AUGUST 1961

Practical WIRELESS

1/6

A Stabilised Power Supply

Voice-operated Switch

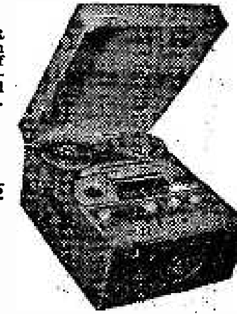
Acorn F.M. Tuner

10,000Ω/V Multimeter

NOISE LIMITER AND SPEECH CLIPPER

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 with latest attractive two-tone polychrome finish, 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.

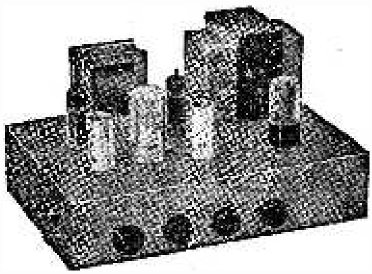


25½ GNS. Carr. 17/6

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

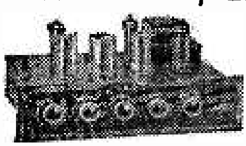
PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES



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 is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/- (Or factory built 51/- extra).

If required louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS. DEPOSIT 24/9, and 9 monthly payments of 24/9.** 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, EZ81. Outputs for 2-3 ohm speakers. Point-to-Point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. **8 Gns.** Full constructional details and price list 2/6. Carr. 10/-.

TELEVISION RECTIFIERS 250 v. 200 mA. small size. Only **6/9 each.**

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.

COLLARO RC 457 4 SPEED MIXER AUTO-CHANGERS. Turnover Studio Pick-up head, for 200-250 v. A.C. **£7.19.6.** Carr. 4/6.

THE SKYFOUR T.R.F. RECEIVER A design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion detector. Valve line-up 6K7, SP61, 6V6G. Selectivity and quality excellent. Simple to construct. Point-to-Point wiring diagrams, instructions and parts list, **1/9**; maximum building costs **£4.19.6.** inc. attractive Walnut veneered wood cabinet 12 x 6½ x 5½in.

D.C. SUPPLY KIT. 12 v. 1 a. consisting of a partially drilled metal case, mains trans., F.W. Bridge Rectifier, 2 fuseholders and fuses. Change Direction switch, variable Speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains, Limited number available at 33/9.

R.S.C. BATTERY CHARGING EQUIPMENT

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

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, Variable Charge Rate Selector Panels, Plugs, Fuses, Fuseholder and circuit, **59/9.** Carr. 4/6.

DEAF AID EARPIECES. Low Impedance with lead, **8/9.** High Impedance Crystal **8/9.**

MICROPHONE INSERTS. Crystal type **6/9.**

Assembled 6 v. or 12 v. 4 amps.
Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finished. Fused and ready for use with mains and output leads. **69/9** Carr. 5/- Terms: Deposit **13/3** and 5 monthly payments 13/3.

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 **49/9** Carr. 3/9.

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**
6v. 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., 0-25a., 0-60 a. 8/9.

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

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

TOP SHROUDED DROP THROUGH

250-0-250 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a.	**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.	**19/9**
250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.	**25/9**
300-0-300 v. 130 mA, 6.3 v. 4 a, 6.3 v. 1 a, for Mullard 510 Amplifier	**29/9**
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**
350-0-350 v. 100 mA, 6.3 v. 4 v. 4 a, C.T. 0-4-5 v. 3 a	**26/9**
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.	**27/9**
300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a.	**27/9**
350-0-350 v, 100 mA, 6.3 v. 4 a, 5 v. 3 a.	**27/9**
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, 5000Ω 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	**49/9**

ELIMINATOR TRANSFORMERS
Primaries 2. 0-250 v. 50 c/s.

120 v. 40 mA, 5-0-5v. 1 a.	**15/9**
90 v. 15 mA, 4-0-4 v. 500 mA	**9/9**

SMOOTHING CHOKES

150 mA, 7-10H 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, **19/9**; 0-9-15 v. 6 a, **23/9**; 0-9-15 v. 8 a, **28/9.**

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, **8/9**; 120:1 Potted. Mu-metal screened, **9/9.**

R.S.C. (Manchester) Ltd. LIVERPOOL, LEEDS, BRADFORD, MANCHESTER

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 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. Carr. and pkg. 5/-

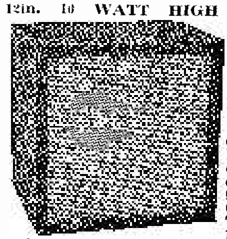
STEREO EQUIPMENT OFFER—Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acos T/O Stereo head suitable most pickups. **£6.19.6** Carr. 7/6

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

ACOS CRYSTAL MICROPHONES. Mic40 stand or desk. Listed 45/-. Only **27/9.** 39-1 Stick type. Listed 5 gns. Only **39/6.**

LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER. Suitable for use with any record playing unit, and most microphones. Negative feed-back 12db. 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 LOUD-SPEAKER IN POLISHED WALNUT FINISHED CABINET



Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only **£4.19.6** Carr. 5/-. Terms: Deposit **11/3** and 8 monthly payments of **11/3.**

12in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 10in. Finish as above. Terms: Deposit **17/9** and 9 monthly payments of **17/9.** Only **£7.19.6.** Carr. 8/6.

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 A11 can be supplied for **18/9.** The amplifier can be supplied, factory built with EL34 output valves and 12 months' guarantee, for **14 Gns.** **TERMS: DEPOSIT 33/9** and 9 monthly payments of **33/9.**

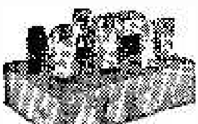
11 Gns. Carr. 10/-

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

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

B.S.R. UA8 4-SPEED AUTO-CHANGERS with Hi-fi turnover pick-up head, **£6.19.6.** Carr. 5/-.

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. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-230-250 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 attractive and durable policrome, 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 in. elliptical for Treble. Cabinet is well made and finished as Junior model. 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/-

Above model fitted Linear Tremolo Unit 5 gns. extra. Or Deposit **11/6** and 9 monthly payments **11/6.**

R.S.C. BASS REFLEX CABINETS. JUNIOR MODEL. Specially designed for W.B. HF1012 Speaker, but suitable for any good quality 10in. speaker. Acoustically lined and ported. Polished walnut veneer finish. Size 18 x 12 x 10in. Handsome appearance. Ensure superb reproduction for only **£3.19.6.** **STANDARD MODEL.** As above but for 12in. speakers. Size 20 x 15 x 13in. Especially recommended for Plessey Dual Concentric Speaker. **£5.19.6.** Suitable legs with brass ferrules, **25/-** per set of 4.

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 A11 or similar amplifier. Rated 10 watts. Price only **£5.19.6.**

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 A11 Amplifier. **£5.10.9.** 12in. R.A. 3 ohms 10 watts (12,000 lines), **59/6.**

TWEETERS. Plessey 3Ω **19/9,** 15Ω **25/9.**

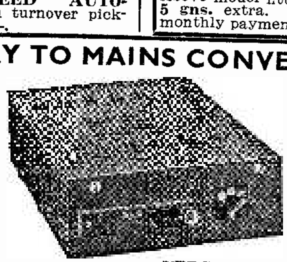
HI-FI CRYSTAL PICK-UP HEADS. (Turnover type with sapphire stylus.) Acos. Standard replacement for Garrard and B.S.R. B.S.R. Ful-fi. Garrard GC2, **19/9.** B.S.R. Stereo-Monaural **39/11.**

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. A.C. mains. Size 11½ x 2½ x 2½in. Controls: Vol. and Tone with switch. 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. Controls are Tuning, W/Ch. and Vol. Only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration, **2/6.** Total building cost **£4.15.9.** For 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.**

LINEAR TAPE PRE-AMPLIFIER Type LP/1. Switched Negative feedback equalisation. Positions for Record 1⅞in. 3¾in., 7½in. and Playback, EMS4 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriptor and a high fidelity amplifier, but suitable for almost any Tape Deck. Only 9 gns. S.A.E. for leaflet.

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. (Manchester) Ltd. Mail Orders to 29-31 Moorfield Road, Leeds 12. Personal shoppers to any of branches below—

73 Dale Street, Liverpool 2 | 5-7 County (Mecca) Arcade, Briggate, Leeds 1 | 8-10 Brown St. (Market St.), Manchester 2 | 56 Morley Street (Above Alhambra Theatre), Bradford

BENTLEY ACOUSTIC CORPORATION LTD.

38 CHALCOT ROAD, CHALK FARM, LONDON, N.W.1. Telephone: PRIMROSE 9090

EXPRESS POSTAL SERVICE. ALL ORDERS DESPATCHED SAME DAY AS RECEIVED. TELEPHONE AND TELEGRAM ORDERS FOR CASH ON DELIVERY SERVICE ACCEPTED UP TO 3.30 P.M.

OA2 17/6	6F6G 7/-	10C2 26/6	35L6GT 9/6	DH76 5/-	EF40 15/-	HN309 24/7	PL83 9/-	U4020 16/7	XFY12 9/6
OB2 17/6	6F11 17/3	10D2 12/-	35W4 7/6	DH77 7/-	EF41 9/-	HVR2 20/-	PL84 12/8	UABC80 9/-	XFY34 17/6
OZ4 5/-	6F12 4/6	10F1 26/6	35Z3 10/6	DK32 12/-	EF42 10/6	HVR2A 6/-	PL820 18/7	UAF42 9/6	XH(1.5) 6/6
1A5 6/-	6F13 11/6	10F9 11/6	35Z4GT 6/-	DK91 6/6	EF50(A) 7/-	KF35 8/6	PM84 17/3	UB41 12/-	XSG(1.5) 6/6
1A7GT 12/-	6F15 15/3	10LD3 8/6	35Z5GT 9/-	DK92 9/-	EF50(E) 5/-	KL35 8/6	PX4 10/6	UBC41 8/6	Y63 7/6
1C5 12/6	6F23 10/6	10LD11 15/11	43 10/-	DK96 8/6	EF54 5/-	KLL32 24/7	PY31 16/7	UBC81 11/4	Z63 7/6
1D6 10/6	6F24 18/7	10P13 15/-	50C5 10/-	DL33 9/6	EF73 10/6	KT2 5/-	PY32 12/6	UBF80 9/-	Z66 17/6
1G6 17/6	6F32 10/6	10P14 19/3	50CD6G	DL66 17/6	EF80 6/-	KT33C 10/-	PY80 7/6	UBF89 9/6	Z77 4/6
1H5GT 10/6	6F33 7/6	12A6 5/-	36/6	DL68 15/-	EF85 6/-	KT36 29/10	PY81 8/6	UBL21 23/3	Z719 6/-
1L4 3/6	6G6 6/6	12AC6 15/3	50L6GT 9/6	DL72 15/-	EF86 10/6	KT41 23/3	PY82 7/-	UCC84 14/7	*Transistors*
1LD5 5/-	6H6 3/-	12AD6 17/3	53KU 19/11	DL92 7/-	EF89 9/-	KT44 12/6	PY83 8/6	UCC85 9/-	*and diodes*
1LN5 5/-	6J5 5/-	12AE6 13/11	77 8/-	DL94 7/6	EF91 4/6	KT61 12/6	PY88 13/3	UCF80 16/7	CG1C 7/6
1N5GT 10/6	6J6 5/6	12AH7 8/-	78 6/6	DL96 8/6	EF92 4/6	KT63 7/-	PZ30 19/11	UCH21 23/3	CG4E 7/6
1R5 6/6	6J7G 6/-	12AH8 12/6	80 9/-	DM70 7/6	EF97 13/3	KT66 15/-	QP21 7/-	UCH42 9/6	CG6E 7/6
1S4 9/-	6J7GT 10/6	12AT6 7/6	83 15/-	E80F 20/-	EF98 13/3	KT88 24/-	QP25 14/6	UCH81 9/6	CG7E 7/6
1S5 6/-	6K7G 5/-	12AT7 6/-	85A2 25/-	E83F 37/6	EF183 18/7	KTW61 6/6	QS150/15	UCL82 11/6	CG10E 7/6
1T4 3/6	6K7GT 6/-	12AU6 23/3	101 13/6	EA50 2/-	EF184 18/7	KTW62 7/6	10/6	UCL83 19/3	GD3, 4, 5,
1U5 6/-	6K8GT 10/6	12AU7 6/6	150B2 15/-	EA76 9/6	EK32 8/6	KTW63 6/6	R12 9/-	UF41 9/-	6, 8 4/-
2D21 15/-	6K8G 6/6	12AV6 12/8	161 10/6	EABC80 9/-	EL32 5/-	KTZ41 8/-	R18 14/-	UF42 12/6	OA70 3/-
2P 26/6	6K25 19/11	12AX7 7/6	185BT 33/2	EAC91 4/6	EL33 12/6	KTZ63 7/6	R19 19/11	UF80 10/6	OA73 3/-
2X2 4/6	6L1 23/3	12BA6 8/-	304 10/6	EAF42 9/-	EL34 15/-	L63 6/-	RG1/240A	UF85 9/-	OA79 3/-
3A4 6/-	6L6G 8/-	12BE6 9/-	305 10/6	EB34 2/6	EL38 26/6		45/-	UF86 17/11	OA81 3/-
3A5 10/6	6L6M 9/6	12BH7 21/3	807 7/6	EB41 8/6	EL41 9/-	MHL4 7/6	RK34 7/6	UF89 9/-	OA86 4/-
3B7 12/6	6L7GT 7/6	12E1 30/-	956 3/-	EB91 4/-	EL42 10/6	MHLD6 12/6	S130 22/6	UL41 9/-	OA91 3/6
3D6 5/-	6L18 13/-	12J5GT 4/6	1821 16/7	EBC3 23/3	EL81 16/7	ML4 8/6	SP4(7) 14/6	UL44 26/6	OA95 3/6
3Q4 7/6	6L19 23/3	12J7GT 9/6	4033L 12/6	EBC33 5/-	EL83 19/11	MS4B 23/3	SP41 3/6	UL46 14/6	OA210 11/-
3Q5GT 9/6	6LD3 8/6	12K5 17/11	5763 12/6	EBC41 8/6	EL84 7/6	MU12/14 8/-	SP42 12/6	UL84 8/6	OA211 20/-
3S4 7/-	6LD20 15/11	12K7GT 5/6	7193 5/-	EBC81 8/-	EL85 13/11	N37 23/3	SP61 3/6	UM4 17/3	OC16 48/-
3V4 7/6	6N7 8/-	12K8GT 14/-	7475 7/6	EBF80 9/-	EL86 17/3	N78 19/11	SU25 26/6	UM34 17/3	OC19 48/-
5R4GY 17/6	6P25 12/6	12Q7GT 5/-	9002 5/6	EBF83 13/11	EL91 5/-	N108 23/3	T41 9/-	UM80 15/3	OC23 87/-
5U4G 6/6	6P26 19/11	12SA7 8/6	AC/PEN	EBF89 9/6	EL95 10/6	N308 20/7	TDD4 12/6	UR1C 18/7	OC26 25/-
5V4G 10/-	6P28 26/6	12SC7 8/6	5-pin 23/3	EBL1 29/6	EL820 18/7	N339 15/-	TH41 26/6	UU6 19/11	OC28 25/-
5Y3 6/6	6Q7G 6/6	12SG7 7/-	7-pin 15/-	EBL21 23/3	EL822 25/-	P61 3/6	TH233 33/2	UU7 16/7	OC35 25/6
5Z3 19/11	6Q7GT 11/-	12SH7 8/6	AC2PEN/	EBL31 23/3	EM34 9/6	PABC80	TP22 15/-	UU8 26/6	OC44 11/-
5Z4G 9/-	6R7G 10/-	12SJ7 8/6	DD 12/6	EC52 5/6	EM71 23/3	13/11	TP25 15/-	UU9 7/6	OC45 10/-
6A7 10/6	6SA7GT 8/6	12SK7 6/-	AC6PEN 7/6	EC54 6/-	EM80 9/-	PCC84 8/-	TP2620 33/2	UY1N 18/7	OC65 22/6
6A8 9/-	6SC7 7/6	12SQ7 11/6	AC/TP 33/2	EC70 12/6	EM81 9/-	PCC85 9/6	TY86F 13/3	UY21 16/7	OC66 25/-
6AC7 4/-	6SG7GT 8/-	12SR7 8/6	ATP4 5/-	EC92 13/3	EM84 10/6	PCC88 18/-	U12/14 8/6	UY41 7/6	OC70 6/6
6AG5 5/6	6SH7GT 8/-	12Y4 10/6	AZ1 18/7	ECC32 5/6	EM85 17/3	PCC89 11/6	U16 10/-	UY85 7/-	OC71 6/6
6AG7 7/6	6SJ7GT 8/-	14S7 27/10	AZ31 10/-	ECC33 8/6	EN31 37/-	PCF80 8/-	U18/20 8/6	VMP4G 15/-	OC72 8/-
6AK5 8/-	6SK7GT 6/-	19AQ5 10/6	AZ41 13/11	ECC34 24/7	EY51 9/-	PCF82 10/6	U19 36/-	VMS4B 15/-	OC73 16/-
6AL5 4/-	6SL7GT 6/6	19H1 10/-	B36 15/-	ECC35 8/6	EY83 16/7	PCF84 16/7	U22 8/-	VP2 12/6	OC75 8/-
6AM6 4/6	6SN7GT 5/6	20D1 15/3	BL63 7/6	ECC40 23/3	EY84 14/-	PCF86 15/-	U24 29/10	VP4 15/-	OC77 15/-
6AQ5 7/6	6SQ7GT 9/-	20F2 26/6	C1 12/6	ECC81 6/-	EY86 9/-	PCL82 10/-	U25 17/11	VP2B 14/6	OC78 8/-
6AT6 7/-	6SS7GT 8/-	20L1 26/6	C1C 12/6	ECC82 6/6	EZ35 6/-	PCL83 10/6	U26 10/-	VP4B 23/3	OC81 8/-
6AU6 10/-	6U4GT 12/6	20P1 26/6	CBL1 26/6	ECC83 7/6	EZ40 7/-	PCL84 12/6	U31 9/6	VP13C 7/-	OC170 13/6
6AV6 12/8	6U5G 7/6	20P3 23/3	CBL31 23/3	ECC84 9/-	EZ41 7/-	PCL85 16/7	U33 26/6	VP23 6/6	OC171 14/6
6B8 5/-	6U7G 8/6	20P4 26/6	CCH35 23/3	ECC85 8/6	EZ80 7/-	PCL86 16/7	U35 26/6	VP41 6/-	OC200 16/6
6BA6 7/6	6V6G 7/-	20P5 23/3	CK506 6/6	ECC88 18/-	EZ81 7/-	PENA4 23/3	U37 26/6	VR105 8/-	OC203 24/-
6BE6 6/-	6V6GTG 8/-	25A6G 10/6	CL33 19/3	ECC91 5/6	FC4 15/-	PENB4 26/6	U43 9/-	VR150 7/6	OCP71 29/6
6BG6G 23/3	6X4 5/-	25L6GT 10/-	CV63 10/6	ECF80 10/6	FW4/500 8/6	PEN4DD	U45 9/-	VT61A 5/-	TJ1 40/-
6BH6 8/-	6X5GT 6/-	25Y5G 10/-	CY1 18/7	ECF82 10/6	FW4/800 8/6	26/6	U50 6/6	VT501 5/-	TJ2 45/-
6BJ6 6/-	6/30L2 10/-	25Z4G 9/6	CY31 11/-	ECF86 19/11	GU50 27/6	PEN25 4/6	U52 6/6	W76 5/6	TJ3 50/-
6BQ7A 15/-	7A7 12/6	25Z5 9/6	D1 3/-	ECH3 26/6	GZ30 9/-	PEN40DD	U54 19/11	W81M 6/-	TP1 40/-
6BR7 23/3	7B6 21/3	25Z6G 10/-	D15 10/6	ECH21 23/3	GZ32 10/-	25/-	U76 6/-	W107 18/7	TP2 40/-
6BS7 25/-	7B7 8/6	27SU 19/11	D63 5/-	ECH35 6/6	GZ33 19/11	PEN44 26/6	U78 5/-	W729 19/11	TS1 10/-
6BW6 8/6	7C5 8/-	28D7 7/-	D77 4/-	ECH42 9/-	GZ34 14/-	PEN45 19/6	U107 16/7	X24M 24/7	TS2 12/6
6BW7 6/-	7C6 8/-	30C1 8/-	DAC32 10/6	ECH81 9/-	GZ37 19/11	PEN46 7/6	U191 16/7	X41 15/-	TS3 15/-
6C4 5/-	7H7 8/-	30F5 6/-	DAF91 6/-	ECH83 13/11	H63 12/6	PEN383 23/3	U201 16/7	X61(C) 12/6	TS4 24/-
6C5 6/6	7R7 12/6	30FL1 10/-	DAF96 8/6	ECL80 9/-	HABC80	PEN453DD	U251 14/-	X63 9/-	V30/10P 28/6
6C6 6/6	7S7 9/6	30L1 8/-	DD41 13/11	ECL82 10/6	13/6	33/2	U281 19/11	X65 12/6	XA101 23/-
6C9 13/6	7V7 8/6	30L15 11/6	DET25 7/6	ECL83 19/3	HL2 7/6	PEN/DD	U282 22/7	X66 12/6	XA102 26/-
6C10 9/-	7Y4 7/6	30P4 12/-	DF33 10/6	ECL86 16/7	HL23 15/3	4020 33/2	U301 23/3	X76M 14/-	XA103 15/-
6CD6G 36/6	8D2 3/6	30P12 7/6	DF66 15/-	EF9 23/3	HL23DD 7/6	PL33 19/3	U329 14/-	X78 23/3	XA104 18/-
6CH6 9/-	8D3 4/6	30P19 12/-	DF91 3/6	EF22 14/-	HL41DD	PL36 12/-	U339 16/7	X79 23/3	XB102 10/-
6D6 6/6	9BW6 15/3	30PL1 10/6	DF96 8/6	EF36 4/-	19/3	PL38 26/6	U403 16/7	X109 17/3	XB103 14/-
6E5 12/6	9D2 4/-	30PL13 16/6	DF97 9/-	EF37A 8/-	HL42DD	PL81 10/6	U404 8/6	XD(1.5) 6/6	XB104 10/-
6F1 26/6	10C1 13/-	35A5 21/3	DH63 6/6	EF39 5/6	19/3	PL82 7/6	U801 29/10	XFG1 18/-	XC101 16/-

ALL GOODS BRAND NEW AND SUBJECT TO FULL MAKERS' GUARANTEE. PLEASE NOTE THAT WE DO NOT SELL SECONDHAND GOODS OR MANUFACTURERS' REJECTS.

VOLUME CONTROLS

All with Long Spindle and Double-pole Switch, 4/6 each.

10 K 25 K 50 K 100 K
¼ mg. ½ mg. 1 meg. 2 meg.

METAL RECTIFIERS *Full List with ratings free for S.A.E.*

DRM1B 13/-	RM-1 5/3	14A86 17/6	14B130 35/-	14RA 1-2-8-3 (FC31) 21/-	18RA 1-1-16-1 (FC116) 6/6
DRM2B 15/6	RM-2 7/6	14A97 25/-	14B261 11/6	16RD 2-2-8-1 12/-	18RA 1-2-8-1 11/-
DRM3B 15/6	RM-3 7/9	14A100 27/-	14RA 1-2-8-2 (FC101) 17/6	16RE 2-1-8-1 8/6	18RD 2-2-8-1 (FC124) 15/-
LW7 21/-	RM-4 14/-	14A124 28/-	16RC 1-1-16-1 8/6	18RA 1-1-8-1 4/6	
RM-0 7/11	RM-5 19/6	14A163 38/-			

JUST OUT. MIDGET SILICON RECTIFIERS. OUTPUT 120 VOLTS AT ½ AMP. TWO IN SERIES GIVE 240 VOLTS AT ½ AMP. NO LARGER THAN A RESISTOR. 10/6 EACH.

ELECTROLYTIC CONDENSERS

Standard Can
16 x 8 x 8 mfd., 500 v. 4/-
32 x 32 mfd., 450 v. 5/9
64 x 120 mfd., 350 v. 8/3

60 x 250 mfd., 275 v. 9/6
100 x 400 mfd., 275 v. 12/6
100 mfd., 275 v. 3/-

200 mfd., 275 v. 4/-
100 x 200 mfd., 275 v. 9/6

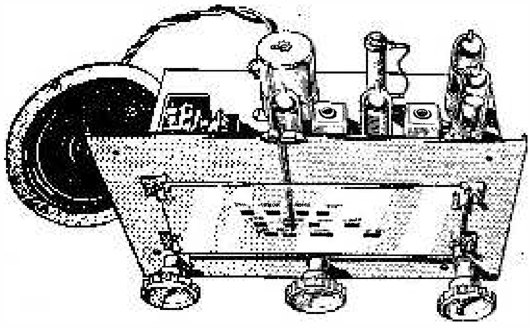
Wire-ended tubular
8 mfd., 450 v. 1/9
16 mfd., 450 v. 2/9
32 mfd., 450 v. 3/9

8 x 8 mfd., 450 v. 3/-
16 x 16 mfd., 450 v. 4/-
32 x 32 mfd., 350 v. 4/-
8 x 16 mfd., 450 v. 3/9

Post/Packing Charge 6d. per item. Orders over £3 post free. C.O.D. 2/6 extra. Full List, with Terms of Business, 6d. Any parcel insured against damage in transit for only 6d. extra. Shop Hours 8.30-5.30. Early Closing Saturday.

HARVERSON SURPLUS CO., LTD.

2 BAND SUPERHET CHASSIS *With Speaker*



ONLY £5.17.6

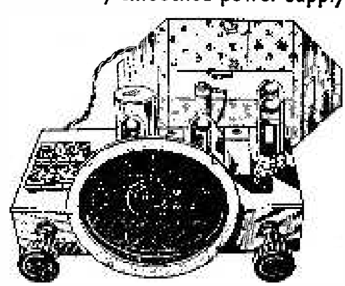
plus 6/6 Post & Packing

A quality 4 valve AC/DC superhet chassis made by a world famous manufacturer. Long and Medium wave coverage. Fitted with a cord and drum reduction tuning drive and attractive illuminated glass dial (size $6\frac{1}{2}$ x $2\frac{1}{2}$in.). Controls: Volume on/off, tuning and wave change. The receiver is self-powered, employing a mains dropper and a valve rectifier. Chassis dimensions $6\frac{1}{4}$ x 9 x $5\frac{1}{2}$in. high. Supplied complete with a good quality 5-inch loudspeaker, valves (UCH42, UAF42, UL41, UY41), AC/DC mains input lead, ivory knobs, etc.

Don't Hesitate, Order Now! This unbeatable bargain is bound to sell out quickly at only £5.17.6, plus 6/6 post and packing.

4 STATION PRESET SUPERHET CHASSIS *With Speaker*

A compact, 4 station preset mains transportable receiver, for operation from AC/DC mains. Two simple controls, volume on/off and 4 position station selector. The latter is set to Light Programme (Long Wave), Third Programme, Home Service and Light Programme (Medium Wave), but may of course be adjusted to alternative selections if required. A frame aerial with throw-out extension is supplied, making this receiver ideal as a general purpose transportable set for the home. A fully smoothed power supply is provided from AC/DC mains input by a mains dropper and a valve rectifier. The good tonal qualities are assisted by the provision of a quality 5in. speaker, which is ready-mounted on the chassis (this is easily detachable if alternative positioning is required). Valve line up, UCH42, UAF42, UL41, UV41. This chassis (size 9 x $6\frac{1}{2}$ x $5\frac{1}{2}$in. high) is supplied complete with valves, knobs, mains lead, aerial, etc. It is beautifully made by a famous maker, and is a first-class buy at the rock bottom price of



ONLY £4.17.6 plus 6/6 Post & Packing

FOR ADDRESS AND MORE STUPENDOUS BARGAINS P.T.O.

CHErrywood 3985/6
LONDON, S.W.19

VALVE BARGAINS

NEW ★ BOXED ★ GUARANTEED ★ PROMPT DESPATCH ★ POST 6d. PER VALVE EXTRA

A70B	12/6
AC/PEN	17/6
ACS/PEN/DD	17/6
AC6/PEN	7/6
ATP4	5/-
AZ1	15/6
AZ2	12/6
AZ31	10/-
B36	15/-
B65	8/6
C1	12/6
C1C	12/6
CBL1	19/9
CL4	12/6
CY1	18/7
CY1C	17/6
CY31	16/7
D41M	12/6
D42	12/6
D43	6/-
DAF96	8/6
DF96	8/6
DH101	19/6
DK96	8/6
DL33	9/3
DL63	9/6
DL66	16/6
DL68	14/-
DL74	9/3
DL82	35/-
DL96	8/6
DW2	9/6
DW4/500	13/6
EA50	1/6
EABC80	8/6
EB34	2/6
EB41	8/-
EBC3	21/-
EBC33	6/3
EBF80	9/-
EBF89	9/6
EBL1	15/-
EBL21	22/-
EBL31	22/-
ECC31	10/-
ECC32	9/6
ECC34	19/9
ECC81	8/-
ECC82	9/6
ECC83	9/6
ECC84	9/6
ECC85	9/6
ECF80	12/6
ECF82	12/6
ECH3	23/-
ECH42	9/6
ECH81	8/6
ECL80	9/3
ECL82	10/3
EF9	21/-
EF36	5/6
EF37	14/-
EF39	5/6
EF40	14/6
EF42	10/3
EF50	4/6
EF51	7/9
EF54	5/-
EF80	7/-
EF85	7/-
EF86	11/6
EF89	9/-
EF91	5/-
EK2	8/6
EL2	11/3
EL3	11/3
EL32	5/-
EL33	13/-

EL35	12/6
EL38	19/9
EL42	10/-
EL84	8/6
EL91	5/-
EM4	10/-
EM80	9/6
EM81	9/6
EM84	9/6
EY51	9/3
EY86	9/3
EZ40	7/3
EZ41	7/3
EZ80	7/-
EZ81	7/-
EZ90	7/3
FC13	18/6
FC13C	18/6
FW4/500	9/6
GT1C	10/-
GZ32	11/3
H30	5/-
H242DD	12/-
HL13C	7/9
HL41DD	16/-
HL133DD	10/-
KT33	12/6
KT45	12/6
KT55	18/6
KT66	17/-
KT70B	11/6
KT71	9/-
KT74	12/-
KT76	12/-
KTW63	7/-
KTZ41	8/-
KTZ63	8/-
L63	5/6
MH4	8/3
MH4/150	7/9
MH41	7/6
MKT4	16/-
ML4	8/6
MS/PEN	6/-
MSP4	17/-
MSP41	13/6
MU14	8/6
N14	12/6
N16	9/-
N108	19/-
BO2	7/9
OC3	7/6
OD3	5/6
OM1	12/6
OZ4	5/6
P14	7/6
P16	5/-
PCC84	9/-
PCC85	9/3
PCF80	9/6
PCF82	11/9
PCL82	11/6
PCL83	13/6
PEN40DD	19/9
PEN46	7/3
PEN383	18/6
PEN453DD	19/9
PL33	18/6
PL36	14/6
PL81	11/9
PL82	8/0
PM12M	7/6
PP35	8/9
PX25	25/9
PY80	7/6
PY81	8/3
PY82	7/-

PY83	8/6
R10	17/-
R16	19/6
S215/UM	7/9
SD6	5/-
SD61	2/3
SP2	11/3
SP4	11/6
SP13	8/3
SP41	3/3
SP42	12/-
SP61	3/3
SU25	19/9
SU2150	7/9
T41	9/-
TH2321	18/-
TP22	15/-
TP2620	15/-
TSE4	8/6
TSP4	7/9
U10	9/9
U17	11/9
U21	17/9
U35	17/9
U37	19/9
U50	7/6
U52	6/9
U74	10/-
U81	12/6
U101	12/6
U191	17/6
U339	17/-
U403	15/6
U404	10/6
UABC80	9/6
UBF80	9/-
UCC84	12/6
UCC85	10/6
UCF80	16/-
UCH42	9/9
UCH81	9/9
UCL82	9/-
UCL83	14/9
UF85	9/-
UF89	8/6
UL41	9/6
UL84	9/-
UR1C	12/6
UR3C	10/-
UU6	17/6
UU7	13/-
UU8	19/9
UU60/250	11/3
UY41	7/6
UY85	7/6
V914	6/9
VMS4B	12/6
VP2B	10/6
VP4	15/-
VP13A	7/6
VP41	6/-
VPT4	7/6
VR505	6/9
VSL631	7/-
VU111	10/-
W21	11/9
W61	10/6
X24	19/9
X41	15/-
X79	17/9
X109	15/9
Y63	7/6
Z14	10/6
Z63	7/6
Z66	17/6
Z359	10/6
1A5GT	6/-
1A7GT	12/-
1D6	10/6

IL4	3/6
ILN5	5/-
IR5	6/6
IS4	9/-
IS5	6/-
2D13C	5/3
2X2	4/6
3D6	5/-
3Q7	9/6
4THA	6/9
5U4G	6/9
5Z3G	12/6
5Z4G	12/6
6AG5	2/9
6AQ5	7/6
6BG6G	17/6
6BJ6	6/-
6C5GT	6/6
6DI	4/-
6F7	9/9
6F8	9/9
6F11	11/6
6F15	11/6
6F32	9/6
6H6	3/-
6J7G	6/-
6K7G&M	5/-
6K25	18/-
6N7	8/-
6P25	12/6
6P28	23/-
6Q7GT	6/6
6R7G	10/-
6SC7G	7/6
6SF7	7/6
6SG7	8/-
6SK7M	6/9
6U7G	8/6
6V6G	7/-
6Z5	8/3
7B8	11/-
7C5	8/-
7C6	8/-
7R7	12/6
7Q7	13/6
8A1	7/6
9	4/6
9A1	7/6
9D2	4/-
10D1	10/9
10F0	8/6
10F3	12/6
10P14	18/-
11D5	5/9
12J7	9/6
12SA7	8/6
12SG7	7/-
12SK7	6/-
12SL7	6/9
12SR7	8/6
12ST7	8/6
18	17/9
19AQ5	10/6
19X3	10/6
20F2	19/9
20P1	19/9
25A6	10/6
25L6	10/-
25Y5	10/-
25Z4	9/6
35L6	9/6
35Z4	6/-
35Z5	9/-
41STH	11/-
43	10/-
43UI	10/-
77	8/-
807	7/6

SPECIAL OFFER
12—6K7G 35/-

MANY MORE VALVES THAN THE ABOVE IN STOCK, PLEASE ENQUIRE FOR TYPES NOT LISTED

TECHNICAL TRAINING in radio television and electronics

Whether you plan to have your own business, to become an electronics engineer, to take up a career in industry, or to brush-up your knowledge and study new developments, transistors, etc., an I.C.S. Course will help you to success. You learn at home in your own time, under expert tuition. Moderate fees include all books.

EXAMINATION COURSES FOR:—

C. & G. Radio and TV Servicing Certificate (R.T.E.B.)

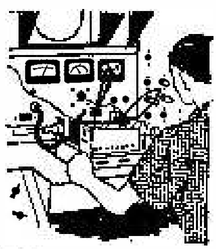
C. & G. Radio Amateurs' Exam. (Amateurs' Transmitting Licence)

British Institution of Radio Engineers, etc.

C. & G. Telecom. Technician's Cert.

LEARN AS YOU BUILD

Practical Radio Servicing Course



A basic course in radio electronic and electrical theory backed by thorough practical training. You build radio receivers, signal generator and multimeter.

Post this Coupon TODAY! for FREE book on careers in Radio, and full details of other I.C.S. Courses

INTERNATIONAL CORRESPONDENCE SCHOOLS
(Dept. 171), Intertext House, Parkgate Road, London, S.W.11.

Please send book on ....

Name .... Age ....
(Block Letters Please)

Address ....

....

Occupation 8.61

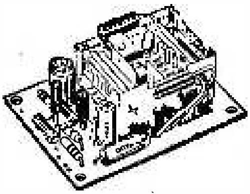
INTERNATIONAL CORRESPONDENCE SCHOOLS

SUMMER SALE!

STOCK OFFERED AT SENSATIONAL REDUCTIONS THIS MONTH

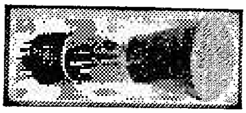
- **Brayhead TV Turret Tuner,** for 33/38 Mc/s. I.F., normally 79/6. With valves 39/6. Less valves 19/6, plus 3/6 post and ins.
- **14in. TV Mask,** grey plastic, normally 10/-. Sale price 5/-, plus 1/6 post and ins.
- **17in. TV Mask,** grey plastic, normally 12/-. Sale price 9/-, plus 1/6 post and ins.
- **TV Rectifier,** R.M.5., equivalent, normally 25/-. Sale price 12/6.
- **14in. TV Cabinet,** modern design. Cost £4 to make. Sale price 9/6, plus 3/6 carriage.
- **Set of Four TV Parts,** scan coils, line E.H.T. frame output and width control. Normally 57/6. Sale price 39/6, plus 2/6.
- **Output Transformer,** fixed ratio for pentode, normally 6/6. Sale price 3/6, plus 1/-.
- **250-0-250 60/80 mA. Mains Transformer,** with 6.3 v. filament winding, half-shrouded dropthrough, standard replacement in many receivers, made to sell at 19/6. Sale price 12/6, plus 2/6 post and ins.
  Ditto, but with additional 5 v. winding for separate rectifiers, made to sell at 21/-. Sale price 13/6, plus 2/6.
- **Auto Transformer,** totally enclosed primary 200-250, secondary 110-120 v 200 w. normally 27/6. Sale price 19/6, plus 3/6.
- **I.F. Coils, standard size by Weymouth** 465 Kc/s. dust cores, normally 12/6. Sale price 6/6 per pair.
- **P.M. Speaker,** 6½in., with output transformer, normally 30/-. Sale price 12/6.
- **Miniature Microphones.** Dynamic American, beautifully made. Sale price 2/-.
- **Pilot Bulbs.** 3-5 volt, 0.3 amp. 3/6 a box of 25.
- **Stick Microphone,** Cosmocord 39/1, normally £3.3.0. Sale price 35/-.
- **Windsor Cabinet and Chassis,** comprises a veneered and polished cabinet, size 14 x 17 x 6½in., and prepared metal chassis with glass dial to fit, normally £3.15.0. Sale price 29/6, plus 5/-.
- **Push-Pull Transformers,** input and output, midget, potted. Sale price 5/- pair, plus 1/6.
- **B78 Holder,** with skirt for screening can. Normally 10d. Sale price 6d. or 5/6 doz.
- **Metal Rectifiers,** 250 v. 60-80 mA. ideal for mains set or instrument, or to replace that expensive valve. Sale price 3/6.
- **FilamentTransformer,** 6.3 v. 1½ amps., normally 8/6. Sale price 6/6, plus 1/- post.
- **Filament Transformer,** 6.3 v. 2 amps., normally 10/6. Sale price 6/6, plus 1/- post.
- **Charging Switchboard,** offered at about 1/20th of original cost. Ex government, contains three reverse current relays, one voltmeter, one mains ammeter, two secondary ammeters and three variable resistors. In original cases. Sale price £3.15.0. 1,250 watt, £2.15.0. 550 watt, carriage 10/-.
- **Cine Camera,** 16 mm. motorised 24 v. for 15 frames per second. Sale price £3.19.6, plus 3/6 carriage.
- **Dinghy Mast,** tubular aluminium, extends from 15in. to 9ft. Sale price 4/6, plus 1/6 postage.
- **Magneto Generator** (hand), as used in telephones. Sale price 7/6, plus 1/6 postage.
- **P.O. Type 3000 Relays,** 2,000 ohm coil, 6 contacts 7/6, 4 contacts 6/6, 2 contacts 5/6, plus postage 1/-.
- **Variable Rheostats,** heavy duty slider resistor rated at 25 amps. Ideal for dimmer circuits, etc. Sale price 7/6, plus 6d. postage.
- **Versatile Wire,** single strand 18 gauge, with p.v.c. covering. New ¼-mile on drum. Sale price 6/6, plus 3/6 carriage.
- **Wire jointer** (welder for 28 gauge or thinner), in bakelite case with trigger switch, works off step-down transformer. Sale price 2/6, plus 9d. postage.
- **Rectifier Bargain,** selenium rectifier 25 v. 25 amp., easil rebuilt into 6. full-wave charger rectifiers, suitable 6 or 12 v. battery at 3 amps. Sale price 15/-, plus 3/6 post.
- **80 ohm Coax,** low loss expanded polythene, normally 9d. per yard. Sale price 6d. yd.
- **Connecting Wire,** 24 gauge. Tuned copper, P.V.C. insulated. Four 100ft. coils, different colours. Sale price 8/-.
- **Superhet 7 v. 5 Waveband Chassis.** Unused. Less valves and power pack. Soiled 75/-. Coil pack with twice as much. Carriage and insurance 7/6.
- **Geiger Counter Tube,** 20th Century. No. G25 with circuit of geiger counter. Sale price 27/6.
- **Twin-twisted Lighting Flex** equivalent 1436, 12/6 per 100 yd. coil. Carriage 1/6.
- **3029 Twin T.R.S. 37/6 per 100yd. coil,** carriage 8/6.
- **3029 Single T.R.S. 20/- per 100 yd. coil,** carriage 2/6.
- **Transistor A.F. equivalent to red spot.** Sale price 2/6.
- **Bakelite Wall Switch** household type 6/- doz. one way, 8/- doz. two way.
- **Wall Switch by Crabtree** two way and off. Sale price 1/- each.
- **Double pole, double through toggle switch** heavy duty, 10 amp. 250 volts. Suitable for controlling photo flood lamps. Sale price 1/2. 13/- doz.
- **Multi-speed Motor with gearbox,** works on A.C. 3 D.C. mains, gives any speed from 1 r.p.m. Sale price 17/6, plus 2/6 postage.
- **Low Resistance Single Headphones,** good British make. Sale price 4/6, plus 1/6.
- **Chest Microphone,** excellent American make with adjustable mouthpiece, 6/6, plus 1/6.
- **Throat Microphone,** 2/6, plus 1/6 post.
- **American Lightweight Headphones,** type HS30. Sale price 17/6, plus 1/6 post.
- **Regulator Resistors,** slider type, 11 ohm, 15/-, 3 ohm, 12/6, 1 ohm, 2/6, plus 2/- post.
- **E.H.T. Transformer,** standard mains input, 3 secondaries, heavy duty potted transformer in cast case, normal price 20/-. Sale price 15/-, plus 3/6 post.
- **Suppressor Condenser,** stops drill, etc., interfering with radio or television. Simple instructions included, normal price 1/6 each. Sale price 1/- each.
- **Bi-Metal Contact Strip** for making thermostat, 1/9.
- **Rectifier Unit,** for working D.C. instruments, motorised equipment, etc., from A.C. mains. Input 200-240 v. Output 200-240 v. 300m amp. 35/-, carriage 7/6.
- **Sniperscope,** "Cat's Eye" for seeing in the dark. Will work burglar alarms. circuits, etc. Sale price 4/-, plus 1/- post.
- **Telephone Handset,** sound powered, just join two together with a pair of wires and you have telephonic communication. Sale price 25/-, plus 3/- post and ins.
- **12-24 v. D.C. Converter.** Sale price 32/6.
- **R.F. 25 Tuner Unit,** complete, new condition. Sale price 8/6, plus 2/6 post.
- **Stud Switch,** heavy duty. 30 amp. contacts, for dimmer, charger, regulator, etc. Sale price 7/6.
- **Powerful Blower,** with motor, 24 v. D.C., but can be operated off mains with rectifier, 15/-, post and packing 2/-.
- **Canadian Telephone Sets,** although originally intended for use with transmitters, these make excellent telephones for calling over long distances in noisy situations. Distances up to 3 or 4 miles (Using our versatile wire, 6/6 for ¼ mile) can be covered using these sets, which contain hand generator, telephone bell, hand microphone, morse key, indicator lamp, buzzer, relay, etc. Sets complete 27/6, with full instructions, complete in carrying case.
- **Ardente Hearing Aid,** normally bargain at £7.10.0. Sale price 49/6, plus 3/6 post and insurance. Need attention, ditto transistorised £3.10.0.
- **Switch for Electric Blanket,** double pole threeposition, 5/-.
- **Packard Bell Pre-Amp,** complete with 6SL7 and 28D7 valves, relay, leads, 'acks, input and output transformers, etc., etc., 7/6, plus 2/- post, less case.
- **Centre Zero meter 3½in. movement,** flush mounting, 500-0-500 micro Amp. Sale price 30/-, plus 1/6 post.
- **Moving Coil Meter, 2½in. movement,** 0-750 micro amp. Sale price 19/6, 0-30 mA., 15/-, plus 2/-, ditto 2,500 micro amp. 15/-.
- **Unbreakable mains leads,** as fitted to electric razors etc. Makes ideal lead for test meters. Twin 6ft. long 6d. per lead. 5/- doz.
- **Cold Cathode Valve CV413** voltage regulator or trigger tube. Unused, but ex equipment. 2/- each.
- **Electric brake disc type** for stopping lathe and coil winders etc. 25/-.
- **VCR517 Cathode Ray Tube** is a plug in replacement for the VCR97. 8/6, carriage and insurance 4/6.
- **10 Valve 1½ metre superhet** contains 9 valves, 6 I.F. Transformers and hundreds of useful spares. Brand new 29/6. Carriage and insurance 10/-.
- **R.F. 24 Tuning units** in soiled condition, but contain valves and many useful components, 3/6, carriage 3/6.
- **3 Wave band Coil pack** for medium short, short ex equipment, but unused 9/6, plus 1/6 post.
- **Rotary Switch by Arrow,** carry 15 amp. A.C. 4 positions hot, off, cold, off. Suitable hair drier, air-conditioning plant etc., 3/6, post 1/-.
- **Rotary Switch by Santon,** suitable 30 amp. A.C. single pole on/off. 3/6.
- **Silicon crystal diodes,** 6/- per doz.
- **Sapphire gramophone needles** miniature or standard 78 r.p.m. type. 12/- doz. 1/6 each.

Please include enough for postage and request "Summer sale list", for details of many other items.



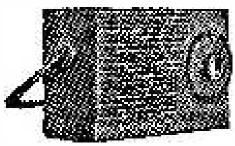
Transistor Amplifiers

2 x CX71's direct coupled cascade drive to 2 precision matched 0C74's in Class B push-pull provide up to 1 W undistorted output from 5 mV. in at 1.5 K-ohm Frequency response, 60-16,000 c/s ± dB. Overall size 3 x 2.2 x 1.2in. **92/6.** Post and ins. 2/6. **750 M/WATT AMPLIFIER.** Similar specification, **£2.2.6.**



Building A Scope?

3in. oscilloscope tube. American made type No. 3FP7, 6.3 v. 0.6 amp. heater, electrostatic deflection, brand new and guaranteed, with circuit diagram of scope, 15/- each, plus 1/6 post and insurance.



Transistor Set Cabinet

Very modern cream cabinet, size 5¼ x 8 x 1¼ in. with chrome handle, tuning knob and scale. Price 7/6, plus 1/6 postage and packing.

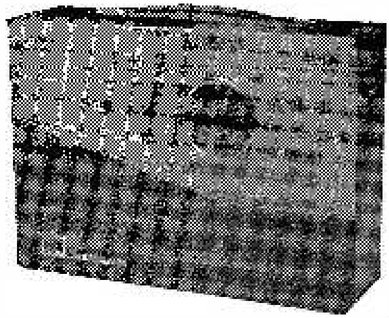
TRANSISTORISED STETHOSCOPE

Trace signal right through: Radio, T.V., Tape amplifier, Hi-Fi, etc.—simplest way to fault-find—carry it like a fountain pen—all parts including transistor barrel crystal, everything except battery, 12/6 plus 1/6, data included or separately 1/6. Or complete with deaf aid type earphone, 20/-.

The Pocket 5 Q.P.P.

This pocket receiver has a remarkable performance comparable in fact with portables being sold at £12 and over. It uses the 3in. moving coil speaker to give really good quality tone and the circuit is reflex R.F. with push-pull output. It completely tunes the medium and long wave bands. Price for all parts and pocket sized cabinet **£4.15.0.** Post and insurance 2/6.

NOW THE "GOOD COMPANION" CAR RADIO AND PORTABLE



Largely due to the helpful criticisms and suggestions received from purchasers of our previous set "The Real Companion" we have improved and now supersede this with a new set which we call "The Good Companion". We feel confident that this new set is one of the finest of its kind available. The design is the combined efforts of our technicians and of those of several of the leading manufacturers in the country, and the resulting set has a performance as good as if not superior to those selling at £20 and more. *It has the eight transistor set performance.*

Features include American Philco R.F. transistors and Mullard A.F transistors—Q.P.P. output giving 750 mW—full coverage on Medium and Long—very fine tuning arrangement—excellent reception of difficult stations like 208—variable feed-back control—full tonal qualities—really superior looking cabinet size 11 x 8 x 3in. approximately—car aerial attachment—several months operation from battery costing only 3/6.

Circuit employs six transistors and two diodes. it incorporates all latest refinements, and oscillator I.F. Transformer are pre-aligned so no instruments are necessary. Anyone who can solder competently can make this set. The instructions are fully comprehensive with plenty of illustrations. Service is available in the unlikely event of your getting into difficulties. All components fully guaranteed.

Price of all components and cabinet to make set as illustrated **£9.19.6.** Post and insurance **5/-.** Battery **3/6** extra.

AGENTS REQUIRED to make up this receiver

POCKET LOUDSPEAKER TRANSISTOR RADIOS

Available Again at 42/6

Read these Testimonials

D. A. Hilton, Leigh, Lancs.
"I received 'Pocket 4' on Christmas Day. I made it up on Boxing Day and I am very pleased with the results. It brings in local stations and many foreign stations including Luxembourg at good strength. I am 13 years old".

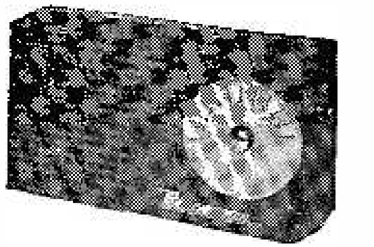
Mr. J. Bell, Wolverhampton.
"I am writing to express my satisfaction at the standard of your kit for your Pocket 4 Transistor set and also to state that it has come up to my expectations in regard to performance".

Mr. R. Belt, Newcastle-on-Tyne.
"I have built your Pocket 5 Transistor set, I am very pleased with it".

Mr. F. Jackson, Ickenham, Middx.
"I have built the Pocket 4 and am more than pleased with the results".

Mr. G. Bamford, Ramsgate.
"I find this set even better than you claim it to be and most certainly up to your usual standard of quality. I feel that nobody could fail to build it and get results. Even the first-time-ever novice, as your circuit diagrams and instructions are so clear and precise."

Mr. A. J. Simmonds, Welling, Kent.
"I purchased from you a week ago the Pocket 4 Transistor Kit, I put it together last night in 1½ hours, on switching on the set I was right on Radio Luxembourg. I must say thank you because not only has the set a very attractive appearance, it also behaves fantastically".



Circuit comprises 2 HF transistors reflexed to equal 4 stages. Permanent germanium diode and high gain AF output stage, fitted with miniature speaker, proper tuning condenser, volume control and in case with handles as illustrated (less monogram), completely portable. No **aerial or earth required.** Pocket 4 uses 3 transistors and 1 diode, price 42/6, plus 2/6 post and insurance. Pocket 5 uses 4 transistors and 1 diode and has feedback control, price 55/-, plus 2/6 post and insurance. Prices are for medium wave models, long or medium versions 8/6 extra.

GOOD RESULTS EVERYWHERE

Nothing can be more disappointing than to find that despite care in making up, your radio just will not work or needs a long high aerial and water pipe earth. We can prove good results in all areas and we guarantee all components for 12 months. Read just a few of the hundreds of testimonials we have received from constructors who have made these sets. Send in confidence. Money refunded if parcel not up to your expectations. Plans free with parts, or separately 1/6. More details S.A.E.

ELECTRONIC PRECISION EQUIPMENT LTD.

post orders are dealt with from Eastbourne, so for prompt attention please post your orders to 66 Grove Road, Eastbourne, marked Department 7. Callers may use any one of the Companies below.

266 London Road, Croydon. Phone: CRO 6558 Half day Wednesday	**29 Stroud Green Rd., Finsbury Park, N.4.** Phone: ARChway 1049 Half day Thursday	**520 High Street North, Manor Park, E.12.** Phone: ILFord 1011 Half day Thursday	**42-46 Windmill Hill, Ruislip, Middx.** Phone: RUIslip 5780 Half day Wednesday	**246 High Street, Harlesden, N.W.10.** Phone: ELGar 4444 Half day Thursday

Brand new, individually checked and guaranteed

VALVES

AC5PENDD 4/-
AL60 6/-
AP4 4/-
AR8 5/-
ARDD5 2/-
ARP3 3/-
ARP4 3/6
ARP12 2/9
ARP21 3/6
ARP24 4/6
ARP34 5/6
ARTH2 7/-
ATP4 2/9
ATP7 5/6
AU1 5/-
AU4 5/-
AW3 4/-
AZ31 8/-
BL63 6/-
BS4A 5/6
BT45 40/-
BT83 22/6
BT9B 25/-
CY31 7/6
D41 3/3
D77 4/3
DA30 12/6
DAF86 8/-
DAF91 6/-
DET5 15/-
DF72 7/6
DF91 3/3
DK96 7/3
DF96 8/-
DK96 7/3
DL92 6/-
DL94 6/-
DL96 8/-
DX25 9/-
E1232 5/6
E1323 25/-
E1524 6/6
EA50 1/6
EABC80 7/3

EAC91 4/6
EB34 1/6
EB91 3/9
EBC21 8/-
EBC41 7/9
EBC90 5/-
EBC91 3/9
EC52 3/-
EC90 10/-
ECC81 5/6
ECC82 6/6
ECC83 7/-
ECC84 7/-
ECC85 7/9
ECC91 4/-
ECF82 8/6
ECH42 7/6
ECH81 7/9
ECL80 8/-
ECL82 9/-
EF22 7/3
EF32 5/-
EF36 3/6
EF37A 8/-
EF39 4/3
EF50 2/6
EF54 3/3
EF55 6/-
EF70 4/-
EF73 6/-
EF80 5/6
EF85 6/10
EF86 9/-
EF89 7/9
EF91 3/6
EF92 4/6
EF95 7/6
EK32 7/-
EL32 3/9
EL33 8/-
EL35 8/3
EL41 8/3
EL42 9/-
EL84 7/6
EL85 10/-

EL91 7/6
EM80 8/-
EN31 22/6
EN32 7/6
ESU208 8/-
EY51 8/-
EY86 8/-
EY91 3/6
EZ40 7/-
EZ41 6/9
EZ80 6/6
EZ81 6/9
FW4/500 6/6
GL450 10/-
GZ32 9/-
HL23 6/-
HL23DD 8/-
HL41DD 8/-
HVR2 12/6
KF35 5/-
KRN2A 19/-
KT2 4/-
KT31 8/-
KT32 8/-
KT33C 4/9
KT44 6/3
KT76 10/-
KTW62 7/6
KTW63 6/6
MH4 3/6
MH41 5/-
ML4 4/-
MS/PEN 6/-
NT37 (4033A) 10/-
OD3 5/-
OZ4 5/-
PCC84 7/-
PCC85 8/3
PCF80 7/-
PCF82 8/-
PCL82 8/6
PEN25 4/6
PEN46 5/-
PEN65 6/6

PEN220A 3/-
PENDD/1360 9/6
PL81 7/6
PL82 8/-
PL83 7/9
PT25H 7/6
PX4 19/-
PX25 9/-
PY83 7/3
PY80 6/9
PY81 7/-
PY82 8/-
QP21 6/-
QP25 5/3
QS75/20 6/9
QS95/10 6/9
QS108/45 6/9
QS150/15 6/9
QVO4/7 12/6
R3 8/-
R10 12/6
REL21 25/-
RK34 2/6
RX235 10/-
SP2 4/-
SP13C 4/6
SP41 2/6
SP61 2/-
SU2150A 4/9
T41 7/-
TP25 15/-
TT11 3/-
TZ20 16/-
U17 5/-
U18 6/6
U27 8/-
U52 5/-
UBC41 7/6
UCH42 7/6
UL41 7/-
UL84 7/6
UL85 7/-
UU9 5/6
UY41 6/-
UY85 6/6
VP23 3/6

VP41 5/6
VR78 4/-
VR99 8/-
VR105/30 7/6
VR150/30 7/3
VT4C 25/-
VU39 6/-
VU111 3/3
VX3138 12/-
W31 7/-
Y63 5/-
Y66 8/-
Z31 6/-
1A3 3/-
1A5GT 5/-
1C5GT 7/6
1D8GT 6/-
1E7GT 7/6
1G6GT 12/-
1LD5 3/6
1LN5 4/9
1R5 6/-
1S5 5/9
1T4 4/-
2A3 8/-
2A5 8/-
2A6 7/-
2034 2/6
2D4A 4/-
2X2 4/-
3A4 5/-
3B7 5/-
3B24 8/-
3E29 (829B) 60/-
3Q5GT 9/-
3S4 5/-
3V4 7/3
5T4 9/-
5U4G 5/-
5Y3GT 6/-
5Z3 8/6
5Z4G 8/-
6AB7 4/-
6AC7 3/-
6AG5 3/6
6AG7 6/-
6AJ7 4/3
6AK5 5/-
6AK7 8/-

6AM6 6/3
6AT6 5/-
6B8 5/6
6B8G 2/6
6C4 3/6
6C5 6/-
6C6G 4/3
6C8G 5/-
6D6 4/6
6E5 5/-
6F6 7/-
6F6G 4/-
6F8G 6/6
6F12 4/6
6F17 7/6
6G6G 3/-
6H6M 2/-
6J5 3/6
6J5G 3/-
6J6 4/3
6J7G 5/-
6K6GT 6/6
6K7G 2/3
6K7GT 4/9
6K8G 5/9
6K8GT 8/3
6K8M 8/6
6L5G 6/-
6L6 9/-
6L6G 6/6
6L34 4/6
6N7G 5/9
6N7GT 6/-
6Q7G 6/-
6R7G 6/-
6R7GT 8/-
6SA7 6/-
6SC7G 5/6
6SC7GT 6/-
6SG7 5/-
6SH 5/-
6SH7 4/6
6SJ7G 5/9
6SK7 5/3
6SL7GT 6/6
6SN7GT 4/6
6SQ7 6/-
6SR7 6/6
6SS7 6/-
6V6G 5/6

6V6GT 6/-
6X4 5/-
6X5GT 6/6
6Y6G 8/-
6Z4 8/-
7B7 7/6
7C6 7/-
7C7 6/6
7H7 7/3
7Q7 7/-
7V7 5/-
7Y4 6/-
7Z4 6/6
8D2 2/6
9D2 3/-
12A6 5/-
12AH7 7/-
12AT7 5/6
12AU6 9/-
12AU7 6/-
12AX7 7/-
12C8 3/-
12E1 22/6
12H6 2/-
12J5GT 3/6
12K7GT 4/6
12K8M 9/-
12SA7 7/6
12SC7 4/6
12SG7 6/6
12SH7 3/-
12SJ7 6/-
12SK7 4/-
12SL7 7/-
12SN7 8/-
12Q7GT 4/6
12SR7 6/-
15D2 6/-
15R 5/-
20A2 7/6
21B6 9/-
30 5/-
35L6GT 8/-
35T 30/-
35Z4GT 7/-
37 4/-
38 4/-
58 6/-
59 6/-
75 8/-

76 5/-
77 6/-
78 7/-
80 6/3
82 8/-
8V3 12/-
84 8/-
89 6/-
210LF 3/-
210VPT 7 pin 2/6
274B 3/-
350B 8/-
393A 15/-
705A 17/6
715B 97/6
717A 8/6
801 6/-
803 22/6
804 55/-
805 30/-
807AMER 6/-
807BR 5/-
808 8/-
810 80/-
813 67/6
815 40/-
816 30/-
826 10/-
829A 30/-
832 15/-
832A 35/-
843 7/6
866A 12/6
872A 35/-
930 8/-
954 2/-
956 2/-
958A 5/-
1616 3/-
1619 5/-
1625 6/-
1626 4/6
1629 4/6
4120 4/-
7193 1/9
6475 5/-
8013A 25/-
8020 6/-

9001 4/6
9002 5/6
9004 4/-
9006 4/-

Cathode Ray Tubes

5BP1 35/-
5CP1 42/6
5FP7 45/-
7BP7 40/-
12DP7 60/-
CV1596 (O9J) 55/-
VCR97 15/-
VCR138 30/-
VCR139A 35/-
VCRX258 (with scanning coil 45/-

Photo Tubes

CMG8 9/-
CMG25 8/-
GS16 12/6
931A 50/-

Special Valves

2J31 45/-
3A/1481 45/-
723AB 45/-
725A 30/-
726A 27/6
931A 50/-
ACT6 200/-
ACT17 75/-
ACT25 40/-
CV691 60/-
KR3 45/-
LS7B 30/-
V1924 22/6
VX7110 15/-
WL417A 15/-

Current Production

3J/170/E £35
3J/192/E £37.10

FREQUENCY METER BC221 TECHNICAL MANUAL 22/6.

Field Telephone Type "L" Excellent guaranteed condition, **£5.5.0** per pair, carriage paid.

Transmitter/Receiver No. 22. 2 Mc/s to 8 Mc/s. Built almost exactly as No. 19 set but much more economical in battery consumption. Complete in fully working condition with power pack for 12 v., Headgear and Microphone assembly and Key, **£9.19.6.** Carriage 15/-.

Marconi SIGNAL GENERATOR. TF144G. 85 kc/s, 25 Mc/s. Made up to new standard. **£70** delivered free.

U.H.F. SIGNAL GENERATOR TYPE T.S.14. 3,200–3,370 Mc/s, power measuring range 20–200 mW, R.F. output power —20 to —100 dbm below 1 mW. Power supply 115 w A.C. Price **£15.** Carriage 15/-.

H.T. Chokes made by Bendix Radio (U.S.A.), 3 Henry's 0.600A D.C. 25 ohms D.C. resistance 18,000 v. R.M.S. 60 cycle test, **£1.12.6.** P. & P. 6/-. Ditto 10 Henry's 250A D.C. 90 ohms resistance 1,500 v. R.M.S. 60 cycle test, **16/6.** P. & P. 3/6.

B.P.5 Transceivers. Specially built for Parachutists during the war. Crystal controlled, C.W., and phone. 2-8 Mc/s. 829 valve as output. 60 w. on C.W. 15 w. on microphone, together with mains power pack 120/220 v. Two rotary converters to work from 12 v. battery, microphone, key and dipole aerial. Price **£15** Carriage 30/-.

Radio Communication Transceiver Type A.R.11. Very compact, external dimensions 12 x 8½ x 5in. Total weight 18 lbs. C.W. 4.4–16.3 Mc/s, 110/220 v. Power output about 10 w. Crystal controlled. Price **£12.** Carriage 20/-.

BRAND NEW ORIGINAL SPARE PARTS FOR AR88 RECEIVERS

I.F. Transformers. 1st, 2nd, 3rd, 4th (for type D), **12/6** each or complete set of 6, **60/-.**

I.F. Transformers. Crystal Load, **12/6** each.

Plates escutcheons (for D and LF), **15/-** each.

Dials (for type D), **10/-** each.

Logging Dial (for D and LF), **10/-** each.

Filter Chokes (for D and LF), **22/6** each.

Output Transformers (for LF), **30/-** each.

Antenna Trimmers (LF and D), **2/6** each.

Filter Condenser 3 x 4µF, **£2.10.0**

Condensers:
3 x .25µF (D and LF), **2/6** each.
3 x .01µF (D and LF), **2/6** each.

RF Antenna Inductors (D and LF), **7/6** each.

Mains Transformers (LF), **£3** each.

Small Mica Condensers, various values, **1/6** each.

Instruction Manual for AR88D, £1.

Specially Built Power Pack for TCS Receiver. 230 v. A.C. mains, including 6X5GT valve, **£3.10.0.** Carriage 5/-.

Marconi CR-100 Communications Receiver. 60 kc/s–30 Mc/s with noise limiter. Completely reconditioned, **£25.** Carriage 25/-.

T.C.S. Receivers. Made by Collins of U.S.A. In fully guaranteed working condition. 1.5–12 Mc/s. Line up: 12SA7 (1) 12SQ7 (1), 12A6 (2), 12SK7 (3). Power requirements 12 v. L.T., 225 v. H.T. **£11.10.0.** Carriage 12/6.

P. C. RADIO LTD.
170 GOLDHAWK RD., W.12
Shepherds Bush 4946

R209 Reception Set. A 10-valve High-Grade Super Heterodyne Receiver with facilities for receiving R/T (A.M. or F.M.) and C.W. Frequency 1–20 Mc/s. Hermetically sealed. Built on miniature valves and incorporating its own vibrator power supply unit driven by a 6 v. battery (2-point connector included). The set provides for reception from rod, open-wire or dipole aerial with built-in loudspeaker or phone output. Overall measurements: Length 12in., width 8in., depth 9in. Weight 23 lbs. In as new, tested and guaranteed condition **£23.10.0,** including special headphone and supply leads. Carriage £1.

Supply Unit Rectifier No. 21. Fully sealed enabling all sets built for 6 v. (R209, R109, etc.) to work from A.C. mains. Input 90–260 v. A.C. (Taps at 10 v. intervals). Output excellently smoothed up to 10 amps with meter indicating exact output voltage. Measurements: 12 x 9 x 10in. Price **£8.** Carriage and packing 15/-.

19 Set Owners. To increase output of your set 6 to 10 times use **RF Amplifier No. 2** with built-in rotary converter for 12 v. input. Four 807 valves output. Simple connection with transmitter. Fully tested condition, **£9.15.0,** including necessary connectors and instructions. Carriage and packing 15/-.

Telephone Handset. Standard **G.P.O.** type, new, **£1.** P. & P. 1/6.

Carbon Inset Microphone, G.P.O. Type 2/6. P. & P. 1/-.

Vacuum Condenser. 32,000 v, 50pF, 12/6. P. & P. 3/-.

AR 88's. Completely rebuilt with new PVC wiring.Type "D" **£75;** Type "LF" **£70.**

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 below) thus ensuring truly "Hi-Fi" record and playback facilities.

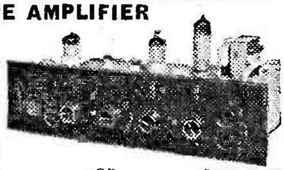
MODEL CR3/S Incorporates the COLLARO "STUDIO" TWIN TRACK 3-speed Deck, operating at 1⅞", 3¾" and 7½" speeds. **£39.10.0**
H.P. Terms: Deposit £7.18.0 and 12 months of £2.17.11.

MODEL TR3/Mk.V1 Incorporates the New TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck operating at 3¾" and 7½" speeds. **£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

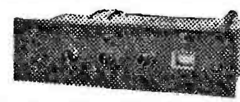
MODEL HF/TR3 TAPE AMPLIFIER

(Mullard Type "A" design)
A very high quality Amplifier incorporating 3-speed treble equalisation, by the latest FEROXCUBE POT CORE INDUCTOR. FOR COLLARO-TRUVOX-BRENELL or WEARITE Tape Decks, has GILSEN Output Transformer. Includes separate Power Supply Unit.



KIT OF PARTS **£13.13.0** OR ASSEMBLED **£17.0.0**
H.P. Deposit £3.8.0 and 12 months at £1.4.11.

MULLARD TYPE "C" TAPE PRE-AMPLIFIER—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 OR BRENELL 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" PRE-AMPLIFIER and POWER Unit Assembled and Tested. **£29.10.0**
H.P. Deposit £4.18.0 and 12 months £2.3.3.
(b) As above but TYPE "C" PRE-AMPLIFIER supplied as complete KIT OF PARTS. **£26.10.0**
(c) The TRUVOX Mk. VI DECK and the assembled Type "C" Pre-amplifier and Power Unit. **£40.0.0**
H.P. Deposit £8.0.0, and 12 months £2.18.8.
(d) As above but Type "C" as complete KIT OF PARTS. **£36.10.0**
(e) The BRENELL Mk. V DECK and the assembled Type "C" PRE-AMPLIFIER and POWER UNIT **£46.0.0**
H.P. Deposit £9.4.0, and 12 months £3.7.6.
(f) As (e) but Tape "C" as complete KIT OF PARTS **£43.0.0**
(g) 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).

EACH OF THE ABOVE CAN BE SUPPLIED IN A PORTABLE CASE FOR £5.10.0 EXTRA, THUS FORMING A COMPLETE PORTABLE PREAMPLIFIER. FULL DETAILS ON REQUEST.

(a) COMPLETE KIT to build the HF/TR3 Amplifier, together with the COLLARO "STUDIO" DECK. **£26.0.0**
(b) As above but with HF/TR3 supplied ASSEMBLED and TESTED. **£29.10.0**
H.P. Deposit £5.18.0 and 12 months £2.3.3.
(c) COMPLETE KIT to build the HF/TR3, together with the NEW TRUVOX Mk. VI TAPE DECK.. **£36.10.0**
(d) As above but HF/TR3 supplied ASSEMBLED and TESTED. **£40.0.0**
H.P. Deposit £8.0.0, and 12 months £2.18.8.
(e) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENELL Mk. V TAPE DECK.. **£42.0.0**
(f) As above but HF/TR3 supplied ASSEMBLED and TESTED. **£45.10.0**
H.P. Deposit £9.2.0 and 12 months £3.5.9.
(g) 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 £9.0.0. Carriage and Insurance 5/- extra.

SPECIAL OFFER OF TAPE

spools. New, boxed and guaranteed. P.V.C. base on latest type plastic

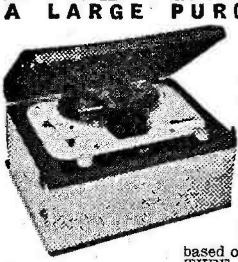
225ft. on 3in. Spool.......... **5/9**
900ft. on 5in. Spool.......... **18/6**
1200ft on 5¾in. Spool...... **21/-**
1800ft. on 7in. Spool...... **21/-**
1200ft. on 7in. Spool...... **32/6**

TAPE ACCESSORY KITS

(a) E.M.I. includes 3 reels leader tape, splicer, jointing tape and stop foil. **37/6**
(b) SCOTCHBOY, includes 3 reels leader tape, splicer, and jointing tape. **29/6**

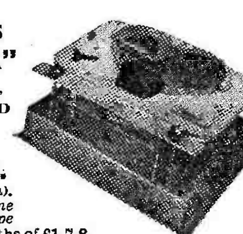
A LARGE PURCHASE OF BRAND NEW AND FULLY GUARANTEED GARRARD TAPE EQUIPMENT

ENABLES THESE OUTSTANDING PRICE REDUCTIONS



The "MODEL HFG/2R" PORTABLE TAPE RECORDER
(Original Price £33.0.0)
FOR ONLY 22 gns.
H.P. Dep. £4.14.0. 12 months £1.13.9. *(Carr. & ins. 10/- extra).* Incorporates THE LATEST GARRARD "MAGAZINE" TAPE DECK and a HIGH QUALITY AMPLIFIER which is entirely based on the very successful MULLARD TYPE "A" DESIGN and specifically developed to operate the GARRARD DECK. Price INCLUDES SUPPLY OF THE GARRARD TAPE MAGAZINE and 4in. SPOOL of DOUBLE PLAY TAPE. Comprises a Twin Track Recorder operating at 3¾in/sec. speed and providing up to 1 hour 10 mins. playing time. Truly "Portable", weighs only 22 lbs. Outstanding features are excellent performance and simplicity of operation.

THE "ADD-A-DECK"



Incorporating GARRARD "MAGAZINE" TAPE and the MATCHED MODEL HF/G2P PRE-AMPLIFIER
Supplied on ONE CHASSIS (as illustrated) READY FOR USE (Carr. & Ins. 10/- extra). **18 Gns.**
Price includes Garrard Magazine and a 4in. Spool Double Play Tape
H.P. Deposit £3.16.0, and 12 months of £1.7.8.
Provides complete tape recording facilities and designed to operate through the pick-up sockets of the standard type of RADIO RECEIVER, or an AMPLIFIER, from which really first class reproduction is obtained. It consists of a Twin Track Deck connected to the Pre-amplifier and operates at 3¾in/sec. speed providing up to 1 hr. 10 mins. playing time.

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

STERN RADIO LTD.

Practical Wireless

VOL. XXXVII No. 654 AUGUST 1961

Editorial and Advertisement Offices:

PRACTICAL WIRELESS

George Newnes, Ltd., Tower House, Southampton Street, W.C.2.

Phone: Temple Bar 4363

Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

SUBSCRIPTION RATES
including postage for one year

Inland - - - - - £1.3.0 per annum
Abroad - - - - - £1.1.6 per annum
Canada - - - - - - 19s. per annum

Contents

Retail or Home-Constructed Equipment

FOR much of the time the amateur radio enthusiast is content with making easily constructed equipment and so long as it does the job it was made for, the finish is not important. Even if it does not work well, the constructor is not so disappointed, as the pleasure is in making it, and tracing and correcting any faults is often as enjoyable. But now and again the need arises for a piece of equipment that looks attractive, works well and is reliable. Now the constructor is faced with the problem of whether to buy a ready-made instrument retail, or of building a home-constructed unit.

The piece of equipment needed will, in many cases, be a receiver, but even if it is a signal generator, a multimeter, an oscilloscope, or any of the multitude of instruments the amateur constructor could find a use for, the electronics industry gives him a wide range from which to choose. The competition between different firms provides a large selection of designs and circuits, and it would be understandable if, just for once, the radio constructor forsook his soldering iron, and purchased a commercial unit.

If he decides upon such a course, there are many advantages at once obvious. First of all, whichever instrument he buys will almost certainly make an attractive addition to the house or work-bench. Another advantage is that the constructor can be sure that the unit works well, as he will almost certainly see it in operation before he decides definitely to purchase it. If the equipment is needed quickly, building one is obviously out of the question, and the local radio supplier offers the solution. An added inducement which might persuade the enthusiast to buy a commercial instrument is the fact that new components are always used, which helps to ensure a long and reliable life for the unit.

If on the other hand, the amateur feels that a home constructed instrument would amply fulfil the requirements and would probably be cheaper, then he may look forward to practising the most popular part of his hobby; that of construction. Here home-constructed equipment has an advantage over commercial products as the constructor will be familiar with every part of the circuit employed and will thus be capable of repairing it himself should a fault arise; whereas if a fault develops in a ready-made set it must be returned to the makers to be serviced.

There is a third possible course open to the radio amateur, and that is to buy one of the numerous kits on the market, which, when built to the exact instructions of the makers, provides a useful instrument in a suitable cabinet usually supplied with the kit.

The firms belonging to the R.E.C.M.F. produce more than seven million components a day. This places before the equipment manufacturing firms and the amateur constructor a wealth of components which should enable anyone faced with this problem of whether retail or home-constructed equipment would serve his purpose best, to decide with complete confidence, that whichever he chooses, the materials will be of the highest standard and the wide selection will undoubtedly provide for the most stringent requirements.

Our next issue, dated September, will be published on August 4th.

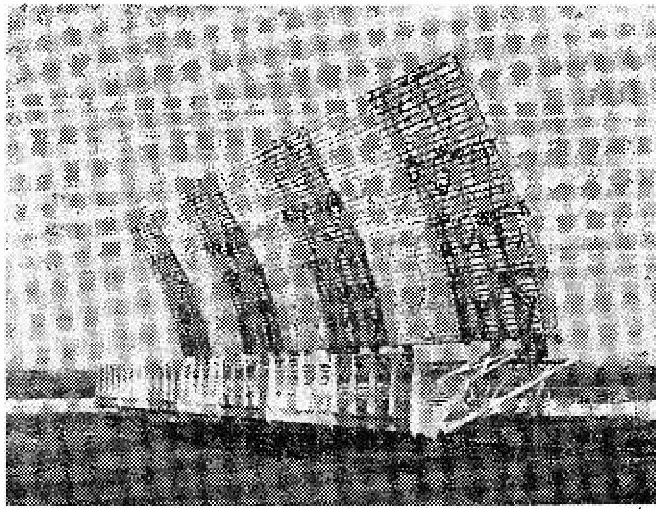
Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of April, 1961, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	Total
London Postal	686,093
Home Counties	652,402
Midland	470,101
North Eastern	512,903
North Western	441,417
South Western	389,319
Wales and Border Counties	228,497
Total England and Wales	3,380,737
Scotland	378,535
Northern Ireland	117,678
Grand Total	3,876,950



A long-range high-cover radar of the type being supplied by Marconi Ltd. to the Admiralty.

Medium Range Radar for R.A.F.

THE Ministry of Aviation recently ordered the new Cossor CR787 medium range radar equipment for airfield surveillance duties. An English Electric travelling wave tube, used as a microwave pre-amplifier ahead of the signal mixer, does much towards achieving the overall receiver noise figure of only 8dB. This is claimed to increase the range by approximately 25per cent. over that otherwise attainable with the same transmitter power and aerial gain.

An important feature, which the travelling wave tube affords, is that the noise figure is consistently maintained at this low level for many thousands of hours, which means that the results obtained at maximum search range will be consistent. Another advantageous factor in the performance of this tube, is that it is normally impossible to damage it by input overload.

Radar for the Royal Naval Air Service

THE Admiralty has ordered the supply of a Marconi high-power (500kW) 50cm radar Type S 264A/H to the Royal Naval Air Station Yeovilton, where it will be installed. The geographical situation of RNAS Yeovilton, places it near to two important air-lanes which makes it essential for the airfield to have a complete knowledge of all airliner movements in the air spaces through which the Navy's fast-climbing fighters have to pass, to reach the upper atmosphere, where they fly without the risk of colliding with any civil aircraft.

Because it operates at long range and has high altitude cover, and is impervious to weather conditions, the Marconi S 264A/H is considered to be well suited to effect this radar control.

Cable Installation at Kincardine

132kV cables will be supplied and installed by AEI Ltd. under a £40,000 contract at the Kincardine generating station. Two 132kV circuits of six single-core oil-filled cables will connect supergrid interbus transformers in a new 275kV sub-station with an adjacent 132kV sub-station, and one circuit of three 132kV cables will connect the 132kV sub-station with the termination of a 275kV overhead line.

Radiotelephones for Ambulances

DEVON County Ambulances will soon be installed with radiotelephones of the type already used by many ambulance services in Great Britain. Pye Telecommunications Ltd. have been awarded the contract, and will complete the installation in four stages, the first being to establish one fixed station. The complete scheme will comprise four fixed stations and approximately 60 mobile units.

Mr. Krushchev at British Trade Fair in Moscow

AT the British Trade Fair, recently held in Moscow, Mr. Krushchev spent some time examining the exhibits at the Ultra Electronics stand. He seemed particularly interested in the engine control equipment and in SARAH (search, rescue and homing equipment).

Mr. Krushchev stated that Russia may well have requirements for SARAH equipment.

Technical Lecture in Moscow

J. SHARPE, B.Sc., A.M.I.E.E., of EMI Electronics Ltd., has been chosen by the Russian authorities as the sole representative of the Scientific Instrument Manufacturers' Association at the British Trade Fair, Moscow, to give a technical lecture to a Russian audience. The subject of Mr. Sharpe's paper will be "Photomultipliers and their Applications".

The lecture will cover such points as design and characteristics of photomultiplier tubes, and their specialised modification for particular applications.

Scottish Radio and Electronics Exhibition

THE Scottish Council recently held, in London, a one-week exhibition of equipment produced by Scottish radio and electronic manufacturers.

This is the second exhibition in this field to be organised by the Council in London.

Altogether there are now fifteen companies in Scotland directly concerned with the production of electronic equipment. This industry employs 8,000 people, which may appear to be a small number, but it must be remembered that this was an industry which was practically unknown in Scotland before the war.

Of particular importance to Scotland is the fact that this development in their electronic industry will provide more opportunities for electronic engineers and applied physicists, chemists, and metallurgists.

New Printed Circuits Factory

A LARGE modern factory, specifically designed and built for the production of all types of printed circuits, instrument panels, etc., has recently been opened by Printed Circuits Ltd., an AEI company, at Boreham Wood. The factory is equipped with two completely automatic machines for etching and anodising.

The equipment provides for automatic selection of any one of a number of dyes which are constantly available to their correct specification, together with the fixing and sealing processes to ensure continuity of colours throughout a long production run. Designed primarily for the rapid etching of printed circuits, the etching unit is capable of handling single and double sided boards of various laminates and thicknesses.

Computer Development

IN 1956 International Computers and Tabulators Ltd. and the General Electric Co. Ltd. agreed to associate and develop their specialist knowledge in their respective fields in regard to computers, through the medium of a jointly owned subsidiary—Computer Developments Ltd.

In the light of experience, and in order to derive further mutual advantage from this association, I.C.T. is forming a subsidiary to be known as I.C.T. (Engineering) Ltd., whose nominal capital will be held as to 90per cent by I.C.T. and 10per cent by G.E.C. This company will assume responsibilities now undertaken by I.C.T.'s Research and Design Division and by the G.E.C. Computer Development Department at Coventry. G.E.C. will continue to supply I.C.T. with a substantial proportion of its steadily increasing requirements for electronic equipment.

Servicing Examinations 1961

THE Intermediate Radio and Television Servicing Certificate Examination this year has attracted 2,678 entries; an increase of 640 on the number who entered for the Radio Servicing Examination in 1960. Entries for the Final Radio and Television Servicing Certificate Examination total 707, an increase of 43.

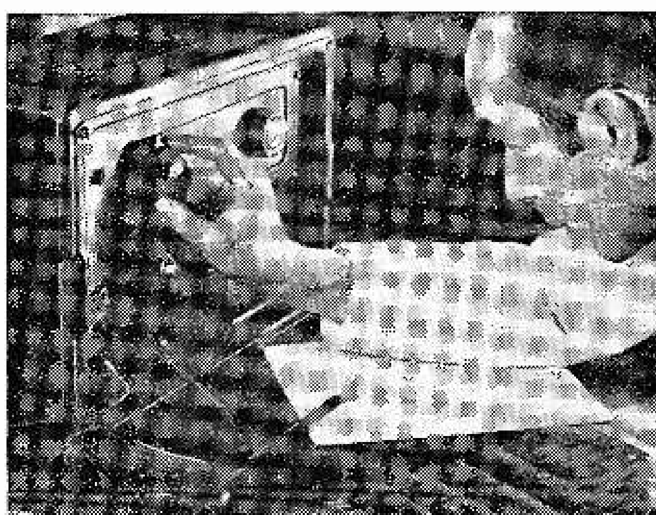
The written papers of these examinations were held on 8th and 10th May. The practical test of the Final Examination was held on 3rd and 17th June. The Intermediate practical test will take place during October, limited to those candidates who have passed the written papers.

British Standard for Fixed Wire-wound Resistors

IN a series dealing with components intended primarily for use in telecommunication and allied electronic equipment, this British Standard is divided into two parts, the first specifying requirements and tests, and the second comprising a list of standard sizes and ratings, for fixed wire-wound resistors.

The specification applies to insulated and non-insulated fixed resistors consisting of a winding of resistance wire on a heat-resisting former, and having a dissipation of 70°C not exceeding 200W and a rated resistance value not greater than 200k. Precision wire-wound resistors are excluded from the standard.

Part I of the standard requires reference to B.S.2011, "Basic climatic and durability tests for components for radio and allied electronic equipment." The object of the tests is to establish, as far as is possible in laboratory conditions, the components' suitability for use over stated ranges of temperature and humidity, their ability to withstand specified conditions of mechanical shock expected in transit or under operational conditions, and their ability to withstand normal assembly processes, such as soldering.



This operator is testing the ohmic resistance of strain gauges at the Boreham Wood factory of Printed Circuits Ltd.

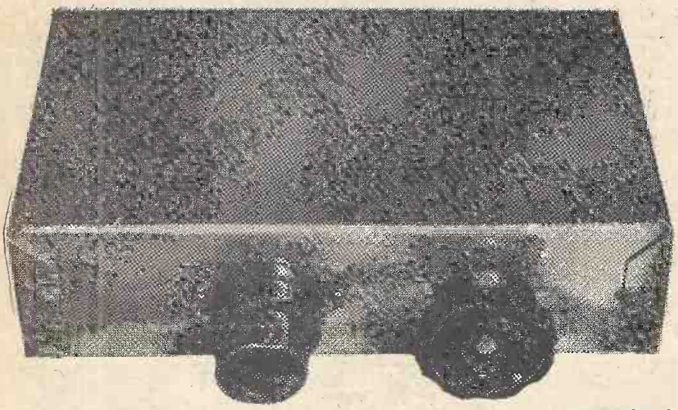
THIS UNIT MAY BE USED WITH A RECEIVER TO ELIMINATE ALL SIGNALS ABOVE A CERTAIN LEVEL. IT CAN ALSO BE USED TO PREVENT OVER-MODULATION IN A PHONE-TRANSMITTER.

THIS unit may be added to either a receiver or a transmitter. With a receiver, it cuts off all signals above a certain level, and thus reduces static or bursts of noise. When used with a phone transmitter, it prevents over-modulation, and allows an increase in effective audio power.

Effect of Clipping

Fig. 1 is a representation of the result of using the clipper in a transmitter. At "A", the transmitter is modulated to such an extent that the greatest signal peaks fall within the 100per cent modulation limits. The general modulation level, apart from these peaks, is perhaps 30 to 50per cent. Owing to the characteristics of the usual voice, this is about the general effect achieved.

At "B", audio gain has been increased. This gives much more power on the general modulation level, but peaks now extend beyond the 100per cent limits. Positive modulation peaks beyond this limit need not be important, if the transmitter can handle them. But, with negative peaks, the P.A. anode voltage is driven below zero, and this breaks the carrier and causes splatter, which can give rise to interference. It is for this reason that more than 100per cent. modulation must never be permitted.



The waveform after the clipper has removed the peaks is represented in Fig. 1A. No over-modulation is present, but if "C" is compared with "A" it will be seen that the general level of audio is much higher. With slight clipping, such as represented by "C", there is almost no sacrifice in communications voice quality.

For receiving purposes, the clipper acts as a limiter, in a similar way to that represented by "C" in Fig. 1. Pulses of high static noise, or loud bursts of reception, are eliminated. This is particularly useful for headphone reception with a powerful receiver, but is also helpful in removing all high amplitude noise pulses.

NOISE LIMITER AND SPEECH CLIPPER

By D. West-Henry

Clipper Circuit

The circuit is shown in Fig. 2. The valve type and component values are not critical, but the two 220k cathode resistors should be matched fairly closely. While the anodes are positive, the audio signal can pass from the input to the output circuit. But when the input exceeds the anode voltage the output cathode cannot follow this swing, so peaks are cut off as at "C" in Fig. 1.

The level at which clipping takes place is set by means of the clipper control. Circuit values are such that the clipper can be inserted where there is an audio swing of some 5V to 10V or so. This means that it can usually be placed before the driver, in a transmitter, or before the output stage, in a receiver.

Current is drawn from the existing power pack. The 8μF condenser and 47k resistor merely serve to decouple and smooth the supply to the clipper.

When the clipper is used with a receiver, the output to the following valve grid may be taken directly from the 0·01μF condenser. The receiver volume control should be earlier in the circuit than the clipper. With all ordinary circuits, this will be so if the clipper precedes the output stage.

When the clipper is used in a transmitter, the clipping action produces square waves and high frequency transients which could cause over-modulation or splatter. The filter thus becomes necessary, and is intended to cut off frequencies beyond approximately 3,000c/s. This does not make much difference to voice quality.

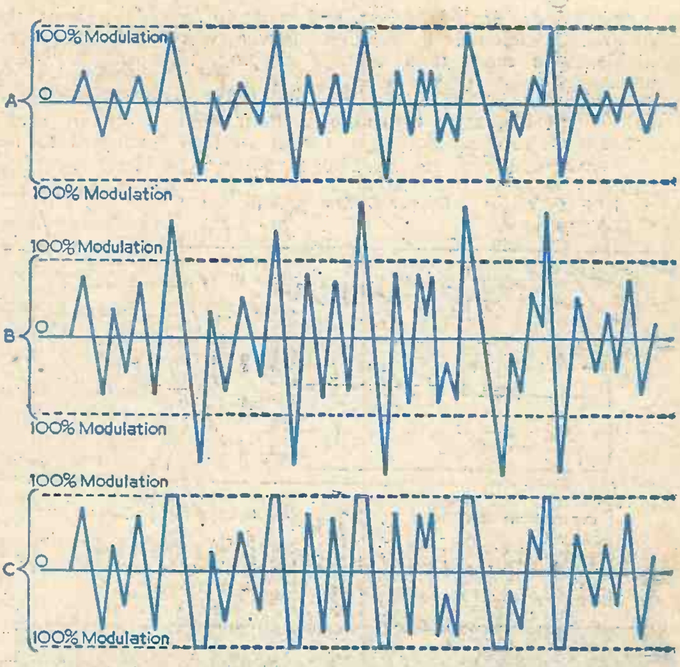


Fig. 1.—This represents the way in which the clipper is used in a transmitter.

Wiring

A wiring plan of the unit is shown in Fig. 3. The unit can be constructed entirely on one side of a 2in. x 7in. or similar aluminium box. The simplest method of construction is to wire the unit on a metal plate with flanges, then add the sides, etc., to complete the box. Complete screening was not found necessary if the unit were suitably placed, but is necessary if the location of the unit might result in hum, instability, or pick up of R.F.

Reasonably short screened leads are provided for input and output connections. It is then only necessary to open the grid circuit of the driver or output valve to include the clipper in circuit. As the unit is in the grid circuit, the screening is necessary to avoid hum or instability. The choke should also be clear of the field near mains transformers or output transformers.

Any normal H.T. voltage is suitable. The 6H6 will require 0·3A at 6·3V for its heater.

Receiver Adjustment

Initially, set the 100k potentiometer so that adequate positive voltage reaches the 6H6 anodes. Adjust the receiver volume control for the usual headphone or loudspeaker output which is required. The clipper potentiometer control knob is then slowly rotated in a clockwise direction, until volume just begins to fall. It should then be found that turning up the receiver volume control causes no further increase in output from the headphones or speaker.

Results will be best if the clipper is so adjusted as to allow a normal degree of volume, and the receiver volume control is set for average volume from the station tuned in. If the clipper is adjusted to clip at a low level, and an attempt made to boost volume by turning up the receiver volume control, quality of reproduction will fall. The clipper is not a form of automatic volume control, or automatic noise suppression, but is a means of always maintaining output between set limits.

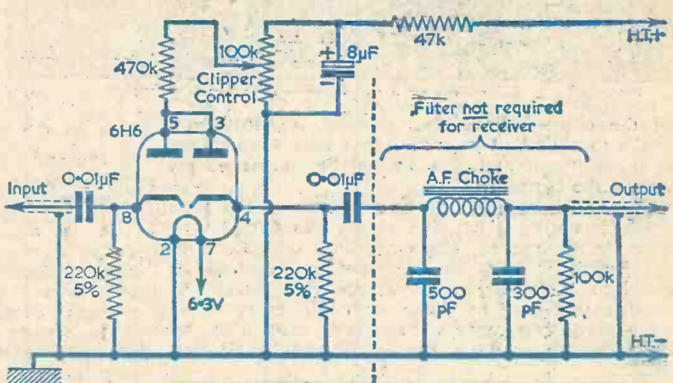


Fig. 2.—The speech clipper circuit.

With a Transmitter

In a 60W modulator, the best circuit position was found to be in the grid circuit of the driver. Using a crystal microphone, followed by a high-gain twin triode, pentode driver, and pentodes in Class AB2, sufficient modulation power was available, with more than average clipping, if wanted.

Bass response in the modulator should be as good as possible, after the clipper. Poor bass response tends to cause sloping of the square tops

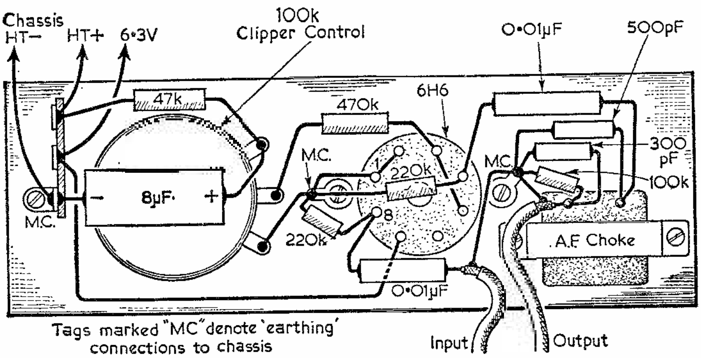
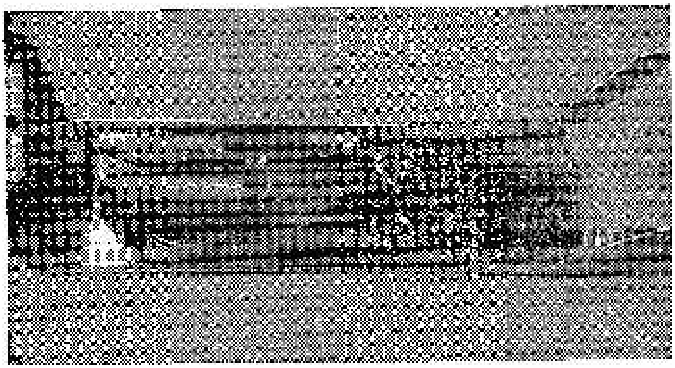


Fig. 3 (above).—This, and the illustration below, show the wiring details of the unit.



of the clipped waveform, thereby re-introducing peaks to a limited extent. Some bass suppression is quite usual, and this should be in the stages before the clipper.

A small surplus audio transformer of the type used for coupling between stages was found suitable for the choke. The inductance required is in the region of 20H, but the winding is not called upon to carry any direct current. If necessary, experiments may be made with chokes or other iron-cored components to hand, and also by changing the values of the 500pF and 300pF condensers, or the 100k fixed resistor. If the filter cuts too severely, speech will sound very low-pitched.

COMPONENTS LIST
Resistors: 470k, 100k, 47k, two 220k, 5per cent
Capacitors: 500pF, 300pF, two 0·01 μF, 8 μF electrolytic.
6H6 valve
100k potentiometer
A.F. Choke

Installation

If an oscilloscope is available, this can be coupled to the transmitter in any of the usual ways which are used to check modulation. Using an artificial aerial load, set the clipper initially as described for receiving, then increase the audio gain until the 'scope shows over-modulation on voice peaks. Slowly turn the clipper control knob until these peaks cease. Increasing the audio gain, or voice level, will then give fuller modulation, without danger of over-modulation. A two-fold increase in average modulation should cause no deterioration in speech quality, and there is the added advantage that carelessly raising the voice or speaking too near the microphone cannot cause over-modulation.

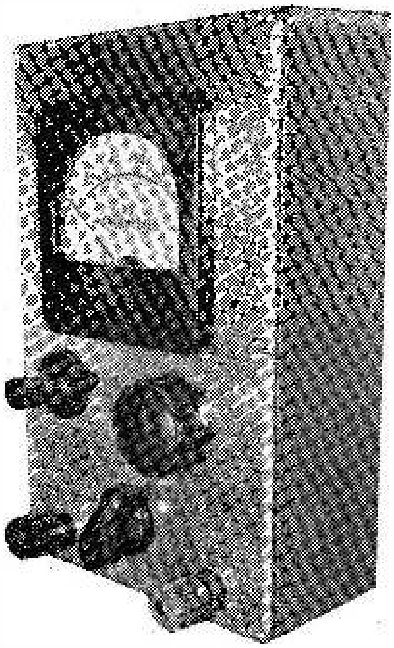
If a 'scope is not available, a temporary circuit may be arranged to show when the P.A. anode is driven below zero voltage. This can be carried out by connecting a valve rectifier from the P.A. side of the modulation transformer, to a limiting resistor and sensitive meter, the latter being connected to chassis. The rectifier should have an inverse voltage rating at least equal to twice the P.A. H.T. voltage, and its cathode or heater is taken to the modulation transformer. Heater current is drawn from an adequately insulated heater transformer, or from an insulated and protected dry battery. When modulation exceeds 100per cent. in the negative direction, the valve rectifier will conduct, giving a momentary indication on the meter. The clipper is adjusted until these indications cease.

Splatter

It is also possible to listen for splatter, each side of the carrier frequency. The station receiver can be used for this, with its aerial and earth terminals shorted to prevent overloading.

Once the clipper is set so that it operates at just under 100per cent modulation, it will not need further adjustment in the normal course of events, when used with a transmitter or receiver. It is necessary to have some extra audio gain available, compared with that which would give 100per cent modulation without the clipper in circuit.

The layout of components in this unit is not critical, but if that shown in Fig. 3 is followed the unit will function free from adverse effects which might otherwise be encountered. ■



A Sensitive Multimeter

A 10,000Ω/V INSTRUMENT

By R. Murray-Shelley

A MULTI-RANGE test meter is an instrument which is almost essential when servicing electronic equipment, or when carrying out experimental work. The unit to be described is very suitable for both these applications. The meter has a total of sixteen ranges, and a basic sensitivity of 10,000Ω/V—sufficiently versatile and sensitive for general use, yet at the same time being sufficiently robust to withstand a certain amount of rough handling.

The Basic Movement

The accuracy and reliability of any instrument of this kind depends to a large extent on the basic meter movement. This instrument is designed around a moving coil meter having a full-scale deflection of 100μA, and an internal resistance of 1000Ω. The values of the shunts and multipliers given are based on a movement having these characteristics; however, the formulae required to calculate these resistor values are to be provided, and therefore almost any movement, of which the full scale deflection and internal resistance are known, could be used.

The larger the scale of the meter, the more accurate the finished instrument will be. A meter having a 2½in. scale was used in the prototype, and such units are readily obtainable from government surplus suppliers. A mirror scale is a very useful addition, since this will prevent errors due to parallax when taking readings. The scale of the meter should be calibrated from 0 to 100. Meters with scales having unusual calibrations will have to be recalibrated, though these should be obtainable more cheaply than the former types.

Ranges

The meter as it stands will only measure current to a maximum of 100μA (or 0·0001A) and volts to 0·1. (This follows from Ohm's Law—V=I x R—the resistance in this case being 1,000Ω.) To enable the meter to measure larger currents and voltages resistors known as multipliers (for voltage) and shunts (for current) are placed in series and parallel respectively with the meter, as required. In this instrument they are selected by means of a rotary switch. The ranges so obtained are:

D.C. volts—0-3, 0-10, 0-100, 0-300, 0-1,000.
A.C. volts—0-10, 0-100, 0-300, 0-1,000.
Current—0-100μA, 0-1mA, 0-10mA, 0-100mA, 0-1A.
Resistance—0-10k, 0-1M.

Voltage Ranges

This instrument is intended to measure both direct and alternating supplies. However, since a moving coil meter which will only respond to direct current is being used, then the alternating current must be rectified before being applied to the meter. Another point which must be considered is that an alternating supply can be measured in two ways. Either the mean, or average, voltage may be measured, or the root mean square (r.m.s) voltage may be obtained. This latter differs from the first by a factor of 1·11.

COMPONENT LIST

Meter	100μA full scale deflection, 1,000Ω internal resistance
MR	4 Westectors, type WX3, connected in bridge circuit or meter rectifier
R1	29k (31k in parallel with 470k)
R2	99k (90k in series with 9k)
R3	1M
R4	3M (2·7M in series with 300k)
R5	10M
R6	81·1k (75k in series with 6·1k)
R7	890k (820k in series with 68k)
R8	2·7M
R9	9·0M (5·6M, 2·2M and 1·2M in series)
R10	111·11Ω (100Ω in series with 11·11Ω—see text)
R11	10·101Ω (wire-wound—see text)
R12	1·001Ω (wire-wound—see text)
R13	0·10001Ω (wire-wound—see text)
R14	150Ω (see text)
R15	10k
VR1	5k linear carbon
Cell	1·5V (e.g. U10 cell)
Terminals, knobs, box, connecting wire, etc.	
S1	3-pole, 2-way rotary switch
S2	3-pole, 12-way rotary switch.

This quantity is known as the form factor, or, more properly, the waveform factor. The average value is, however, little used today, and most references in A.C. terminology are made to the root mean square form of measurement. For this reason the instrument is designed to measure r.m.s. volts directly.

TABLE I

Resistance	Eureka 22s.w.g.	26s.w.g.	Copper 28s.w.g.	40s.w.g.
111·1 Ω	30ft 3in.	9ft 4¾in.		
10·101 Ω		8ft 11½in.		
1·001 Ω				2ft 1¼in.
0·10001 Ω			2ft 1in.	

The formula for obtaining the multiplier values for the direct voltage ranges is:

$$R = \frac{V}{Im} - Rm$$

where V is the maximum voltage to which the meter is required to measure, Im is the meter full-scale deflection in amps, and Rm is the internal resistance of the meter.

For alternating voltage ranges, the formula is:

$$R = \frac{E - 1}{Im \times 1{\cdot}11}$$

where E is the required full scale alternating r.m.s voltage.

A voltage drop occurs across the rectifier, and allowance must be made for this when calculating the multiplier values. This drop is considered as being 1V, which is found to be quite satisfactory in practice. The rectifier itself consists of four Westectors (type WX3) connected in a bridge circuit. These rectifiers are of the copper oxide type and are very suitable, having a maximum output current of 100μA. They are small, and connection is made to them through their wire terminals. Alternatively, a miniature bridge rectifier, sold as a meter rectifier, may be used. They can thus be wired directly into the circuit and are self-supporting. Changing from direct to alternating voltage ranges is accomplished by means of a 3-pole, 2-way switch connected as shown in the circuit diagram (Fig. 1).

Current Ranges

The instrument will measure up to 1A in five ranges. This is more than adequate for normal servicing of radio and television equipment. The shunts are of a much lower resistance than the multipliers used for the voltage ranges, and therefore they may be conveniently wound by hand. The values and the lengths of resistance wire or insulated copper wire required are given in Table 1.

(To be continued)

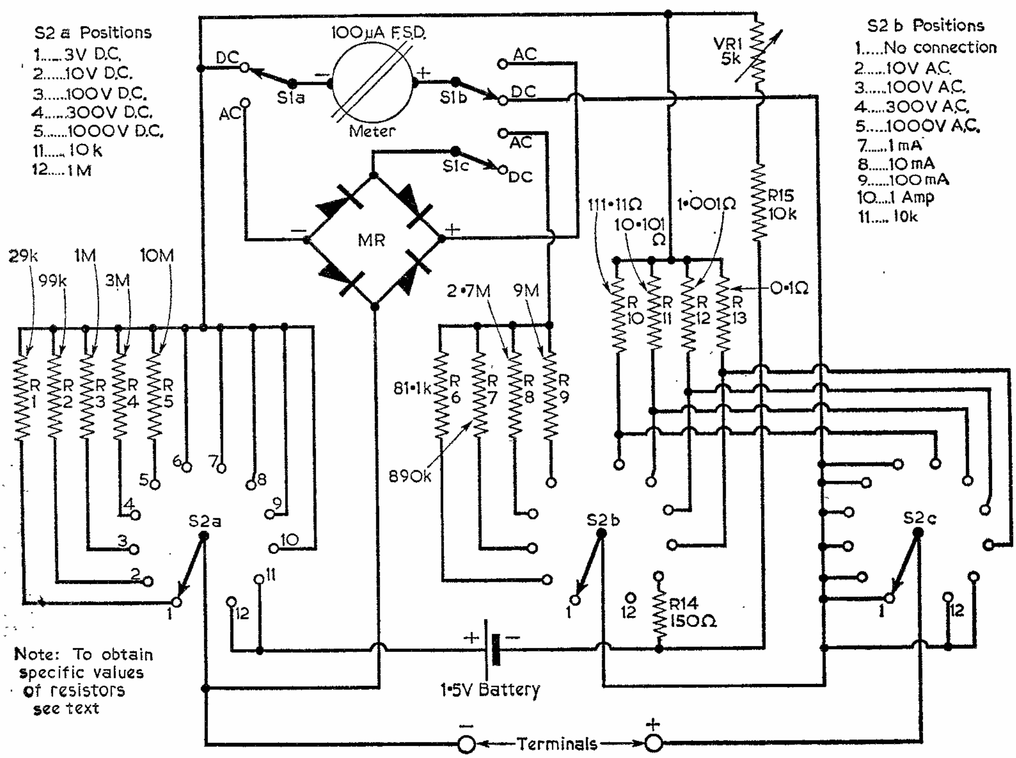


Fig. 1.—The complete circuit of the meter.

AN ACORN F.M. TUNER

A BAND II PRE-AMP AND F.M. TUNER

By C. J. Lloyd

THIS unit is a two-stage receiver of simple design and construction, with a performance which may surprise those who are not familiar with the capabilities of the super-regenerative circuit at high and very high frequencies. Two acorn valves are used, and these, together with the remainder of the components, may be obtained for a few shillings. The heater rating of each valve is 150mA at 6·3V (though they operate satisfactorily at a lower voltage) and the total H.T. consumption is less than 2mA at about 100V, so that few constructors will find it necessary to provide a separate power pack, though details of a suitable unit will be given. In spite of its simplicity of construction, the receiver is capable of giving an A.F. output equal to that of the usual type of tuner. When fed from a reasonable aerial, and carefully adjusted, the output, from a good amplifier has a very satisfactory quality, and the background is quiet. Further simplification of the circuit and adjustment is possible, though at the expense of some gain; details will be given below. Little or no drift occurs on warming up.

The receiver consists of a conventional pre-amplifier (Fig. 1a) designed round a 954 valve, followed by a 955 acorn triode in a super-regenerative circuit (Fig. 1b). In the prototype the two stages were constructed separately, the first having been used originally as a pre-amplifier and, on occasions, as a 90Mc/s signal generator. This stage is recommended to those in fringe areas whose conventional tuners, in spite of being provided with a good aerial, require some pre-amplification of the signal. A modified form, having less gain, has given excellent results in Oxford—a fringe area—when followed by a converted R.F. 26, the aerial being a 2ft vertical rod attached directly to L1 (since it was not possible to use even an indoor dipole). In these conditions a commercial tuner gave no result at all, and the output of the converted R.F. 26 alone was almost inaudible. Although it might have been expected that the pre-amplifier would introduce noise, none could be detected in the output, and the quiet background and freedom from interference which are associated with reception of the F.M. transmissions were obtained.

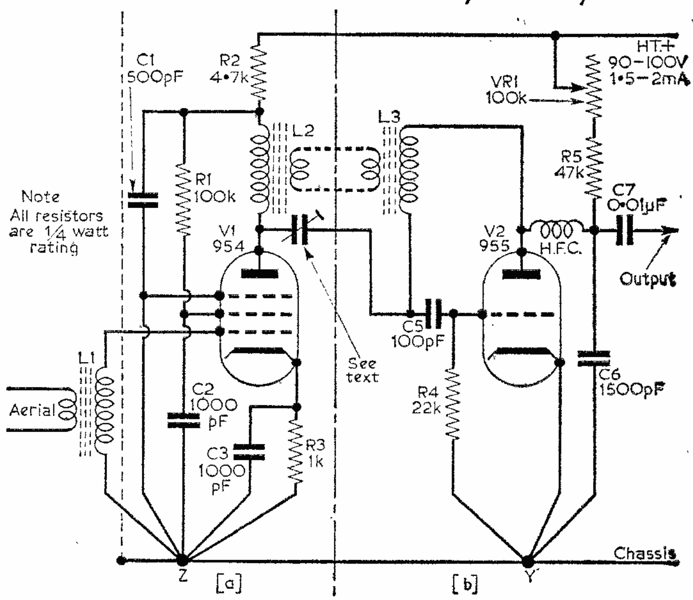


Fig. 1.—The complete circuit of the tuner.

Construction of the Pre-amplifier

First, the coils are wound, each consisting of 7 turns of 28s.w.g. enamelled wire close wound on a $\frac{1}{4}$in. former, with a $1\frac{1}{2}$ turn coupling coil of thin, PVC-covered, wire over the larger winding. The turns are cemented in place with polystyrene cement, Balsa cement, or Durofix. The coil formers and cans, size $\frac{3}{4}$in. diameter by 1in. tall, were recovered from a disused TV chassis, and iron dust cores are used for tuning. The can size is not important, but the number of turns must be suitably adjusted if the diameter of the former differs from $\frac{1}{4}$in. Those used in the prototype have the merit of small size, which facilitates compact construction and short wiring. Further, the coil formers were fitted with six tags instead of the usual four, so that two tags were available for use as anchor points for the H.T. supply lead and decoupling capacitor. In their absence it would have been necessary to provide a tag strip, and to increase the size of chassis to accommodate it.

The prototype chassis is of heavy gauge tinplate, 2in. square, whilst both stages can be accommodated on a chassis 5in. × 2in. It is suggested that a suitable piece of metal be cut and bent as shown in Fig. 2, which also gives dimensions for drilling; the upturned edges give rigidity and yet permit ease of soldering, and sides may be sweated on to complete the box form when wiring is complete. The dimensions may be altered to suit different sizes of coil can and other components, but the constructor must aim at rigidity, compactness and short wiring if instability is to be avoided. If aluminium is used, earthed soldering tags must be provided and the sections will have to be bolted together where tinplate would be

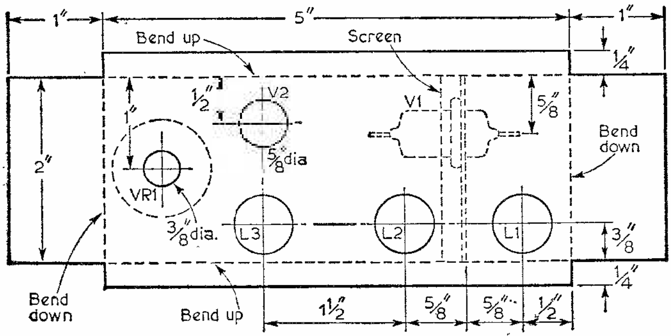


Fig. 2.—The drilling dimensions for the chassis.

sweated. A slight rearrangement of components would allow a 2oz tobacco tin to be used.

The 954 valve, supported by its wiring, projects through a $\frac{9}{16}$in. hole in a screen sweated to the main chassis as shown in Fig. 3. For this operation, a large hot iron is recommended. Before inserting the valve, an insulating 'washer' of thin paxolin or waxed paper is fitted to prevent the valve pins, or their wiring, from accidentally touching the screen.

The coil formers should be mounted so that the positions of the tags permit the wiring to be kept short; resistors and capacitors should be of small dimensions for the same reason. The wiring of the grid circuit of the 954 is very simple, the earthy end of L1 being taken to the earth point on the screen shown in Fig. 3. This diagram will enable the wiring of the 954 to be completed; it shows only the relative positions of the components, and it will be found that the wiring is more compact than Fig. 3 suggests. Soldering to the valve pins is simple, but it must be done with care. Fairly thin wire, well tinned, must be used, and a loop made to fit the pin of the valve. The loop should be held in position at the *end* of the pin, when very brief contact with a really hot iron carrying a little solder will make the joint without cracking the glass seal.

The Super-Regenerator

In the opinion of the writer, this circuit has been undeservedly neglected in recent years. The older generation of experimenters will remember it for its performance on the short waves before the superhet become popular, but some comment on it may be appreciated by others. Referring to Fig. 1b, the valve is connected as an oscillator at signal frequency, the H.F. choke taking the place of the usual anode load. The values of R4 and C5 are so chosen, however, that rectification of the oscillation at the grid charges C5, blocking the grid and quenching the oscillations until the charge leaks away through R4, when the valve again oscillates. This cycle of operations is

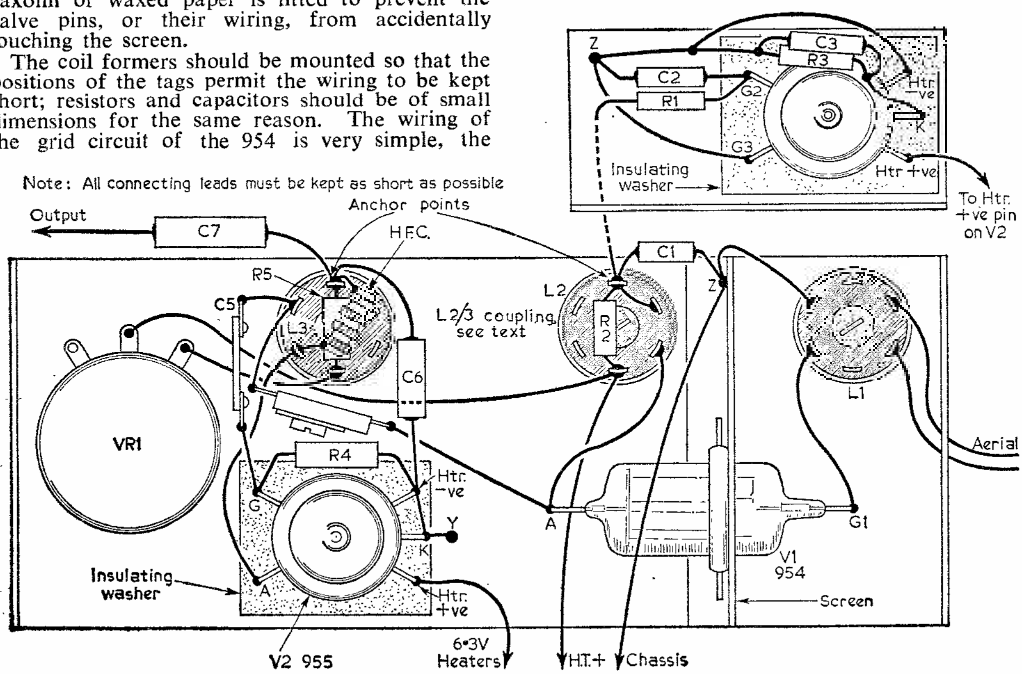


Fig. 3.—The component layout and wiring diagram.

repeated, maintaining the valve in its most sensitive state. An A.M. signal fed to the grid-anode coil is demodulated and, the impedance of the choke to A.F. being virtually zero, the A.F. content of the signal appears across R5/VR1. and is taken from C7. C6 bypasses the quench frequency, and its value will affect the operation of the circuit to some extent, but its value is not critical; if made too large there will be some loss of 'top'. The frequency of quenching is determined largely by the time-constant of R4/C5 and it is, of course, supersonic, but it must not be greater (and preferably much less) than 1/100 of the signal frequency. It is for this reason that the super-regenerator is not suited to reception on the medium and long waves. The circuit is very sensitive to changes in the period in each cycle during which quenching is in operation, and VR1,

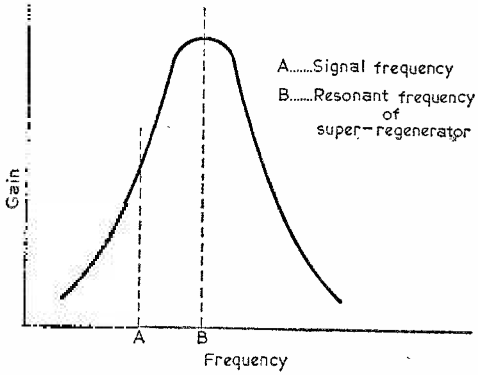


Fig. 4.—This shows the gain of the 954 valve plotted against the frequency.

which varies the anode voltage of the valve, is included to adjust the working conditions to the optimum. It will be found that VR1 must be carefully adjusted for best results, and after the preliminary setting up it might be advantageous to replace it with a variable resistor of lower value, together with a fixed resistor, to cover the range of resistance required.

Quality

Since the operation of the circuit maintains the valve in its most sensitive state, its amplification is much greater than in any other configuration. It is, however, incapable of giving good quality from A.M. signals (though speech is satisfactory), and it has at times been accused of being temperamental. This reputation is not deserved; if construction and adjustment are carefully carried out, the circuit is perfectly stable. The tuning is relatively broad, but this is offset by the fact that the valve tends to respond only to the strongest of the several signals which may simultaneously reach it owing to lack of selectivity in the preceding stages. Tuning is comparatively easy, since a loud hiss, which indicates that super-regeneration is taking place, disappears when a carrier is tuned.

It must be emphasised that on no account must this circuit be used without an R.F. stage to isolate it from the aerial, as its quenched oscillations will cause interference over a wide area, not merely to BBC transmissions but to those of essential services. Interference from an unscreened coil or H.F. choke can be troublesome, but tests have been made with the prototype, using a standard type of FM tuner to detect radiation, and the constructor may rest assured that no trouble will be caused in this respect.

F.M. Reception

Fig. 4 shows diagrammatically the gain of the valve plotted against frequency. If the F.M. carrier frequency is at point A, changes in frequency owing to modulation will cause corresponding changes in gain, and the A.F. signal will appear at the anode of the valve. Further, if the straight line portion of the graph about A will accommodate the full frequency variation, distortion will be absent; thus the broad tuning of the super-regenerator is an advantage. It will be seen that the transmission may be tuned at two points, one on either side of the peak. The setting of the carrier at an off-peak position means that the maximum gain of the valve cannot quite be realised, but the amplification at VHF is so great that the small loss is of little consequence.

Construction of the Super-Regenerator Stage

The 955 envelope projects through a $\frac{9}{16}$in. hole in the chassis (Fig. 3), and again the pins are prevented from shorting to earth by an insulating washer. Coil L3 is identical with L1 and L2. Several small R.F. chokes from surplus VHF equipment have been used successfully, but a suitable choke may be made by winding 60-100 turns of 32s.w.g. enamelled wire on a $\frac{1}{4}$in. former. Fig. 3 shows the disposition of under-chassis components, and also the valve wiring.

COMPONENTS LIST

Resistors *(All $\frac{1}{4}$W)*

R1	100k	R4	22k
R2	4·7k	R5	47k
R3	1k	R (Fig. 5)	25—120k 1W
Capacitors			
C1	500pF	C2	1000pF
C3	1000pF	C4	trimmer, see text
C5	100pF	C6	1500pF
C7	0·01μF		
Smoothing capacitors 8—8μF			
VR1	100k		
V1	954	V2	955
H.F.	Choke	Mains transformer	

Power Supplies

If power is drawn from an existing source, e.g. an A.C. mains amplifier, it will be necessary to include a $\frac{1}{2}$W or 1W resistor in the H.T. supply line, and, since the current required is only $1\frac{1}{2}$-2mA, the resistor will have to be of a high value — not less than 100k — depending on the voltage available at the amplifier. The H.T. line voltage of the tuner is not critical, and the 954 will take 250, but the anode voltage of the 955 at its optimum working point is of the order of 50 and too high an H.T. voltage will create difficulty in the operation of VR1, which may have to be increased in value. A decoupling condenser of, say 1 or $2\mu F$, should be connected from the slider of VR1 to chassis.

A suitable power pack is shown in Fig. 5, where the value of R must be chosen by experiment to give the necessary low H.T. voltage; smoothing is adequate. Suitable transformers are sold for use in struments and pre-amplifiers—the writer uses one taken from a very old battery eliminator.

Coupling the Two Stages

Several methods of coupling the two stages have been tried, and the constructor is recommended to experiment for himself. In general, the closer the coupling the better the signal but the more critical the tuning and the greater the influence of the tuning of L2 on L3, and vice versa The 1½ turn windings on L2 and L3 may be connected together, either directly or with a small capacitor, preferably variable. included in the loop. Direct connection is recommended for preliminary experiments — in the prototype this method produces an output equal to that of the usual type of tuner. The writer uses a 3-12pF trimmer between the anode of V1 and the junction of L3/C5, adjusting the capacity (which is not critical) to give the best compromise between output and ease of adjustment. Alternatively, this capacitor may join the anodes of V1 and V2.

Adjustment of the Pre-amplifier

A pre-amplifier is a poor substitute for a good aerial. Articles on the construction of VHF aerials have appeared in this magazine, and the best that conditions permit should be used. The H.T. voltage should be raised to 230-250, and the aerial twin feeder connected to the coupling coil of L1, a short length of twin feeder being used

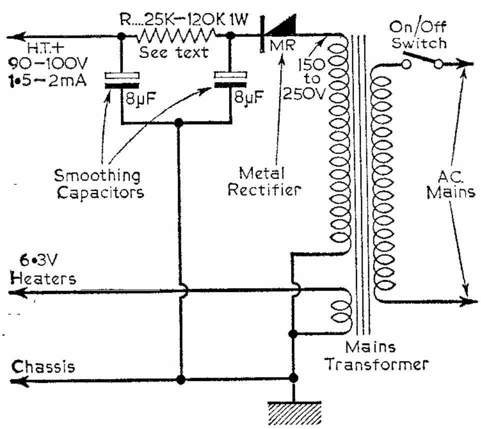


Fig. 5.—The circuit of a suitable power pack.

to connect the 1½ turn coil of L2 to the aerial input of the set. If V2 has been included in the unit it must not be permitted to oscillate, and the H.T. supply to it should be disconnected. L1 and L2 are then tuned, using a 'screwdriver' made from a plastic knitting needle (or even a matchstick) until they peak on the Network Three (Third Programme) frequency. Resonance may be judged by ear, but better by connecting a voltmeter (10V range. 500Ω/V or better) across the electrolytic capacitor in the discriminator stage and tuning for maximum reading. There will be no sign of instability, indicated by a sudden large increase in the meter reading, when L1 and L2 are brought to resonance, if screening is adequate, the wiring is short and a common earthing point is used. The coils may then be slightly staggered in tuning, screwing one core in and the other out until the meter (or the ear) indicates that amplification of the Home, Light and Third Programme frequencies is the same. Alternatively, if required, resistors may be soldered in parallel with the main windings of L1 and L2 to broaden the tuning—5 or 10k may be tried—but some loss of gain will follow. The cores should finally be sealed in position with wax. If maximum amplification is necessary, a worth-while increase in gain is obtained by tuning the coils to each station as required, a procedure less tedious than it sounds if the core is provided with a suitable extension, e.g. a short length of plastic rod or tube.

By coupling output to input, using an inch or two of flex, L1 and L2 being in resonance, a Band II oscillator is obtained which may be found useful in aligning an F.M. receiver. If the valve refuses to oscillate the connections to one of the coils should be reversed. Care must be exercised in its use—it can cause interference—and the H.T. voltage should be kept as low as possible consistent with oscillation. A loop of wire, connected to the aerial input of the receiver by a length of twin flex and placed near the oscillator will pick up the signal, and movement of the loop will vary the input to the set over a wide range.

Adjustment and Operation of the Tuner

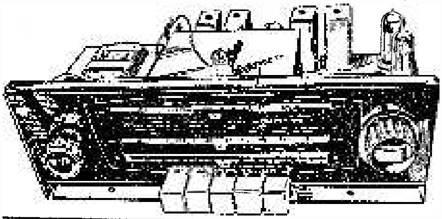
VR1 is set to minimum and the 955 tested for oscillation by shorting its grid to earth when the anode current will rise and the anode voltage fall (note that a high resistance voltmeter must be used owing to the high resistances in the circuit; also note that if the H.T. voltage is too low for oscillation to occur, the same effects are noticed on shorting the grid to earth).

Connecting to an Amplifier

The output is fed to an amplifier, or to high resistance phones, through C7, coaxial cable being used for the amplifier connection. A hiss will indicate that super-regeneration is taking place. If the pre-amplifier stage has been aligned as described above, tuning L3 should bring in the transmission, when the three cores are trimmed, and VR1 adjusted, for best results The prototype can be aligned, however, in a few minutes by connecting the aerial to L1, searching for a signal and making a final adjustment of the cores. If difficulty is experienced, it is useful to remember that a brass nut stuck on to the bottom of the core will give a wider range of tuning and will correct a coil with too high an inductance. If a signal generator is available. a modulated signal should be injected into L3 when the resonant frequency of L3 may be found and adjusted: the signal is then transferred to L1 and the first stage aligned.

(Continued on page 319)

BRAND NEW AM/FM (V.H.F.) RADIOGRAM CHASSIS AT £14 (Carriage paid)

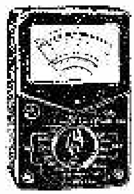


Tapped input 200-225 v. and 226-250 v. A.C. ONLY.
Chassis size 15 x 6¾ x 5¾in. high. New manufacture, 12 mths. guarantee.
Dial 14½ x 4in. in black and gold.
Pick-up. Extension Speaker. Ae., E., hd Dipole Sockets. Five "piano" push buttons—OFF L.W., M.W., F.M. and Gram. Aligned and tested. With all valves and O.P. Transformer. Tone Control Fitted.
Covers 1,000—1,900 M.; 200-500 M.; 88-98 Mc/s.
Valves EZ80 rect., ECH81, EF89, EABC80, EL84, ECC85.
Speaker and Cabinet to fit chassis (table model), 47/6 (post 3/6).
10 x 6in. ELLIPTICAL SPEAKER. 20/-, to purchasers of this chassis.
TERMS:—(Chassis) £5 down and 5 Monthly Payments of £2, or with Cabinet and Speaker £5.10.0 down and 6 Monthly Payments of £2.
This chassis is an ideal partner for the radiogram cabinet appearing on this page.

THE "CABY" TEST METERS

Prices include **Test Prods, Batteries, Instruction Book.** Also measure dB. Accuracy: A.C., 3 per cent, D.C., 2 per cent.

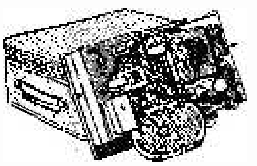
A-10 **£4.17.6** B-20 **£6.10.0**



A.10—2K ohms/v. on A.C. and D.C. volts (10, 50, 250, 500 and 1000 v.); 10K and 1M ohms; ½ mA, 25 mA and 250 mA. D.C. Size: 5¼ x 3⅞ x 1½in. Weight 17 oz.

B-20—10K ohms/v. on 0.5 v. and 2.5 v.; 4K ohms/v. on 10, 50, 250, 500 and 1000 v., A.C. and D.C. Resistance 2K, 200K, 2 M and 20M ohms; D.C. current, 100 microA. 2.5 mA, 25 mA, 250 mA. Size: 5⅞ x 3⅞ x 2½in. Weight, 24 oz.

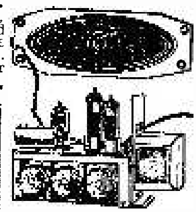
TAPE RECORDER FOR ONLY £17.17.0 (10/- carr.)



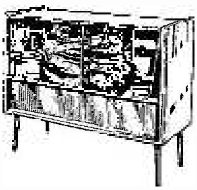
A QUALITY ARTICLE. Valves EZ80, ECC83, ECL82, DM70. Acos Crystal "mike", 850ft. Tape and extra spool. 3¾in./sec. Mike and Radio inputs; Vol. on/off tone, Ext. L.S. and Monitor. Fast forward and reverse. Cannot be accidentally erased. Magic Eye Indicator. 6 x 4in. Speaker. Cabinet 14 x 11½ x 7in. Supplied completely built and in cabinet.

B.S.R. "MONARDECK" TAPE DECK SINGLE SPEED. Our price only **£7.2.6** (5/6 carr.). 850 ft. first grade tape 5¾in. plastic spool, **16/-**, post 1/-.

3-VALVE AMPLIFIER (INC. RECT.). 4 watts. Valves ECC83, EL84, and EZ80. Controls, volume, bass and treble. On/off switch. (Chassis size 6¾ x 3 x 2½in.) 6½in. round or 7 x 4in. elliptical speaker. Not suitable for microphone input. A.C. only. P. & P. 3/-. **67/-**



SUPERB CONTEMPORARY CABINET



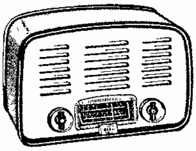
Fitted with 3 sliding doors providing room for Radio, Tape Recorder, Autochanger, 4 speakers, and record storage.

PRICE **15 Gns.**

Free delivery in London area.

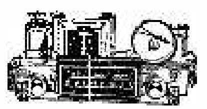
SAVE 10/-. Swiss made Unic Shaver operating from 1.5 v. battery, usual price 59/8. Our price 50/- with battery. Takes U2 battery. Not a toy, but a shaver (carr. paid).

COLLARO STUDIO TAPE TRANSCRIPTOR. 3 MOTORS, 3 SPEED. Push Buttons. **£10.17.6** (10/- carr.) incl. spool.



LISTEN WITHOUT INTERFERENCE

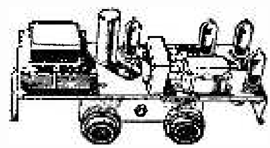
Fully built V.H.F./F.M. Set for **£8.12.0** (carr. pd.). Covers 88 95 Mc/sec. Wired, aligned and tested. Mullard permeability tuner and 4 valves (ECC85, ECL82 and two EF91), 2 diodes. Cheap room dipole, **10/-.** 300 ohm twin feeder, **6d.** yd.



SELF-POWERED VHF TUNER CHASSIS. Covering 88-95 Mc/s. Mullard permeability Tuner, Dims. 10½ x 4½ x 5in. high. ECC85, EF91, EF91 and 2 diodes. Metal Rectifier. Mains transformer. Fully wired and tested. Only **£7.14.0** (carr. pd.). Room dipole **10/-.** 300 ohm twin feeder **6d.** yd. Tuner without power pack **£6.14.0** (carr. pd.).

STEREO AMPLIFIER £4.15.0 (3/- p. & p.)

Brand new. 200-250 A.C. Tone and volume controls each channel. EZ80; ECC83; and 2—EL84; giving 2 x 4W. Size 12 x 3½ x 3½ ins. O.P. Trans. for 2-3Ω speaker. Separate on/off switch to allow balancing to remain set. Monaural push/pull amplifier giving 8W same price.



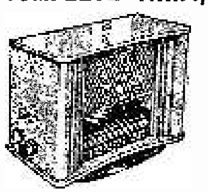
JUST ARRIVED. Write for details of printed circuit 6-transistor chassis, new, working order, 8½ x 2⅞in. with ferrite aer., dial and 6 x 4in. speaker. M. and L.W. ONLY **£7.10.0** (3/- post).

BATTERY ELIMINATOR. For 4 Low Consumption Valves (96 range). 90 v. 15 mA. and 1.4 v. 125 mA, **42/6** (2/6 post). 200-250 v. A.C. Size 5¾ x 3¾ x 2in. Also for 250 mA, 1.4 v. and 90 v. 15 mA at same price.

AUTOMATIC RECORD CHANGERS. ALL 4-SPEED WITH TURN-OVER CRYSTAL CARTRIDGE (carr. 5/- extra). B.S.R. UA8, **£6.10.0**; UA8 stereo, **£7.5.0**; latest UA14, **£7.10.0.** Motor board to fit changer **3/6.**

COMPLETE V.H.F./A.M. RADIO FOR £13.10.0

(carr. paid)



Brand new set, in superb walnut cabinet (size 19 x 8½ x 14½in. high). Covering 80-100 Mc/s. 16-49 M., and 200-500 M. Mains trans. 200-250 v. with 3 tappings. Ferrite rod aerial for A.M. Controls: volume on/off, tone, tuning, w/change. Gram and ext. speaker position provided. Valves 12AT7, 12AH8, 6BJ6, EABC80, 6BW6 and metal rectifier. Fully guaranteed. Some without F.M. working at **£12.0.0.** Today's Value, £20.

GRAMOPHONE AMPLIFIER

With 5in. SPEAKER. Baffle 12½ x 6in. EZ40 and EL41. Tone and Volume. On/Off switch. Two Knobs. Ready to play. Useful for Stereo. ONLY **57/-**, post 3/-.

TWO-TONE BROWN RECORD PLAYER CABINET (with Motor Board for Autochanger) and Gramophone Amplifier to fit Cabinet for **£5.5.0** (5/- carr.). Size 17 x 15 x 8½in. Brand New. BSR UA8 autochanger to fit **£6.10.0** (extra carriage 2/6).

7 STRAND TINNED COPPER CONNECTING WIRE 40/- per 500 yds. carr. paid.

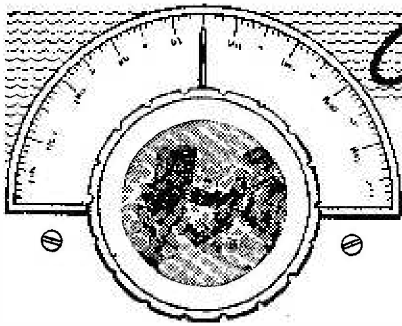
Send 6d. (stamps will do) for 20 p. illustrated catalogue. All New Goods. Delivered by return. Terms:—One-third down and balance plus **12/6** in four equal monthly payments. Postage with down payment (C.O.D. 2/-, extra).
SEE SPECIAL TERMS FOR A.M./F.M. CHASSIS.

Posted Orders to Camberley Please

ALL ITEMS GUARANTEED 12 MONTHS— B.V.A. VALVES 3 MONTHS

GLADSTONE RADIO 58A HIGH STREET, CAMBERLEY, SURREY Tel. 22791

Also at 247 New Road, Portsmouth, Hants. and 56 Stokes Croft, Bristol 1 Tel. 27809
Camberley closed Saturday. Portsmouth and Bristol closed Wednesday.



On Your Wavelength

BY THERMION

The Radio Show

AS I write these lines information is beginning to trickle through from the various manufacturers concerning the wonders which they will be revealing to the public at this year's Radio Show. As usual, much secrecy surrounds some of the proposed exhibits and I do hope that some of the suggested ideas materialise this year. Previously I have heard rumours about items which were going to be revealed at curtain up, but which had, in fact, not got beyond the laboratory—and in some cases not even progressed beyond the drawing board. I have not yet, however, heard much which will interest the home constructor. Suppliers for this band of enthusiasts now seem to be dwindling to infinitesimal proportions, and the amount of apparatus seen at the show, to interest him, becomes smaller and smaller. One old faithful is still there, however, although his sights now seem to be laid on the manufacturer, with the poor home constructor waiting to pick up the odd items which fall from the table. This seems a great pity, and I well remember the day when the late Mr. Camm suggested that future exhibitions should have a separate components or home-constructor's section—there was so much available and it was included with complete receivers and other apparatus on the stands and many complaints were received by us concerning the difficulty of seeing these particular items. The Component Makers' Exhibition is now a two-yearly affair and is more for the trade, so the amateur is more or less forced to rely upon the surplus market, but I must admit that this does provide a most interesting field—especially for those who are young in heart and have plenty of spare time. Some of the surplus equipment, which can now be obtained, provide a most interesting source of items when one is able to settle down and dismantle them, whilst others, wrapped in mystery, and in the absence of circuits and service manuals, provide many interesting hours of investigation to find out firstly what they are and how they function, and secondly to find a circuit or arrangement in which they can be used.

Those Transistors

I still receive much correspondence on the subject of transistors, and recently heard from an enthusiast who wants to build an electronic organ of the standard type, but using transistors. I am afraid this is rather a problem and I do not think it has been successfully tackled yet—even in America. The popular Hammond does not, of course, use valves for the production of the notes and tones, these being developed by rotating phonic wheels, so the substitution cannot be effected here. Amplifiers and similar techniques can, however, in any design of organ, have the valves replaced in most cases by transistors, but I have not yet heard of a transistorised oscillator which will develop sufficient harmonics to provide a six or seven octave keyboard. It should be quite a saving from the power and space point of view, but I wonder if the enclosed circuitry in an organ body would be subject to too much heat. It seems that stability would suffer, even if one could find a satisfactory circuit, and I am afraid I must leave this type of development to the expert in this field. I should, of course, as always, be glad to hear of any successful experiments which readers have carried out in this particular connection.

The Printed Circuit

I recently had an opportunity of going over a factory which concerned itself solely with the production of printed circuits, and I found this a most fascinating subject. The old methods have disappeared, and the accuracy now employed in the making of these circuits is almost astounding. The depositing of the metallic layer, for instance, is controlled to such a high accuracy that two or more layers may be deposited on such an item as a small circular spring to provide exactly the right degree of tension, and when one considers that the overall diameter of this spring is less than half an inch and it consists of spiral slots removing nearly half of the total, one has to admit that this is indeed a "printed circuit par excellence". At the other extreme, of course, there were the large computer panels which could be made up to about 10ft square. One would think that the manufacture of this type of apparatus was not controlled to the same degree as some of the more delicate components parts used in modern electronic equipment. I was very surprised, therefore, to find that in the manufacture of the printed units there is one section which is of the modern dust-free, air-controlled type almost on the same lines as those employed in a modern transistor manufacturing building. All the operators wear special dust-free overall equipment, and the air is washed and controlled in a most remarkable manner. I wonder how far this printed technique will progress as techniques are developed in this ever widening field of radio and associated practices?

COMPLETING CHASSIS No. 3 — THE VARIABLE FREQUENCY AUDIO OSCILLATOR

By E. V. King

THE P.W. SIGNAL GENERATOR

(Continued from page 257 of the July issue)

REFER to Fig. 21; July issue. Wire in R22 between pin 1 (V4) and pin 6. Make sure it does not touch the centre spigot.

Wire in R23 between pin 3 and earth. Join R25 and R24 together, using short leads, and solder R24 to pin 2 and R25 to chassis.

From the junction of R24 and R25 take C18 to the last unearthed tag of the tag strip, and from there a lead straight across the unit to the centre tag of VR1. Remove C17 from the position shown in Fig. 19 and solder it between pin 1 and the next tag but one of the strip, and continue with a lead across the unit to the output socket (C16 has already been removed).

Testing the Oscillator, Cathode Follower and Amplifier

Connect phones to the output socket and switch on. With the output control on full, the volume should be such that it can be heard a yard or two away from the phones. On switching S5, the note will change somewhat. It should be possible to control the volume with VR1.

If an A.C. valve voltmeter is available, the output from this unit should be in excess of 100V with VR1 full on. The prototypes (three were built) all gave between 150 and 180V peak-to-peak output on the middle range.

Adding the Variable Potentiometer

In order that the frequency may be altered, the values of the resistances R17 and 18 must be made variable by a series arrangement of a pair of ganged potentiometers. (The circuit is given in Fig. 22.) These should, if possible, be of the "log" type to avoid undue cramping of the frequency scale at the top (high frequency) end of the scale. A "log"-scaled potentiometer connected wrongly will make matters even worse!

The potentiometer is fixed on a metal bracket which is soldered to the top of the chassis, Fig. 23. It must go on the right side looking from the front to allow room for the main R.F. frequency dial to come later. When finally fixed, make sure the tags do not short to earth. Fig. 23 shows the potentiometer with the tags facing upwards; this is done for clarity—finally it is rotated so that the tags are underneath and the wires short.

Underchassis Wiring (Fig. 23)

R18 (see Fig. 17 last month) is removed completely, R17 (Fig. 17) is unsoldered from pin 7 of V3a and the wire shortened. Note that it is left connected to the tag strip. Make sure C12 is still connected to pin 7 of the valve (V3a).

Above-chassis Wiring

The centre tags of both potentiometers are connected together (see Fig. 23) and a lead is taken from the junction, through a grommeted hole, to pin 7 of V3. The remaining two tags to be used are connected as shown in Fig. 23—one via R18 to chassis and the other to the end of R17 (the end which was disconnected from pin 7 of V3a).

Testing

Plug into the mains and connect phones to the output socket. With VR2/3 turned fully clockwise, the frequency of the note heard should be exactly as it was before. As VR2/3 is moved anti-clockwise the frequency will become lower, going down to about 150c/s. If any trouble is found in testing, it can only be due to a fault in the wiring or in the components just added. These should be thoroughly checked.

Adding the Variable Range Switch and Condensers

Readers who wish to do so may experiment by replacing C11 and C12 by other condensers of any similar values. They will find that the frequency range is altered and that VR2/3 still operates.

In order to make the instrument cover the range given, condensers will have to be switched in as required (see Fig. 24). The ranges of the prototype were as follows:—

1. 15c/s to 330c/s (by the addition of C19/20 and S6/7).
2. 15c/s to 3·3kc/s (this range is now working).
3. 1·5kc/s to 33kc/s (by addition of C21/22 and S6/7).

There will be no difficulty if beginners follow the instructions carefully.

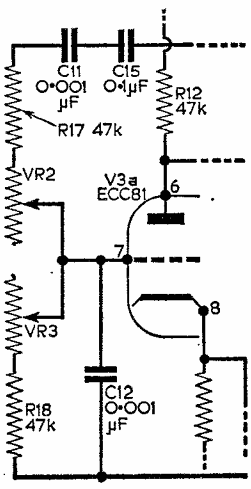
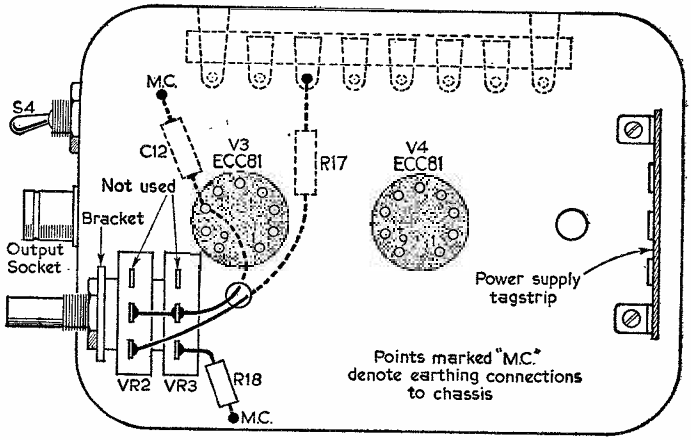


Fig. 22 (left).—To make the frequency of the audio note produced variable, two ganged potentiometers must be added.

Fig. 23 (right).—The wiring of the two ganged potentiometers.



Wiring C11 and C12 via S6/7

Temporarily remove C12 (see Fig. 23). Make sure there is now only one lead on to pin 7 of V3 (see Fig. 25). Examine the wiring of V3 again as it will be difficult to reach later. Solder a lead on to pin 7 (V3a), making two leads in all on this pin. One goes to the sliders of the potentiometers and the other, just fitted, is taken to contact "a" of S6.

The Switch (S6/7)

If a switch similar to that in Fig. 25 is used, the beginner will find the wiring easy. In Fig. 25 the switch is shown to the left as it looks when viewed from the rear, and the wires are lettered to correspond to the switch contacts (see also Fig. 24).

If any other switch is used, great care is necessary to distinguish the connections before fitting: "a" must make contact with "d" at the same time as "b" makes contact with "h"; "a" must make contact with "e" when "b" makes contact with "j"; "a" must make contact with "f" when "b" makes contact with "k". This will ensure that two similar condensers are always in the circuit at the same time. Do not proceed until you are quite sure about these switch connections (check with Fig. 24).

Refer to Fig. 25. The lead from pin 7 (V3a) to "a" has been connected. Remove R17 from the internal tag strip (see Fig. 23) and solder it to "b" on the switch. Adjust the length of the wire as necessary. R17 will be held "in the air" about ¼in. from switch. (The other end is left as already wired.)

Earth two tags on the tag strip as shown in Fig. 25. Connect the three condensers C12, C22 and C20 to these earthed tags and connect the others ends to switch contacts "e", "d" and "f" respectively.

Remove C11 from the tag strip (see Fig. 17 last month), and unsolder C15 from the tag strip. The end of C15 just unsoldered is now soldered to a new tag strip similar to the one on the other side of the chassis. On this tag strip, all tags except the end ones are insulated from the chassis.

C11 (previously removed) is now fixed to this new tag strip; a lead continues to "j" of the switch (see Fig. 25). Solder C19 as shown, and continue a lead to "k" on the switch. Fix C21 as shown and continue a lead to "h" on the switch.

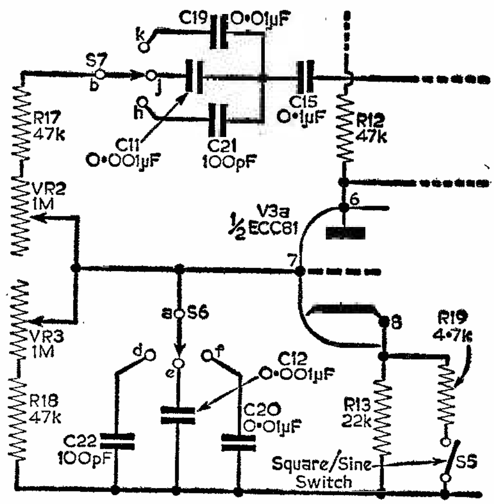


Fig. 24 (above).—The circuit of V3a modified to include switched capacitors for three ranges.

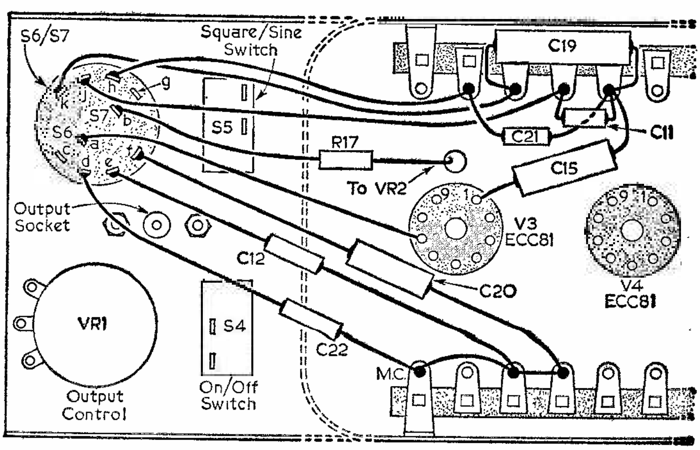


Fig. 25 (right).—The wiring for the modifications included in Fig. 24.

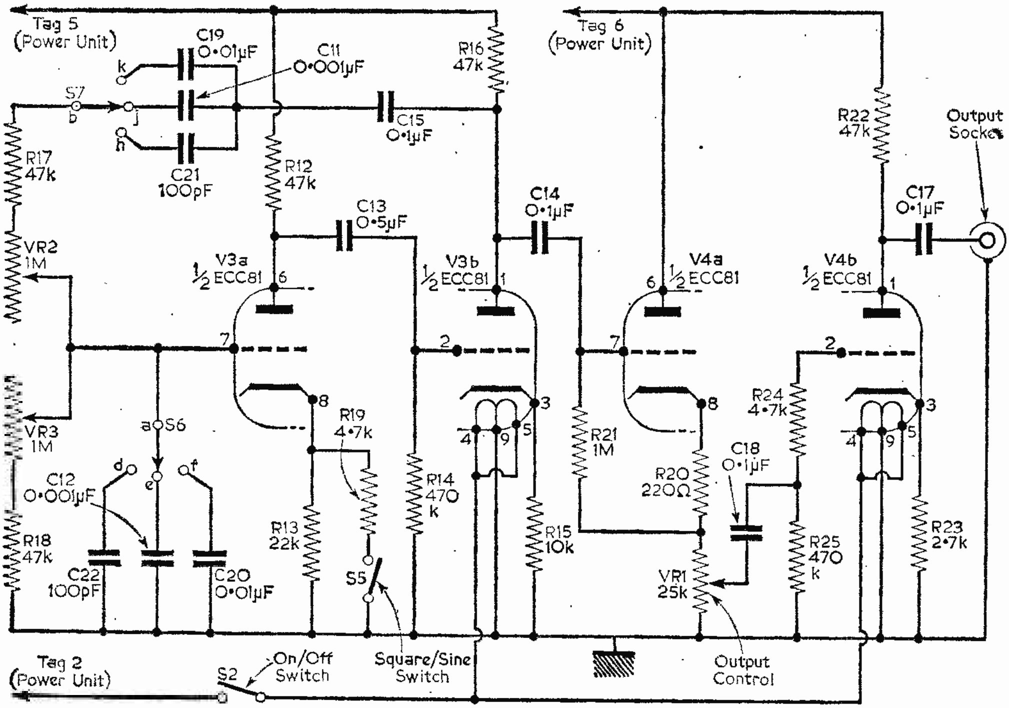


Fig. 26.—The complete circuit of the Variable Frequency Audio Oscillator—Chassis Number 3. This circuit is given only for reference and only experienced constructors should attempt to build this unit without employing the progressive constructional details given in this and previous issues.

Testing the Unit

Turn the switch S6/7 fully anti-clockwise, then one click clockwise. Test as before. The unit should now work as it did after fitting the potentiometer, but before fitting the range switch. If it does not, either some wiring has been moved (to cause a short circuit) or a mistake has been made in the wiring.

COMPONENTS LIST
For Figs. 22 to 25

C19 0·01 μF 1000 or 750VW
C20 0·01 μF 1000 or 750VW
C21 100pF mica or ceramic
C22 100pF mica or ceramic
The higher the tolerance of C11, 12, 19, 20, 21, and 22, the better the instrument will be.
Optional wave shaper
For this R13 is changed to a 4·7k component and a variable resistor of 25k is put in series with it. This will have to be mounted on the back of the cabinet. It may prove valuable when used in conjunction with an oscilloscope. If this is incorporated, R19 and S5 are not required
S6 and S7 Two pole, three way single wafer switch
VR2, 3 1M potentiometers

Turn the switch fully anti-clockwise. The note will now be very low when the potentiometer is turned anti-clockwise, each pulse being heard clearly in the phones. Probably the unit will tune down to about 10c/s. When the sine/square switch is placed at "square" the pulses will be very sharp —rather like the "cracks" of a geiger counter.

Turn the range switch fully clockwise, and then back one click. This will give the high pitched, whistle-like range. (Some older people will not be able to hear the extreme high frequency range. say, from 16kc/s to 35kc/s.)

Current Consumption

H.T. lead to tag 5 on power unit: 0·5 to 0·8mA according to the frequency setting.

H.T. lead to tag 6 on power unit: Between 5 and 8mA.

These values should be checked and the exact value noted in case a fault develops later.

Circuit

The complete circuit of the oscillator is given in Fig. 26. No beginner should attempt to make this in one go; the chances of his success would be poor. The circuit is given, so that, having built the unit, the beginner will be able to see the whole circuit at a glance. This is valuable if any trouble should arise.

(To be continued)

VOICE-OPERATED SWITCH

A DELAY MECHANISM FOR USE WITH A TAPE RECORDER

By D. P. Francis

IN order to widen the range of any tape-recorder, a simple voice-operated switch may be employed. In a unit of this type, the audio signals are employed to actuate a relay which opens or closes the capstan motor circuit, and also that of the bias oscillator. By virtue of this switch, the tape is only running when it is desired to record, and a saving in tape can be realised, especially if recordings are of an intermittent nature. Incorporated in the voice switch is a delay circuit to stop the switch turning off the recorder during slight pauses, or even between words. The period of this delay can be altered as explained later.

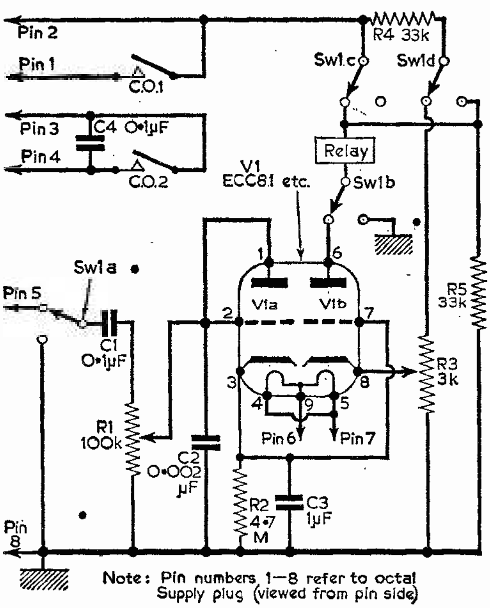


Fig. 1.—The circuit of the switch.

Power Supply

Before starting on the construction the reader would be advised to check that the tape-recorder can supply the necessary current to work the voice switch. A supply of about 200/250V at 7mA and 6·3V at 0·4A is required for the H.T. and valve heater respectively. If this cannot be accomplished, a small power supply can be made up. It is assumed that the reader has sufficient knowledge for this as no power supply details are given; circuits have appeared in these pages in previous issues.

Operation

When normal operation of the recorder is desired, the unit is simply switched off by means of SW1. This will be so when playing back a previous recording or recording direct from a radio-jack. When switched off, the audio input is disconnected and the relay is held energised by a simple resistance network, R3, R4 and R5.

The input to the switch is taken from the output valve of the recorder at a point where it enters the recording head network, so that any audio signals present in the microphone are thus also fed into the unit via C1, R1. C1 is the H.T. blocking capacitor, R1 being the sensitivity control. R1 controls the amplitude of the signals fed into the unit, and therefore the point at which R1 operates. It should be noted that if R1 is turned towards maximum sensitivity, random noise will cause the relay to energise; needless to say, this is undesirable.

Valve V1 is a double triode, ECC81, the anode and grid of the first section being strapped together to form a diode. An ECC35 or ECC83 would also be suitable. The diode rectifies any signals presented to the anode, and a positive D.C. voltage appears across C3 and R2. These two components constitute the delay circuit. The time delay with the specified values of C3 and R2 is approximately 5 seconds. The reader can increase the value of one of them to increase the delay. Decreasing the value will bring about a decrease in the time lag.

This positive voltage is coupled to the grid of V1b, and if sufficient to overcome the positive bias applied to the cathode by R3, the valve will conduct and amplify the signal. This increase in the anode current causes the relay to energise, and thus switch on the recorder.

When, after recording, no more signals are fed into the unit, capacitor C2 will discharge through R2 at a rate dependent upon the C/R time constant. When the voltage charged in C2 falls below that applied to the cathode of V1a, the valve will cease to conduct and the relay will de-energise, so switching off the recorder.

COMPONENTS LIST

R1	100k ¼W pot.	C1	0·1 µF 350VW
R2	4·7M ½W	C2	0·002 µF 350VW
R3	3k w.w. pot.	C3	1 µF 350VW
R4	33k 2W	C4	0·1 µF 350VW
R5	33k ½W		

V1 ECC81, ECC35, ECC83
6,500 Ω relay, 2 make/break contacts
4-pole, 2-way, wafer switch
Length of 8-core lead. Connecting wire
Suitable aluminium chassis, size about 6in. x 4in. x 2½in.; aluminium for bottom cover and brackets.
Valveholder, solder, nuts and bolts, etc.

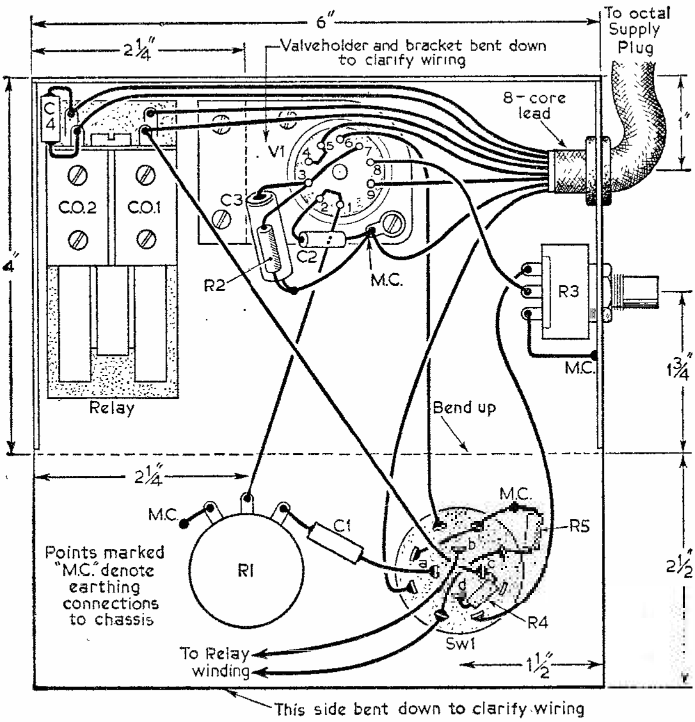


Fig. 2.—The component layout and wiring diagram of the switch.

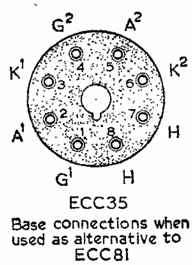


Fig. 4 (above).—The base connections for the ECC35 valve; an eight pin plug which may be used as an alternative to the ECC81.

Construction

The unit can be built within a chassis 6in. x 4in. x 2½in. A smaller chassis could be used if a smaller relay is used, as long as the coil has a resistance of about 6,500Ω. If an ECC35 valve is used, the unit will be slightly larger than when made with an ECC81 or ECC83.

The recorder can be adapted by fitting a supply socket for the unit, such as an octal valveholder.

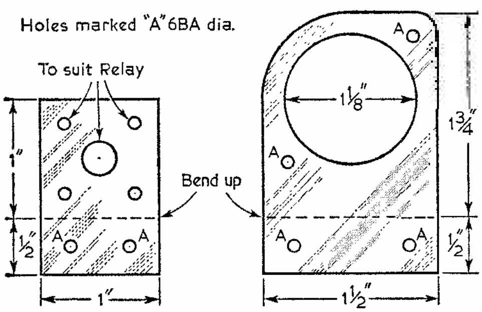


Fig. 3.—The relay support bracket (left) and the bracket to support V1 (right)

A suitable hole is made at the rear of the tape-recorder for the socket, and eight leads soldered to the pins, making certain that the length of the leads is sufficient to reach the various points in the recorder circuitry.

The H.T. supply lead to the bias oscillator is disconnected, the valve being connected to pin 1 and the supply lead to pin 2 of the socket. One of the leads to the capstan driving motor is similarly treated, and is connected to pins 3 and 4 Pin 5 of the socket is soldered to the recording head network at the junction with the output valve. This lead is for the audio input. Pins 6 and 7 are connected in parallel with one of the valve heaters. Pin 8 is the earth lead and is connected to the chassis.

The next step is to cut out suitable brackets for V1 and relay and drill and bend them as shown in Fig. 3. Before the valveholder is mounted in position, it would be wise, and also far easier, if the holder were wired.

The positions of the various components can be seen from Fig. 2. Complete the remainder of the wiring, using a grommet for the hole through which the 8-core lead passes through the chassis. Check all wiring, ensuring that the leads are not cross-connected, e.g. heaters connected to the H.T. supply.

Adjustment

The setting up of the switch can best be accomplished with the aid of an audio signal generator or a morse code oscillator. If the reader has not access to either, a receiver fitted with a BFO may be used (beat frequency oscillator). This is carried out by tuning the receiver to a station (not a morse transmission, as this might cause the relay to chatter) and switching on the BFO. The microphone is placed adjacent to the loudspeaker or headphones. A low-range A.C. voltmeter is also required.

Using the meter, measure the voltage at the junction of C1 and R1, adjusting the recorder input control until a reading of 3V is obtained. R1 is now turned to maximum sensitivity, i.e. maximum resistance to earth. R3 is now adjusted until the relay just closes. Check that the voltage at R1 is still 3. R3 can now be sealed against movement.

(Continued on page 329)

465 Kc/s. SIGNAL GENERATOR. Total cost 15/-. Uses B.F.O. Unit ZA 30058 ready made. **POCKET SIZE** 2¼ × 4¼ × 1in. Slight modifications required, full instructions supplied. Battery 7/6 extra 69 v. + 1½ v.

TRIMMERS, Ceramic. 30, 50, 70 pF., **9d.**; 100 pF., 150 pF., **1/3**; 250 pF., **1/6**; 500 pF., 750 pF., **1/9**.
RESISTORS. Preferred values. 10 ohms to 10 meg., ¼ w., **4d.**; ½ w., **4d.**; 1 w., **6d.**; 1½ w., **8d.**; 2 w., **1/-**.
HIGH STABILITY. ½ w., 1%, **2/-**. Preferred values. 10Ω to 10 meg. **Ditto, 5%, 100Ω to 5 meg., 9d.**

5 watt	**WIRE-WOUND RESISTORS**	1/3
10 watt	25 ohms—10,000 ohms	1/6
15 watt		2/-
12.5K to 50K 10 w	.. ..	3/-

AMERICAN "BRAND FIVE" PLASTIC RECORDING TAPE

			Spare Plastic Reels	
Double Play	7in. reel, 2,400ft	60/-		
	5in. reel, 1,200ft	37/6		
Long Play	7in. reel, 1,800ft	35/-		
	5¾in. reel, 1,200ft	23/6	3in.	1/6
	5in. reel, 900ft	18/6	4in.	2/-
Standard	7in. reel, 1,200ft	25/-	5in.	2/-
			5¾in.	2/-
	5in. reel, 600ft	16/-	7in.	2/6

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

O.P. TRANSFORMERS. Heavy Duty 50 mA, **4/6.** Miniature. 3S4, etc., **5/6.** **Multiratio** push-pull, **7/6.** Push-Pull 10 w., **15/6.** 10 to 20 w., 6K. P.P., **30/-.**
L.F. CHOKES 15/10 H. 60/65 mA, **5/-**; 10 H. 85 mA, **10/6**; 10 H. 120 mA, **12/6**; 10 H. 150 mA, **14/-.**

MAINS TRANSFORMERS: 200/250 v. A.C.
STANDARD, 250-0-250, 80 mA, 6.3 v. 3.5 a. tapped 4 v. 2a. **Rectifier 6.3 v. 1 a. 5 v.**

2 a. or 4 v. 2 a. ditto, 350-0-350 ..	22/6
MINIATURE, 200 v. 20 mA, 6.3 v. 1 a.	10/6
MIDGET, 220 v. 45 mA, 6.3 v. 2 a. ..	15/6
SMALL, 220-0-220, 50 mA, 6.3 v. 3.5 a.	17/6
STD, 250-0-250, 65 mA, 6.3 v. 3.5 a. ..	17/6
HEATER TRANS, 6.3 v. 1½A **7/6 3A**	10/6
Ditto 1.4, 2, 3, 4, 5, 6.3 v. 1½A ..	8/6
Ditto **Tapped,** 3 to 30 v., 2A	22/6

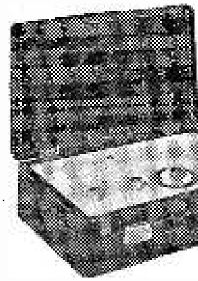
ALADDIN FORMERS and core, ¼in., **8d.**; ⅜in., **10d.** 0.3in. **FORMERS 5937/8 and Cans TV/2.** ⅞in. sq. x 2⅛in. and ⅜in. sq. x 1¾in., **2/- ea.,** with cores.
SOLON Midget Iron 200/10v. or 220/40v. 25w., **24/-.**
MAINS DROPPER. 3in. x 1⅛in. Adj. Sliders, 0.3 amp., 1000 ohms, **4/3.** 0.2 amp., 1000 ohms, **4/3.**
LINE CORD. 0.3 amp., 60 ohms per ft, 0.2 amp., 100 ohms per ft, 2-way, **1/-** per ft, 3-way, **1/-** per ft.
LOUDSPEAKER P.M. 3 OHM. 5in. Rola, **17/6,** 8in. Plessey, **19/6.** 7in. x 4in. Plessey, **18/-,** 6½in. Rola, **18/6.** 10 x 6in. **27/6.** 10in. Rola, **30/-.** 4in. Tweeter, **25/-.** 12in. R.A., **30/-.** 14 x 8in. **45/-.**
STENTORIAN HF1012. 10in. 3 to 15 ohms 10 w., **95/-.** 12in. Baker 15 watt 3 ohms or 15 ohms, **90/-.**
12in. BAKER FOAM SUSPENSION. 15 ohms, **£6.**
CRYSTAL DIODE. G.E.C., **2/-.** **GEX34, 4/-.**
HIGH RESISTANCE PHONES. 4,000 ohms, **15/-** pr.
LOW RESISTANCE PHONES (BA5), **7/6** pr.
MIKE TRANSF. 50-1, **3/9** ea.: 100:1. Potted, **10/6.**
SWITCH CLEANER. Fluid squirt spout. **4/3** tin.
TWIN GANG TUNING CONDENSERS. 365 pF. miniature 1in. x 1½in. x 1⅝in., **10/-.** 500pF Standard with trimmers, **9/-**; midget, **7/6** with trimmers.
SINGLE. 50 pF, **2/6**; 80 pF, 100 pF, 160 pF, **5/6.** Solid dielectric 100, 300, 500, pF **3/6.**
SPEAKER FRET. GOLD CLOTH. 17in. x 25in., **5/-**; 25in. x 35in., **10/-.** Tygan, 52in. wide, **10/-** ft; 26in. wide, **5/-** ft. Send for samples S.A.E.

New and Boxed VALVES 90-day Guarantee.

1R5	7/6	6K8G	7/6	EABC80	8/6	HABC80	12/6
1S5	7/6	6L6G	10/6	EB91	6/-		
1T4	6/-	6N7M	3/6	EBC33	8/6	HVR2A	6/6
2X2	3/6	6Q7G	7/6	EBC41	8/6	MU14	9/-
3S4	7/6	6SJ7M	6/6	EBF80	10/-	PCC84	9/6
3V4	7/6	6SN7	6/6	ECC84	9/6	PCF80	9/6
5U4	7/6	6V6G	6/6	ECF80	9/6	PCL82	11/6
5Y3	7/6	6X4	7/6	ECH42	10/6	PL82	10/6
5Z4	9/6	6X5	6/6	ECL82	10/6	PY80	7/6
6AM6	5/-	12AT7	8/-	EF41	9/6	PY81	9/6
6B8	5/6	12AU7	8/-	EF50	5/6	PY82	7/6
6BE6	7/6	12AX7	8/-	EF80	8/-	SP61	3/6
6BH6	9/6	12BE6	8/6	EF91	5/-	UBC41	9/6
6D6	6/-	12K7	8/6	EF92	5/6	UCH42	9/6
6F6G	7/6	12Q7	6/6	EL32	5/-	UF41	9/6
6H6	3/6	35L6	9/6	EL41	9/6	UL41	9/6
6J5	5/6	35Z4	7/-	EL84	8/6	UY41	8/-
6J6	5/6	80	9/6	EM81	9/6	UY85	8/6
6J7G	6/6	807	5/6	EZ40	7/6	U22	8/-
6K6GT	6/6	954	1/6	EZ80	7/6	VR105	8/6
6K7G	5/-	EA50	1/6	EY51	9/6	VR150	9/6
				EY86	10/-		

DK96, DAF96, DF96, DL96 **8/6** ea. **30/-**set.

"REGENT" 4 VALVE



"96" RANGE VALVES

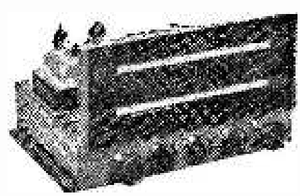
KIT PRICE £6. 6. 0.

carr 4/-

PRINTED CIRCUIT BATTERY PORTABLE KIT

Medium and long wave. Powerful 7 x 4in. high Flux Speaker. T.C.C. Printed Circuit and condensers. Components of finest quality clearly identified with assembly instructions. Osmor Ferrite Aerial Coils. Rexine covered attache case cabinet. Size 12in. x 8in. x 4in. Batteries used B126 (L5512) and AD35 (L5040), **10/-** extra. **Instructions 9d.** (free with kit). Mains Unit ready made for above **39/6.** Sold separately. Details free.

ARMSTRONG AF 208 AM/FM RADIOGRAM CHASSIS



★ Full VHF Band (87-108 Mc/s) and Medium Band, 187-570M. ★ 7 Valves ★ 5 Watts Output ★ 15dB Negative Feedback ★ Separate wide range Bass and Treble Controls ★ 2 Compensated Pick-up Inputs ★ Frequency Response 30-22,000 c.p.s. ± 2/dB ★ Tape Record and Playback Facilities ★ Continental Reception of Good Programme Value ★ For 3 7½ and 15 ohm speakers. 12 Month guarantee ★ Installation and Service Manual Supplied. Leaflet free.

Price **22 Guineas** Carr. Free

RECOMMENDED SPEAKER 12in. BAKER STALWART, £4.10.0.

4 Speed Autochangers, B.S.R., U.A.8	£6.15.0
4 Speed Autochangers, U.A.8 Stereo	£7.10.0
Garrard RC121-GC8 Head ..	£8.15.0
Garrard Model 210, G.C.8 Head ..	£10.10.0
4 speed Single Players, E.M.I ..	£6. 5.0
Garrard TA Mk. 11 G.C.8 Head ..	£8. 0.0
Garrard 4 HF Transcription G.C.8	£17.19.6
Garrard Stereo Heads	£2. 0.0

Volume Controls

Long spindles. Midget 5K ohms to 2 Meg.

No. Sw.	D.P.Sw.
3/-	4/6

Linear or Log Tracks.

80 ohm CABLE COAX

Semi-air spaced ¼in. Stranded core. **6d.yd.** 40 yds. 17/6. 60 yds. 25/-. Fringe Quality Air Spaced. **1/-yd.**

COAX PLUG .. **1/-** **LEAD SOCKET** .. **2/-**
PANEL SOCKETS 1/- **OUTLET BOXES 4/6**
BALANCED TWIN FEEDER yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. **1/6.** 80 ohms only.
WIRE-WOUND POTS, 3 WATT. Pre-set Min. TV Type. All values 10 ohms to 25 K., **3/- ea.** 30 K., 50 K., **4/-.** (Carbon 30 K., to 2 meg., **3/-.**)
WIRE-WOUND 4 WATT Pots. Long Spindle. Values, 50 ohms to 50 K., **6/6**; 100 K., **7/6.**

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., **4/6**; 9 x 7in., **5/9**; 11 x 7in., **6/9**; 13 x 9in., **8/6**; 14 x 11in., **10/6**; 15 x 14in., **12/6**; 18 x 16 x 3in., **16/6**;
Aluminium Panels, 12 x 12ins., **4/6**; 14 x 9in., **4/-.** 12 x 8in., **3/-**; 10 x 7in., **2/3.**

HI-GAIN BAND 3 L.T.A. PRE-AMP KIT. Cascode circuit with valve ECC84, or PCC84. **Price 29/6. With Power Pack, 49/6. Plans only 6d.** Band I BBC version, same prices.

CONDENSERS. 1000 pF, 7 kV. T.C.C., **5/6,** 500 or 1,000 pF, 20 kV., **9/6.** 0.1 mfd. 7 kV., **9/6.** Tubular 500 v. 0.001 to 0.05 mfd., **9d.** 0.1, **1/-**; 0.25, **1/6**; 0.5/500 v., **1/9**; 0.1/350 v., **9d.**; 0.1/1000 v. **1/9**; 0.01/2,000 v., **1/9**; 0.1 mfd., 2,500 volts, **3/6.**
CERAMIC CONDS. 500 v., 0.3 pF to 0.01 mfd., **9d.**
SILVER MICA CONDENSERS. 10% 5 pF to 500 pF, **1/-**; 600 pF to 3,000 pF, **1/3.** Close tolerance (±1 pF) 2 pF to 47 pF, **1/6.** Ditto **1% 50 pF** to 815 pF., **1/9**; 1,000 pF to 5,000 pF, **2/-.**

I.F. TRANSFORMERS 7/6 pair
465 Kc/s Slug Tuning Miniature Can. 1¾in. x ⅞in. square. High Q and good bandwidth. **Data sheet supplied.**

NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350v.	2/-	50/350v.	5/6	8/600v.	9/-
2/350v.	2/3	100/25v.	2/-	16/450v.	5/-
4/450v.	2/3	250/25v.	2/6	32/350v.	4/-
8/450v.	2/3	500/12v.	3/-	100/270v.	5/6
8/500v.	2/9	8+8/450v.	3/6	2,500/3v.	4/-
16/450v.	3/-	8+16/450v.	3/9	32+32/350v.	5/-
16/500v.	4/-	8+16/500v.	5/6	32+32/450v.	6/-
32/450v.	3/9	16+16/450v.	4/3	50+50/350v.	7/-
25/25v.	1/9	16+16/500v.	6/-	64+120/350v.	11/6
50/50v.	2/-	32+32/350v.	4/6	100+200/275v.	12/6

SELENIUM RECTIFIER. 300 v. 85 mA., **7/6.**
CONTACT COOLED. 250 v. 50 mA, **7/6**; 60 mA, **8/6**; 85 mA, **9/6**; 200 mA, **21/-,** FC31, 300 mA, **27/6.**
COILS Wearite. "P" type 3/- each. Osmor Midget "Q" type adj. dust core from **4/-.** All ranges.
TELETRON. L. & M. T.R.F., with reaction, **3/6.**
FERRITE ROD AERIALS. M.W., 8/9; M. & L. 12/6.
FERRITE ROD AERIALS for transistors. M. & L. **10/-.**
T.R.F. COILS. A/HF. 7/- pair. H.F. CHOKES, 2/6
FERRITE ROD, 8in. x ⅜in. dia., **2/6.**

JASON F.M. TUNER COIL SET, 29/-. H.F. coil, aerial coil, Oscillator coil, two I.F. trans. 10.7 Mc/s. Ratio Detector and heater choke. **Circuit book using four 6AM6, 2/6.**
COMPLETE JASON F.M. KIT FMT1. with set of 4 valves, **£6.5.0.** Details **S.A.E.**

FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 6 or 12v. 1½ amp., **8/9**; 2 a., **11/3**; 4 a., **17/6**
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amps, **15/6**; 2 amps., **17/6**; 4 amps., **22/6.** Circuit included.
VALVE and TV TUBE equivalent books, **9/6.**
VALVE DATA. Vol. 1, 2, 3 or 4, **5/-,** each.
TOGGLE SWITCHES. S.P. **2/-.** D.P. **3/6. D.P.D.T. 4/-.**
WAVECHANGE SWITCHES

5 p. 4-wave 2 wafer long spindle	6/6
2 p. 2-way, or 3 p. 2-way short spindle ..	2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way long spindle	3/6
3 p. 4-way, or 1 p. 12-way long spindle ..	3/6

VALVEHOLDERS. Pax Int. Oct., **4d.** EF50, EA50, **6d.** B12A, CRT, **1/3.** Eng. and Amer. 4, 5, 6, and 7 pin, **1/-.** **MOULDED MAZDA** and Int. Oct., **6d.** B7G, B8A, B8G, B9A, **9d.** B7G with can., **1/6.** B9A with can., **1/9.** **CERAMIC** EF50, B7G, B9A. Int. Oct., **1/-.** S/Cans. B7G, B9A, **1/-.**

NEW MULLARD TRANSISTORS

Audio	OC71 .. 6/-	RF	OC44 ..	10/6
	OC72 .. 8/6		OC45 ..	9/6

Sub Miniature Electrolytics. 15 volt. 1, 2, 4, 5, 8, 25, 50, 100 mfd. **2/6 each.**
"P.W." Pocket 6 Transistor Kit. All parts Printed Circuit and Cabinet............**£8.15.0**

RADIO COMPONENT SPECIALISTS

OUR ONLY ADDRESS
337 WHITEHORSE RD., WEST CROYDON

Postal Service 1/-, *over £2 free.* *C.O.D. 1/6* *(Export Post Extra. No C.O.D.)* **(Wed. 1 p.m.)** **THO 1665. Buses 133 or 68**

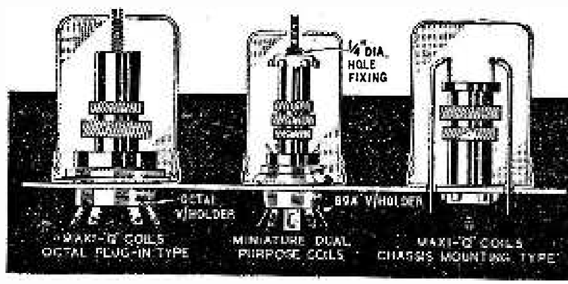
MAXI-Q

"WE COULD BLIND YOU WITH SCIENCE"

on the technical superiority of our coils but are sure you would prefer us just to say

"WE GUARANTEE THEM"!

Coverage from 3.8 to 2,000 metres in 7 ranges—Each coil is packed in an aluminium container which may be used as a screening can for the coil itself—Brass threaded adjustable iron cores—Colour coded moulded polystyrene formers—Chassis/Plug-in Technical Bulletin DTB.1 **1/6**—Dual Purpose Technical Bulletin, DTB.4 **1/6**—Colour Code Identified Coils: BLUE Signal Grid Coil with Aerial Coupling winding—YELLOW Signal Grid Coil with inter-valve coupling winding—GREEN Grid Coil with reaction and coupling windings—RED Superhet Oscillator for I.F. of 465 Kc/s—WHITE Superhet Oscillator for 1.6 Mc/s. Prices range from **4/1** to **4/9** each. Five Colour Glass Scale, Back Plate, Pointer, Pulleys and Cord for use with 315 pF tuning condensers. Coverage (1) **150-400** Kc/s; (2) **530-1,600** Kc/s; (3) **1.5-4** Mc/s; (4) **4-12** Mc/s; (5) **10-30** Mc/s; Price **19/-**.



GENERAL CATALOGUE covering full range of components send 1/4d. in stamps or P.O PLEASE SEND S.A.E. WITH ALL ENQUIRIES

DENCO (CLACTON) LTD. (Dept. P.W.), 357/9 Old Road, Clacton-on-Sea, Essex

---

The book for the serious model-maker. . .

RADIO CONTROLLED MODELS

by F. J. Camm

THE remote control by radio of models—whether aeroplanes, boats, locomotives, tanks or steam rollers as well as stationary models—is an important post-war development with a keen, wide-world following of hundreds of thousands of enthusiasts. This practical book is the result of the author's numerous experiments and long research on the subject and includes information already published in the nationally read "Practical Mechanics" plus additional material. Contents include steering control gear; receivers; transmitters; control box; tuned reeds; model actuators; tuning transmitting aerials details for model battleship and aircraft, etc. Fully illustrated with circuit details, diagrams and photographs, etc.

12s. 6d. FROM ALL BOOKSELLERS

. . . or in case of difficulty 13s. 6d. by post from C. ARTHUR PEARSON LTD., Tower House, Southampton Street, London, W.C.2

EXPRESS ELECTRONICS

ROSEDENE LABORATORIES

KINGSWOOD WAY, SELSDON, SURREY

VALVES NEW TESTED AND GUARANTEED FOR THREE MONTHS

1C1	7/6	6AT6	6/-	8D3	4/-	AF91	7/6	ECL82	9/6	PCL82	7/-
1C2	7/6	6BA6	7/-	12AH8	10/-	DF96	8/-	EF41	9/-	PCL84	7/-
1C3	8/-	6BE6	7/-	12AT7	6/-	DH76	7/6	EF80	8/6	PL81	12/6
1F1	8/-	6BH6	5/9	12AU7	5/6	DH77	6/-	EF86	9/-	PL82	7/-
1F3	7/6	6BJ6	5/9	12AX7	6/-	DH142	8/6	EF91	4/-	PY81	6/9
1FD1	8/-	6BR7	8/9	12BE6	8/6	DH150	10/-	EF92	5/6	PY82	7/6
1FD9	7/6	6BS7	10/6	12BH7	10/6	DK91	7/6	EL41	9/6	PY83	7/6
1L4	6/9	6BW6	7/6	12K8GT	11/-	DK92	7/6	EL84	7/-	R19	11/6
1P1	8/-	6BW7	7/-	12Q7GT	7/6	DK96	8/-	EM34	7/-	U26	9/6
1P10	7/6	C10	9/-	12SN7	7/6	DL92	7/6	EM84	10/-	U52	7/6
1P11	7/6	6D2	4/-	16A5	9/-	DL94	7/6	EY51	7/6	U76	7/6
1R5	6/-	6F12	4/-	25A6G	8/6	DL96	8/-	EY81	10/-	U78	5/-
1S5	6/-	6H6GT	2/-	25L6GT	7/6	EB91	4/-	EZ40	7/6	UBC41	8/6
1T4	7/6	6J7GT	7/6	25Z4G	9/-	EBC41	10/-	EZ80	5/6	UCH42	9/6
1U5	6/-	6K7G	5/6	30C1	6/9	EBF80	8/6	EZ81	6/9	UF41	8/6
3Q4	8/-	6K8G	6/-	30L1	7/-	ECC81	6/-	KT33C	9/6	UL41	8/6
3S4	7/6	6Q7G	6/-	35L6GT	9/-	ECC82	5/6	KT66	11/6	UY41	7/6
3V4	7/6	6SL7GT	6/-	35W4	8/6	ECC83	6/-	N17	7/6	W76	6/6
5U4G	7/6	6SN7GT	6/-	35Z4GT	8/-	ECC84	7/6	N18	8/-	W142	8/6
5Y3GT	4/6	6V6G	7/6	53KU	10/6	ECF80	8/6	N19	7/6	X17	7/6
5Z4G	9/6	6X4	5/-	5763	7/6	ECF82	6/9	N37	10/6	X142	9/-
6AK6	6/6	6X5G	5/-	80	6/-	ECH42	9/-	PCC84	6/9	X150	9/-
6AL5	4/-	6X5GT	6/-	DAF91	7/6	ECH81	10/-	PCF80	6/9	Z77	4/-
6AM6	4/-	7B7	7/6	DAF96	8/-	ECL80	8/6	PCF82	7/-	ZD17	7/6

Coax. Super quality ¼in., 6d. yd. Plugs, 9d. Sockets, 9d.

VOLUME CONTROLS MIDGET SIZE LONG SPINDLES. D.P. switch 4/- Less switch, 2/6. Values 10K to 2M, B9A, B7G v. Holders 9d., Screens 9d., Contact Cooled Rectifiers 250v. 50 mA, 6/6, 85mA, 8/6.

MATCHED PAIRS

EL84 17/-, 6V6G 17/-, 6BW6 18/- per pair. Push Pull O.P. Transformers for above 8-15Ω 14/6. P. & P. 1/6. 12in. P.M. Speakers 3Ω 24/6. Baker's "Selhurst" 12in. 15Ω 15W, 90/-. P. & P. 2/6. 12in. Stereo Model £7.7.0.

SETS OF VALVES

DK91, DF91, DAF91, DL92 or DL941..19/6
DK96, DF96, DAF96, DL96..........27/6
1C3, 1F1, 1FD1, 1P1..............27/6
1R5, 1T4, 1S5, 3S4, or 3V4...........19/6

ECH42, EF41, EBC41, EL41, EZ40 ......37/6
UCH42, UF41, UBC41, UL41, UY41 ......35/-

Postage and packing 6d. Over £1 post free. C.O.D. 2/6.

An Amateur Communications Receiver

WIRING AND ALIGNMENT

By P. Hayes

(Continued from page 230 of the July issue)

In last month's issue, the circuit was described and explained.

Components

There is considerable latitude in the value of the components except for the padders, grid components of the oscillators, and the tuning capacitors. Other valves may be used instead of the EF91's (for example 6AM6, Z77, 8D3, 6F12, etc.). Octal based valves can be used instead, but gain may be less, and the size of the receiver will have to be increased. An EA50 is used as the detector, but any other valve detector may be used, but most probably another valveholder will have to be drilled. A crystal diode can, of course, be used but it might be damaged if a very strong local signal is tuned in with the gain up. None of the other components is critical and they must be of 20per cent tolerance. However, the decoupling capacitors should not be reduced below 0·05μF.

Construction

The chassis can be made from a sheet of aluminium, or can be bought ready made.

The coils can be placed roughly in the positions indicated in Fig. 3. This procedure is carried out if a coil-pack is not to be used. The strip of metal nearest to the I.F. amplifier should be either of copper or another material which will take solder, or be of aluminium and have numerous soldering tags bolted on it (Fig. 5).

Wiring

The heaters and the power pack should be wired first and tested. The R.F. stage is wired next, the "earthy" ends of the components being soldered to the end of the screens between the coils. When this stage has been completed, the mixer stage is wired. The oscillator stage has to be carefully

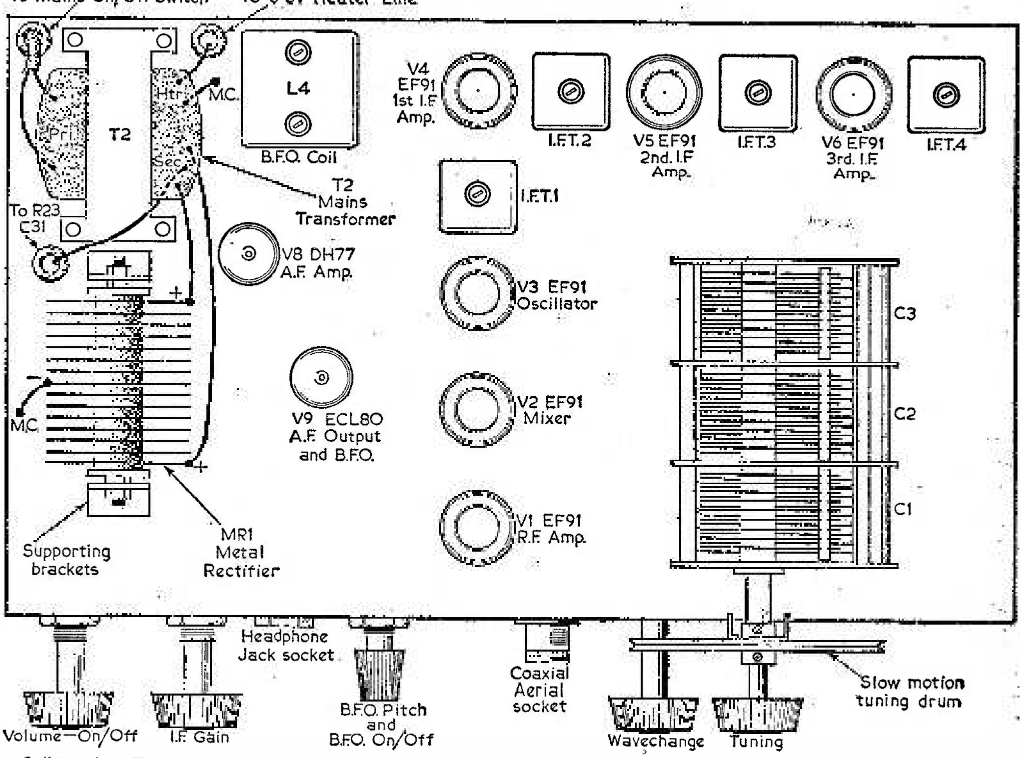
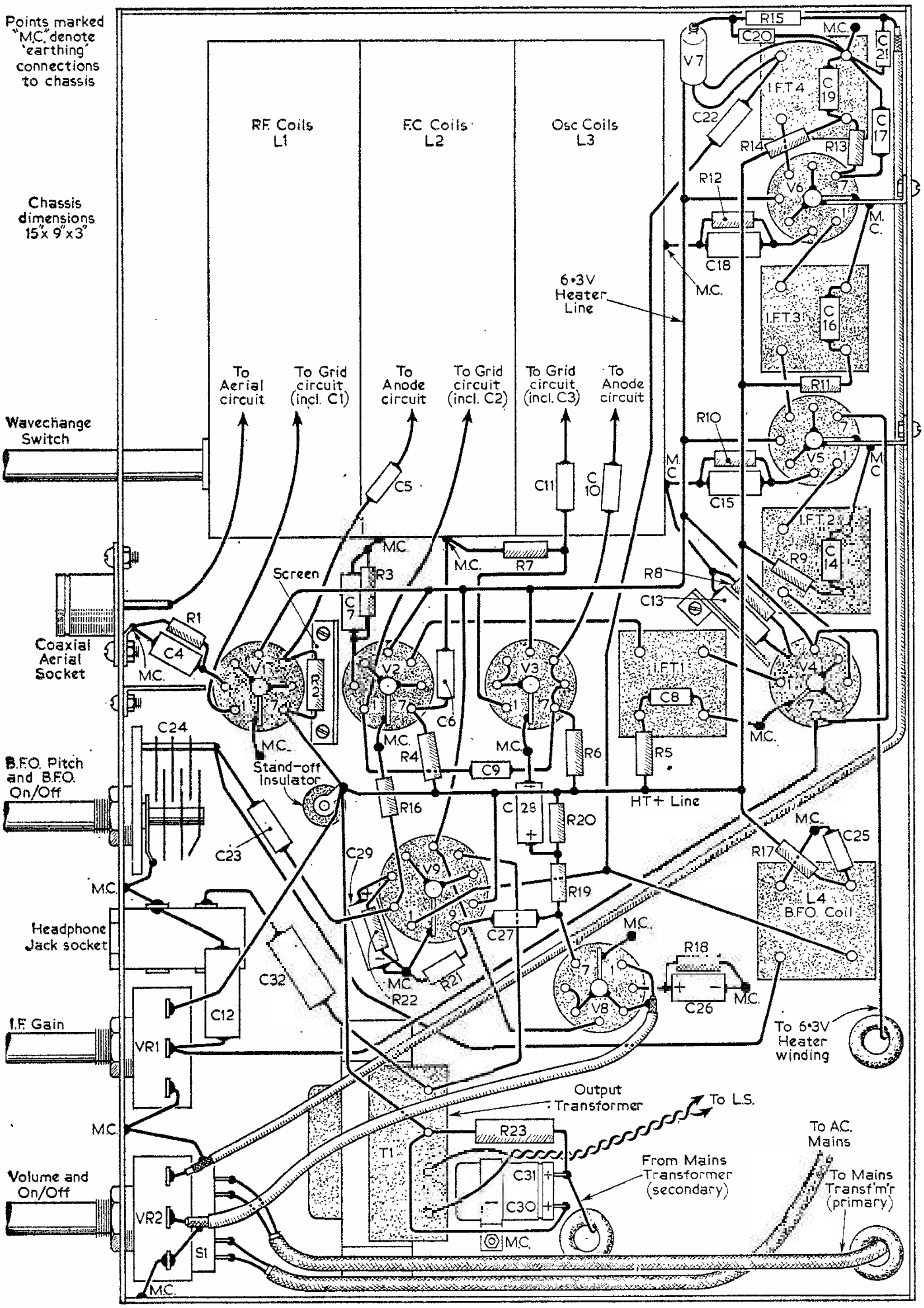


Fig. 2 (above).—The above-chassis layout of components.

Fig. 3 (on page 312).—The complete underchassis wiring diagram.



Points marked "M.C." denote 'earthing' connections to chassis
Chassis dimensions 15" x 9" x 3"
Wavechange Switch
Coaxial Aerial Socket
B.F.O. Pitch and B.F.O. On/Off
Headphone Jack socket
I.F. Gain
Volume and On/Off
RF Coils L1
F.C Coils L2
Osc Coils L3
To Aerial circuit
To Grid circuit (incl. C1)
To Anode circuit
To Grid circuit (incl. C2)
To Grid circuit (incl. C3)
To Anode circuit
6·3V Heater Line
HT+ Line
Screen
Stand-off Insulator
I.F.T.1
I.F.T.2
I.F.T.3
I.F.T.4
L4 B.F.O. Coil
To 6·3V Heater winding
Output Transformer
To L.S.
From Mains Transformer (secondary)
To A.C. Mains
To Mains Transf'm'r (primary)
T1
VR1
VR2
S1
M.C.

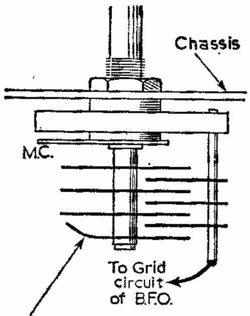


Fig. 4.—A modified air-spaced capacitor (C24) which is included in the BFO circuit.

constructed to avoid drift. None of the components connected to either the grid or the anode should be placed near any of the heat-generating resistors such as the smoothing resistor, R23.

The first I.F. stage is wired quite simply, but untidy wiring should be avoided as instability can easily occur. The lead from the first I.F.T. marked or coded AVC should be taken directly to earth. The other stages, also, should be connected as neatly as possible. No wires, especially those to grid or anode connections, should be any longer than is absolutely necessary. Even with the neatest possible wiring, instability may be experienced at high levels of gain, and the bias resistors should be accordingly increased. The reader can experiment profitably with the value of these resistors if no instability is experienced. A good way of obtaining added selectivity is to choose such a value for the cathode bias resistors that the set is on the verge of oscillation, thus giving an effect similar to the use of "reaction" in TRF receivers. A useful increase in gain is also obtainable, but valve noise is also increased.

The detector must be placed at one end of the "trough" formed by the sides of the chassis and the screens of the coil-pack. This is to avoid instability caused by the capacity between the valve and its wires and the grid connection of the last I.F. valve. It should be noted that incurable instability will almost certainly occur if the I.F.T.s are not firmly bolted down on the chassis.

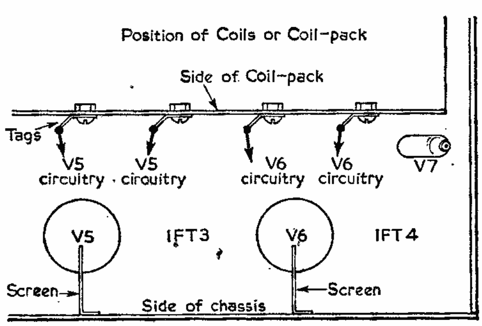


Fig. 5.—The strip of metal nearest to the I.F. amplifier should be of either copper or another material which will take solder, or be of aluminium and numerous solder tags attached to it, as indicated.

It will be noticed that screened cable has been specified for the connection from V7 to the volume control. The author has not found this necessary but it is advisable to screen this lead, and that from the volume control to V8.

COMPONENTS LIST

All resistors are ½W unless otherwise stated

R1	180Ω	R13	10k
R2	4·7k	R14	1k
R3	180Ω	R15	47k
R4	4·7k	R16	47k
R5	1k	R17	100k
R6	4·7k	R18	1k
R7	47k	R19	220k
R8	1k	R20	47k
R9	1k	R21	100k
R10	1k	R22	390Ω
R11	1k	R23	1k, 5W
R12	1k		

All capacitors 20per cent; 300VW unless otherwise stated

C1, C2, C3	3 x 0·0005μF Three gang tuning capacitor	C17	0·1μF
		C18	0·1μF
		C19	0·1μF
C4	0·1μF	C20	100pF
C5	0·001μF	C21	100pF
C6	0·1μF	C22	2pF
C7	0·1μF	C23	0·0001μF
C8	0·1μF	C24	0-25pF
C9	2pF	C25	0·1μF
C10	0·001μF	C26	25μF, 25VW
C11	47pF	C27	0·1μF
C12	0·5μF	C28	8μF
C13	0·1μF	C29	50μF, 25VW
C14	0·1μF	C30	16μF
C15	0·1μF	C31	8μF
C16	0·1μF	C32	0·1μF, 750VW

Valves

V1	EF91	V6	EF91
V2	EF91	V7	EA50
V3	EF91	V8	DH77
V4	EF91	V9	ECL80
V5	EF91		
L1, L2, L3	See text	L4	Any I.F. coil, 465kc/s
I.F.T.1, I.F.T.2, I.F.T.3, I.F.T.4	Miniature I.F. transformers	VR1	100k
		VR2	1M

T1 Output transformer
T2 Mains transformer
Primary 250V
Secondaries 250-0-250V, 100mA, 6·3V, 3A (5V, 2A for heaters of rectifier, if used)
MR1 Metal rectifier 250-0-250V, 100mA, full-wave
Chassis 15in. x 9in.
Loudspeaker 3Ω
Jackplug and socket for headphones
7 B7G valveholders with skirts and screening cams
1 B9A valveholder

The audio amplifier construction is of no special importance except for the need for neat wiring to cut down on hum and to reduce instability. Apart from these necessities, the construction of the A.F. amplifier is straightforward.

(Continued on page 337)

SIGNAL GENERATOR OUTPUTS

By R. Brown

THE instruction handbook on a communications receiver usually has a long and detailed section on testing. The sensitivity, we are told, for example, should be 6μV for a 20dB signal-to-noise ratio—a figure which can be easily checked, it says, with the aid of a signal generator.

It is at this stage that difficulties first appear. The signal generator has an output attenuator calibrated in microvolts; should this attenuator be set to 6μV? Will this give the correct input into the receiver, and will the signal generator effectively simulate the aerial? It all depends upon which convention the manufacturer of the instrument used.

Signal Generator Output Circuits

Connected across the output valve of the signal generator there is usually a simple valve voltmeter, which is mounted on the front panel of the instrument. It has only one calibration mark, a line which is usually marked "set carrier level". When setting up the instrument, the gain of the output stage is increased until the meter is at the "set carrier level" mark. The output stage is then giving a standard, known voltage output (V). This output is then taken, via the output attenuator (which allows accurately known fractions of this voltage to be selected), to the output socket.

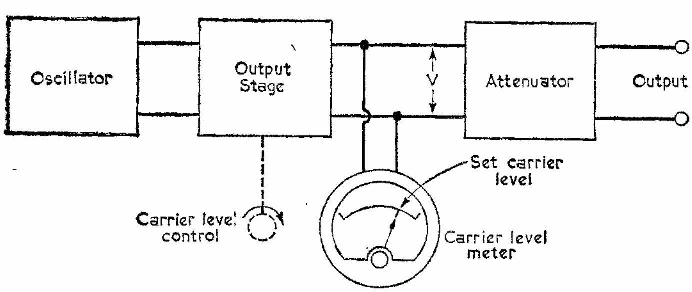


Fig. 1a.—The carrier level control (output stage gain) is adjusted until the carrier level meter deflects to the set carrier level mark. This gives an accurately known fixed input, "V" to the attenuator.

Inside the signal generator is a resistance (R_A), which is equal (and should have the same value at all settings of the attenuator) to the characteristic impedance of the attenuator in series with a voltage E. The value of this voltage will depend upon the setting of the attenuator, being equal to V when the attenuator is introducing no attenuation (Fig. 1a).

The generator E is shown as having zero internal impedance. This is not difficult to see if one realises that zero internal impedance simply means that the value of E is not affected by the amount of current drawn from the generator. This condition will be met, for if a load is connected to the output terminals and the value of E falls, E is simply restored to its original value by adjusting the carrier level control.

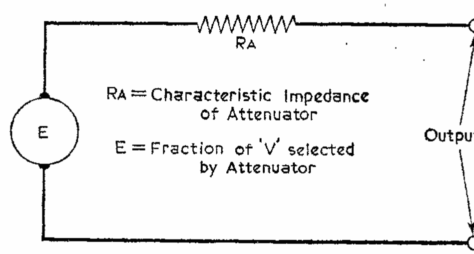


Fig. 1b.—This is the equiva'ent circuit of Fig. 1a as seen from the output terminals. The generator "E" has zero internal impedance.

Attenuator Calibration

With an accurately known variable voltage output, at a known and constant source impedance, the next problem is to mark the various attenuator positions. There are three methods commonly used. The first two are of value when the signal generator is to be used normally with loads having an input impedance equal to the signal generator output impedance (R_A). The third method is more versatile and allows the voltage developed across the load to be found quickly and easily whatever value of load is used.

The First Method

Using the first method, the attenuator markings give the voltage developed across a certain value of load resistance—a value normally equal to the signal generator output impedance (Fig. 2a). This is very convenient because, if, for example, 100μV is to be applied across a load, and the load has the correct impedance, then the attenuator is simply set to the 100μV setting.

The shortcomings of this method become apparent when attempting to make measurements on loads with impedances other than that of the signal generator — e.g. medium frequency receivers, which work from non-resonant aerials. The value of the voltage across the load has to be calculated each time. While this is not difficult.

it is certainly an inconvenience, particularly when a number of measurements at different voltages have to be made.

The value of E has first to be found. This will usually be equal to twice the figure given on the attenuator. The fraction of E which is developed across the load has then to be calculated using the equivalent series circuit of E, R_A and the load Fig. 2b. But the value of R_A may not accurately be known, since the manufacturer sometimes guarantees that the stated voltage will appear only across the matched load. If, for example, the carrier level meter were in error over a small part of the range, the value of R_A could be altered over this portion of the range to correct this error. And this could give rise to errors when working into unmatched loads.

The Second Method

The second method of marking the attenuator has much the same type of advantages and disadvantages as has the first.

The attenuator is marked in terms of the power delivered to a matched load. This is given by $E^2/4R$.

This will, since the generator is working into a matched load, be the maximum power obtainable from the signal generator (Fig. 3a).

The Third Method

With the third method, the attenuator readings give the value of E directly. The manufacturer states the value of R_A with some accuracy, and thus no particular value of load is presupposed. A calculation sometimes has to be made, but this is simple, and since R_A and E are guaranteed, within reasonable limits, there is no chance of error (Fig. 3b).

The latter method is the one most suited to receiver measurements. The receiver manufacturer is normally referring to the source, EMF (E), when he states that the sensitivity should be 6μV for a 20dB signal-to-noise ratio.

Connecting the Signal Generator to the Receiver H.F. and VHF

As with all electronic measurements, receiver sensitivity is best checked under conditions which are as close as possible to normal working conditions. To achieve this the signal generator, when connected to the receiver input, should present the same impedance as the normal aerial.

Aerial Radiating Resistance

In the H.F. and VHF bands, a resonant aerial, such as the half-wave dipole, is normally used. The feed is taken from a current antinode, so that the impedance presented to the receiver can be considered to be purely resistive, being equal to the radiation resistance of the aerial. Aerials usually have a radiating resistance of either 50 or 75Ω, and signal generators are normally designed with either 50 or 75Ω outputs. Thus, provided that the signal generator has the right output impedance it will effectively simulate the aerial.

Changing the Output Impedance

It may well be that a signal generator having the correct output impedance is not available. Occasionally receivers are designed to work from aerials having radiating resistances other than 50 or 75Ω. This does not present any great problem, for the output impedance can be changed with the aid of external impedances.

(To be continued)

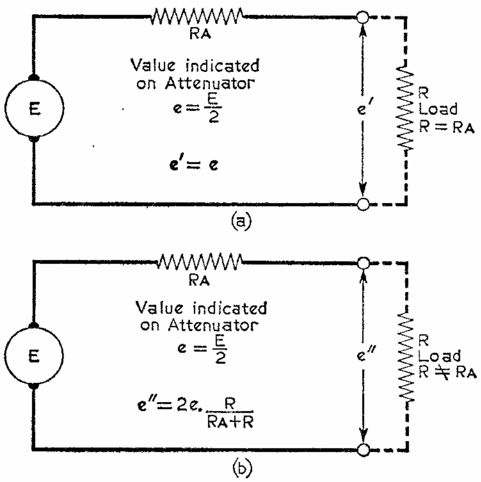


Fig. 2.—The output conditions for a signal generator in which the attenuator markings give the output voltage developed across a load having a value equal to Ra; 2a shows this condition, while 2b shows the condition when the load has a value different from Ra.

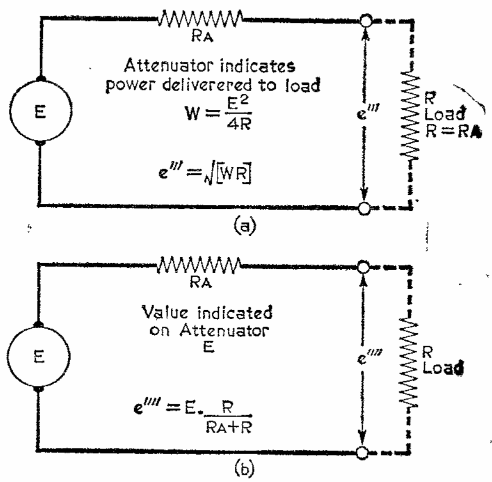


Fig. 3a.—The attenuator markings give the power delivered into a matched load, R—Ra.
Fig. 3b.—The attenuator indicates directly the value of E.Ra is reasonably constant over the whole range of the instrument.

A STABILISED

By J. W. Adams

SOONER or later the serious experimenter requires a source of H.T. which is stabilised against variations of the mains supply and output current. The unit described will conform to these requirements, providing an H.T. voltage adjustable between 150 and 300 D.C. at a maximum current of 100mA.

Construction of the unit is straightforward, and can follow Figs. 2, 3 and 4. The layout of the components is not critical, but the wiring to the control grid of V3 should be kept short to avoid introducing hum into the circuit. Note the fact that 47Ω grid stopper resistors are fitted close up to the grid pins of V2.

Voltage Control

If desired, the meters can be omitted, the voltage

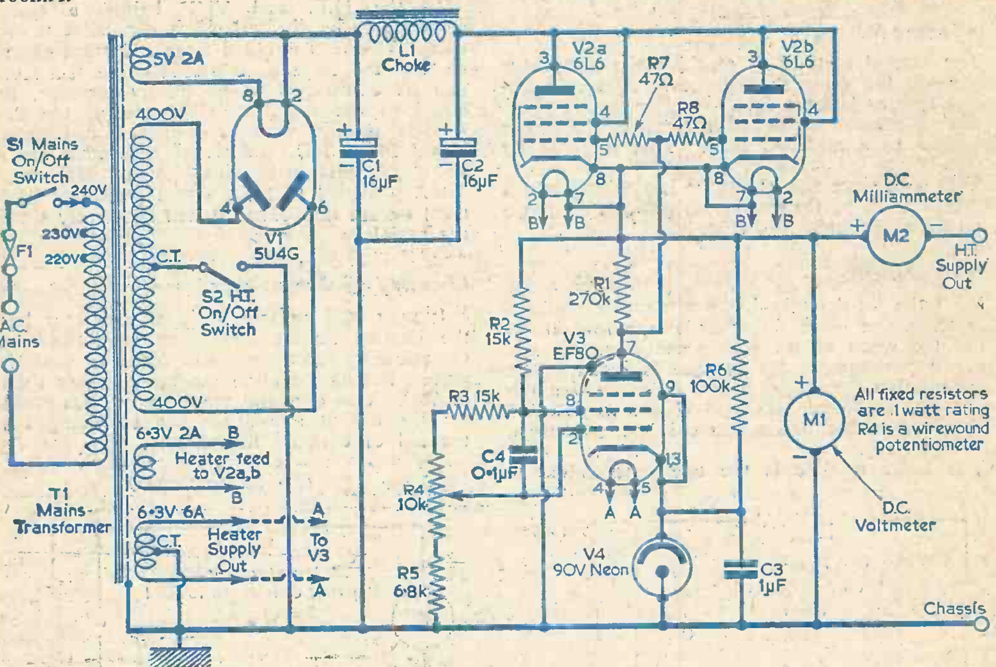


Fig. 1.—The circuit of the unit.

Operation

The theoretical circuit is shown in Fig. 1. Briefly the circuit operates as follows: the H.T. voltage from a conventional full-wave rectifier circuit is applied to the anodes of two triode-connected 6L6 in parallel; the stabilised output is taken from the cathodes, which are connected to one side of a separate heater winding on T1 so as to prevent the rated heater-cathode voltage being exceeded.

Regulation of the bias on the grid of V2, and hence of the output voltage, is achieved by V3, an EF80, acting as a D.C. amplifier. Variations in the output voltage affect V3 through the potentiometer network R2, R3, R4 and R5, causing an alteration of the bias voltage on the grid of V2 which restores the output voltage to that selected by R4. The neon V4 holds the cathode potential of V3 at some 90V.

adjustment control R4 being directly calibrated. The smoothing choke L1 should be rated at around 120mA with an inductance of 10H.

Fig. 2b shows the major details of the chassis,

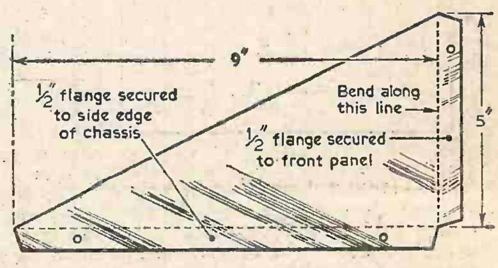
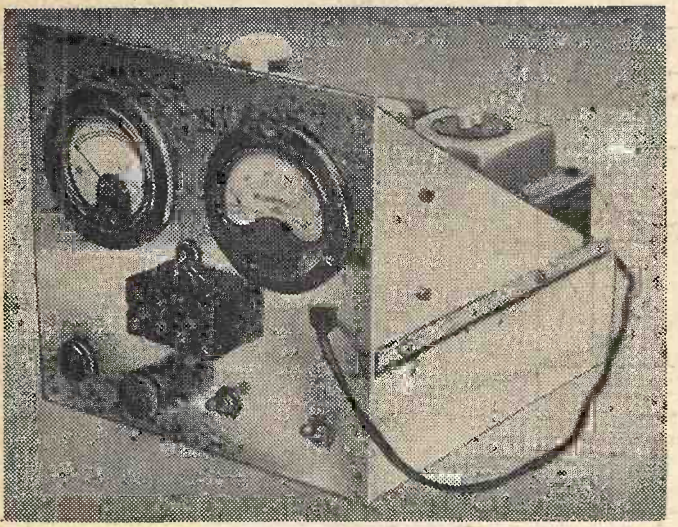


Fig. 2a.—The dimensions of the front-panel support.

POWER SUPPLY

A UNIT THAT WILL GIVE AN ADJUSTABLE H.T. VOLTAGE, STABILISED AGAINST THE VARIATIONS OF THE MAINS SUPPLY



The completed unit

which is made from 16s.w.g. aluminium. The sheet of aluminium should be cut to size and the holes for the valveholders should be cut to the correct size with a punch, or with the aid of a hand-drill and cold chisel, the resultant hole being cleaned with a half-round file. The same technique can be applied to cutting the rectangular hole for the mains transformer, the hole being omitted in the case of a transformer of the upright mounting variety. The chassis can then be bent, and the corner strengthening flanges bolted to the corresponding chassis wall.

Chassis

The panel (Fig. 3), and the two strengthening brackets (Fig. 2a), are made of 18s.w.g. aluminium to the dimensions shown and care should be taken to ensure that the various holes line up with the corresponding holes in the front wall of the chassis. Holes to suit M1 and M2 should be cut only if the metering facilities are to be incorporated. The panel can be fixed in position and the brackets bolted to the rear edge of the panel and to the chassis.

The various components are fitted in the positions shown in the diagrams. To keep the

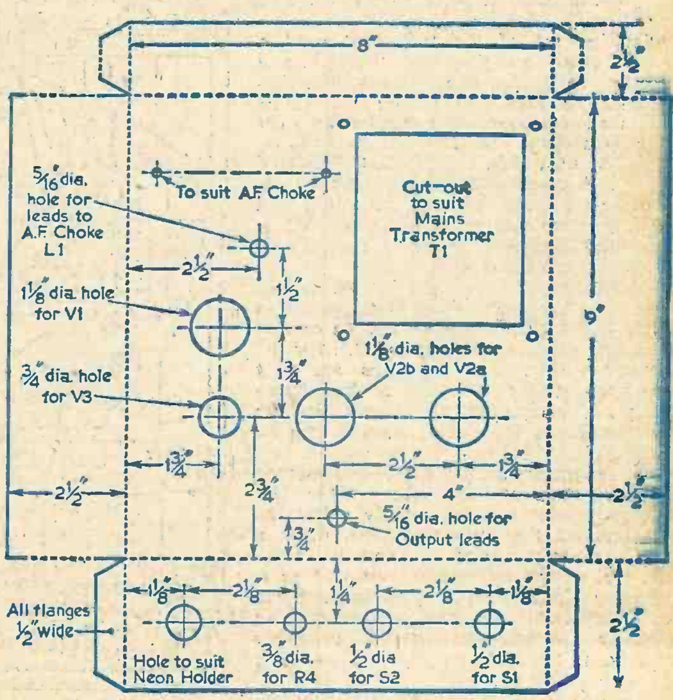
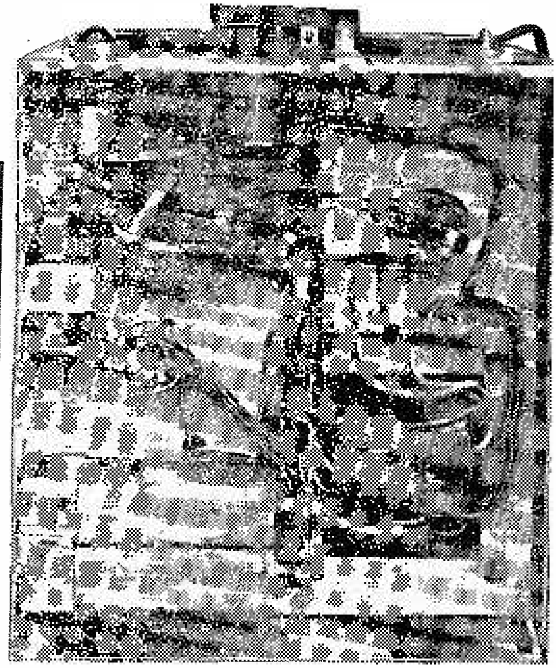


Fig. 2b.—Constructional details of the main chassis.



Right—An underchassis view.

wiring convenient, the valveholders should be orientated as shown in Fig. 4. Difficulty may be experienced in obtaining a suitable mains transformer, and one may be salvaged from an old

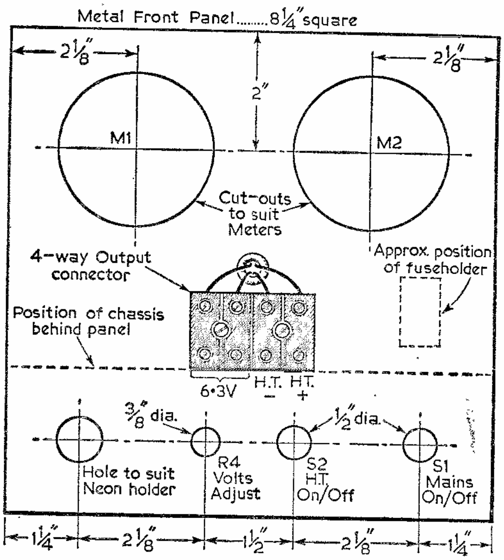


Fig. 3. (above).—The position of the controls and meters, etc., on the front panel.

television set of the type that used a transformer to supply both the H.T. and heater voltages. The various windings should be identified before the transformer is removed. The requirements for the secondary windings are as follows: 5V 2A, 6·3V 2A, 6·3V 6A, 400-0-400V 150A. A component with similar ratings can be used, but it should be noted that the separate heater winding for V2 is essential because the cathode of V2 is directly connected to it.

All resistors are of at least 1W rating. the layout of the wiring is suggested in Fig. 4; the A.C. wiring should be carried out first using a heavy gauge flex for the heater wiring. The tag-strips are only required if the transformer has flying leads. The resistors, condensers, and the remainder of the circuit should then be wired.

If the meters are not used—for reasons of economy or otherwise — the 10k potentiometer can be directly calibrated to indicate the output voltage, using a D.C. voltmeter and a load of some nature, as the off-load output voltage is slightly higher than that on load. Some trouble may be experienced in making the neon strike, and this will probably be due to the presence of a series resistor

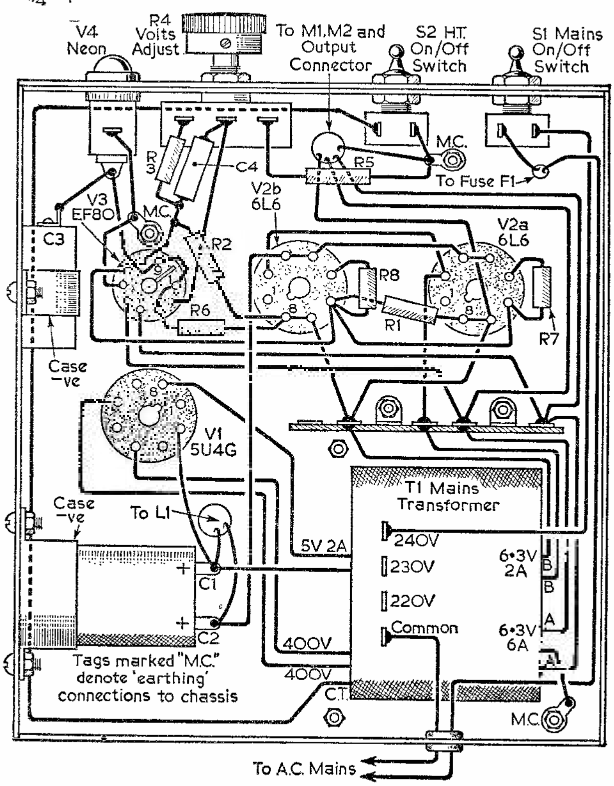
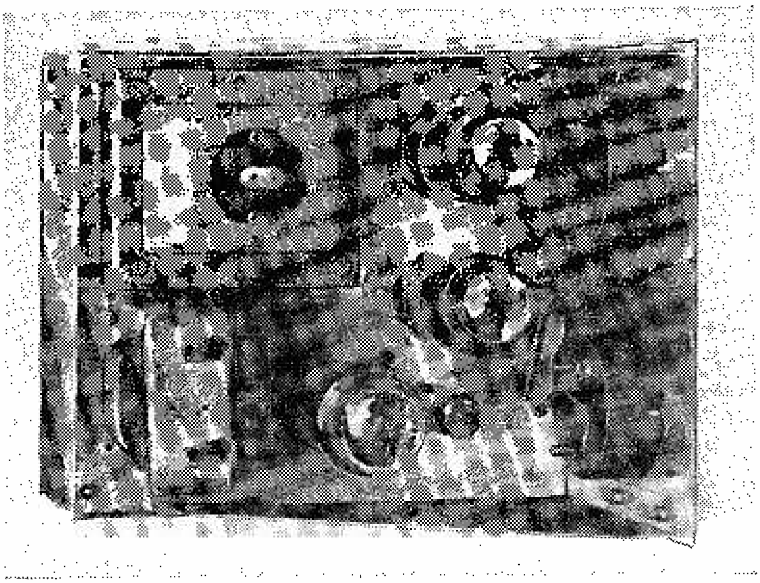


Fig. 4. (right).—The underchassis wiring diagram.

in the neon-holder or in the base of the neon. The latter can be removed by soaking the neon in methylated spirit, unsoldering the base and removing the resistor. The base can then be resoldered and fixed in position using a cellulose filler as a cement.



A top view of the unit.

Housing

A case can be fitted to the unit if desired, and it should provide adequate ventilation above and below the chassis. An alternative arrangement would be to construct the stabilisation section of the circuit as a separate unit for use in conjunction with an existing power supply. The prototype holds the output at 250V ±2V, at a current of 50mA, for a variation in the mains input voltage of ±30V.

Greater Current

The unit will provide a greater output current if an adequate mains transformer and smoothing choke are employed, together with an extra 6L6 in parallel with "V2". If less power is required, one 6L6 may be omitted.

Testing

After checking all the wiring the valves can be inserted in their respective holders and the unit tested. ■

COMPONENTS LIST

Resistors: all 1W

R1	270k	R5	6·8k
R2	15k	R6	100k
R3	15k	R7	47 Ω
R4	10k w.w. potentiometer	R8	47 Ω

Capacitors:

C1, 2 16 μF 500 VW electrolytic

C3	1 μF	C4	0.1 μF
V1	5U4G	V3	EF80
V2a	6L6	V4	90V neon with a red panel holder.
V2b	6L6		

T1 see text
L1 see text
M1 suitable D.C. voltmeter
M2 suitable D.C. milliameter
Three International Octal valveholders
One B9A valveholder
S1 SPST toggle switch
S2 SPST toggle switch
3A cartridge fuse and holder
4 way output connecter

AN ACORN F.M. TUNER

(Continued from page 300)

L2 and L3 are not independent, and there will thus be several core positions at which a station may be received. With a little patience, L1 and L2 can be so tuned that all three services may be received by adjusting L3 only. If capacity coupling is used between the two stages, L2 can be replaced by a resistor of, say, 22k. There are then only two coils to tune, but there is some loss in gain. If this modification is used, it would be as well to raise the H.T. voltage to V1.

Modifications

The basic circuit has been used in several modified forms, and the constructor may like to experiment for himself. Several super-regenerators have been tried, but the Flewelling circuit described is simpler than any and as efficient as most. Air-cored coils have been tuned with trimmers, but there is some sharpening of tuning which is undesirable in the 955 stage, though it may be an advantage in the pre-amplifier. It is essential to avoid the use of unscreened components if radiation and instability are to be countered, for there are three tuned circuits virtually in resonance. ■

Phase Splitters and Phase Reversers

By J. B. Dance

CIRCUITS FOR AUDIO AMPLIFIERS AND OSCILLOSCOPES

(Continued from page 246 of the July issue)

IN last month's issue the article concluded with the fact that feedback must be introduced to remove the disadvantages of the simple phase reverser.

This feedback is conveniently applied in the "see-saw" circuits which have all of the advantages and none of the disadvantages of the simple phase reverser. The latter is not therefore used very often nowadays.

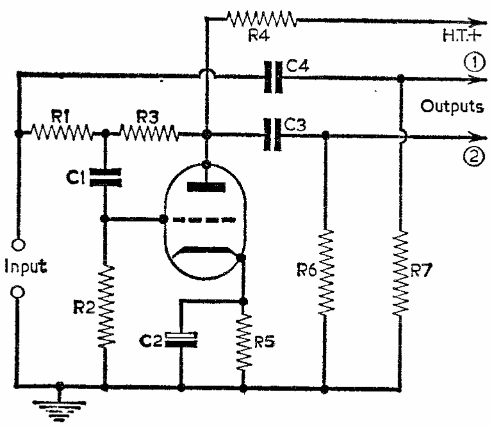


Fig. 6.—The phase reverser of a see-saw circuit.

The See-saw Circuit

The see-saw circuit is widely used in modern high fidelity audio amplifiers. There are a number of different forms of this circuit which derives its name from the way in which the input and output voltages of the phase reversing stage "see-saw" at the audio frequency about a mid-point; the grid voltage is taken from near this mid-point. The circuit is also known as the "floating paraphase" circuit and as the "anode follower".

The simplest form of the circuit is shown in Fig. 6. The main difference between this circuit and the simple phase reverser is that a feedback resistor (R3) is connected between the grid and anode of the valve (the condenser C1 passes audio easily and is used merely to prevent the D.C. anode voltage from reaching the grid). The outputs are taken from the two points shown, one of them being directly from the input.

Ideally, R1 and R3 should not be exactly equal in value if perfect balance is to be obtained. In practice, however, they are normally made equal and, providing that the phase reversing stage has a fairly high gain from grid to anode, reasonably good balance is obtained owing to the feedback from the anode to the grid.

Practical Circuits

Four different see-saw circuits are shown in Fig. 7 (a-d) with some typical component values, the main differences being the position of the D.C. blocking condensers and the grid leak. The first valve of each circuit is merely an ordinary amplifying stage and the second valve the phase reverser. The performance of the circuits (a) and (b) is very similar, but circuit (c) is not used so often, as the coupling condensers would have to be several times larger than in the other circuits if an equivalent low frequency performance were to be obtained. In the circuit of Fig. 7(c) both output valve grids (not shown in the circuit) and the V1(b) grid are returned to earth through R1; thus the circuit is economical in components. The circuit of Fig. 7(d) is very good, as the unbalance caused by the loading effects of the grid resistor used in the other three circuits is eliminated.

The cathode resistor used in the circuits need not be bypassed with a condenser if the valves used are of similar types (for the same reason as in the phase reverser circuit). Valves of the same type are normally used for this reason and also because the H.T. decoupling is simplified.

Output Voltage

The maximum output voltage from any of the

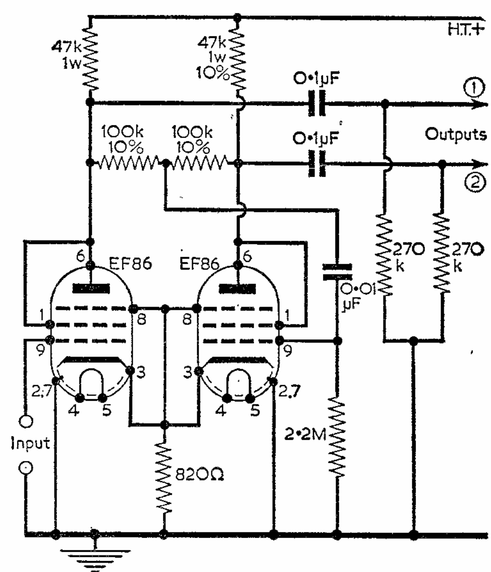


Fig. 7a.—A see-saw circuit.

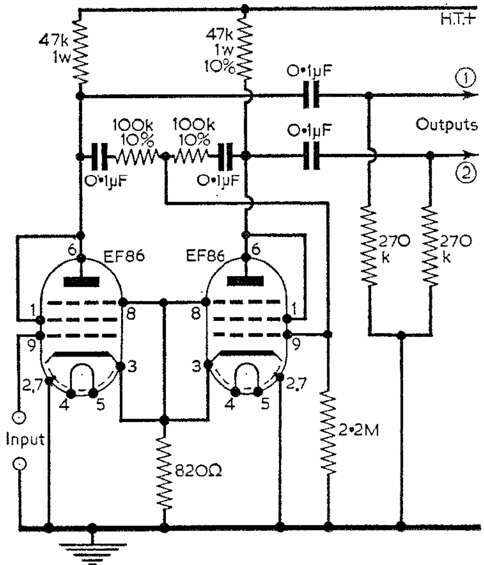
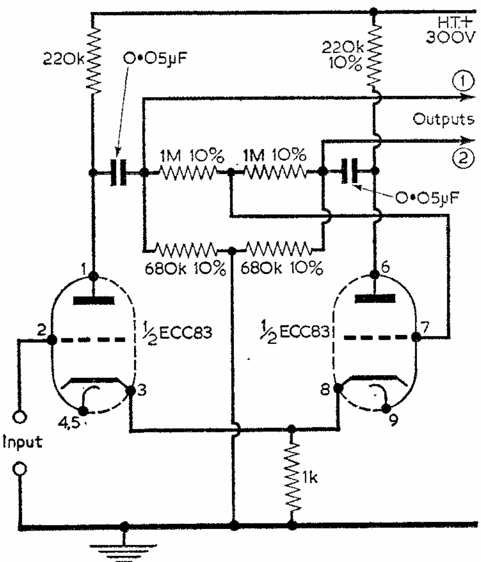


Fig. 7 circuits is about twice that of the same valve used as a concertina phase splitter. The circuit of Fig. 7(d) will provide an audio output of nearly 60V peak at 4per cent distortion when

Fig. 7c.—A see-saw circuit which is not often used on account of the larger condensers which are required. The grids of the two output valves are returned to earth through R1.

the H.T. supply is 300V D.C., with less distortion at lower output voltages. The circuit can therefore feed output valves directly without any intermediate push-pull stage. The gain of the circuit



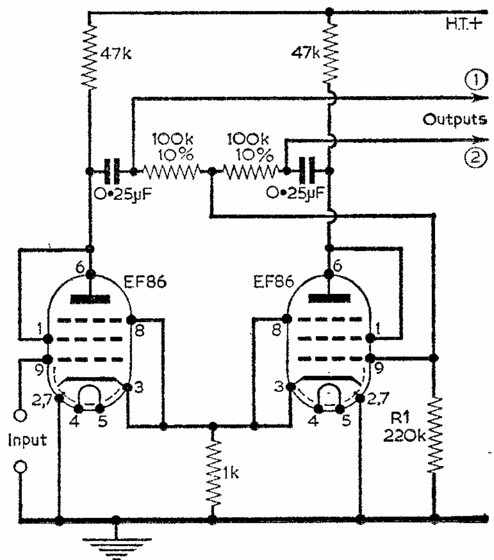
of Fig. 7(d) is about 60. The balance is quite good, but usually not quite so good as that given by the cathode follower phase splitter.

Common Anode Impedance

A slightly different circuit is shown in Fig. 8. The principle of operation is the same as that of the four circuits of Fig. 7, but the common impedance is in the anode circuit instead of the grid

Fig. 7b.—A see-saw circuit with isolating condensers in series with each 100k resistor.

circuit. The H.T. supply in the circuit of Fig. 8 should be well smoothed, as hum or any other variations in the H.T. voltage are fed to the grid of V1(b) but not to the other grid. Each of the two audio output voltages in this circuit is equal to about sixteen times the input voltage.



Cathode Coupled Circuit

A rather different type of phase splitter is shown in Fig. 9. The first valve is similar to a cathode follower phase splitter but is cathode coupled to the second stage. No signal reaches the grid of V1(b) and it may therefore be considered as a

Fig. 7d.—In this circuit, the unbalance due to the loading effects of the grid resistor used in the other three circuits is eliminated.

grounded grid amplifier. The outputs are taken from the two anodes via D.C. blocking condensers as shown.

The cathode and anode voltages of V1(b) are of the same phase as the input, but V1(a) reverses the phase of the signal in the ordinary way. The circuit is known as the "cathode coupled phase splitter", the "Schmitt phase splitter" or the "long tailed pair" (although the latter name is

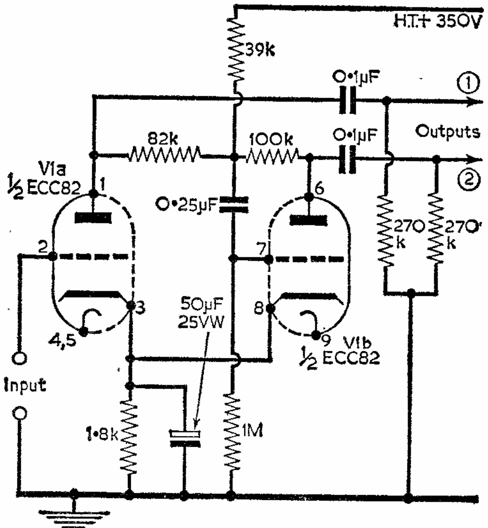


Fig. 8.—A self-balancing phase splitter with a common anode impedance.

also used for cathode coupled push-pull amplifiers). R1, R6, C4 and R4 are necessary to provide a suitable bias.

If the two output voltages are to be equal, R2 cannot equal R3, or the A.C. signal currents would cancel at the cathode and V1(b) would receive no input. If R2 is nearly equal to R3, R5 must be large, so that a small out of balance current passing through it will provide enough voltage to operate V1(b).

Disadvantages

When the stage is very nearly balanced and the two anode resistors have equal values, the signal voltage from the cathodes to earth will be approximately half the input voltage because the grid-cathode signal voltages of the two valves will be equal but 180° out of phase. Thus, the gain of the stage is only one half of that of a conventional amplifier circuit using a single valve of the same type.

Both anode currents are passing through a fairly large cathode resistor and this results in the cathodes being at a fairly high positive potential above earth. If the heaters are earthed, a valve must be chosen which has a suitably high heater-cathode voltage rating. The high cathode potential also necessitates a higher H.T. voltage in order to maintain a reasonable anode-cathode voltage and low distortion.

Unbalance

If a reasonable value of cathode resistor is used, say 22k, the unbalance is likely to be over 10per cent. This is too large for a circuit which will be used in a high fidelity audio amplifier. The unbalance can be reduced by substituting a pentode for the cathode resistor, the grid of the pentode being fed with the unbalance voltage.

(Continued on page 346)

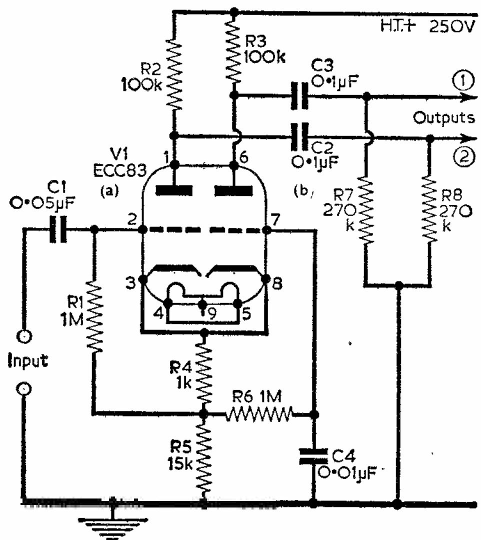


Fig. 9 (above).—A Schmitt cathode-coupled phase splitter.

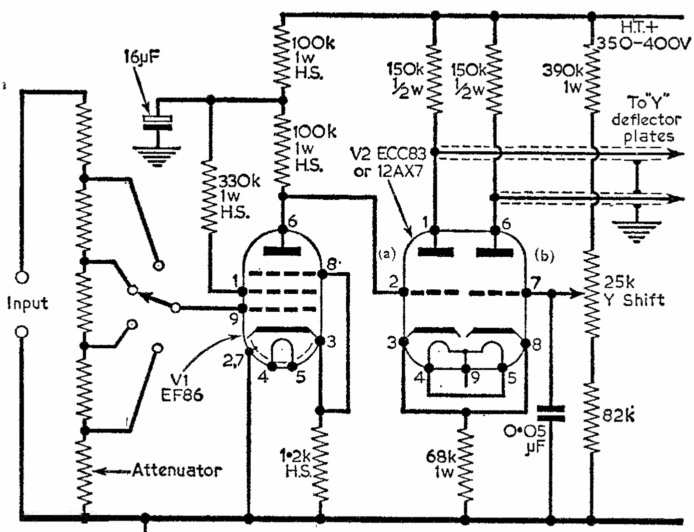


Fig. 10.—A simple oscilloscope amplifier for D.C. and audio frequencies.

SENSATIONAL NEW 1961 DESIGNS—*BY CONCORD*

LOW PRICES ★ PICTORIAL STEP-BY-STEP PLANS ★ EASY AS A.B.C.

THE NEW "LISBON" TRANSISTOR SET

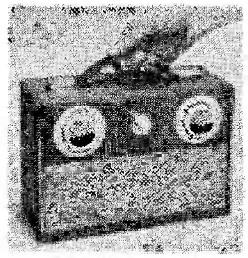
19/6

Build the miniature, highly sensitive **"LISBON"** design. This is a pocket 2-stage transistor set not much larger than a matchbox. Excellent clear reception covering all medium waves and working for months and months off a tiny 1½ or 3 volt battery costing only 3½d. A very simple set to build and an excellent introduction to transistor circuitry. Everything can be supplied down to the last nut and bolt including **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS FOR ONLY 19/6**, plus post and packing 1/6. (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.

"MAJORCA" 7 TRANSISTOR RADIO

£10.19.6

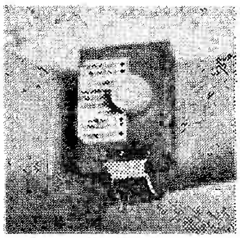
Build this 7-TRANSISTOR "MAJORCA" superhet portable with Car Radio aerial attachment. An exceptional high quality design giving remarkable tone with push-pull output. Can be built for ONLY £10.19.6, including everything down to the last nut and bolt and **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS.** Post and packing 3/6 (C.O.D. 3/- extra). Parts sold separately.



OUR NOVEL WRIST RADIO

22/6

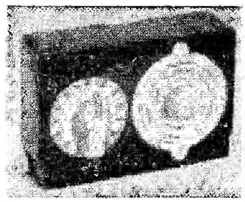
Our engineers have designed this novel Wrist Radio using latest transistor techniques. Size only 1½ x 1 x ⅜in. "Featherweight" yet gives clear, crisp reception over all medium waves. Tiny battery lasts months and months costing only 4d. No snags—anyone can build it in an hour or two using our **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS.** All parts can be supplied including case and strap **FOR ONLY 22/6**, plus post and packing 1/6 (C.O.D. 2/- extra.) Parts sold separately, priced parts list 1/-.



THE NEW "FLORIDA" VALVE RADIO

27/6

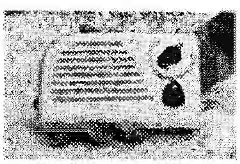
This sensational **"FLORIDA"** model is one of our most sensitive valve radios. It is a highly compact, self-contained miniature push button base, valve pocket radio at absolutely rock bottom building cost. Covers all medium waves with very latest circuitry bringing in stations from all over Europe without fuss. Size only 4½ x 2¾ x 1½in. A fascinating pocket radio. We can supply all the parts including beautiful 2-tone case and **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS**, screws, wire, etc. Can be built for the exceptionally **LOW PRICE OF 27/6**, plus post and packing 1/6 (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.



OUR NEW 4 STAGE "MINUETTE"

39/6

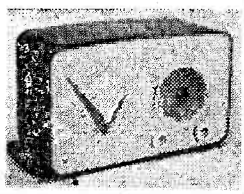
Build this newly-designed **"MINUETTE" 4-STAGE** transistor set in very strong ready drilled **ULTRA-MODERN CASE**, size only 6 x 3½ x 1in. Uses three transistors and diode and **SELF-CONTAINED LOUD SPEAKER.** Very sensitive, ideal for office, bedroom, holidays, etc. Months and months of listening off an 8d. battery. Can be built **FOR ONLY 39/6**, including **PROPER CASE**, miniature speaker, etc. **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS** etc., plus post and packing 1/6 (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.



THE NEW "MONTE-CARLO" RADIO

£5.15.0

One of our new, exciting designs, the **"MONTE CARLO"** is a powerful, all mains, miniature table radio with the latest trimmings, gold insert knobs, special unmarkable plastic veneer, etc. The amazing circuit covers all medium and long waves with good selectivity, fantastic tone and output. Includes ready drilled and punched chassis, standard octal base valves, etc. All the parts can be supplied including **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS.** Everything down to the last nut and bolt **FOR ONLY £5.15.0**, plus post and packing 3/6 (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.



THE NEW 3-STAGE "RIO"

29/6

Our fabulous new **3-STAGE MINIATURE LOUDSPEAKER DESIGN THE "RIO"** covers all medium waves including Home, Light, etc. Very reliable and lightweight. Works for months and months off an 8d. battery. Can be assembled in an hour or two. All parts can be supplied including miniature speaker and everything down to the last nut and bolt with **SIMPLE AS A.B.C. PICTORIAL STEP-BY-STEP PLANS** for ONLY 29/6, plus post and packing 1/6 (C.O.D. 2/- extra). Parts sold separately, priced parts list 1/-.

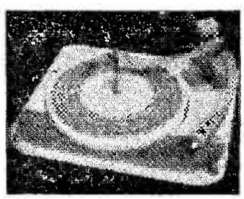
BRAND NEW RECORD CHANGERS

ONLY £8.15.0 BRAND NEW! the latest 4-speed Autochanger, B.S.R. UA14, as illustrated, few only **OUR PRICE £8.15.0.** P.P. 3/6.

BRAND NEW! the B.S.R. 4-speed Autochanger, UA8, few only left. **OUR PRICE £6.15.0.** P. & P. 3/6.

BRAND NEW! the **COLLARO** Junior 4-speed record player. **OUR PRICE 75/-.** P. & P. 3/6.

BRAND NEW! COLLARO "Conquest", 4-speed Autochanger. **OUR PRICE £7.15.0** P. & P. 3/6.



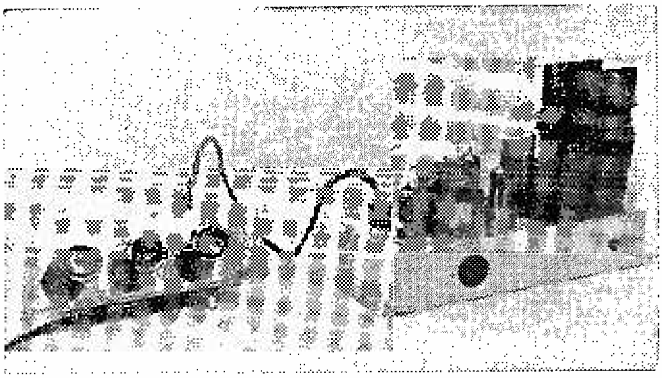
CONCORD ELECTRONICS

Dept. PW33

210, Church Road, Hove, Sussex

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*

IN last month's issue, all the circuitry was explained and a few constructional details of the main and pre-amplifiers were given.



An Inexpensive Amplifier

(Continued from page 207 of the July issue)

By V. E. Holley

The power supplies for the pre-amplifier are taken from the B7G socket on the main amplifier and as the gain from this point onwards is not high, the signal from the pre-amplifier can be passed into the same socket in a screened cable without fear of hum pick-up. If it is more convenient, there is no reason why the pre-amplifier should not be built on the main chassis and in this case, the B7G socket will do for V1. The volume and tone controls can be fitted along the front runner, the chassis being made about 1½in. wider to accommodate them. No other alteration to the layout is necessary.

Pre-amp Construction

A plan of the separate chassis on which the pre-amplifier is built, together with the controls, is shown in Fig. 4 (July issue). It is also of 16s.w.g. aluminium and is designed to be screwed to the inside of the cabinet behind the control panel. The valve is mounted on an inch wide bracket fitted across the chassis at a point 2¾in. from the end adjacent to VR1. The valve and its immediately associated components can conveniently be made up as a sub-assembly and fitted to the chassis with self-tapping screws after the controls have been fitted and wired. The control panel carries also the mains switch and pilot light for all the equipment in the cabinet. If single chassis construction is adopted, it is recommended that the mains switch should be either a separate control or incorporated with VR2, where it is not likely to introduce hum. The prototype was required only for radio reproduction. If other inputs are to be used regularly, it is suggested that the control panel be enlarged to accommodate a co-axial socket and change-over switch, the wiring for which should be thoroughly screened.

Wiring

The wiring diagrams are given in Figs. 5 (page 207, last month) and 6. It will be seen that the double electrolytic C8/C10 is mounted in the vacant space beneath the mains transformer. If a drop-through type of trans-former is used, it must be fitted elsewhere but there are several alternative positions and the choice is entirely one of convenience. Tinned copper wire of 22s.w.g. is suitable for wiring up, and lengths of more than an inch or so should be covered with sleeving. An

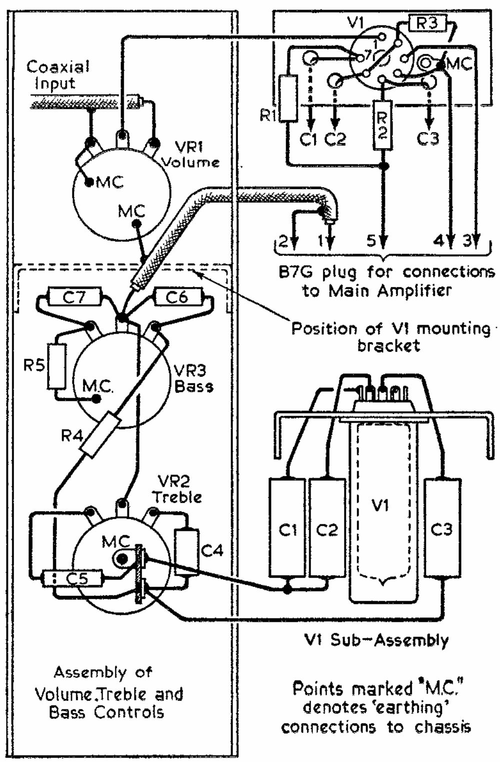


Fig. 6.—The wiring diagram of the pre-amplifier.

octal socket is used for connecting the loud speaker, the spare tags being used for anchoring one or two small components.

Components

All the resistors may be ½W except R18 (10W) and R17 (1W). The two 47k load resistors in the invertor stage and the grid resistors in the output stage, must be matched fairly accurately and if this cannot be done, 5per cent components or better should be used. It is advisable that all the capacitors except C2, should be 500VW, so that in an emergency they will be able to withstand the peak output from the rectifier. Of the valves, V1 may be almost any voltage amplifying pentode and V2 any double triode, though a lowμ type is to be preferred.

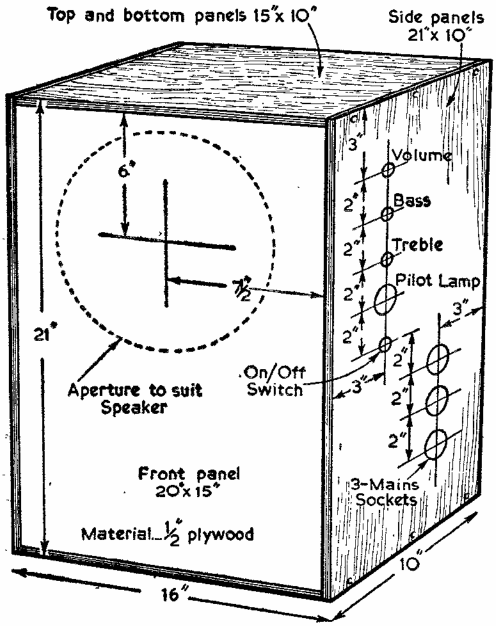


Fig. 7.—Details of a suitable cabinet for this amplifier

Testing

When construction is complete, make a check with a meter between the chassis and the rectifier cathode (pin 8) to see that there are no shorts in the H.T. circuits. If all is well, the power can be connected and a measurement made of the voltage between C13 and chassis. It should be about 265V which, allowing for bias, gives about 250V between the anodes of the output valves and their cathodes.

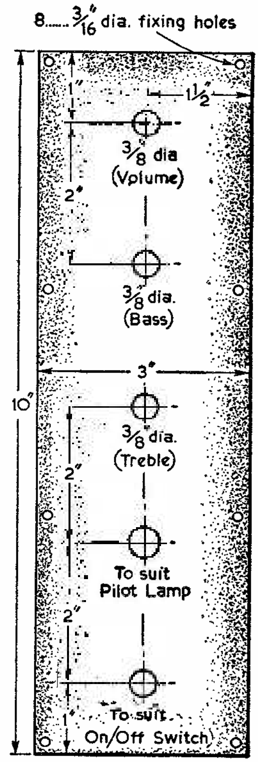
Instability

If there is instability or the reproduction sounds distorted, it will probably be caused by incorrect connection of the feedback circuit. Either the primary or secondary connections to the output transformer should be reversed.

Installation

Lack of space precluded any serious attempt at a high fidelity speaker enclosure and so it was decided to rely on a simple standing box-baffle, on top of which the tuner could be stood in its own smaller cabinet. The baffle is suitable for an 8in. or 10in. speaker and houses, in addition the amplifier, the pre-amplifier and control panel.

Fig. 8.—Dimensions of the control panel.



Material.....tinted perspex, laminated plastic etc.

Making a Cabinet

The dimensions of the cabinet are given in Fig. 7. Suitable material is plywood not less than ½in. thick and much time and hard labour will be saved if the supplier can be persuaded to cut the pieces accurately to size on a power-saw bench. Assembly is by simple butt joints, glued and screwed with 1¼in. wood screws. These should be inserted about three or four inches apart along each joint in holes drilled previously to receive them. The holes should be countersunk so that the screw heads finish up just below the surface. The first operation is to cut a hole in the front for the speaker. This is best done by making a 1in. hole with a brace and bit on the circumference and cutting away the unwanted material with a coarse hack saw blade in a pad handle. The aperture need not be trimmed off—a rough sanding to remove splinters is enough.

Assembly

The top, bottom and sides should be assembled around the front for trial, using a couple of screws at each corner; the front should be a good push fit into the rectangle thus formed. When all is well, dismantle and make holes in the right hand side for the controls as shown in Fig. 7, after which the top, bottom and sides can be assembled permanently with glue and screws. Push the front into position and set aside for the glue to harden. Do not secure the front yet. When the glue is hard, remove the front and cover it with a piece of speaker material. This is best secured to the wood with an impact adhesive at the edges. Stick one edge first and allow it to dry thoroughly; the material can then be stretched tightly over the board and the remaining edges secured, after which the front can be fitted permanently to the cabinet. Apply glue to the mating surfaces and push it into position. Place the assembly face down on a flat surface and adjust the position of the front so

(Continued on page 329)

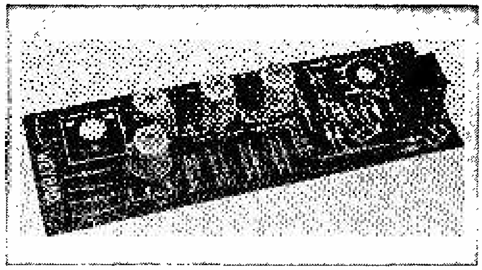
WEYRAD

COILS AND TRANSFORMERS FOR A 2-WAVE TRANSISTOR SUPERHET WITH PRINTED CIRCUIT AND FERRITE ROD AERIAL

LONG AND MEDIUM WAVE AERIAL—RA2W
On 6 in. rod, $\frac{7}{16}$ in. diameter, connections to 6-Tag Ring, 208 pF tuning 12/6

OSCILLATOR COIL P50/1AC
Medium wave in screening can. For 176pF tuning condenser 5/4

1st AND 2nd I.F. TRANSFORMERS—P50/2CC
470 Kc/s operation with 250 pF tuning in cans. $\frac{11}{16}$ in diameter by ¾ in. high ... ... 5/7 (2 REQUIRED)



3rd I.F. TRANSFORMERS—P50/3CC
Last stage transformers to feed diode detector. Size at P50/2 ... ... 6/-

DRIVER TRANSFORMER—LFDT2
Upright mounting with six connecting tags—$1\frac{5}{16}$ in. x ⅞ in. x 1¾ in. 9/6

PRINTED CIRCUIT—PCA1
Size 2¾ in. x 8¼ in. Ready drilled and printed with component positions 9/6

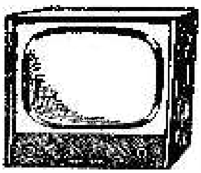
THESE COMPONENTS ARE APPROVED BY TRANSISTOR MAKERS AND PERFORMANCE IS GUARANTEED.

Constructor's Booklet with full details, 2/-.

WEYMOUTH RADIO MANUFACTURING CO., LTD.
CRESCENT STREET, WEYMOUTH, DORSET

COMPLETE 17in. TV

£11-10-0



An excellent ex-Rental Table model. Famous manufacturer. Tuned ITA/BBC. Guaranteed 12 months. Terms available. Personal collection advised. Special delivery rate by arrangement up to 50 miles, or despatched in 3 parcels for easy assembly, 25/-.

MULLARD TRANSISTORS

6 and 1 DIODE

1 OC81D	6/9	1 OC44	9/9
2 OC81	6/9	2 OC45	8/9
1 Diode	1/9	1 Diode	1/9

G.E.C. types available, also Ediswan, XC121 and XB113 at 8/9 each.

POST FREE **47/6** PER SET

RECORD PLAYER CABINET

69/6

Luxury cabinet in two tone coffee colour. Size 15½ x 17 x 9½in. Takes all popular record player units and amplifiers. Position for 8in. Speaker. Detachable lid for Stereo conversion. P. & P. 4/6.

VALVES

SALVAGE GUARANTEED

9d. each 7/6 doz.
EB91, 6J5, 6J7, SP41, SP61, 4D1, 6AL5, 6D1, 6D2, 6H6, 6SG7, 6SH7, 6SJ7, 8D2, 9D2, 10C2, 12Y4, 15D2, 78, EA50, EB34, EF36, EF50, HL41DD, P41, P61, T41, TT11, VR35, VR51, VR37, VR137, VT201, VT501, Z66, W150.

1/9 each 17/6 doz.
1LC6, 6AK8, 6AM6, 6C4, 6D6, 6F1, 6F12, 6F13, 6F14, 6F15, 6K7, 6K25, 6LD, 6P25, 6P28, 6SL7, 6U4, 7C5, 7Q7, 7Y4, 6AT6, 8D3, 12SJ7, 12SK7, 14H7, 12H7, N142, PEN45, PEN46, EF91, DH77, EBC80, EBC41.

2/9 each 30/- doz.
6L1, 6L18, 6SN7, 6U4GT, 10D1, 10F1 10P13, 10P14, 12BE6, 25A6, 25Z5, 25RE' 42, 43, 874, APV4, X78, 20P3, KT81, 12AU7' 12AT7, 20D1, KT36, 807, N37, L63, EBF80' ECC31, ECC82, ECC83, ECC85, PL33'

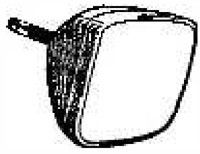
5/9 each 60/- doz.
5U4, 6F6, 6K8, 6Q7, 6V6, 6X5, 12K7, 12K8, 12Q7, 1625, 20F2, 20L1, 20P1, 20P4, EBC33, ECF80, ECH35, ECL80, EL33, EL38, EL41, EL42, EZ40, GZ32, KT33C, PL38, PCC84, PCF80, PL81, PL82, PL83, PY80, PY81.

Postage: 1 valve—7d.; 6—1/6; 12—2/6.

REPLACEMENT

REBUILT

TV TUBES



12 months' Guarantee. H.P. Terms available. Ins.; carr., 15/6.

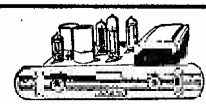
21in.	99/6
17in.	90/-
15, 14, 12in.	70/-

£1 extra without old bowl, refundable if same received within 14 days.

14 in. Tubes 36/24 35/-

Salvage purchase of guaranteed replacement tubes. Carriage 5/-.

TAPE RECORDER AMPLIFIER £7.19.6



Compact, well designed 5 valve amplifier. Output 3.5W. Input for Microphone, Radio and Gram. Size 8½ x 3 x 4½in. Ins., carr. 4/6. 12 months' guarantee. Terms available. Extras: Dial plate including sockets and superimpose switch, 3/6. Knobs, 2/6.

DUKE & CO. (LONDON) LTD.

621/3 Romford Road, MANOR PARK, E.12.

ILF 6001/3

9 a.m.—6 p.m. Half Day Thursday

STAMPS FREE CATALOGUE

SPEAKER CORNER

ELLIPTICAL SPEAKERS 15/9 each
New slot type, 7 x 4in. and 8 x 3in. P. & P. 2/9

MINIATURE SPEAKERS 16/9 each
2½ and 3 inch. Postage 1/-.

SPEAKER SALE—TO CLEAR 8/9 each
5in., 6in., 8in. and 7 x 4in. Ex. manufacturers' Salvage. Money back guaranteed. P. & P. 2/9.

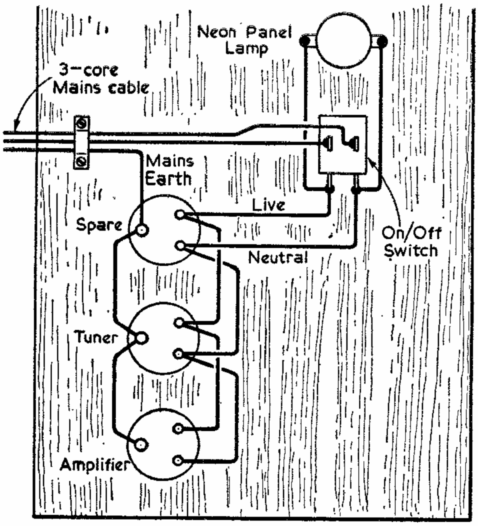


Fig. 9.—The mains wiring inside the cabinet.

(Continued from page 326)

that the outer surface of the speaker material is flush with the sides of the cabinet; secure with screws.

Finishing

The outer surface of the cabinet must be sanded off to remove any projections and covered with some sort of material which can be stained and polished. Veneer should be avoided unless the constructor has experience in its application but the same result can be achieved with 2mm hard-wood ply, having an oak, walnut, etc., facing. This should be cut to size and secured with an impact adhesive to the outside of the cabinet. Care is necessary to ensure that the surfaces are brought together in exactly the right position at the first attempt.

Cut first a sheet for the front, 15¼in. x 20½in. and make in it an aperture of the desired shape and size. If this is a rectangle as in the prototype, the cut out portion can be used for the top of the cabinet. Apply the remaining "frame" to the cabinet in such position that it is flush at the top, projects ⅛in. each side and leaves ½in. of uncovered cabinet at the bottom. Cut and fix plywood to the sides in the same way, remembering to make holes in the right-hand side for the controls. The ply for the top should measure 15in. x 10in. so as to fit flush at the rear and leave a 2mm rebate at the front and sides when the job is finished.

Polishing

The outer ply surface must now be prepared for final polishing. Remove any projections at the corners with No. 2 glass paper and then thoroughly sand the whole surface with No. 0 paper. Wood dye of the desired colour may now be rubbed in with a rag wad. The best final treatment is french polish, using one of the polishes sold for amateur use but if the constructor does not feel inclined to tackle this, a very reasonable finish can be produced by rubbing in a floor sealing compound of self-drying oils marketed by a well known polish manufacturer. Two or three coats will be required, with 24 hours between each. When polishing is done, the ½in. uncovered strip round the bottom can be enamelled black and the appearance can be further enhanced by adding to the bottom two wood battens about 7½in. x 1in. x ½in. as "feet" so that the cabinet will stand ½in. above floor level.

Control Panel

This may be of tined Perspex, etc., to blend with the cabinet or a contrast can be produced by using black or white material. Laminated plastic sheet as used for covering kitchen surfaces is very suitable but must be cut and drilled rather carefully to avoid chipping the polished surface. Cut to the dimensions given in Fig. 8 and secure to the cabinet with chromium plated screws.

Loudspeaker

The performance of the amplifier merits a good quality speaker. The prototype uses an 8in. cambric cone type having a wide frequency response. It should be mounted first upon a piece of ½in. or ¾in. fibre board (about 10in. square for an 8in. speaker), which should then be secured to the inside of the cabinet over the aperture provided. To avoid resonances, it is advisable to line the inside of the cabinet with sound absorbent material; ordinary carpet felt secured with adhesive is satisfactory.

Connections

The mains supply to the cabinet should be taken first to the switch and then distributed to sockets inside the cabinet in the position shown in Fig. 7, into which the amplifier and tuner can be plugged. A spare socket is useful for additional apparatus. The wiring is shown in Fig. 9. The amplifier can be secured to the floor of the cabinet in any desired position by wood screws through the chassis flanges. ■

Voice-operated Switch

(Continued from page 308)

Care must be taken to ensure that the H.T. supply for the switch unit is taken direct from the recorder's H.T. and not via contacts of C.O.2.

Other uses for this switch will become apparent to the user after experience is gained in its use. Two of such possible uses are as a "baby alarm", when the switch is used to switch on an amplifier so that the infant's cries may be heard. Instead of an amplifier, an audio oscillator can be employed or even a warning light. The second use is for the transmitting amateur. Here the unit can be readily employed to turn the station over from "transmitting" to "receive" merely by speaking into the microphone. This is, of course, when the transmitter is modulated and not when using C.W. ■

Short-wave Listeners' Log

QUITE a number of enthusiastic short wave listeners collect QSL cards. These are cards which are sent by transmitting stations, and are an acknowledgement or confirmation of a contact having been made. In the case of the S.W. listener, they are confirmation of the receipt of a report from the listener.

Procedure

Such cards bear the station call sign, and other details, and their collection, from stations all over the world, is an interesting side activity for the S.W. listener. Rare cards, from distant stations, are often used to decorate a corner near the receiver. As some S.W. listeners may have started collecting QSL cards, or may have found that expected cards do not arrive, a few details of the best methods of obtaining such cards should prove useful.

First, it may be stated that some stations almost always acknowledge listeners' reports, while others seldom, or never, send any acknowledgement. It is thus inevitable that some reports do not bring the expected QSL card. Apart from this, it is the usefulness of the report which will often decide whether it obtains a card acknowledgement or not.

A listener report is not of much use if very brief, and from a locality which an amateur is contacting. During the contact, he will already have obtained an up-to-the-minute report over the air. In the same way, it is not much use sending reports to stations which are very near. The listener who wants to obtain a good return of cards, for reports sent out, thus needs to choose conditions where he thinks his report will be of real use or interest to the transmitting station. Sometimes this depends on the transmitting equipment. For example, it could be useful to know that a very low power transmitter was received well at a locality fifty miles or so away, whereas if the station was using greater power, this report would not mean much.

Information

The report should always contain information, such as the type of receiver and aerial, and should give readability and signal strength in accordance with the usual code. If the listener remembers that the real purpose of his report should be to convey useful information to the station heard, this may help.

Reports, when forwarded direct, should be correctly addressed. This is most important with all stations and particularly those overseas. When possible, the inclusion of a stamped and addressed envelope will be very helpful in getting a reply. With overseas stations, an international reply coupon will usually be required for the reply, unless the listener makes use of one of the various schemes which exist for the collection and forwarding of cards. It is possible for reports and acknowledgements to travel at the lower unsealed rates.

Some listening experience, and a good short wave receiver and aerial will go a long way towards obtaining a good return in QSL cards. The DX bands, such as 20m and 15m are of course much more likely to provide distant stations. Local bands, such as 80m, will provide dozens of local stations in an hour or so, and there is very little point in sending reports to them.

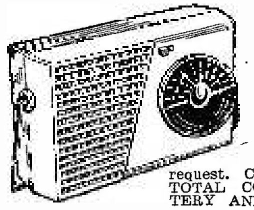
Reports should always be accurate. A mistake in copying the call sign, for example, might result in the report being forwarded to the wrong station. The report is then useless. Some S.W. listeners have cards printed with spaces for the required information (such as date, time, receiver, conditions, signal strength, etc.) and use these for reports. The SWL cards themselves resemble QSL cards, but have no call sign. They are a good investment for a listener who is going to collect QSL cards regularly.

Weaker Signals

When an interest is taken in regular long-distance reception, it is a good plan to give some attention to the weaker signals. Several bands can furnish very loud reception of American, African, European, and Asian stations, but the really notable DX signal will usually be at a rather lower level. As various countries move into the dark hemisphere, they may become audible, and this accounts in some measure for the hour by hour change in conditions.

A notebook, with pages ruled for GMT, frequency or wavelength, station, and receiver dial readings, will prove extremely helpful. It is convenient to devote one page to each band, rather than mixing up reception notes of several bands all on the same page. It is quite possible to maintain regular day to day reception from countries very many thousands of miles away. Previous notes on reception conditions, or stations heard, will also be a very useful guide.

"P.W." 6 TRANSISTOR PERSONAL RECEIVER



Designed by the technical staff of *Practical Wireless*: easy to build, using printed circuit, and 1st Grade Matched Transistors and Diode. Full Medium and Long Wave coverage to internal speaker. All parts sold separately (new components only) enabling you to buy as required, and full detailed price list will be sent on request. Constructional details 1/6. TOTAL COST INCLUDING BATTERY AND CABINET **£8.19.6.**

"POCKET 4" TRANSISTOR RECEIVER

Attractive cabinet as illustrated above for "P.W.6". Uses miniature speaker, proper tuning condenser, and volume control. Built-in aerial makes unit efficient and portable. Ideal for the beginner. All components for only 42/6 (p. & p. 2/6). Ten-page constructional book free with parts or separately 1/6. S.A.E. for parts price list.

SUMMER SPECIAL

"GOOD COMPANION" 6 TRANSISTOR COMBINED PORTABLE & CAR RADIO. ★ 750 mW output. ★ 6 transistors and 2 diodes. ★ Full Medium and Long Wave coverage. ★ Quality speaker. ★ Pre-aligned I.F.T.'s. ★ Brilliantly styled 2 tone cabinet, size 11 x 8 x 3ins. ★ Very fine tuning with calibrated dial. ★ Latest printed circuit. ★ Internal high gain aerial, with car aerial socket. ★ Easy to follow construction data.

All parts sold separately and full illustrated details will be sent on request.

Total cost **£9.19.6** plus 5/- post and Ins. (Battery 3/6 extra.)

UNIVERSAL AVO METERS. In first-class condition, thoroughly overhauled and guaranteed perfect. In the well-known AVO styling with 5in. hand calibrated Mirror Scale. Complete with leads and internal batteries. The 50 RANGE MODEL 7, ONLY **£12.10.0.** and the SUPERLATIVE 20,000 OHMS PER VOLT MODEL 8, ONLY **£17.10.0.** (Regd. P. & P. 5/- on either). S.A.E. for full details.

H.R.O. SENIOR COMMUNICATIONS RECEIVERS. With all 9 coils, giving coverage of 50 kc/s—30 Mc/s. Checked and in perfect working order. Rack mounting type **18 gns.**, Standard Table Model **21 gns.** (Carr., etc. 22/- either type).

H.R.O. MAINS POWER UNITS. A.C. input 115/230 v. output D.C. (fully smoothed) 230 v. 75 mA. and 6.3 v. 3.5 A. Complete in black crackle case. ONLY **59/6.**

POCKET VOLTMETERS. Read 0-15 volts and 0-300 volts A.C or D.C. BRAND NEW and UNUSED. ONLY **18/6.**

B.C. 221 FREQUENCY METERS. The famous American crystal controlled, portable frequency measuring standard. Coverage 125 kc/s—20 Mc/s. With original numbered calibration book. Perfect order. Illustrated details on request. ONLY **£16.**

UNIVERSAL VOLT-OHM-MILLIAMMETER. Reads A.C. and D.C. Volts up to 1,000 in 5 ranges, at 1,000 ohms per volt. D.C. current (3 ranges) to 500 mA. Resistance readings to 200 K ohms in 2 ranges. Basic movement 300μA sensitivity. Easily read open scale, beautifully made and fully guaranteed. Limited number available under import quota. Complete with leads, prods. and internal battery. ONLY **59/6.**

ACOS TYPE 39-1 STICK MICROPHONE. With screened lead and stand **39/6,** plus 1/6 p. & p.

CRYSTAL DESK MICROPHONE. With screened lead and built-in stand, **16/6,** plus 1/6 p. & p.

HARRIS ELECTRONICS
(LONDON) LTD.
138 Gray's Inn Road, London, W.C.1.
(Phone: TERminus 7937)

Please include carriage costs on All items.

(Open until 1 p.m. Saturdays). We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.

RETURN-OF-POST SERVICE

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.

● GRAMOPHONE EQUIPMENT

ALL LATEST MODELS
ALL POST FREE

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
RECORD CHANGERS			
GARRARD RC210 (GC8 PU)	£9.19.6	£1.19.6	12 of 15/-
B.S.R. UA14 (TC8 PU) ..	£7.15.0	£1.11.0	12 of 12/-
B.S.R. UA8 (TC8 PU) ..	£7. 5.0	£1. 9.0	12 of 11/4
B.S.R. UA14 Monarch (TC8S Stereo/LP/78) ..	£8.18.0	£1.16.0	12 of 13/6
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
E.M.I. (Acos Stereo/Mono PU)	£6.15.0	£1. 7.0	12 of 10/8
TRANSCRIPTION UNITS			
GARRARD 4HF (GC8 PU)..	£18. 9.9	£3.15.9	12 of £1.7.0
PHILLIPS AG2009	£10.10.0	£2. 2.0	12 of 15/8

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

● LOUDSPEAKERS

GOODMANS: Axiom 110 10in. **£5.0.0; Axiom 112** 10in. **£8.10.0; Axiette** 8in. **£6.12.1; Axiom 300** 12in. **£11.5.9; Axiom 400** 12in. **£16.1.0; Audiom 60 Bass,** 12in. **£9.12.9; Trebax Tweeter £6.4.0; CX500 Cross-over unit £1.19.0.**
WHITELEY: HF 1016 10in. **£8.0.0: HF 1012** 10in. **£5.0.0; HF816** 8in. **£6.17.3: T816** 8in. **£6.10.0: T10 Tweeter £4.8.3; T359 Tweeter £1.15.0; CX3000 Cross-over unit £1.11.6; CX1500 Cross-over unit £2.0.0.** H.P. Terms available.

● LATEST TEST METERS

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
AVO Model 8	£24. 0.0	£4.16.0	12 of £1.15. 2
AVO Model 8 with leather carrying case ..	£27.18.0	£5.12.0	12 of £2. 0.11
AVO Model 7	£21. 0.0	£4. 4.0	12 of £1.10.10
AVO Model 7 with leather carrying case ..	£24.18.0	£5. 0.0	12 of £1.16. 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 B20	£6.10.0	£2. 0.0	3 of £1.13. 4

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

● AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 3-3, Mullard 2 and 3 Valve Pre-amp, Mullard Stereo, Mullard Mixer, GEC 912 Plus. Fully detailed list on any of these sent upon request.
Instruction Manuals: All Mullard Audio Circuits in "Circuits or Audio Amplifiers", **9/5.** GEC 912, **4/6.** All post free.

● "BRAND FIVE" RECORDING TAPE

Long Play: 900ft (5"), **18/6;** 1200ft (5¾"), **23/6;** 1800ft (7"), **35/-.**
Double Play: 1200ft (5"), **37/6;** 2400ft (7"), **60/-.** (All Post Free!)

● TAPE DECKS

All carriage free

	Cash Price	Hire Purchase Deposit	Mthly/Pmts.
B.S.R. TD2	£8.19.6	£1.16.6	12 of 13/7
COLLARO STUDIO	£12.19.6	£2.12.6	12 of 19/-
ARMSTRONG PAB03 Tape Pre-amp	£16.16.0	£3. 8.0	12 of £1.4.7

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

● OUTPUT TRANSFORMERS

GILSON: W0696A. W0696B, **50/6,** post 2/-. W0710, W0710/8K, **55/6,** post 2/-. W0892, **62/3,** post free; W0767, **27/-** post 1/6.
PARTRIDGE: P3667, **52/6,** post 2/-; P4014, **98/6,** post free; P4131, **60/-,** post free; P3591A, **99/-,** post free; P5202, P5203, **95/-,** post free.
PARMEKO: P2641, **28/-,** post 1/6.

● JASON FM TUNER KITS

Complete with valves.

Standard Tuners: FMT1, **£6.19.6;** Power Pack, **£2.12.6;** FMT2, less power supply, **£8.9.6:** with power supply, **£10.9.6. Fringe Tuner:** FMT3, less power supply, **£10.9.6:** with power supply, **£12.7.6. FM/TV Switched Tuners:** JTV2, **£15.17.6:** Mercury 2, **£11.7.6.** (Important. When ordering JTV2 and Mercury 2 kits it is essential to give TV Channel required). Hire Purchase terms available. Instruction manuals available separately if required. Data Booklets for FMT1, FMT2 and FMT3. **2/10.** JTV2 **3/10.** Mercury 2, **3/10.** All post free.

● **ILLUSTRATED LISTS** *are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT AMPLIFIER KITS, MULLARD CATHODE RAY TUBES. Any will be sent free upon request.*

● **TERMS OF BUSINESS**
Cash with order or C.O.D. We charge C.O.D. orders as follows. Up to £3, minimum of 2/8. 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 except where stated. Postage extra on Overseas orders irrespective of price.**

WATTS RADIO (MAIL ORDER) LTD.
54 CHURCH STREET, WEYBRIDGE, SURREY
Telephone: Weybridge 4556
Please note: Postal business only from this address.
CLOSED FOR ANNUAL HOLIDAY AUGUST 11th-26th

Trade News

HI-FIDELITY RECORD CHANGERS

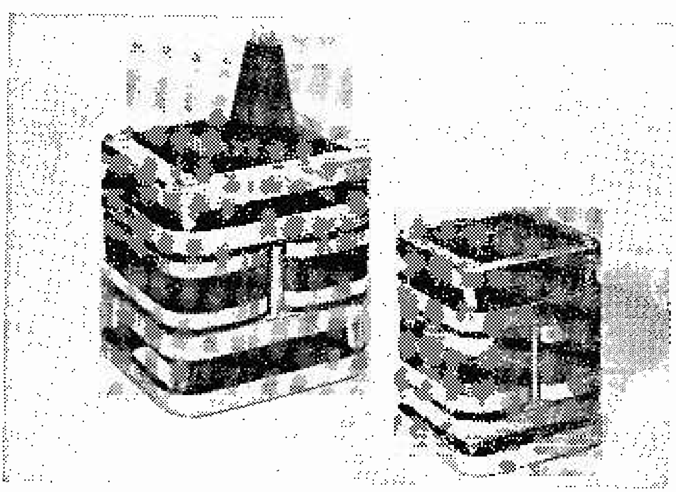
SEVERAL hi-fidelity record changers were on view at the Radio and Electronic Components Exhibition, as part of the Collaro stand. The C.60 Studio Model record changer, a four-speed machine, gives a performance within very close wow, flutter, rumble and speed tolerances. A new model, the A-700, was also shown.

The "Studio" Tape Transcriptor was once again on view. This is a three-speed deck with either half or quarter track magnetic heads.

All these pieces of equipment are made by *Collaro Ltd., Ripple Works, By-pass Road, Barking, Essex.*

VALVES AT THE R.E.C.M.F. EXHIBITION

A SPECIAL feature of the Standard Telephones and Cables Ltd. stand at the Component show was a range of valves for industrial and communications applications.



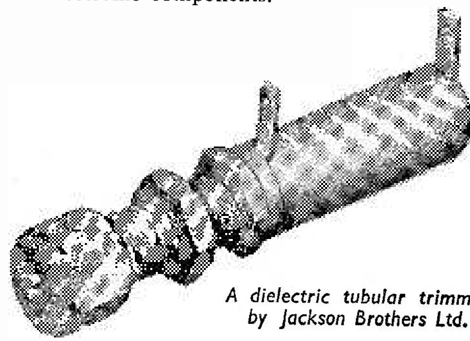
Two of the Vanguard series of transformers manufactured by Gresham Transformers Ltd.

A new compact, forced-air-cooled oscillator triode which develops 5kW at up to 120Mc/s was on show.

Among the many STC transistors on view, were a number of silicon diffused mesa types, and a range suitable for switching applications in computers. *Standard Telephones and Cables Ltd., Connaught House, Aldwych, London, W.C.2.*

NEW CONDENSERS AND TERMINAL STRIPS

AMONG the new components shown at the R.E.C.M.F. Exhibition on the Jackson Brothers Ltd. stand were gang condensers—Type P. These were designed for A.M./F.M. and A.M. use. Also on show were dielectric tubular P.T.F.E. trimmers which incorporate low loss and wide temperature range features, and have a special locking device. *Jackson Brothers (London) Ltd., Kingsway, Waddon, Surrey,* manufacture these and many other electronic components.



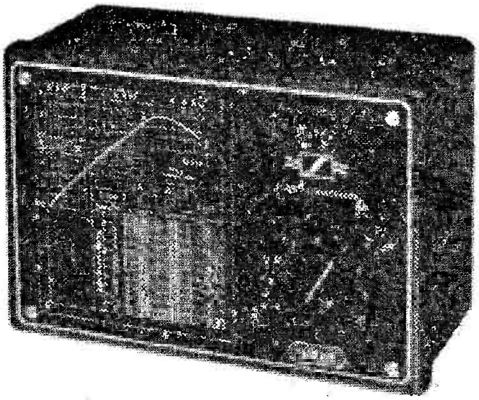
A dielectric tubular trimmer by Jackson Brothers Ltd.

SPEAKER CABINET FOR A POCKET TRANSISTOR RECEIVER

RECENTLY introduced by the Zenith Radio Corporation, is an auxiliary speaker cabinet which converts a pocket transistor set into a full-size radio. The "Converta", as it is called, is now available in this country and consists of the Zenith Royal 50c transistor set—obtainable separately—which plugs into a cabinet containing a larger speaker. The price of the Royal 50c and the speaker cabinet is 27 guineas. *The Zenith Radio Corporation, Sovereign House, Queen Street, Mayfair, London, W.1.*

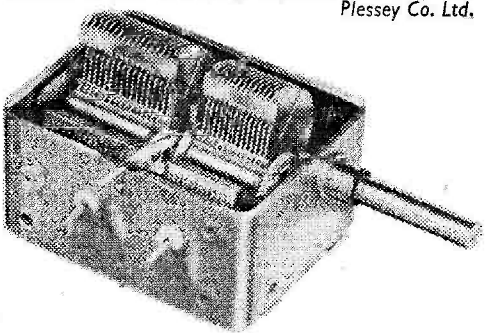
NEW SERIES OF TRANSFORMERS

A NEW series of transformers—the Vanguard range—was on show on the Gresham Transformers stand at the recent Radio and Electronic Components Exhibition. The Vanguard range is the latest development in the design of resin cast transformers by Gresham. The range fulfils all the requirements of RCS.214, yet the transformers are lighter and sometimes smaller than similar counterparts. This new range is made by *Gresham Transformers Ltd., Twickenham Road, Hanworth, Middlesex.*



Above.—A Grundig Inductance Decade distributed in this country, by Wolsey Electronics Ltd.

Below.—A new two gang capacitor made by the Plessey Co. Ltd.



INDUCTANCE DECADES

SOME additions to the range of Grundig Measuring Instruments have been announced by Wolsey Electronics Ltd., the sole distributors of this make of instruments in the country. The additions are three inductance decades (Types LD.1, 2 and 3) which are intended for quickly constructing filter circuits, electro-acoustic equivalent circuits, equalisers, etc. By using large ferrite shell-type cores the quality factors for medium audio frequencies are maintained above 100 with good level stability and temperature independence. The three instruments cover from 1mH to 1·1H overall. The inductance decades cost £23 10s. 0d. each and are distributed by *Wolsey Electronics Ltd., Cray Avenue, St. Mary Cray, Orpington, Kent.*

NEW GANGED CAPACITOR

A NEW two gang capacitor has recently been put on the market by the Plessey Co. Ltd., intended for radio receivers demanding a high performance tuning unit.

The rigid style of frame ensures freedom from low-frequency microphony and the robust assembly and widely-spaced vanes in the oscillator section give freedom from vane microphony. A high order of capacitance matching accuracy between the two sections enables the receiver designer to provide tuned circuits with a negligible loss caused by any mis-matching between R.F. and oscillator sections. This capacitor is made by *The Plessey Co. Ltd., Ilford, Essex.*

TRANSISTOR PORTABLE

A NEW transistor portable receiver is now available from Philips Electrical Ltd. at $16\frac{1}{2}$ guineas. The model 303T covers long and medium wave bands and has provision for use with a car aerial. It weighs only $5\frac{3}{4}$ lb and measures $10\frac{3}{4}$in. x $3\frac{1}{2}$in. x $7\frac{3}{4}$in. The receiver operates on two 9V batteries

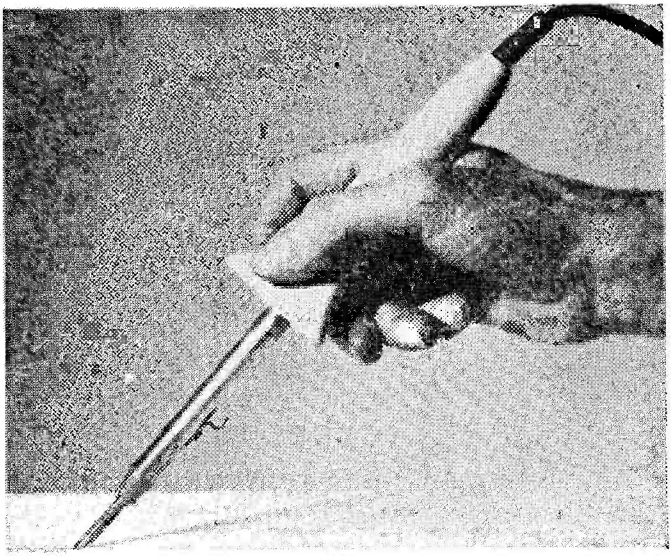
(Continued on page 337)

A BIT CLEANER

THIS bit cleaner was designed to be attached to the standard soldering iron rest for A.N.T.E.X. Precision miniature irons. It comprises a specially prepared brush to ensure speedy and efficient cleaning. The new attachment costs 3s. 3d, and can be obtained complete with the iron rest for 15s. 9d. This new product is manufactured by *A.N.T.E.X. Ltd., 7/8 Idol Lane, London, E.C.3.*

LIGHTWEIGHT SOLDERING IRON

INTRODUCED this year by Remploy is this lightweight 25W soldering iron (MH 1/7). It was designed primarily for radio, television and instrument work. It incorporates a light in the front of the plastic handle which lights when the iron is live. It is available in three voltage ranges; 100/110, 200/220, 230/250. The soldering iron costs 23s. 6d, and is made by *Remploy Ltd., 25/28 Buckingham Gate, London, S.W.1.*



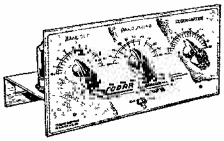
The 25W soldering iron introduced this year by Remploy.

CODAR "CLIPPER" ALL BAND RECEIVERS 10-2000 METRES

LISTEN TO AMATEURS, AIRCRAFT, SHIPPING, SHORT, MEDIUM, LONG WAVE BROADCAST STATIONS THROUGHOUT THE WORLD

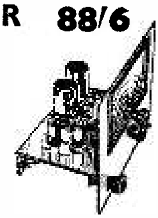
THE MINI-CLIPPER 39/6

The miniature valve radio with the BIG SET features! Covers all Short, Medium, Long waves 10-2000 metres (5 coils). Smart all satin silver ali. front panel with engraved dials, etc. Ball bearing, air spaced variables. Size only $6\frac{3}{4} \times 3\frac{1}{2} \times 4$in. Battery lasts months. No drilling. Total building cost including punched chassis, valve, front panel. One coil for 20-60 metres, nuts, bolts, wire, Step-by-step pictorial plans, **39/6.** P. & P. 2/-. Additional coils and electrical bandspread optional extras. Parts sold separately. Full plans, parts list, 2/-.



THE SUPER CLIPPER 88/6

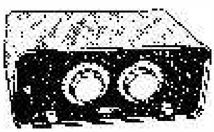
This world-famous hybrid receiver has achieved remarkable success. Tremendous performance with Hi-gain valve detector PLUS two Ediswan transistor amplifiers which are supplied assembled, only 3 wires to connect! Large precision dial, 7 x 4in., with 2 pointers, bandset and bandspread, dual slow-motion drives, air spaced variables. Punched chassis 8 x $5\frac{1}{2}$in. Batteries last months. Covers 10-2000 metres (5 coils). Total building cost including chassis, valve, 2 transistor stages, 2 coils 20-60 and 55-190 metres. Step-by-step pictorial plans, nuts, bolts, wire, **88/6.** P. & P. 2/6.



THE CLIPPER. As above but one transistor stage, **79/6.** P.&P. 2/6 Optional Front Panel, Silver Hammer finish, all holes, **6/9.**

THE CLIPPER CR 45

£6.17.6



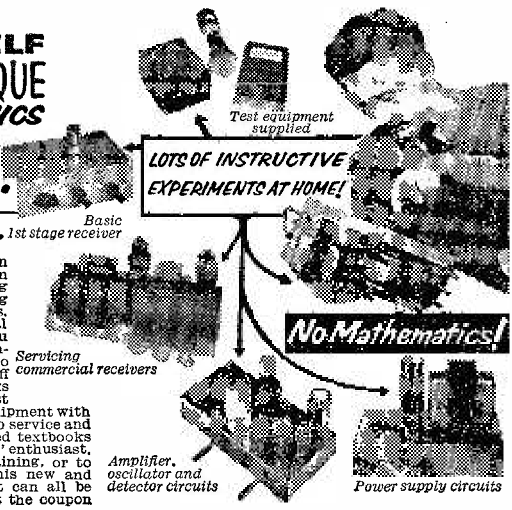
This A.C. Mains receiver is the latest model in the famous CLIPPER Series and combines really top performance with superb professional finish. It is the finest ALL BAND receiver at the price with a new high gain circuit using ECC81 double triode, EL84 output, EZ80 full wave rectifier. Power output $3\frac{1}{2}$ watts for 2/3 ohm speaker. Covers 10-2000 metres (5 coils). World-wide reception. Outstanding features include 3 planetary slow motion drives, separate electrical bandspread, air spaced low loss variables, satin silver dials, silver hammer front panel. Total building cost, including 10 x $5\frac{1}{2}$in. punched chassis, valves, front panel, 2 coils 20-60 and 55-190 metres, nuts, bolts, wire, etc., 10 pages pictorial plans, **£6.17.6.** P. & P. 3/6.
Optional extra. Modern styled Cabinet, rear panel, silver hammer finish, **27/6.** Parts sold separately. Full plans, parts list, 10 pages, **3/6** post free.

No technical knowledge is required to build these fine receivers. Only new guaranteed components are supplied. Send 3d. stamp for illustrated leaflets, testimonials. Suppliers to Educational Authorities, Government Departments, etc.

CODAR RADIO COMPANY, COLEBROOK ROAD, SOUTHWICK, SUSSEX

NEW! DO-IT-YOURSELF TRAINING TECHNIQUE *in RADIO & ELECTRONICS*

You LEARN while you BUILD...



SIMPLE...PRACTICAL...FASCINATING...

ANNOUNCING—after many years of highly successful operation in the U.S.A. and in Europe—the latest system in home training in electronics is now introduced by an entirely new British training organisation. *AT LAST*—a comprehensive and simple way of learning—by practical means—the basic principles of radio and electronics, with a minimum of theory. *YOU LEARN BY BUILDING* actual equipment with the components and parts which we send you. You advance by simple steps using high quality equipment and performing a whole series of interesting and instructive experiments. No mathematics! *INSTRUCTION MANUALS* and our teaching staff employ the latest techniques for showing clearly how radio works in a practical and interesting manner. You really have fun whilst learning! *And* you end by possessing a first rate piece of home equipment with the full knowledge of how it operates and—very important—how to service and maintain it afterwards. A full library of magnificent illustrated textbooks are included with the Courses. *IN FACT* for the 'Do-it-Yourself' enthusiast, the hobbyist, or those wanting help with their radio career training, or to set up their own full or part-time servicing business—then this new and exciting instructional system is exactly what is needed and it can all be provided at very moderate cost. Easy payments available. Post the coupon now, for full details. There is no obligation.

BUILD YOUR OWN • RADIO EQUIPMENT • TEST GEAR • HI-FI INSTALLATION—AND LEARN AS YOU DO IT

RADIOSTRUCTOR

BRITAIN'S LEADING RADIO TRAINING ORGANISATION

FREE— POST TODAY

To: RADIOSTRUCTOR (Dept. G107), Reading, Berks.

Name.......................................
Address.......................................
.... BLOCK CAPS PLEASE

(821) *We do not employ representatives* 8-61

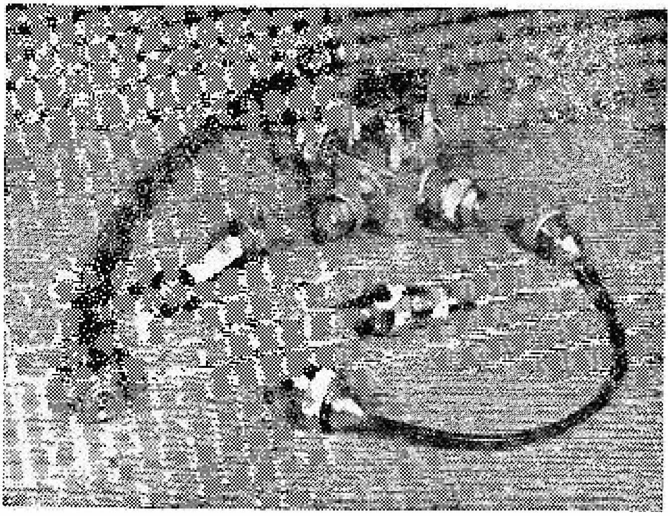
(Continued from page 334)

and may be obtained in two different colour schemes. The portable is produced by *Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.*

CABLE CONNECTOR

THIS year Marconi's Wireless Telegraph Co. Ltd. exhibited at the Components Exhibition for the first time.

Among the many pieces of equipment on show was a connector which has been designed to provide a rigid and reliable interconnection of 4000Mc/s microwave equipment. Alternative connectors for flexible cable or panel-mounting requirements are available. The design incorporates a sealing ring for waterproofing the connecting joint and a specially designed tool is available for assembling the connectors. The impedance is 50Ω and the voltage standing wave ratio is less than 0·2dB between 3600Mc/s and 5000Mc/s per pair of connectors. The price of the connectors is from £2 2s. 0d., depending on the type. They are manufactured by *Marconi's Wireless Telegraph Co. Ltd., Chelmsford, Essex.*



The type F1200 coaxial connector made by Marconi's Wireless Telegraph Co. Ltd.

SOLID STATE MICROWAVE SWITCHES

A NEW range of silicon p-n junction type microwave switches has been announced by the Electronic Apparatus Division of Associated Electrical Industries Ltd. They employ variable resistance diodes which enable them to handle higher powers than the type employing variable capacitance diodes and they are operated from 1·5V D.C.

The diodes will operate at any frequency from the S-band to X-band and are offered in tunable mounts to achieve maximum efficiency at any particular frequency in the wide band for which each mount is designed. *Associated Electrical Industries Ltd., Crown House, Aldwych, W.C.2.*

RADIO REMOTE CONTROL

A DEVICE that will enable a car radio to be remotely controlled from any seat or a single radio installation in the house to be tuned in from every room, was on view on the stand of Hughes International (U.K.) Ltd. at the Radio and Electronic Components Manufacturers Exhibition.

With this device, a silicon capacitor, radios can be tuned electrically at the end of a long wire rather than mechanically with a rigid shaft. Also these capacitors make "signal seeking" possible in tuned circuits. At the push of a button the capacitors sweep the band to the next station.

These "signal seeking" circuits also have inherent automatic frequency control characteristics: i.e. the receiver will automatically follow the station whenever the transmitted frequency varies.

The silicon capacitors are manufactured by *Hughes International (U.K.) Ltd., Kershaw House, Great West Road, Hounslow, Middlesex.*

An Amateur Communications Receiver

(Continued from page 313)

Alignment

The wiring should be checked prior to switching on the set. The local station should be tuned in. If no signal is receivable, the wiring should be checked. If all seems right, the only fault may be misalignment of the I.F. stages.

If suitable instruments are available, the alignment is considerably simplified. A signal generator should be set to 465kc/s using modulation, and the cores of the I.F.T.'s are adjusted for maximum volume, starting with I.F.T.4 and ending with I.F.T.1. The generator should then be set to a frequency in the medium waveband, say, about 1·25Mc/s, and the tuning condenser adjusted to this frequency on the dial. A signal should be audible. If not, turn the oscillator core (or trimmer) until the signal is heard. The procedure is repeated over all the wavebands until the best volume from all receivable stations is obtained.

If a signal generator is not available, the core (or trimmer) of the oscillator coil should be adjusted to obtain the local station. When it is receivable, it can be used to "home" on. The cores of the IFTs are adjusted for optimum signal strength, followed by adjustment of the R.F. and mixer coils. The I.F. frequency is not necessarily 465kc/s, but it will not affect the performance of the receiver. In fact, the author aligned his receiver by ear, and experienced no difficulty.

Performance

Using the receiver, the author has heard, in the last three months, amateur stations from over sixty countries, some as far away as New Zealand and Argentina. A 132ft long wire about 30ft high was used as the aerial. ■

Club News

REPORTS OF CURRENT ACTIVITIES

AMATEUR RADIO MOBILE SOCIETY
Hon. Sec: G3FPK, 79 Murchison Road, London, E.10.

The second International Mobile Rally was held on Sunday, June 18th, on the USAF base at the RAF Station, Barford St. John, near Banbury. Talk-in stations G3NMS/A on 1980kc/s and G3HGE/A on 2 metres, were in operation from the early morning. The star attraction this year was the performance by the U.S. 3rd Air Force Band. At this Rally, the Annual General Meeting was also held. The election of the 1961/2 Committee followed the reports of the Committee and the Treasurer.

BRIDLINGTON AND DISTRICT RADIO SOCIETY
Hon. Sec: H. H. Mills, G3AJB, 28 East Road, Bridlington, East Yorkshire.

During April, the Society held its first Annual General Meeting, at which, the Chairman, H. Jones, G3GBH, Treasurer, J. Wilson, G3MCF, and Secretary, H. Mills, were all re-elected. Also during April it was decided to run an "A" station at the National Field Day. On April 24th, J. Hargreaves, G5VO, gave a lecture on "Basic Radio Theory", and on May 1st, members enjoyed three Mullard films.

Recently the meeting place has been changed and now members will meet at "S.T. Contest", Applegarth Lane, Bridlington, at 7.30 p.m. on Wednesday evenings.

BRITISH TWO-CALL CLUB
Hon. Sec: G. V. Haylock, G2DHV, 28 Longlands Road, Sidcup, Kent.

Major D. W. J. Haylock, G3ADZ, has been elected to the post of president this year, and the vice-president is Air Commodore E. C. Poole. Membership is open to all British subjects with at least one overseas call sign.

CLIFTON AMATEUR RADIO SOCIETY
Hon. Sec: E. Godsmark, G3IWL, 211 Manwood Road, Crofton Park, London, S.E.5.

On April 21st members heard a lecture by C. Hatfull, G3HZI on "Direction Finding".

No lectures or demonstrations have been arranged for the summer, but there will be two portable transmitting field days and two direction finding field days. The club will be active as G3GHN/P during N.F.D.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.

As part of the Golden Jubilee Year celebrations, 120 members, friends and guests attended the Founder Members' Dinner at the Derbyshire Yeoman, on Saturday, April 22nd. These celebrations are being held to commemorate the foundation of the Derby Wireless Club in 1911. The Club has the distinction of being the first of its kind in the Country.

GUILDFORD AND DISTRICT RADIO SOCIETY
Hon. Sec: J. R. Barker, 35 Banders Rise, Merrow, Guildford, Surrey

At the Annual General Meeting John Barker was elected the new Secretary, and D. Tillier was elected as Treasurer. On May 11th Maurice Child gave a talk on "The Early Days of Radio", and on the 26th of the same month, G8VH gave a short lecture.

The club meets on the 1st, 3rd, and 4th Thursday of every month at 41 Egley Road, Woking.

A modulator, suitable for use with the club transmitter, is in the course of construction.

HARLOW AND DISTRICT RADIO CLUB
Hon. Sec: B. H. Wynn.

On Sunday, June 11th the Club held a mobile rally near Harlow.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY
Hon. Sec: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorkshire.

G3FQH gave a lecture on May 3rd; his subject being SSB. All meetings are at the Sportsman Inn, Ogden, Halifax.

Future Events:
July 12th—Spares sale.
July 26th—An informal evening.
August 9th—A discussion on the "Scout-Jamboree-on-the-Air".

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

At the AGM, held during May, H. Jones, G5ZT was elected President, E. Fallou was elected Chairman, and J. Fallon, Treasurer.

The Ernie Hillyard trophy was once again presented to John Fallon, as was the G5ZT trophy.

READING AMATEUR RADIO CLUB
Hon. Sec: R. G. Nash, G3EJA 9 Holybrook Road, Reading.

At the April meeting the clubroom was filled with students and candidates for the 1961 R.A.E., to hear Mr. Kirkpatrick, Chief of the Radio Section of the G.P.O. London, and Mr. Horsnell, telephone manager of the Reading G.P.O., give a talk about, and answer questions on, licensing conditions for the radio amateur.

G3NNF gave a talk at the June meeting on L.F. aerials for confined spaces.

RHONDDA RADIO SOCIETY
Hon. Sec: A. Chapman, 23 John Street, Porth, Rhondda, South Wales.

The Society has now been established at its headquarters, "The Royal" Hotel, Trealaw, Rhondda.

The following officers have recently been elected; Chairman—S. Weaver, G3ITQ; Vice-chairman G. Williams, GW2F0F; Treasurer—G. Tuckwood; and joint Secretaries—A. Chapman and W. Smale, GW3DRK.

Future film-strip lectures include "Modulation and Modulators" and "R.F. Amplification".

SOUTH SHIELDS AND DISTRICT AMATEUR RADIO CLUB
Hon. Sec: D. Forster, G3KZZ, 41 Marlborough Street, South Shields, Durham.

The Club holds meetings in Trinity House, Social Centre Laygate, on Friday evenings for theory and morse classes; and on the last Wednesday in each month at 7.30 p.m.

A mobile rally will be held on Sunday, July 9th, at Bents Park Recreation Ground, Coast Road, South Shields. The talk-in stations will be G3KZZ/A on 1980kc/s, and G3DD1 on 3600kc/s. Light refreshments will be available on the site.

COURSES OF INSTRUCTION

BRENTFORD EVENING INSTITUTE.
Clifden Road, Brentford, Middlesex.

During the session 1961-62 the Institute is arranging classes in the following subjects:

Radio Amateurs' course in preparation for the London City and Guilds Examination; which will be held on Wednesdays from 7 to 9 p.m.

Morse Code for amateurs; Tuesdays 7 to 9 p.m.
Mathematics for Radio Amateurs; Thursdays 7 to 9 p.m.
Radio Servicing; Tuesdays 7 to 9 p.m.
All classes open the week beginning Monday, 18th of September.

WESLEY EVENING INSTITUTE
Wesley Road, London, N.W.10.

Due prominence will be given to television topics in the classes for session 1961-62. The classes will be held on Mondays and Wednesdays from 7—9 p.m. They will commence on September 18th.

The course, which is mainly intended for amateurs, covers theory and some practical work.

There is a mid-evening canteen and ample parking space.

Applications for enrolment should be made to: "Jeanville", Brighton Road, Addleston, Weybridge, Surrey.

TRAINING IN ELECTRONICS

A school for training engineers in the use of electronic equipment has been established by Associated Electrical Industries Ltd. at New Parks, Leicester, headquarters of the Electronic Apparatus Division. Trainees include not only members of the Company's Construction Department but also customers' engineers.

The courses will enable AEI Construction Department electronic specialists to keep up to date with the rapid and advanced developments taking place within the electronics industry; to extend the knowledge of engineers specialising in heavy current electronic engineering; and to train newly qualified engineers in current techniques in industrial electronics.

At present there are two types of courses—the advanced dealing with electronic machine tool control systems, lasting approximately five weeks, and an elementary course, on simpler equipment, over five days.

REDUCTIONS IN MULLARD TRANSISTORS

OC19	48/-	OC72	8/-	OC78D	8/-
OC35	25/6	OC72pr	16/-	OC81	8/-
OC44	11/-	OC73	16/-	OC84	11/-
OC45	10/-	OC75	8/-	OC170	13/6
OC70	6/6	OC77	10/-	OC171	14/6
OC71	6/6	OC78	8/-	OC201	12/6
				OC202	36/-

A SPECIAL OFFER OF SIX MULLARD TRANSISTORS
1 OC44, 2 OC45, 1 OC81D, 2 OC81.
Only 37/6 set.

EDISWAN TRANSISTORS
XA104 12/-, XA103 10/- XB102 6/6 ea.

P.W. TRANSISTOR SIX PRINTED CIRCUIT VERSION
All components available from stock
Complete kit £9.15.0.

Full detailed shopping list, point to point wiring diagram, fully illustrated.........	1/6
Coil Set (Osc. and 3 I.F.T.s)...	22/6
Driver Transformer	11/6
Output Transformer	10/6
Ferrite Rod Aerial	10/-
Printed Circuits	9/-
OO Gang Condensers	11/-
Volume Control V.C. 1545 ...	10/6
Switch	3/6
Hardware Kit	4/6
Transistors (set of 6 plus crystal diode GD9)	70/-
Speaker	19/10
Case	7/6
Complete Kit of Condensers...	15/-
Complete Set of Resistances...	6/6
Trimmers (2)	2/8

All above components are brand new and are fully guaranteed.

TAPE DECKS

Collaro Studio Tape Transcriptor
3 motors, 3 speeds, 1⅞, 3¾, 7½ i.p.s., take 7in. spool. Push-button control. Price **£12.12.0.** Tape extra. Carr. & Ins. 5/6.

Latest B.S.R. "Monardeck" Single Speed
3¾ i.p.s. takes 5¾in. spools. Simple controls. **£7.7.0.** Tapes extra. Carr. and Ins. 5/6.

MICROPHONES

★ **Acos Mic., 39/1.** Crystal stick microphone for use as a hand, desk or floor stand unit. Listed at 3 gns. OUR PRICE **37/6.** Table Stand **7/6** extra. Floor stand adaptor, **12/6** extra.

★ **Acos Mic. 40,** as supplied with modern tape recorders with a folding rest and 8ft. lead. Listed at £1.15.0. OUR PRICE **19/6.**

★ **GBS Microphone,** pencil stick type fitted with muting switch, **42/-.**

★ **T.S.L. Crystal "Stick" Microphone,** Model MX3, for general purpose use, complete with table stand, **45/-.**

★ **T.S.L. Moving Coil Microphone,** for high or low impedance. Brown and cream plastic case with a fold-in table rest, 6ft. cable and a standard 3-way connecting continental plug, **£4.4.0.**

★ **Acos Mic. 45,** dual purpose, designed to fit into the hand, has built-in stand for desk use, die-cast case for a variety of applications from music to dictation, with lead, **25/-** each.

TELEVISION TUBES RE-GUNNED
Super screen TV tubes with a 12 months' guarantee.
Tubes all types 12in. to 14in. ... **£4.5.0** Tubes all types 15in. to 17in. ... **£4.15.0**
Carriage and insurance 10/- extra. Allowance against the return of old tube.

AUTOMATIC RECORD PLAYER UNITS

B.S.R. Monarch UA8, 4 speed unit, fitted the B.S.R. Full/Fi cartridge **£6.15.0**

B.S.R. Monarch UA8, as above but fitted with B.S.R. Full/Fi Stereo cartridge **£6.19.6**

B.S.R. Monarch UA14, 4 speed unit in two-tone grey **£7.19.6**

Garrard 210, 4 speed unit, arm wired for stereo, fitted with GC8 monaural cartridge **£10.19.6**

Garrard 209, 4 speed unit, fitted with GC8 cartridge **£10.10.0**

Garrard Laboratory Series Auto turntable type A, can be supplied with or without base, and cartridges to your specification, prices from......**£21.1.5**

Collaro, the latest Collaro Studio automatic record changer, 4 speed unit, finished in cream, fitted with turnover cartridge **£7.19.6**

ALPHA

VALVES BY RETURN POST

AZ1	10/-
AZ31	10/-
DAF96	8/-
DF96	8/-
DK96	8/-
DL96	8/-
EABC80	9/-
EAF42	9/6
EB91	4/6
EBC3	5/-
EBC33	6/9
EBC41	8/9
EBF80	9/9
EBF89	9/6
ECC81	8/-
ECC82	7/6
ECC83	9/-
ECC84	10/-
ECC85	9/6
ECF80	12/-
ECF82	10/6
ECH42	9/6
ECH81	9/-
ECL80	9/6
ECL82	10/6
ECL83	15/-
EF6	5/-
EF36	3/6
EF41	9/6
EF50	5/-
EF50SYL	7/-
EF80	7/-
EF85	7/-
EF86	12/6
EF89	8/9
EF91	5/9
EF91(BVA)	7/6
EF92	6/-
EF183	15/-
EF184	15/-
EK32	7/-
EL32	4/6
EL33	10/-
EL41	9/-
EL84	9/-
EL91	4/6
EM34	9/6
EM80	9/6
EM81	10/6
EY51	9/6
EY86	10/-
EZ40	7/6
EZ41	7/6
EZ80	7/-
EZ81	7/-
FC13	5/-

FW4/500	10/-
GZ32	11/6
HL23DD	8/6
HL42DD	10/-
KT2	5/-
KT33C	6/-
KT61	10/-
KTW61	6/6
MX40	12/6
OZ4	4/6
PCC84	12/-
PCC85	8/6
PCF80	8/9
PCF82	11/6
PCL83	13/6
PL36	13/6
PL81	11/-
PL82	8/6
PL83	9/6
PX25	12/6
PY80	7/6
PY81	8/6
PY82	7/-
PY83	8/6
PEN4VA	10/-
PEN25	5/-
PEN45	8/-
SP4	5/-
TH30C	5/-
TP22	8/-
U10	9/6
U25	13/6
U26	10/-
U50	8/-
UABC80	9/-
UAF42	9/6
UBC41	8/6
UBC81	11/4
UBF80	9/-
UCC84	10/11
UCC85	9/6
UCH42	9/6
UCH81	9/6
UCL82	11/6
UCL83	13/6
UF85	9/-
UF89	9/-
UL41	9/-
UL84	9/-
UU6	19/3
UY1N	12/6
UY41	6/6
UY85	7/-

VP23	5/-
VR105/30	8/-
VR150/30	7/6
VU39 (MU 12/14)	8/9
Y63	7/6
1A7GT	13/6
1C2	11/6
1C5GT	12/6
1H5GT	9/-
1N5	10/6
1R5	7/6
1S5	6/6
1T4	5/6
3D6	5/-
3Q4	7/6
3Q5GT	9/6
3S4	7/6
3V4	8/-
4D1	3/-
5R4GY	9/6
5U4G	5/-
5V4	11/6
5Y3G	8/-
5Y3GT	7/6
5Z4G	9/-
6A7	10/-
6A8G	9/-
6AK5	5/-
6AL5	4/-
6AM5	7/6
6AM6	4/-
6AQ5	7/6
6AT6	8/6
6BA6	7/6
6BE6	7/6
6BH6	9/-
6BJ6	9/-
6BW6	9/-
6C4	4/6
6C5GT	6/6
6C6	5/-
6D6	5/-
6CH6	7/6
6F6G	7/-
6F6M	7/6
6J5GT	5/-
6J5M	6/6
6J6	4/-
6J7G	6/6
6K7G	3/6
6K7M	6/9
6K8G	6/6
6K7GT	5/9
6K8GT	10/-
6L6G	8/-
6L6M	9/6
6L18	11/6
6N7GT	7/6
6Q7G	7/6

6Q7GT	9/6
6SK7	6/-
6SL7GT	8/-
6SN7GT	7/6
6SQ7	9/3
6U4GT	12/-
6V6G	5/-
6V6GT	7/9
6X4	7/6
6X5G	7/-
6X5GT	7/-
6/30L2	12/6
7B6	10/6
7B7	8/6
7C5	8/-
7C6	8/-
7H7	8/-
7S7	9/6
7Y4	6/6
10F1	12/6
10P13	22/3
12A6	5/-
12AH8	12/-
12AT7	7/6
12AU7	8/-
12AX7	8/-
12BA6	9/-
12BE6	9/-
12C8	7/-
12J7GT	10/6
12K7GT	6/6
12K8GT	13/6
12K8M	13/-
12Q7GT	6/6
12SK7	6/-
12SL7	8/-
12SN7GT	10/-
15D2	7/9
25A6G	8/-
25L6GT	10/-
25Z4	9/6
25Z5	7/-
25Z6	10/-
30FL1	10/6
30L15	23/3
30P4	15/-
30P12	12/6
30PL1	12/6
35L6GT	10/-
25Y5	9/9
35Z4GT	8/-
42	8/-
35Z5GT	9/-
50L6GT	8/6
75	10/6
80	8/6
142BT	3/6
210DDT	4/6
210VPT	3/6

LOUDSPEAKER UNITS
All brand new

2½in. square Rola C25	26/10
2½in. square EMI	18/6
4in. square Elac Tweeter	12/6
5in. round Plessey with O.P.T. ...	16/6
6½in. round Celestion	17/6
8in. round Richard Allen	18/6
10in. round Elac	25/-
12in. round Plessey	29/6
6in. x 4in. Plessey	19/6
7in. x 4in. Plessey	19/6
8in. x 4in. Celestion and Richard Allen	19/11
10in. x 6in. Celestion and Plessey...	21/6

RECORDING TAPE
Special Offer of Top quality recording tape, 3¼in. spool 200ft, **5/3**, 5in. spool 600ft, **13/9**, 5¾in. spool 850ft, **18/6**, 7in. spool 1200ft, **23/-**. Extra-play tape, 3¼in. spool 300ft, **7/-**, 5in. spool 900ft, **21/-**, 5¾in. spool 1275ft, **26/6**, 7in. spool 1800ft, **37/6**.
Empty spools, 3¼in., **1/6**, 5in., **2/-**, 7in., **3/-**.

RECTIFIERS
RM1 **5/3**, RM2 **6/9**, RM3 **7/6**, RM4 **13/6**, RM5 **19/6**, 14A86 **19/6**, 14A97 **19/6**, 14A100 **19/6**, LW7 **17/6**, 18RA **1-1-16-1 6/-**, FC31 (14RA 1-2-8-3) **22/6**, FC101 (14RA 1-2-8-2) **16/6**.

LIGHTWEIGHT SOLDERING IRON
Latest design, for use on 200/250 volts, with detachable handle, can be carried quite comfortably in pocket, **18/9** each.

HENLEY SOLON SOLDERING IRONS
65 watt, with oval bit, **29/-** each; 65 watt, with pencil bit, **30/8** each; 25 watt, instrument model, **24/-** each.
All spares available from stock.

CATALOGUE
OUR 1962 CATALOGUE IS NOW AVAILABLE. PLEASE SEND 1/- IN STAMPS FOR YOUR COPY. TRADE CATALOGUE ALSO AVAILABLE, FOR WHICH PLEASE ATTACH YOUR BUSINESS LETTER HEADING.

TERMS: Cash with order or C.O.D. Postage and Packing charges extra; as follows: Order value 10/- add 1/3; 20/- add 1/9; 40/- add 2/6; £5 add 3/6 Minimum C.O.D. fee & postage 3/-. For full terms of business see inside cover of our catalogue. Personal Shoppers 9 a.m. to 5 p.m. Mon. to Friday; Saturday 10 a.m. to 1 p.m.

ALPHA RADIO SUPPLY CO

103 LEEDS TERRACE
WINTOUN STREET
LEEDS 7

ADDING COMMUNICATIONS FEATURES

TUNING AND BAND CALIBRATION

By F. G. Rayer

(Continued from page 217 of the July issue)

A SUITABLE R.F. stage is shown in Fig. 9. C1 and C2 are two sections of the tuning condenser, and a 3-gang component will now be wanted, the remaining section being used for the oscillator, as in Fig. 7 (July issue).

C3 is a panel operated aerial trimmer. It allows slight changes caused by the aerial to be corrected, and allows accurate trimming on all parts of each band. It also avoids the need for trimmers across each coil in the aerial circuit, though these can still be fitted, if preferred. To trim such a circuit, set C3 at about half value, and adjust the pre-sets C4 and C5, and those connected to the oscillator coils, for best results. Subsequently, when listening to very weak stations, or after any changes to the aerial circuit, C3 may be adjusted by means of its control knob, for best reception. Many expensive communications sets have such a panel aerial trimmer. A capacity of about 50pF will usually suffice.

Fig. 9 incorporates a potentiometer or variable resistor for R.F. gain control. This is practically essential for some purposes — as when receiving C.W. with the AVC switched out of action. It is, of course, panel mounted, with a control knob.

Assuming that unit coils are fitted, three coils will be wanted for each waveband. To avoid ganging difficulties, it is wise to obtain aerial frequency-changer and oscillator coils in matched sets, from a single maker. The oscillator coils must be for the I.F. which will be employed—usually about 465kc/s, unless a double superhet is in view.

For the R.F. and F.C. circuits shown, the wave-change switch will need six poles. A long switch with individual wafers will allow ample separation between R.F. and F.C. circuits and wiring. When all coils and trimmers are connected, any error in switch connections, or coils, may be difficult to reach. It is thus quite a good plan to connect the coils for one band only, and then to test the receiver. Errors can then easily be corrected, and other sets of coils added.

Tuning Arrangements

A high quality tuning drive, or bandspread tuning, is desirable. The latter has attractive features, and can be provided by wiring a low capacity condenser in parallel with the main tuning condenser, as in Fig. 10. For general purposes, the bandspread condenser can be of about 15pF to 30pF maximum capacity.

If the usual gang condenser is 500pF per section, and the bandspread condenser is 25pF per section, 180° rotation of the latter will equal about 9° of rotation with the 500pF condenser. This greatly simplifies tuning any narrow band of frequencies, and also makes a high-ratio reduction drive unnecessary.

Connections between the two condensers should be short and direct, and small ball drives can be fitted to both. Bands can be accurately calibrated as described later.

Some wide coverage communications receivers employ gang condensers of 500pF each section. But if most interest is in the S.W. bands, a lower

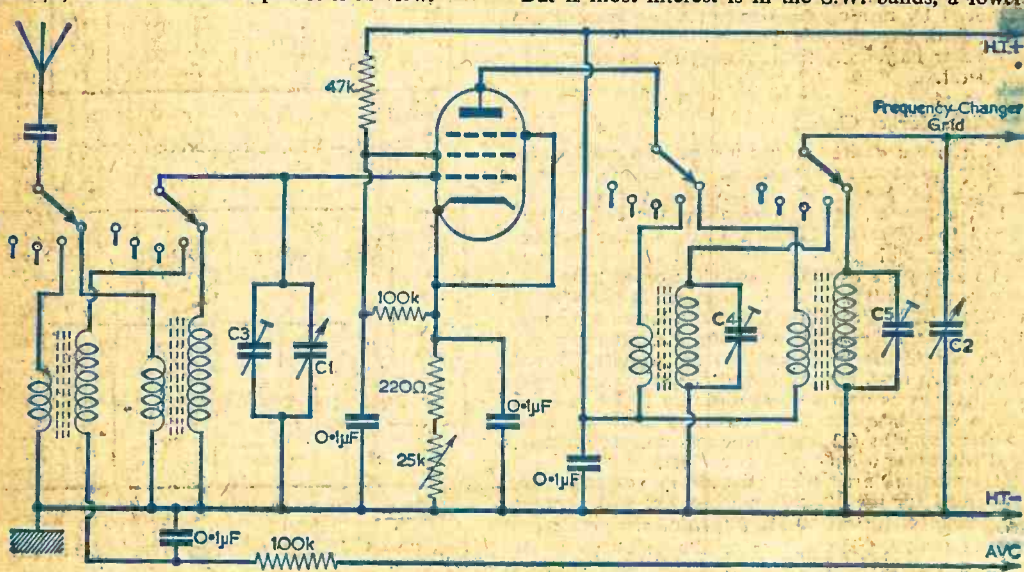


Fig. 9.—An R.F. stage with panel trimmer.

capacity, such as about 300pF each section, will be slightly better. An extra set or so of coils will be needed, but the L/C ratio will be more favourable.

Various high quality drives which give a form of mechanical bandspreading are also available. One of these will be very useful when much listening is done on various narrow frequency bands, and when an arrangement like that in Fig. 10 is not provided.

Band Calibration

Accurate band calibration is an extremely useful feature, and is most easily achieved by using a calibration marker. A 100kc/s crystal controlled oscillator for this purpose is shown in Fig. 11. This can easily be constructed as a separate unit, and power can be drawn from the receiver. Some very high-grade communications sets already have such an oscillator.

The 100kc/s oscillator will provide marker signals at 100kc/s (0·1Mc/s) intervals. These signals will be audible up to 15Mc/s to 30Mc/s or so, according to receiver sensitivity. It is thus only necessary to tune slowly down through the bands, and mark the dial each time the signal is heard. Identification of the particular harmonics can easily be made by counting from any known station frequency, such as the National Physical Laboratory transmissions on 2·5Mc/s, 5Mc/s and 10Mc/s.

To permit an extremely high degree of accuracy, the marker can be tuned to zero beat with the BBC Light Programme (200kc/s) or with one of the NPL signals. The 100pF trimmer is for this purpose. Output is taken to the receiver aerial terminal. For accurate tuning of the receiver to the marker harmonics, the BFO should be working.

With a separate bandspreading condenser, an extremely high accuracy in logging can be achieved by turning the bandspreading control to zero, setting the large condenser to zero beat with a marker harmonic, then turning the marker and BFO off.

Another Marker Circuit

If it is not desired to use a crystal, a somewhat similar result can be achieved by making up the oscillator in Fig. 12. Spares can be used for this. C1 is a pre-set, and should allow the coil to be tuned to 200kc/s. C2 is a small vernier tuning condenser, with knob.

To adjust the oscillator, switch it on at least ten minutes in advance, and tune in the 200kc/s (1500m) Light Programme. Reduce signal strength by removing the aerial, or using a short piece of wire. Set C2 at half capacity, and adjust C1 to about zero beat. C2 can then be adjusted until the oscillator is as nearly as possible on 200kc/s. The audio tone heard in the receiver speaker will fall in frequency as C2 approaches its correct setting, and will cease when tuning is correct.

Harmonics are then tuned in exactly as described for the 100kc/s marker, but will appear at 200kc/s (0·2Mc/s) throughout the receiver tuning ranges. The oscillator should be checked against the Light Programme signal at frequent intervals, and C2 adjusted as necessary.

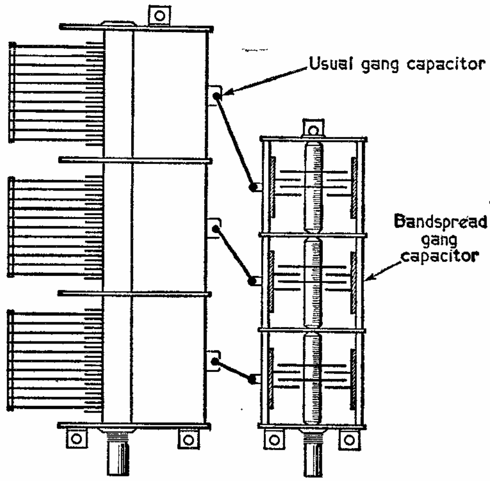


Fig. 10.—A low capacity condenser for bandspread tuning.

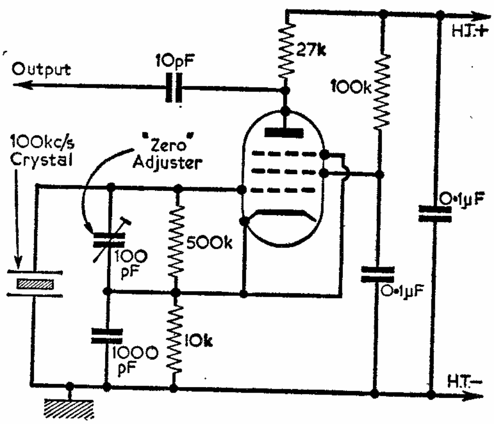


Fig. 11.—A 100kc/s calibration marker.

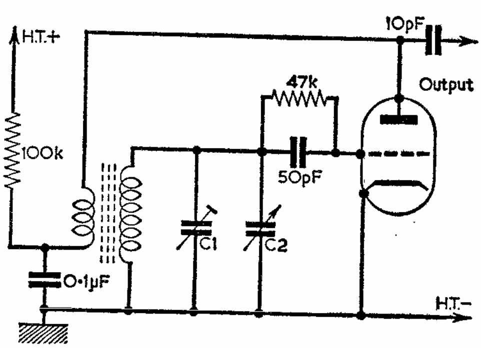
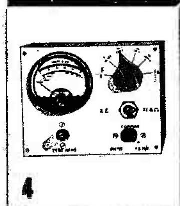
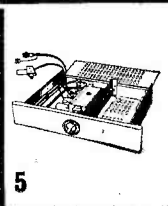


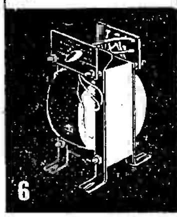
Fig. 12.—A 200kc/s secondary standard marker.

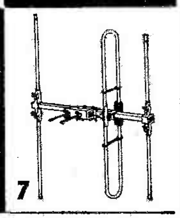
(To be continued)

CHECK with these BARGAINS



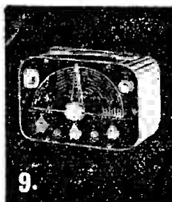


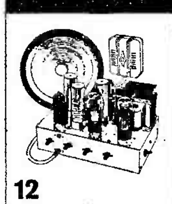




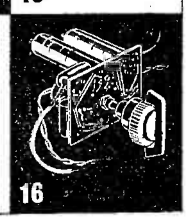
EASY TERMS AVAILABLE EXCEPTING AUTO-CHANGES

1. **3-TRANSISTOR POCKET RADIO with MINIATURE SPEAKER, FERRITE ROD. and 2 GERMANIUM DIODES.** The only 3-transistor radio available at the price. Build it in 1 evening! Tunable over M/L waves. Complete with easy-to-follow instructions and all components (less batteries obtainable anywhere 1/3.). **27/6. P. & P. 2/-.** (All parts available separately.)
2. **3-TRANSISTOR SUPER POCKET RADIO with MINIATURE SPEAKER.** Plus Germanium Diode and Printed Circuit. Size 3½ x 4 x ⅞in. 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. **OSCILLOSCOPE 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. **£15.15.0, P. & P. 7/6 or 30/- deposit, plus P. & P. 7/6 and 12 monthly payments of 26/6. 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 1 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.** 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/-, 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 100 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. CW. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy ± 2 per cent.





SATISFACTION GUARANTEED OR MONEY REFUNDED



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 4½in. 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.** 45 r.p.m. "Star" motor "Acos" crystal pick-up, 3 transistor push-pull amplifier complete with transistors. Output 500 milli watts, **49/6, P. & P. 3/6.**

12. **8-watt PUSH-PULL 5 VALVE AMPLIFIER.** A.C. mains 200-250 v. Size 10½ x 6½ x 2¼in. 5 valves. For use with all makes and type of pick-up and mike. Negative feedback. 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 Std. or L.P. records, musical instruments such as guitars, etc. Suitable for small halls, **£3.19.6, P. & P. 8/6.** Crystal mike to suit **15/-, P. & P. 1/6.** 8in. P.M. Speaker to suit **12/6, P. & P. 1/6.**

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 4⅝in., below baseboard 2⅝in. Fitted with Ful-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 4½ x 3¾ x 1½in. 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.**

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

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

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

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 commerical 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 the cover.

PHONETIC ALPHABET

SIR,—I am a keen short wave listener and have spent many happy hours on the 40m amateur band. Lately, however, I find it increasingly difficult to recognise the call-signs, given both before and after the QSO. This is, I believe, the result of the amateur using a code known only to himself.

The task of the operator and the listener would surely be simplified if the current phonetic alphabet was made standard and included in the R.A.E. examination.—P. A. ELLIS (Windsor).

DAMAGE TO TRANSISTORS

SIR,—Whilst considering the damage caused to transistors through reversed polarity, I recalled the function of a diode—to allow a current to flow in one direction only—and look forward to the time when we shall see germanium, or perhaps silicon diodes which have an extremely low forward resistance, but a sufficiently high resistance to prevent reverse current from damaging the transistors. The diode could be incorporated into the positive line, acting as a fuse. — B. FORHEAD (Cobham).

TRANSISTOR SET RECEPTION

SIR,—May I add to the remarks of Mr. James (June issue) about the small portables on sale for a few pounds. I maintain that locality is all important and, in fact, have proved this to myself.

At the moment I am experimenting with a three transistor set. It uses only four components (including the tuning system) and is capable of good reproduction over a small dynamic speaker. Last year I had a similar model in use on the Norfolk Broads when many stations were received, including some European broadcasts; but when used in the North West of England its performance was much worse.

I am, I think, one of your oldest readers and I have, like Thermion, used mangle rollers and bell-wire to read, in morse, the weather report from Poldhu.—G. W. PHILLIMORE (Cheshire).

SIR,—I thoroughly agree with what Mr. James said about portable radios working well in some parts of England and not in other districts. I constructed a transistor portable radio and received Home, Light, Luxembourg, Third and foreign stations in Birmingham; but when I made a visit to Nottingham, only 50 miles away, no signals at all were picked up.

I wonder if any reader could explain the following query? I recently bought an amplifier that had a built-in loudspeaker. I plugged it into the mains, and by accident the aerial lead-in touched one of the input wires of the amplifier. Then, quite suddenly, the Light Programme came through the loudspeaker as a strong signal. This amplifier now serves as an excellent Light Programme receiver.—B. N. JOYCE (Birmingham 31).

FRENCH TELEVISION RECEPTION

SIR,—With reference to Mr. Forsyth's query (June issue) on the reception of French TV sound on 355m; it is most unlikely that the sound could be heard on medium waves. What I think this reader heard was the medium wave station at Nancy on 358m, which carries the France II network. It is very probable that this service was relaying the sound from the TV programme at that period.—R. PATRICK (Derby).

BBC TELEVISION RECEPTION

SIR,—In reply to Mr. Shucksmith's letter, in the June edition, who receives BBC television on 3·5Mc/s in the 80m band; I receive ITV television on the same frequency.

The reason is that a signal is being emitted from the I.F. stage of a television receiver. It is impossible for these to be the actual signals from the television transmitters, as BBC TV is about 6Mc/s and ITV is about 1090Mc/s. — W. B. BICKHAM (Trull, Somerset).

SIR,—Like Mr. Shucksmith (June issue) I have also received BBC television on the 80m band. I believe that the signal is being emitted from a nearby TV receiver, for when the television is on in my own home, the signal is fairly strong, but when switched off it is very weak. Furthermore, this set has an external ITV converter, and when this is turned to ITV, this signal can be heard.—R. J. BOWSER (Luton).

YOUNG ENTHUSIASTS

SIR,—I read in the June issue that you would like to hear from young enthusiasts. I made my first set when I was eight years old. This was the simplest crystal set, but soon I added a two valve amplifier to it, using HL2 and KT2 valves. I followed this with a five-watt amplifier, based on a Roding circuit using two 6C4 and one 6V6 valves, to use with an A.M. tuner. I next made another of these amplifiers and built them both into a stereo radiogram, which used a home-made pick-up arm. I have since constructed many pieces of equipment, including several P.W. designs. I am fourteen years old.—J. FISHER (Finchley).

CORRESPONDENTS WANTED

SIR,—I am 18 years old and am very interested in radio as a hobby. I hope to become an amateur transmitter in the near future and would like to correspond with any other amateurs. I will answer all letters received. — V. N. SURENDRAN (Karithala -X-, Ernakulam, Kerala State, India).

SIR,—I am 16 years old and am very interested in radio construction and amateur radio. I would like to correspond with radio enthusiasts of my own age.—C. F. HILLON (18 William Road, Haydock, St. Helens, Lancashire).

UNMARKED COMPONENTS

SIR,—I have recently decided to take up home construction again, and am annoyed to find that the hobby still seems to be back in the 20's. In those days I seem to remember there were continual notes in your pages about manufacturers marking components with the maker's name and value. This particularly applied to variable condensers and such items, but to-day I find that these parts are still without any indication as to value. It seems to me that it is more important to-day that these markings should be conspicuous as the components are so much smaller and are available in various types. The spacing and the size controls the capacity and one cannot therefore look at it and say that's a two-gang 0·0003μF, for instance, and as some two-gang units have the two sections of different capacities one is in the dark when the box in which it is bought is thrown away. The colour-code is all right so far as it goes, but I have found so many components which carry no identification — transistors included. — R. W. ENTWISTLE (York).

POWER SUPPLY

SIR,—The present tendency to use "A.C./D.C." techniques in all mains apparatus seems to me very bad, not only from the point of view of efficiency but also from the safety angle. How can a manufacturer justify a "live" chassis when the slight extra expense of a mains transformer will make the set safe? I believe the reason this is now being done is because there have been several cases of fire arising from the use of a main transformer with wire of too low a current-carrying capacity. To me this is as bad as using the live chassis arrangement, and I would have thought that the I.E.E. or some other body would have introduced a regulation making it illegal to use this type of construction in domestic equipment. The service engineer may know how to handle this type of equipment but in these days of "do it yourself" too many householders are likely to try and put a fault right, with disastrous results.—R. E. BENNETT (Wolverhampton).

Phase Splitters and Phase Reversers

(Continued from page 322)

The unbalance mentioned above is not normally too large if the circuit is to be used in an oscilloscope amplifier. The supreme advantage of the cathode coupled phase splitter for use in oscilloscope amplifiers is that the circuit can easily be modified to function without any coupling condensers or transformers whatsoever. Such a circuit can be used to amplify the very low frequencies—or even D.C. itself—which are sometimes involved in oscilloscope work. The circuit is not very susceptible to jitter or hum owing to any H.T. fluctuations; the distortion is fairly low and there is practically no tendency to oscillate. For oscilloscope work involving no frequencies below about 50c/s, however, one of the circuits shown in Fig. 7 may be found more convenient, as they give about twice the gain. The cathode follower phase splitter is not normally used in oscilloscope work unless it is followed by a push-pull stage, as the maximum output voltage is too small.

A typical oscilloscope amplifier which will function from D.C. to above the highest audio frequencies is shown in Fig. 10 (page 322). The potential divider resistors between the input and the EF86 valve (V1) attenuate the input voltage to a suitable value for feeding into the amplifier. These resistor values can be chosen to meet individual requirements. There is some negative feedback across the cathode resistor of V1, but in any case the use of a cathode bias condenser is not advisable if the amplifier is to be used for low frequency work.

The valve capacities reduce the high frequency response of the circuit. The high frequency response could be improved by the use of smaller anode resistors, negative feedback and compensating condensers or chokes. Arrangements must, of course, be made to ensure that the final anode of the cathode ray tube is at approximately the same voltage as the mean deflector plate potential.

Gain

If a signal voltage of amplitude 10 to 20mV is applied to the input of the Fig. 10 circuit, the gain is sufficient to give a reasonable deflection on a 3in. cathode ray tube. Care must therefore be taken during the construction of the amplifier to ensure that unwanted pick-up is avoided.

A further advantage of the cathode coupled phase splitter in the output of an oscilloscope amplifier is that the grid of V2(b) in Fig. 10 can be supplied with a D.C. voltage from a potentiometer for the Y-shift. Cathode coupled circuits can be used in cascade without condenser coupling.

Summary

High fidelity audio amplifiers normally use one of the circuits in Fig. 7, especially if economy is important. The circuits of Figs. 2 and 3 (July issue) give rather better balance, but an extra stage is normally required. The circuit of Fig. 4 (last month) gives high gain. Oscilloscope amplifiers for use at D.C. or low frequencies use the cathode coupled phase splitter; otherwise they normally use one of the see-saw circuits. ■

RECEIVERS & COMPONENTS

TRANSISTORS BRAND NEW. Mullard OC81D 2 OC81MAT **30/-**. Newmarket set of 6 + 1 diode **45/-**; Red spot **3/6**, White spot **4/-**, Green/Yellow **4/-**, Yellow/Red **6/-**, Diodes general **10d.**, GEX34 3/3, OA81 3/3, Miniature cap 2/3 ea. Rectifiers RM5 **12/6**, SM5 **13/6**. All postage paid by CHAPPLE RADIO, 107 Neasden Lane, N.W.10.

SPEAKERS — ELAC 5in., 3 ohm; 12 **£5**; 50 **£17**. C HEYWOOD, The Croft, Ladybrook Rd, Bramhall, Ches.

"WEYRAD" TRANSISTOR RECEIVER

LONG & MEDIUM WAVE, P.P. O/P. ALL COMPONENTS AVAILABLE TOTAL COST £8.5.6. CONSTRUCTOR'S BOOKLET 2/-.

TRANSISTOR AM FEEDER UNIT, SUPERHET AVAILABLE NOW. Size 4¼ x 3 x 1¼in. TOTAL COST OF COMPONENTS £5.10.0. CONSTRUCTOR'S BOOKLET, 1/9. Send S.A.E. for Shopping Lists. **35 OHM ALLAN SPEAKERS, 27/1. JACKSON "OO" GANG (with Trimmers), 10/6.**

WESTHAM RADIO SUPPLIES
Rear of 176 Abbotsbury Road
WEYMOUTH, DORSET

" HEATHKITS " can now be seen in London and purchased on easy terms. Free brochure. DIRECT TV REPLACEMENTS LTD., Dept. PW/7/7, 138 Lewisham Way, S.E.14. Tideway 6666.

COMPONENTS, VALVES, Tubes, etc. Write or phone for free list. ARION TELEVISION, 4 Maxted Rd., Peckham, S.E.15. (New X 7152).

SPEAKER REPAIRS. Cones/Fields fitted. Clock Coils Wound. L. S. REPAIRS, Pluckley, Ashford, Kent.

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

In Scotland . . . .

RENVUE

for Better Value

COMPLETELY REPROCESSED TUBE
(NEW GUN, RESCREENED, ALUMINISED)

12.6v and 6.5v, 0.3 amp, 17 and 15in. Types ...	**£6.10.0**
12.6v and 6.5v, 0.3 amp., 14in. Types	**£6. 0.0**
12v, 15in. Types	**£7. 0.0**
2v, 12 and 15in. Types ...	**£6. 0.0**

Electrostatic 90 degree and 110 degree tubes 10/- extra. Carr. paid.

10/- ALLOWED ON OLD TUBE
Terms arranged.

FERGUSON

14in. BBC and STV Consoles ...	**£12.10.0**
14in. BBC and STV Receivers ...	**£10.10.0**
17in. BBC and STV Receivers ...	**£19. 0.0**

COMPLETELY OVERHAULED AND FITTED WITH COMPLETELY REBUILT TUBE
with One Year's Guarantee

£5 Deposit. Terms on Balance

Renfrew Electronics Ltd.
Anderson Drive
Renfrew : Scotland
Tel.: Renfrew 2642

RECEIVERS & COMPONENTS
(continued)

TRANSISTOR BARGAINS

EVERYTHING FOR THE FAMOUS **WEYRAD**
Kit now only **£9.19.0d.** plus 3/6d. P. & P.

- ★ Top grade components guaranteed.
- ★ 6 Transistor Superhet circuit.
- ★ 7" x 4" speaker, 500 mw. output.
- ★ Beautiful leatherette covered case.
- ★ NO EXTRAS TO BUY.
- ★ All parts available separately.

Descriptive book with circuit **2/-** P. & P. 4d.

TRANSISTORS
Red Spot 3/-; White, 3/9; Yellow (6 volt), 2/3; Yellow/Green, 3/9; Red/Yellow, 5/-; STC/TS1 (OC71), 4/3; TS17 (OC72), 6/- each P. & P. 6d.

EDISWAN
XA101, 102, 103, 104, 9/- each. XB102, 103, 104, 8/- each. XC101, 10/-, or complete set with diode 52/6; P. & P. 6d.

NEWMARKET
NKT152A (OC44), 10/-, 153A (OC45), 8/6, 252A (OC71), 5/6, 253A (OC74), 6/9 each, or complete set with diode for 43/-, P. & P. 6d.

MULLARD
OC16, 21/-, OC170 (up to 100 Mc/s.), 13/6, OC81D, 6/9, OC81, 8/-. P. & P. 6d.
Condensers, Sub-Miniature, 1, 2, 4, 5, 8, 10, 16, 30 and 50 mfds. at 2/3 each P. & P. 3d.

TRANSISTOR TRANSFORMERS
1 : 1 C.T. Sec., Driver, 10/-; 6.6 : 1 C.T. Prim Output, 9/-; 3.6 : 1 plus 1 Split Sec. Driver, 11/9; 9.2 : 1 Output, 8/-. P. & P. 6d.
Headphones for Crystal Sets, 12/6 (light weight). P. & P. 1/-.
Sub-Miniature Jack Plugs and Sockets 3/6 pair. **Slider Wave Change Switch, 2/6. Transistor Holders,** 1/-. P. & P. 3d.

SPEAKERS
2½in. E.M.I. 3 ohm, 17/11, 15, 35, and 80 ohm, at 19/6. Elliptical 7 x 4, 35 ohm, 25/-. 3 ohm 8in., 15/-, 10in., 29/-, 12in., 45/-. P. & P. 1/6.

SOUND VISION
137 MOULSHAM STREET,
CHELMSFORD - ESSEX

DENBY'S ELECTRONICS

CAPACITORS
16 µF 700 v. D.C. (electrolytic)......3/6
4 µF 1200 v. (Paper)......................4/-
1 + 1 µF 250 v. 1¾ x 2 x ¾in.................6d.
T.C.C. Metalmite 0·1, 0·05, 0·02, 0·01, 0·005, 0·001 µF, 350 v. D.C..........9d. each
6/6 doz. your selection. 45 pF silver mica 3d.

TWIN SCREENED FLEX (grey). Only ⅛in. diam. for record player pick-up leads, etc. 8 lengths, 22-in. long............1/-
FLEX (black). 7 strands 36 s.w.g., $\frac{1}{16}$in. diam., 31in. long, 8 lengths for 6d., 40 for 2/-.

TWIN FUSEHOLDERS (enclosed type), holds two standard 1¼in. fuses "knockouts" for surface or concealed wiring .... 1/6 each

POTTED CHOKES

75 H	40 mA	1800 ohms	5/-
15 H	110 mA	510 ohms	7/6
11 H	60 mA	180 ohms	4/-
9 H	200 mA	275 ohms	10/-
4 H	350 mA	120 ohms	11/-
4 H	170 mA	150 ohms	9/-

VARIAC TRANSFORMER, Primary 200-240 v., secondary 220 v. 7·5 amp....70/-
Orders below 5/-, postage 9d. extra.
Send S.A.E. for List.

"HILLSIDE", COLDSHAW, HAWORTH, KEIGHLEY, Yorks.

6in. Dia. (yes—six inch) **Milliameters** 0/1 fl. round Ernest Turner **79/-** (3/6). **2½in. Dia. Voltmeters** 0/500 fl. round Weston 1000 ohms per volt, **47/6** (2/6). **Special Valves** 4/250A **£8.10.0**: QY3/125 **£6.10.0**: 4212 **£4. Simpson Model 443** Volt-ohmeters 2½ in. meter in case **£3.10.0** (5/-). **Metal Rectifiers** 24 v. 12A **20/-** (3/6).

40 PAGE LIST OF OVER 1,000 ITEMS IN STOCK AVAILABLE—KEEP ONE BY YOU.

Wide Band Aerial Amplifiers, ten separate outlets from one aerial rack mounting **£9.10.0** (7/6). **Pocket Radioactive Dosemeters,** quartz fibre fountain pen type **25/-** (1/-), reduction for quantities. **5 Foot P.O. Racks** 19in. wide drilled and tapped **65/-** (10/-). **Elliott** 0/½ volt moving coil **Voltmeters** 2000 ohms per volt, 2½in. dia; ideal as basic meter **25/-** (2/6). **Mains Filter Units.** laboratory precision type totally enclosed 2½ amps. **10/-** (2/6). **Sigma** 10,000 ohms SPDT Relays **12/6** (1/6). **Metal Rectifiers** 24 x 12A **20/-** (3/6). **AVO Geiger Counters £9.10.0** (5/-). **Bendix 6ft. enclosed Transmitter Cabinets,** 19in. wide **£5** (20/-). **P.O. Racks** 19in. wide, 3ft. high **£2** (10/-). **Metal Rectifiers** 12 v. 1 amp **5/-** (1/6). **20 Foot** Super Lightweight Aluminium Tripod self supporting 1½in. dia. **Masts,** complete, 7 lbs. weight **£10.10.0** (30/-).

We have large quantities of "bits and pieces" we cannot list—and invite your enquiries—we can probably help—every one answered.

Amounts in brackets are carriage England and Wales.

P. HARRIS, ORGANFORD, DORSET.

KINGSLAND ELECTRONIC COMPONENTS

Stupendous Offers

1958 ELECTRONIC COMPONENTS

Potentiometers in banks of four fixed on grey stove enamelled plate 1¾ x 6¼ inches easily detachable, **4/6**, p. & p. 1/9.

1¼in. cartridge fuse holders screw cap type mounted on grey stove enamelled plate approx. 1⅝in. wide with perspex cover in banks of three, four and five. **3/6, 4/6, 5/6,** p. & p. 1/9.

Try our surprise pack of accessories, if not satisfied return within seven days and money will be refunded, **7/6**, p. & p. 2/6.

6 assorted voltage droppers, **5/-**, p. & p. 1/6.
100 assorted condensers, **6/-**, p. & p. 1/9.
Instrument Rectifier with circuits, **5/6.**
6 volt or 12 volt vibrators, **3/6** each p. & p. 1/6.
Mike and pick-up transformers ideal for baby alarms, **4/6**, p. & p. 1/-.
6 assorted potentiometers, **5/-**, p. & p. 1/9.
50 assorted resistances and condensers, 6 miniature valve holders, 2 tag strips, 40 separate contacts each **3/9**, p. & p. 1/9.

182 KINGSLAND RD., SHOREDITCH, E2. *Tel: SHO* 6572. *Sorry, U.K. only.*

RECEIVERS & COMPONENTS
(continued)

GUARANTEED VALVES from **1/-**. Radio, TV components. Transistor set Kits from **10/-**. S.W. Kit **22/6**. List 3d. HAMILTON RADIO (W), 13 Western Rd., St Leonards, Sussex.

RECLAIMED VALVES, tested and perfect; huge stocks; all one price, **5/-** plus 6d. postage each. Delivery by return. LEWIS, 46 Woodford Ave., Ilford, Essex.

VALVES 100%. Most types, all **3/6**, inc. postage. BOWMAN, 18 Plunket Rd., Wheatley, Doncaster.

NEW AM/FM STEREO

- INPUTS FOR TAPE, 78's, etc.
- MW—LW—VHF
- PUSH-PULL OUTPUTS—16W
- SEPARATE TONE AND VOLUME
- INTEGRAL PREAMPLIFIER

BEL, Marlborough Yard, London N.19
Arc 5078

RESISTORS—100 new, wire ended, assorted, all types, **7/6** box, post free. COOK'S OF BEDFORD, 29 St. Mary's Street, Bedford.

STOCK SALE. Lists 2d. Mail only.—98 Greenway Avenue, E.17.

BARGAINS
Push-Pull Amplifiers, £2.15.0, less valves; **£4** with valves. Brand new. 200-240 A.C. bass, treble and volume controls on flying panel. Valves EZ80, ECC83, two EL84, giving 8W output. Size 12 x 3¼ x 3¼in. O.P. Trans. 2-3 ohms. Suitable for Crystal Mike input. P. & P. 3/6 extra.
Brand New 12in. **TELEVISION TUBES**, ONLY **£2.10.0.** P. & P. 5/- extra. Same day despatched.
MILES, RADIOVISION
NEWTOWN, WICKHAM, HANTS.
Phone: Wickham 2156

FOR SALE

INDEPENDENT 200/240 volt electricity supply for only £8. American Dynamotor Unit, runs Television, Electric Drills and all Universal AC/DC Mains Equipment from 12 volt car battery. Cost £40, our price £8. — S.A.E., full details. Scientific Products, P., Cleveleys, Lancs.

TRANSISTOR PORTABLE Recorders, complete with all accessories, 15 gns. Studio Recorder, 3 speeds, 7 in. reels, superimposing magic eye, 28 gns. Collaro Studio Tape Deck with Bradmatic heads, £11.10.0 Tape Amplifiers, £8.10.0. Professional Grade Tape: 7 in. spools, 1200 ft. **20/-**, 2100 ft. **35/-**; 5¾ in. spools, 850 ft. **17/6**, 1200 ft. **20/-**. AM/FM Stereophonic Radiogram Chassis, 21 gns. Latest Collaro C60 Autochanger, **£7.15.0.** Collaro 4-speed Turntable and Pickup, 3½ gns. High quality Crystal Microphones, **21/-**. Jack Plugs **2/6**. Jack Sockets **1/6**. 7 in. x 4 in. Speakers **10/-**. Satisfaction guaranteed.—RADIO SERVICE CENTRE, 10 Hatter Street, Bury St. Edmunds.

"AVO" VALVE TESTER for sale, £7. —24 Haselbury Road, Edmonton.

PETERBOROUGH! Suffering from BBC interference? Our Channel 5 rejector gives 40dB attenuation of unwanted signal at ITA aerial socket. 10/- post free!—Ajax Electronics, 572 Fulham Road, London, S.W.6.

FOR SALE
(continued)

100 BAYS of Brand New Adjustable Steel Shelving, 72in. high x 34in. wide x 12in. deep; stove enamelled dark green, sent unassembled. Six shelf bay **£3 15s.** Sample delivered free. Quantity discounts. N. C. BROWN LTD., Eagle Steelworks, Heywood, Lancs. Tel: 69018.

VHF UNIT. Ready built Front End F.M. unit. Coverage 85-100Mc/s, I.F. 10.7Mc/s. Single valve (ECC85). Price, including circuit and data but without valve, **£2.12.3**, plus 2/- postage.
VHF TUNER UNIT. Ready built without dial and valves. Price, including circuit and data. **£6.16.0**, plus 3/6 postage. Delivery ex stock.
(DEPARTMENT E/2)
ROTOPONS LIMITED
54 BEDDINGTON LANE, CROYDON, SURREY.

ASK your dealer for American Ferro-dynamics. "Brand Five" Recording Tapes—the best tape value!

FERROGRAPH 2A Tape Recorder, £25.0.0.—Radio Development, Queen Street, Belfast.

WANTED

A PROMPT CASH OFFER for your surplus Brand New Valves, Speakers, Components, Test Instruments, etc. R.H.S., 155 Swan Arcade, Bradford 1.

WANTED VALVES
All types for prompt cash. Must be new. State quantity.
WILLIAM CARVIS LTD.
103 North Street, Leeds 7

NEW VALVES bought, state price. A. D. A. MANUFACTURING CO., 172 Alfreton Road, Nottingham.

WANTED: Service Sheets. No quantity too large. Highest prices paid. SULTAN RADIO, 29 Church Road, Tunbridge Wells, Kent.

NEW VALVES WANTED
Any type, any quantity
CASH PAID
R.S.T. 211, Streatham Road, Mitcham, Surrey.
Telephone: MITCHAM 6201

SOUND RECORDINGS

RECORDING TAPE, save up to 30% send for list; also 50 second-hand recorders in stock.—E. C. KINGSLEY AND CO., 132 Tottenham Court Road, London, W.1. EUS 6500.

PRIVATE GRAMOPHONE Records made from your own recorded tape. Weddings, Choirs, Greetings records, etc. LP's from **17/6**. S.A.E. SOUND SERVICES (Dept. 2), 28 Viewforth Terrace, Sunderland. Tel: 57032.

LINE OUTPUT TRANSFORMERS
SCAN COILS SPECIALISTS

Makes	*Models*	*Prices*
ACE:	Spares available.	
ALBA:	T301, T304, T394, T484,	
	T494, etc.	39/6
AMBASSADOR:	Spares supplied.	
ARGOSY:	Most models available.	
ARMSTRONG:	Spares supplied.	
BAIRD, BANNER, BEETHOVEN:	Spares supplied.	
BUSH:	TV11A, 11B, 12A, 12B,	
	TVG12A, 12B, TRG12A, 12B	45/-
	TVG26, TV32, TV33, TVG34	
	TVG34A, T36, TV36, TVG36	
	TV36C, VTG36C, TV43 ..	89/6
	TV53, TV56, T57, TV57,	Rew'd
	TVG58, TV62, TV63, TV66,	only
	TV67, etc.	69/6
COSSOR:	930 & T, 931, 933-4-5, 937,	
	938A & F, 939 & A & F ..	59/6
	943T, 940-946, 945, 945B, 949	69/6
CHAMPION, COLUMBIA:	Spares supplied.	
DECCA:	D17 & C	69/6
	DM1, DM2C, DM3, DM4/C..	65/-
	DM5, DM14, DM17, 444, 555	65/-
DEFIANT:	TR1453, TR1753	59/6
DYNATRON:	Spares supplied.	
EKCO:	TS93, TCS102, TS105, TS114	
	TRC124, TC138, TS188,	
	TS193	55/-
	TRC139, TC140, T141, TV142	47/6
	T161, TC162, T164, T165, etc.	47/6
	TC208, TV209, T231, T221,	
	T231F, T248, T283, T284,	
	T293, etc.	55/-
ENGLISH ELECTRIC/ETRONIC.	Spares supplied.	
FERGUSON:	103T, 105T, 113T, 135T,	
	145T	66/6
	941T-953T inclusive ..	59/6
	991T-997T inclusive ..	66/6
	203T-246T inclusive ..	69/6
	306T, 308T	65/-
FERRANTI:	14T3, 14T3F, 14T4	45/-
	17K3 & F, 17T3 & F. ..	45/-
	17K4 & F, 17SK4 & F. ..	45/-
	17T4 & F	45/-
	14T5, 17SK5, 17K5 ..	45/-
G.E.C.:	BT1251, BT1252, BT1746,	
	BT1748, BT4743	49/6
	BT4643, BT5147, BT5246-48	89/6
	BT5348-BT5643R inclusive	49/6
		and 89/6
H.M.V.:	1824 & A to 1831 inclusive..	67/6
	1840, 1841, 1842-1848 ..	67/6
INVICTA:	T118, T119, T120	55/-
	All other models available.	
K.B.:	LFT50, LVT50, LFT60,	
	MV60	107/6
	All models available, etc.	
MARCONI:	All models available.	
MASTERADIO:	All models available.	
McMICHAEL:	All models available.	
MURPHY:	V200, V202C	57/6
	V240, V250	95/-
PAM, PETO SCOTT, PHILCO:	All models available.	
PHILIPS:	1768U, 2168U	105/-
	All models available.	
PILOT:	All models available.	
PORTADYNE:	All models available.	
PYE:	CTM4, FV4C, FV4COL ..	55/-
	V4, VT4, V7, VT7	55/-
	LV30, FV1, FV1C	69/6
	CS17F, CTM17F, CW17 ..	69/6
	CW17C, CW17CF, CW17F,	
	etc.	68/6
	All models available.	
RAYMOND:	All models available.	
REGENTONE:	All models available.	
R.G.D.:	6017T, 7017, C54, etc. ..	59/6
	All models available.	
SOBELL:	TS17, T346	65/-
	All models available.	
STELLA:	ST5721U	105/-
	ST8617U, ST8621U, ..	105/-
	ST8917U	105/-
STRAD, TELEVOICE, TRUVIEW:	Available.	
ULTRA:	86 series, 815 series, with U25,	
	etc., complete	79/6
	All models available.	
VALRADIO:	Spares available.	
VIDOR:	CN4217-CN4231 inclusive..	65/-
WESTMINSTER:	Spares available.	
WHITE-IBBOTSON:	Spares available.	

Scancoils, Osc. and Output Txs. for all above makes available.
Post and Packing 2/6. **C.O.D. 3/- extra.**
All Enquiries S.A.E.

WYNDSOR TELEVISION
Dept. P.W.
St. ALBANS ROAD, BARNET, HERTS
BAR 1769

MISCELLANEOUS

STAN WILLETTS

43 SPON LANE, WEST BROMWICH
Tel. WES 2392.

178B ASTON ROAD, BIRMINGHAM
Tel. AST 2528.

TELEVISION TUBES, makers' 12 months' guarantee, £5.10.0 each, 20/- allowed on old tube, MW31-74, CRM141, CRM142, AW36-21, MW36-24, CRM153, MW43-64, MW43-69, CRM171, CRM172, C17FM, L7LK, 7041A, L72K, C17BM, £5.10.0, 20/- on old tube.

CRT TELEVISION TUBES, makers' 2 years' guarantee, MW43-69, MW438, AW4380, AW43-88. Carr. & Ins., 10/-.

TRANSISTORS, brand new, OC76 (OC71, OC72, OC78), 7/6, matched pair 17/6; OC44, 9/9; Green Spot, 2/9. Crystal Diodes, 10d., 7/6 per doz. P. & P. 4d.

CAR AERIALS, window fitting, 19/6; Wing scuttle or roof fitting, 19/6; 39 inches, heavy chrome on brass.

COAX CABLE (AERIAXIAL). Air spaced, 40 yds. for 18/6. P. & P. 1/-.

SPARK PLUGS for all types, 4 for 10/9, plus 1/- postage.

VALVES—BRAND NEW—Guaranteed. LR5, 1T4, 1S5, 3S4, 3V4, 4 for 19/6; DF96, DAF96, DK96, DL96, 4 for 26/-; 5Y3gt, 5/9; 6V6 6/6, 7Y4 7/6, 6X4 5/9, 12BE6 5/9, 30L15 8/9, 955 1/6, 6Sn7 5/-, ECC81 5/-, ECC82 6/9, ECC83 6/9, ECF80 8/6, ECH42 7/9, ECL80 7/9, EF41 7/6, EF80 5/-, EL84 7/9, EY51 7/6, EY86 8/6, PCC84 7/9, PCF80 7/9, PCL84 7/9, PY81 6/9, PY82 6/6, PL81 9/-, PL82 7/6, UAF42 7/9, UL41 7/9, UCH42 7/9, UCC85 6/9, KTW61 2/6, KT63 5/6, VR36 2/6, VR39 2/6, VR91 1/-, VR92 1/-, 6SN7 5/-.

URGENTLY WANTED—
NEW VALVES & TELEVISION SETS

PRINTED CIRCUITS to your design, sample 6d. sq. inch. Quantity reduction.—Scott, 114 Trentham Drive, Nottingham.

—YOU READ MUSIC?—

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes. It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing.

Write NOW for free leaflet and further details to C. & S., 20 Maude Street, Darlington, Durham.

SERVICE SHEETS

SERVICE SHEETS, Radio, TV, 5,000 models. List 1/-, S.A.E. enquiries: TELRAY, 11 Maudland Bk., Preston.

FAULTFINDER FILES, showing common faults that each receiver is prone to and other useful servicing information, 2/- ea. List 9d., plus postage. S.P. DISTRIBUTORS, 44 Old Bond Street, London, W.1.

SERVICE SHEETS. We have the largest stock of Radio and TV Service Sheets in the country for sale at 4/- each. Why tolerate delay in obtaining your supplies when we will dispatch by return? Service Sheet List 1/-. Also Maufacturer's Manuals for sale and hire, 1961 List now available, 1/-, S.A.E. please. Mail orders only to S.P. DISTRIBUTORS, 44 Old Bond Street, London, W.1.

38 SET WALKIE TALKIE
CIRCUIT INFORMATION

Alignment Procedure. Typical faults in Ex W.D. Sets. Components location diagrams. Circuit diagram. Complete Circuit description. Instructions for use, etc. P.O. 5/-. Address in block capitals, please.

CAMPBELL
Laundry Lane, Hungerford, Berks.

SERVICE SHEETS, Radio and TV 4/- each. List 1/-. All orders despatched on day received. Also manuals for sale and hire. S.A.E. please. SULTAN RADIO, 29 Church Road, Tunbridge Wells, Kent.

SERVICE SHEETS; also Current and Obsolete Valves for sale. JOHN GILBERT RADIO, 20 Extension, Shepherd's Bush, Market, London, W.12. (Phone: SHE 3052.)

SERVICE SHEETS (1930-1961) from 1/-, with free Fault Finding Guide. Catalogue 6,000 models, 1/-. 125 Radio/TV Sheets covering 370 popular models 20/-. S.A.E. enquiries, HAMILTON RADIO, Western Road, St. Leonards, Sussex.

SERVICE SHEETS from 6d. each. Manuals, sale, hire. S.A.E. DARWINS, 45 Shaw St., St. Helens, Lancs.

BOOKS & PUBLICATIONS

FIND TV SET TROUBLES IN MINUTES from the great book "The Principles of TV Receiver Servicing." 10/6 all book houses and radio wholesalers. If not in stock, from Secretary, I.P.R.E., 20 Fairfield Road, London, N.8.

EDUCATIONAL

COUNTY OF ESSEX
SOUTH-EAST ESSEX TECHNICAL COLLEGE
Longbridge Road, Dagenham

MARINE RADIO OFFICERS' COURSES

The College offers full-time courses of one or two years' duration leading to the 1st and 2nd Class P.M.G. Certificates and the M.O.T. Radar Maintenance Certificate.

Applications for enrolment should be made as soon as possible. Late enrolments may be considered up to 11th September, 1961. Officers possessing the P.M.G. 2nd Class or both 1st and 2nd Class Certificates may join the course at appropriate points to complete their qualification.

For further particulars apply to the Principal.

★ **LEARN** ★
RADIO & T/V SERVICING
for your OWN BUSINESS/HOBBY

● by a new exciting no-maths system, using practical equipment recently introduced to this country.

FREE Brochure from:—

RADIOSTRUCTOR

DEPT. G77, READING, BERKS. 8/61.

PLYMOUTH AND DEVONPORT TECHNICAL COLLEGE

TAVISTOCK ROAD
PLYMOUTH

Principal:
E. BAILEY, B.Sc., F.R.I.C., A.M.I.Chem.E.

RADIO OFFICERS' COURSES

FULL-TIME COURSES start in **September 1961** for P.M.G., Radio and M.O.T. Radar Maintenance Certificates.

Applications, giving particulars of previous education, should be made now to the Principal.

DIAMOND STYLI
DASCO
FOR DIAMONDS

Manufacturer's offer to users—send us your old stylus arm and we will retip with finest Transcription quality Diamond.
To ensure best reproduction every Diamond is inspected for **finish and radius** with 500 magnification.

FOR £1.0.0 ONLY

Or we will supply complete with any stylus arm for £1 5s. 0d. Tax Paid and will despatch within 48 hours of receipt, post free.

All Diamonds are Guaranteed for One Year
(Sapphires also supplied 4/6 Tax Paid)
Mail Orders to:—**Dasco, Frith Park, Tadworth, Surrey.**

SITUATIONS VACANT
(continued)

CITY AND GUILDS (Electrical, etc.) on "No pass—no fee" terms. Over 95% successes. For details of Electrical Engineering, Applied Electronics, Automation, etc., send for our 148-page handbook, free and post free. B.I.E.T. (Dept. 242A), 29 Wright's Lane, London, W8.

VACANCIES EXIST
in the
ADMIRALTY SURFACE WEAPONS ESTABLISHMENT EXTENSION
at
ROYAL NAVAL STORES DEPOT, COPENACRE, HAWTHORN, WILTS
for

ELECTRICIANS (RADIO)
and
ELECTRICAL FITTERS

Applicants for the former position should have at least five years' experience in the trade and for the latter must have completed a recognised apprenticeship.

The Establishment is located 8 miles from Bath. The work is interesting and varied, in modern test rooms and workshops, and is mainly concerned with the testing and modification of naval radio and radar equipment.

The commencing basic rate of pay is £9.18s.2d. for a five-day 42-hour week. In addition, new entrants are assessed for a meric award after three months' service and this award is back-dated to the date of joining. The intitial award may be up to 25/- per week and further awards up to a total of £3 per week may be granted. After a minimum period of service all employees are considered for establishment on permanent staff.

Admiralty employment confers certain benefits, including assisted travel, paid sick leave entitlement, paid public holidays, and a fortnight's paid annual holiday.

Recreation and welfare facilities are available.

Applications, in writing, should be addressed to the
**OFFICER-IN-CHARGE
ADMIRALTY SURFACE WEAPONS ESTABLISHMENT EXTENSION,
ROYAL NAVAL STORE DEPOT,
COPENACRE, HAWTHORN,
WILTSHIRE**

REPANCO

HIGH GAIN COILS AND TRANSFORMERS
for the
HOME CONSTRUCTOR

Send 6d. stamp for comprehensive List of
REPANCO COMPONENTS
and Easy-to-Build Receivers

RADIO EXPERIMENTAL PRODUCTS LTD
33 Much Park Street
Coventry
Tel. 27114

VALVES SAME DAY SERVICE
NEW! TESTED! GUARANTEED!

SETS		
	IR5, IS5, IT4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94 ..	Set 4 for 19/6
	DAF96, DF96, DK96, DL96	4 for 27/6
	6K7G, 6K8G, 6Q7G, 6V6G, 6X5G, or 5Y3G	5 for 24/6

1A7GT	11/6	6P1	13/6	35A5	14/-	ECC81	5/-	EZ80	6/3	T41	9/6
1D5	8/-	6P25	9/-	35L6GT	9/-	ECC82	6/3	EZ81	7/-	U22	7/3
1H5GT	10/-	6Q7G	6/-	35Z4GT	6/9	ECC83	7/-	FW4/500	8/-	U24	17/6
1N5GT	10/-	6Q7GT	9/6	35Z5GT	8/6	ECC84	8/9	GZ30	8/6	U25	13/-
1R5	5/6	6SL7GT	6/3	50L6GT	8/9	ECC85	8/3	GZ32	9/6	U26	10/-
1S4	8/-	6SN7GT	4/9	AC/TH1	16/9	ECF80	8/6	KT33C	7/-	U50	6/-
1S5	5/3	6U4GT	11/-	AZ31	9/6	ECF82	8/6	KT41	11/6	U52	4/6
1T4	3/6	6V6G	5/-	B36	8/6	ECH21	13/6	KT44	6/6	U78	4/9
1U5	5/9	6V6GT	6/6	CL33	12/3	ECH35	6/3	KT61	10/-	UABC80	7/9
3A5	9/-	6X4	4/9	DAC32	10/-	ECH42	8/9	KT63	6/6	UAF42	9/-
3Q4	7/-	6X5GT	5/-	DAF91	5/3	ECH81	8/-	MU14	7/6	UB41	8/6
3S4	6/-	7B6	9/-	DAF96	7/6	ECL80	7/6	MX40	9/6	UBC41	7/9
3V4	7/-	7B7	7/6	DCC90	9/-	ECL82	9/6	N18	7/-	UBF80	8/9
5U4G	4/6	7C5	7/6	DF33	10/-	EF39	4/6	N37	10/6	UBF89	8/-
5V4G	8/-	7C6	7/6	DF91	3/6	EF40	12/6	PC95	10/-	UC92	12/6
5Y3GT	6/-	7H7	7/6	DF96	7/6	EF41	8/3	PCC84	7/6	UCC84	12/9
5Z4G	7/9	7S7	9/-	DH76	4/9	EF42	9/6	PCC89	11/-	UCC85	7/6
6AL5	3/9	7Y4	7/-	DH77	6/9	EF80	5/6	PCF80	7/9	UCF80	14/-
6AM6	3/6	10C2	17/6	DK32	11/6	EF85	5/6	PCF82	8/-	UCH21	13/6
6AQ5	6/-	10P13	14/6	DK91	5/6	EF86	9/9	PCF86	14/-	UCH42	8/-
6AT6	6/9	12AT6	7/-	DK92	7/6	EF89	7/-	PCL82	9/-	UCH81	8/-
6BA6	6/-	12AT7	5/-	DK96	7/6	EF91	3/6	PCL83	11/6	UCL82	10/9
6BE6	5/9	12AU6	8/6	DL33	9/-	EF92	4/3	PCL84	7/6	UCL83	13/3
6BH6	5/9	12AU7	6/3	DL35	9/6	EF183	14/-	PCL85	13/6	UF41	8/9
6BJ6	5/9	12AX7	7/-	DL92	6/-	EL33	10/-	PENA4	11/-	UF85	8/6
6BW6	8/-	12K7GT	5/3	DL94	7/-	EL41	8/6	PEN36C	8/-	UF89	7/-
6CD6G	26/9	12K8GT	11/6	DL96	7/6	EL42	9/-	PL36	11/6	UL41	8/-
6F1	12/6	12Q7GT	4/9	EABC80	7/-	EL84	7/-	PL81	9/6	UL84	7/6
6F6G	6/6	12Z3	7/6	EAF42	8/6	EM34	6/9	PL82	7/-	URIC	8/-
6F13	11/-	14S7	18/6	EB91	3/9	EM80	8/6	PL83	7/6	UY21	11/3
6F14	16/6	20F2	17/6	EBC33	5/-	EM81	8/6	PL84	10/-	UY41	6/6
6K7G	2/6	20L1	17/6	EBC41	8/-	EM84	10/-	PY32	11/-	UY85	6/6
6K7GT	5/-	25A6G	8/-	EBF80	8/-	EY51	7/6	PY80	7/6	VP4B	9/6
6K8G	6/3	25L6GT	7/9	EBF89	8/9	EY84	10/-	PY81	6/9	VP41	5/-
6K8GT	9/3	25Z4G	7/6	EBL21	13/6	EY86	7/9	PY82	6/6	W76	5/3
6L18	10/3	25Z6GT	9/6	EC92	11/-	EZ40	6/9	PY83	7/9	W77	4/6
6LD20	8/-	30L15	11/-	ECC40	15/-	EZ41	7/-	PZ30	17/-	Z77	3/6

READERS RADIO
24 COLBERG PLACE, STAMFORD HILL, LONDON, N.16 STA. 4587

Post 6d. per valve extra.
Any Parcel insured Against Damage in Transit 6d. extra.
Any C.O.D. Parcel 3/- extra.

1961 EDITION

RADIO AMATEUR'S HANDBOOK
32/6 by The A.R.R.L. Post 2/-

RADIO VALVE DATA. Compiled by "WW" 7th Ed., 6/-. Postage 10d.

RADIO AMATEURS' EXAMINATION MANUAL, an R.S.G.B. Pub., 5/-. Postage 6d.

MODEL RADIO-CONTROL by E. L. Safford, 21/-. Postage 1/-.

THE ALL IN ONE TAPE RECORDER BOOK. Focal Pub., 12/6. Postage 8d.

PRINCIPLES OF TRANSISTOR CIRCUITS by S. W. Amos, 21/-. Postage 1/-.

HI FI FOR BEGINNERS by J. Borwick, 7/6. Postage 6d.

WORLD RADIO TV HANDBOOK 1961. 16/6. Postage 1/-.

COMPLETE CATALOGUE, 1/-.

THE MODERN BOOK CO.
BRITAIN'S LARGEST STOCKISTS
of British and American Technical Books
**19-21 PRAED STREET
LONDON, W.2**
Phone: PADdington 4185
Open 6 days 9-6 p.m.

PADGETTS RADIO STORE
40 MEADOW LANE, LEEDS 11
Phone: Cleckheaton 2866

PYE TV, 14 inch. Model VT4, 13 channels. Reconditioned, perfect order, £6.10.0, carriage 17/-.

Tube Unit. Type 116A. Complete unit with all valves and VCR97 tube, as new, 15/-, carriage 7/6.

Complete 12in. TV Chassis. Less valves, fourfor 10/-, carriage 5/-.

SCR522 Receiver. Less valves, 5/-, carriage 7/6.

SCR522 Transmitter. Less valves, 5/-, carriage 5/-.

P.M. Speakers. Removed from TV sets. Guaranteed perfect. 6½in. and 7 x 4in. 5/- each, post 2/-.

NEW VALVES, Ex-units. All post free.

6K7	2/-	EF91	1/9	DLS10	1/-
6K8	3/6	EB91	1/9	KT63	4/-
6X5	4/-	EL91	1/9	U12	5/-
6C4	1/6	954	1/6	5U4	4/6
VR91	1/6	9001	9d.	1S4	2/-
VR91 red	2/-				

Valves removed from TV sets. All tested on a new Mullard Valve tester, are 100% as new. They carry a 3 months' unconditional guarantee. All valves Post Free.

EF80	2/6	6P25	5/-	10P14	5/-
ECL80	5/-	6F1	3/-	10F1	3/-
ECC82	5/-	SP61	1/6	10C2	3/-
EL38	5/-	6G6	2/6	20D1	5/-
EF50	1/3	6Y6	2/-	20L1	5/-
EY51	5/-	6SS7	2/-	20P3	5/-
EBF80	5/-	PY81	5/-	U25	5/-
6SN7	2/9	PL81	5/-	20P4	5/-
6F13	5/-	PL82	5/-	U281	5/-
6F14	5/-	PY80	5/-	U329	5/-
6F15	5/-	PL33	5/-	U801	8/6
6LD20	5/-	PZ30	5/-	KT36	5/-
6K25	5/-	PL38	5/-	L63	3/-
6AL5	1/6	10P13	5/-	N37	5/-
6P28	5/-				

Many more types in stock

Reconditioned 12in. TV sets. Bush TV24A and TV24C, 5 channels, 55/-: 13 channels, £4.10.0, carriage and ins. on the sets, 17/-. Tubes are not boosted and sets work well.

TV Tubes. Regunned. 12 months' guarantee. 12, 14 and 17in. all at £3.15.0 each, carriage and insurance 7/6.

SELENIUM RECTIFIERS

F.W. BRIDGE	H.T. Types H.W.
6/12v. 1 a. ..3/11	150 v. 40 m.a. .. 3/9
6/12v. 2 a. ..6/11	250 v. 50 m.a. .. 3/11
6/12v. 3 a. .. 9/9	250 v. 60 m.a. .. 4/11
6/12v. 4 a. ..12/3	250 v. 80 m.a. .. 5/11
6/12v. 6 a. ..15/3	250 v. 250 m.a. .. 11/9
6/12v. 10 a. ..25/9	CONTACT COOLED
6/12v. 15 a. ..35/9	250 v. 80 m.a. H.W.
24 v. 2 a. ..14/9	6/11. 250 v. 50 m.a. F.W. (Bridge) 8/11

B.S.R. MONARDECK TAPEDECKS. Speed 3¾in. per sec. High quality recording heads, 7 gns. Carr. 5/-. Suitable polished veneered walnut carrying case for above 39/6. (Space for amplifier.)

EX-GOVT. CASES. Size 14-10½in. high. Well ventilated, black crackle finished, undrilled cover. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/- postage.

LINEAR TREMOLO/PRE-AMP UNIT Type TPU/1, with 3 controls, volume, amplitude and frequency. Inputs for guitar and microphone. Requires power supply of 250 v. 10 m.a. and 6.3 v. 1 a., available from any R.S.C. or LINEAR amplifier. The unit is merely connected to normal input socket of hi-fi amplifier or Guitar amplifier. Only 5 gns.

MICRO-AMMETERS. 3in. diam. 0-50 micro-amps, 33/9.

HI-FI 10 WATT AMPLIFIERS Brand new. Manufacturer's discontinued line. Fitted Mullard valves. Dual inputs for "mike" and gram., etc. Bass and Treble Controls. High sensitivity and quality. For 230-250 v. A.C. Carriage 7/6. **£6.19.6**

POCKET PORTABLE 3 TRANSISTOR RADIO DESIGN. Handsome plastic cabinet. "Built-in" ferrite rod aerial, and Miniature loudspeaker unit, Regenerative circuit using 2 Brimar R.F. transistors, 1 output transistor and crystal diode. Point-to-point wiring diagrams and instructions 11d. Total cost of all necessary parts only 49/9.

PRACTICAL WIRELESS SUPER SIX POCKET PORTABLE RADIO DESIGN Diagrams etc., 1/9 or All parts including printed circuit and first grade transistors £8.19.6.

MULTI-METERS. Ferranti Universal A.C./D.C., 59/6.

CABY A10. Basic Meter sensitivity 155 micro-amps, A.C. and D.C. ranges £4.17.6.

CABY B20. Sensitivity up to 10,000 ohms per volt, A.C. and D.C., £6.10.0. S.A.E. will bring leaflets on A10 or B20.

RELAYS. Carpenters' Type, Polarised 2 times 9,500 turns at 1.685 ohms, 13/9. Miniature Type G.E.C. 670 Sealed, wire ends, 4 c/overs, platinum M1095, 12/9.

SPECIAL OFFER EX-GOVERNMENT SELENIUM RECTIFIERS. 12 v. 15 amp. with large square cooling fins. 19/9 each.

EX. GOVT. SMOOTHING CHOKES. 200 mA., 3-5 H., 50 ohms, Parmeko 8/9; 100 mA., 5 H., 100 ohms 3/11; 150 mA., 10 H., 50 ohms 9/9; 80 mA, 20 H., 900 ohms 5/9; 120 mA., 12 H., 100 ohms 8/9; 50 mA., 50 H., 1,000 ohms 6/9; 100 mA., 10 H., 100 ohms 6/9; 60 mA., 5-10 H., 250 ohms 2/11.

EX. GOVT. MAINS TRANSFORMERS Primaries 200-250 v. 50 c.p.s. A.C.

250v. 60 m.a. 6.3v. 2a.	10/11
270-0-275v. 100 m.a. 6.3v. 7a. 5v. 3a...	21/9
300-0-300v. 60 m.a. 6.3v. 2a.	12/11
300-0-300v. 100 m.a. 6.3v. 2a. 5v. 2a. ..	18/9
350-0-350v. 160 m.a. 6.3v. 5a. 5v. 3a...	27/9
5v. 10a. Parmeko	11/9
4-4v. C.T. 6-8 amps, Parmeko ..	7/9
400-0-400v. 200 m.a.	17/9
0-35-40-45-50v., 300 m.a. 6.3v. 3a. ..	17/9
450-0-450v. 100 m.a. 6.3v. 1.5a. 4v. 3.5a. 5v. 2.5a.	22/9

2 VOLT ACCUMULATORS Varleys small size 4 x 3¼ x 1½in., 2 v. 14 A.H., brand new, 6/9 ea., 3 for 15/6.

FIELD TELEPHONES

With bell require only small battery. Suitable for office, factory, warehouse, or outside intercommunication. 59/6 each.

R.S.C. (Manchester) Ltd.

LIVERPOOL BRADFORD MANCHESTER and LEEDS

TERMS: C.W.O. or C.O.D. No. C.O.D. under £1. Post 1/9 extra under £2. 2/9 extra under £5. Open 9 to 6. Weds. until 1 p.m. Trade supplied. S.A.E. with all enquiries.

Mail Orders to 29-31 Moorfield Road, Leeds 12.

Personal Shoppers to: 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1.
8-10 Brown Street (Market Street), Manchester 2.
56 Morley Street (next to Majestic Ballroom), Bradford.
73 Dale Street, Liverpool 2.

RADIO VALVE DATA

6/-, new 7th edition by Wireless World postage 9d.

Radio Amateur Examination Manual by R.S.G.B. 5/-, postage 8d.
R.S.G.B. Amateur Radio Call Book, 4/-, postage 6d.
Radio Upkeep and Repairs by Witts, 15/-, postage 1/-.
Model Boat Radio Control by Casebrook, 6/-, postage 6d.
Coil Design and Construction Manual, R.F.A.F.. coils, chokes, transformers, 5/-, postage 6d.
Hi Fi Transistor F.M. Tuner by Sinclair 3/6, postage 6d.
Introduction to the C.R. Oscilloscope by Harley Carter 16/-, postage 9d.
Service Valve Equivalents by R.S.G.B. 2/-, postage 6d.
Short Wave Receivers for the Beginner by Data, 6/-, postage 6d.

UNIVERSAL BOOK CO.
12 Little Newport Street, London, W.C.2 (adjoining Lisle Street)

MICROAMMETER

MICROAMMETER. 0-50µA. 3 x 2¾in., brand new Weston, scaled 0-3, 0-30, 0-300, real bargain, 22/6, post 1/3. MULTIMETER SCALE, circuit, wiring diagram, and parts list for making super-sensitive 18,000 o.p.v. multimeter, 9d., FREE with meter. All parts in stock, including ready made shunts.

1% ½W High Stab. Resistors 2/- each. All standard values plus 2K, 2.5K, 3K, 4K, 5K, 6K, 7K, 7.5K, 8K, 9K, 9.5K, 20K, 25K, 30K, 40K, 50K, 60K, 70K, 75K, 80K, 90K, 200K, 225K, 250K, 300K, 400K, 450K, 500K, 600K, 700K, 750K, 800K, 900K, 2M, 2.5M, 3M, 4M, 5M, 6M, 7M, 8M, 9M, 10M. Many others.

Precision Wirewound Resistors. 1 Watt 1 ohm to 1K, 1% 2/9, ½% 3/-, 0.2% 4/3; to 5K 1% 3/3, ½% 3/6, 0.2% 4/9; to 20K 1% 4/-, ½% 4/3, 0.2% 6/-; to 100K, 1% 4/3, ½% 4/6. Postage extra. S.A.E. enquiries, please.

PLANET INSTRUMENT CO.
25 DOMINION AVE., LEEDS, 7.

LOOK! IT'S TRUE

RED SPOT TRANSISTORS 3/- each, 3 for only 8/6.
WHITE SPOT TRANSISTORS 3/- each.
YELLOW/GREEN 3/6 each, 3 for 10/-.
RED/YELLOW TRANSISTORS now only 5/6 each.
SURFACE BARRIER SB305 TRANSISTORS 9/6 each.
SPECIAL PRICE OFFER OF OC71, 8/6; OC72, 10/-; OC45, 11/6; OC44, 13/6; XA102, 12/6; XA101, 11/6.
SIX MATCHED TRANSISTORS OC44, 2xOC45, OC81D and 2xOC81. Set of 6, 59/6.
TRANSISTOR HOLDERS 1/3. 3 for 3/6.
MINIATURE SLIDER SWITCHES DP/DT 2/9.
SUB-MINIATURE TRANSISTOR TRANSFORMERS. Push-pull Driver 4·5:1, Push-pull Output 20:1. Boxed with Spec. 9/6 pr.
DIODES 1/- each, 3 for 2/6, 7/6 doz.
CRYSTAL EARPIECES with lead 8/6.
LOW IMP. EARPIECES with lead 8/6.
VARI-LOOP STICK M.W. Coils with CIRCUIT 4/6.
ALL SENT POST FREE IN U.K. by
PETHERICK'S RADIO SUPPLIES
22 High Street, Bideford, N. Devon
Tel: Bideford 1217
S.A.E. WITH INQUIRIES PLEASE

RES/CAP. BRIDGE 38/- p. & p. 2/-

Checks all types of resistors, condensers 6 RANGES
Built in 1 hour. Direct reading
READY CALIBRATED
Stamp for details of this and other kits.
RADIO MAIL (Dept. OP)
Raleigh Mews, Raleigh Street, Nottingham

"GLOBE-KING"

WORLD-FAMOUS KITS AND RECEIVERS

Designed and marketed specially for the newcomer and beginner, the "Globe-King" kits continue to enjoy world-wide popularity. Unsolicited Testimonials include many from Transmitting Amateurs and Professional Operators praising performance and efficiency of this miniature equipment. The single-valve kit costs only 79s. 6d. complete down to the last screw. First-class components throughout, three coils, three low-loss S.W. variables includes band-spreading, Siemens-Ediswan Mazda valve, etc., Unit-assembly and construction. "Easy-Build" Diagrammatic Instructions enclosed with each Kit. Send now for Catalogue—it's free, but please enclose stamp for postage.

JOHNSONS (Radio)
ST. MARTINS GATE, WORCS.

Unrepeatable Offer *save £s.*

6 MULLARD transistors, and diode superhet receiver kit, push-pull output, ferrite rod aerial, 2½in. high flux speaker, CAMERA shape cover of fine leather hide, with shoulder strap. MAJESTIC appearance. CAN BE BUILT complete for only **£6.15.6** plus 3/- P. & P. and 2/- battery.

Very easy to assemble.

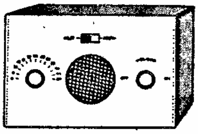
Circuit diagram and instructions supplied FREE ON ORDER.

SURRKITT ELECTRONICS LTD.
16 CHALCOT SQUARE, LONDON N.W.1. *Tel.:* PRI 3962

WIRECOMP ELECTRONICS

378 HARROW ROAD, LONDON, W.9
TEL: CUNNINGHAM 9530
Hours of business: 9 a.m. to 6 p.m. Open all day Saturday. Opposite Paddington General Hospital.
Buses 18B and 36 pass the door.

COMPLETE POCKET RADIO KIT

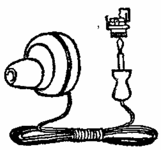


"THE COMPANION"
(Our improved version of the Traveller's Friend)

£8.19.6 COMPLETE KIT OF PARTS
P. & P. 3/6.
in leatherette cases.

This amazing set can be built complete for **£8.19.6.** Size 6⅞ x 4¼ x 1⅜in., just right for the pocket. Uses 6 guaranteed first grade transistors, covering Long and Medium wavebands, latest printed circuit. High Q internal ferrite rod aerial, with socket for car aerial. Complete with step by step instructions. All parts sold separately. Battery PP.4 (Ever Ready 2/- each).

MINIATURE EARPHONE FOR TRANSISTOR RADIOS



Light weight plastic earpiece, can be worn without discomfort, provides excellent reproduction of music and speech. Fully guaranteed complete with 3 ft. of fine flex, plug and socket.
Crystal earpiece as illustrated
Magnetic " " " " **8/-**
P. & P. 1/-.

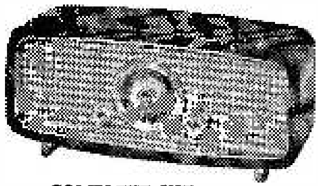
P.V.C. MAGNETIC RECORDING TAPE

STANDARD	LONG PLAY
600ft on 5in. spool 15/-	900ft. on 5in. spool 18/6
850ft on 5¾in. spool 16/6	1200ft. on 5¾in spool 21/-
1200ft on 7in. spool 21/-	1800ft. on 7in. spool 32/6

P. & P. 1/-.

SEND S.A.E. FOR FREE PRICE LIST OR PAY US A PERSONAL CALL

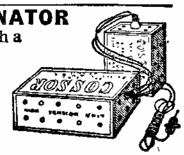
"SONIC SIXTY" TRANSISTOR KIT



6 Mullard Transistors. 1 Diode, Internal Ferrite Rod Aerial. 7 x 4in. high quality Speaker. 500 mW push-pull output. MW and LW. Calibrated Direct Drive Assembly. Modern Walnut Cabinet 17 x 7½ x 5in.

COMPLETE KIT READY TO BUILD **£9.15.0** P. & P. 4/6
ALL PARTS SOLD SEPARATELY

BATTERY ELIMINATOR



Convert your Battery Set to Mains with a COSSOR BATTERY ELIMINATOR MU2. For operation on 200/250 v. 50 c/s A.C. mains. Output: L.T., 1.5 v. 125 mA; H.T. 90 v. 10 mA.

39/6
P. & P. 2/6

OUR LATEST RECORD PLAYER KIT

£7.19.6 COMPLETE KIT OF PARTS
P. & P. 3/6.

A.C. Supply 200—250 v. Attractive cabinet covered in Red plastic, size 14 x 12½ x 6¼in. with gilt fittings. Uses Collaro Junior single play 4-speed motor, Acos GP67—32 cartridge and ready assembled amplifier with UL41 valve, 7 x 2in. speaker.

SURPLUS RADIO SUPPLIES

2 LAING'S CORNER
MITCHAM, Surrey
Telephone MIT 8820

SURPRISE YOUR FRIENDS
by showing them a
1 meg ohm **WIRE-WOUND**
1% 1 watt **RESISTOR**
Price 1/6 or 12/- for 12.

SURPRISE YOURSELF BY LOOKING at our CATALOGUE
Price 1/6

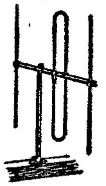
G.P.O. Telephone Jack Sockets	1/-
Carbon Microphones	1/-
50ft. Connecting Wire	1/-
High Quality F.M. Diodes ...	1/-

Postage and Packing 1/- per parcel.

JAMES H. MARTIN & CO.

Radio & Television Component Service
Finsthwaite, Newby Bridge Ulverston, Lancs.
Lists available. Inland 3d. stamp only
Overseas, airmail 5/- refundable.

BBC - ITV - F.M. AERIALS



B.B.C. (BAND 1). Telescopic loft, **19/6.** External, S/D. **26/3.**
I.T.V. (BAND 3). 3 Element loft array, **24/-.** 5 Element, **32/6.** Wall mounting, 3 Element, **33/9.** 5 Element, **41/3.**
COMBINED B.B.C. + I.T.V. Loft 1+3 Element, **41/3.** 1+5 Element, **48/9.** Wall mounting, 1+3 Element, **56/3.** 1+5 Element, **63/9.** Chimney and mast mounting units also available.
F.M. (BAND 2). Loft "H". **28/-.** 3 Element loft, **52/6.** S/D loft, **12/6.** External S/D, **26/3.** State channel when ordering. C.W.O. or C.O.D. P.P. 2/6. Coaxial cable, **8d.** yd. Coaxial plugs, **1/3.** Send **6d.** stamps for illustrated lists.

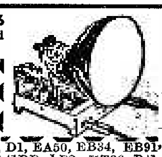
K.V.A. ELECTRONICS (Dept.P.W.)
3B, Godstone Road, Kenley, Surrey.

RADIO BOOKS

NEW PICTORIAL APPROACH TO LEARNING
BASIC ELECTRICITY, 5 parts.
BASIC ELECTRONICS, 6 parts.
The Complete Set sent on payment of first instalment.
LEARN WHILE YOU PAY
Write for FREE Illustrated Prospectus giving details of instalment plan!

BOYS' BOOK OF CRYSTAL SETS AND SIMPLE CIRCUITS, 3/-.
TRANSISTOR CIRCUITS Nos. 1, 2, 3, 4, 3/- each.
ELECTRONIC NOVELTIES, 5/6.
ELECTRONIC GADGETS, 4/-.
SERVICING TRANSISTOR RECEIVERS 6/6.
Postage included in above prices.
SEND STAMP FOR LISTS.
SELRAY BOOK CO.
60 HAYES HILL, HAYES, BROMLEY, KENT. Tel. HURstway 1818

TV CHASSIS 5/6



Plessey. Less valves and tube. Circuit incl., 7/6.

VALVES

9d. ea. 2D21, 4D1, 6C9, 6AL5, 6D1, 6D2, 8D2, 9D2, 10C2, 10F3, 12Y4, 15D2, 78, 7193, ACP4, AR6, AR10, C2C, CV66, D1, EA50, EB34, EB91, EF34, EF36, EF50, HL41DD, LP2, KT36, P41, P61, R19, SP61, SP41, T41, TDD13C, TT11, VR35, VR107, VR137, VT201, W150, W76.

1/9 ea. (17/6 per doz.)
1LC6, 6AK8, 6AM6, 6C4, 6D6, 6F1, 6F12, 6F13, 6F14, 6F15, 6L18, 6K7, 6K25, 6LD, 6N7, 6P25, 6P28, 6SL7, 6SQ7, 6U4, 7A7, 7B7. 7C5, 7Q7, 8D3, 12SH7, 12SJ7, 12SK7, 14H7, N142, PEN45, PEN46, EF91, EBC80, EBC41, 6AT6, EB41.

2/9 ea. (30/- per doz.)
10D1, 10F1, 10P13, 10P14, 12BE6, 25A6, 6L18, 25Z5, 25RE, 42, 43, 874, APV4, B36, CY1, CY31, DH76, ECC34, ECC91, 12AT7, 12AU7, 20D1, KT36, 6U4GT, 807, N37, L63, EF41, EF80, EBF80, ECC31, ECC81, ECC82, ECC83, ECC84, ECL80, 6L1, ECH42, TH41, TH233, U22, U31, UAF42, UB41, UCH42, UF42, UL46, PY31, PL33, U281, U282, UY41, U35, Z77.

5/9 ea. (60/- per doz.)
5U4, 6F6, 6K8, 6Q7, 6V6, 6X6, 12K7, 12K8, 12Q7, 1625, 20F2, 30P4, 20L1, 20P1, EBC33, ECH35, ECL80, EL33, EL38, U801, 6CD6, EL41, EL42, EZ40, GZ32, KT33C, PCC84, PCF80. PL38, PL81, PL82, PL83, PY80, PY81.

P.P. COMPONENTS, LTD. Post Extra
219 Ilford Lane, Ilford, 1 Valve 7d.
Essex. STAMP FOR FREE LIST 6 Valves 1/6

ONE-FINGER PIANISTS

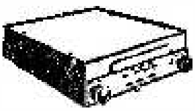
Build your own electronic keyboard and play everything! Send for free leaflet. Guitar, cello, flute and trumpet are all easy. Write now . . .

C. & S., 20 Maude Street, Darlington, Co. Durham

EDDY'S (NOTTM) LTD.
172 Alfreton Road Nottingham

Build your own CAR RADIO!

★ 7 Transistors ● Long and Medium Waves ● Two Watts Output ● R.F. Stage and Automatic Gain Control



10½ Gns.
P. & P. 5/- extra

6 or 12 volts (state which)
Supplied with full instructions
Size 7¾ × 7¼ × 2½in.
SPEAKER, extra 17/11

THROAT MIKES. 1/- ea. Post 6d. also super quality throat mike 2/- ea. Post 9d. could be used for electrifying musical inst. **VIBRATORS.** 12 volt 4 pin 4/11. Post 1/ . **CRYSTAL SETS.** Complete 2 wave bands high gain, good quality, 19/11 also with transistor amplifier extra 9/11. P. & P. 2/6. **HEADPHONES.** High res. to suit above crystal sets. Good quality 13/11 pr. P. & P. 1/6.
NIFE ACCUMULATORS. 1.25 v. size 3 x 2¾ x ⅞in. 7 amp. hrs. weight 13 ozs. 1/11 each. P. & P. 1/6 only add 9d. per cell.
All above are new and guaranteed

New and Surplus valves guaranteed and tested by return post.

AC2/PENDD	7/6	EZ40	6/3	6B8G	2/11
C1C	7/6	EZ41	7/-	6C4	3/6
DAF91	4/9	EZ81	6/9	6C6	4/9
DAF96	6/11	KT33C	6/6	6F13	11/6
DF91	3/11	HL23DD	7/11	6F33	6/6
DF96	6/11	MU14	7/-	6J5G	2/9
DL96	6/11	PCC84	7/6	6J5GT	3/9
DK92	7/6	PCC85	9/3	6J5M	4/3
EAF42	8/6	PCF80	7/6	6J7G	5/-
EB41	6/11	PEN36C	8/-	6K7G	1/11
EB91	3/6	PEN46	6/6	6K7GT	3/11
EBC41	7/6	PENA4	12/6	6K8G	5/3
EBF80	8/-	PL33	8/3	6Q7G	5/9
ECC85	6/11	PL36	10/9	6SA7M	5/9
ECH42	7/9	PL81	9/-	6SG7M	4/9
ECH81	9/-	PL82	7/-	6SJ7M	5/9
ECL80	7/-	PL83	7/6	6SL7GT	6/6
ECL82	9/11	PY80	7/-	6SN7GT	4/3
EF36	3/-	PY81	6/6	6U4GT	10/-
EF37	7/6	PY82	6/9	6V6G	4/9
EF40	12/3	PY83	7/3	6V6GT	6/-
EF41	7/6	PZ30	9/6	6X5GT	5/11
EF42	7/6	SP61	2/6	10F1	6/6
EF50	1/9	TDD4	7/6	12A6	5/3
EF80	5/-	VP23	6/6	12AT6	7/6
EF85	5/11	1D5	7/6	12K7	5/3
EF86	9/6	1L4	3/6	12Q7	5/3
EF91	3/6	1R5	5/6	20D1	8/6
EF92	4/6	1S5	4/9	25L6GT	7/6
EL41	7/3	1T4	3/11	25Z4G	7/6
EL42	9/6	3S4	5/11	35W4	6/9
EL84	6/6	3V4	6/9	35Z4	5/3
EL85	10/3	5Y3GT	6/9	30F5	7/11
EL91	4/6	5Z4G	7/6	90AV	6/6
EY51	7/11	5U4G	4/-	954	1/6
EY86	7/9	6AG5	4/-	955	2/11
				956	3/6

Any parcel insured against damage in transit for only 6d. extra per order. All uninsured parcels at customer's risk. Post and Packing 6d. per valve extra. C.W.O. or C.O.D. only C.O.D. charge 3/-. extra. S.A.E. with enquiries.

THE PUNCH YOU NEED!

HOLE PUNCHES

One Minute Type

⅜" diameter	...	...	5/6 ea.
½" ,,	...	...	6/4 ,,

Screw-up Type

½" diameter	...	...	6/8 ea.
⅝" ,,	B7G	...	7/2 ,,
¾" ,,	B8A, B9A	...	7/8 ,,
13/16" ,,	...	...	8/3 ,,
⅞" ,,	...	...	8/7 ,,
1" ,,	...	...	9/6 ,,

Postage and packing 1/-

1⅛" diameter	Int. Octal	...	10/11 ea.
1¼" ,,	...	...	13/3 ,,
1⅜" ,,	...	...	15/6 ,,
1½" ,,	B9G	...	17/11 ,,
2 3/32" ,,	Meter	...	27/8 ,,

Postage and packing 1/9

Complete set including postage and packing £7.

OLIVER & RANDALL LTD
Dept. I.
40 Perry Hill, London, S.E.6
Tel.: BECkenham 8262

BENSON'S BETTER BARGAINS

CONDENSERS: Block paper 8 mfd. 1 kVw **10/-;** 8/600 v. **6/6;** 8/400 v. **5/-;** 8/250 v. **4/-;** 4/2 kVw **7/6;** 4/1kVw. **4/6. SWITCHES:** Wafer: 2 pole, 4 way, 4 bank 1P6W6B, 4P2W2B, 1P7W3B, 1P11W2B, 4P2W5B, **3/6** each, Ceramic 2P4W1B, 1P5W3B, 1P11W, 3P3W2B, 4P3W1B, **3/6.** STUD, 1P24W2B, 1P8W2B, **3/6;** 1P19W2B, **5/6;** 1P40W3B in brass case, **12/6. MORSE KEY** with buzzer on board, wired for 4½ v. battery, **8/6** (p.p. 1/6). **TELE "F"** intercom. sets, good condition, pair **65/-,** post free Gr. B. **METERS** (10Q/4) with two movements, 600 and 400μA, **8/6. TRANSFORMERS.** Mains, for R1132/R1392, **25/-;** (P. 3/6). Input 110/240. Output 1860 v. 4 mA, **12/6. MONITOR 56,** triggered oscilloscope, 230 v. A.C. input, with cables and circuit. Cathode probe unit extra, **17/6. £8.10.0.** (Rail 15/-). **CR100** Noise Limiter assembles with valve, **3/6. NEW M.C. METERS,** 3½in. round flush, 50μA **70/-;** 200μA centre zero, **50/-;** 1 mA, centre zero, **45/-;** 1 mA, **55/-;** 100 mA, **8/6;** 2in. 300 mA, each **8/6; VIBRATORS,** Mallory G634C 12 v. 4-pin, **7/6;** 6 v. 5-pin reversible, **7/6. DRIVES:** slowmotion Admiralty 200: 1 ratio, scaled 0-100,, **5/6. R1155 S.M.** "N" type, new **10/6. VIBRAPAK,** 6 v. D.C. to 250 v. 60mA, smoothed cased, **22/6** (p.p. 3/6), or 12 v. **25/-, DYNAMOTORS** (post 3/6). 12 v. to 250 v. 60 mA, **11/6,** 6 v. to 250 v. 60 mA, **11/6. CHOKES.** LF 10H, 200 mA, **8/6;** "C" 10H, 250 mA, **12/6;** 5H, 400 mA, **10/6;** 30H, 50 mA, **7/6,** 10H, 500 mA, "C" **22/6;** 20H, 100 mA, **9/6;** 8H, 190 mA, **8/6;** 16H, 150 mA, **9/6. TRANSISTORS** V30/10P, **10/-; GERM. RECTIFIERS** GJ5M, (300 P.I.V., 550mA), **10/-.**

CLOSED HOLIDAYS
24 JUNE—10 JULY (inc.)

RELAYS (LONDEX) co-ax, small 12/24 v., **7/6;** 12/24 v. DP/CO, **5/6;** 24 v. DP/CO plus 1M (Two on Base), **8/6. Rectifier Unit (U.S.A.)** H1-C1 with 3/5T4. 3/6L6, 2/VR150, 1/6SN7 1/6SL7, new **65/-** (rail 5/-). **Valveholders:** B7G W/Skirt, **5/-** dozen: **I.O.** Ceramic, **1/-** each. LIST AND ENQUIRIES S.A.E. please. **Terms, C.W.O. Postage extra.** Imm. despatch, *Callers and post:* **W. A. BENSON (P.W.), 136 Rathbone Road, Liverpool, 15.** *SEF* 6853. *Callers:* **SUPERADIO (Whitechapel). Ltd., 116 Whitechapel, Liverpool 1.** *ROY* 1130

A comprehensive, practical "basic" course in television transmission and reception—

A BEGINNER'S GUIDE TO TELEVISION

by F. J. Camm

THE great success of F. J. Camm's *A Beginner's Guide to Radio* has prompted this companion volume. It is in the form of a series of lessons and is thus suitable for both student and teacher and originally appeared as a series of articles in *Practical Television.* These aroused great interest, and there have been frequent calls for back issues no longer available. Readers may thus prefer the series in its present, more permanent form. Much additional matter has been added.

FULLY COVERS *Persistence of Vision and Scanning. The Cathode-ray Tube explained. The Timebase. Interlacing—Frequency Bands—The Receiving and Transmitting Systems. The Aerial . Tracing the signals through the Receiver . The Video Section . The Television Camera explained . The Tuning Signal, Test Card C, and tracing faults . Early systems of Scanning . Colour Television . The N.T.S.C. System—Tricolour Tubes explained . More about Colour TV Tubes and Receivers . Telecine—Video Tape Recording . Stereoscopic Television . Technical Terms . Index.*

With 61 detailed illustrations in line and tone. 2nd edition.

ONLY 7s. 6d. net
FROM ALL BOOKSELLERS

. . . or in case of difficulty send 8s. 6d. with form below to GEORGE NEWNES LTD., Book Department, Tower House, Southampton St., London, W.C.2.

Order here

Please send me one copy of **A BEGINNER'S GUIDE TO TELEVISION.**

Name..

Address..

....

....

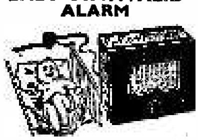
I enclose postal order/cheque for 8s.6d.
P.W. August, 1961.

SUNDRIES

★ 1000 ohm Personal Phone with Leads and Jack Plug and Socket, suitable for most Commercial Transistor Radios. **17/6.**
★ 9.065 Mc/s 3rd Overtone Crystal for all 27 Mc/s Model Control Transmitters. **12/6.**
★ 7 section chromed Telescopic Aerials, 38 in. with fixing bracket, **12/6** P.P. 1/6. 64in. Version, **17/6.** P.P. 1/6.
★ ACOS Crystal Mic Inserts. 2in., **12/6**; 1¼in., **7/6**; ½ x ⅜in., **7/6.**
★ Mercury Batteries, 1.3 v. 500mAH. ⅝in. x ⅜in. **1/3** ea. P.P. 3d.
★ Siemens High Speed Sealed Miniature Relay, 1700-1700 ohms. **15/- ea.**
★ 4.7 volt 1 watt Zener Diode. **19/6 ea.**
★ 2¼in. 10 ohm Speaker, **17/6.**
★ ACOS 39-1 Stick Mic. with lead and stand, **39/6.** P.P. 1/6.
ALL COMPONENTS IN STOCK for "WEYRAD" 6-Transistor Superhet. Booklet **1/3** post free.
Leaflet on request.

BABY SITTER

ALL TRANSISTOR BABY OR INVALID ALARM



NOW MORE SENSITIVE !

Battery operated, push-pull, 400mW output. Low impedance microphone enables unit to be used up to 200 yards. Output on 5in. speaker.

- GUARANTEED for 6 MONTHS and 100% SAFE.
- Microphone is placed within 6 ft. of baby: twin flex is taken to amplifier unit and placed in any room required.
  COMPLETELY BUILT AND TESTED **£5.10.0** P.P. 2/6.
- **Used All Night, Every Night, Battery Life 3 to 4 months.**

★ Quartz Crystals ★
Over 600 types in stock for all purposes—fully guaranteed.
Free List on Request

TRANSISTOR FM TUNER

(cover removed)

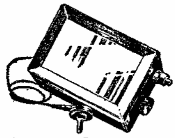
- 2-OC171 and 3-OC170 Selected Transistors.
- Fully Tunable 85 to 108 Mc/s.
- 10.7 Mc/s I.F.

A new design for Hi-Fi to feed quality valve or transistor amplifiers. Noise level better than 55dB. Hammer finish case. Pre-aligned and tested units. Fully Illustrated Book **3/6. All Parts as Shown 18 gns. P.P. 3/-.**

2 WATT POWER AMPLIFIER

● Designed to boost up the output of Portable Transistor Radios when used in a Car. Works from 6 or 12 volt (state which) Car Battery—uses power transistor. All Parts **49/6, P.P. 2/-.**

3-TRANSISTOR AND DIODE PERSONAL POCKET RADIO



● SUPER-3 ●

QUALITY OUTPUT ON PERSONAL EARPHONE

A simple to build local station radio with personal earphone output. Built-in Ferrite Aerial and Battery lasting 9 months.

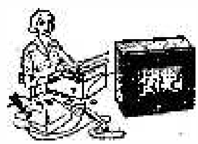
ALL PARTS
37/6 P.P. 1/6
● NO EXTRAS TO BUY
Size 4⅝ x 3 1¼in.

★ IDEAL for BEGINNERS

ALL TRANSISTOR MEDIUM LONG AND SHORT WAVE PRE-BUILT UNITS IN STOCK. FULLY ILLUSTRATED BOOKLET SHOWING USES. 2/6.

ALL TRANSISTOR
● TIME SAVER ●

OFFICE OR HOME TELEPHONE PICK-UP AMPLIFIER



BUILT, TESTED, READY TO USE
£5.10.0 P.P. 2/6

★ No more "Holding Up" wasting time waiting for your call to come through. When it does the amplifier can be switched off if required. **No** connections, just Sellotape the pick-up coil to back of phone as above.

● **5-inch speaker; 3 months' battery life. Now with 400mW output**

RANGER 2 ★ PERSONAL POCKET RADIO ★

● Two Transistor Two Diode version of "Ranger-3". See back page. Similar in performance.

All Parts **59/6** P.P. 1/6

● **PICTORIAL PLANS AND DETAILS FREE ON REQUEST**

ULTRA MINIATURE TRANSISTOR COMPONENTS

- Set of OSC. and 3 IF's. Size $\frac{7}{16}$ x $\frac{7}{16}$ x ½ inch. **21/-.**
- 1$\frac{7}{16}$ inch Square Poly. 2-gang Tuner with Trimmers. **17/6.**
- Driver and Output Transformer (matched to 8/10 ohms). **12/6** pr.
- 2¼ inch 10 ohm Speaker. **17/6.**
- Ferrite Aerial Slab. **3/6.**

Circuit Diagram Free with Coil Set.

★ DECCA AMPLIFIER ★

Portable Record Player Amplifier with tone and volume controls,
59/6 P.P. 2/-.
● **Fully Guaranteed** ●

ADDON AMPLIFIER

250mW push-pull stage with 3 inch speaker. Converts any earphone radio to full loudspeaker. All parts **59/6.** P.P. 1/6
● **Diagrams Free** ●

SUNDRIES

★ Sub-miniature Jack Plug and Socket, **3/6** complete.
★ Mullard LA4 Pot Core complete **12/6.** LA10 complete **17/6.**
★ 208 + 176 pF 00 tuner **9/6.**
★ Sub-miniature 27 Mc/s 3rd Overtone Xtal for model control **30/-.**
★ Personal Earphones used with RANGER 2 and 3. British made, **12/6**
★ 2½ inch round $\frac{11}{16}$ deep 3 ohm speaker, **17/6**
★ 2¼in. 80 ohm Speaker, excellent quality, **17/6.**
★ 600 ohm Personal Car Phone with jack and socket, **10/6,** P.P. 9d.
★ Acos 40 Desk Mic **19/6.** P.P. 1/6.
★ 1 Watt Push-Pull Transformers for OC81 Transistors, 3 ohm, **25/-** pair.
★ OA70, OA81 Diodes. **3/-** each. OA91 **4/-.**
★ Acos 45 Hand Mic. **29/6.** P.P. 1/6.
★ Crystal Lapel Microphone, ideal for portable tape recording, **18/6.** P.P. 1/-.

POCKET IRON

★ Pocket Iron, 220/250v A.C./D.C. 30 watts, complete with mains plug, case, etc. Handle unscrews to cover element enabling iron to be carried in pocket. Only **18/6.** P.P. 1/-.
★ MINI-4, medium and long 6-stage pocket superhet. 4 Mullard transistors. All parts **£6.19.6.** Details on request.
★ 3-Transistor hearing aid transformer coupled. Size 3 x 2 x ⅜in. High gain. Includes min. mic. and earphone. Volume control. All parts. **79/6.** P. & P. 1/6.
★ Light operated switch. 2-transistor plus selenium cell with relay. Ideal for car parking lights, headlamp dimmer, burglar alarms, etc. All parts. **29/6.** P. & P. 1/-.

★ VALVES ★

WE STOCK OVER 800 TYPES OF VALVES AND TUBES AT REALLY COMPETITIVE PRICES.
Free List on Request

Henry's Radio Ltd

DEPT. B8
5 HARROW ROAD . LONDON W.2

Opposite Edgware Road Tube Station
OPEN MON. to SAT. 9-6, THURS. 1 o'clock
Telephone: PADdington 1008/9

SEE BACK PAGE

OUR SPECIALITIES
Transistors, Valves, Quartz Crystals, Components at Competitive Prices

Practical Wireless

BLUEPRINT SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, constructional details are available free with each blueprint except for the PW Monophonic Electronic Organ.

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

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

SPECIAL NOTE

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

Title	*Number*	*Price*
CRYSTAL SETS		
Junior Crystal Set	PW94	2/-
Dual-wave Crystal Diode	PW95	2/6
STRAIGHT SETS		
Battery Operated		
Modern One-valver	PW96	2/6
All-dry Three	PW97	3/6
Modern Two-valver	PW98	3/6
SUPERHETS		
Mains Operated		
A.C. Band-pass Three	PW99	4/-
A.C. Coronet-4	PW100	4/-
A.C./D.C. Coronet	PW101	4/-
The PW Pocket Superhet	—	5/-
MISCELLANEOUS		
The PW 3-speed Autogram	—	8/-
The PW Monophonic Electronic Organ	—	8/-
(No constructional details are available with this blueprint)		
TELEVISION		
The PT band III converter	—	1/6

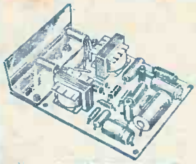
Title	*Number*	*Price*
A.C. Fury Four	PW20	2/6
Experimenter's Short Wave	PW30a	2/6
Midget Short Wave Two	PW38a	2/6
Band-Spread Three (Battery)	PW68	2/6
Crystal Receiver	PW71	2/-
Signet Two (Battery)	PW76	2/6
Simple S.W. One-valver	PW88	2/6
Pyramid One-valver	PW93	2/6
BBC Special One-valver	AW387	2/6
Short-Wave Two	AW429	2/6
Short-Wave World Beater	AW436	3/6
Standard Four Valve S.W.	WM383	3/6
Enthusiast's Power Amplifier	WM387	3/6
Standard Four Valve	WM391	3/6
Listener's 5-Watt Amplifier	WM392	3/6

QUERY COUPON

This coupon is available until 4th August, 1961, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.

PRACTICAL WIRELESS, AUGUST, 1961.

Published on the 7th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), Ltd., South Africa and Rhodesia: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage for one year: Inland £1.3.0. Abroad £1.1.6 (Canada 19s.). Registered at the General Post Office for the Canadian Magazine Post.



¾ WATT 4 TRANSISTOR AMPLIFIER

- 1 watt peak output.
- ±3dB 70c/s to 12 kc/s.
- Output to 3 ohm speaker.
- 9 volt operated.

Built and Tested 69/6 P. & P. 1/6

A printed circuit high gain amplifier size 4 x 2¾ x ¾ in. using Mullard OC71/OC81D and 2-OC81 Transistors. Ideal for Intercomm., Record Player, Tuner Amplifier or any application requiring a quality and reliable amplifier.

Full Details and uses on request

PRICES DOWN! →
NOW EVEN BETTER VALUE FOR MONEY

CONTESSA

6 TRANSISTOR MEDIUM AND LONG WAVE SUPERHET TERRIFIC SENSITIVITY

UNBEATABLE IN PERFORMANCE AND APPEARANCE

SPECIFICATION

- 425mW Push-Pull Output.
- 6 "Top-Grade" Ediswan Transistors
- New Type Printed Circuit with all Components marked.
- Full Medium & Long Wave Tuning.
- High "Q" Internal Ferrite Aerial.
- Car Radio Adaptation and AVC.
- Slow Motion Fingertip Tuning with Station Names.
- "Hi-Fi" Quality Speaker.
- Attractive Rexine Covered Cabinet.

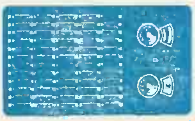
TOTAL COST OF ALL PARTS **£10.19.6** P.P. 3/6
NO EXTRAS TO BUY

COMBINED PORTABLE AND CAR RADIO

Call for demonstration. No technical knowledge necessary. All parts sold separately. Only the best in components used throughout. New descriptive Leaflet and Prices on request.

6-TRANSISTOR FIDELITY "CORONET"

MEDIUM AND LONG WAVE POCKET RADIO



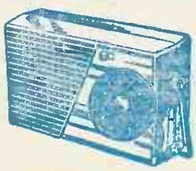
- Size 2¾ x 4⅜ x 1¼in.
- Quality Push-Pull Speaker Output.
- Guaranteed for 12 Months.
- Phone and Tape Sockets.

ALL BRITISH DESIGN AND CONSTRUCTION

9½ gns Reg. Post 2/6 (INCL. BATTERY)

★ 'PW' 6-TRANSISTOR ★

MEDIUM AND LONG WAVE SUPERHET
(as described November P.W.)



- A sensitive superhet with 150mW push-pull output on 2½in. speaker. Uses 6 first grade Mullard transistors and printed circuit. Moulded cabinet. Red, Blue or Cream.
- All parts sold separately. Send for list. Illustrated Building Plans, 1/6 plus post.

Size 5¼ x 3 x 1¾in.

ALL PARTS REQUIRED **£8.19.6**

★ NO EXTRAS TO BUY—EVERYTHING SUPPLIED ★

TRANSISTORS

MORE THAN **50%** PRICE REDUCTIONS

MULLARD AND EDISWAN →

SEND FOR LATEST PRICE LIST

6 MULLARD TRANSISTORS & DIODE

1—OC44 1—OC71 AND 1—OA81
2—OC45 2—OC72 PER SET ONLY **50/-**

Other Matched Sets Available

PRACTICAL TRANSISTOR CIRCUITS

Contains easy-to-follow plans of 40 all-transistor units, including light-operated switches, amplifiers, transmitters, receivers, test oscillators, signal tracers, hearing aids, radio control, etc. All parts available separately. 3/6 POST FREE.

★ RANGER 3 ★

Size 4⅜ x 3 x 1¼in.

NO EXTERNAL AERIAL OR EARTH

3-TRANSISTOR and 2-DIODES

PERSONAL POCKET RADIO with 5 stages giving clear reception on medium wave, amateur top band and shipping.

FULL STATION SEPARATION

Only first grade components used throughout. As described in March RC.

- Easy to follow instructions with pictorial layout.
- Reception of Radio Luxembourg guaranteed (most areas).

Free Instructions and Price List on request. Easy to build

ALL COMPONENTS **79/6** P.P. 1/6
NO EXTRAS TO BUY
Everything Supplied.

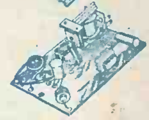
AFTER SALES SERVICE, GUARANTEED SUCCESS

★ MODEL CONTROL RECEIVERS ★

Lightweight Transistor Receivers for even the smallest model boat, car, train, aircraft, etc. A really fascinating hobby. Any valve type tone transmitter may be used with the "Supertone" range operating on 27 Mc/s radio control.

ALL TYPES ARE EASY TO BUILD WITH GUARANTEED RESULTS UP TO ¼ MILE. 4½ VOLT OPERATED AND TRANSFORMER COUPLED FOR HIGH SENSITIVITY.

- "SUPERTONE—RR4". Relayless Receiver, 4-transistor OC170/OC71/OC72/V15/201P, giving 300mA current rise. No. relay, couples directly to actuator or servo, etc. Size 2¾ x 2 x ¾in. All parts 72/6 P.P. 1/6.
- "SUPERTONE—1C", Single Channel OC170/OC71/OC72 transistors. Output to relay, 18mA rise. 2¾ x 2 x 1in. All parts 59/6. P.P. 1/6.
- "SUPERTONE—3C", 3 Channel Output to 3 Reed Unit, giving 3 Channels. OC170/OC71/OC72 transistors. Size as above. All Parts 59/6. P.P. 1/6.



SEND 6d. STAMP FOR DIAGRAMS AND DETAILS

AVO MODEL-8 (List £24.10.0). Latest Avo-8 Multimeter, complete with instructions, batteries and test leads. **£17.10.0** Regd. P.P. 5/-. 12 Months' Guarantee

AVO MODEL-7 (List £19.10.0). Model-7 Multimeter, complete with leads, batteries, etc. **£12.10.0** Regd. P.P. 5/- 12 Months' Guarantee

"P.W." ROADFARER

Complete set of parts as specified. £16.19.6, P.P 3/-. All components sold separately. List on request.

PLEASE ← TURN PAGE

Henry's Radio Ltd

Dept. B.8 PADdington 1008/9
5 HARROW ROAD, LONDON W2
Open Monday to Sat. 9-6, Thurs. 1 o'clock

SEND 6d. STAMP FOR NEW ILLUSTRATED PRICE LISTS