	9/9	6AQ5	7/-	6L18	10/3	7Y4	8/-	12SQ7	8/-		28/6
AZ31	11/2	ECC85	9/-	EM84	9/9	KT88	21/-		25/-	UCC84	10/-	Z309	7/-	6AT6	8/-	6L19	14/-	8D2	2/6	1487	15/9		
B36	14/-	ECF80	11/3	EM80	9/3	KTW61	6/-	PEN4VA		UCC85	10/6	Z359	7/-	6AU6	9/9	6N7GT	7/-	9D2	3/3	15D2	7/3	50L6GT	8/-
CBL31	22/9	ECF82	12/3	EM81	9/6	KTW63	7/-		14/-	UCF80	15/6	1A3	3/-	6B8G	3/9	6P28	25/-	10C1	11/9	19AQ5	9/-	75	10/9
CCH35	22/9	ECH21	22/-	EY51	9/3	KTZ41	3/3	PEN25	5/6	UCH42	9/9	1A5GT	5/6	6BA6	7/-	6Q7G	7/-	10C2	10/9	19BG6G	3/-	77	7/-
CL4	11/9	ECH42	9/-	EY86	9/3	MH41	6/6	PEN46	6/6	UCH81	9/9	1A7GT	11/9	6BE6	7/6	6Q7GT	9/-	10F1	14/6	20D1	5/-	80	8/-
CL33	18/-	ECH81	8/6	EZ40	7/-	ML4	8/-	PEN38822/-		UCL82	15/6	1C2	11/-	6BG6G	22/-	6SA7GT	7/6	10F9	14/6	20P2	25/-	142BT	8/3
CY31	15/9	ECL80	9/3	EZ41	7/-	M84B	18/-	PEN220A		UCL83	11/6	1C5GT	11/9	6BH6	8/6	8SG7	7/-	10L1	9/-	20L1	25/-	185BT	30/-
CV73	5/9	ECL82	9/9	EZ80	6/6	M8P4/5	7/-		3/9	UF41	8/6	1D5	11/9	6BJ6	8/6	8SH7	5/6	10LD11	9/8	20P1	25/-	210DDT	4/3
C96A	6/-	EF22	8/-	EZ81	6/6	M8P4/7	7/-	PEN45DD		UF85	8/6	1D6	11/9	6BR7	11/9	8SJ7	9/-	10P13	16/6	20P3	22/-	210VPT	3/3
DAF96	8/3	EF36	4/6	EZ90	7/-	MVS/PEN			25/-	UF89	8/6	1H5GT	10/-	6BW6	8/6	8SK7	5/6	10P14	18/-	20P4	25/-	83	9/9
DF96	8/6	EF37A	14/-	EI148	1/9		9/3	PENA4	14/6	UL41	9/6	1L4	6/-	6BW7	8/-	8SL7GT	7/6	12A6	6/-	20P5	22/-	301	9/9
DH63	11/6	EF39	5/6	FC13	6/-	MX40	16/-	PM12M	7/6	UL44	25/-	1LD5	3/-	6C4	3/9	8SN7GT	7/-	12AT6	10/-	25A6G	9/9	302	9/9
DH101	11/6	EF40	13/6	FW4/500	9/3	N37	18/6	QP21	4/6	UL46	25/-	1N5	9/9	6C5GT	6/-	8SQ7	8/9	12AT7	7/-	25L6GT	9/6	304	9/9
DK96	8/6	EF41	9/3	GTIC	25/6	N78	18/6	R16	25/-	UL84	8/8	1R5	7/-	6C6	4/6	U4GT	11/3	12AU6	7/6	2524	9/-	305	9/9
DL96	8/6	EF42	10/3	GZ32	11/-	N339	28/-	R19	2/9	UU6	18/6	1S4	9/9	6C31	7/-	U5/6G5		12AU7	7/6	2525	7/6	306	9/9
DL145	9/3	EF50	3/9	H30	4/6	OZ4	5/-	SP61	2/9	UU8	25/-	1S5	6/-	6CD6G	28/-		16/-	12AX7	7/6	2526	9/6	807	6/-
DM70	7/-	EF50SYL		H63	9/3	P61	3/3	SP4/5	9/9	UY1N	11/9	1T4	5/6	6D6	4/6	6U5G	8/-	12BA6	8/6	2758U	18/6	954	1/9
DN41	16/6		6/6	HL23DD	8/-	PC84	8/6	SP4/7	9/9	UY21	11/9	2C26	1/3	6CH6	9/9	6U7G	8/-	12BE6	8/6	30C1	9/9	955	3/9
EA50	1/3	EF54	5/6	HL22	6/-	PCF80	9/-	T41	22/-	UY41	7/-	2P	25/-	6F6G	7/-	6V6G	5/6	12C8	8/6	30F5	9/9	956	3/3
EABC80	8/6	EF55	9/3	HL41	3/3	PCF82	11/9	TDD13C	7/-	UY85	6/6	2X2	4/-	6F6M	7/-	6V6GT	7/9	12E1	32/6	30F11	9/9	5763	10/9
EAF42	9/6	EF80	7/-	HN309	23/-	PCL82	11/6	TH233	17/6	VP13C	3/3	3A4	6/6	6F1	13/-	6X4	7/-	12H6	3/3	30L1	18/6	9002	5/-
EB34	1/9	EF85	7/-	K40N	8/6	PCL83	13/6	TP22	7/6	VP23	6/-	3A8GT	5/6	6F13	13/-	6X5G	6/6	12J5GT	2/9	30P4	19/-	9003	5/-
EB41	8/-	EF86	11/6	KF35	8/-	PL38	16/6	TP25	25/-	VP41	8/-	3D6	4/6	6F15	13/-	6X5GT	6/6	12J7GT	10/-	30P12	11/9	9004	5/-
EBC33	6/3	EF89	8/-	KK32	20/6	PL36	14/6	VP133	14/-	3Q4	7/6	6F17	11/9	6/30L2	11/9	12K7GT	7/-			30P16	9/-	9006	5/-
								VR22(PM 2A)	2/9	3Q5GT	9/-	6F33	16/6										
										3S4	7/-	6H6	2/3										
								VR105/30		3V4	8/-	6H6GT	2/3										
									7/8	4D1	2/9	6J5GT	4/6										
								VR116	3/9	5R4GY	9/-	6J5M	6/-										
								VR150/30		5U4G	6/3	6J6	5/6										
									7/-	5V4	10/9	6J7G	6/-										
								VU120A	3/3	5Y3G	7/6	6J7M	8/6										
								VU39(MU 12/14)	8/6	5Y3GT	7/6	6K7G	3/9										
										5Z4G	8/6	6K7M	6/3										

SPEAKER FRET

Super quality heavily woven fret. 54 inches wide. Usual price 50/- per yard. P. & P. 1/.

OUR PRICE, **19/6** per yard

MIDGET I.F. TRANS & COILS

A pair of midget 465 kc/s I.F. transformers, plus LW and MW coils. OUR PRICE 10/- per set. P. & P. 1/9.

Set of I.F. transformers for transistor superhet. 9/-. P. & P. 1/9.

CYLDON 12 CHANNEL TURRET TUNERS

New purchase offered at still lower price. I.F. 33-38 Mc/s. Complete with PCC84 and PCF80 valves and 8 sets of Coils for 5 Band I channels and 8, 9, 10 Band III. New and unused. Value over £7. OUR PRICE, Post paid **32/6**

MINIATURE AMPLIFIER

Miniature amplifier, size 3½ x 2½ x 4½ins. Ideal for record player, etc. Controls, volume/on-off, bass and treble. Supplied ready built, less valves (UY85, UF89, UL84), and mains transformer, at the give away price of **14/-** P. & P. 2/6

COSSOR C.R.T. SNIP

108K 10-inch. New and boxed, 15/-, plus 6/- P. & P.

75K 10-inch. New and boxed. 15/-, plus 6/- P. & P.

ION TRAP MAGNETS

To suit the above, **2/9 each.** P. & P. 3d.

EASY AS A.B.C. TO BUILD

The new, exciting De Luxe "Gold Star" Pocket Radio in beautiful moulded plastic case— **37/6**

This model is a highly sensitive, self-contained set covering all medium waves. Uses modern miniature "button-base" valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans—the case is supplied ready drilled! Size of radio only 4¼in. x 2¼in. x 1¼in.!—and batteries fit inside. We can supply all parts including case, detachable aerial, instruction book, wire, screws, etc., for only 37/6, plus 2/6 Post and Packing. C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/6.)

29/6

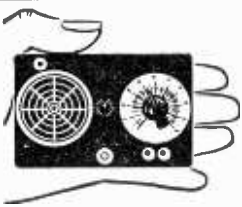
Our engineers have designed a novel Wrist-Watch Radio using latest Transistor Techniques. Size only 1¼in. x 1in. x ¾in. ! ! !—"Feather-weight"—yet gives clear, crisp, personal-phone reception over all medium waves. Tiny battery inside lasts months—costs 5d. No snags, anyone can build it in an hour or two using our pictorial step-by-step simple plans. All parts supplied (including case and strap) for only 29/6 (add 2/6 Post, etc.). C.O.D. 2/- extra. (All parts sold separately, priced parts list 1/6.) Send Now!

Can Be Built for 47/6. Build this exceptionally sensitive high efficiency personal phone radio. Uses unique assembly system and can be built by anyone without any radio knowledge whatever in 45 minutes. Handsome black-crackle steel case with specially made black and gold dial with stations printed. Size of radio only 6¼in. x 5in. x 3in. Covers all medium and long waves. H.T. consumption only 1 to 1.5 mA. Ideal for Bedroom, Garden, Holiday, etc. BUILD THE "SKY-ROMA" NOW! Total building cost—everything down to the last nut and bolt, 47/6 (Postage, etc., 2/-)—with full set of clear, easy-to-follow plans. (Parts sold separately. Priced parts list and plans 1/6.) C.O.D. 2/- extra.

47/6

29/6

The sensational "Silvertone" model! A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" building cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4¼in. x 2¼in. x 1¼in.—a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, screws, wire, etc., for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/9.)



THIS TRANSISTOR SET Can Be Built For Only 29/6. The "Sky-Scout" Pocket two-stage transistor set, size only 4in. x 3¼in. x 1¼in. Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- Post and Packing. INCLUDING CASE, TRANSISTOR, STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS, nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list and plans 1/6. VERY SIMPLE TO BUILD.

29/6

This amazing "Tiny-Tim" model—no larger than a match box—costs nothing to run—ever! No batteries! No Valves! No complete electricity! Will *never* run down or burn out. Uses the latest TRANSISTOR TYPE GERMANIUM DIODE, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can build it within an hour using our step-by-step instruction book, etc., for only 17/6, plus 2/- Post and Packing (C.O.D. 2/- extra). (Parts sold separately, priced parts list 1/9.)

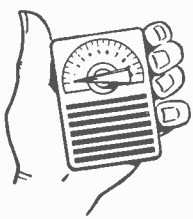
17/6

Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step! Remarkably sensitive—covers all medium waves, inc. Luxembourg, Home, Light. Size only 2in. x 3in. x 5¼in.—Not a Toy! But a Real, Personal-phone, Valve Radio with Detachable Aerial! IDEAL FOR BEDROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc., for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately, priced parts list 1/9.) Send Today! Money refunded if parts returned intact within 7 days.

39/6

Choice of beautiful walnut veneered cabinet or ivory bakelite. This is the lowest possible price consistent with high quality. No radio knowledge whatever needed . . . can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12in. x 6in x 5in. Build this long-range powerful midget NOW. TOTAL BUILDING COST INCLUDING PLANS, ETC. £5/7/6. (Post and Packing 3/6). Parts sold separately. Priced parts list and plans 1/9. C.O.D. 2/- extra.

107/6



45/-

TWO-TRANSISTOR POCKET SET. Can Be Built for 45/-. BUILD THE "SKY-GNOME" VEST-POCKET TWO TRANSISTOR RADIO which gives a superb performance and is highly sensitive. Weight under 7 ozs.—yet it is a THREE-STAGE receiver covering all medium waves, working entirely off a "penlight" battery. Every part tested before despatch! SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS. Total building cost including case, transistors, etc.—everything down to the last nut and bolt—ONLY 45/- with plans. Postage, etc., 2/- (C.O.D. 2/- extra.) (Parts sold separately. Priced parts list and plans 1/6.) RUSH YOUR ORDER TODAY!

CONCORD ELECTRONICS

210, Church Road, Hove, Sussex

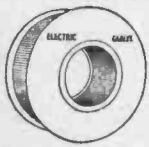
Dept. PW24

Orders receive prompt attention. Cheques accepted. Cash on delivery 2/- extra. Please print name and address in block letters. Suppliers to Schools, Universities, Government and Research Establishments. **Complete range of components and valves stocked.** *Regret no C.O.D. abroad. DEMONSTRATIONS DAILY AT WORKS.*

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, calibrated scale and full instructions, price 19/6, plus 2/6 post and insurance.

Versatile Wire



Single-strand 18-gauge with P.V.C. covering which makes it rustproof. Extra strong, will stand tremendous strain. Ideal for gardening, clothes lines, indoor aerials, etc., etc. Also being steel alloy and having a resistance of approximately ½ ohm per yard this can be used for electrical work, soil heating, wrapping round water pipes, etc. New on drum containing 3,000ft. Price 8/6, plus 3/6 carr.

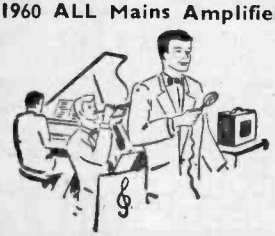
Welding Transformer

Output 2/3 volts by high and low switch. Continuous rating 250 amps. Intermittent for spot welding exceeds 2,000 amps. Unused, slightly soiled, but perfect working order. £3.10.0 plus 3/6 carriage.

TV Workshop Aids

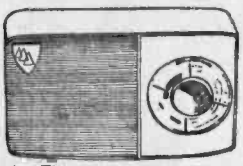
E.H.T. SEALER. Apply with soldering iron. Stops corona discharge, etc. 2/6 per stick.
POLYTHENE TAPE. 2in. x 10 thou. for E.H.T. insulation up to 25 kV. 5/- per 20ft. roll.
SPONGE STRIP. ½in. x ½in. For sealing or cushioning. 9d. per foot.
ANTI-STATIC SCREEN CLEANER For TV tubes and screens. Perspex or glass. Delays accumulation of dust. 3/- per tube.
CELLULOSE CEMENT. Specially prepared for radio gluing of metal, glass, ceramic, wood, fabrics. 4/6 per tin.

1960 ALL Mains Amplifier



Undoubtedly finest value obtainable in amplifiers—powerful three valve circuit ideal for dances, parties, etc. Complete with valves, mains, transformers, volume and tone controls, but less chassis, speaker and cabinet. Price only 29/6, plus 2/6 post and ins. Data free with parts or available separately 1/6.

TRANSISTOR LOUDSPEAKER RADIOS

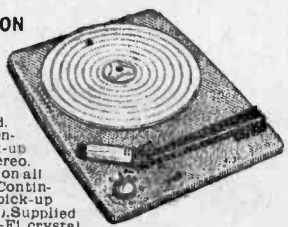


Results guaranteed. Nothing can be more disappointing than to find that despite care in making up, your little radio just will not work. This is unlikely to happen with our set, but if it does, you may send it in for service, we guarantee good results.

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 set complete to last nut and bolt, with proper case, tuning condenser, and miniature loudspeaker. Our sets **do not need external aerials**, also they may be built in stages to car radio output. Post and insurance 2/6.

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 AG3019 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 meg. Ohm in three ranges (self-controlled) Self-contained, 3½in. movement. Price £10 or 10/- deposit and 23 fortnightly payments of 10/-. Non-callers add 5/- carriage and insurance.

Transistor Set Cabinet

Very modern cream cabinet, size 5½ x 3 x 1½ in. with chrome handle tuning knob and scale. Price 7/6, plus 1/6 postage and packing.

Another Battery Charger Bargain

Components would Cost More

Car Battery Charger—ready made high output battery charger in stove enamelled sheet steel louvred case. 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.

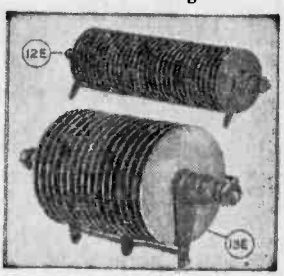
Connecting Wire

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

Yaxley Switches

1 Pole 3 Way	1/6
1 Pole 5 Way	2/-
1 Pole 11 Way	2/6
1 Pole 12 Way	3/-
2 Pole 2 Way	2/6
2 Pole 4 Way	2/-
2 Pole 6 Way	2/6
2 Pole 8 Way	3/6
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	2/-
6 Pole 3 Way	2/6
6 Pole 3 Way	3/6
8 Pole 2 Way	2/-
9 Pole 3 Way	2/6
12 Pole 2 Way	2/-

Rectifier Bargains



Selenium rectifier type 12, 500 v. ½ A. half-wave, easily rebuilt into full wave or multiple type, contains 30 35 mm. discs. Price 8/6, plus 1/6 post. Type 13, 36 volt 9 amp. easily rebuilt into six full wave charger rectifiers suitable for 6 or 12 volt batteries 3 amps, contains 24 84 mm. discs. Real bargain at 19/6, plus 1/6 post.

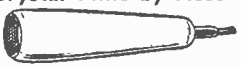
Morganite Potentiometers

Single and 2-gang types available, standard size with good length spindle, all new and boxed. **Single types**, 1/- each, values available: 5K, 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg. **Gang type** 3/- each—values available: 5K±5K, 100K±100K, ½ meg. ± ½ meg., 2 meg. ± 2 meg.

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.

Crystal Mike by Acos



Model 39/1. this is ideal for tape or general amplifiers, complete with screened lead 39/6. plus 1/- post.

Chassis Assembly

Superhet Chassis. 3-waveband. coloured scale. scale pan. etc. Scale size 14¼in. x 3¼in. Chassis size 15in. x 15in. Mullard £3.10.0. ditto unbranded. x 2in. Price 9/6. plus 1/6 post.

UNIQUE OPPORTUNITY TO BUILD FINE TRANSISTOR SET

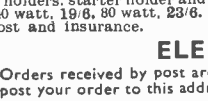
Constructor's parcel consisting of cabinet approx. size 4¼ x 3¼ x 1¼in. with handle and embellishment as illustrated. turning dial tuning condensers and easy to follow constructional data. Price 22/6 plus 2/6 post and insurance. You can build a pocket transistor set as currently being sold at 17 gns. We can supply all necessary parts at highly competitive prices. Alternatively build your own circuit. Circuit diagram and constructional data supplied separately. 1/6.

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.

"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.

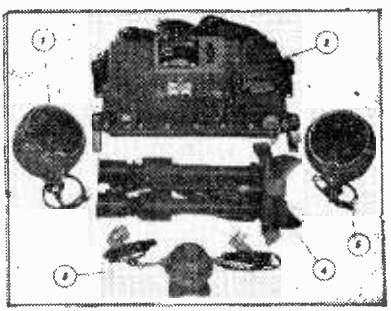


Fluorescent Light Bargain

Kit of parts comprising: choke. two lamp holders. starter holder and starter. 40 watt. 19/6. 80 watt. 23/6. Plus 2/- post and insurance.

Components for Transistor Sets

Sub-miniature Electrolytics. 1 mfd 18v., 2.5 mfd 6v., 4 mfd 6v., 8 mfd 6v., 5 mfd 12½v., 10 mfd 6v., 25 mfd 6v., 30 mfd 3v., 50 mfd 3v., 200 mfd. All 1/9 each.
Transistor Ferrite Rod Aerial with medium and long wave coils with circuit. Price 7/6.
Oscillator Coil and set of 3 I.F. transformers for transistor set with circuit. Price 23/6.
Midget 3in. P.M. Loudspeaker for transistor set. 3 ohm or 80 ohm coil. Price 18/6.
Midget 208 pF + 176 pF two-gang Tuning Condenser with trimmers, ¼ spindle drilled and tapped. Price 9/- plus 1/- post.
Push-pull Output Transformers. for transistors OC78. etc. Sub-miniature. Price 8/6. plus 1/- post.
Push-pull Input Transformer to match the above. Output Transformer. 8/6.
0.0005 mfd Single Tuning Condenser. Solid dielectric ¼in. spindle for transistor or crystal set. 3/9; ditto with spindle tapped 6 BA, 4 -.
Transistors tested. Set of six for Superhet includes matched pair. Mullard £3.10.0. ditto unbranded 45/-; suitable as mixers. 9/6 each. Suitable as I.F. amplifiers. 8/6; suitable for R.F. and Regen circuits. 6/6; matched pairs for Push-pull Output. 16/- per pair. High gain for single ended output. 7/6. Ordinary white spot. 3/9; red spot. 3/6.
Resistors. miniature quarter watt type for transistor sets. All popular valves. 5d. each.
Miniature ceramic condensers 6d. each.



TABBY EQUIPMENT COMPLETE

Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, powerpack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—£6.19.6 or 10/- deposit and 15 fortnightly payments of 10/-.

R1155 for Spares

These are less valves but otherwise reasonably complete—ideal for spares—prices £2 to £4 depending on condition—carriage 7/6.

CABINET SNIP

Extremely well-made portable amplifier case finished in two-tone and very modern in appearance. Large enough for stereo outfit with tape deck or auto-changer. Snip price 56/9, plus 3/6 carriage and insurance.

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	2in. flush ..17/6
250-0-250 microamp ..	2¼in. surface27/6
750 microamp	2¼in. surface17/6
5-0-5 milliamp	2¼in. flush..17/6
0-30 milliamp	2¼in. flush..17/6
0-100 milliamp.....	2¼in. flush..15/-
0-300 milliamp.....	2¼in. flush..15/-
0-500 milliamp.....	2¼in. flush..15/-

Unbreakable Mains Lead type of lead fitted to electric razors makes fine lead for test meters and any other devices where subject to continuous bending. Twin figure eight construction. soft cream p.v.c. covered. Normally costs 2/- per yard. Three 6ft. leads for 2/-.

Filament Transformer, 6.3 v., 1½ amp. 6/6.

0.3 Amp Dropper—tappings marked 200/220/250. 3/6.

Auto-Transformers, totally enclosed primary 200-250, secondary 110-120v., 150 w., normally 27/6. Price 17/6.

Output Transformer—standard pentode—4/6. multi ratio. 6/6.

Bi-metal Strip with heavy duty contact—ideal for thermostat, fire, lamp, etc., 2/6.

Neon Lamp—midget wire ended. ideal mains tester. etc., 2/-, ex Govt., 1/6.

5 amp. 12 v. full-wave Charger Rectifier, normal price 17/6. Price 10/-, plus 1/6 post and ins.

Install those extra points. 3.029 twin flat T.R.S. cable. Big purchase enables us to sell this at 45/- per 100 yds., carriage 8/6.

Head Phones. DLR5. Ideal crystal sets, etc., 8/6. plus 2/- post.

Goodmans Multi Ratio Output Transformer. 6 watt. 8 ratios. from 12-1 to 72-1. Centre tapped for push/pull. 7/6, plus 1/-.
Ditto, unbranded. 6/6. post 1/-.

Cold Cathode Valve CV413. Voltage regulator or trigger switch—unused but ex-equipment. 2/6 each.

Tag Panels. Ideal for constructors. experimental circuits. etc., 3 of each of 12 different types. 5/-, post 1/6.

Belling Lee 2BA fully insulated terminals for mounting through metal panels, 1/6 each.

Terminal Heads, insulated 4BA. 2/ doz. **0.1 mFd. 350 v.** Small tubular metal cased condensers made by Dubilier, 2/6 doz.

50 Assorted Resistors. Well mixed and useful values ¼ and ½ watt. 5/- for 50. Ditto, but 1 watt. 6/6 for 50.

Mains Transformer. Standard 230 v. input 250-0-250 at 80 mA., 6.3 v.at 5 A., 12/6, post 1/6.

Toggle Switch. Standard metal body, type with round dolly, fixing ring and on/off indicating plate, 1/3 or 12/- doz.

Metal Rectifier. 250 v. 60-80 milliamps., ideal for mains set or instrument or to replace that expensive valve. 4/6.

Screened Cable. Rubber covered flexible with metal braiding, ideal for microphone or gramophone extensions. 4d. per yd., 30/- per 100 yds.

ELECTRONIC PRECISION EQUIPMENT LTD.

★ Orders received by post are despatched from our warehouse, **Dept. 7, 66 Grove Road, Eastbourne,** and to save time, please post your order to this address. Please include enough for postage. Callers, however, should use one of the following addresses:

Electronics (M.P.) Ltd., 520 High Street North, Manor Park, E.12 Phone: Ilford 1011 Half day Thursday

Electronics (Ruislip) Ltd., 42-46 Windmill Hill, Ruislip, Mddx. Phone: RUISLIP 5780 Half day Wednesday

Electronics (Croydon) Ltd., 266 London Road, Croydon. Phone: CRO 6558 Half day Wednesday

Electronics (Finsbury Park) Ltd., 29 Stroud Green Rd., Finsbury Park, N.4. Phone: ARChway 1049 Half day Thursday

Stern's "fidelity" TAPE RECORDERS

BEFORE YOU BUY —YOU SHOULD HEAR THESE RECORDERS. THEY ARE COMPARABLE TO THE MUCH HIGHER-PRICED MODELS

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.

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

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

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

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

MODEL TR3/Mk. VI Incorporates the New TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck **£49.10.0**
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 3¾in./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.

PRICE **£25.0.0** (Including a 4in. spool of Long Play Tape.) Terms, Dep. £5.0.0, 12 months £1.16.8.

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**
Terms, Deposit £4.8.0, 12 months £1.12.3.
The model HF/G2A is available separately for
(a) COMPLETE KIT OF PARTS £11.0.0
(b) ASSEMBLED £12.15.0

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 Preamplifier fitted to the Garrard Tape Deck, operates at 3¾in./sec. speed, connects into the tape input channel or pick-up sockets of existing Amplifier or Radio Chassis. COMPLETE WORKING UNIT, containing 4in. spool of Long Play Tape.

PRICE **£23.15.0**
Terms, Dep. £4.15.0, 12 months £1.14.10.

Alternatively we offer Complete Kit of Parts to build the HF/G2P Preamplifier with the ASSEMBLED AND TESTED GARRARD DECK for **£20.15.0**
Terms, Dep. £4.2.0, 12 months £1.10.5.

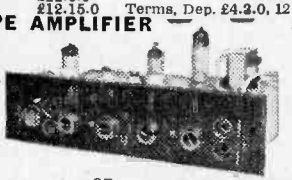
Model HF/GR2 Contains the Model HF/G2A-D Unit (described opposite). A small robust recorder with outstanding performance. Truly portable, weighs only 22 lbs. Twin Track operates on 3¾in./sec. speed.

PRICE **£29.15.0**
H.P. Terms, Deposit £6.0.0, and 12 months at £2.3.7.

The Preamplifier Model HF/G2P is available separately for
(a) Complete Kit of Parts £9.10.0.
(b) Assembled £11.5.0.

MODEL HF/TR3 TAPE AMPLIFIER

(Mullard Type "A" design)
A very high quality Amplifier incorporating 3-speed treble equalisation, using the latest FEROXCUBE 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 £1.4.2.

MULLARD TYPE "C" TAPE PREAMPLIFIER—ERASE UNIT

The "Hi-Fi" link to add full tape recording facilities to High Fidelity home installations. Incorporates FEROXCUBE POT CORE PUSH PULL OSCILLATOR and 3-speed treble equalisation by FEROXCUBE POT CORE INDUCTOR. FOR WEARITE-COLLARO-TRUVOX-BRENELL or MOTEK TAPE DECKS. Includes separate power Supply Unit.

KIT OF PARTS **£14.0.0** H.P. £3.8.0 Deposit and 12 months £1.4.11. OR ASSEMBLED **£17.0.0**
(Excluding power unit £11.15.0 and £14.10.0 respectively).

FOR THE HOME CONSTRUCTOR
SPECIAL 'COMBINED ORDER' PRICES

(a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PREAMPLIFIER and Power Unit Assembled and Tested **£29.10.0**
H.P. Deposit £5.18.0 and 12 months £2.3.3.

(b) As above but TYPE "C" PREAMPLIFIER supplied as complete KIT OF PARTS **£26.10.0**

(c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PREAMPLIFIER and Power Unit assembled, tested **£35.0.0**
H.P. Deposit £7, and 12 months £2.11.4.

(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" Preamplifier and Power Unit **£40.0.0**
H.P. Deposit £8.0.0, and 12 months £2.18.8.

(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" PREAMPLIFIER and POWER UNIT **£46.0.0**
H.P. Deposit £9.4.0, and 12 months £3.7.6.

(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 **£56.0.0**
H.P. Deposit £11.4.0, and 12 months £4.2.1.
(Carriage and Insurance on above quotes 10/- extra)

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

(a) COMPLETE KIT to build the HF/TR3 Amplifier together with the COLLARO "STUDIO" DECK. **£25.10.0**

(b) As above but with HF/TR3 supplied ASSEMBLED and TESTED **£29.0.0**
H.P. Deposit £5.16.0, and 12 months £2.2.6.

(c) COMPLETE KIT to build the HF/TR3, together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK **£30.15.0**
(£1 extra if we are required to wire up Deck Switch Banks.)

(d) As above but HF/TR3 supplied ASSEMBLED and TESTED **£34.10.0**
H.P. Deposit £7.0.0. and 12 months £2.10.5.
(£1 extra if we are required to wire up Deck Switch Banks.)

(e) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK **£36.0.0**

(f) As above but HF/TR3 supplied ASSEMBLED and TESTED **£39.10.0**
H.P. Deposit £7.18.0, and 12 months £2.17.11.

(g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK **£41.10.0**

(h) As above but HF/TR3 supplied ASSEMBLED and TESTED **£45.0.0**
H.P. Deposit £9.0.0, and 12 months £3.6.0.

(i) THE WEARITE 4A DECK with assembled and tested HF/TR3 Amplifier including WEARITE Head Lift Transformer **£55.0.0**
H.P. Deposit £11.0.0. and 12 months £4.0.8.

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 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—and 1,200ft. SPOOL E.M.I. TAPE—ALL FOR £9.10.0. Carriage and Insurance 5/- extra.

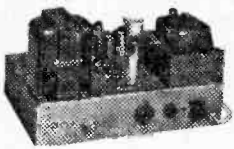
FULLY DESCRIPTIVE LEAFLETS ON ALL OF ABOVE ARE AVAILABLE—BUT PLEASE ENCLOSE S.A.E. AND STATE WHICH LEAFLET IS REQUIRED.

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 undistorted power output of up to 10 watts is obtained. We supply **SPECIFIED COMPONENTS AND NEW MULLARD VALVES**, including **PARMEKO MAINS TRANSFORMER** and choice of the latest Ultra-Linear **PARMEKO** or the **PARTRIDGE** Output Transformer.
PRICE COMPLETE KIT (**PARMEKO** Output Trans.). **£10.0.0**
Alternatively we supply **ASSEMBLED** and **TESTED**. **£11.10.0**
ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, £1.6.0 EXTRA

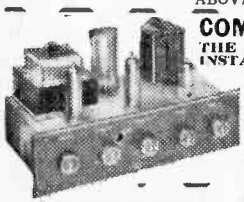
MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves, and designed to operate with the MULLARD **MAIN AMPLIFIERS**, but also perfectly suitable for other makes.
PRICE COMPLETE KITS OF PARTS **£6.6.0** ASSEMBLED AND TESTED **£8.0.0**
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 **PARMEKO MAINS TRANSFORMERS** and choice of the latest **PARMEKO** 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 OF PARTS **£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 **PARMEKO 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 UA8 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**
The **COLLARO** 4-speed Single Record Player, Studio Pick-up. **£6.9.6**
THE NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER. **£8.7.6**
UA12 also available incorporating the **B.S.R. STEREO** Pick-up, plays L.P. and 78 Records. **£10.10.0**
GARRARD MODEL TA/MK.11 4-speed Player fitted high output Crystal Pick-up. **£8.10.0**
GARRARD MODEL RC/210. Autochanger 4-speeds. High output. Crystal Pick-up. **£10.10.0**
Carriage and Insurance on each above, 5/- extra.
H.P. TERMS AVAILABLE ON EQUIPMENT OVER £9. DESCRIPTIVE LEAFLETS AVAILABLE FOR ALL EQUIPMENT. PLEASE SEND S.A.E.

Dept. P.W. **109 FLEET ST., LONDON, E.C.4**
Telephone: FLEET STREET 5812/3/4

PRICE REDUCTIONS

(a) The KIT OF PARTS to build both the "5-10" Main Amplifier and the 2-valve PRE-AMP CONTROL UNIT..... **£15.15.0**
(b) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. £3.16.0 and 12 months of £1.7.8..... **£18.18.0**
(c) The KIT OF PARTS to build the DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT..... **£21.10.0**
(d) The DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED **£25.0.0**
H.P. Terms: Deposit £5 and 12 months of £1.16.8.
(e) THE KIT OF PARTS to build one "5-10" MAIN CHANNEL and the DUAL-CHANNEL PRE-AMP CONTROL UNIT.. **£21.10.0**
(f) ONE "5-10" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER both ASSEMBLED and TESTED **£25.0.0**
H.P. Terms: Deposit £5, 12 months of £1.16.8.
(g) KIT OF PARTS to build Two "5-10" MAIN AMPLIFIERS (incorporating Parmeko Output Transformers) and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT **£31.0.0**
(h) TWO "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0**
H.P. Terms: Deposit £7.4.0, 12 months £2.12.0.
Carriage and Insurance 7/6 extra. Prices quoted are subject to £1.6.0 extra for Partridge Transformer.

STEREO PRE-AMPLIFIER

This model incorporates two Mullard 2-valve Pre-Amplifiers combined into a Single unit enabling it to be used for both **STEREOPHONIC** or **MONAURAL** operation. It is designed primarily to operate with four range of **MULLARD MAIN AMPLIFIERS** but will also operate equally well with any make of Amplifiers requiring an input of 250 m/volts.
COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0**
H.P. £3 Dep. and 12 mths. at £1.2.0

MULLARD FOUR CHANNEL MIXER UNIT

Self powered with Cathode follower output. Incorporates Two inputs for MICROPHONES. One for CRYSTAL PICK UP and a fourth for RADIO or TAPE.
Complete Kit of Parts **£8.8.0**
Assembled and Tested **£10.0.0**
TERMS: Deposit £2 and 12 months at 15/-.

Mk.11 "Fidelity" FM TUNING UNIT

An attractively presented Unit incorporating MULLARD PERMEABILITY TUNING HEART and corresponding Mullard valve line up. FOR THE CONSTRUCTOR **£10.10.0** ASSEMBLED **£14.5.0**

A SPECIAL CASH OFFER!!

This very attractive **PORTABLE AMPLIFIER CASE** together with a good quality **GRAM AMPLIFIER** and a matched **P.M. SPEAKER.**
For ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS.
The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Rexine.
WE ALSO SUPPLY SEPARATELY—
(a) The 2-stage (plus Rectifier) **AMPLIFIER** **£4.2.6**
(b) The **PORTABLE CARRYING CASE** **£3.17.6**
(c) 6½in. **P.M. SPEAKER 18/9** Carriage and Insurance 4/- extra.

RETURN-OF-POST

We offer a really efficient Mail Order Service on all items stocked. All cash orders are dealt with on the day of receipt. Hire purchase orders are subject to slight delay but this is kept to the absolute minimum.

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 gold hammer finished panel and glass dial. Four EF91 valves are used and an external power supply is required. Complete kit **£8.19.6.** Power Pack Kit **£2.12.6.**

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 **£9.9.6.** Kit with power supply **£10.9.6.**

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 ECC81 valves. Kit less power supply **£10.8.6.** Kit with power supply **£12.7.6.**

F.M./TV SWITCHED TUNERS

Kits for two new Jason F.M./ITV 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 BBC 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 **£15.17.6.**

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 **£11.7.6.**

IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

GRAMOPHONE EQUIPMENT

ALL LATEST MODELS

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
RECORD CHANGERS			
COLLARO Conquest (Studio O PU) ..	£7.19. 6	£1.12. 0	6 of £1.4.7
GARRARD RC210 (GC8 PU) ..	£9.19. 6	£1.19. 6	12 of 15/-
B.S.R. UA14 Monarch (TC8 PU) ..	£7.15. 0	£1.10. 0	6 of £1.4.2
B.S.R. UA8 Monarch (TC8 PU) ..	£7. 5. 0	£1. 9. 0	6 of £1.2.8
B.S.R. UA14 Monarch (TC8S Stereo/LP/78) ..	£9.18. 0	£1.18. 0	12 of 15/-
SINGLE RECORD PLAYERS			
GARRARD TA (GC8 PU)	£8.10. 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 RP594 (O, P or T PU)	£9.18. 9	£1.18. 9	12 of 15/-
E.M.I. (Acos Stereo/Mono PU) ..	£6.15. 0	£1. 7. 0	12 of 10/8
TRANSCRIPTION UNITS			
COLLARO 4T/200 (TX88 PU)	£18.13. 0	£3.15. 0	12 of £1.7.4
COLLARO 4TR/200 Motor only	£13.18. 3	£2.15. 3	12 of £1.0.5
GARRARD 4HF (GC8 PU)	£18. 9. 9	£3.15. 9	12 of £1.7.0

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

NEW ILLUSTRATED LISTS

NOW READY!

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

BLANK CHASSIS

The very latest blank chassis for the home constructor. Packed flat for easy and safe posting. These are made in bright tinplate and have the top plate and four side channels packed flat complete with nuts and bolts for assembly. The top plate is completely flat for easy drilling before assembly. Earth connections can be made directly by soldering. Available in the following sizes: 7 x 5 x 2in., 4/9, post 1/3. 10 x 5 x 2in., 5/3, post 1/4. 10 x 7 x 2in., 6/-, post 1/6. 14 x 5 x 2in., 7/3, post 1/6. 14 x 10 x 2in., 8/9, post 1/9.

CATHODE-RAY TUBES

BRAND NEW STOCK. NOT REBUILDS.
12 MONTHS' GUARANTEE

We can supply all BVA branded tubes at the new reduced prices. This includes Brimar, Cossor, Emiscope, Emitron, Ferranti, G.E.C., Mazda and Mullard. Full list of all available types sent on request.

STEREO COMPONENTS

Morganite ganged potentiometers as specified for the Mullard circuits. Lot/Anti-Log, 500k, 1 meg., 2 meg. Log/Log, 250k, 1 meg., 2 meg. Lin/Lin, 500k, 1 meg. All **10/6** each.

Denco Chassis for the Mullard circuits. All drilled with printed front panel.

Three Valve Stereo Amplifier, 22/-. Seven watt Stereo Amplifier, 24/6. Stereo Pre-Amplifier, 24/6.

Pick-up cartridges. B.S.R. TC8S **£9.4.11.** Ronette DC284, **£3.19.6.** Both are turn-over types for Stereo, LP and 78 records.

LATEST TEST METERS

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
AVO Model 8 ..	£23.10. 0.	£4.14. 0	12 of £1.14. 6
AVO Model 8 with leather carrying case ..	£27. 8. 0	£5. 8. 0	12 of £2. 0. 4
AVO Model 7 ..	£19.10. 0	£3.18. 0	12 of £1. 8. 8
AVO Model 7 with leather carrying case ..	£23. 8. 0	£4.12. 0	12 of £1.14. 6
AVO Multiminor ..	£9.10. 0	£1.18. 0	12 of 14/4
AVO Multiminor with leather carrying case ..	£11. 9. 0	£2. 5. 0	12 of 17/-
TAYLOR Model 127A ..	£10. 0. 0	£2. 0. 0	12 of 15/-
CABY A-10	£4.17. 6	£1. 7. 6	3 of £1. 6. 8
CABY B-20	£6.10. 0	£2. 0. 0	3 of £1.13. 4

Full details of any of the above supplied free on request.

TAPE DECKS

	Cash Price	Hire Purchase Deposit	Mthly/Pymts.
B.S.R. TD2 ..	£9.19. 6	£1.19. 6	12 of 15/-
COLLARO STUDIO ..	£15.10. 0	£3. 2. 0	12 of £1. 2. 0

All carriage free.

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

TRANSISTORS

ALL BRAND NEW STOCK—NOT SURPLUS

MULLARD—Audio OC70, OC71, 14/- each; OC72 Audio Output Matched pair, 34/-; RF, OC44, 26/-; OC45, 24/-.

MAZDA—XB102, XB104, Audio, 10/- each; XC101 Audio Output, Matched pair, 34/-; RF, XA101, 23/-; XA102, 26/-; XA103, 15/-; XA104, 18/-.

WATTS RADIO (MAIL ORDER) LTD

54 CHURCH STREET, WEYBRIDGE, SURREY. **Telephone: Weybridge 4556**

PLEASE NOTE: POSTAL BUSINESS ONLY FROM THIS ADDRESS

SERVICE

RECORDING TAPE

DOUBLE PLAY

B.A.S.F. 300ft (3"), 14/-; 600ft (4"), 25/-; 1200ft (5"), 45/-; 1800ft (5½"), 58/-; 2400ft (7"), 77/6.

EMITAPE 100. 400ft (3"), 17/-; 1200ft (5"), 45/-; 2400ft (7"), 80/-.

SCOTCH BOY 200. 400ft (3"), 17/-; 1200ft (5"), 45/-; 2400ft (7"), 80/-.

TELEFUNKEN. 1200ft (5") in plastic container, 40/-; 1800ft (5½") in plastic container, 50/-; 2400ft (7"), 75/-.

LONG PLAY

BASF. 210ft (3"), 9/-; 850ft (5"), 28/-; 1200ft (5½"), 35/-; 1800ft (7"), 50/-.

EMITAPE 99. 99/3 250ft (3"), 9/6; 99/3N 250ft (3½"), 9/6; 99/9 850ft (5"), 28/-; 99/12 1200ft (5½"), 35/-; 99/18 1800ft (7"), 50/- 99/9, 99/12 and 99/18 available in **Emicase, 2/6** extra.

SCOTCH BRAND 150. 300ft (3½"), 9/6; 900ft (5"), 28/-; 1275ft (5½"), 35/-; 1800ft (7"), 50/-.

TAPE ACCESSORIES

BIB Tape Spliceer, 18/6. Post 9d.

WEARITE De-fluxer, 50/-. Post 1/3.
Full tape list including special offers of standard tapes available free.

LOUDSPEAKERS

	Cash Price	Deposit	Hire Purchase Mthly/Pmts.
GOODMAN'S			
Axiom 110, 10"	£5. 0. 0	£1.10. 0	3 of £1. 6. 8
Axiom 112, 10"	£8.10. 0	£1.14. 0	6 of £1. 6. 0
Axiette, 8"	£6.12. 1	£1. 7. 1	6 of £1. 0.10
Axiom 300, 12"	£11. 5. 9	£2. 5. 9	12 of 16/8
Axiom 400, 12"	£16. 1. 0	£3. 4. 0	12 of £1. 3. 7
Audiom 60 Bass, 12" ..	£9.12. 9	£1.18. 9	12 of 14/6
Trebax Tweeter ..	£6. 4. 0	£1. 5. 0	6 of 19/10
CX5000 Cross-over unit	£1.19. 0	—	—
WHITELEY			
HF1016, 10"	£7.12. 3	£1.11. 3	6 of £1. 3. 6
HF1012, 10"	£4.15. 0	£1.10. 0	3 of £1. 5. 0
HF816 8"	£6.10. 6	£1. 6. 6	6 of £1. 0. 8
T816, 8"	£6. 3. 9	£1. 3. 9	6 of £1. 0. 0
T10 Tweeter	£4. 4. 0	£1. 4. 0	3 of £1. 3. 4
T339 Tweeter	£1.13. 3	—	—
CX3000 Cross-over unit	£1.10. 0	—	—
CX1500 Cross-over unit	£1.18. 3	—	—

OUTPUT TRANSFORMERS

GILSON
W0696A, W0696B, 50/6, post 2/-. W0710, W0710/8K, 55/6, post 2/- W0892, 62/3; W0767, 27/-; post 1/6.

PARTRIDGE
P3667, 52/6, post 2/-; P.4014, 98/6; P4131, 60/-; P3591A, 99/-; P5202, P5203, 95/-.

PARMEKO. P2641, 27/-; post 1/6.

ELSTONE. OT3, 25/-, post 1/6; OT/ML, 45/-, post 2/-.

ELLISON. OPT64, 20 watt P-P Multi-ratio, 30/-, post 2/-.

AMPLIFIER KITS

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". 9/5. GEC 912. 4/6. All post free.

HIRE PURCHASE TERMS

are available on any item. Repayments may be spread over 3, 6 or 12 months. Details as follows: Three months: Deposit 6/- in the £. Service charge 5 per cent but minimum charge of 10/-. Six and Twelve months: Deposit 4/- in the £. Service charge 10 per cent. but minimum charge 20/-.

TERMS OF BUSINESS

Cash with order or C.O.D. We charge C.O.D. orders as follows. Up to £3, minimum 2/6. Over £3 and under £5, 1/6. Over £5 and under £10, 1/8. Over £10, no charge. **Postage extra on CASH orders under £3.**

Practical Wireless

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Contents

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.*

OUR FREE BLUEPRINT

LAST month we announced the P.W. "Pocket Superhet" and on page 608 of this issue we present the first article on the receiver. The article is illustrated with large, clear, half-tone pictures which will be of great use when the receiver is being constructed. The free blueprint of the set contains large, clear diagrams—of the circuit, and above- and below-chassis wiring—and a list of parts required to build the receiver.

The circuit of the Pocket Superhet is designed to cover both medium and long waves; this provision, while introducing wavechange switching is essential for those readers living outside the reception areas of the medium wave Light Programme transmitters. The circuit used is for the most part conventional except that the coupling to the base of the first-transistor is by means of a coupling winding and tapping on the L.W. coil, thus avoiding the additional switching often used. The input, or mixer, stage is followed by two I.F. stages to achieve high sensitivity. A crystal diode is employed as the detector which feeds the driver stage. The output circuit is of the push-pull type and gives more than sufficient output for most purposes. An efficient AGC circuit is included in the design so that the large sensitivity is only used for weak stations.

The performance of the set is excellent and is comparable with many commercial designs. A prototype was exhibited at the Radio Show and was admired by many readers who visited our stand. The attractive plastic cabinet in which the receiver was housed gave rise to many favourable comments. It ensures that the completed set has a truly professional appearance. On page 638 of this issue, you will find details of a special gift offer. For only 6s. 6d. you will be able to purchase a case complete with a dial and a chrome-plated handle.

In this month's article, the principal constructional details are given, and with the aid of the blueprint, even those comparatively new to radio construction should find little difficulty in building the receiver. In the second article, next month, the procedure for testing the set will be described and complete information will be given on how to align the R.F. and I.F. sections.

We are sure that this design will prove very successful; therefore be sure to order next month's issue well in advance, for the demand for the second part of the article will be great. The demand for the plastic cases will also be great; be sure to order yours quickly.

A FILM SHOW

ANOTHER film show has been arranged in collaboration with Mullard Ltd. It will be held at Caxton Hall, Westminster, and readers are invited to send for their free tickets which are now available from these offices. The films will be shown on Friday, January 13th, 1961, and the programme will begin at 7.30 p.m. When applying for tickets, enclose a stamped addressed envelope (at least 3½ ins. x 6 ins.). Mark your envelope "Caxton Hall" in the top left-hand corner.

Our next issue, dated December will be published on November 4th

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 July, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	Total
London Postal	769,776
Home Counties	725,181
Midland	535,071
North Eastern	586,732
North Western	497,057
South Western	432,344
Wales and Border Counties	260,578
Total England and Wales	3,806,739
Scotland	443,355
Northern Ireland	130,900
Grand Total	4,380,994

Thailand Communications

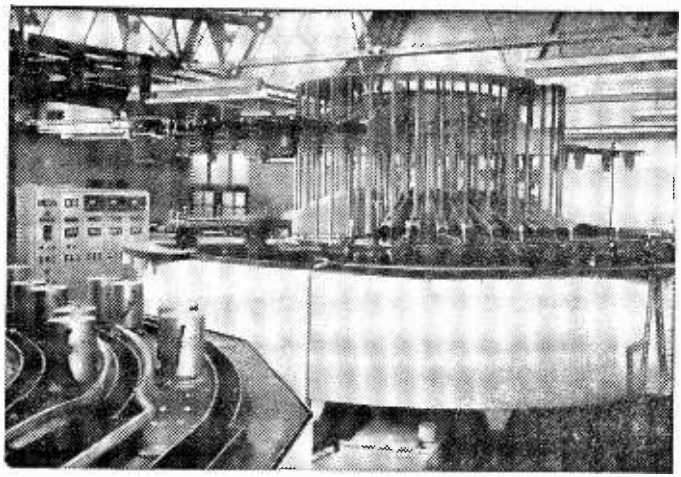
TWO guests were received by Associated Electrical Industries during September, both from Thailand. They were Lt.-Gen. Phachirn Nimibutr and Mr. Chamroon Vajrabhaye. Anticipating swift growth of Thai telecommunication systems, they chose to examine the research and manufacturing resources of Great Britain. Telephone exchange installations were inspected between visits to A.E.I. laboratories.

Thailand's public telephone systems are rapidly expanding, especially around the capital city, Bangkok. Already a £500,000 contract has been awarded to A.E.I. which will bring into operation another 10,500 telephone lines.

Picturesque Bangkok, and ten other Thai towns, will soon be able to boast of automatic telephone exchanges of a modern design that will clash boldly with the ancient temples of Siam.

URSI Meeting

REPRESENTATIVES from Russia and America joined with delegates and observers from 27 countries at a general meeting of the International Scientific Radio Union (URSI) held recently in London. The press and television organisations were admitted to allow the public to hear about some of the discussions on radio studies into space research, which was the subject of the meeting.



The illustration above shows the interior of the new factory at Borehamwood of Printed Circuits Ltd. This is a result of a programme of complete reorganisation started eighteen months ago.

New Automatic Factory at Borehamwood

EIGHTEEN months ago a programme of complete reorganisation of Printed Circuits Ltd. began. Included in this programme was the building of what is now one of the largest and most modern factories of its type in the world. Automatically printed circuits, industrial nameplates and instrument panels will be produced on two etching and anodising machines which are of a completely revolutionary design.

Two years of research and development have gone into making this method of production unique. So new is this process that human handling has been eliminated throughout the whole operation. This factory has been completed in association with Millet Levens Ltd., of Borehamwood.

Radio Hobbies Exhibition

FOR the amateur radio enthusiast, a noteworthy event of the autumn will be the International Radio Hobbies Exhibition at the Royal Horticultural Society's Old Hall, Westminster. Home-constructed equipment of all descriptions will be on show and will be demonstrated.

As usual the Radio Society of Great Britain, which sponsors this annual event, will award prizes for outstanding examples of completely amateur equipment.

Most of the commercial exhibits will be kits and components for the home constructor, rather than already assembled apparatus. The Radio Clubs of the Armed Forces will show the latest communications equipment issued to them as well as equipment built by themselves. Technical books and journals will be on sale.

The show, which takes place from November 23rd to 26th, will be open from 11 a.m. until 9 p.m. daily.

Indian Pipeline Project

FOR Murphy Radio Ltd. a £1,000,000 contract with Oil India Private Ltd. has recently been secured. An extensive V.H.F. radio network is to be formed in North Eastern India. Starting at a point 100 miles south of the Nepal border, a radiophone link system will follow the route of the oil company's pipeline over 700 miles of terrain which was previously considered impossible and uneconomical to transverse with such means of communication. At intervals of about 30 miles along the eastward-bound net-

work, Murphy radio stations will be installed to give a total of 36 communication channels along the pipeline route. These radio stations will be close to pumping houses so that oil-flow statistics as well as speech may be relayed easily along any one of these channels.

Parametric Amplifier

RECENTLY developed by Marconi's for use with their range of 50cm radar is a parametric amplifier. A fully coherent pump frequency is incorporated and the tube itself and its solenoid are manufactured by the English Electric Valve Co. (also of Chelmsford), Marconi associates within the English Electric Group of Companies.

Aircraft Test Bed for Electric Equipment

A MIRAGE IV jet aircraft carried a Marconi Döppler navigator at twice the speed of sound recently, while testing this piece of equipment. The Générale Aéronautique Marcel Dassault, who have recently ordered this type of navigating equipment, were testing its accuracy under conditions likely to be experienced in their aircraft.

Student's Visit to Sweden

FOR 27-year-old post-graduate student John Beal, B.Sc., next month sees the beginning of an educational visit to Sweden. Sponsored by the journals, "British Communications and Electronics", "British Power Engineering" and "Nuclear Engineering", he will visit various Swedish research establishments.

Travelling Wave Tube

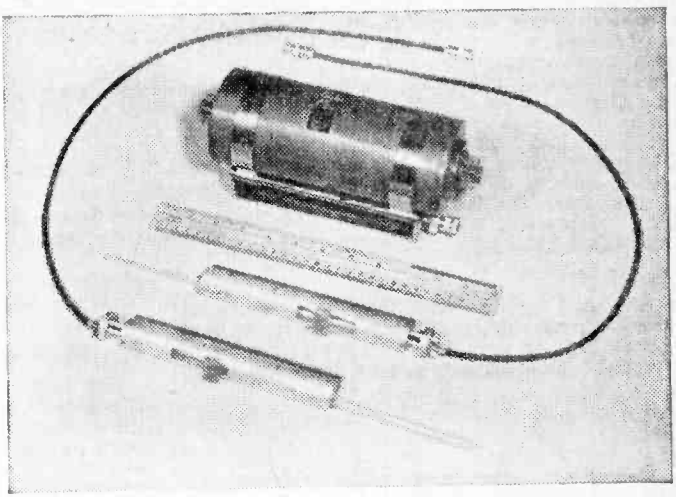
A CONTRACT worth 2 million dollars for the supply of Travelling Wave Tubes to The Radio Corporation of America has been awarded to Mullard Ltd. These tubes are intended for use in a new multi-channel radio communication system.

A travelling wave tube is a special type of electronic valve providing useful wide-band amplification at frequencies well beyond those at which conventional valves can function successfully. Mullard have extensive experience in the development of these and other special types of electronic tubes for communications systems.

The tubes to be supplied to R.C.A. were, in fact, developed by Mullard Research Laboratories and will be manufactured at the Company's Transmitting and Microwave Valve Plant at Waddon, Surrey. First shipments are expected to be made in May 1961.

£250,000 Contract for Solartron Oscilloscopes

CONTRACTS totalling £250.000 for the supply of Solartron Oscilloscopes to the Admiralty and Ministy of Aviation have been awarded to Solartron Laboratory Instruments, Ltd., a subsidiary of the Solartron Electronic Group Ltd., Farnborough. The oscilloscopes are the Solartron Double-Beam Oscilloscope Type CD. 711S.2, the Precision Measuring Oscilloscope Type CD. 643S.2, and the General Purpose Oscilloscope Type CD. 5235.2.



A parametric amplifier for use with their range of 50cm radar has been developed by Marconi's. The above illustration shows the parametric amplifier tube and solenoid with associated baluns (balance-to-unbalance transformers) and coaxial lines.

Mechanical Handling Exhibition

THE next Mechanical Handling Exhibition — the world's largest display of all classes of industrial labour-saving and ancillary equipment—is to be held at Earls Court, London, England, from 8 to 18 May, 1962.

It will be the eighth in the series of this biennial exhibition which started in 1948. Its growth, both in influence and attendance, reflects the spectacular development of industrial mechanisation in recent years. Over 300 firms displayed their products at the 1960 exhibition, occupying 500,000sq. ft of space within the hall and extending into the forecourt to provide a spacious outdoor demonstration area.

Record numbers of visitors came to the 1960 show and placed orders amounting to millions of pounds. Overseas visitors, 45 per cent greater in number than on any previous occasions, came from 77 different countries.

First Electronic Newspaper

A BEACONSFIELD man, 44-year-old Mr Cyril Gee, of Hogback Wood Road, recently made newspaper history.

He is the managing editor of Europe's first newspaper devoted to electronics—one of the world's fastest-growing industries.

Titled "Electronics Weekly", the new 24-page newspaper was launched by Heywood and Company at a Savoy Hotel, London, reception on September 6.

Mr. Gee is well- known as founder-editor of "British Communications and Electronics".

His new venture, "Electronics Weekly", will cover the scientific, technical, commercial, economic, financial and statistical aspects of electronics.

Radio Construction for the Beginner

No. 2—A SIMPLE CRYSTAL RECEIVER

By D. B. Kidd

EVERY beginner should try to acquire, as soon as possible, a knowledge of the symbols used in the theoretical drawings of circuits. These are conventional signs which have evolved from pictures of the components, and save time and trouble in electrical diagrams and illustrations.

Electrical Notation

All the symbols which should be memorised first by the beginner appear in Fig. 1(a) and this diagram should be carefully compared with Fig. 1(b), which is a practical form of the same circuit. This illustration shows the proposed layout of the parts as described in the first instalment of this article. It need not be followed too precisely; in fact, the receiver, like most circuits, will work in any sort of physical arrangement, provided the electrical connections are a true likeness of the original.

Fig. 1(b) does not show an actual aerial or earth, but this receiver, whose only source of power is the minute amount of current set up in the circuit by the transmitter many miles away, will only function with a good aerial and earth.

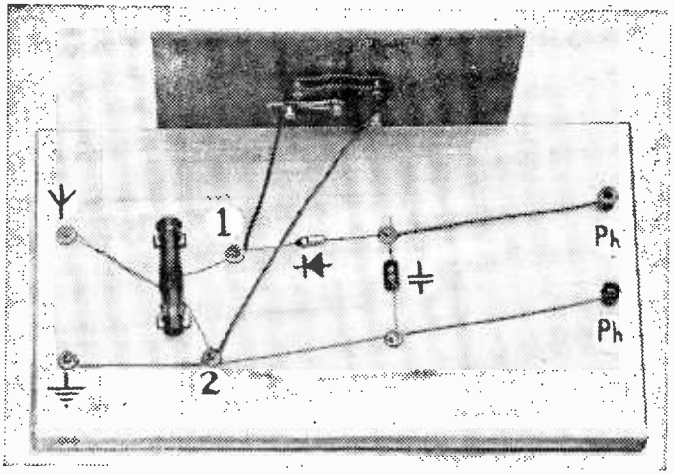


Fig. 1(b).—Practical layout of the circuit in Fig. 1(a), with the symbols corresponding to the parts indicated.

The Aerial

A "good aerial" need only be a length of strong copper wire, preferably insulated, as long and as high as possible. The great majority of "crystal" receivers use a wire from the house

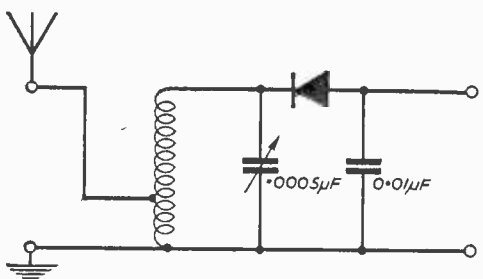


Fig. 1(a).—Circuit of the simple crystal receiver.

window to some high object (a pole, a tree or the top of another building). It is important that the wire should not make electrical contact with anything between its far end and the point where it is coupled to the receiver. With modern plastic-covered wire, this warning may be safely ignored, but if bare wire is used for the aerial, the following simple precautions should be taken.

The far end of the wire should not be tied directly to its support. Instead, it should be tied to a foot or two of non-conducting material (nylon fishing line is perfect, but waxed string will do), and this in turn tied to the support. Where the wire passes into the house, a short length of plastic sleeving should be slipped over it at any point of contact with walls, window frames, sills, etc.

The Earth Line

The earth line consists of a length of stout copper wire leading, as directly as possible, from the receiver to the ground. It should be anchored there by soldering (or bolting tightly with a brass nut and bolt) to a fair-sized metal object. A copper rod or tube is ideal, but a large tin-can, filled with soil and buried completely works very well.

Beginners who cannot arrange an earth line of this sort need not despair. A stout copper wire led to the nearest *cold* water pipe will nearly always give a good earth connection, provided the bared end of the wire is tightly bound or clamped to clean metal. Any paint or corrosion can easily be removed with a file or coarse sandpaper from an inch or so of the pipe and contact may then be made satisfactorily. Provided the earth line is a good one, indoor aerials will sometimes work.

Assuming the reader has solved these problems and has also acquired a pair of high impedance headphones, the parts listed in the last instalment may now be mounted on the board.

Mounting the Tuning Condenser

The variable or "tuning" condenser should be fixed to the panel by boring a hole, $\frac{1}{4}$in. in diameter, in the centre of it. The threaded bear-

ing should then be passed through the panel and secured by the nut provided. A knob is fitted tightly to the spindle. If the reader is using an old air-spaced condenser, he will have to make his own arrangements for fixing it somewhere on the board. The air-spaced type are generally considered superior in performance and for the beginner they have the added advantage of showing the opening and closing effect of the vanes. This is almost impossible to observe in the solid dielectric type.

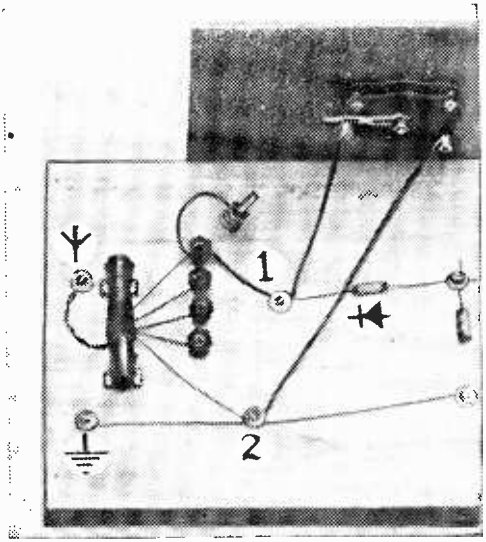


Fig. 2(a).—A modified circuit with tappings on the coil.

For this receiver, six brass woodscrews and washers will be required in the construction. They should be set out as shown in Fig. 1(b), after the washers have been burnished on both faces with the "flour" grade glasspaper. Lengths of connecting wire are now measured as required and the last half-inch or so bared and curled clockwise round the screws beneath the washers. Provided the washer has been well burnished, this method of wiring results in a contact resistance of only a fraction of an ohm. If more than one wire is clamped at the same point the pressure is less and the resistance rises somewhat, but is still very small. If a screw fails to grip easily, a new place should be found for it immediately, as low pressures lead to hidden resistances and poor contacts.

The tuning condenser used is provided with two small nuts to secure the ends of the wires. These should be tightened very firmly, using a pair of pliers if necessary.

The two terminals on the right of Fig. 1(b) are small hexagonal sockets, obtainable from a well-known chain store. They will fit tightly into two $\frac{9}{64}$in. holes drilled in the board. As $\frac{9}{64}$in. is perhaps an awkward size of drill, the reader may care to use a $\frac{1}{4}$in. drill, then enlarge the hole slightly. The bared end of each connecting wire is passed through the slot in the threaded brass tube and the plastic portion screwed down on to it. These sockets will accommodate any small wander plug, and if the headphones are not so equipped, a couple of these will have to be procured and fitted.

The position of the various components should be clear enough from Fig. 1(b), the smaller ones being labelled as an additional help. It does not matter which way round the crystal diode is mounted in this circuit, though in some circuits it is critical.

Winding the Coil

All that remains to be done now is to wind the coil and fasten the aerial and earth leads to the two screws on the extreme left of the board. In order to save coil wire and space, and to guarantee a fair performance, the coil is wound on a ferrite core which may be any scrap of ferrite rod at least $1\frac{1}{4}$in. in length.

All the coils mentioned in this series will be "pile wound"; that is to say, the turns will be restricted to a small length of the core, in this case the middle half-inch of the piece of ferrite. A small piece of $\frac{1}{2}$in. wide adhesive cellophane tape is wrapped round the middle of the ferrite and will act as a guide in winding the coil and none of the turns should be allowed to stray outside this band. Leaving six inches or so free to connect with, the coil wire is now wound on to the guide band, the first turn being trapped by the succeeding turns as soon as possible. After 15 turns, wound with an even tension, have been completed, a loop about three inches long should be twisted in the wire near the core, then winding recommenced. This loop is to form the aerial "tapping" as shown in Figs. 1(b) and 1(a). A further 45 turns (60 turns in all) are wound in the same way, then the coil wire is cut, leaving about 6in. to spare. The windings are secured with another band of Sellotape wrapped on very tightly.

The enamel must now be removed from the ends of the three wires. This is best carried out by drawing the ends gently through a small piece of the "flour grade" glasspaper, folded with the rough surface inwards. When the ends of the three wires appear bright from all points of view they can be connected, the beginning of the coil going to the screw labelled (2) in the illustration, the end of the coil to (1) and the "tapping" loop to the aerial screw (top left).

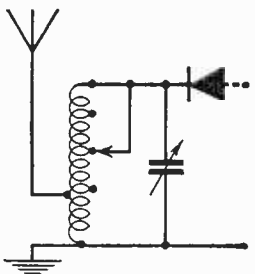


Fig. 2(b).—The theoretical circuit corresponding to Fig. 2(a).

The Completed Set

When the aerial and earth leads have been connected, and the ends of the ferrite rod secured in the two small tool-clips previously listed, the receiver is complete. On plugging in the headphones and turning the tuning knob medium-wave stations should be heard.

The reader is now in a position to carry out a few experiments with the receiver. First, the total

number of turns can be altered. The number of turns chosen, namely 60, is adequate for coverage of the medium waveband using a piece of ferrite 1½in. long. As the length of the ferrite rod increases, so the number of turns needed becomes less, falling to about 45 turns by the time an 8in. length is reached. By increasing the number of turns the average wavelength which can be received will lengthen roughly in proportion to the number of turns. An application of this rule is as follows:—

The centre of the medium waveband is about 280m and the middle of the long waveband is about 1,376m, that is, about five times as large. So if 60 turns gives a correct medium waveband covering, then $5 \times 60 = 300$ turns will be about correct for a long waveband coil.

A Multi-Band Receiver

A multi-band receiver can easily be constructed by making a number of tappings on the coil, then "shorting out" those which are not wanted for tuning. Fig. 2(b) shows this in diagram form and Fig. 2(a) as a practical layout.

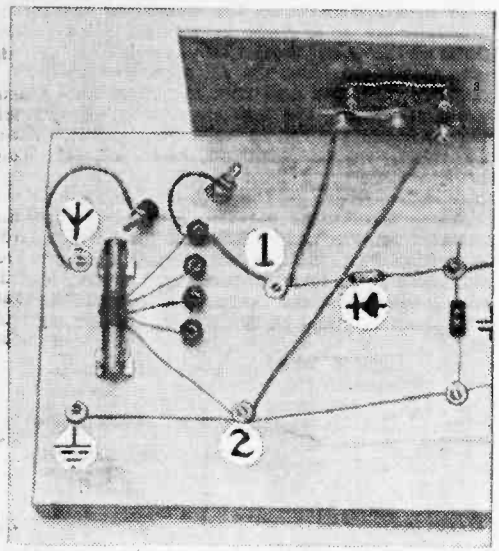


Fig. 3(a).—The modified receiver with tappings for both diodes and the aerial.

Four extra sockets are arranged as shown, the beginning of the coil going to screw (2) as before and the 15th turn to the aerial in the form of a looped "tapping" as previously described. Other tappings go to the lower three sockets and the end of the coil to the uppermost socket of the row. This socket has a length of wire with a "free" plug attached, and is also joined by a wire to screw (1) as labelled. Different wavebands are selected by plugging into one of the four sockets.

As tuning condensers of the ordinary sort tune over a range of roughly 3 : 1 in wavelength, the tappings are best arranged by multiplying sucessively by this number. For instance, if the first tapping chosen is 20 turns, then the second socket up should be connected to a 60-turn tapping (20×3), the third up to a tapping at 180 turns (60×3), and the uppermost socket to the end of the coil at 540 turns (180×3).

Beginners can gain valuable experience by listening carefully on a number of wavebands in this way, especially after dark. A paper disc stuck on the panel behind the pointer knob can be used to mark the points at which various stations were heard. These can be inked in four colours, corresponding to four differently coloured sockets.

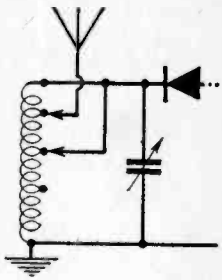


Fig. 3(b).—Theoretical circuit corresponding to Fig. 3(a).

The aerial tapping has been given as 15 turns from the earth end (beginning of the coil), but this tapping is best determined by experiment. The choice of an aerial tapping will decide the loudness at which the station is heard (i.e., the receiver's sensitivity) and the ability of the set to separate stations (i.e., its selectivity). For such an experiment, a row of sockets is arranged as before, connected to various tappings on the coil. Into these sockets a "free" plug, on a length of wire from the aerial screw, is inserted. There is no reason why one single row of sockets should not be used for both plugs, and Figs. 3(a) and 3(b) show just such an arrangement, the tappings being shared by both the waveband plug and the aerial plug. Owing to the special form of these wander plugs, both may occupy the same socket at any moment, one plug fitting into the other, three deep.

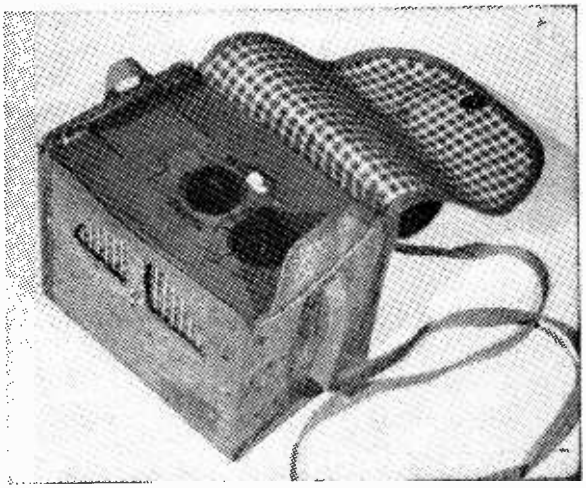
In conclusion, the writer would like to point out that these experiments should be regarded as starting points. The next instalment will describe the construction of a one-transistor, dual-waveband receiver, using the same mechanical contact techniques.

(To be continued)

CAMERA CASE PORTABLE

A SMALL, SENSITIVE SIX-TRANSISTOR SUPERHET

By F. N. Hart



The completed receiver.

IN order to accommodate a larger loudspeaker than those usually found in pocket transistor radios (and thereby obtain better quality reception), this set was designed to fit into a camera case made by a well-known British firm. It is 5in. wide x 4⅛in. deep x 3½in. front to back. It is made of an attractive plastic and has a shoulder strap.

The inside of the case has to be reinforced (except for the front) with cardboard stuck on with a contact adhesive.

Preparing the Case

Two pieces of the case are cut out, above the press stud, to form an opening, so as not to impede the sound. The edges are then folded in and stuck with the adhesive.

The loudspeaker baffle is of $\frac{3}{16}$in. three-ply. It is cut to the shape of speaker, leaving a "cross" of the wood in the middle so as to withstand pressure from the press button when the lid is closed. These apertures are covered with a piece of thin "baffle" covering material to match the case. Drill and cut the baffle as in Fig. 3.

The top panel is of thin bakelite, fixed partly by an angle bracket to the chassis, and partly held by the tuning condenser, which is already drilled to take screws, both in front and in the bottom.

The Chassis

The chassis is made of bakelite drilled so that threaded brass rods can hold the 'speaker rigidly 2½in. from the chassis at the bottom. The top panel and chassis can be joined as soon as the components are assembled on them, but the loudspeaker and baffle should be left until all the wiring is completed except for the two leads from the output transformer.

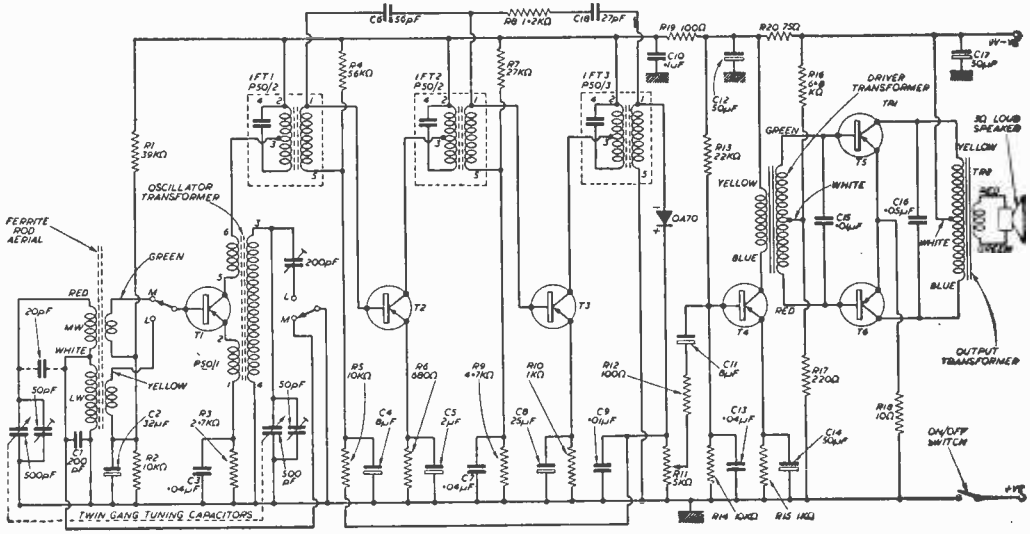


Fig. 1.—The circuit diagram.

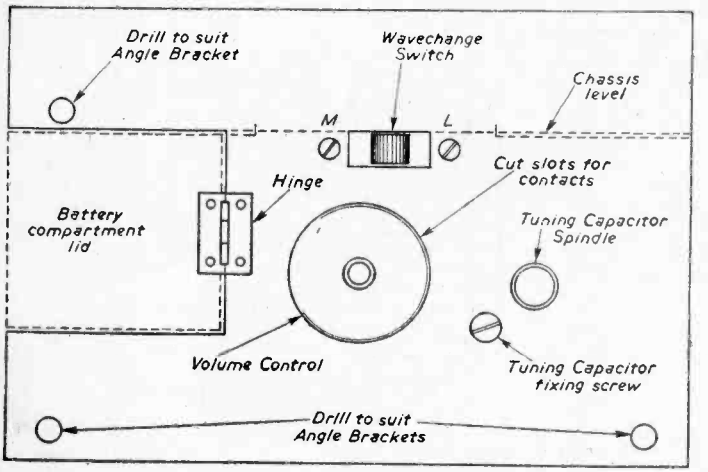


Fig. 2.—The top panel of the receiver.

The top panel (Fig. 2) is now cut and drilled, leaving a square space to the left, for the lid of the battery compartment. This is 1½in. square, and if the piece is cut out with a fine saw, it may be used as the lid, being held by a small brass hinge. The chassis and lid are drilled to take very small screws or rivets. The slot and screw-hole for the slider switch must now be drilled, counter-sinking all the screws on the panel so that they are hidden. At this point the panel may be covered with a coloured adhesive material.

Drill the slots to take the four lugs of the volume control switch, which are mounted by bending them over outwards from the centre. Make the hole for tuning condenser spindle.

Mounting the Components

Now drill the chassis and cut a space in the front to allow room for the wave-change switch which is mounted on the top panel. Also cut the apertures for the six transistor holders and stick them in place with a quick drying adhesive. The oscillator and I.F. coils are the first to be put on the chassis, and then the tuning condenser is mounted taking care to see that the fixing hole in the front coincides with that on the panel.

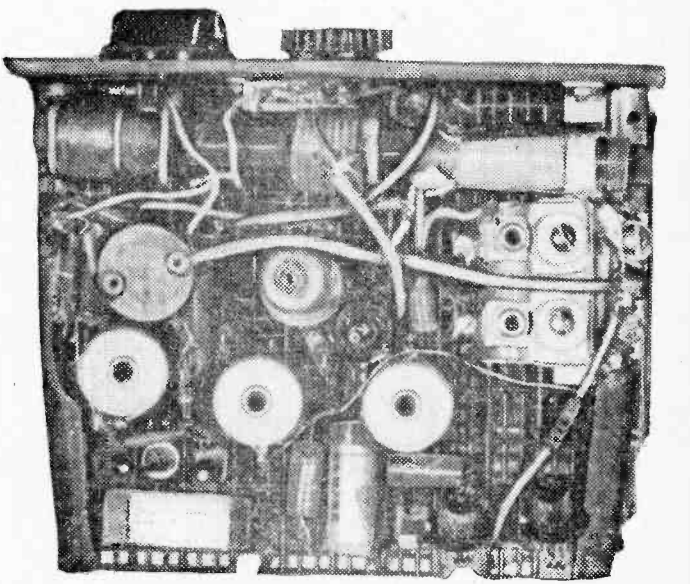
It is advisable, from time to time during assembly, to attach the top panel to the chassis to see that components do not foul one another, and that holes coincide with their respective brackets, etc.

After seeing that the aerial will fit into its place on the holder, put it on one side until later. This holder is made from a piece of coil former or composition tube. It is packed with a grommet or a piece of rubber. The tube is held to the chassis by a small wood screw.

The I.F. cans each have two holding lugs which are passed through the chassis and bent over, forming soldering lugs. The earth bus-bar can be soldered to them as early as possible to secure them.

The oscillator coil, having no "can", must be an accurate fit and is only held in place by its soldering pins, but it can be secured by a small dab of adhesive, taking care not to get any on the pins and so impede soldering. These components are actually intended for printed circuits, but provide no difficulty when soldering. After the coils and transistor holders are attached, the trimmer gang can be screwed in place: one of the screws bearing a soldering tag. The padder condenser is left until the first and second I.F. transistor holders are completely wired, but it is supported in place by an angle bracket, held by a screw through a spacing bush of insulating material. For this reason it is as well to remember its position when soldering the holders. For safety it is a good idea to put a dab of nail varnish or paint on the collector side of these holders to ensure that the transistors are not inserted the wrong way round.

Solder the earth position connections to the cans and the tuning condenser soldering lug on to its fixing screw and to the trimmer gang. It is most important that a very good earth is maintained. In fact to ensure stability, not only is a bus-bar from the can lugs on the back needed, to which all the earth ends of condensers and resistors are



Above chassis wiring.

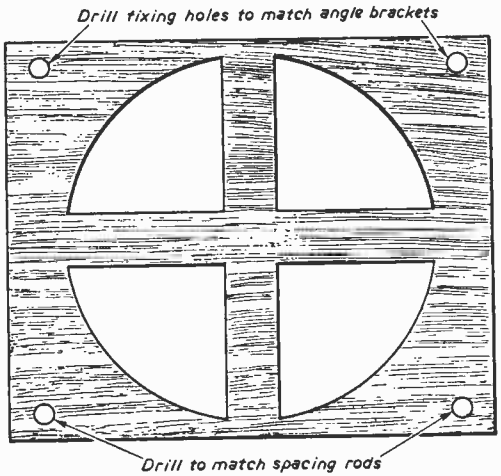


Fig. 3.—The loudspeaker panel.

fixed, but another earth line must be soldered to each can on the top side of the chassis.

The leads from C2, C3, C7, C8, C13, C14, pass through the chassis, and R3 and R9 are mounted vertically to save space. R18 has one lead passing through to join the emitters of transistors T5 and T6, the other end going to the trimmer earth lug. R6 is mounted on top of its blocking condenser C5 (2μF). The remaining resistors and condensers are mounted and soldered on the inside.

When the battery compartment (Fig. 5) is firmly stuck, the I.F. transformers can be mounted. They have at each end, a lug which should be pushed through slits cut in the cardboard and bent over. A four tag soldering bar should be stuck on to the bottom or secured with a short screw, taking care it does not protrude inside and interfere with easy insertion of the battery.

Solder the positive and negative wires first, as they should go flush against the chassis to leave room for leads to resistors and condensers, and solder the earth ends of these components. In the model, the earth ends of C4, C9, and C10 are soldered direct on to the bottom of the tuning condenser, but care must be taken to ensure a clean joint by scraping it well. Leads can be anchored where necessary by passing them through twice and soldering, when using the loudspeaker fret as chassis.

From time to time, when soldering, make sure that the loudspeaker on the baffle does not foul anything. As a precaution against any shorting, cover the metal part of the magnet case with Sellotape. Now mount and solder the padder.

COMPONENTS LIST

Ferrite Rod 4in. Long. M. W. Coil FRM2 (Teletron).
L. W. Coil TL (Teletron).
2-gang tuning condenser (365pF).
2 Trimmer condensers (60 + 60pF).
1 Padder condenser (200pF).
1 Oscillator Coil P50/2.
2 I.F. Coils P50/2 (Weymouth).
1 3rd I.F. Coil P50/3.
1 Driver Transformer DI31 (Ardente).
1 Output Class B Transformer DI32 (Ardente).
1 Slider Switch D.P.-D.T. and holding screws.
Battery 9V PP6 Clips.
Resistors and condensers as in circuit.
Transistors.
1 Ediswan XA104.
2 Mullard OC45.
1 Red Spot XB104.
2 Matched XB104 or 2 matched OC72 Mullard.
1 Diode OA70 Mullard.
1 sub-miniature volume control (5k) with switch (hearing aid type).
Top panel mounting.
3½in. 3Ω loudspeaker (Elac).
Kodak camera case No. 912.
1 tuning knob.
22 s.w.g. wire, sleeving 4 colours.
Paxolin: 4¾ x 3¼ x $\frac{1}{16}$in. (for panel).
Paxolin: 4⅛ x 3⅜ x $\frac{1}{16}$in. (for chassis).
4 small single-hole brackets: ¼in. wide and ½in. each arm.
1 piece $\frac{3}{16}$in. three-ply 4½ x 3⅜in. for baffle.
Small brass hinge for battery compartment lid.
4 rivets or small screws for the hinge.
Adhesive plastic sheet.
Thin L.S. covering material (4½ x 3⅜in.).
2 brass threaded rods with brass nuts (8) 2½in. long.
Sundry small screws and nuts.
1 coil former or composition tube to fit ferrite rod at centre.
6 transistor holders.
1 small 4-tag soldering strip and 2 or 3 separate tags.
Sellotape.

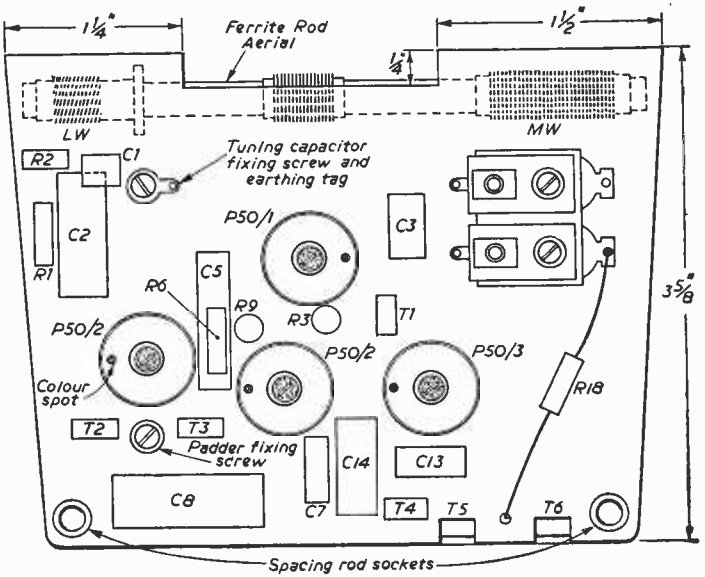


Fig. 4.—Above chassis layout.

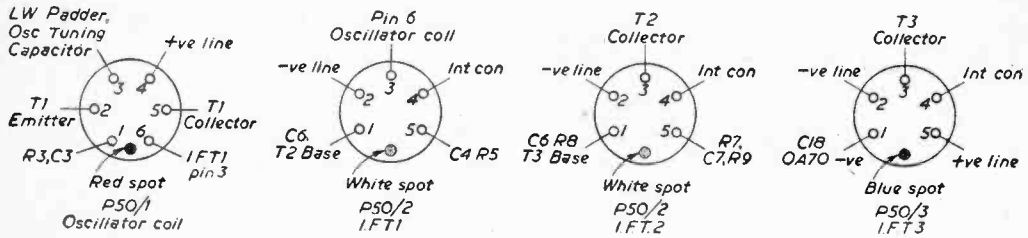


Fig 6.—Coil connections.

Resistors R4, R5, R7, R13, R19, and the positive end of the diode, are the last to be mounted and soldered. Insert the ferrite rod into the holder. Slip on the coils and solder the leads.

Solder on the battery leads, making sure that they are long enough to allow for the battery to be inserted after the clips have been put on. The surplus is tucked in under the lid.

Testing

When the set is ready for testing, see that the loudspeaker and baffle fit neatly into position. Then remove the spacing rods leaving only the left-hand, front, angle-bracket, fixing screws holding the baffle to the panel. Now provided that enough lead is left loose from the output transformer after soldering, the loudspeaker can be moved freely.

Insert transistors into their holders, and ensure that the battery switch is off and the wave change switch on the medium wave. Now switch on.

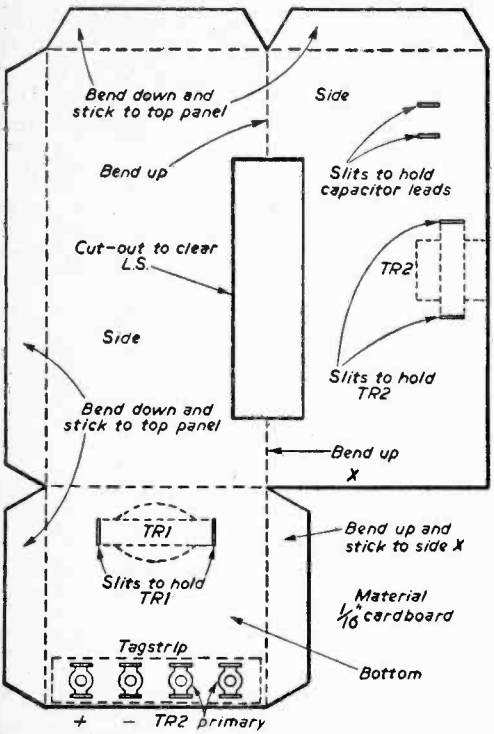
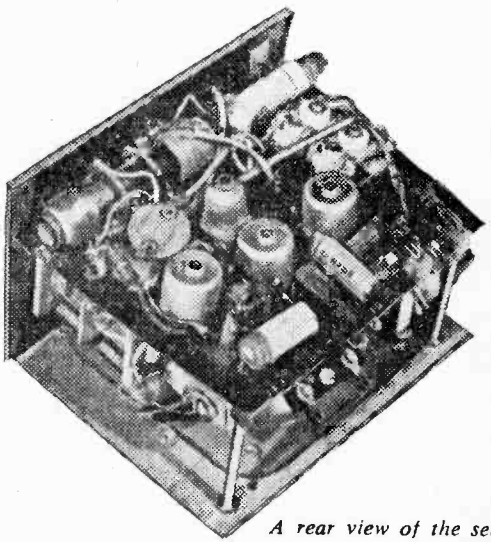


Fig. 5.—The battery compartment.

The coils are pre-set by the makers and should only need a slight adjustment when a station is heard. Turn the set, when the signal is powerful, to the position of weakest reception, thus preventing automatic gain control masking effects of adjustment.

Normal trimming practice is used, moving the aerial coil to the strongest position on the lower frequencies, and adjusting the trimmers for the highest.



A rear view of the set.

If there is any instability when the intermediate frequencies are in harmony, the neutralising chain C6, R8, C18 needs variation. The coil makers specify a resistance about 2·7k between base of T2 and C6, but this was found to be unnecessary. Variation of the values of these resistors should clear up the instability. In the model, however, an extra heavy earth lead from the trimmer to the tuning condenser was needed.

Long Wave Adjustment

The long-wave adjustment is easy, but if near a powerful medium wave transmitter, there may be some break through, on to the long wave band, and care should be taken that this is not being used for adjustment purposes.

When testing is finished, switch off and remove the battery. Fasten the loudspeaker baffle to the remainder of the set and carefully insert into the case. Replace the battery and the set is ready for use.

Selecting Output Transformers

CALCULATING THE TURNS RATIO

By J. Gray

FOR proper results, the output transformer used to couple the speaker to a receiver or amplifier should be of the correct type. Choosing a transformer for this purpose need not present any difficulty when the method of finding its ratio is known, as it is on this point that an error is most likely to be made.

Most loudspeakers have an impedance of only a few ohms, while the optimum load (or best anode impedance for a valve) is usually several thousand ohms. To obtain an impedance match from valve to speaker, a step-down transformer is therefore required. The primary, or large winding, is connected from anode to high tension positive, as in Fig. 1, and the secondary is wired to the speaker.

The transformer ratio can be found by dividing the optimum load of the valve by the speaker speech coil impedance, and finding the square root. That is:

$$\text{Ratio} = \sqrt{\left(\frac{\text{Optimum Load}}{\text{Speaker Impedance}}\right)} : 1$$

As an example, assume the optimum load for the output valve is 5,000Ω, and the ratio to match a 2Ω speaker is to be found.

$$\sqrt{\left(\frac{5{,}000}{2}\right)} : 1 = \sqrt{(2{,}500)} : 1 = 50:1$$

The required ratio is thus 50:1.

The optimum loads to be used with various output valves are listed by the valve manufacturer. Speaker manufacturers also give the impedance of their speakers, and the correct transformer ratio can thus be worked out.

For all ordinary purposes, the ratio is not highly critical, and good results will be obtained with a transformer having a ratio fairly near that actually needed. But a very great departure from the correct ratio should be avoided, because the quality of reproduction will begin to fall.

The optimum load depends to some extent on the anode voltage, and is usually given for a typical voltage. To avoid the need for calculation, Table I (overleaf) may be used. This shows popular battery and mains output valves, the anode voltages at which they would most likely be used, and the optimum load and transformer ratio for 2 to 3Ω speakers and 15Ω speakers. It is thus only necessary to look up the ratio required for the valves listed in the table.

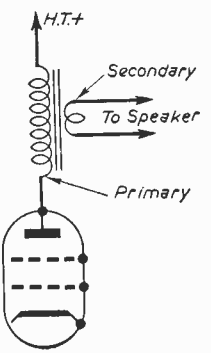


Fig. 1.—Single output valve with speaker transformer.

It will be observed that a possible cause of mismatching can arise if a 2/3Ω speaker is used instead of a 15Ω model. Very many speakers are of approximately 2/3Ω impedance, but numerous models of other impedance are also made. It is thus wise to ascertain the speaker speech coil impedance, especially with miniature speakers, large "quality" units, or any other type of reproducer where the more usual 2/3Ω impedance may not be used.

Push-Pull Circuits

When two valves are used in a push-pull circuit, a centre tapped transformer is required, as shown in Fig 2. The optimum load impedance for the complete stage may then be given as from anode to anode. For example, if each valve, used alone, had an optimum load of 5,000Ω, the anode-to-anode impedance, with the valves working in the same way but together in push-pull, would be 10,000Ω. The total ratio of the transformer would thus be twice that of the circuit in Fig. 1, so that each valve would have the same load, with only one-half of the primary.

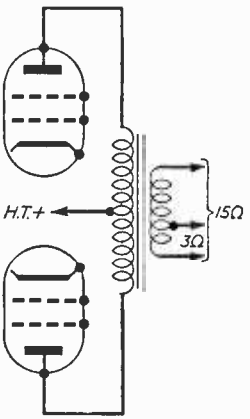


Fig. 2.—Push-pull output and optional speaker tappings.

With valves in push-pull, the actual load depends on operating conditions. It is thus wise to take the figure from the maker's data, and to choose the transformer to suit.

Some transformers have various tappings, so that a number of ratios can be selected. If so, choose the tags from the maker's instructions, or use those found to give best quality and volume. There may also be optional secondary connections, as shown in Fig. 2 In this case, those used should suit the speaker impedance.

Current Carrying Capacity

With battery valves, an anode current of some 10mA or so may not be exceeded, and the transformer primary may be wound with fine wire, especially with midget components. Such transformers are not suitable for mains valves, where the anode current will often be some 30 to 60mA, in average receivers and amplifiers. For mains valves, it is thus necessary to use a larger transformer, so that the primary can carry the current which must pass. Such transformers are listed as "mains output valve" transformers; or the actual current carrying capacity of the primary may be given. For average equipment, a transformer able to carry 60mA will be large enough.

TABLE 1.
OUTPUT TRANSFORMER RATIOS.

Valve.	Anode Voltage. (V)	Optimum Load (Ω).	Ratio. 2/3Ω speaker.	Ratio. 15Ω speaker.
3V4	90	10,000	64:1	25:1
3S4, 1S4	67½	5,000	45:1	18:1
	90	8,000	58:1	23:1
6AQ5, 6BW6, 6V6, 7C5, 9BW6, 19AQ5	250	5,000	45:1	18:1
6F6	250	7,000	54:1	21:1
6L6	250	2,500	32:1	13:1
12A6	350	4,200	42:1	17:1
25A6G	180	8,000	58:1	23:1
25L6	135	4,000	40:1	16:1
35L6	200	3,000	35:1	14:1
	200	4,500	43:1	17:1

With high-power amplifiers, or any equipment using very large output valves, currents of 100mA or more may be encountered. It is then necessary to use a larger transformer to suit.

Transformer Quality

With ordinary receivers and amplifiers of popular type, the relatively inexpensive transformers will be satisfactory. But with special equipment, such as "quality" amplifiers, a particular transformer may be specified. If so, it should be used if possible, because the more expensive type of transformer may have sectional windings, balanced construction, or other features intended to avoid phase shift or other limitations of small transformers. For the same reason, where a particular ratio or component is specified in a circuit employing negative feedback, this should be followed. If not, phase shift may result in some frequencies not being at 180deg in the negative feedback loop, or the drop in effective output impedance, resulting from the feedback, may not be taken into account.

The ratios in Table I therefore apply to valves used in ordinary circuits of straightforward type, and with the valves wired for operation in the normal way—that is, as tetrodes or pentodes. If the valves are triode connected for any reason (screen grid and anode employed together as anode) then the optimum load will be reduced. A transformer of lower ratio would then be necessary.

Transformer Connections

It is worth noting that the resistance reading which would be obtained with a D.C. meter does not show what the transformer impedance is. For example, a 5,000Ω transformer may have a D.C. resistance of only a few hundred ohms, depending on the gauge of wire with which it is wound. In the same way a 2/3Ω secondary may have a D.C. resistance of only a fraction of an ohm.

D.C. readings will, however, allow primary and secondary to be correctly identified, if necessary. In the case of a surplus or unmarked transformer, such readings will also allow the relative positions of taps or a centre-tap to be located.

Flight Deck Communications System

A FLIGHT deck communications system designed to permit voice communication between a flight deck control centre of an aircraft-carrier and flight deck crews has been developed by the Telecommunications Division of The Plessey Company Ltd. on behalf of and in conjunction with the Admiralty. Normally, direct voice communication on the flight deck is impossible due to aircraft noise and to ear protectors that are worn by crew members.

This system enables the controller to transmit orders over a broadast channel at audio frequencies. The signals are fed into a magnetic coupling loop encircling the flight deck of the aircraft carrier. Crew members carry a receiver that picks up the audio signals, amplifies and feeds them to an earphone built in the ear-protector.

Key members of the flight-deck crews are able to talk back to the control centre by means of a V.H.F. radio transmitter which is carried clipped to the receiver.

Fully transistorised, the miniature portable equipment is battery operated and protected by a nylon cover.

Audio Broadcast Channel

The audio signal for the broadcast channel is selected from one of three input points: a local microphone, a remote microphone, or the talk-back channel.

After amplification by a microphone pre-amplifier, the audio signals are mixed with a signal which is used for AGC and the combined signal is fed to the power amplifier.

The receiver pick-up coil consists of a potted ferrite inductor which receives the combined audio-frequency and AGC signals from the broadcast loop.

After amplification the audio signal is separated in a low-pass filter and applied to the output stage which drives the headset.

Talk Back Channel

Talk back from the crew to control is effected by means of a V.H.F. radio link. Key members of the crew each carry a transistorised transmitter which is mechanically joined to the broadcast channel receiver.

The microphone input is amplified by two common emitter stages and fed via an emitter-follower to modulate the output of the transmitter.

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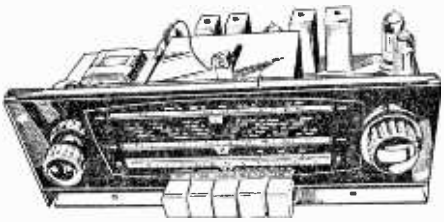

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50 RESISTORS, 5/-, ALL DIFFERENT VALUES.
21 TUBULAR CONDENSERS (7 values 0.001 to 0.1 mf), 4/6.

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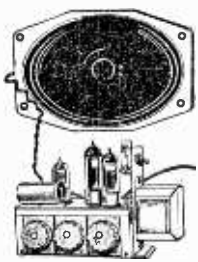

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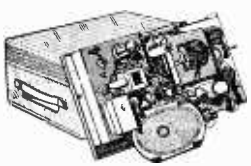

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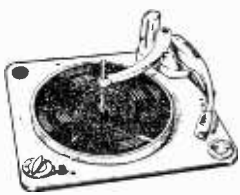

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See additional advertisement on page 620

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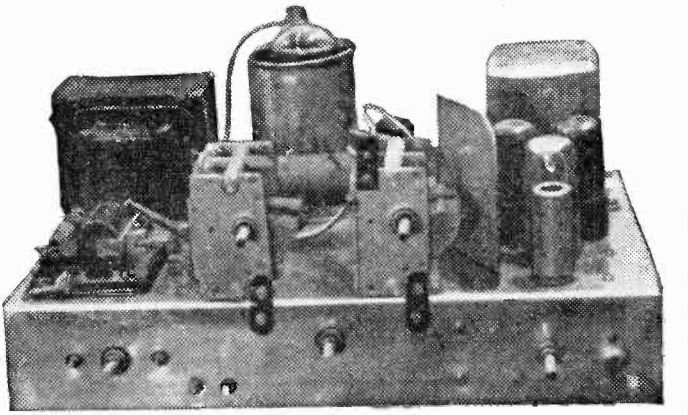
Six-Valve Top-Band Tx

THE CONSTRUCTION OF THE TRANSMITTER

By R. Dowling

(Continued from page 490 of the October issue)



The completed transmitter.

WHEN building the transmitter, it is first necessary to mark-out the chassis. In this connection, Fig. 4 shows the relative positions of the various large components. No attempt has been made to show the position of small holes, etc., for two reasons: first, the constructor may not be using components of exactly the same size as the ones used by the writer, and, secondly, the precise positioning of most of the smaller components is not very critical.

As mentioned last month, it is suggested that the power supply section be built first. Little difficulty should be encountered in making it function satisfactorily.

Modulator

The writer next tackled the modulator section. Again, this is not a "difficult" circuit to build. The thing to remember when building up a multi-valve circuit of this sort is to adopt a systematic approach, and to tick off on the circuit diagram each component as it is wired in. Let us therefore consider the wiring-up of each valve in detail.

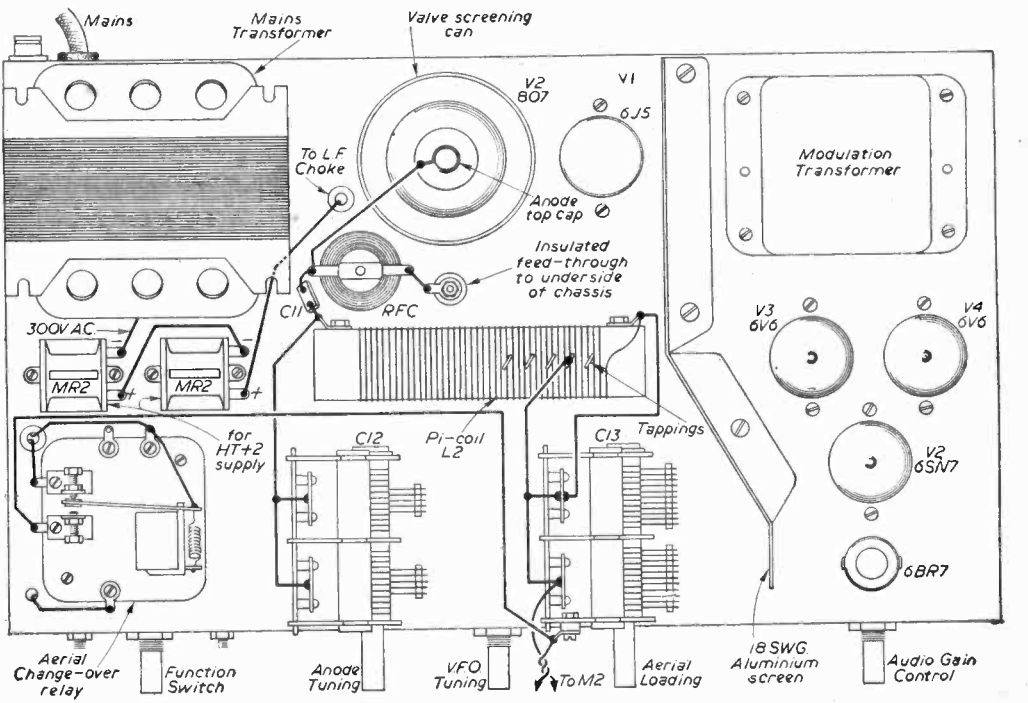


Fig. 4.—The above-chassis layout. (The microphone socket is adjacent to the A.F. gain control.)

The pre-amplifier (6BR7). All leads to the control grid of this valve must be as short as possible. The lead from the microphone socket to the control grid of this valve must be as short as possible and it must be screened, the screening being earthed at both ends. The wiring to the screen-grid, suppressor-grid and cathode is less critical, but even so there is no point in making the leads longer than necessary. The heater leads should be of twisted flex, and neither lead should be earthed at the valve Finally, the anode wiring must again be kept very short and the lead to the audio gain control VR1 screened at both ends.

The Phase-splitter (6SN7). The phase-splitter is a low-gain stage; its purpose is not one of amplification but of converting the single-phase output of the 6BR7 into two phases 180deg apart which feed the push-pull 6V6's. Accordingly, the tendency of this valve to pick up hum is not nearly so great as that of the valve preceding it. Leads should nevertheless be no longer than necessary, especially to the two grids.

The Output valves (6V6's). Here again, the wiring is not specially critical; if it is carried out in accordance with the layout of Fig. 5 then no trouble should be experienced.

A very satisfactory method of assessing the performance of the modulator when completed is by means of a pair of high impedance headphones connected across the secondary of the modulation transformer. The match is obviously not going to be perfect (most high impedance headphones having an impedance of about 2,000Ω), but even so one can obtain a good impression of the general performance of the modulator in such respects as hum level, microphony, etc. It might be mentioned in passing that in the case of the actual modulator built up by the writer very little hum was apparent in headphones even with the gain turned up fully.

Finally, then we come to the R.F. section. Again, if a systematic approach is adopted the likelihood of wiring errors is considerably minimised.

The V.F.O. (6J5). Begin with the wiring of the grid-cathode section, which forms the actual

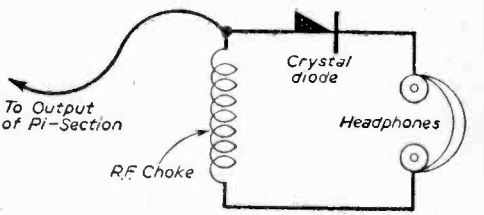


Fig. 6.—A simple modulation monitor.

oscillatory path in the Clapp oscillator. Heavy gauge wire must be used here; 18s.w.g. should be regarded as the minimum. Each length of wire should be only as long as absolutely necessary and should be quite rigid; only if precautions such as these are taken will satisfactory stability be

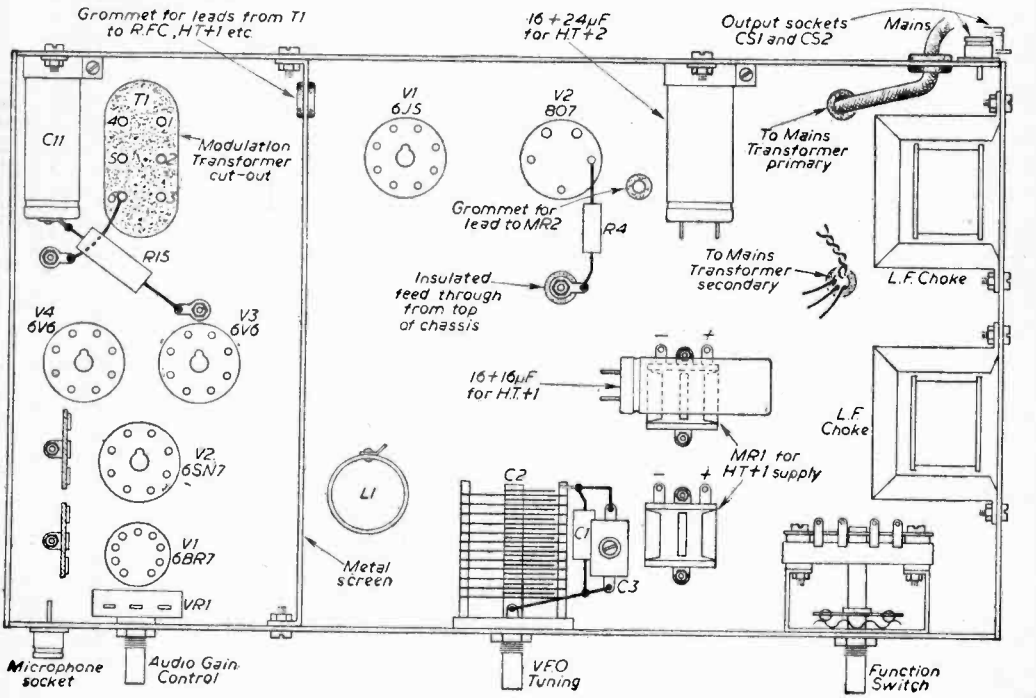


Fig. 5—Positions of components on the underside of the chassis.

obtained from the V.F.O. It will be seen from Fig. 5 that the V.F.O. coil and condenser are mounted some distance from the rest of the V.F.O.; the reason for this is two-fold: first, in order that the condenser might be brought out conveniently to the front of the transmitter, and, secondly, that the tuned circuit is thereby removed to some extent from heat-producing parts of the circuit.

The Power Amplifier (807). The output of the V.F.O. is conveyed to the control grid of the P.A. by means of C8 (100pF). The cathode wiring of the 807 consists of the lead to the function switch S1, and the lead from the function switch to the 50mA meter M1. The leads to the meter should be of twisted flex.

The anode and the screen-grid of the 807 are connected to the secondary of the modulation transformer: the anode via an R.F. choke and the screen-grid via a 22k resistor. The output of the 807 is then taken through a 1000pF capacitor C11 to the π-section output. The coil L2 should not be bolted directly against the chassis, since this will impair the Q; in the original transmitter the coil was raised from the chassis by means of two small "feet" at either end.

Operating Details

The main function control is the four-pole three-way switch S1; the three positions are labelled "net," "receive" and transmit." In the "net" position the P.A. and the modulator are both switched off, so that it is possible to detect the note of the V.F.O. in the receiver. In this way, one can move frequency within the band without causing any interference to other stations because no carrier is being radiated.

Preliminary adjustment of the transmitter is best carried out with a dummy aerial connected across the output to earth. This can take the form of an 80Ω non-inductive resistor of 10W rating.

It is first of all necessary to adjust the V.F.O. until it is operating within the correct frequency range; this is carried out as follows. Begin by setting the station receiver B.F.O. If the V.F.O. trimmer is now adjusted using an insulated tool it will be found possible to tune in the note of the oscillator. Once the approximate position of the trimmer has been determined in this way, it should be

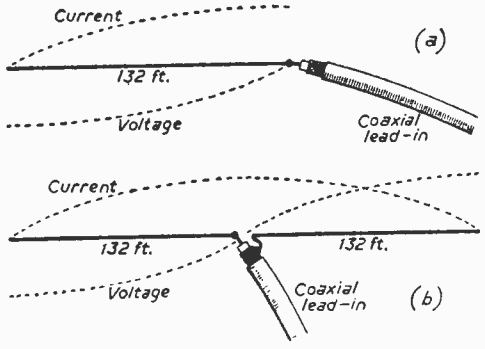
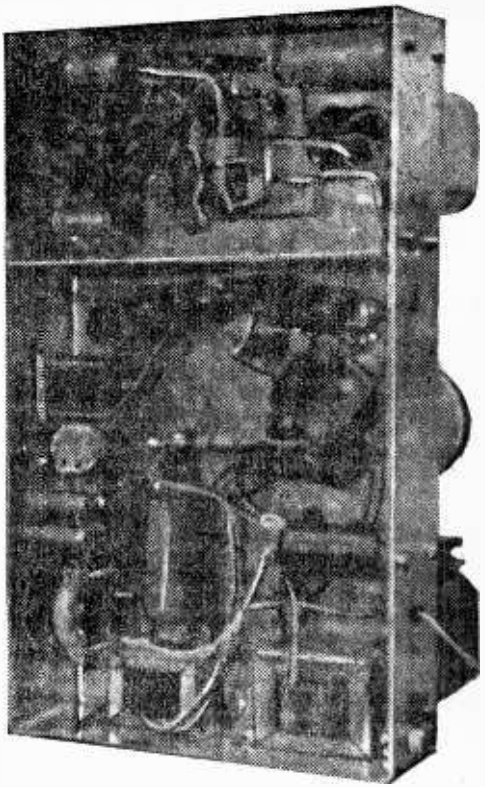


Fig. 7.—The end-fed quarter-wave (a) and the centre-fed dipole (b) aerials are very suitable if space is available.



Underchassis wiring of the transmitter.

carefully readjusted until the band is comfortably covered by the swing of the main V.F.O. condenser.

Next, one can attempt to load the transmitter into the dummy aerial. First of all, switch the function switch to "transmit" and set both the π-section variable condensers to maximum capacity. If the anode tuning condenser C12 is now rotated a point will be found where the anode current of the 807 suddenly dips. At the same moment the current in the aerial will be seen to increase sharply. Let us suppose that the anode current dips down to 10mA, and the anode voltage is 300V. Now,

$$P=EI$$

$\therefore$ Power input$=300 \times (10/1{,}000)=3$W.

However the G.P.O. allows a maximum input power of 10W on this band; thus we can use the above expression to calculate the value of anode (or, more strictly speaking, **cathode**) current as measured by M1:

$$P=EI$$

$\therefore$ $10=[300 \times$ anode current (mA)$]/1.000$.

$\therefore$ anode current (mA)$=33$mA$=(10/300) \times 1.000$mA.

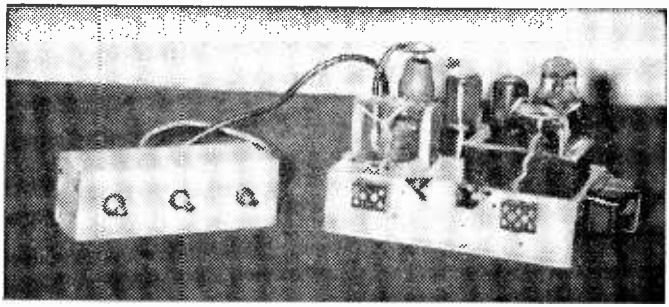
The problem is, therefore, to increase the value of the anode current at dip from 10mA, say, up to about 33mA. This is achieved quite simply by means of the aerial loading condenser, C13. Previously, we have kept this at maximum capa-

(Continued on page 634)

Converting to Stereo

ADDING THE SECOND CHANNEL

By D. W. Easterling



The control unit and main amplifier.

THE equipment to be described was designed to provide at reasonable cost a second sound channel for an existing fairly expensive monaural hi-fi assembly. The original system consisted of a good quality crystal pick-up, feeding a comprehensive pre-amplifier/tone corrector unit, and main amplifier. For the reproduction of stereophonic recordings it was necessary to change the original monaural pick-up head for a suitable stereo type, and arrange the connections so that one signal (left) was fed through the original amplifier and loudspeaker chain, while the other signal (right) fed an additional second amplifier and loudspeaker system.

Circuitry

Although there is no reason why the stereo head, and system in general, cannot be used for playing monaural microgroove records, the original head, together with its associated pre-amplifier was a comprehensive affair containing steep-cut filters, etc., suitable for all types of record, including the early 78's; consequently it was desirable that both amplifier and loudspeaker chains might be fed together from the original head and pre-amplifier when required.

In the case of the record player concerned (Philips Type AG2009), stereo and monaural heads are plug-in types, and freely interchangeable. Referring to Fig. 1 it will be seen that when the stereo head is in use, the "left" signal feeds, via terminal (1), to the original amplifier chain; while the "right" signal feeds, via terminal (3), to the new control unit, and amplifier chain. Without any switch changing, the above system is also suitable for monaural microgroove records.

When it is desired to use the comprehensive facilities of the original head and pre-amplifier, for the simultaneous reproduction of monaural records through both channels, switch S1 in the new control unit is moved to position (m); thus deriving its input from the output of the original pre-amplifier. Both channels are now fully controlled by the original pre-amplifier, but in addition, the new channel is still controlled by the new control unit to facilitate tone and volume balance between each channel. It should be noted that when the monaural head is used, the input to terminal (3) becomes dead due to the internal shorting strip in the head.

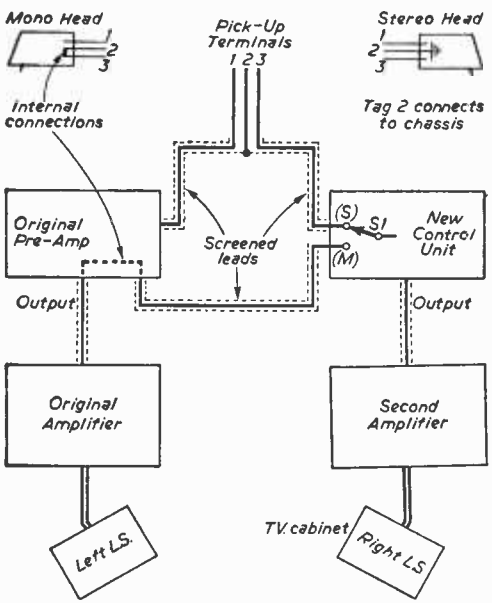


Fig. 1.—Block diagram of the arrangement of the amplifiers.

Amplifier Design

As crystal pick-ups usually have a greater output than magnetic types, an amplifier having only moderate gain may be employed.

It was found that in the interests of stability, low hum level, and ease of mounting in the cabinet, the control unit should be separate from the main amplifier. Details of the main amplifier are given first.

From Fig. 2 it will be seen that the amplifier circuit consists of a push-pull output stage driven by a single pentode voltage amplifier. Class A push-pull output enables a fairly small, and therefore a cheap output transformer to be used, while still maintaining a low value of distortion. Unlike most push-pull arrangements associated with sound reproducing equipment, it requires no special phase splitting valve stage or transformer.

Operation

The input signal is fed to the grid of valve V1, where it is amplified and passed via C3 to the grid of the first push-pull valve (V2). The output of V2 is developed across one half of the output

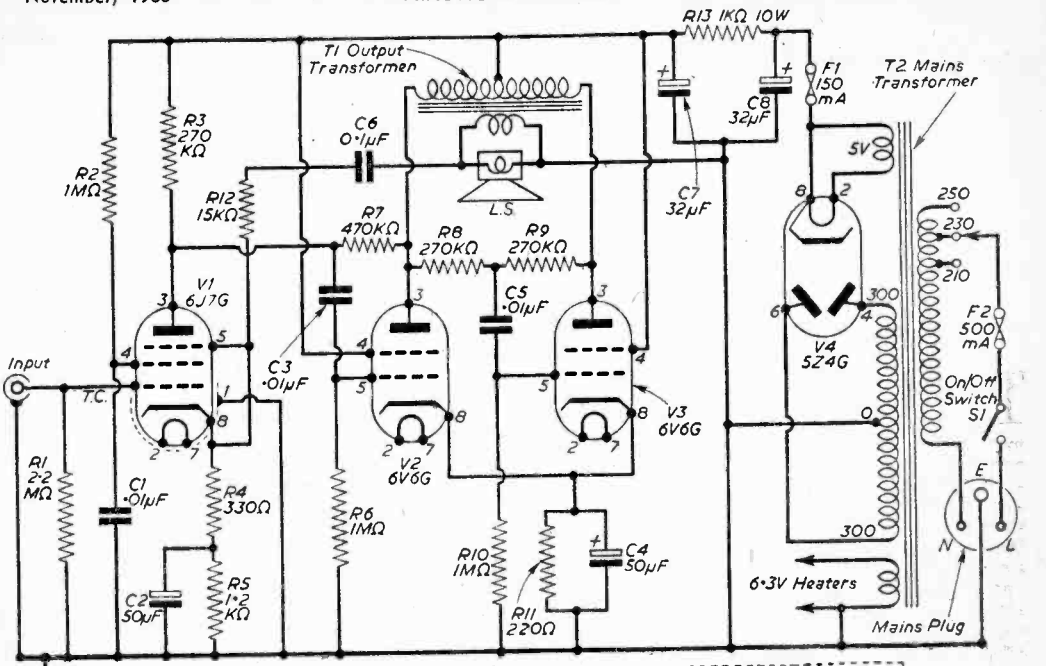


Fig. 2.—Circuit of the amplifier.

transformer in the usual way; but a second output is taken via R8 and C5 to the grid of V3; thus the phase reversal across V2 ensures that V5 is fed by a signal of the correct phase for push-pull operation. The output of V3 is developed across the second half of the output transformer primary; and again, a second output is taken via R9, back to the junction of R8/C5. The values of R8 and R9 are similar, and as the output signals of V2 and V3 are anti-phase, there is a tendency to cancel out. Complete cancellation cannot occur because any drop in the signal applied to V3 will

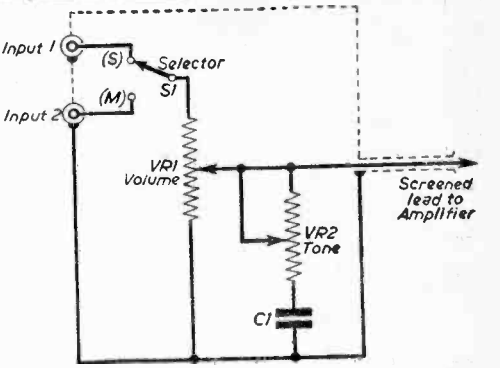


Fig. 3.—Control unit circuit. (VR1 and VR2 are 2M log pots; C1 is 0·01μF.)

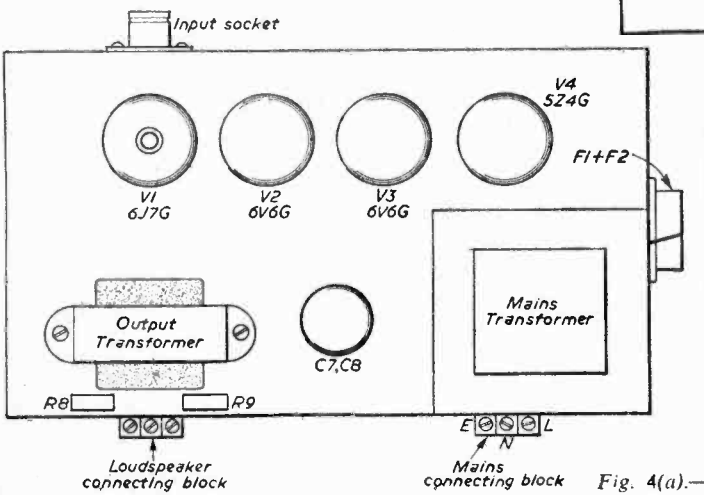


Fig. 4(a).—Above-chassis layout.

unbalance the output circuit, causing a greater signal to be fed to its input. The circuit is, therefore, balanced, and the output signals of V2 and V3 will always be the same.

One advantage of the circuit just described is that a fair measure of negative feedback is automatically achieved. Further negative feedback is provided across V2 by resistor R7, and by the main loop from the secondary of T1, via C6 and R12, to the cathode of V1.

The power section of the circuit is conventional,

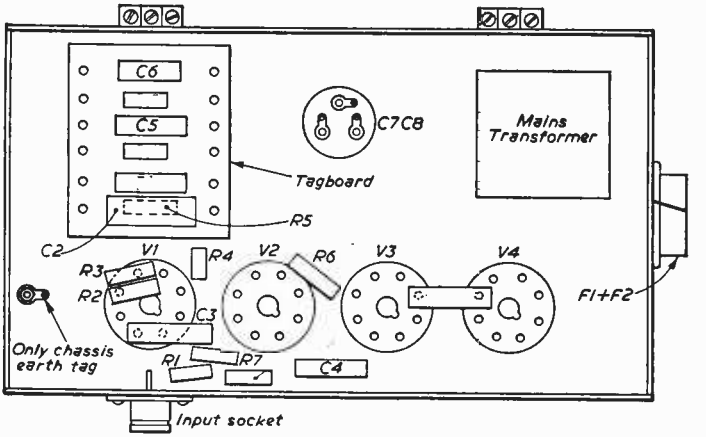


Fig. 4(b).—Underchassis lavout.

consisting of a full wave rectifier system with resistor-capacitor smoothing. If the obtainable H.T. voltage is greater than 300. an additional resistor between F1 and R13 can be used with advantage. The mains transformer, besides providing a tapped H.T. supply to the rectifier, also supplies current for the amplifier valve heaters, and rectifier filament.

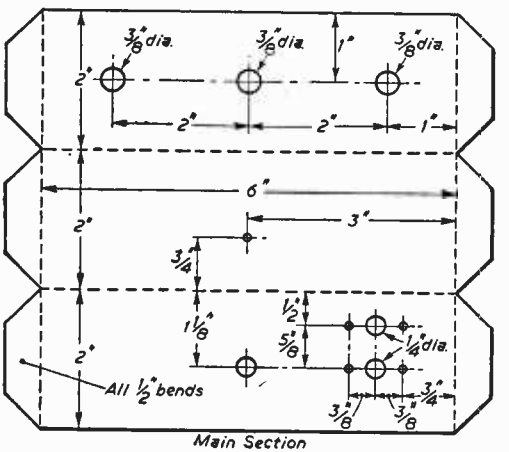


Fig. 5(a).—Drilling details of the control unit.

The control unit circuit, shown in Fig. 3, is simple, and contains three controls: selector S1. a single-pole changeover switch; VR1. volume control; and VR2, in conjunction with C1. acting as a simple "top cut" tone control. All are mounted in a metal box, and connected to the main amplifier by screened lead.

Construction

The main amplifier is mounted on a "U"-shaped chassis, the original dimensions being 8in. × 4½in. × 2in. deep. The component layout is shown in Figs. 4(a) and (b), but detailed dimensions are not given as these will vary according to the components used. Where the layout is varied, consideration should be given to keeping leads as short as possible. Incidentally, the mains switch (S1 in Fig. 2) was not fitted in the prototype. as this function is already provided in the original pre-amplifier.

Wiring is fairly straightforward. and should present no difficulties provided sufficient tags are available. The tagboard shown in Fig. 4(b) is very useful in this respect. For the prevention of hum it is best if the wiring is earthed to the chassis at only one point: near the input socket. It is also best if the leads carrying A.C. (such as heater and transformer wiring)

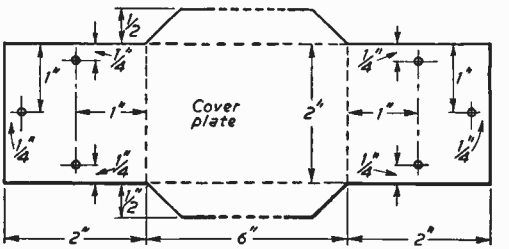


Fig. 5(b).—Control unit cover plate.

are twisted together. Earth and C6 connections to T1 secondary should give minimum gain, and can be left until the first test run.

The metal box containing the control unit is made in two parts from thin aluminium sheet, or tinplate. Templates for each section are illustrated in Figs. 5(a) and (b). The main section holds the controls.

(Continued on page 614)

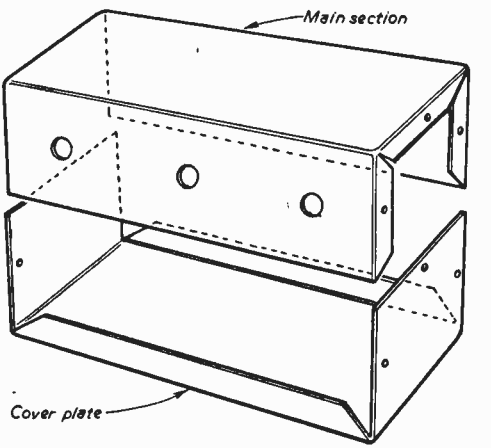


Fig 6.—Assembly of the control unit box.

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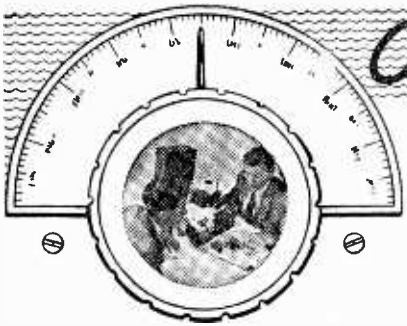


On Your Wavelength

BY THERMION

V.H.F. Reception

WHEN the BBC first introduced its V.H.F. service, it was emphasised that the service was intended purely for local reception and that medium waves would still have to be used when long distance reception of other than local BBC programmes was required. However, it seems that the V.H.F. transmitters are more effective than was prophesied for I am continually hearing of instances of long distance reception of F.M. The other day, in fact, I was visiting friends in the Midlands and although about 120 miles from the transmitter, reception of Wrotham was possible without any complicated circuitry. The results obtained were very satisfactory and, of course, the fidelity of the programmes was far better than those transmitted from the local station. As many readers will know, the cables to the Wrotham transmitter are specially designed to reduce the loss in quality which normally occurs when long land-lines are used. The cables are said to give extremely good results up to about 10kc/s —a higher figure than is possible on the land-lines from, say, London to Manchester. Although it is hoped eventually to improve the land-lines linking the BBC in London to the other BBC centres, it will probably be some time before the standard compares with the results from Wrotham.

Considering that so much was claimed when V.H.F. first started, it often seems to me that the service falls short of the standard required. I admit that it has proved a reliable service where previously none existed or where there was overwhelming foreign interference; in many areas, V.H.F. gives results which could only be obtained by such a method of transmission, but now the service has become well established, it is surely time to improve the fidelity of the broadcasts, so that all programmes compare with the technical standard of a long-playing gramophone record. At present, so far as I can tell, the only transmissions which approach this standard are those from Wrotham, and then only when they are of local origin.

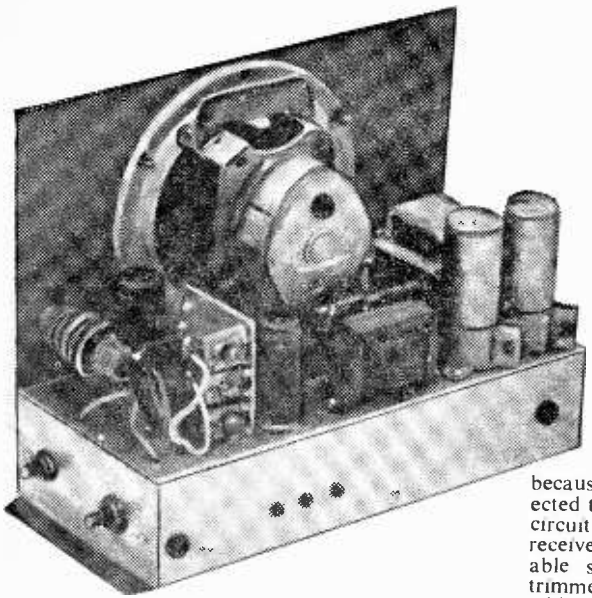
From my own point of view therefore, if I had to live away from Wrotham, I should certainly investigate the possibility of building a radio capable of receiving transmissions from this station. Provided that a very efficient aerial is employed, reception should be possible in many areas remote from the official service area.

Our "Pocket Superhet"

By the time you read this, you will probably have examined your free copy of the blueprint of the P.W. "Pocket Superhet" which has been given away free with each copy of this issue. Midget transistorised receivers are currently very popular and it was their growing popularity that prompted the design of this pocket-sized set. I have followed the development of the set from its inception and can vouch for its excellent performance. One of the features which I found particularly attractive was the plastic cabinet which adds to the "finish" of the completed receiver. This cabinet is the subject of a special gift offer and by using the coupon on page 638 of this issue, readers may obtain it for only 6s. 6d. If this cabinet is employed, no criticism will be made that the final result looks unprofessional. With the free blueprint, the construction of the receiver is made very easy and I am sure that many readers who would otherwise not attempt the construction will be able to proceed with confidence.

Our "Olympic" TV Receiver

Many of you will no doubt know already that in the October issue of our companion journal *Practical Television* the first article appears on the construction of a television set. This design has taken several months to prepare and is definitely well worth building. The circuit contains several unusual features but to my mind, one of the most sensible of them is the careful attention to stability in the tuned circuits and timebases. This means that no adjustment is necessary to either "hold" control or to the Band III oscillator circuit—in fact, there is no "fine tuning" control. The October issue of *Practical Television* also contains a free blueprint of the wiring of the "Olympic".



A Midget T.R.F. Receiver

SWITCHED TUNING FOR THE BEGINNER

By J. Smith

ALTHOUGH simple and economical in design and construction, this is a serviceable and efficient set for domestic use. The valves employed are of the modern, all glass, type but are available at present at less than 5s. each. Despite its small size, there is room in the chassis for components of standard size and the constructor will be able to make use of such parts as he has available, provided only that they are suitable electronically.

Circuit

The circuit is given in Fig. 1. Switched tuning to receive three transmissions is employed, so saving the cost of a ganged capacitor tuning drive and scale; it also enables the best use to be made of the selectivity of the two tuned circuits because tracking errors are avoided and the selected transmissions can be tuned "spot on" in each circuit. The selectivity obtainable is good enough to receive satisfactorily any transmission of reasonable strength, even after dark. Postage stamp trimmers of 50pF capacity are used for tuning, with fixed capacitors as required in parallel.

R.F. Stage

The R.F. amplifier, V1 is a high gain vari-μ pentode, EF92, and the gain of the stage is controlled by variation of the cathode bias in the usual way. Variable resistor VR is so connected that the aerial coil, L1 is short-circuited when the control is at minimum, so enabling the volume to be reduced to zero. The mains switch is incorporated in this control.

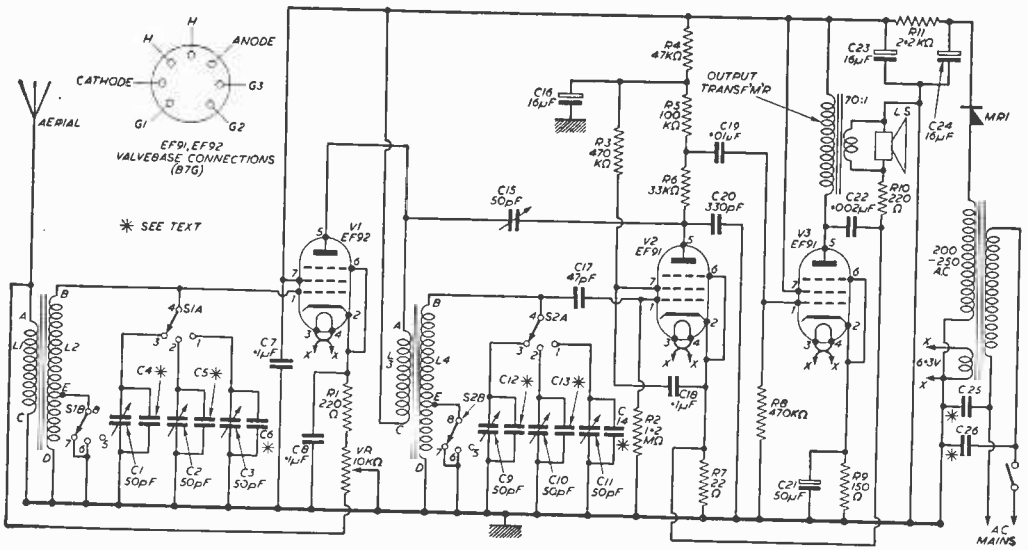


Fig. 1.—The circuit diagram.

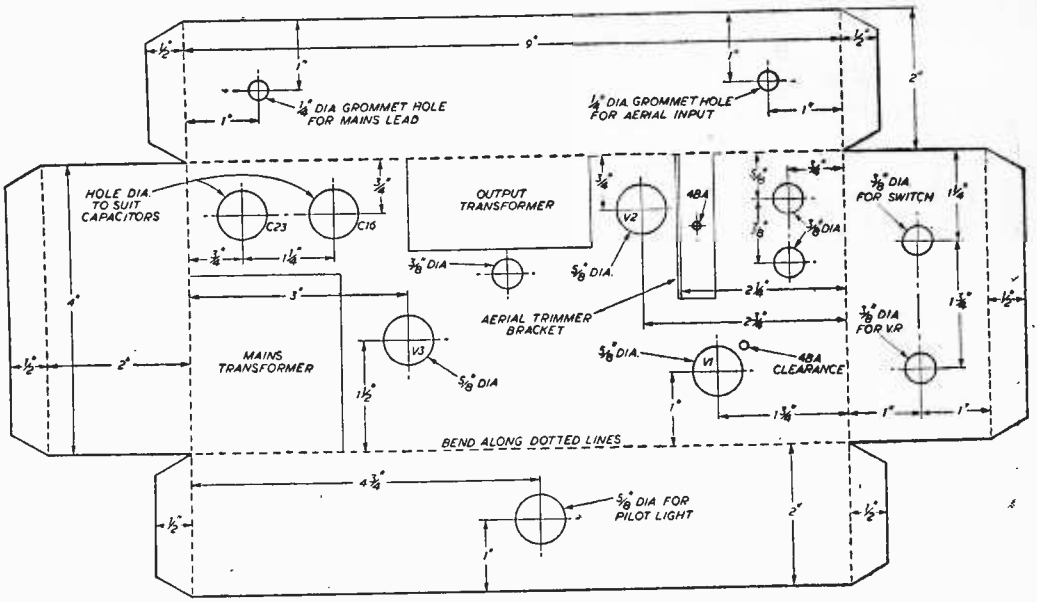


Fig. 2(a).—Plan of the chassis.

Detector

A high gain R.F. pentode, EF91, is used as a leaky grid detector and in the interests of quality, the grid leak and capacitor are 1.2M and 47pF respectively. The grid leak damps the tuned circuit somewhat but the resultant loss of selectivity is recovered by reaction, applied via the postage stamp trimmer C15. The capacitor C20 provides a path to earth for R.F. currents in the anode circuit and R6 encourages them to take this route. The load resistor is R5, while R4 and C16 provide decoupling and additional smoothing.

Note that the screen of V2 is decoupled to cathode to avoid the degeneration through the feedback resistor, R7, which would occur if the screen were decoupled to earth.

Output Stage

The signal from V2 is transferred via C19 to the grid of V3 which is also an EF91. Although it is properly an R.F. amplifier, it functions well in this position and having only a modest current requirement of some 12mA, it enables the power supply to be reduced in both bulk and cost. Of course, it cannot be expected to produce a large undistorted output but there is adequate volume for ordinary listening. For the usual 3Ω speaker the output transformer should have a ratio of 70 or 80:1 and a reasonably high primary inductance. The cathode bias resistor is 150Ω and it is essential that C21 should not be less than 50μF if it is to have any worthwhile by-passing effect on such a low resistance.

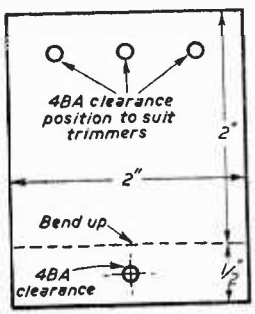


Fig. 2(b). — Aerial trimmer bracket.

Negative Feedback

It will be seen that there are two negative feedback paths. One from the anode of V3, via C22, is at R.F. and provides heavy feedback to the cathode of V2. The EF91 is a very efficient amplifier of R.F. and this arrangement is necessary so that any R.F. signals reaching its grid from V2 anode are reduced so as to be insignificant. The second feedback path from the secondary of the output transformer to V2 cathode, is at A.F.. It reduces the residual hum and improves the quality of reproduction; it also avoids having to include in V3 anode circuit the resistance/capacity network commonly used with pentode output valves to restrict output at the higher frequencies.

Power Supply

The power requirement is 200/250V at 20mA and 6.3V at 1A, which can be supplied quite easily by a small mains transformer of the type used in television converters, etc. A contact-cooled rectifier is used and smoothing is provided by R11 in conjunction with C23 and C24. The value of R11 must be such that the H.T. line voltage is not less than 170 and it may need to be adjusted according to the output obtainable from the transformer. If R11 is reduced below 1.5k, it will probably be desirable to increase the capacity of C23 or C24 or both to maintain good smoothing.

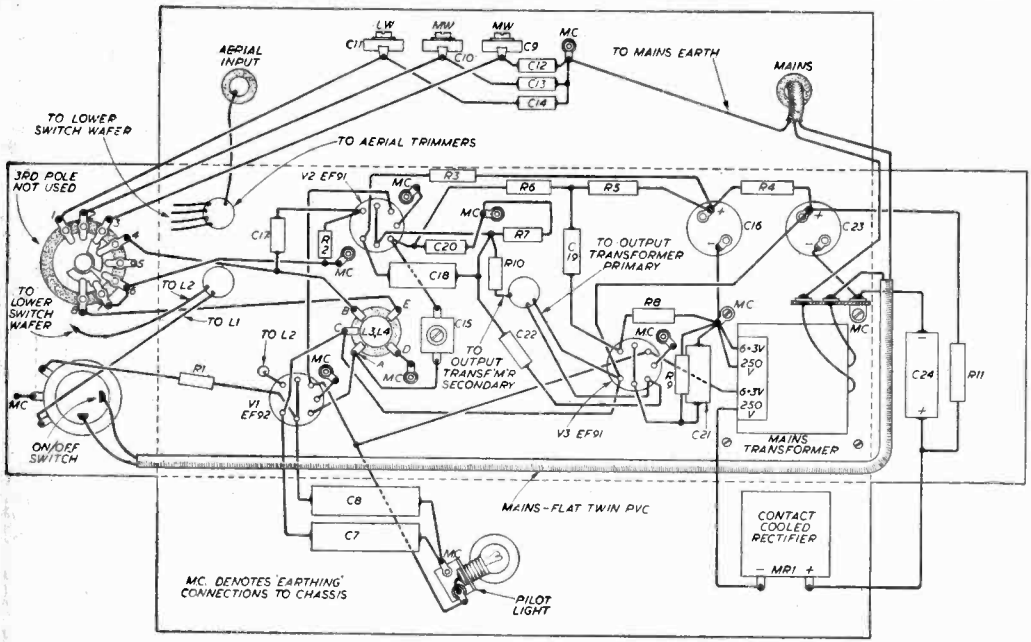


Fig. 3.—The underchassis wiring.

each may safely be doubled. As a guide, the prototype uses a transformer with a nominal 200V secondary and on a 240V supply, R11 is 2.3k (2-4.7k resistors in parallel). The power consumption of the set on 240V mains is less than 20W.

Operation

The aerial required will depend to some extent on local reception conditions but about 20ft of wire will usually be ample for good reception and a good signal/noise ratio. The tuning of the R.F. grid circuit is affected by the aerial capacity in the usual way and the trimmers should be adjusted finally with the set connected to the aerial with which it is to be used. An earth is not necessary but electrical interference will be greatly reduced if the chassis is connected to mains earth at a three-pin outlet via a three-core flexible mains lead. In good reception areas, the set will give good results as a portable with about 4ft of wire as an aerial. In this case, the full range of control of VR will probably not be required and some increase in sensitivity and selectivity may be obtained by omitting the connection between the bottom of VR and the top of L1.

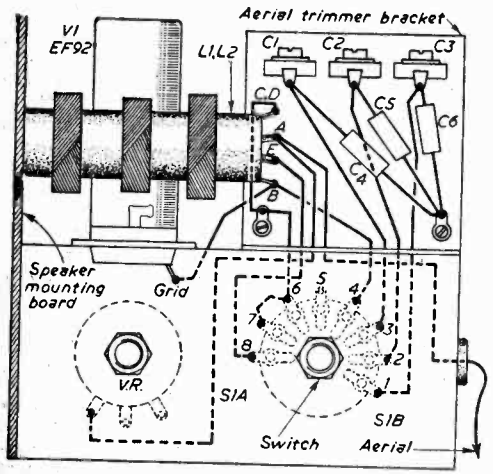


Fig. 4.—End elevation showing the R.F. grid wiring.

Components

The coils may be any dual-range T.R.F. pair and if the detector coil has a reaction winding, this may be used if desired instead of the arrangement shown in Fig 1. The Q of the coils is not very important as the set relies for its sensitivity on the high gain of the valves. The tuning switch is a 2-bank, 3-pole, 3-way Yaxley type and it must be modified slightly by fitting a screen between the two wafers. The screen should be of light aluminium, 1¼in. square, having a ¼in. hole in the centre for the switch spindle and two 4B.A. clearance holes to suit the switch bolts. Remove the outer wafer from the switch, fit the screen and then one or two washers on each bolt to provide a clearance between the screen and the outer wafer, which should then be replaced. All the resistors can be ½W except R11 (1W) and because the H.T. comes on through the metal

rectifier before the valves are warmed up and ready to receive it, all the capacitors, except C21, must be rated for not less than 350V working.

Construction

The receiver is easily and conveniently constructed on a chassis of 18s.w.g. aluminium, 9in. x 4in x 2in., a plan of which is given in Fig. 2(a). The cut-outs and fixing holes for the mains and output transformers and for the coils, are not shown in the plan as they will depend on the components used in each case. The layout is not at all important except that, to ensure stability, all the wiring and components in V1 grid circuit must be above the chassis and those in V2 grid circuit, below. Note that the lead from V1 grid passes through the chassis immediately it leaves the grid.

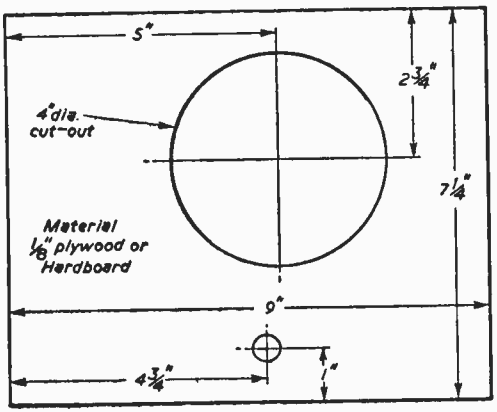


Fig. 5.—The speaker mounting board.

The wiring is shown in detail in Figs. 3 and 4. In these drawings, the wiring and components have been opened out for clarity so that some of the connections appear much longer than they really are; in construction, they should be made no longer than necessary. Tinned copper wire of 22s.w.g. is suitable for wiring and lengths of more than an inch or so should be covered with sleeving. A convenient order of assembly is, first to fit the valve holders, then transformer, smoothing capacitors and speaker in that order. The chassis can then be stood firmly upside down on the bench for wiring up. The 5in. speaker is fitted integral with the chassis as shown in the illustration, as this simplifies the construction of the cabinet. A piece of ¼in. ply or hardboard, 9in. x 7¼in. is required as a mounting board, with cut-outs for speaker and pilot light as shown in Fig. 5. This is bolted to the front of the chassis at three points and unless the speaker is a light one, it must be supported by a stay or bracket at the rear so that it is quite firm. The capacitors, C4, 5, 6, 12, 13 and 14 may not all be required. They should be omitted when wiring up, the trimmers only being fitted.

Switch Wiring

The wiring of the two wafers is identical. When the switch is fitted in the chassis, its connections are not very accessible and it is well to solder some lengths of wire to the appropriate tags beforehand. Identification of the connections afterwards will be facilitated if wire or sleeving of several different colours is used.

Testing

When the wiring is complete and before switching on, a check should be made with a meter between the "hot" end of R11 and the chassis to see that there are no shorts in the H.T. circuits. The set can then be switched on, the H.T. line voltage checked and the value of R11 adjusted if necessary. If with C15 at minimum, there is A.F. instability, the connections to the output transformer primary should be reversed so that the feedback becomes negative.

MIDGET T.R.F. RECEIVER COMPONENTS LIST

Resistors (¼W)
- R1 220Ω
- R2 1·2M
- R3 470k
- R4 47k
- R5 100k
- R6 33k
- R7 22Ω
- R8 470k
- R9 150Ω
- R10 220Ω

Resistors (1W)
- R11 2·2k

Variable Resistor
- VR 10k with switch.

Capacitors
- C1, 2, 3, 9, 10, 11 and 15. 50pF (max.) trimmers.
- C4, 5, 6, 12, 13, 14—values as required (see text next month).
- C7 0·1μF.
- C8 0·1μF.
- C16 16μF, 350V electrolytic.
- C17 47pF.
- C18 0·1μF.
- C19 0·01μF.
- C20 330pF.
- C21 50μF, 25V electrolytic.
- C22 0·002μF.
- C23 16μF, 350V electrolytic.
- C24 16μF, 350V electrolytic.

Coils
- Any T.R.F. dual range pair.

Valves
- V1 EF92, B7G base and screen.
- V2 EF91, B7G base and screen.
- V3 EF91, B7G base.

Switch
- Yaxley type, 2-bank, 3-pole, 3-way.

(Note:—Capacitors C25 and C26 may be included if their presence reduces interference; their working voltage should be 350 A.C.)

(To be continued)

Practical Wireless

POCKET SUPERHET

CONSTRUCTIONAL DETAILS OF OUR FREE BLUEPRINT RECEIVER

THE outside dimensions of this receiver are approximately 5½in. x 3¼in. x 1¾in., so that it is of small size but not so extremely cramped that construction is abnormally difficult. A superhet circuit is used, tuning both long and medium waves, with a self-contained ferrite rod aerial. with this type of circuit quite a reasonable selection of stations can be received. Running costs are small. current consumption being about 7mA with no signal, or at low volume, and rising to about 15mA or so when receiving an average programme at normal volume.

Operation

The circuit is shown in the blueprint, and brief details of its working may be of use to constructors who are not familiar with this type of receiver. The rod aerial has two tuned windings. the long wave section being shorted out, for medium wave reception. Coupling to the first transistor base is by means of a coupling winding and tapping on the L.W. coil, and this avoids the additional switching often used in this part of the circuit, when separate coupling windings are provided. The aerial windings are tuned by the 208pF section of the gang condenser.

A single oscillator coil is used with the first transistor, a 180pF fixed condenser being brought across the tuned section. for L.W. reception. By this means the single oscillator coil allows both M.W. and L.W. tuning.

The output from the first transistor. which operates as frequency changer, is amplified by two intermediate frequency stages. This provides a good measure of sensitivity. These two stages are neutralised by means of the two resistors and condensers wired to the I.F. transformers and base circuits.

Detector

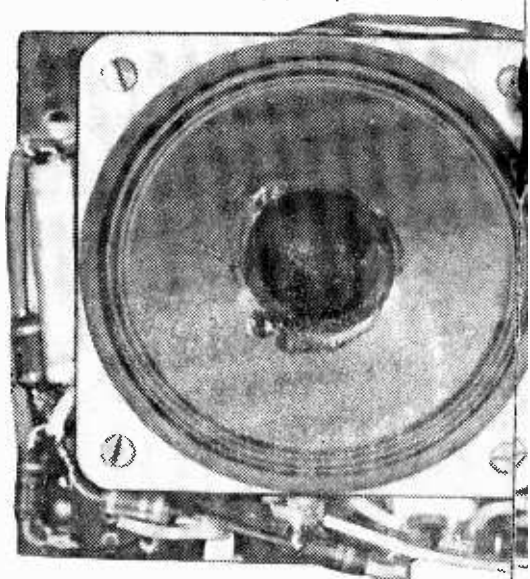
A crystal diode acts as detector. the audio output being developed across the 10k potentiometer, which serves as volume control. Part of the rectified voltage is fed back as bias to the first I.F. stage, to provide a degree of automatic volume control.

The audio signal obtained from the slider of the volume control is applied to the first audio frequency transistor, which acts as driver for a pair of transistors in push-pull. This type of output stage is most economical in current drain. for the power obtained. and will give adequate output for the loudspeaker.

Most of the other resistors are associated with circuits which provide suitable emitter and base voltages for the transistors. and the values shown should be followed. The small capacity condensers, used in frequency changer and I.F. stages, are also fairly critical. and should not be modified. The larger condensers, however (that is, of 0·04μF and larger), are used for by-pass purposes, and this means that the values are not critical. The values given are the lowest capacities that it is wise to employ. As a result, the actual condensers are small. But this does not mean that larger capacities may not be used, either because they are to hand, or can be more readily obtained. Provided they are of small size, 0·05μF or 0·1μF condensers will be satisfactory.

Chassis Drilling

The chassis is $\frac{1}{16}$in. thick or similar paxolin. 3in. x 5½in. A piece about 2½in. x 1⅜in. is cut out. to accommodate the speaker magnet in the position shown in the blueprint. A small piece, about 1⅞in. x ⅜in., is required to carry the output transformer. The paxolin can be cut easily with a metal saw or any other saw with small teeth. It should be checked that the speaker will fit easily, and the paxolin may be filed a little to clear the cone surround, if this is necessary. The four corner holes of the speaker are then used as a guide to marking 6B.A. clearance holes on the paxolin. The tuning condenser should now be positioned, and a clearance hole drilled for the spindle and ball-bearing projection. Short bolts in the tapped front plate of the condenser secure it to the paxolin. Drilling positions for these bolts may most easily be marked by pressing a piece of paper upon the front



The compact layout of the rece

plate of the condenser, and using the indentations formed as drilling positions.

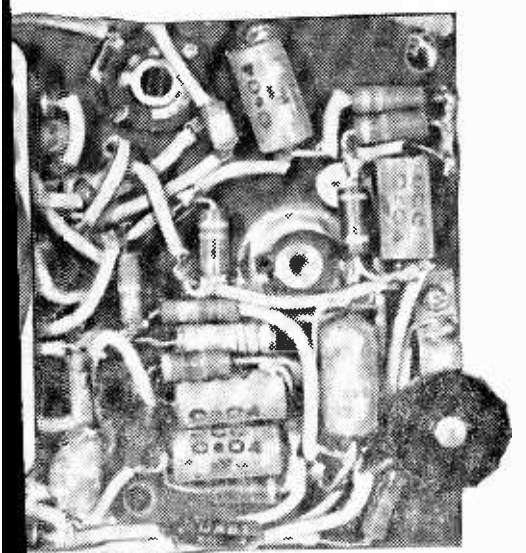
Mounting the Volume Control

The volume control is mounted on a ½in. long 8B.A. countersunk headed bolt, so that it comes centrally in the aperture in the case. The aperture may need widening slightly, with a fine file. The volume control may also fit better if a slight indentation is cut in the case, to receive the bolt head. This must, of course, be very shallow, to avoid penetrating the front of the case.

The volume control is spaced from the chassis by using extra nuts on the 8B.A. bolt, as shown. The height of the control is adjusted, by this means, until it fits correctly in the aperture in the case. To prevent the body of the control rotating, a small projection passes through a hole in the metal strip, and this strip is bolted to the chassis by a short 8B.A. bolt. The bolts and metal strip, electrically common to the centre of the control, form the slider connection, so the nuts must not touch the battery leads or tags, or other metal parts.

Volume control connections are clearly shown. The strip is filed to clear the small tags, and thin flexible leads should be soldered to these before finally mounting the control. These leads may be coloured for identification—red for battery positive, green for 0·01μF condenser connection, and a bare wire for the condenser frame (or earth) circuit.

The chassis, with tuning condenser, volume control and speaker, should now be placed in the case. A 6B.A. clearance hole, for the wavechange switch operating level, must now be drilled through paxolin chassis and the front of the case. The drill should be kept vertical, so that the two holes will coincide. The hole is 1⅜in. from the end of the chassis, and just sufficiently far from the edge of the wavechange switch wafer to clear the case.



r may be clearly seen here.

The Wavechange Switch

The wavechange switch operating spindle consists of a 6B.A. bolt, ¾in. long, with half its length filed flat so that it will pass inside the rotating section of the switch wafer. A nut should be placed on the bolt before filing, so that the threads can be cleared be removing the nut. A small operating lever, cut from brass, is drilled to take the bolt, and soldered to the bolt head. A 6B.A. washer is then put on the bolt, and this is threaded through the case. A further washer is added, and two half nuts, locked together. The lever must be small, and so positioned that it does not touch the tuning dial.

The switch can be set into three positions, but only two are required. To avoid a switch position which would give no reception, but leave the battery on, two tags are wired together. As a result, turning the switch lever fully one way or the other gives L.W. or M.W. reception, as required.

When it is found that the tuning condenser, colume control, wavechange switch and speaker fits correctly, the chassis is removed from the case. The speaker, gang condenser, switch wafer, and volume control should also be set aside, so that they are not damaged while drilling the other holes.

Oscillator Coil and I.F. Transformers

The positions for the oscillator coil and I.F. transformers will be seen in the chassis diagrams on the blueprint. The oscillator coil has six pins, and six clearance holes are drilled for these. A red dot is placed between pins 1 and 6. Small holes are also needed for the can tags. After drilling for each transformer, and the oscillator coil, these parts should be set aside until the remaining drilling is finished. Each I.F. transformer has five pins, the space coming between pins 1 and 5. Pins 4 are not used, but must not touch other leads, etc. A blue spot distinguishes the third I.F. transformer from the others, which are marked with white spots.

The driver transformer has two projecting lugs. One passes through a slot made by drilling small holes close together, and the other clips round the edge of the chassis. The output transformer is mounted on its strip by passing its lugs through holes. Notches need filing in this strip, to clear the speech coil tags of the speaker.

Components and Wiring

The tuning condenser is bolted in place, a tag under one bolt head forming the "frame" connection. The oscillator coil and I.F. transformers are inserted, and the tags of the screening cans bent out to hold them. One tag on each can is cut short. The others are left projecting slightly, and are all wired together, and to the earth line. The speaker is not fixed until other wiring is finished.

Note: All the diagrams — circuit, wiring, etc. — associated with this receiver appear on the blueprint given away with this issue. Continual reference to the blueprint is essential when constructing the receiver and reading the text.

Soldering

A soldering iron with a small bit is necessary for wiring up. The ends of many condensers and resistors have to be cut very short, and the iron should not be applied to any joint longer than is required to obtain a good connection. The transistors are only added as wiring progresses, and particular care is needed when soldering these, as prolonged heating may cause damage. Each transistor can have ¼in. lengths of insulated sleeving threaded on collector and emitter leads before the leads are passed through the chassis. The base leads can be left bare here, but must be insulated on the other side of the chassis. No attempt is made to cut the leads from the transistors as short as possible. They should, in fact, be left fairly long, even where this means that the connection will form a loop. Exceptional care in soldering is not then required, but the iron should not be kept in contact with any transistor lead longer than three or four seconds. A good joint can usually be made in less than this. The same care is wise when connecting the OA81 diode. Long heating of condensers, resistors, transformer and coil pins should also be avoided.

Rear of Chassis

The aerial is best left until other wiring has been carried out, and details are given later. The rod is to be mounted on the rear side of the chassis, however. This is done by taking two rubber grommets which are a push fit on the rod, and cutting two slots in pieces of paxolin ¼in. x 1in. to fit. Two small brackets are bolted to the paxolin pieces, and to the chassis. The rubber grommets, with the rod, may then be pushed into the slots.

Two tags of the twin 60pF trimmer are soldered to one bracket, as shown in the blueprint, this point going to the earth line. One trimmer is wired to the rear fixed plates tag of the gang condenser, as shown, the 250pF fixed condenser also being soldered to this tag. The other trimmer is taken to the wavechange switch, and "switch" tags of the rod windings, as also shown.

The 470Ω resistor is soldered directly across the 32μF condenser, and the condenser leads pass straight down through small holes. With all the electrolytic condensers, the polarity shown must be observed. Where no other markings are given on the actual components, the plain end of the can is negative, and the lead at the ridged end of the can is positive.

It will be seen that some of the transistor connections pass directly to the driver and output transformer. These leads should be covered throughout their length with insulated sleeving. With the output transistors, both emitter leads pass together through a single hole, to the 5Ω resistor.

The Front of the Chassis

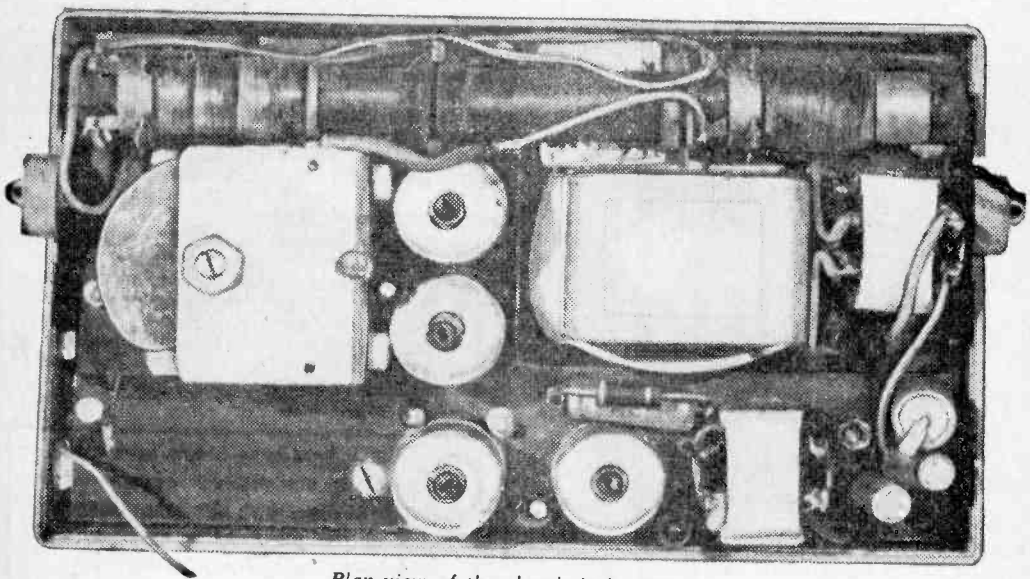
Most of the small components are on the front side of the chassis. A little extra space has been left between components in the wiring diagram so that connections can be followed more easily.

Soldered joints to the oscillator coil and I.F. transformer pins should be made fairly quickly, so that heat will not loosen internal connections. The three fixed condensers, which appear in the circuit in parallel with the I.F. transformer primary windings, are included in the cans, ready connected.

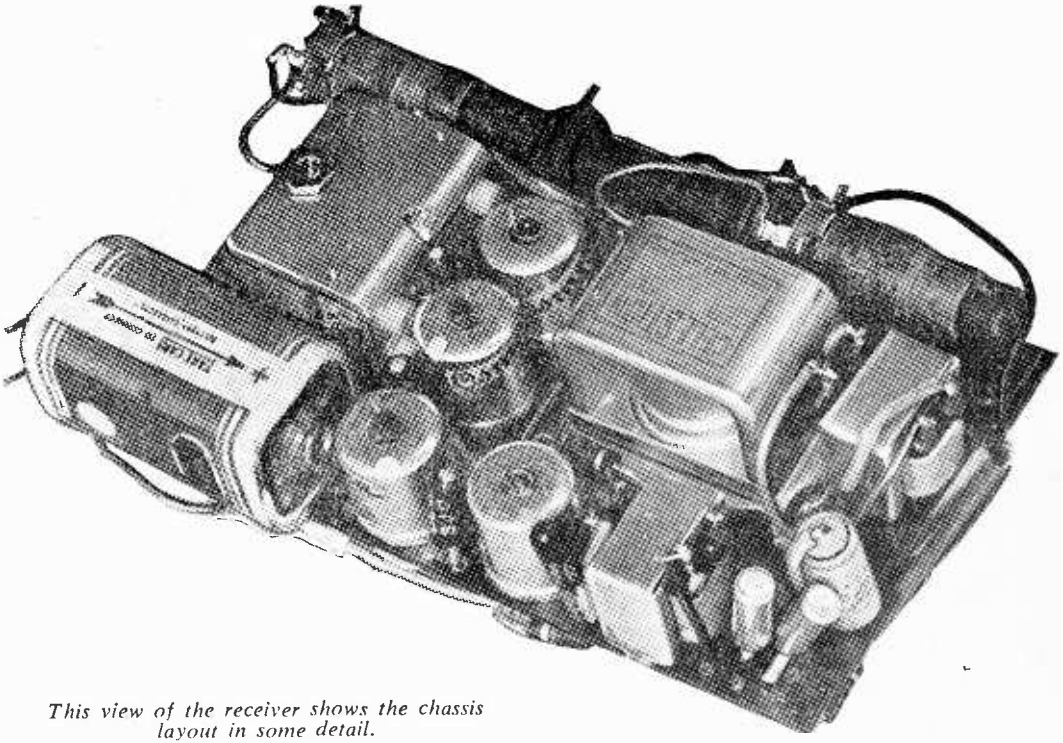
A fairly thin gauge wire, with small diameter sleeving, will be most convenient for connections. About 1yd of 26s.w.g. tinned copper wire, and 1yd of 1mm sleeving, will easily be sufficient for the receiver.

Wiring

It is wise to wire one stage at a time, inserting the transistor as the stage is completed. If the



Plan view of the chassis in its case.



This view of the receiver shows the chassis layout in some detail.

transistors are located as shown, emitter, base and collector leads will emerge at the front of the chassis in the positions shown in the blueprint. It may also be helpful to use coloured sleeving to identify these leads. It is essential that the emitter, base and collector leads do not touch each other, or other connections, and that they are correctly wired.

A check should be kept of resistor values, as they are wired in, because a mistake may cause lack of results, or distortion, and prove difficult to remedy later.

Volume connections should be taken from the blueprint in the manner already described. As the control also contains an on/off switch, incorrect wiring here will prevent the set working.

Leads and parts must be kept clear of the four holes used to mount the speaker, and also the holes used to secure the chassis in the receiver case. All other parts are kept flat, near the chassis, as there is only about 9mm clearance between chassis and case.

Wavechange Switch

The wavechange switch wafer is mounted by passing small pieces of 18s.w.g. tinned copper wire through the two holes in it, and through matching holes in the chassis. A small loop of tinned wire is made round these 18s.w.g. wire pins, and a touch of solder used to hold each in place.

The single tag of the switch goes to the earth line at the other side of the switch, one tag goes to the 180pF condenser. The other two tags this side are joined, and wired to the 60pF trimmer, and switch tags of the aerial.

The aerial is shown out of position in the blueprint, so that leads to it can be seen. With the medium wave section, the tags marked "B" and "Tap" go to the small winding of enamelled wire. This winding is connected to the tapping on the long wave section. This tapping is only a few turns from the earthed end of the L.W. section, so care is necessary to wire the L.W. winding correctly. The beginning of the M.W. tuned section is connected to the front fixed plates tag of the gang condenser, the end of this winding goes to the wavechange switch, trimmer, and "S" tag of the L.W. section. Bend the condenser tags flat after wiring to them.

The Aerial

The aerial connections are best made with thin flex, so that the positions of the windings on the rod can be modified when aligning the receiver. When testing and aligning the set, before inserting it in its case, a small strip of paxolin can be used to manipulate the wavechange switch rotor. When the set is inserted in its case, the wavechange switch lever must be turned so that the flats on 6B.A bolt match the position of the rotor, or the chassis will not fit in the case.

NEXT MONTH:

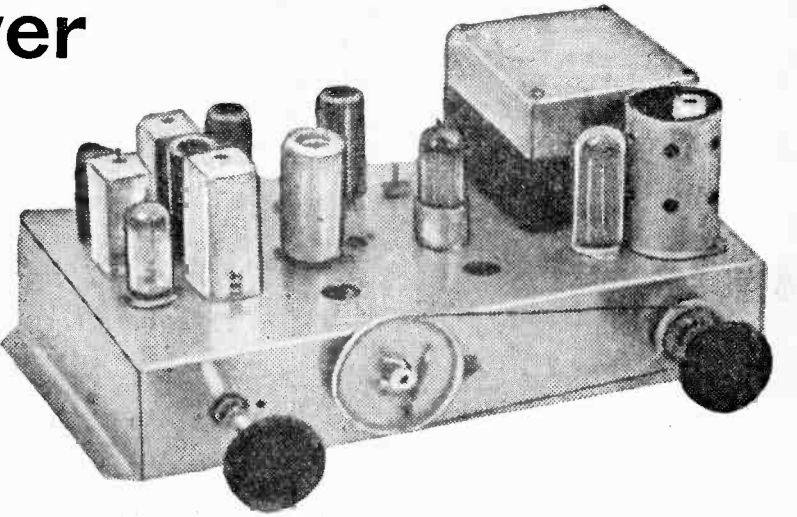
Testing and aligning the receiver

Low Drift V.H.F. Receiver

MAKING A SUITABLE CABINET

By E. H. Berny

(Continued from page 518 of the October issue)



A CABINET of functional design and pleasing appearance in which to house the receiver together with a speaker up to 8in. diameter may be made from ⅜in. 5-ply wood having an oak, walnut or similar hardwood facing. Old television cabinets are a good source of supply. No complicated joinery is required and only simple tools are needed.

First, cut two pieces of wood each 13in. x 7½in. for the top and bottom. In the bottom make six 1in. holes for ventilation as in Fig. 12. Next cut two pieces each 11in. x 7½in. for the sides. Rebates, ¼in. deep, must be formed at the top and bottom of each side on the unfaced surface as follows. Draw a line parallel with and slightly more than ¼in. from the edge of the wood and fasten along it with a couple of panel pins, a wooden straight-edge to act as a guide for the saw. Make a cut ¼in. deep along the line with a tenon saw, taking care to keep the tool at right angles to the surface and close up against the straight-edge. Remove the unwanted wood with a chisel and finish off with No. 2 glasspaper. When all the rebates have been formed, assemble temporarily the top, bottom and sides, using three or four 1in. panel pins driven half way home at each corner. Square up the assembly and secure it temporarily with a strip of wood fastened diagonally across the back so that it looks like Fig. 14.

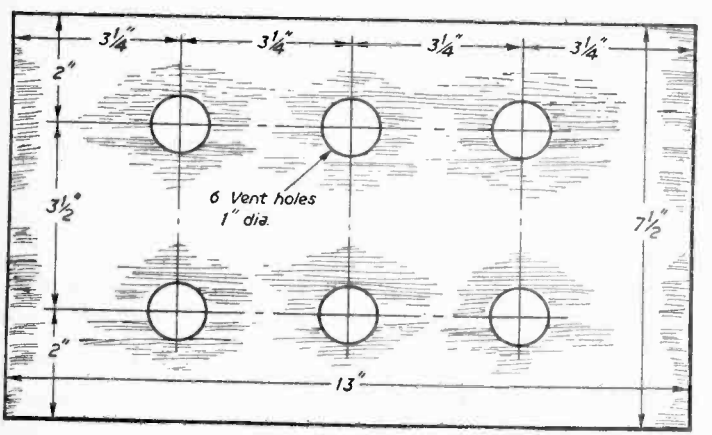


Fig.* 12.—*The bottom of the cabinet.

The Front

To mark out the front of the cabinet, place the assembly front down on the unfaced surface of a piece of plywood and mark round both the inside and outside. Cut the front very slightly larger than the outside rectangle so marked, so as to leave a little to spare for sanding down. The inside rectangle is the line along which a ¼in. deep rebate must be formed all round the edge by the method already described and when this has been done, the front should be a good push fit into the assembled portion of the cabinet. If, as may happen, it is a little slack, there is no need to worry as the strength of the cabinet will not be greatly affected. The holes and cutouts should now be made. The speaker aperture is best cut by first making 1in. holes in the four positions shown in Fig. 13. It is then a simple matter to remove the unwanted wood

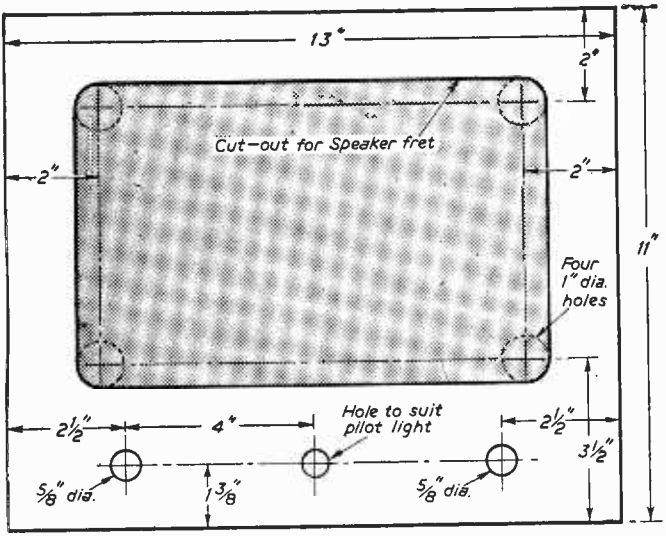


Fig. 13.—The front of the cabinet.

with a pad saw or a coarse hacksaw blade held in a pad handle. Work from the faced surface of the wood so that the saw will not tear the facing. Finish off the edge of the aperture with glasspaper and give it a coat of matt black paint.

Assembly

Dismantle the assembly, apply a coat of casein glue to all mating surfaces and re-assemble, driving the panel pins right home. Glue alone will be sufficient to secure the front but the joint will have to be kept under pressure by means of weights till the glue is dry. The success of the whole operation up to this point depends chiefly on the accuracy with which the wood is cut and the rebates formed. This is not difficult but requires a little time and care which will be well rewarded. It is important of course, to use a good glue.

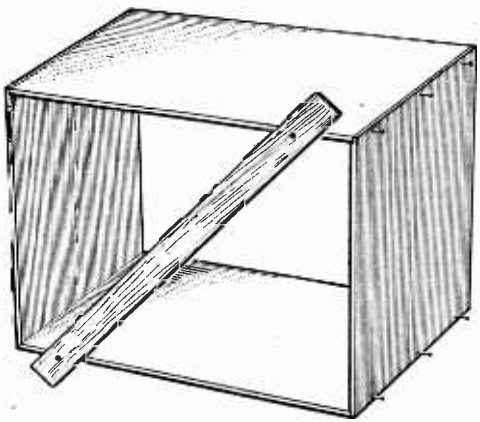


Fig. 14.—The temporary assembly of the top, bottom and sides of the cabinet.

Finishing

Allow 24 hours for the glue to harden thoroughly, then punch in the panel pins so that the heads are below the surface; fill in the holes and any other blemishes with plastic wood of the same colour as that in which it is desired finally to polish the cabinet. When the filler is hard, give a good rub down with No. 2 glasspaper, removing surplus filler and any projections at the corners. Finish off with No. 0 glasspaper. The final result depends greatly on the preparation at this stage, so make sure no scratches or other blemishes remain. Wood dye of appropriate colour may now be rubbed in with a rag wad.

Polishing

The best result is obtained by French polishing which, contrary to popular belief, is not at all difficult if done with one of the several polishes prepared and sold for amateur use. The constructor should follow carefully the instructions supplied with the polish. Alternatively, a very reasonable finish can be obtained by the application of clear varnish. Three or four coats will be required with a light rub down with No. 0 glasspaper between each. About 48 hours should be allowed for each coat to dry before rubbing down and the varnish should be applied and allowed to dry in a dust-free atmosphere.

Four ½in. rubber buffers should be fitted to the bottom of the cabinet to permit under-chassis ventilation and to prevent damage to any polished surface on which the receiver may stand.

Heat Deflector

It is desirable to fit a heat deflecting screen above R30 so that the rising current of air is carried away to the top rear of the cabinet. This prevents the top of the cabinet from warming up and improves

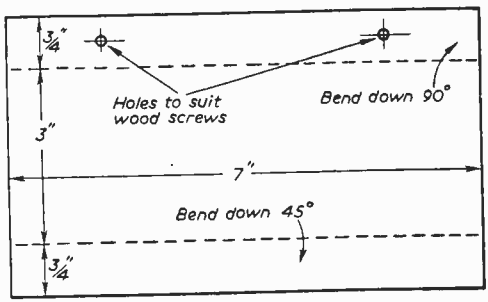


Fig. 15(a).—The heat deflector.

the interior ventilation. It may be made quite simply from a piece of 16 or 18s.w.g. aluminium to the measurements given in Fig 15(a) and secured to the side of the cabinet with two small wood screws. Fig. 15(b) shows how it should be arranged.

Fitting the Receiver

Glue a piece of Tygan or similar material over the speaker aperture. Cut a piece of ¼in. plywood or hardboard to size and make a 7in. aperture for the speaker as in Fig. 16. Secure the speaker over the aperture with two 4B.A. countersunk bolts, nuts to the rear, in the positions shown. The assembly should now be mounted in the top of the cabinet so that wood screws in the two remaining securing holes of the speaker will pass through the ¼in. ply into the cabinet front. The ply should then be further secured to the cabinet by a small wood screw at each corner. Fit in the bottom of the cabinet a piece of perforated zinc about 12in. x 7in. to cover the ventilation holes. Slide the receiver into position and mark on the bottom of the cabinet by measurement the positions of the chassis flanges. Make holes through the bottom to receive 4B.A. bolts or self-tapping screws of about the same diameter; two at the mains transformer end and one at the other will suffice. Make corresponding holes in the chassis flanges. Solder temporarily a short length of insulated wire to the negative end of C26, and fit the receiver. Do not fit the securing bolts yet.

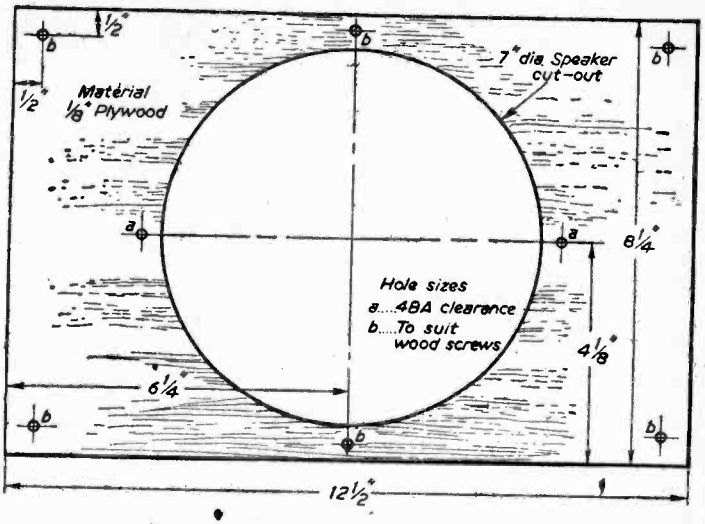


Fig. 16.—The speaker mounting board.

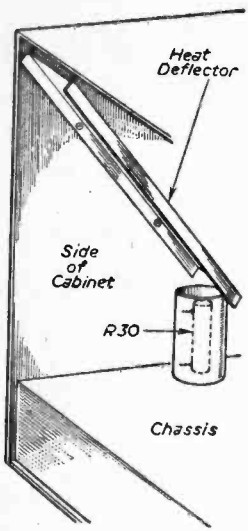


Fig. 15(b).—Fitting the heat deflector.

Calibration

Fit the tuning knob, which should be about 1½in. in diameter, connect an aerial and switch on. After 15 minutes, connect a meter or tuning indicator to C26, tune in each station in turn and make a mark on the tuning knob at top dead centre for each. The knob can then be taken to an engraver for permanent marking. Remove the chassis from the cabinet, detach the temporary connection from C26, replace the chassis and insert the securing bolts.

Cabinet Back

As the chassis is "dead" and there are no exposed voltages, the cabinet need not have a back. If one is needed, it may be of ¼in. ply or hardboard and can be secured to ½in. wooden fillets glued inside the cabinet. Holes should be made for ventilation at both top and bottom.

CONVERTING TO STEREO

(Continued from page 600)

Capacitor C1 is mounted between VR2 and an earthing tag secured by a 6B.A. nut and bolt. If tinplate is used, a directly soldered connection may be made. The remainder of the wiring is simple, and is completed by taking the screened lead for connection to the amplifier through the hole provided.

The cover plate is secured to the main section by six 6B.A. self-tapping screws, three on each end. Holes (bored with a number 43 drill) should be made, and the screws fitted, one at a time; so that the holes in each section properly match.

Correct inter-connection of the various units can be taken from Fig. 1. In addition, the new amplifier has to be supplied from the mains. The original amplifier has a mains outlet connecting to the gramophone motor; this supply being switched by a pre-amplifier control. The outlet is also now used to supply the second amplifier.

One last word of warning: While it is permissible to use the stereo head for playing monaural microgroove records, on no account use the mono head for stereo records, otherwise they will be seriously damaged.

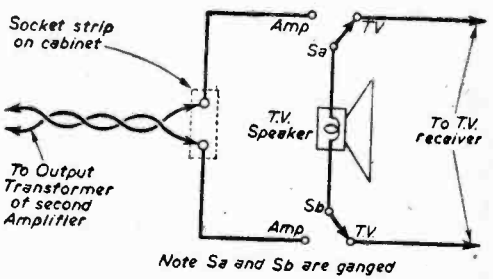


Fig. 7.—Using the loudspeaker of a TV receiver for the second channel.

Inexpensive P.A. Equipment

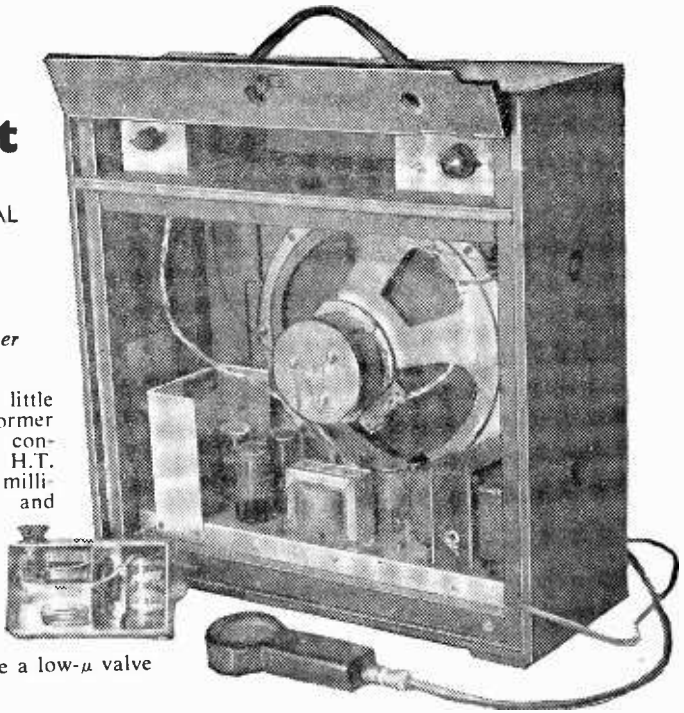
COMPLETE CONSTRUCTIONAL INFORMATION

By V. E. Holley

(Continued from page 537, October issue)

THE mixer circuit uses very little power and a small mains transformer of the type used in television converters is suitable, and as the H.T. requirement is only two or three milliamps, a contact-cooled rectifier and simple smoothing are adequate.

The constructor should not be tempted to employ a double triode instead of the two pentodes. The inputs are at high impedance and if a high-μ valve is used, there will be high frequency attenuation owing to the Miller effect while a low-μ valve will not have sufficient gain.



The completed equipment in its case.

Construction

The unit is conveniently constructed on a small chassis of 16s.w.g. aluminium to the measurements given in Fig. 12, the two volume controls and the panel lamp being arranged to protrude through the motor board in the front right hand corner. The mains transformer is mounted separately some distance away to minimise hum pick-up. Care must be taken with the heater wiring for the same reason and pin 2 on each valve base should be earthed. It is inevitable that some hum will be introduced by the heaters but as it will be heard only at near maximum gain, which will never be required, it does not merit any further attention. Complete elimination can in any case only be obtained by operating the heaters from a source of D.C. which is a troublesome and unnecessary complication. The layout is shown in Fig. 13.

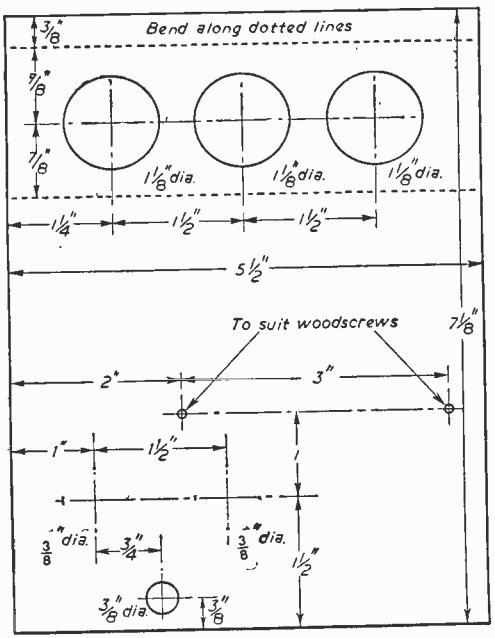


Fig. 12.—Plan of the chassis of the mixer unit.

Pick-up

High fidelity is not necessary for the reproduction of dance music and any inexpensive single player of the popular type will be suitable. Acceptable quality must nevertheless be maintained and the response of the pick-up must be examined to see what correction is necessary to compensate for recording loss. If the pick-up is of a superior type having a level response and no internal compensation, the circuit of Fig. 14 may be used. With the component values as shown, it provides full compensation at the rate of 6dB/octave below about 250c/s. There will of course be a serious loss of output at middle and high frequencies, but this is easily put right by a turn of the volume control.

Most crystal pick-ups of the popular type have a rising output below about 400c/s which provides some compensation. In such cases it will generally be satisfactory to add compensation at the rate of 3dB/octave, which may be done with the same

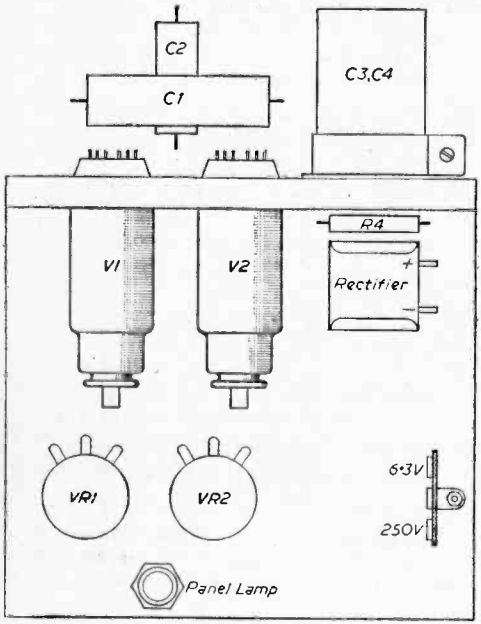


Fig. 13.—Layout of the mixer unit.

circuit using component values R1=0·32M, R2=0·15M and C=0·005μF. If the response of the pick-up is unknown, the best arrangement must be found by trial and error, and in this connection the aim should be to make the load at middle and high frequencies approximately that recommended by the manufacturers. The reactance of C being negligible, the required figure is given by the formula

$$R1 + \left[\frac{R2 \times R3}{R2 + R3}\right]$$

Housing the Player

If the constructor already has a portable record player it will be a simple matter to install the mixer unit within the case, the only requirement being that there should be a minimum clearance of 2in. between the motor board and the bottom of the case. Not much heat will be generated but it is desirable to provide ventilation holes through the case and the motor board, those in the latter being positioned underneath the turntable out of sight.

If no portable player is available, a satisfactory turntable and pick-up can be obtained from surplus sources, and a case of professional appearance in which to house it can be made at the cost of a few shillings. No complicated joinery is required.

Making a Case

Suitable material for the motor board is ⅜in. 5-ply; for the sides of the case ¼in. will serve, and for the top and bottom ⅛in. is suitable. Unless the player is of unusual size or shape, the dimensions to be given may be followed exactly.

First prepare the motor board, 15in. × 13in. and cut out the holes required for the motor, pick-up, controls, etc. The motor should be mounted on the side of the board remote from the mixer unit in such a position that the centre of the turntable is located at the point "X" in Fig. 15. The position of the pick-up relative to point "X" will depend on the manufacturer's instructions, which should be followed exactly to ensure proper tracking.

Prepare next the front and back, each 15in. x 5½in., and the two sides, which, if ¼in. wood is being used, will each be 13½in. x 5½in. It is now advisable to make a trial assembly of the front, back and sides around the motor board to check the fit, securing them temporarily to each other and to the motor board with ¾in. panel pins, driven half-way home. The motor board should be positioned so that its lower surface is 2½in. from the bottom of the assembly. When any misfits have been rectified, a good resin glue should be applied to all mating surfaces and the pieces re-assembled, driving the panel pins right home. When the glue is dry, a stiffener, 13in. x 2½in. x ¾in., having a couple of 1in. holes in it for ventilation and the passage of cables, should be pinned and glued below the motor board as shown in Fig. 15. This will increase the strength of the case considerably and will reduce vibration from the motor.

Making the Lid

Next prepare the top of the case from ⅛in. ply and fit it permanently in position with glue and panel pins. The bottom should also be fitted now; it must be removable and should be secured with small brass screws to a ⅜in. square wood

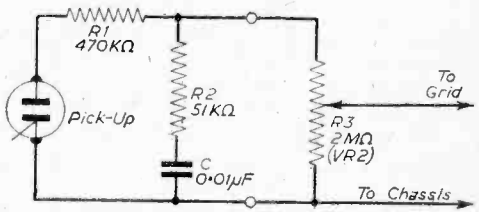


Fig. 14.—Compensation circuit for the pick-up.

fillet glued around the inside of the case, ⅛in. from the bottom edge.

When all has been assembled, draw a line round the case 2½in. from the top, and with a sharp tenon saw cut the case into two pieces along this line. The result is a box with a lid which is an exact fit. This operation requires some care, and if the constructor is not confident of his skill with the saw, he should fit temporarily on each side of the line of cut a strip of plywood with a straight edge, leaving just enough room between the strips for the saw to enter. If the saw is then used horizontally and at right angles to the surface, a clean accurate cut will be made. Strips of wood about 1in. wide and ⅛in. in thickness should now be glued round the inside of the case above the motor board so as to project into the lid, thus locating it firmly when closed.

External Connections

External access must be provided for the microphone input, the output to the amplifier and the mains connection, and it is an advantage if the case has a power socket from which the supply for the amplifier can be taken. As with the main amplifier these fittings should be flush with the outside surface of the case. Flush mounting coaxial sockets are used for the input and output, the former being sited as close as possible to VR1. For the mains connection, the plug half of a 2-pin 5A flex connector is screwed to the underside of the motor board in such a position that the pins project into a hole cut in the rear of the case: this hole should be of such shape and size to admit the socket half of the same connector. The same kind of fitting can be used for the mains supply to the amplifier, but in this case the socket portion is secured to the motor board, projecting into a similar hole to a position flush with the outside surface.

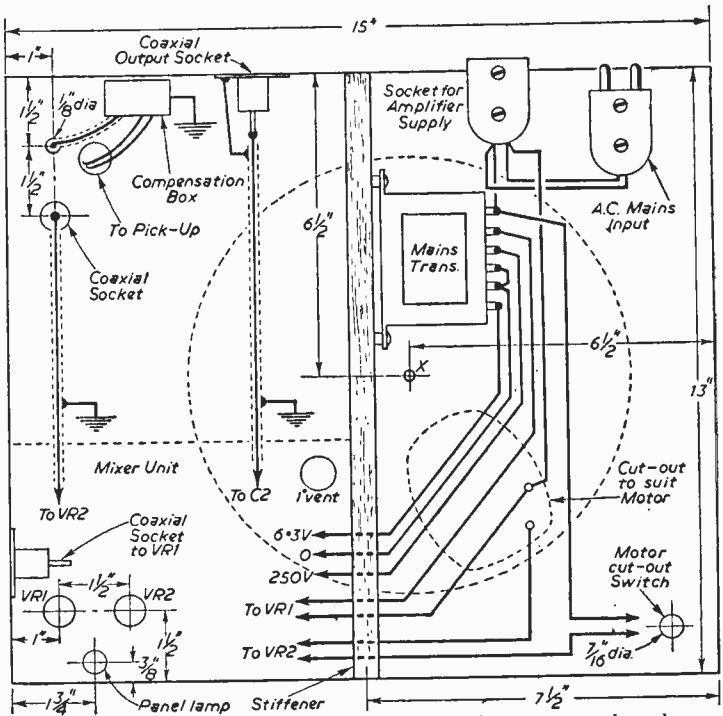


Fig. 15.—Layout of the record player motor board.

The leads from the pick-up are taken first to a small metal box under the motor board, in which is installed R1, R2 and C of the compensation circuit (Fig. 14). The compensated signal is then taken through the motor board by a short screened lead terminating in a coaxial plug. The plug fits into the adjacent socket and the signal is then returned to the under side of the motor board and carried to VR2. A second microphone channel is thus obtainable when required by removing the plug and connecting a mike cable in its place. A switch is provided to cut out the gramophone motor when this arrangement is in use. The wiring of all the switches and fittings under the motor board is shown in Fig. 15.

Finishing

Fittings on the outer surface of the case should now be removed and the heads of the panel pins punched below the surface. A small wire nail with the point sawn off makes a good punch. Fill all blemishes with plastic wood and when it is hard, give the case and lid a good rub down with No. 2 glass paper. The final finish can be obtained if desired by the application of wood dye and clear varnish, but a much more professional appearance will be achieved if the case is covered with material obtainable from a well-known chain store under the name of "leathercloth" in a variety of colours. About 1¼yd will be required. It should be secured to the case with resin glue, a thin coating being applied to both surfaces and the cloth then stretched tightly into position.

When the covering is dry, the input and output sockets can be replaced and a pair of surface mounting hinges fitted to attach the lid. A stay is also required inside and a pair of clip fasteners at the front to secure the lid when closed. The corners of the case should be trimmed off and metal corner pieces fitted; eight will be needed. Two ¼in. ventilation holes should be made in the bottom, one beneath the motor and one under the valves, using a sharp centre bit so as to make a clean cut through the leather cloth. A carrying handle should be fitted to the front in such a position that the attachment screws pass into the edge of the motor board, so ensuring firm attachment and good balance. Finally, eight ¼in. rubber buffers should be fitted, four on the bottom and four at the back so that the player may stand upon them horizontally and vertically.

Operation

If the power supply for the main amplifier is taken from the socket on the player, the whole equipment will be under the control of the gramophone operator. The maximum overall gain is considerably more than can be used and the excess should be removed first by the application of maximum negative feedback and then by means of the volume control on the main amplifier. In this condition the equipment will have a silent background, and it will be found possible to obtain the maximum designed output on either channel by operation of the controls on the player and without introducing hum or other undesirable effects. The two inputs can be mixed in controllable proportions and it is possible for instance to make announcements without entirely interrupting dance music and to fade gradually from one input to the other.

Comprehensive Guitar Amplifier

A COMPLETE UNIT WITH TREMOLO, ETC.

By B. L. Phillips

(Continued from page 511 of the October issue)

THE potentiometer mentioned last month in the feedback circuit of V1 varies the input to the buffer and is called the Vibrato or Tremolo Depth Control. The anode of this buffer is direct-coupled to the screen grid of the pentode EF86, whilst the guitar input is conventionally coupled to the grid. A very high value of cathode resistor is used on the EF86 to bias it towards cut-off, as in this condition the oscillator can easily modulate the guitar input.

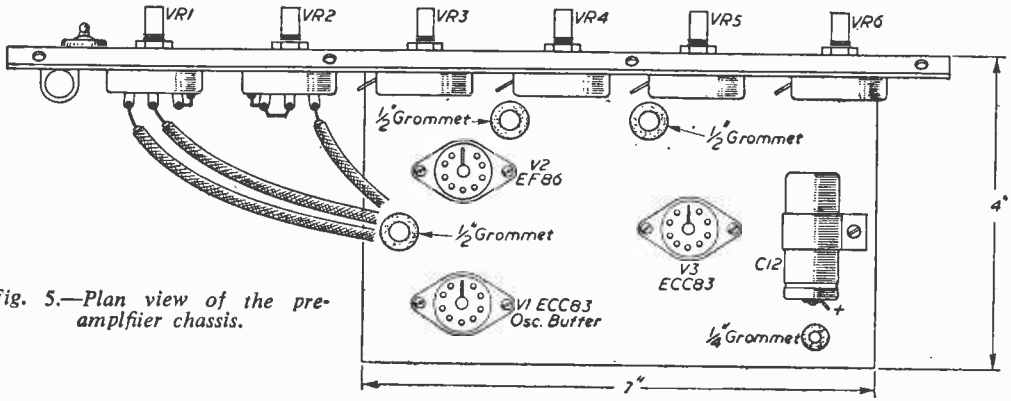


Fig. 5.—Plan view of the pre-amplfiier chassis.

Thus, at the anode of the EF86, we have the modulated guitar output, plus the oscillator itself. If this were amplified, then the oscillator would appear in the output as an annoying "thump"! So the output is fed through a high-pass filter which removes the oscillator output whilst allowing the modulated output to be fed to the pre-amplifiers. The pentode stage has only a little gain, and the input to this is approximately the same as the other inputs although some increases in volume may be noticeable when using the vibrato input. The volume control is placed after the filter with the other input controls. Wiring in the oscillator, buffer and mixer stage is not critical at all, but it is recommended that screened lead be used where indicated to avoid hum pick-up. The leads to the volume controls should be screened,

(Continued on page 625)

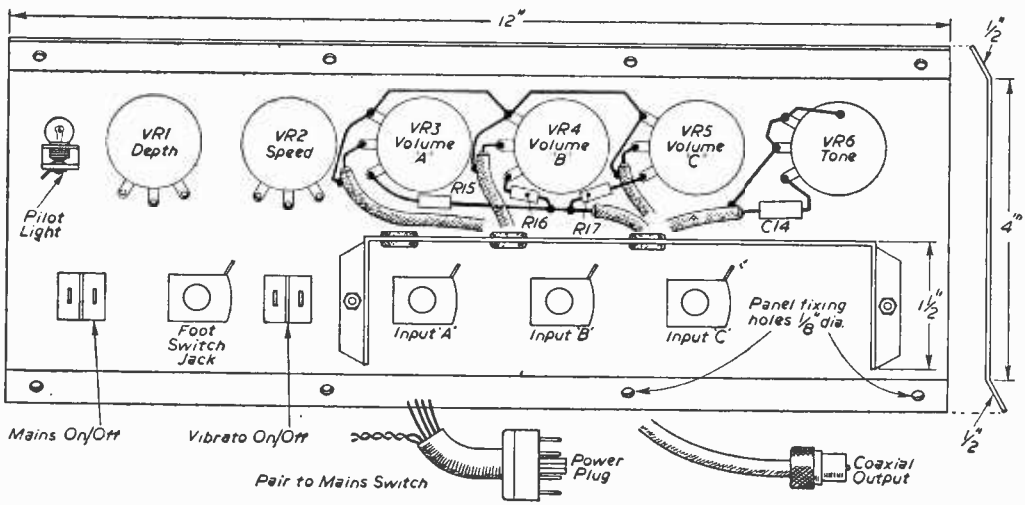


Fig. 6.—Rear view of the pre-amplifier panel (the top of the panel is bent inwards, the bottom outwards, for mounting to the cabinet).

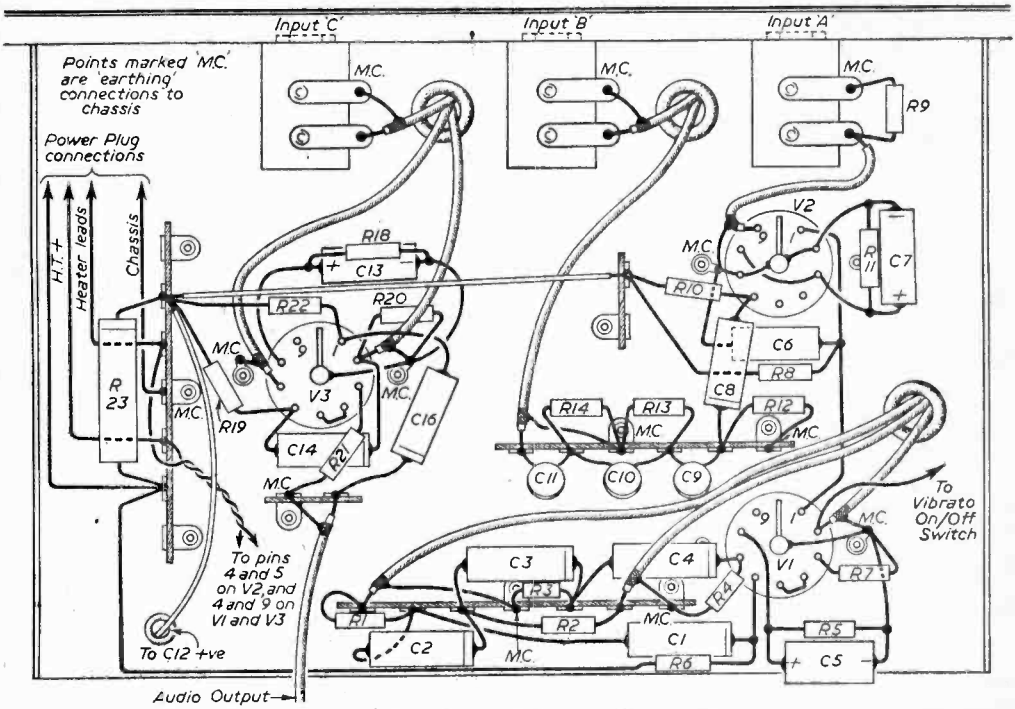


Fig. 7.—Underchassis wiring of the pre-amp.

(Continued from page 622)

and only one earth wire run from each control and jack.

To enable the vibrato to be switched on and off, a switch is employed to earth the buffer grid. This is in series with a closed circuit jack, so that an external foot switch can be used, if desired, from this jack on a screened coaxial lead. If this is used the switch on the amplifier is closed, putting the grid through to the foot switch. The "depth" control enables either deep, medium, or low vibrato effects to be employed, and the "speed" control gives a range of roughly 4 to 10c/s vibrato speed. The speed range may be altered by altering the 470k resistor in series with the speed control to say 250k, when it will be faster.

Construction

Figs. 5 and 6 show the general layout of the pre-amplifier chassis. The main panel should not be less than 12in. x 5in. and of 16s.w.g. aluminium or steel, and bent as shown in Fig. 6. The panel will have an inclination of 45deg so both top and bottom edges should be at as near to 45deg with the panel face as possible. Four ¼in. holes are drilled in each bent side for the cabinet mounting screws. The six volume control mounting holes should be spaced out equally to occupy the whole panel area. The three input jacks are mounted directly under the controls they are connected to, which puts them under the sub-chassis. Connections between controls and jacks may be open wire, but short lengths of screened cable are preferred. The three 100k stoppers may be connected together above the sub-chassis, and a single screened lead fed from their junction to the grid of the ECC83.

The sub-chassis supporting the valves and associated circuits is made from 16 s.w.g. metal, bent with two edges down 1½in. of the front edges of the chassis being bent out to bolt to the panel. If the pilot light is fitted, a small hole made in the panel with a strip of red celluloid across it is required as the jewel". The lamp socket must be insulated from the panel, as the heater chain is only grounded at the main power-chassis end to reduce hum. A small piece of ebonite or paxolin will suffice, bolting the lamp holder to this with a well countersunk bolt, and then bolting the insulated support to the panel.

Heater leads must be well twisted and kept away from the signal circuits as far as can be arranged. Fig. 7 gives a more detailed idea of how the pre-amplifier chassis is wired, and shows the majority of the connections.

Cabinet

In Fig. 8 is shown the cabinet used for the prototype, which was constructed out of 5-ply, screwed together. It can be covered in plastic material or rexine. The speaker fret material can be expanded metal or a heavy cloth, a narrow strip of wood screwed across the speaker opening gives added protection. It was found in the prototype that the pre-amplifier chassis could not be inserted in the cabinet with the valves in place, the glass pips just fouling the cabinet top. The valves can be easily

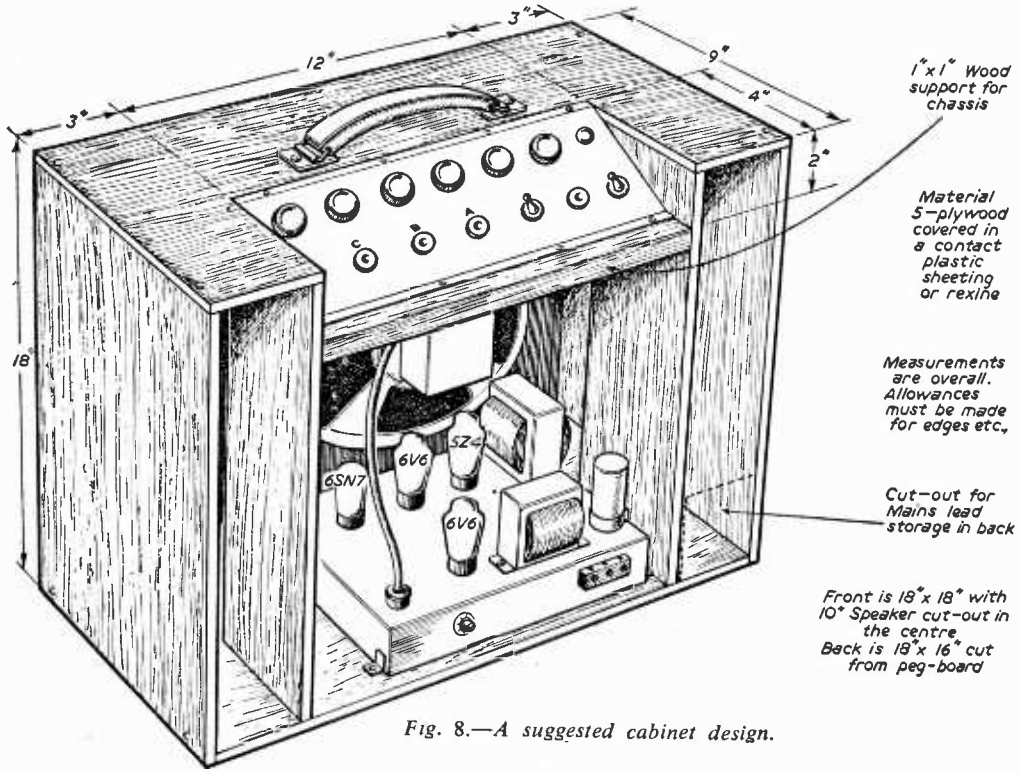


Fig. 8.—A suggested cabinet design.

put into place after the chassis has been placed in the cabinet opening by leaving it protruding slightly at the front so the bases can be seen looking down on it from above. The valves are then pushed home by putting them up from below. The chassis front may be painted a dove grey and the notations for the controls written on with Indian ink. Then give the face a coat of clear varnish.

Final Tests

With the equipment switched on, turn each volume control to zero with the vibrato switched off, and turn the tone control for maximum treble. Little hum, but some "hiss" should be heard from the speaker. Adjust the negative feedback control until this noise level is such that it can be heard only 3-4ft from the set. If an electric guitar is available it may be connected to each input in turn and checked for volume. The vibrato may be switched on and this checked for depth and speed. Microphony may be evident with some valves in the pre-amplifier, and if this is found, then the offending valve (most likely the ECC83 amplifier) must be changed. New valves in good condition do not show this trouble. The equipment will handle high outputs without overloading, and, say, two guitars on chords and one melody are reproduced extremely clearly with few intermodulation troubles.

AUTOMATIC CONTROL OF MACHINE TOOLS

A NEW type of German milling machine, fitted with a British tape-control system, which anticipates errors and stops the machine before they would have been made, thus eliminating the scrapping of valuable workpieces, was shown publicly for the first time at the German Machine Tool Fair at Hanover from September 11th to 20th.

The machine—a Droop and Rein FS80 vertical mill—is controlled by the "Emicon" system designed and manufactured by E.M.I. Electronics Ltd. This system incorporates a new angle safety unit, which foresees any programme error or irregularity in the tape and brings the safety circuits into operation before the cutter arrives at that point.

The big advantage of E.M.I.'s new system is that the machine is stopped before the fault has affected the workpiece. Immediately the irregularity has been investigated and if necessary corrected, cutting can continue.

Other Features

The "Emicon" system fitted to this machine also provides several other facilities. It gives contour control in any two axes and very fine step control in the third dimension. It also provides zero shift in all axes, which facilitates accurate positioning of the workpiece, considerably reducing the setting-up time.

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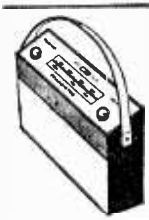

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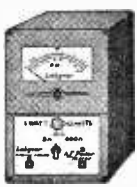

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Trade News

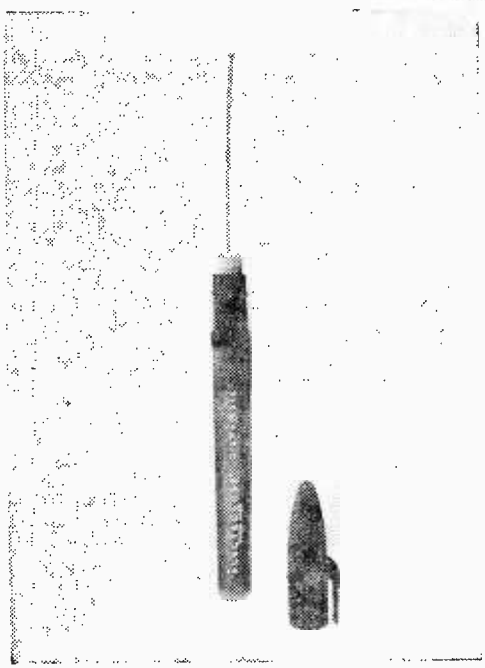
NEW PRODUCTS AND DEVELOPMENTS

SAFARI PORTABLE RADIOGRAM

THIS lightweight radiogram is powered by three 9V batteries which make it completely portable. The Safari is a nine transistor model with a long and medium waveband radio section incorporated. It will accommodate all sizes of records on a four-speed auto-stop record player with a turnover cartridge and sapphire styli for 78 r.p.m. and long playing records. A combined volume and tone control, wavechange switch, radio/off/gram switch and tuning control are located on the front panel. The cabinet is covered with imitation leather and is available in two colours—red and natural and tan and natural. The price is 37 guineas and this model may be obtained from *Dynatron Radio Ltd., Maidenhead, Berks*

ELECTROLUBE POCKET DISPENSER

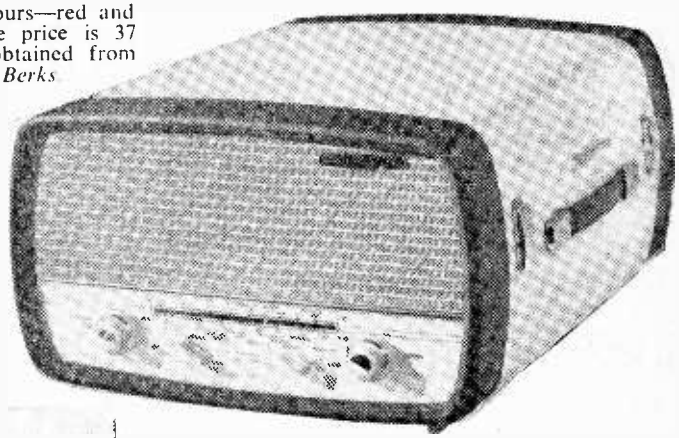
A POCKET size "Pen" type dispenser which enables low resistance lubricant to be economically applied to otherwise inaccessible places has been introduced by Electrolube Ltd. A sharp pull on the fountain-pen type cap automatically releases a thin 3in. nylon "Snorkel" tube which permits direct application of controlled drops when the reservoir body is squeezed or flexed. The amount of pressure on the nylon reservoir body controls the amount of lubricant used. The handy pocket dispenser is made by *Electrolube Ltd., Oxford Avenue, Trading Estate, Slough.*



The Electrolube "Pen" type pocket dispenser.

CAPACITOR PRECISION DECADE BOX

A LOW-PRICED capacitor precision decade box, Model DC-1U-F, has been introduced by Beulah Electronics. This instrument provides capacity values from 100pF to 0·11μF steps so that exact capacitor values are available for determination of capacitor values in compensating networks, filters, etc. Precision 1 per cent silver-mica capacitors are employed for high accuracy. Switches are ceramic wafer types for minimum loss and feature smooth action. The price is £9 net. *Beulah Electronics, 138, Lewisham Way, New Cross, London, S.E.14.*



The Safari Portable Radiogram.

REFLECTOGRAPH TAPE RECORDER

THIS tape recorder, Model A, has separate record and playback amplifiers providing continuous monitoring from the tape with provision for instant comparison between input signal and recorded signal. The recorder will take spools up to 8½in. Further information on this model may be obtained from *Multimusic Ltd., Maylands Avenue, Hemel Hempstead, Herts.*

PUSH BUTTON CAR RADIO

PUSH button station selection and wavechange is the main feature of a new car radio introduced by Philips. Model 493VT uses four valves plus transistor output stage and tone control is continuously variable All connections are on flexible leads and an adjustable aerial trimmer is mounted externally in the aerial lead. Model 493VT retails at 28 guineas and is manufactured

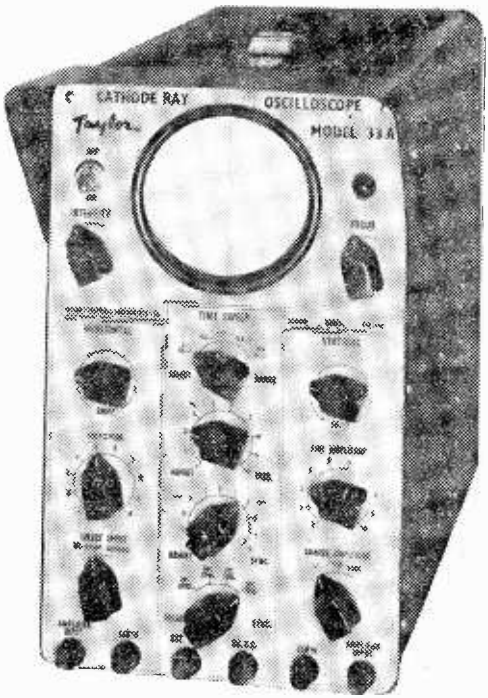
by *Philips Electrical Ltd., Century House, Shaftesbury Avenue, London W.C.2.*

PAM STEREOPHONIC RADIOGRAM

ONE of the new models from Pam (Radio & Television) Ltd. is the RG.630 stereophonic radiogram. This has a three waveband VHF radio and four-speed stereo/mono record player complete in one cabinet. Two wide range loudspeakers are fitted on the swing doors which may be closed when not listening to stereo. Model 630 measures 21¼in. high plus 11in. legs, 33in. wide and 15¾in. deep with ample record storage space. The makers are *Pam (Radio & Television) Ltd., 295, Regent Street, London W.1.*

NEW OSCILLOSCOPE

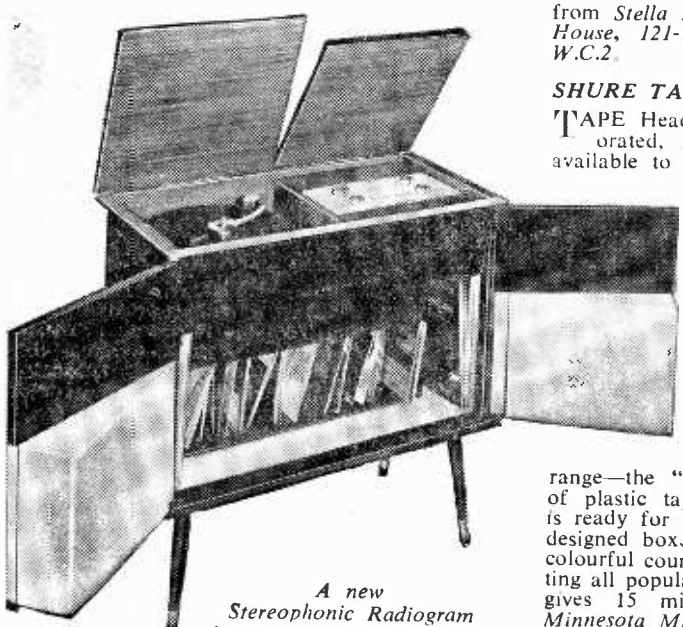
MODEL 33a is a new oscilloscope recently released by Taylor Electrical Instruments Ltd. This instrument has a hard time base having good synchronisation characteristics covering the wide range of frequencies from 2c/s to 100kc/s and can be operated either free running or triggered. Horizontal and vertical amplifiers with push-pull output are provided, the latter being of high gain with a frequency range extending from a few cycles per second to 60Mc/s. Further information on the oscilloscope, including the price, may be obtained from *Taylor Electrical Instruments Ltd., Montrose Avenue, Slough.*



The Taylor oscilloscope—Model 33a.

TWO NEW "STELLAPHONES"

TWO new tape recorders have been added to the range of "Stellaphone" recorders. They are the ST.455 and the ST.454 selling at 59 guineas and 37 guineas respectively. Both these models have four-track operation. Model ST.455 is a three-speed recorder housed in a portable cabinet with a detachable lid. Model ST.454 is a single speed instrument with push-button operation. Details of these tape recorders may be obtained from *Stella Radio & Television Co. Ltd., Astra House, 121-123, Shaftesbury Avenue, London, W.C.2.*



A new Stereophonic Radiogram from Pam—Model RG.630.

SHURE TAPE HEADS

TAPE Heads made by Shure Brothers Incorporated, Evanston, Illinois, U.S.A. are now available to manufacturers in the U.K.

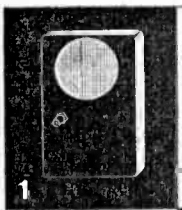
The range includes the new 4-track Stereo Tape Head Model TR54A and Stereo Erase Head Model TE28A.

Full details and specifications can be obtained from the sole U.K. representative of Shure Brothers—*Mr. J. W. Maunder—at 95, Hayes Lane, Beckenham, Kent.*

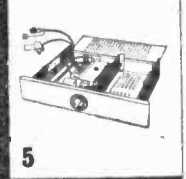
"ONE-FIVE SPECIAL"

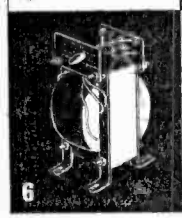
THE makers of "Scotch" Brand Magnetic tapes have added their latest addition to the range—the "One-five Special". With 150 feet of plastic tape on a 3in. reel, the "Special" is ready for instant mailing in its own specially designed box, and is available to Retailers in a colourful counter display containing 12 reels. Fitting all popular recorders, the "One-five Special" gives 15 minutes playing time at 3¾in./sec. *Minnesota Mining and Manufacturing Co. Ltd., 3M House, Wigmore Street, London, W.1.*

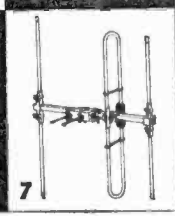
CHECK with these BARGAINS

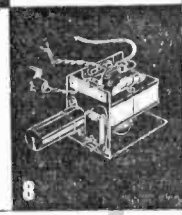


ORDERS BY POST WILL RECEIVE OUR PROMPT ATTENTION

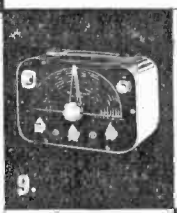


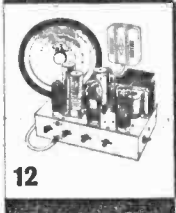




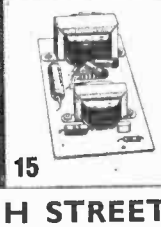


1. **2-TRANSISTOR POCKET RADIO with MINIATURE SPEAKER, PRINTED CIRCUIT AND FERRITE ROD.** Size 3½ x 4¼ x ¾in. Tunable over medium and long waves. Set of parts including ivory coloured case, 2 transistors and all necessary components (less batteries—available anywhere at 10d.). 22/6, P. & P. 1/6. Wiring diagram 1/6, free with kit.
2. **3-TRANSISTOR POCKET RADIO with MINIATURE SPEAKER.** Plus Germanium Diode and Printed Circuit. Size 3½ x 4 x ¾in. Ferrite Rod Aerial. Two Surface Barrier Transistors and one Audio. Tunable over medium and long waves. To build yourself 39/6, P. & P. 1/6. Circuit diagram 1/6, free with kit. All parts of items 1 and 2 sold separately.
3. **DOUBLE BEAM "SCOPE" for D.C. and A.C. APPLICATIONS.** A high gain, extremely stable differential Y-amplifier (30 mV/C.M.). Provide ample sensitivity with A.C. or D.C. inputs. Especially suitable for measurements of transistor operating conditions where maintenance of D.C. levels is of paramount importance. Push-pull X amplifier; Fly-back suppression: Internal Time-base Scan Waveform available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external + I/P and CRT Brightness Modulation. A.C. mains 200/250 v. £19.19.0 P. & P. 7/6 or 50/- deposit plus P. & P. 7/6 and 12 monthly payments of 33/4. FULL 12 MONTHS' GUARANTEE INCLUDING VALVES and TUBE.
4. **A.C./D.C. POCKET MULTI-METER KIT.** 2in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0–50, 0–100, 0–250, 0–500. Milliamps 0–10, 0–100. Ohms range 0–10,000. Front panel, range switch, wirewound pot (for ohms zero setting), toggle switch, resistor and rectifier. 19/6, P. & P. 1/6. Wiring diagram 1/-, free with kit.
5. **CHANNEL TUNER.** Will tune to all Band I and Band III stations. Complete with P.C.C.84 and P.C.F.80 valves (in series) I.F. 16–19 or 33–38. Can be modified as an aerial converter (instructions supplied). 32/6, plus 3/6 P. & P. **HEATER TRANSFORMER** to suit above, 200–250 v., 6/-, plus 1/6 P. & P.
6. **MAINS TRANSFORMERS.** All with tapped primaries, 200-250 volts, 0–160, 180, 200 v.. 60 mA, 6.3 v. 2 amps, 10/6. 280–0–280 80 mA, 6.3 v. 2 amp, 6.3 v. 1 amp, 10/6. 350–0–350 v., 70 mA, 6.3 v. 1 amp, 6.3 v. 2 amp, 10/6. 250–250 v. 70 mA. 6.3 v. 2 amp, 10/6. P. & P. 3/-.
7. **WOLSEY 3-ELEMENT FOLDED DIPOLE.** I.T.V. Aerial less mounting bracket for external use, complete with 12 yds. of coaxial cable, 15/-: 4-element, 17/6. P. & P. 3/6.
8. **BUILT POWER SUPPLY UNIT.** A.C. Mains 200–250 v. D.C. Output 250 v. at 75 mA. Also 6.3 v., 2 amp. heater winding. 21/-, P. & P. 3/6.
9. **SIGNAL GENERATORS.** Cash £6.19.6 or 25/- deposit and 6 monthly payments of 21/6, P. & P. 5/-. Coverage 100 kc/s to 200 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Case 10 x 6½ x 5¼in. Three miniature valves and Metal Rectifier. A.C. mains 200/250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent; Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy ± 2 per cent.
10. **SIGNAL GENERATORS.** Cash £4.19.6 or 25/- deposit and 4 monthly payments of 21/6, P. & P. 5/-. Coverage 120 kc/s to 84 Mc/s. Case 10 x 6½ x 4¼in. Size of scale 6½ x 3½in. 2 valves and rectifier. A.C. mains 230–250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Accuracy ± 2 per cent.
11. **BATTERY RECORD PLAYER AND AMPLIFIER.** Comprising 45 r.p.m. "Starr" motor, "Acos" crystal pick-up, 3 transistor push-pull amplifier, complete with transistors. Output 500 milliwatts, 49/6. P. & P. 3/6.
12. **8-WATT PUSH-PULL AMPLIFIER COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER.** A.C. mains 200–250 v. Size 10½ x 8½ x 2½in. 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feed back. Two inputs, mike and gram. and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s. ± 2 db: 4 db down to 20 kc/s. Output 8 watts at 5 per cent total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohms speech coils. For use with 8td. or L.P. records, musical instruments such as guitars, etc. £4.19.6, P. & P. 7/6 or 20/- deposit plus P. & P. 7/6 and 4 monthly payments of 23/-.
13. **B.S.R. MONARCH UA8 WITH FUL-FI HEAD.** 4-speed, plays 10 records, 12in., 10in., or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position. colour brown. Dimensions: 12½ x 10¾in. Space required above baseboard 4¾in., below baseboard 2¾in. Fitted with Pul-Fi turnover crystal head. £6.19.6. P. & P. 5/- With Stereo Head. £7.19.6. P. & P. 5/-.
14. **TRANSISTOR TESTER.** For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case, size 4¼ x 3¾ x 1¾in. Scale marked in gain and leakage. 19/6. P. & P. 2/6.
15. **PUSH-PULL OUTPUT STAGE** inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the POCKET RADIO. Kit of parts, including transistors. 19/6. P. & P. 1/6. Wiring diagram 1/6, free with kit.
16. **PORTABLE AMPLIFIER.** On printed circuit for A.C. Mains 200/250 v. Size 4 x 3in. with tone and volume control. Valves: ECL82 and EZ80. 39/6. P. & P. 2/6.





SATISFACTION GUARANTEED OR MONEY REFUNDED



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

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

ALL ENQUIRIES S.A.E.
GOODS NOT DISPATCHED OUTSIDE U.K.

Club News

REPORTS OF CURRENT ACTIVITIES

AMATEUR RADIO CLUB OF NOTTINGHAM

Hon. Sec.: E. C. Weatherall, 16 Aveberry Close, Clifton, Nottingham.

September 22nd saw the opening of a course of R.A.E. instruction for newcomers. The course is under the direction of A. Davis, G3LXL, and classes will continue to be held throughout the winter.

Future Events:

October 4th—Open Night.

October 25th—"The Panoramic Adaptor" by G3JWQ.

AMATEUR RADIO MOBILE SOCIETY

Hon. Sec.: N. Fitch, 79 Murchison Road, London, E.10.

"Uncle Tom's party", an annual club event, took place this year at Bishop's Stortford, Hertfordshire, on August 28th.

Future Event:

November 12th—Gala buffet and ball.

CALCOT RADIO SOCIETY

Hon. Sec.: F. D. Mitchenall, 12 Glenwood Drive, Tilehurst, Reading.

During October two lectures were given for club members in St. Birinus' Church Hall. One was on transistor portable receivers, by S. Woodward; and the other on transistor circuitry, by J. A. B. Dunn.

Future Event:

November 25th—A lecture and demonstration on recording TV pictures on tapes will be given at St. Birinus' Church Hall, Calcot, Reading.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Derby and District College of Art, Green Lane, Derby.

Hon. Sec.: F. C. Ward, 5 Uplands Avenue Littleover, Derby.

The estimated number of visitors who attended this year's Mobile Rally was 1,000, some 500 less than last year and it is thought that the unsettled weather was responsible for the reduced attendance.

At the time of closing the transmitters at 2.45 p.m. G3ERD/A on 160m had contacted 41 mobiles and G3EEO/A on 2m had worked seventeen.

A car park check at 3.15 p.m. provided a count of 215 cars, 65 of which had been equipped for mobile operation. The visitors log was closed at 3.30 p.m. and showed a total of 461 which included 163 call signs among which was ON4GK Theodore Nissen from Antwerp who, incidentally was the lucky recipient of the major raffle prize, an Electric Washing Machine.

The Mobile Competition was of a novelty nature being based on an elimination competition. The winner was F. James, G6NW, from Hayes, who carried off the other Washing Machine. The runner up was P. Hill, G3NPU, of Eastbourne.

The main programme commenced at 2 p.m. but the Children's Sports were somewhat curtailed due to a shower of rain. The flying display was also postponed to 5.15 p.m. A new feature was a display of unarmed combat by members of the Derby Olympus Judo Club, this created quite an attraction.

The main hall was packed to capacity for the start of the Monster Junk Sale at 3.45 p.m. Business was brisk for the next 45 minutes whilst the Chairman, Tom Darn, G3FGY, auctioned the oddest variety of articles to the amusement of the crowd of well over 600.

Raffle prizes were presented at 5 p.m. by the President's wife, Mrs. A. G. G. Melville, after which a 60-minute Cartoon Film Show was screened for the juniors while parents refreshed themselves in the School Refectory where refreshments were in the hands of the Treasurer, Harry Shaw, assisted by members' families and friends.

Quite a lot of new friendships were made but some of the old faces were missing. Suggestions and criticisms will be welcomed by the Chairman of the Organising Committee, G3FGY.

EXETER AMATEUR SOCIETY

Hon. Sec.: J. Duff, 70 Cranford Avenue, Littleham Cross, Exmouth, Devon.

New members are invited to attend club meetings in the recently acquired clubroom at the Exeter Y.M.C.A. The club meets on the second Thursday of each month.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: H. James, G3MCN, 448 East Prescot Road, Knotty Ash, Liverpool 14.

During October the Society held its Annual General Meeting.

Future Events:

October 11th—G3MCN "Vacation in Holland." Illustrated by colour slides.

October 18th—Open night.

October 25th—G3HII talk on "TV Studio Work".

MITCHAM AND DISTRICT RADIO SOCIETY

Hon. Sec.: M. Pharaoh, G3LCH, 1 Madeira Road, Mitcham.

A lecture, by G3JJG, on Third Method Single Side-band for the Amateur, was held on September 9th; and a lecture and demonstration on 23cm equipment was given by G3FP on the 23rd of the same month.

Future Events:

October 7th—Lecture on Colour Television by the BBC.

November 18th—Talk by Collins Radio Co.

PLYMOUTH RADIO CLUB

Hon. Sec.: R. Hooper, 2 Chestnut Road, Peverell, Plymouth, Devon.

The clubroom is again open for the Tuesday evening meetings. The aerial at the clubroom has been resited and it is hoped that more interesting contacts will result during the coming winter.

Future Event:

October 18th—Junk Sale.

STOKE-ON-TRENT AMATEUR RADIO SOCIETY

Hon. Sec.: V. J. Reynolds, G3COY, 90 Prince's Road, Hartshill, Stoke-on-Trent, Staffordshire.

The Stoke-on-Trent A.R.S. has, in recent months, been on the air from several exhibitions and rallies. 1960 is the city's jubilee year, and for the period of the celebrations the special call-sign GB3SOT has been used in place of the more familiar call of the society (G3GBU).

The society's most recent event was "The Rally of Boats". This was in co-operation with the local boat club who staged their national boat rally. Several craft were fitted for FM operation.

WELLINGBOROUGH RADIO CLUB

Hon. Sec.: P. E. B. Butler, 88 Wellingborough Road, Rushden, Northamptonshire.

During the summer recess the club TX has been completely overhauled and G3KSC rebuilt the modulator.

Future Event:

November 3rd—Film night on British Railways.

WEST MIDDLESEX TAPE RECORDING CLUB

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

The meeting at St. George's Hall, Southall, on Thursday, August 25th, was taken up with playing back the unedited tapes of the visit to Whipsnade Zoo, and it was decided to play them again at Hampton on September 8th, with a view to consolidating all three efforts to make a feature tape in due course. Also, a further tape from Fred Gazelev concerning his scheme for the Blind, was played, and a recording made of the subsequent discussion.

The meeting felt that Fred could best be helped by individual offers of help such as dubbing, reading and technical assistance, as such help was liable to be required at short notice which rather ruled it out as a Club activity.

The next meeting was at the Railway Hotel, Station Road, Hampton, at 7.30 p.m. on Thursday, September 8th, to listen to the Whipsnade tapes and make rude comments thereon, and the second meeting of the month was at the St. George's Hall, Lancaster Road, Southall, at 8 p.m. on Thursday, September 22nd. Stanley Mace also presented a tape entitled "The Bird-Watcher's Dilemma".

We seem to be standardised for a while in our meeting place. There will be two meetings per month until further notice. On the second Thursday of the month at the Railway Hotel, Station Road, Hampton, and on the fourth Thursday of the month at St. George's Hall, Lancaster Road, Southall. The Hampton meetings start at 7.30 p.m., and the Southall meetings start at 8 p.m., and refreshments are provided.

We are attempting to obtain some specially written playlets or sketches suitable for recording, from a local author who has won several prizes for his material, and it is hoped to arrange future recording sessions for putting these on to tape.

Future Events:

October 13th—At the Railway Hotel, Station Road, Hampton, Bruce Bargavel will be singing, with a pianist, and Members are invited to bring along their equipment to do some live recording of voice and piano.

October 27th—A visit from a leading tape-recorder manufacturer, for a demonstration.

November 10th—Members are invited to bring along their home-made equipment and gadgets for the approbation of their fellows.

Short-wave Listeners' Log—3

SHORT wave enthusiasts who can read Morse will usually find many interesting signals on any active band. In order to produce an audible tone from C.W. transmissions, the receiver beat frequency oscillator has to be operating. Receivers of other types than "communications" may not be fitted with a B.F.O. In this case a unit can be made by making a simple one-valve oscillator. Any small triode or H.F. pentode will serve. Current is drawn from the receiver, and the coil tunes to about the intermediate frequency of the receiver. The oscillator is coupled to the detector diode by a small capacity such as an insulated loop round the diode connection.

Setting a B.F.O.

When initially setting a B.F.O., tune in a signal with it switched off. The B.F.O. frequency is adjustable with a small condenser (e.g. 25pF) and the audio tone produced will be the difference between receiver I.F. and B.F.O. frequency (e.g., for a 465kc/s I.F. tuning the B.F.O. to 466kc/s or 464kc/s would give 1kc/s, or 1000cs. audio output).

With communications receivers having a crystal filter or single-signal circuit, the B.F.O. should be adjusted to the high frequency side of the I.F., so that the heterodyne image can fall in the crystal rejection notch. With simple T.R.F. receivers, C.W. Morse can be heard by bringing the detector into oscillation and tuning slightly to one side of the transmitter frequency.

If little proficiency in code reading has been gained, it is as well to choose the amateur bands, selecting slow, clear signals free from chirps and tails, and clearly keyed. The 80m band will often provide stable, clear local C.W. signals. On this band most messages heard will be in English.

Amateur and Commercial Stations

When some speed in reading has been obtained, various commercial and similar stations may be selected. When 12w.p.m. can be copied, it will be found that occasional snatches at 16, 20, or even more words per minute can be taken down. At this stage it may be found that a stable, cleanly keyed 16w.p.m. commercial transmitter is easier to read than 10 or 12w.p.m. from a chirpy, poorly-keyed amateur station. Unfortunately, many commercial signals will be in cipher, though some are in plain English.

The various stations previously listed generally continue to be well received at the times given. In many cases the English transmissions that are beamed towards this country are of excellent signal strength.

The New Amateur Band

Attention to the fairly new 15m amateur band is worth while for long range Dx. This band covers 21·0Mc/s to 21·45Mc/s and in favourable conditions has a long skip distance. Very good reception has been obtained from the far east, west, and Africa.

When conditions are good, U.S.A. amateurs can sound almost like "locals" on the 15m and 20m bands. Many long distance commercial stations also employ frequencies in the neighbourhood of 19m to 20m, 16·75m to 17m, and 13·8m to 14m, and excellent reception of these is quite usual.

Six-Valve Top-Band Tx

(Continued from page 597)

city; if we now slightly reduce its capacity, it will be found that the dip which occurs on rotation of the anode tuning condenser is less pronounced. It may be found, for example, that instead of the dip down to 10mA which we had originally, the dip is now only to 15mA (corresponding to a power input of 4½W). It will also be found that the aerial current indicated by M2 is now considerably greater. All we need do, therefore, to load up to 10W is gradually to reduce the value of the aerial tuning condenser until the dip produced by the anode tuning condenser is about 33mA.

While we have the dummy aerial connected up it is interesting to determine the approximate efficiency of the P.A. stage. Let us suppose that the transmitter has been loaded up to 10W, and that the aerial current meter M2 reads 250mA (i.e. ¼A). Now,

$$P = I^2R$$

Power dissipated in 80Ω dummy load $= (1/4)^2 \times 80W$
$= (80/16)W$
$= 5W$

Efficiency = [Output power/Input power x 100]%
$= (5/10) \times 100$ per cent
$= 50$ per cent.

It is also well worthwhile at this stage to monitor the transmission. This can be carried out in a variety of ways; the one the writer prefers is shown in Fig. 6. It is, in effect, an extremely simple crystal set which can be connected to the output of the transmitter. If the modulation seems satisfactory one can then proceed to remove the dummy aerial and plug in the aerial itself.

Conclusion

As stated earlier in the article, the actual length of the aerial is not very critical from the point of view of loading up the transmitter. Those without very much garden space will find that a 66ft wire, erected as high as possible, will give good results. If space is available, a quarter-wave end-fed aerial is very satisfactory; it may be fed with 80Ω coax without introducing too great a mismatch. The aerial used by the writer is half-wave and end-fed, about 35ft high at the highest point. In the space of about six months, over 30 counties of the British Isles have been contacted on phone.

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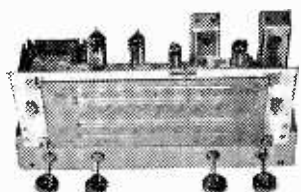

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Letters to the Editor

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.

HI-FI SYSTEMS

SIR,—I would like to second Mr. A. Jenning's letter (P.W. July), and hope that you will be able to include some early articles on installing a Hi-Fi system from scratch.—E. TUNER (Birmingham).

MANUAL WANTED

SIR,—I would like to know if any of your readers has a circuit diagram and/or manuals for the Ex WD. Tx/Rx W.S. 22?—A. PINNINGTON (Wirral, Cheshire).

INFORMATION REQUIRED

SIR,—I wish to fit an "S" meter to a communications receiver. If anyone can supply information about this, I would be very grateful.—R. McA. (Northern Ireland).

BOOKS WANTED

SIR,—My letter appeared in the August edition of this magazine asking for information about the Hallicrafters S-20R receiver. I received a number of replies to this letter, and I thank everyone who sent me information.

One such person is an Indian living near Madras, a young man who although holding a Diploma in Radio Servicing and Maintenance, is unable to get a job, owing to the small number of jobs available in India in comparison to the great number of qualified people. While waiting for such a job, he spends his time trying to learn more about his subject by reading books and by corresponding with people of any age who are interested in Radio or Electronics of any kind.

Would anyone who would like to write to this person, or who would like to send some books or odd bits of radio "spares", please write to me enclosing s.a.e.—R. LESTER (Highgate).

CONVERTING TO MAINS

SIR,—With the end of summer many constructors will no doubt be desirous of converting their battery-portable receivers into mains versions for winter at-home listening. I should certainly like to do this with mine but I am not certain of the procedure. Could any of your magazine readers or perhaps a contributor to your magazine help here?—J. ROBINSON (Buckinghamshire).

TRANSISTORS

SIR,—The point I wish to press is this. Recently we have been entertained by Transistors v Valves. This seems to be a most pointless argument. I have waited in vain for 12 months for a valve enthusiast to answer one question—why use valves? Most letters on the subject have proved pointless. People who compare amplified crystal sets to valve radios only betray their own ignorance while to those who say "a valve can heat up to great temperatures," I say why do you want hot valves? I don't. In the last year I have handled 40 transistors and only damaged one electrically and three mechanically and I have made almost every error in the book.—D. RICHARDSON (Edinburgh).

ONE VALVER

SIR,—I was glancing through some of my past issues of the P.W. when I noticed a letter from W. H. M. Godwin, of Kenya, referring to a 1L4 triode one valver and its peculiarities in receiving far-off stations.

I too have a one valver battery set for use with headphones which hrings in LW and MW stations exceptionally clearly. The valve used is a 3S4 beam tetrode and only requires a small aerial as an earth upsets reception of Luxembourg.

You might think that this letter is a waste of time, but the oddity of my set is the battery it uses. The L.T. for the valve is a 2V accumulator, the H.T. for the valve is, or should be, 90V, but the circuit was designed for 22½V. I find it works off a 1·5V pen cell for H.T. with equal volume as that of a crystal set.

My receiver brings in Luxembourg, Home and Light programmes, etc., with clarity with a 1·5V H.T. It also runs off a 2V H.T. from the same supply as the valve heater.

I find that it sounds rather odd to be able to say "My valves run off a 2V L.T. and 2V H.T.".—K. HAMLEY (Northants).

TAPE CLUB

SIR,—I am interested in forming a Tape Club at Dartford and would like to hear from interested readers.

As a reader from No. 1, I have been very interested in Valves v Transistors article; I think that at the moment neither has a majority of people favouring one or the other but in the next two to three years I am sure the transistor will take first place in about 90 per cent. of all equipment.—E. H. FOREMAN (Dartford).

CROSS-OVER NETWORKS

SIR,—I was very interested by the comment of Mr. James in the October issue on the subject of cross-over networks.

I disagree that these devices are either compli-

cated or expensive, and if Mr James cares to visit his local library he will find a host of information on the subject. Recently I tried an apparently similar circuit using an 8μF condenser and the results were good, but were greatly enhanced by the addition of a small home-made choke.

Mr James will find that the loudspeakers have a great deal to do with cross-over, and a good bass speaker 8in. in diameter or larger will make almost any cross-over sound much better, because good bass cannot be obtained with a smaller speaker.

Finally, the table of cross-over frequencies concerning different networks and speaker impedances can also be found at the library. —J. A. BAKER (Doncaster).

INTERFERENCE

SIR,—In your October issue Mr. Parsons commented on the interference on or near 208m medium wave. I entirely agree and have great difficulty in pin-pointing this popular station.

In my opinion, and I am sure many people will agree, there should be a radio conference every five or seven years. Any new medium or long wave stations that want to come on the air should make arrangements at one of these conferences, and register them.

Soon we will have so many stations on medium wave that we will not be able to decipher any of them unless our receivers are made a great deal better than they are now.— N. D. ROFE (Bawnboy, Eire).

STEREOPHONIC SOUND

SIR,—In regard to Mr F. Barrington's letter, printed in the October issue may I say how misinformed he is about stereo records.

The majority of the latest mono extended play and long play records are also released in stereo thereby letting stereo enthusiasts take full advantage of their equipment.

I have just completed a 3W stereophonic amplifier and find it gives excellent results. Also the acoustics of the room, in which the units are situated, did not impair with sound reproductions so much as to make me wish I had not constructed this piece of equipment.

From Mr. Barrington's letter I understand that he prefers modern records. Who wants these records in stereo anyway? The majority sound bad enough already, what would reproduction sound like in stereo!

If he wanted a good quality amplifier for these records he should not have used stereo but should have built a mono one instead. After all there has been a great number of well-designed circuits in PRACTICAL WIRELESS for gram amplifiers and I feel that Mr. Barrington should have thought about all aspects of stereo before he started.—M. L. How (Palmers Green).

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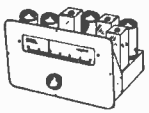

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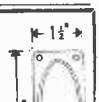

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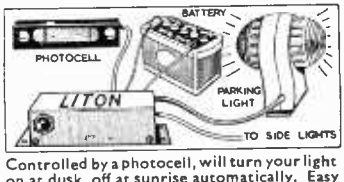

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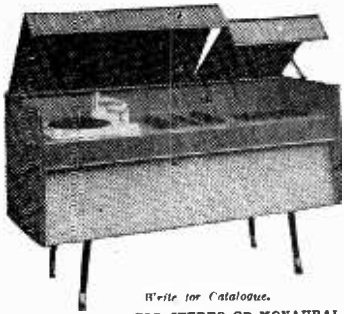

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Practical Wireless

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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 blueprint.

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.*

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The PW 3-speed Autogram	—*	8/-
The PW Monophonic Electronic Organ	—	8/-
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The PT Band III converter	—*	1/6

Title	*Number*	*Price*
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Crystal Receiver	PW71*	2/-
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Pyramid One-valver	PW93*	2/6
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
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