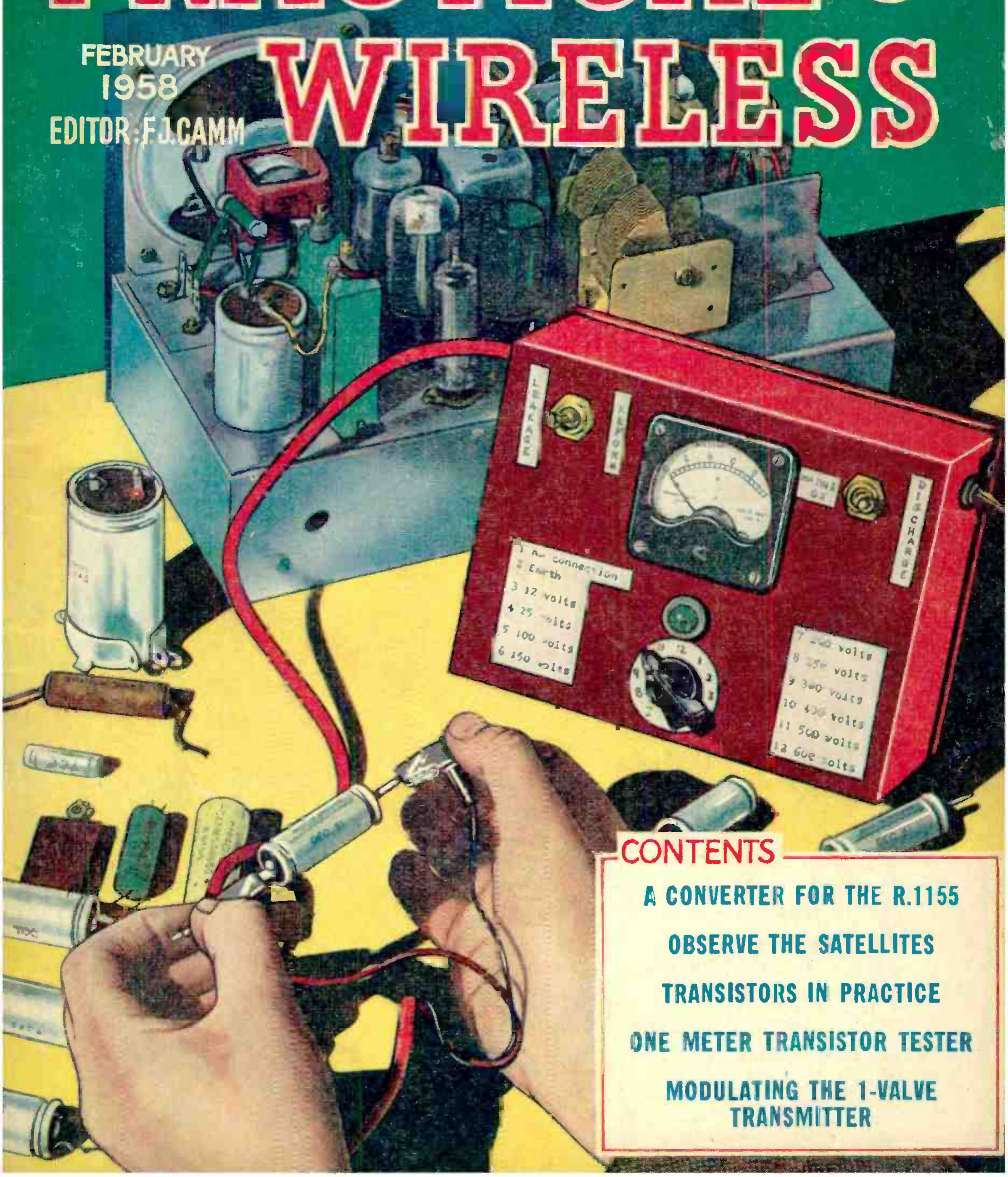
A CONDENSER CONDITION TESTER

PRACTICAL WIRELESS

1/3

FEBRUARY 1958
EDITOR: F. J. CAMM



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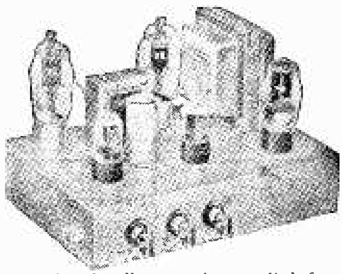
T&C 1102

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

High-Fidelity Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages. High sensitivity. Includes 5 valves (807 outputs). High Quality sectionally wound output transformer, specially designed for Ultra Linear operation, and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut." Frequency response ± 3db., 30-30,000 c/cs. Six negative feed-back loops. Hum level 71 db. down. ONLY 70 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs. For **STANDARD** or **LONG - PLAYING RECORDS.** For **MUSICAL INSTRUMENTS** such as **STRING BASS, GUITARS,** etc. **OUTPUT SOCKET** with plug provides 300 v. 20 mA. and 6.3 v. 1.5 a. For supply of a **RADIO FEEDER UNIT.** Size approx. 12-9-7in. For A.C. mains 200-230-250 v. 50 c/cs. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value at £7 15/- or factory built 45/- extra. Carriage 10/-.

£7-15-0



If required louvred metal cover with 2 carrying handles can be supplied for 18/9. Additional input socket with associate Vol. control so that two different inputs such as Gram and 'Mike' or Tape and Radio can be mixed, can be provided for 13/- extra. Guaranteed 12 months.

TERMS on assembled two input model: **DEPOSIT** 25/6 and nine monthly payments 25/6.

HIGH-FIDELITY MICROPHONES and **SPEAKERS** in stock. Keen cash prices or Credit terms if supplied with amplifier.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response ± 3 db. 30-30,000 c/cs. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used. 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 outputs for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for **18/9.** The amplifier can be supplied, factory built with 12 months' guarantee, for **£13.13.0. TERMS: DEPOSIT** 36/- and 9 monthly payments of 31/-.

ONLY £10-19-6 Carr. 10/-

COLLARO RC54 3-SPEED AUTO-CHANGERS with Studio Pick-up. Brand new. For 110 v. 50 c.p.s. A.C. mains. Price with 110 v. to 200-250 v. Auto Trans. only **7 Gns.** Carr. 5/6.

COLLARO RC/457 4-SPEED AUTO-CHANGERS with high fidelity Studio Pick-up. Latest model. Brand new. Cartoned. For 200-250 v. 50 c.p.s. A.C. mains. Our price **£8/19/6.** Carr. 5/6. Credit Terms. Deposit 3 gns. and 6 monthly payments of **21/6.**

COLLARO 4 SPEED SINGLE PLAYER with separate pick-up, as fitted RC457. For 200-250 v. A.C. mains. **£4.12.6.** Post 3/9.

LG3 MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with above or any other single or auto-change units. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Overall size 6¾ x 4½ x 2½in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only **55/9.**

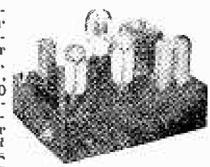
PORTABLE CABINETS. Exceptionally attractive appearance. Takes above amplifier and 3 or 4 speed auto-changer or single player. **69/6.** Carr. 4/6.

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

LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER. Suitable for use with Collaro, B.S.R. or any other record-playing unit, and most microphones. Negative feed-back 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/cs. Output for 2/3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5-5½in. high. Output for 2-3 ohm speaker. Guaranteed for 12 months. Only **£5/19/6.** Send S.A.E. for illustrated leaflet. Credit Terms. Deposit 22/6 and 5 monthly payments of **22/6.**

LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER. For 200/230-250 v. 50 c/cs. A.C. mains. Valve line-up ECC83, ECC83, EL84, EL84, EZ81 miniature Mullard. The unit has self-contained Pre-amplifier Tone Control stages and separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets are provided. Size is only 9-7-6in. Output Matchings for 3 and 15 ohm speakers. Only **12 GNS.**: or Deposit **26/9** plus 10/- carr. and 9 monthly payments of **26/9.** Send S.A.E. for leaflet.

R.S.C. 4-5 WATT A5 HIGH-GAIN AMPLIFIER



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

R.S.C. TA1 HIGH QUALITY TAPE DECK AMPLIFIER. With "built in" power pack and output stage. For Tape Decks with High or Low Impedance. Playback and Erase Heads, such as Lane, Truvox, Aspden, Collaro, Brennell, etc. For A.C. Mains 230-250 v. 50 c/cs. **Linear frequency response** of ± 3 db., 50-11,000 c/cs. Negative feed-back equalisation. Illustrated leaflet 6d.

Ready for use. ONLY **11 GNS.** Carr. 7/6

STAAR GALAXY 4 SPEED MIXER AUTO-CHANGER. Attractive two tone finish. A precision manufactured unit with a motor which virtually eliminates "wow" and rumble. The only changer with exclusive finger tip control. Playing Desk size 11½ x 10in. Depth below baseboard 2in. Above 5in. Fitted pick-up with dual sapphire tipped stylus. For 200-250 v. 50 c.p.s. A.C. mains. A limited number of these luxury units available at only **9 GNS.** Carr. 4/6. Brand New.

R.C.A. 20 WATT RE-ENTRANT SPEAKERS, 15 ohms or 600 ohms matching. For Outdoor work. Only **8 GNS.**

P.M. SPEAKERS. All 2-3 ohms, suitable for use with LG3, L45, A5, or A7 amplifiers, 5in. Goodmans, 17/9. 7 x 4in. Elliptical Elac., 19/9. 6½in. Goodmans, 17/9. 8 in. Rola, 19/9. 10in. Goodmans, 27/9. 10 x 6in. Elliptical Goodmans, 27/9. 12in. Plessey, 29/11. 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts, hi-fidelity type. Recommended for use with our A8 Amplifier. **£4/10/9.** 12in. Plessey 3 ohms 10 watts. (12,000 lines), 59/6.

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

M.E. SPEAKERS 2-3 ohms, 8in. R.A. Field, 600 ohms 11/9.

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

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

AM/FM RADIOGRAM CHASSIS

HIGH QUALITY 6-8 WATT PUSH-PULL OUTPUT

For 200-250 v. Mains. Long wave, Medium, F.M. and Gram. Complete with 8 B.V.A. valves. Guaranteed 12 months. Only **22 GNS.** Or Deposit **£2/12/-** and 9 monthly payments of **£2/12/-.**

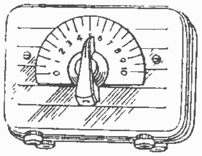
Terms: C.W.O. or C.O.D. NO C.O.D. under £1. Post 1/9 extra under £2; 2/9 extra under £5. All goods supplied subject to terms and guarantee as detailed in current catalogue. Open 9 to 5.30; Sats. until 1 p.m. Catalogue 6d. Trade list 5d. S.A.E. with all enquiries.

RADIO SUPPLY CO. (LEEDS) LTD.

(Dept. W) 32, THE CALLS, LEEDS, 2

YOU can build any of these at Low Cost!

A MINI TRANSISTOR RADIO



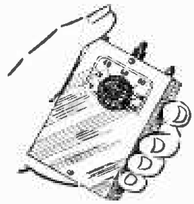
AN IDEAL PRESENT

A two-stage highly sensitive circuit uses a new super high gain transistor coil and mini tuning condenser. Gives remarkable performance. With step-by-step instructions. Beginners can't go wrong. Get your order in while prices are low. Send 2/- for wiring diagram and component price list.

Total building costs **37/6** includes Plastic case mini ear-piece. Batteries etc. All parts sold separately.

Ideal for :
- Late night listening.
- Children's nursery, etc.

TRANSISTOR POCKET RADIO

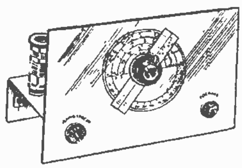


The ideal low cost transistor pocket radio for the beginner. The Two-Stage circuit utilises the new R.C.S. VARILOOPSTICK transistor coil. A specially designed miniature .0005 tuning condenser permits the receiver to be in a case which fits in the palm of your hand. Works for months off small battery costing 7d. Can be built in 30 minutes. PRICE **30/-**

All components are sold separately, full construction data, including plan to parts for 2/-.

1v. WORLD WIDE SHORT-WAVE RADIO

EXPLORE THE WORLD ON SHORT WAVES!



Can be built for **30/-** from our list of components which can all be purchased separately, covers 10-100 metres and is capable of receiving speech and music from all over the world. Price includes the famous 954 acorn valve and one coil covering 40-100 metres.

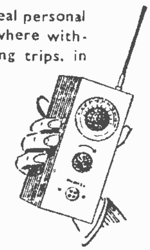
Provision is made to increase to two or three valves and all components are colour coded. Send 2/- for point to point wiring diagram, layout and price list.

PERSONAL PORTABLE RADIO

THE SET FOR PERSONAL LISTENING

This little set was designed to give you a real personal portable radio that you can listen to anywhere without disturbing others. Use it on camping trips, in bed, in your office. Supplied with detachable rod aerial, it covers all the medium waves 200-500 metres. Average building time one hour. PRICE **30/-**

Send 2/- for specification, point to point circuit and parts price list.



Post and packing : Under 10/- add 9d. : under 40/- add 1/6 : over POST FREE.

R.C.S. PRODUCTS (RADIO) LTD., 11, OLIVER ROAD, LONDON, E.17. *(Mail Order only)*

NOW—*the easy way to buy your Test Set*

MIP

PORTABLE TEST SETS

Series 90 & 100

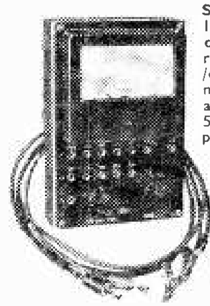
New easy terms for purchase of the superb M.I.P. Test Sets are offered by the makers. These terms are as follows :—

Series 90 Miniature Test Set
Cash price **£9.15.0** or deposit **35/-** and six monthly instalments of **28/10.**

Series 100 Portable Test Set
Cash price **£12.7.6** or deposit **47/6** and six monthly instalments of **36/-.**

Other credit terms from the following suppliers :—

HOME RADIO (MITCHAM) LTD., 187 London Road, Mitcham, Surrey.
FRITH RADIOCRAFT LIMITED, 69-71 Church Gate, Leicester.



Series 90
19 self-contained ranges a.c./d.c. 200 micro-amps—5.000ohms per volt.

SEND THIS COUPON FOR FULL DETAILS WITHOUT OBLIGATION

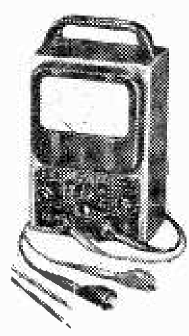
To : MEASURING INSTRUMENTS (PULLIN) LTD.,
Electrin Works, Winchester Street, Acton, W.3.

*Please send illustrated leaflet of the M.I.P. Series 90/100**
Test Set, together with details of the new easy payment scheme.
* Delete whichever Series number not required.

NAME ____________________

ADDRESS ____________________

P.W. ____________________



Series 100
21 ranges a.c. / d.c. 100 micro-amps—1,000 volts 10.000 ohms per volt.

Stern's "fidelity" TAPE RECORDER

IT HAS EVERYTHING—EXCEPT A HIGH PRICE

TESTED AND APPROVED AT THE TRUVOX LABORATORIES

IT INCORPORATES: The NEW TRUVOX Mk. IV TAPE DECK together with the "fidelity" MODEL HF/TR2 TAPE AMPLIFIER (both illustrated on this page), and a Rola 10in. x 6in. P.M. SPEAKER.

PRICE . . . Including CRYSTAL MIKE and 1,200ft. reel of PLASTIC TAPE.

£49 . 10 . 0.

(OR £3 EXTRA WITH REV. COUNTER.)

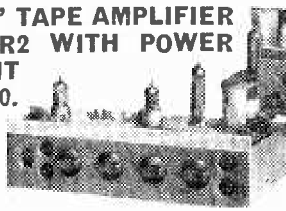
(Plus £1/10 - carriage and insurance, of which £1 is refunded on return of Packing case.)

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

CREDIT SALE: Deposit £12/8/- and 9 m'thly payments of £4/10/8.
HIRE PURCHASE: Deposit £24/15/- and 12 monthly payments of £2/5/11.

NEWS!! Our "Fidelity Junior" Tape Recorder is now available. It is similar in appearance to the model illustrated above and incorporates the TRUVOX MK III Deck and the correctly matched HF TR1.A Tape Amplifier.
Price is only 39 gns. complete with ACOS crystal mike and 1200ft. of Plastic Tape. **39 Gns.**

The "fidelity" TAPE AMPLIFIER Model HF/TR2 WITH POWER SUPPLY UNIT



PRICE £16 . 0 . 0.
(Carr. and ins. 6/-)

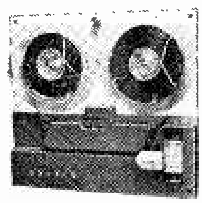
H.P. TERMS: Deposit £8 and 9 months of £1.

CREDIT TERMS Deposit £4 and 9 monthly payments of £1/9/4. **When ordering, please advise make of deck in use. Send S.A.E. for full details.**

Can be supplied to correctly operate with Collaro and Truvox Decks.

HOME CONSTRUCTORS
We can supply a COMPLETE KIT OF PARTS to build this TAPE AMPLIFIER for £12 (plus 5/- carr. and ins.). The Assembly Manual, Practical Diagrams, etc., are available for 2/6.
WE MAKE SPECIAL PRICES TO PURCHASERS OF TAPE EQUIPMENT (i.e., buyers of Deck and Amplifier together, etc., etc.). **SEND YOUR ENQUIRY TO US . . . H.P. and CREDIT SALE TERMS ARE AVAILABLE.**

The NEW TRUVOX MkIV TAPE DECK

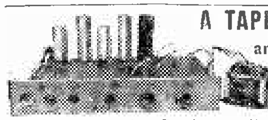


ONE OF THE BEST DECKS ON THE MARKET.

PRICE £27 . 6 . 0. (Plus 10/- carr. and ins.)

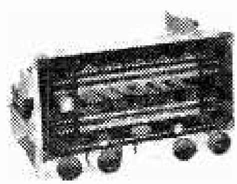
CREDIT TERMS: Deposit £6/17/- and 9 monthly payments of £2/10/-.
H.P. TERMS: Deposit £13/13/- and 12 monthly payments of £1/5/4.
WE ALSO HAVE A FEW DECKS WITH REV. COUNTERS. Price £30/9/-
Send S.A.E. for details.

A TAPE PRE-AMPLIFIER and ERASE UNIT



STERN'S MODEL HF/TR1.—A completely assembled Pre-amplifier with own Power Supply. Can be supplied correctly matched for use with Truvox or Collaro Decks and incorporates Recording Level Indicator and Monitoring facilities. Please send S.A.E. with any enquiry. PRICE **£11 . 10 . 0.** (Plus 5/- carr. and ins.)
SPECIAL PRICE REDUCTION WHEN PURCHASED WITH TAPE DECK.

WE HAVE THE FULL RANGE OF DULCI CHASSIS IN STOCK



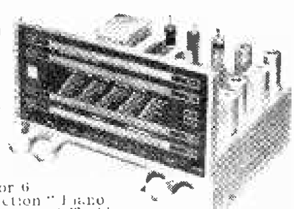
THE MODEL H.4. is illustrated but all Chassis and Tuners are similar—send S.A.E. for leaflets. H.P. and CREDIT SALE TERMS are available. Send S.A.E. for details.

RADIOGRAM CHASSIS These two Chassis are really well designed and reproduce most excellent quality on both Radio and gram.

MODEL H.3. A 3 Waveband AM/FM CHASSIS **£20.17.0.**
MODEL H.4. A 4 Waveband AM/FM CHASSIS **£24.6.6.**
MODEL H4/T. A 4 Waveband AM/FM TUNER with self-contained POWER SUPPLY **£20.17.0.**

MODERNIZE YOUR OLD RADIOGRAM

The NEW ARMSTRONG FB. 409 A.M./F.M. Radiogram Chassis



"A chassis for those who want the highest quality." ● A 9-valve line up employing the latest MULLARD preferred-type valves. ● Provides complete coverage of the V.H.F./F.M. Transmissions plus the Short, Medium and Long Wavebands. ● Has Push Pull Output with Negative Feedback for 6 watts peak Output. ● Quick Action "Piano Key" Selectors and separate Bass and Treble Controls. ● Has "Magic Eye" Tuning Indicator. ● Dimensions 13in. x 9½in. x 8in. high. Dial size 11½in. x 5½in.

PRICE **£29 . 8 . 0.** TERMS: Credit £7.7.0 and 9 monthly payments of £2.14.0.
(Plus 6/- carr. & ins.) H.P. £14.14.0 and 12 monthly payments of £1.7.3.
SEND S.A.E. FOR ILLUSTRATED LEAFLET.

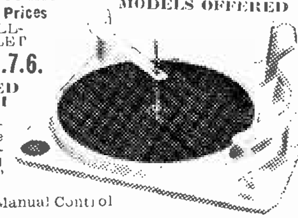
RECORD PLAYERS

at Greatly Reduced Prices

THE VERY LATEST MODELS OFFERED

Send S.A.E. for ILLUSTRATED LEAFLET

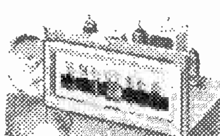
"CASH ONLY" £8.7.6. (plus 5/- carr. & ins.)



THE NEW 4-SPEED B.S.R. MONARCH

- A "MIXER" Auto-changer complete with High Fidelity Crystal "Turn-over" head.
- Incorporates the Manual Control position.

STERN'S "F.M." TUNING UNIT



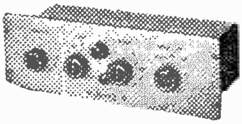
A 5-valve Tuner incorporating the latest Mullard Permeability Tuning Heart and a "Magic Eye" Tuning Indicator.
PRICE ASSEMBLED READY FOR USE: £14.10.0.
(Plus 7/6 carriage and insurance.)
TERMS: (a) Hire Purchase: Deposit £7.5.0 and 9 monthly payments of 18/4.
(b) Credit: Deposit £3.12.6 and 9 monthly payments of £1.6.7.

HOME CONSTRUCTORS—You can build this unit for **£10.0.0.** Full Assembly Instructions are available for 1/6.

STERN RADIO
LIMITED

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

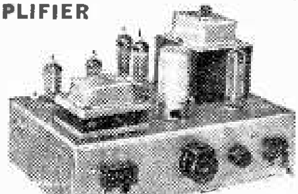
STERN'S REMOTE CONTROL UNIT



Designed in particular for use with the MULLARD 5-10 Main Amplifier

Ideally suited for simple domestic installation as an alternative to the more elaborate Pre-amplifier (shown and described opposite). Tone Control facilities are really excellent and in conjunction with the "5-10" Main Amplifier reproduction is of very high quality. Perfectly suitable for use with all the popular Record Players (B.S.R., Collaro, Garrard) and the modern Radio Tuner Units. Front Panel contains: (a) Coloured Indicator, (b) Separate BASS and TREBLE CONTROLS, (c) 3 position Selector Switch, (d) Volume control. Inputs on back for Radio and Gram. and Gram equalising is incorporated.
FULL DATA is contained in the 5-10 MAIN AMPLIFIER MANUAL at 1/6.

The MULLARD "5-10" MAIN AMPLIFIER



The most popular and successful Amplifier yet designed and certainly needs no recommendation from us. Our kit is complete to MULLARDS specification including the latest PARMEKO ULTRA LINEAR OUTPUT TRANSFORMER and the recommended Mullard Valve line-up.

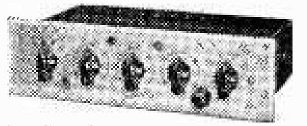
PRICE OF COMPLETE KIT OF PARTS (Plus 5/- carr. & Ins.) **£9.10.0**
or alternatively we supply — FULLY ASSEMBLED and TESTED for (Plus 5/- carr. & ins.) **£11.10.0**

The ASSEMBLY MANUAL containing FULL SPECIFICATION is available for 1/6.

We also offer the "5-10" incorporating the latest PARTRIDGE ULTRA LINEAR OUTPUT TRANSFORMER for an extra ... **£1.6.0.**

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

"A design for the Music Lover"

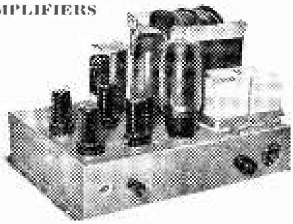


This unit can be used with any Main Amplifier. Briefly it has inputs for all types of MICROPHONES, HIGH and LOW GAIN PICK-UPS and a RADIO TUNING UNIT. It incorporates (a) GRAM EQUALISING CONTROL. (b) STEEPCUT FILTER. (c) Continuously variable BASS and TREBLE CONTROLS, a variable OUTPUT CONTROL which enables its use with any type of Amplifier, and Jack Sockets on Front Panel for TAPE RECORD and TAPE PLAYBACK.
Used with the "5-10" the reproduction is comparable to that normally associated only with the very expensive commercially made High Fidelity Amplifiers. PRICE OF COMPLETE KIT OF PARTS **£6.6.0**
WE ALSO OFFER IT ASSEMBLED READY FOR USE, £8 (plus 5/- carr. & ins.).
The ASSEMBLY MANUAL contains full specification, and is available for 1/3.

BRITAIN'S FINEST "Hi-Fi" AMPLIFIER

THE GENUINE WILLIAMSON

STILL SETS THE STANDARD FOR ALL AMPLIFIERS



Many versions of the Williamson have been offered to the public at various low prices, but the "only Williamson" is the Amplifier built to the designer's specification and employing only the very high grade Components, i.e., PARTRIDGE TRANSFORMERS, CHOKES, etc., that he specifies. It is only in doing this that the exceptionally high standard that has made this Amplifier so famous, particularly in America, is obtained . . . WE HAVE DONE THIS ! ! . . . and we offer these KITS OF PARTS including Partridge and other high grade Components as follows:

(a) To build the MAIN AMPLIFIER ONLY (Illustrated above), **£14.10.0**

(b) To build the TWIN POWER SUPPLY UNIT ONLY (insufficient space to illustrate this), **£13.10.0**

(c) COMPLETE KIT to build both above, **£27.0.0**

We will also supply both COMPLETELY ASSEMBLED and will be pleased to quote. Credit and H.P. Terms are available. The complete SPECIFICATION and general ASSEMBLY INSTRUCTIONS are available for 3/6.
Our "fidelity" PREAMPLIFIER illustrated and described above (or alternatively the R.C.A. Pre-amplifier at £16.5.0) is recommended for use with the Williamson.

SPECIAL PRICE REDUCTIONS . . . WE OFFER YOU . . .

PRICES ARE SUBJECT TO £1.6.0. EXTRA IF PARTRIDGE TRANSFORMER IS PREFERRED.

(a) The COMPLETE KIT of PARTS to build both the MULLARD 5-10 and the REMOTE CONTROL UNIT for **£11.11.0**

(b) The COMPLETE KIT of PARTS to build both the MULLARD 5-10 and the "Fidelity" PRE-AMPLIFIER TONE CONTROL UNIT for..... **£15.15.0**

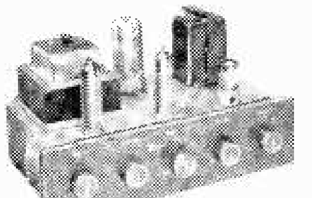
ALTERNATIVELY WE WILL SUPPLY ASSEMBLED and FULLY TESTED, as follows—

(a) The MULLARD 5-10 and the REMOTE CONTROL UNIT for......... **£14.0.0**
CREDIT SALE TERMS, £3.10.0 Deposit and 9 monthly payments of £1.5.3. H.P. TERMS, £7 Deposit and 9 monthly payments of 17/9.

(b) The MULLARD 5-10 and the "Fidelity" PRE-AMPLIFIER-TONE CONTROL UNIT for **£18.18.0**
CREDIT SALE TERMS, £4.15.0 Deposit and 9 monthly payments of £1.14.7. H.P. TERMS, £9.9.0 Deposit and 12 monthly payments of 17/6.

WHEN ORDERING PLEASE INCLUDE 7/6 to cover cost of Carriage and Insurance.

THE NEW MULLARD "3-3"



A COMPACT AMPLIFIER PROVIDING VERY HIGH QUALITY REPRODUCTION ON BOTH RADIO AND GRAM

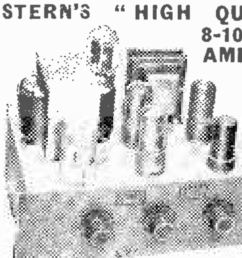
Price: For complete kit of parts: **£7.10.0**
(plus 6/6 coverage and insurance).

Alternatively supplied ASSEMBLED and FULLY TESTED: **£8.19.6**
(plus 6/6 coverage and insurance).

The complete specification containing assembly diagram is available for 1/6.
Developed from the very popular 3-valve 3-watt Amplifier designed in the Mullard Laboratories. Our kit is complete to the Mullard specification, including supply of specified components, valves and a PARMEKO OUTPUT TRANSFORMER. We also include switched inputs for 78 and L.P. records, plus a radio position. Extra power to drive a Radio Tuning Unit is also available.

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION

STERN'S "HIGH QUALITY" 8-10 WATT AMPLIFIER



Has power supply for Radio Tuning Unit

PRICE OF COMPLETE KIT OF PARTS (Plus 5/- carr. & ins.) **£7.10.0**
SUPPLIED ASSEMBLED and READY FOR USE **£9.10.0**

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

CALLERS ONLY

We have in stock various designs for HOME CONSTRUCTORS including F.M. Tuners, A.M./F.M. Tuners, Midget Battery Portable, Mains Units, etc., etc.

SPECIAL CASH ONLY OFFER !!

This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched 6½in. P.M. SPEAKER. ALL FOR ONLY **£8.7.6** (plus 7/6 carr. & ins.).

The Amplifier consists of a 2 Stage design incorporating the modern B.V.A. valves types ECC83, EL84 plus EZ80 Rectifier and has separate BASS and TREBLE CONTROLS. The Portable Case will also accommodate almost any make of Autochanger, and is attractively finished in Maroon and Grey colour Rexine.

WE ALSO SUPPLY SEPARATELY—

(a) The 2-Stage (plus Rectifier) AMPLIFIER..................	£4.2.6
(b) The PORTABLE CARRYING CASE..................	£3.17.6
(c) 6½in. P.M. SPEAKER............	16/9

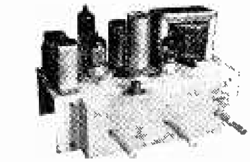
Carriage and insurance, 4/- extra.
We also have a smaller PORTABLE CASE Ideal for Record Players. PRICE ONLY £3.3.0 (plus 3/- carr. & ins.).

(Dept. P.W.)

109 & 115 FLEET ST., LONDON, E.C.4.

Telephone: FLEet 5812/3/4.

Guitar Amplifier operates directly from A.C. mains—high fidelity.

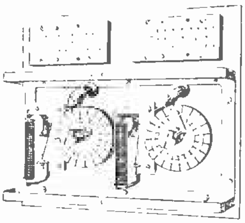


3-valve 4.5 watt with frequency response better than 40-15,000 c.p.s. Control panel size 8in. x 2½in. comes fixed to chassis but is intended for independent mounting. Separate bass and treble controls giving fullest variation of cut and lift. Separate switch, absolutely no mains hum. Remarkable value at **£4/19 6.**

All the parts for making Transistorised Enlarging or Process Timer, with constructional details **£2 10 -.**

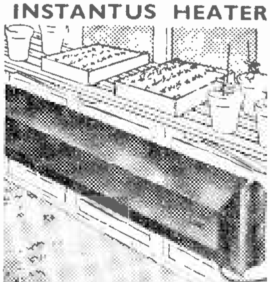
Wrap our heater cable around the pipes in your loft to prevent a freeze-up. 21 yards **£1 1 -.** post free.

TOWARDS AUTOMATION



Rotary switch—Ministry Ref. No. AP57579, this is a motor-driven switch, the driving motor being a synchronous type for working on 110 volts 50 cycles. The two switches have 20 positions each and are enclosed by a Perspex fronted lid, separately operated relays providing interlocks. Sale price 27 6 each. Carr. 3 6.

INSTANTUS HEATER

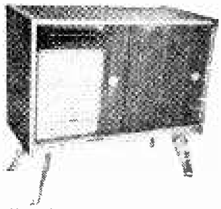


Convector heater, 1 kW. rating, 4ft. long, made from heavy gauge sheet steel (galvanised). Can be used for greenhouse, workshop, aviary, etc., etc. Price **£2/10/-**, or with thermostat, **£4/5/-**, carriage 5/-. GUARANTEED 5 YEARS.

500 WATT MODEL. For very small greenhouses. **32/6.** Carriage 5 -.

2 KW MODEL. This has copper-clad element and is free standing, **£5/17/6** or with thermostat, **£6/17 6.**

CABINETS FOR ALL

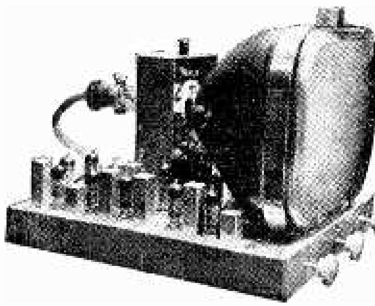


The CONTINA

Another addition to our range of cabinets. This is styled after the best of continental radios. Finished in highly polished dark walnut veneer, with panelling picked out in gold. Interior is veneer, being light mahogany which contrasts nicely with the dark walnut and generally gives a very pleasing appearance. The doors slide on metal runners and are fitted with gold insert finger plates. A really excellent cabinet for any home—size 3ft. 1½in. long, 1ft. 3in. deep, 2ft. 1½in. high, including legs which are 10in. from floor. Motor board 12½in. x 17in., equipment aperture 17½ x 9½in. gives ample space for 8in. speaker. Ample storage space for recordings. Price **£19 19 -.** carriage and insurance 20/-.

Call to see our range or send stamp for list.

17in. T.V. WHICH *YOU* CAN MAKE IN ONE EVENING

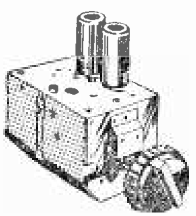


Undoubtedly the most up-to-date televisor for the home constructor. You can build it in an evening and the set when finished will be equal to a factory-made equivalent.

- ★ No technical knowledge required.
- ★ All miniature valves.
- ★ Metal rectifier.
- ★ Turret Tuner—12 channel.
- ★ Ferruxcube, E.H.T. and scan coils.
- ★ Suitable for any modern 12, 14 or 17in. tube.

Cost with 17in. Tube and Speaker **£47** or **£6** down and 8 monthly payments of **£5 15**—or less Tube and Speaker **£29/10** - or **£4 10**- and 8 monthly payments of **£3/10/-**. Non callers add 10/- carriage and insurance. All parts brand new and guaranteed for twelve months. FULL INFORMATION AND DATA, 3 6.

TURRET TUNER



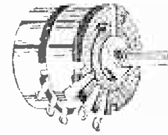
Brand new stock, not surplus, with coils for Band I and III complete with valves PCC84 and PCF80—I.F. Output 33 33 Mc/s with circuit diagram. 79 6. With knobs 3 6 extra, post and insurance 2 6.

THIS MONTH'S SNIP INDICATOR No. 96

Contains many hundreds of very valuable spares including no less than 12 potentiometers. This indicator unit will take the VCR97 or the VCR517 and with relatively simple modifications can be turned into an Oscilloscope. Limited quantity offered at the extremely low price of 10/- each, carriage and packing 4/6 up to 250 miles, beyond this distance at cost.

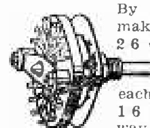
Big stocks of all types of components are kept at all depots. Some special component bargains are also listed below.

MORGANITE POTENTIOMETERS



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

CERAMIC SWITCHES

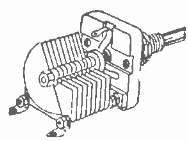


By one of our best makers, 3 pole, 3 way, 2 6 each, also standard type switches 12 pole, 2 way, 1 6 each 6 pole, 3 way, 1 6 each, 3 pole, 6 way, 2/6 each, 6 pole, 4 way, 2/3.

50 assorted resistors. Well mixed and useful values, ¼ and ½ watts. **Price 5/- per 50.**

50 assorted resistors. Well mixed and useful values. 1 watt. **Price 6 6 per 50.**

FINE TUNERS



Ceramic trimmers all with ¼in. spindle of fair length. 5, 10, 15, 30, P.F. at 2/3 each or 24 - per dozen.

Coil Pack for superhet 465 Kc s I.F. Medium and 2 short waves. 9.6.

Midget coils. Ideal for formers in cans, with dust cores. 4 6 per dozen.

TRANSISTORS

A good range of transistor parts, miniature transformers, electrolytics, etc., available at all branches.

Red Spot and audio ... 10/-
Blue Spot 1.6 Mc/s ... 15/-
White Spot 2.5 Mc/s ... 20/-

VALVE HOLDERS

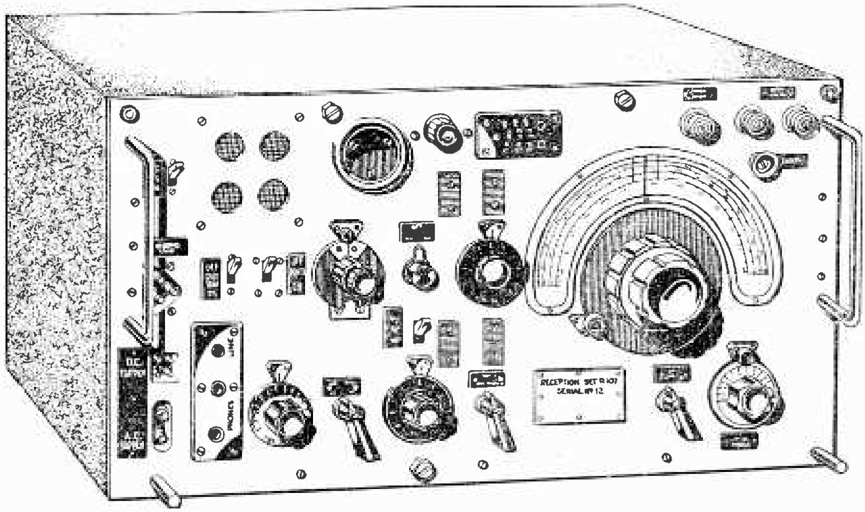
Amphenol type B7G-B9A and int.-octal. Price 5 - doz. as you want them. Nylon loaded 7 6 doz.

CONNECTING WIRE

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

EXCLUSIVE OFFER OF THE R.107

THE ARMY'S FINEST COMMUNICATIONS RECEIVER



COMPLETE, READY TO SWITCH ON

£8-19-6
(Carriage 20/- England and Wales, rest of U.K. extra.)

Just purchased from the Ministry of Supply, this magnificent 9 valve 3 Wave-band receiver gives World Wide Reception over a coverage of 1.2-17.0 Mc/s (18-250 metres), taking in severa important Amateur Bands, Shipping Band, and part of the Medium Wave Band, including the B.B.C. Light Programme, sensitivity is I micro-volt on CW, and 2-6 micro-volts on R.T. The controls include a Bandwidth Switch ("Wide" or "Narrow"), choice of A.V.C. and B.F.O., Audio Filter, R.F. Gain, Aerial Trimmer. Has built-in Output Stage with Internal Speaker, which can be switched out to use Headphones. Uses normal International Octal Valves. Incorporates A.C. Mains Power Unit for 100-250 volts, and Vibrator Pack for 12 volts D.C. In Grey metal case size 24in. x 13in. x 17in. These sets are slightly used, but in first class condition, thoroughly checked and aerial tested before despatch.

COLLINS TCS TRANSMITTERS. Special offer of these famous American Transmitters. Frequency Range 1.5-12.0 Mc/s in 3 bands. Employs 7 valves. 2 of 1625 in P.A. Stage, 1625 buffer and 1625 modulator stage, 3 of 12A6 in Oscillator stage. Radio Telephone or Radio Telegraph. Provision for VFO or Crystal Control. 4 Crystal positions. Has Plate and Aerial Current meters. IN BRAND NEW CONDITION. ONLY **£12.10.0** (carriage, etc., 15/-.)

WIRELESS SET NO. 19 Mk. II.—The famous Army Tank Transmitter-Receiver. Incorporates "A" Set (TX/RX covering 2.0-8.0 Mc/s, i.e., 37.5-150 metres), "B" Set (VHF, TX/RX covering 230-240 Mc/s, i.e., 1.2-1.3 metres) and intercommunication Amplifier. Complete with 15 valves as follows: 6 of 6K7G, 2 of 6K8G, 2 of 6V6G, and 1 ea. 6B8G, 6H6, E1148 EF50, 807, and booklet giving circuits, notes, etc. Size 17½in. x 8¾in. x 12¾in. Magnificently made by famous American firms. IN BRAND NEW CONDITION. ONLY **65/-** (carriage, etc., 10/-).

12 VOLT POWER UNIT for the above available, **25/-** (carriage, etc., 5/-).

MARCONI BAND III CRYSTAL CALIBRATORS. Frequency range 170-240 Mc/s. Incorporates 5 Mc/s crystal for better than .001 per cent. accuracy. Directly calibrated dial, internal A.C. mains pack. Complete with spare set of valves and instruction manual in maker's transit cases BRAND NEW. ONLY **£4/19/6.**

POWER UNIT TYPE 3. Primary 200/250 v. 50 cycles. Outputs of 250 v. 100 mA. and 6.3 v. 4 amps. Fitted with H.T. current meter and voltmeter. For normal rack mounting and has grey front panel size 19in. x 7in ONLY **70/-** (carriage, etc., 7/6).

6 v. VIBRATOR PACKS. Output approx. 130 v. at 30 mA., fully filtered and smoothed. Complete. ONLY **12/6.**

R1155 SUPER SLOW-MOTION TUNING ASSEMBLY. As used on all late model 1155s. Easily fitted to "A" sets, etc. ONLY **12/6.**

EHT TRANSFORMERS. 5.5 kV. (Rect.) with 2 v. 1 a., **79/6.** 7 kV. (Rect.) with 2 v. 1 a., **89/6.** 2.5 kV (Rect.) with 2-0-2 v. 1.1 a., 2-0-2 v 2 a. (for VCR97 tube, etc.), **42/6** (postage 2/- per trans.).

INSULATION TESTERS (MEGGERS). Read up to 20 megs. at 500 volts pressure. Overhauled and in perfect order ONLY **£8.10.0.**

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

CRYSTALS. British Standard 2-pin 500 kc/s, **15/-.** Miniature 200 kc/s and 465 kc/s **10/-** each

ROLA 6½in. P.M. SPEAKER. Mounted in grey crackled metal cabinet 9in. x 9in. x 4⅞in., with volume-control. Ideal for use with receiver, or as extension. BRAND NEW. ONLY **27/6** (Post 2/6.)

12 VOLTS 1 AMP. BATTERY CHARGER. Very robust, ex-Admiralty. In grey crackled metal case size 6in. x 6in. x 4½in. BRAND NEW ONLY 35/-. (Post 2/6.)

MAINS ISOLATING TRANSFORMER. Manufactured by Vortexion. Fully shrouded Will provide true 1 : 1 ratio from nominal 230 v. Primary Rated at 100 watts. BRAND NEW. ONLY **22/6.** (Post 2/6.)

HARRIS ELECTRONICS (LONDON) LTD.

Formerly U.E.I. Corporation.

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.)

PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXIII, No. 614, FEBRUARY 1958

EDITOR : F. J. CAMM

25th YEAR OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

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

 PRACTICAL WIRELESS *incorporates "Amateur Wireless."*

Sixteen Million Without TV

ACCORDING to the BBC handbook, there are nearly 16,000,000 people who possess radio sets but are without television. The official licence statistics at the moment of going to press are : 14,677,612 broadcast receiving licences, this total including 7,524,071 for television and 326,161 for radio sets fitted in cars, these figures relating to Great Britain and Northern Ireland. According to this there are 7,153,541 radio sound licences, and television licences hold the lead by 370,530. The two services are thus running somewhat neck and neck. Although there is a recession in applications for licences they are still being made at the rate of 120,000 a month, so absorption point has not yet been reached.

RESTRICTIVE PRACTICES

THE Chancellor of the Exchequer, in a recent speech, said it should be the aim for firms to abandon restrictive practices without waiting for the rulings of the Trade Practices Court. "This is not the moment for rings designed to keep prices up, or restrictive practices designed to prevent them from coming down. If any firm can lower their prices, it is their patriotic duty to do so and do so quickly" Perhaps some radio manufacturers can take this hint.

"RADIO-CONTROLLED MODELS"

ON February 20th we shall publish "Radio-controlled Models," at 12s. 6d. or 13s. 6d. by post. This book covers the following subjects : Simple Steering Control Gear ; A Single-valve Super-regenerative Receiver; A Two-valve Transmitter for Radio Control ; Control Box ; Wavemeter ; Interference ; Layout ; Obtaining a Second Channel using the Mark/Space System ; A Proportional Steering Circuit and Reversible Sequence Engine Control Gear ; A Detailed Design for a Radio-controlled Boat Using a Glow-Plug Engine and an Electric Motor in the Power Unit ; A Six-valve Crystal-controlled Transmitter ; Radio Control for Model Aircraft (Sequence System); Tuned Reeds and Audio Control; More About Model Actuators ; Tuning Model-control Transmitting Aerials ; A Bulb Model-control Frequency Meter ; An Auto-switch for Model-control Transmitters ; A Radio-controlled Model Battleship ; Building a Radio-controlled Model Aircraft.

This book is published in conjunction with our companion journal, *Practical Mechanics*, and orders should be sent to the Book Department, address as on this page.

THE "PRACTICAL HOUSEHOLDER" EXHIBITION

THE PRACTICAL HOUSEHOLDER Exhibition, organised by our companion journal, will open at the Empress Hall, Earls Court, London, on February 19th, and close on March 1st. The price of admission is 2s. 6d. This is the first exhibition ever to be held at the Empress Hall, and it will interest every householder, whether house owner or tenant.—F. J. C.

Our next issue, dated March, will be published on February 7th.

Round the World of Wireless

By "QUESTOR"

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of October, 1957, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	*Total*
London Postal	1,116,536
Home Counties	1,125,673
Midland	843,456
North Eastern	1,109,449
North Western	818,805
South Western	704,181
Wales and Border Counties ...	444,791
Total England and Wales ...	6,162,891
Scotland	802,660
Northern Ireland	187,990
Grand Total	7,153,541

V.H.F. in Scotland

THE BBC's new Very-High-Frequency Sound Broadcasting Station radiates the Scottish Home Service on 94.3 Mc/s, the Light Programme on 89.9 Mc/s, and the Third Programme and Network Three on 92.1 Mc/s.

The station will have an effective radiated power of 120 kW, and as at other BBC VHF sound broadcasting stations the transmissions will be horizontally polarised. Receiving aerials must, therefore, be fixed horizontally.

The new station will serve about four million people in an area which includes the counties of Renfrew, Stirling, Clackmannan, Fife, Kinross, Peebles, Midlothian, East and West Lothian, most of Lanarkshire and Dunbartonshire, the northern half of Ayrshire, the southern parts of Perthshire and Angus, and a substantial part of Berwickshire. Listeners within this area who provide themselves with suitable receivers and where necessary with suitable external aerials will find that VHF transmissions are much less susceptible to interference from foreign stations and from electrical apparatus than the long-wave and medium-wave transmissions, and that they are capable of giving much better sound quality.

Obituary

IT is with deep regret that we announce the death of Mr. Frank S. Allen, M.I.Prod.E., works director of E. K. Cole Ltd. a director of Ediswan-Ekco (Aust.) Pty. Ltd., Egen Electric Ltd., Ekco Electronics Ltd. and The National Ekco Radio and Engineering Co. Ltd. (India).

Mr. Allen, who was 56 years' old, died peacefully in his sleep while in London. The funeral service took place at the Parish Church of St. Mary, Prittlewell, Southend-on-Sea.

Commencing his career in the motor industry as an Austin apprentice, Mr. Allen subsequently held executive and managerial positions with the Austin Motor Co. Ltd., Citroën Cars Ltd., etc., with whom he gained a wide experience of works and production problems. He took an active interest in the Austin Ex-Apprentices Association, of which he was a founder.

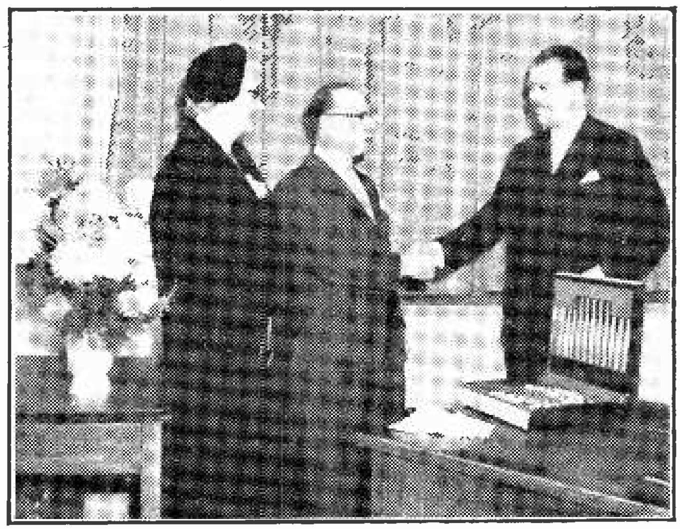
He joined E. K. Cole Ltd. in 1941 as assistant works manager and four years' later he was appointed general works manager, radio division. He was largely responsible for the change-over from war to peace production of the Ekco factories.

Stereophony

AT the Annual Audio Engineering Society Convention held in New York towards the end of last year the accent was on stereophony, and some new stereo discs played a large part in the demonstrations. Fear was expressed by some that these discs might have a deterring effect on stereo tape similar to the effect colour TV had on black and white TV.

New Gramophone Disc Speed

AT the Convention mentioned above a new gramophone disc speed was announced. This is 8 r.p.m. and it was stated that a 12in. disc would play for 10 hours. A 7in. disc would give four hours playing. In addition to the longer playing time the slower speed also results in a reduction of surface noise, but



On November 25th, 1957, Mr. Alan Burr, Sales Promotion Manager of the Valve Sales Department of Mullard Ltd., celebrated 25 years of service with the company. He was presented with a cheque and a canteen of cutlery.

this is accounted for by the reduced high frequency response.

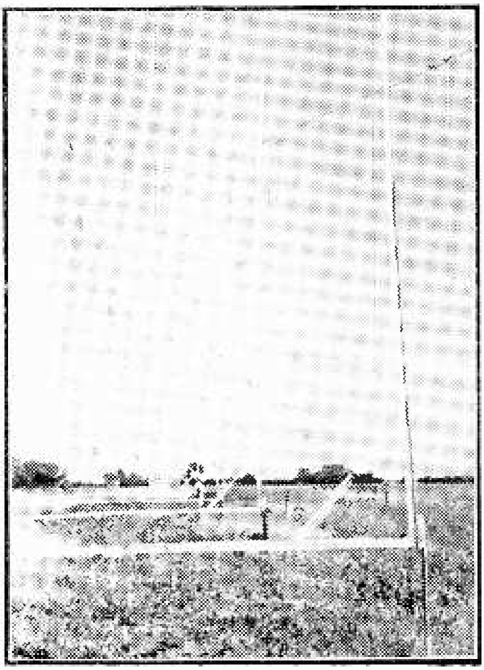
New Battery Principle

A NEW battery is announced from U.S.A. This makes electricity from gases, by feeding oxygen and hydrogen through its electrodes. The battery is known as a fuel cell. The hydrogen and oxygen enter through specially treated hollow porous carbon electrodes. When the gases diffuse to the electrodes surfaces they come into contact with a solution of potassium hydroxide. At the hydrogen electrode, an electron is released by electro-chemical reaction. There is claimed to be no deterioration in the cell which will operate indefinitely so long as oxygen and hydrogen are fed to it.

More Marconi Radio for Police

RECENT orders received by Marconi's Wireless Telegraph Co. for mobile radio equipment for the use of the Police Forces include two from the Metropolitan Police for a total of 140 10 watt F.M. transmitter/receivers Type HP81B. These follow an order for 50 of the same equipments ordered last year and now in use in London. A compact equipment of modern design the Type HP81B has proved itself to be suitable for use under the most exacting conditions.

Orders for over 140 Marconi Type HP55 mobile VHF radios have been placed for the use of other Police Forces in the U.K. A considerable quantity of these is being supplied to the Home Office which is responsible for the wireless equipment of all but four of the Police Forces in England and Wales.



A fixed aerial "pencil beam" at the Mullard Radio Observatory. This aerial is 3,200 feet in length and the width across the apertures is 40 feet.

The HP55 is one of the 7/8 watt V.H.F. mobile equipments of the HP50 series developed by Marconi's for police, fire and ambulance services, harbour control and similar purposes. They are self-contained with the transmitter, receiver and power supply unit housed in a single compact cabinet. Because of their high degree of stability they are suitable for close channel separation and it is possible to arrange switching between two or three closely controlled channels within a small frequency band. A high stability crystal oscillator is used in the transmitter, while the superheterodyne receiver is crystal controlled and employs double-frequency changing.

25 Years' Service

ON December 5th, 1957, Clive Barwell, general publicity manager, Mullard Limited, completed his 25th year of service with the company.

He was presented with a cheque and an 8-day mantel clock by Mr. S. S. Eriks, managing director, who with other Mullard directors and executives entertained Mr. and Mrs. Barwell to lunch. Many other gifts were presented to Mr. Barwell by his colleagues from all parts of the organisation.

Apart from a period as production manager of one of the company's radio valve factories, Clive Barwell has been continuously engaged in advertising, publicity and P.R. work.

Ekco Instrumentation for New Atomic Reactor

PLUTO, the new research reactor which recently commenced operation at Harwell, is equipped with Ekco nuclear instrumentation. Ekco Electronics Ltd. designed, installed and commissioned the complete nuclear instrumentation and control circuitry for this latest-type heavy water moderated reactor.

The instrumentation is designed to:

1. Measure and control the nuclear process of the reactor, giving linear, logarithmic and differential indication of the reactor power.

2. Remotely indicate the position of the control elements and detect their misalignment.

3. Measure the fast neutron and gamma radiation in various parts of the reactor for health monitoring purposes and detect the radioactivity of leakages into the heavy water coolant system.

Mobile V.H.F. Speeds Oil Operations

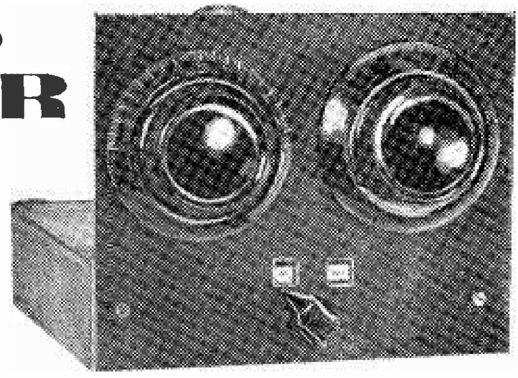
BEHIND the announcement that Kuwait Oil Company has ordered approximately £23,000 worth of V.H.F. frequency-modulated radio transmitting and receiving equipment from Marconi's, lies an interesting illustration of how the efficiency of a fleet of road vehicles can be considerably improved by the incorporation of a system of radio communication.

For the purposes of Kuwait Oil Company's scheme, their road transport system will be divided into four basic units, namely, the drilling unit, the engineering unit, the production unit and the transport and fire-fighting unit. Each of the 37 vehicles involved will be fitted with a 10-watt V.H.F. mobile transmitter/receiver, type HP81A, in order to keep the crew in continuous two-way touch with the nearest base.

An R 1155 CONVERTER

THIS UNIT IS ALSO SUITABLE AS THE "FRONT END" OF AN AMATEUR BUILT COMMUNICATIONS RECEIVER

By R. H. Wright (G31BX)



The completed converter.

ONE disappointing feature of the R1155 Communications Receiver, available on the surplus market, is the gap in frequency coverage between 1.5 and 3 Mc/s (unless one has purchased the Trawler Band model) and the loss of frequencies above 18.5 Mc/s. From the amateur point of view this cuts out the 1.8 to 2.0 Mc/s band together with the 21 and 28 Mc/s bands—so useful for really long distance work. However, the missing frequencies may be added by means of a Superheterodyne converter, as shown in Fig. 1. Such a converter may also be used as the "front end" of an easy-to-build amateur communications receiver.

The Circuit

The incoming signal is mutually coupled to the secondary side of L1, which is tuned to the signal frequency by C1. The voltage produced across this circuit is applied to the grid of the hexode side of the triode-hexode frequency changer valve, V1. The triode section of this valve operates, together with L2 and C4, as a Meissner Oscillator, always tuned 465 kc's above the frequency of the incoming signal. This signal and the locally produced oscillation will then mix to produce the intermediate frequency of 465 kc/s and, if the anode circuit L3/C8 is tuned to this frequency, the resulting signal will be passed through C7 to the input of the R1155 receiver, which must now be tuned to 465 kc/s and so becomes, in effect, a second frequency changer and I.F. amplifier. The increase in signal strength and selectivity of such an arrangement is extremely noticeable.

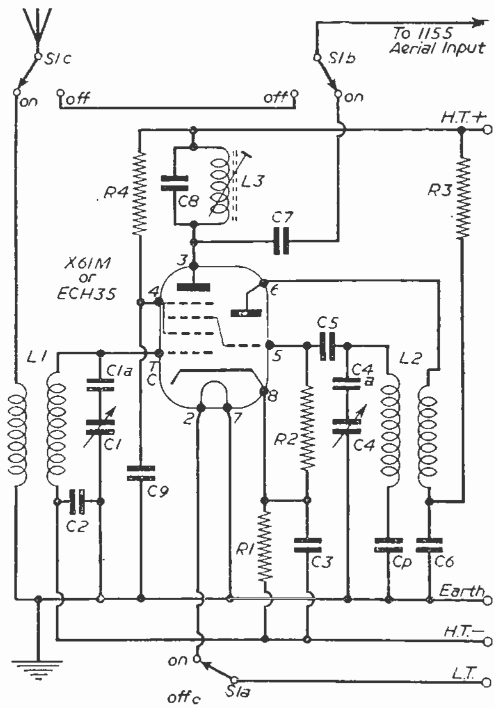


Fig. 1.—Theoretical circuit of the Converter for the R1155.

Construction

A chassis 8in. × 8in. × 2in. gives ample room for mounting all components without having to crowd them together, thereby running the risk of unwanted coupling. The coils, L1 and L2, are Denco Octal-based plug-in types, ranges 3 and 5. Range 3 covers 1.67 to 5.3 Mc/s and, therefore, in addition to the 1.8 to 2.0 Mc/s amateur band will also cover the trawler band, and also the

LIST OF COMPONENTS

C1, C4—300 pF variable capacitors, air dielectric. 500 pF capacitors may be used if good quality mica capacitors having a capacity of 0.001 μF are joined in series. (C1a, C4a)
C2—0.01 μF mica capacitor.
C3, C6, C9—0.1 μF 350 v. working capacitors.
C5, C7—100 pF mica capacitors.
C8—300 pF pre-set. (See text.)
Cp—Range 3 coils: 1,100 pF mica. Range 5 coils: not required.
R1—200 ohm, 1 watt resistor.
R2—68 k.ohm ½ watt resistor.
R3, R4—47 k.ohm 1 watt resistors.
L1, L2—Denco Octal-base plug-in coils:
Blue range 3 / Red range 3 — 1.67 to 5.3 Mc/s.
Blue range 5 / Red range 5 — 10.5 to 31.5 Mc/s.
L3—Denco Blue range 1, chassis mounting coil (see text).
V1—Osram X61M or Mullard ECH35.
S1 a/b/c—3-pole 2-way switch. 3 International Octal chassis mounting valve bases. Chassis 8in. × 8in. × 2in.

3.5 Mc/s amateur band. Range 5 tunes from 10.5 to 31.5 Mc/s. covering the 14. 21 and 28 Mc/s amateur bands. These coils are coloured according to their use. blue for H.F. input (L1). and Red for the 465 kc/s oscillator coil (L2), thus two coils will be required for each range.

The padding capacitor, Cp in Fig. 1 will. of course, have to be changed on different ranges. but this is made easy by the fact that the end of

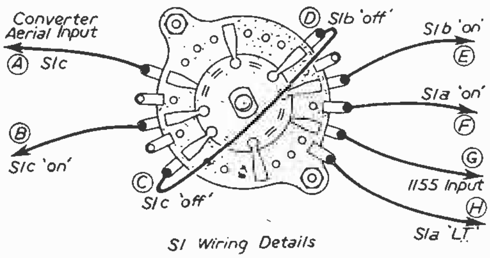


Fig. 4.—Switch connections.

the red coil normally connected to this capacitor is taken to different pins on each coil base. In the case of the range 3 coil. the connection is taken to pin 7 in the base. and this pin should then be connected to earth through the padding capacitor, which has a value of 1.100 pF. No padding capacitor is required on range 5, and the coil connection is taken to pin 6, which, should be earthed.

The Octal bases for the coils are positioned as in Fig. 2, which shows the layout of the components on top of the chassis. Denco chassis-mounting coils are available for these ranges. but plug-in types were preferred in order to reduce the losses and eliminate the somewhat complicated switch connections which would otherwise be necessary. If C1 and C4 are ganged. it will be necessary to arrange trimmer capacitors across the grid windings of L1 and L2 to give correct tracking. Such trimmers may actually be soldered to the coils and so plugged in with the coils. However. even with correct padding and trimming. perfect tracking is not possible over the whole of the tuning range and therefore in order to make the best of weak signals separate capacitors have been employed. Tuning is not complicated in any way by this arrangement provided that the two capacitors are kept approximately in step when tuning and once the station has been "tuned-in" slight adjustment of C1 will "peak" the signal. Thus, accurate alignment is not necessary. but a two-gang capacitor may be used

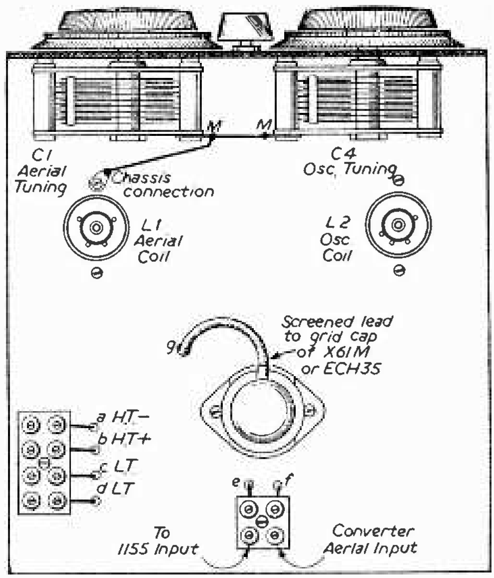


Fig. 2.—Top of chassis details.

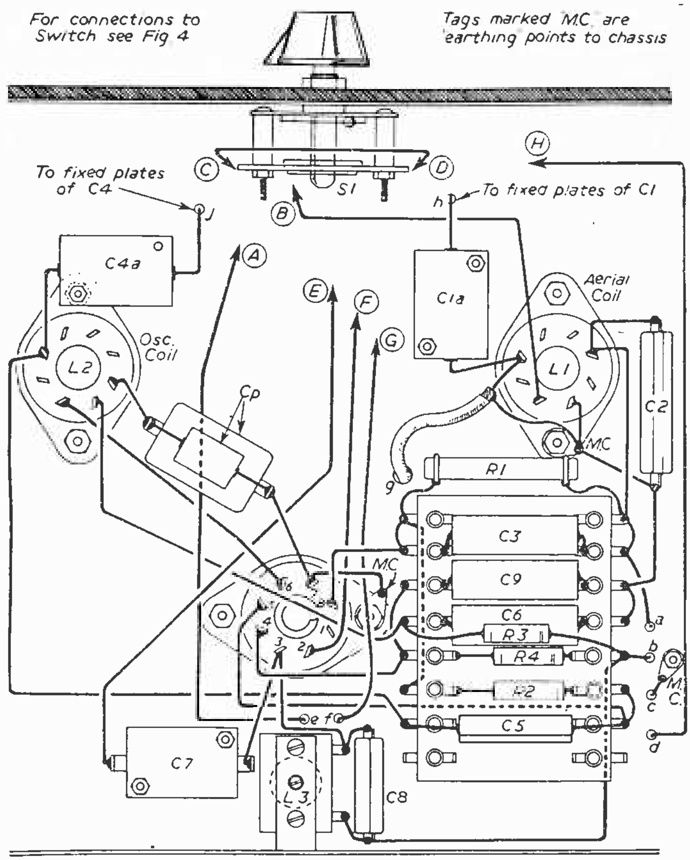
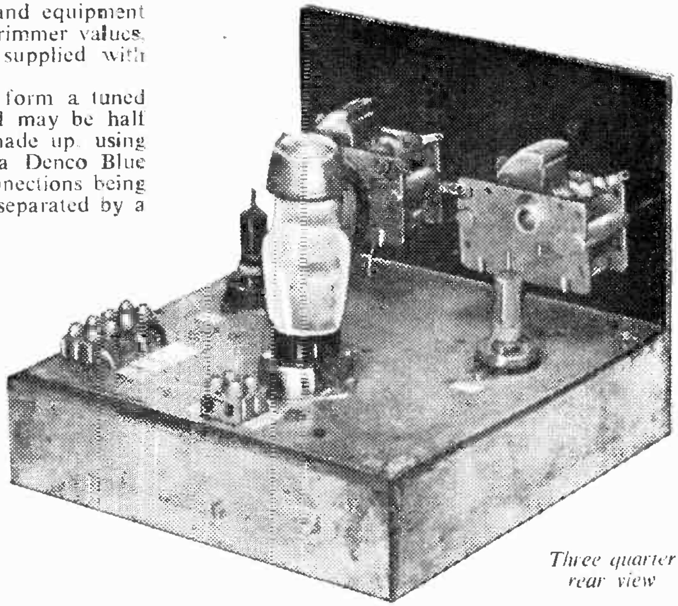


Fig. 3.—Underside wiring and layout details.

if the reader has sufficient skill—and equipment—for alignment. Full details of trimmer values, etc., are given on a data sheet supplied with each coil.

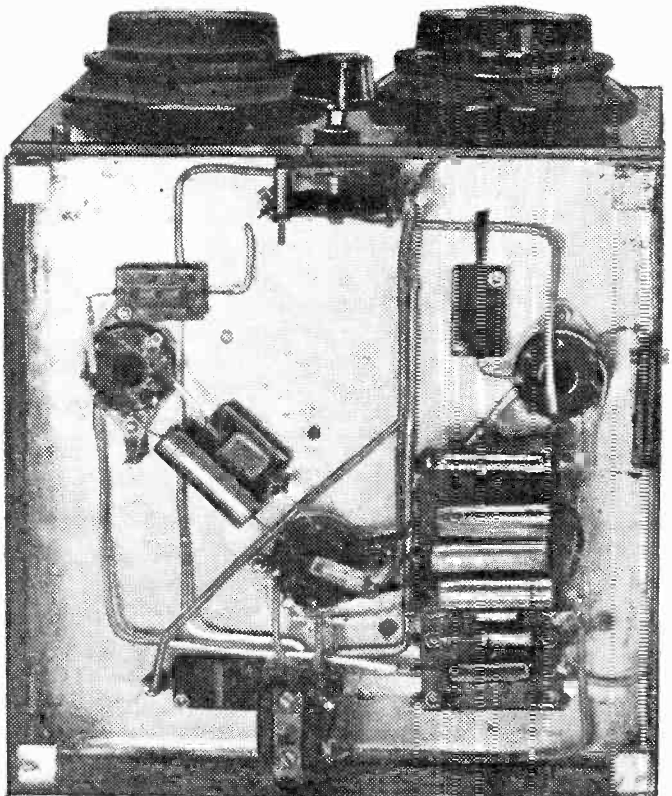
L3 and C8 (together with C7) form a tuned anode coupling to the R1155, and may be half a 465 kc/s I.F. transformer or made up using a 300 pF pre-set capacitor and a Denco Blue Range I chassis mounting coil, connections being made on the coil to the two tags separated by a paint spot.



Three quarter rear view

Power Supplies

The power requirements of the unit are extremely modest and may be obtained from the power unit supplying the R1155 receiver. If this is the case, no connection should be made between H.T. — and chassis, since this will short-out the bias in the R1155 receiver. If the converter is to be operated from a separate power unit from that used with the receiver all connections to H.T. may be taken to chassis, together with H.T. negative and C2 may be omitted. A three-pole two-way switch, connected as shown in Fig. 1 (S1 a, b, c) will enable the unit to be switched on or off and at the same time connect the aerial to the converter or to the receiver.



View of the underside of the chassis. Compare this with Fig. 3. C6 occupies a different position in this chassis.

Adjustment

First tune the R1155 receiver to 465 kc/s. Adjust C8 to about 1/10th of its full value. Tune in a strong signal on the converter, keeping C1 and C4 approximately in step, then "peaking" the signal with C1. Finally adjust L3 and C8 for maximum signal output. (If C8 and L3 are part of an I.F. transformer, any adjustment will probably be unnecessary. It may be necessary to make some slight adjustment to the tuning of the 1155, particularly if the dial calibration is not exactly accurate, but no further adjustment of C8 will be required on either range. A slow motion dial, such as the Eddystone type 843 or 598 will be found almost a necessity for C4, particularly on range 5 coils and a similar dial for C1, though not so necessary, will be found helpful. Surplus slow motion dials are occasionally available on the surplus market and advertised in these pages.

Making the "Simpletone"

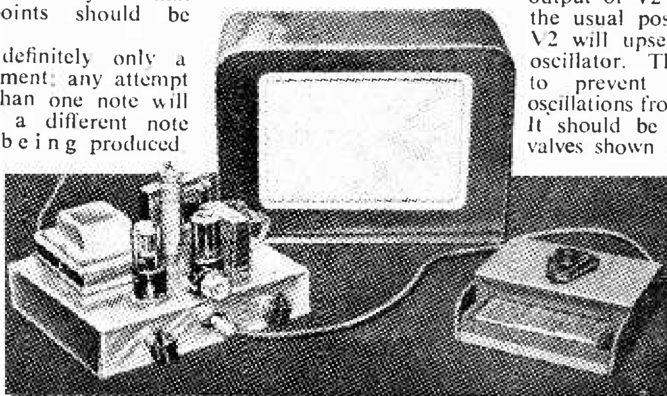
A SIMPLE MONOTONE ELECTRIC ORGAN

By G. M. Sweet

THIS is another use for that versatile audio oscillator, the multivibrator.

It is not the purpose of this article to explain the exact function of this oscillator, since that has been dealt with in previous issues of this magazine, apart from numerous text-books. Obviously this economical little organ cannot hope to compete with its modern multitone counterpart, so it is only fair that its weaker points should be explained.

First, it is definitely only a solo-note instrument; any attempt to play more than one note will only result in a different note altogether being produced. Secondly, the maximum musical range that can be covered, with the circuit described, is three octaves (24 notes, excluding semitones), although only nine notes are shown in the illustration above these notes.



The "Simpletone" ready for use.

The Circuit

This is comparatively straightforward; the only point worth mentioning is perhaps the range control (the ganged switch S1 and S2). By switching in the various matched pairs of coupling condensers here, it is possible to alter that part of the musical spectrum which the keyboard can cover. But since any alteration in the position of this switch may necessitate some retuning of the keyboard, it may be preferred to omit it. The volume control must be incorporated in the output of V2 since its insertion in the usual position of the grid of V2 will upset the tuning of the oscillator. The purpose of C12 is to prevent any random R.F. oscillations from entering the mains. It should be pointed out that the valves shown are merely chosen as being the most readily available. In fact the 6SN7 can be substituted by any pair of triodes, or even pentodes, etc., connected as triodes, but it is preferable to use a pair of the same valve type to give a greater output, or the 6V6 replaced by an H.F. pentode to give a smaller output. But the danger of shock whilst tuning the keyboard does not merit the risk of using A.C./D.C. valves or omitting the mains transformer.

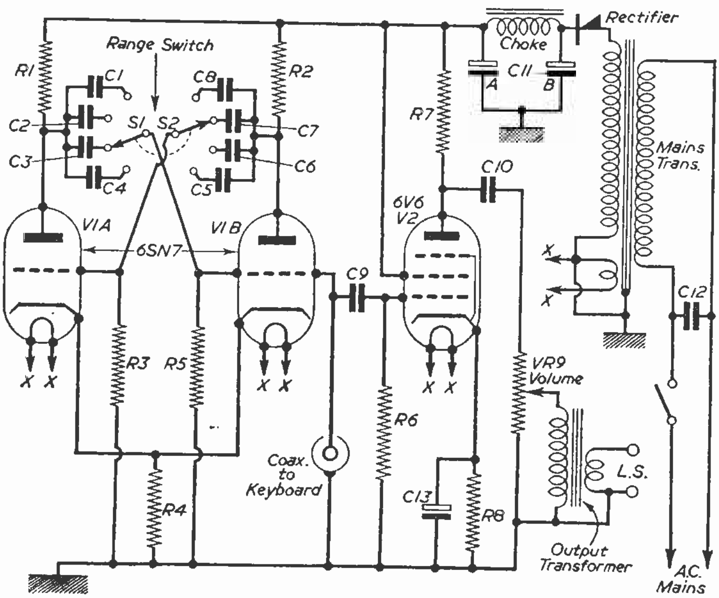


Fig. 1.—Theoretical circuit of the "Simpletone."

LIST OF COMPONENTS

C1 to C4 and C5 to C8
2 at 1,000 pF.
2 at 2,500 pF.
2 at 5,000 pF.
2 at 7,500 pF.
C9 .05 μF.
C10 1 μF.
C11 8-8 μF.
C12 .01 μF. 1,000 v.
C13 25 μF.
V1 6SN7, V2 6V6
R1 100 K. ohm.
R2 100 K. ohm.
R3 47 K. ohm.
R4 500 ohm.
R5 3.3 meg.
R6 500 K. ohm.
R7 : 6.8 K. ohm 6 watt.
R8 240 ohm.
R9 500 K. ohm.
R10 47 K. ohm.
RXs 1 megohm (see text).
CX 500 pF. (see text).
250 v. 60 mA. half-wave mains transformer, smoothing choke, 60 : 1 output transformer, double pole four-way switch, 60 mA half-wave metal rectifier, 7 x 10 chassis.

The Keyboard

For those who are unfamiliar with the working of this oscillator it should be explained that the control of the frequencies or notes produced is effected by the variation of the gridleaks of either VIA or VIB; but for simplicity, only the gridleak of VIB is altered in this circuit. From a study of Fig. 3, it will be seen the wiring of the keyboard is arranged so that all of the resistors, RX (one for each note required). are connected in series; each resistor is then short circuited by a switch (SX) which must be the key itself. In this way there will be a complete short-circuit between the grids of VIB and chassis when none of the keys is pressed, thus virtually muting the instrument when not in use. Immediately a key is pressed

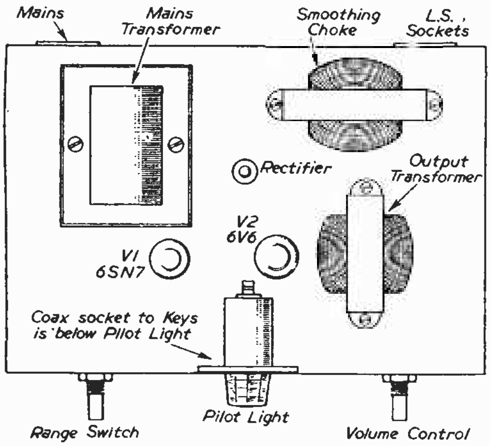


Fig. 2.—Plan of the chassis of the "Simpletone."

the short-circuit across the appropriate resistor will be broken. as with SXE, and a note will be heard.

It is essential that R10 (47KΩ) be wired in series with the potentiometer controlling the highest note of the keyboard, since this is the minimum value of gridleak that VIB must have to function properly. The correct value of each of the tuning resistors RX is 1 megohm, but in the interest of economy it may be required to use a smaller value obtained from the surplus market. In this case the value can be reduced to 200 KΩ for the lower half of the keyboard, and reduced to 50 KΩ for the higher notes, and the difference "padded" in by a suitable fixed resistor.

The Semitones

On the author's modest nine-note keyboard it was found unnecessary to construct additional keys to cover the semitones (black notes). By

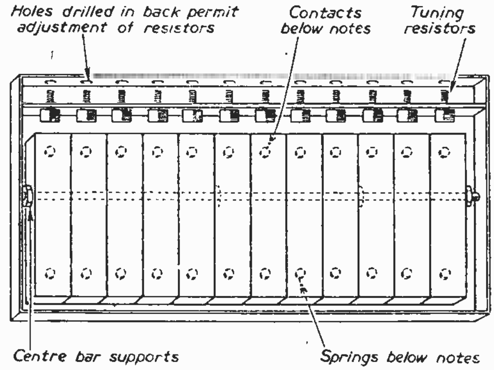


Fig. 4.—Suggested layout for the manual.

merely arranging for the keyboard to be shunted by a 500pF condenser with a bell-push type switch (S3 and CX), whilst a note was being played, the frequency was dropped the required tone lower.

Keyboard Construction

Since it is unlikely that a keyboard can be bought with the exact number of notes required, the only alternative will be to construct one's own. A toy piano could be used, provided that the contacts wired to each note remain firmly together when at the rest position.

The whole of the keyboard can be built in plywood and the sizes of the notes is a matter of choice. From a study of the diagrams it will be seen that the keys are supported by a central

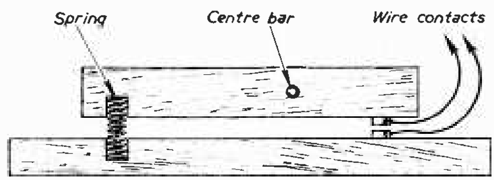


Fig. 5.—Diagram of the key action.

bar through the middle, the hole for which should be drilled about three-fifths from the front of the key to give extra leverage. This bar must have an extra bracket for support every four keys or so to prevent sagging. The contacts at the back can be in the form of drawing pins with the wires wound round, and these contacts are held rigidly together by a spring at the other end, which is let into the base and the key.

If the tuning pots are broader than the keys they will have to be mounted in two layers instead of side by side.

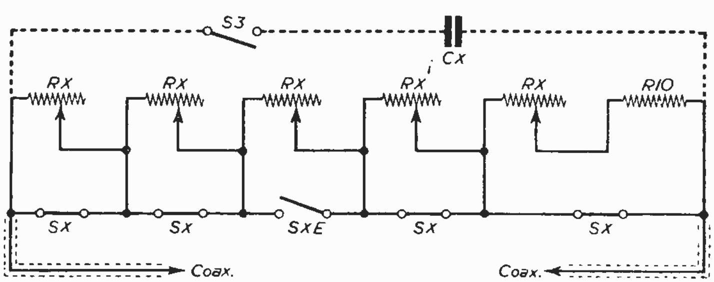
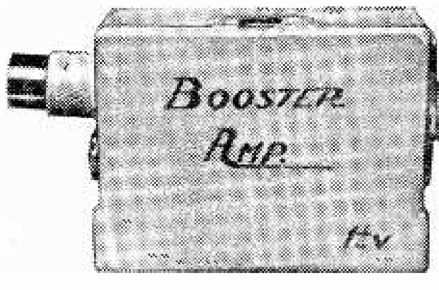


Fig. 3.—Simplified diagram of the key circuit.

A Transistor Booster Amplifier

A SIMPLE TWO-STAGE PRE-AMP. By P. Thornton



THE purpose of this amplifier is to provide a self-contained matching unit for a low-impedance source into a high-impedance input, i.e., low-impedance moving-coil microphone into a high-impedance input of a tape recorder, etc. At the same time the unit gives a considerable increase in signal level.

In order to make the unit as compact as possible and independent of external power supplies, transistors were decided upon. Power is provided by half a penlight battery, and the whole is enclosed in a plastic box with hinged lid obtainable from the popular stores for a few coppers.

The connections to and from the unit are by coaxial plug and socket, the author having used this type of connection in practically all of his audio equipment and associated units for some considerable time.

The use of these coaxial connections enables small units such as these to be plugged direct into other equipment without the need for any lead at all.

LIST OF PARTS

C1, C2, C3—8 μF 6 v. wkg. T.C.C. Type CE69A.
R1—150 k. midget ¼ watt.
R2—100 k. midget ¼ watt.
R3—2.2 k. midget ¼ watt.
T1, T2—Red Spot transistors.
L1—Miniature surplus stock 5 : 1 transformer.

Construction

The case is first prepared by making a hole at both ends to receive the plug and socket. No attempt should be made to drill these holes as splintering of the Perspex will result. The best way is to pierce the Perspex with a hot pencil bit soldering iron. The end at which the socket is fitted is pierced with a hole about ⅛in. diameter, and while the Perspex is still soft the centre conductor of the socket is pushed through the hole and the body of the socket held firmly against the case so that when the Perspex hardens the socket lies flush with the surface of the case.

The socket is then cemented to the Perspex, using a cellulose adhesive such as Durofix. The coaxial plug is now fitted. Only the front half and the centre are used. The back half and the cable grip are discarded. The case is pierced with soldering iron to make a hole slightly smaller than the diameter of the threaded portion of the plug and before the case hardens the plug is quickly pushed into the hole with a twisting action, thereby cutting a thread in the material and making the plug a firm fit in the case. A 1in. length of tinned copper wire is then soldered into the centre connector of the plug to form a lead and the centre connector is pushed into the body of the plug and coated with cellulose cement. Cement is also applied liberally all round the inside of the case where the plug and socket enter. When left to dry for 24 hours the assembly should be strong and rigid.

Small strips of copper foil are now cemented into the two bottom corners to make contact with the battery. A 4 B.A. ½in. screw is heated by a soldering iron and then pushed through the Perspex about 1/32in. above the copper foil at the front end. A small tag of copper foil is now soldered to the screw so that by turning the screw about a quarter turn the foil tag makes contact with the foil battery strip (Fig. 2).

The electronic assembly is next made up. No chassis of any form is used, the various com-

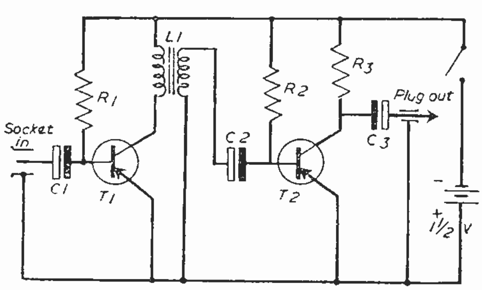
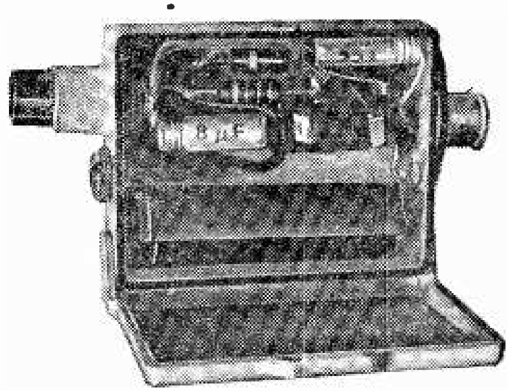


Fig. 1.—The Theoretical Circuit.



The Layout of the parts may be seen from this illustration.

ponents simply being wired together. Due to the small dimensions and lightness of the components, this method of assembly is entirely satisfactory. The interstage transformer is the heart of the assembly, the components connected to this are soldered straight on to the four pins of the transformer. Note: A pair of long-nosed pliers should be used as a heat shunt at every soldered joint.

When the electronic assembly is finished it should fit into the top half of the case. All that is now necessary is to connect the leads of C3 and C1 to the coaxial plug and socket respectively and connect leads to switch and battery. Remember to connect the outers of the socket and plug to the positive line.

Operation

Before switching on check all connections and the polarity of the battery. This is extremely important as reversed polarity will burn out both transistors.

The unit can be tested by connecting a low-impedance microphone to the input (socket) and feeding the output into a pair of high-impedance headphones or into a power amplifier.

It is important that the unit is only used with a low-impedance input, as a high-impedance input will result in a loss of signal strength and excessive background noise.

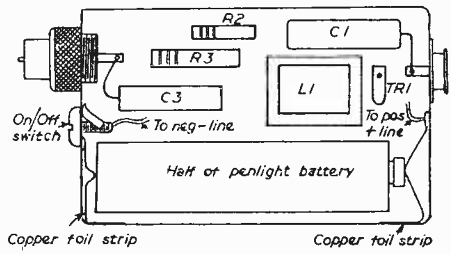


Fig. 2.—Layout of the parts.

MSF Standard Frequency Transmissions

DETAILS OF THE NPL RADIATIONS

A MODERN standard of frequency of high precision is an expensive and elaborate piece of equipment, but it differs from the other standards of measurement in that it can be made available continuously over wide areas by means of radio transmissions. The National Physical Laboratory has taken a leading part in establishing the salient requirements and properties of such transmissions and regular transmissions are now made on frequencies of 2.5, 5 and 10 Mc/s which are among those allocated to this purpose by international agreement.

The MSF transmissions, originated experimentally in 1950 and now operated on a permanent basis from the Post Office Station at Rugby on behalf of the National Physical Laboratory, are intended to serve mainly the United Kingdom and Western Europe, and the reception reports that have been received over the last five years show that this object is achieved by the present programme. Most users obtain satisfactory reception of one of these frequencies which are radiated almost continuously. The accuracy that can be obtained from them is, however, limited by the propagation conditions which can cause changes in the received frequency amounting to $\pm$ 2 parts in 10^7. An additional transmission is therefore made for one hour each day on a frequency of 60 kc/s. The ground ray is receivable over a wide area, but even if the sky wave is used, the propagation effects are small and do not in general cause errors exceeding a few parts in 10^9. This transmission has proved so valuable that the carrier wave of the more powerful 16 kc/s GBR telegraph transmitter is now also controlled by the MSF standard. The new transmission does not, however, form part of the MSF service nor does it carry the special modulation programme. It transmits Observatory time signals at 10.00 and 18.00 hours G.M.T. each day but the signals do not prevent the carrier wave from being employed as a standard if suitable reception techniques are employed. For example, local standards have been compared with this carrier wave with an accuracy exceeding $\pm$ 1 part in 10^9 in the United States of America and New Zealand.

Programme and Technical Details

The transmissions on 2.5, 5 and 10 Mc/s are continuous except for a break between 15 and 20 minutes past each hour which is made to permit of noise measurements during these intervals and also to serve as a means of identification if more than one transmission is being received on the same frequency. The power is 0.5 kW in all cases and a bottom fed mast radiator is used for the 2.5 Mc/s transmitter and quadrant dipoles for the 5 and 10 Mc/s transmitters.

The 60 kc/s transmission operates between 14.29 and 15.30 G.M.T. each day with a power of 10 kW.

Modulation Programme

Minutes past each hour				*Modulation*
0–5		30–35	45–50	1000 c/s
5–10	20–25	35–40	50–55	1 c/s pulses, 60th pulse increased in duration to 100 milliseconds
10–14	25–29	40–44	55–59	Unmodulated
14–15	29–30	44–45	59–60	Speech announcement

(Owing to maintenance work on the aerials at Rugby it has been necessary to change the time of the 60 kc/s transmission to 19.59-21.00 G.M.T. since the beginning of November, 1956, and to replace the 16 kc/s GBR transmission by another from GBZ at Criggion on 19.6 kc/s.)

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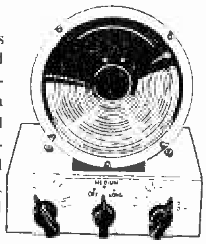

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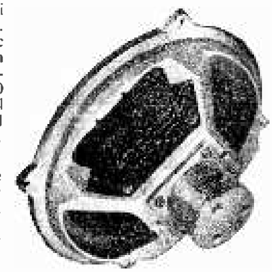

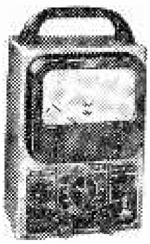

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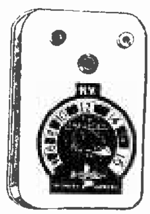

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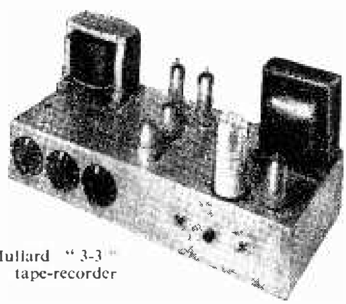

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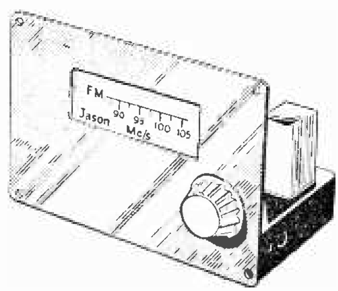

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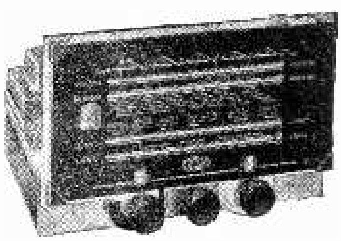

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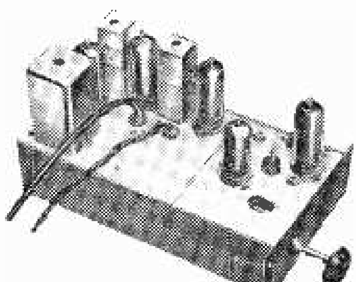

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Observe the Satellites–2

HOW TO PICK UP AND TRACK THE ARTIFICIAL MOONS

By O. J. Russell, B.Sc.(Hons.), G3BHJ

(*Continued from page 776, January Issue*).

PREVIOUSLY the outlines of the Doppler principle of satellite velocity determination were mentioned. This, as previously explained, involves measurement of the observed satellite frequencies. On approach the frequency is higher than the true frequency, while when receding the observed frequency is lower than the true frequency. Readers were introduced to the "conversion factor" of 1½ cycles per second per megacycle per 1,000 m.p.h. of velocity. This indicates that for the 20 Mc/s. transmission the observed frequency shift will be 30 cycles per 1,000 miles per hour of relative velocity. Thus with a satellite moving at 18,000 m.p.h., a total frequency variation of some 540 cycles above and below the true frequency will be observed. Fig. 1 illustrates this diagrammatically, and shows how the rate of drift varies. However, aurally the drift takes place very slowly if one is listening to a high beat note, and plenty of time will be available for measuring the initial and final frequencies.

As earlier explained, the time during which signals may be observed at any one approach of the satellite may be from a minute or so up to periods of an hour or more, depending upon propagation conditions. On the 40 Mc/s frequency, ionospheric effects will be less marked, and some 10 minutes or so will be the probable audibility period for a close transit. We have to remember that under some propagation conditions the 20 Mc/s signals may be heard for much longer periods, although this will not apply very often to the 40 Mc/s signals. For the 108 Mc/s American satellite signals, the duration of audibility will be close to the "optical" visibility, so that the maximum audibility will be around 10 minutes, perhaps a little longer. For all signals under "optical range" conditions, which will apply to the lower frequency satellite signals when DX conditions are poor, one will expect the satellite signals to appear suddenly at reasonable strength, rapidly peaking in less than a minute to full audibility, and holding a steady signal for several minutes before disappearing as suddenly as the signal first appeared. Under ionospheric and other anomalous propagation conditions, not only the 20 Mc/s signals but the higher frequency signals may be greatly extended in range.

The Aerial

So much for the duration of audibility when a satellite makes a transit. How best to receive such signals? Clearly an aerial system having a good pick-up for the distant signals is required, as the strong "overhead" signals can be left to look after themselves. Moreover, an aerial having a good pick-up from all directions is necessary, so that one may cope with varied satellite orbits and angles of approach. The ideal aerial for this application is a vertical type. Several forms of vertical aerial may be used depending upon site restrictions. Thus the "simplest" vertical system is a 12ft. whip fed by coaxial cable, as shown in Fig. 6. In fact the Allwave Belling Lee type of anti-interference vertical rod aerial is very useful for this type of reception, and many households will already have such aerials for domestic reception. Another sure-fire performer is the groundplane aerial, which will give very good results (Fig. 7). These aerials should be mounted at a reasonable height to minimise absorption of low angle signals by surrounding

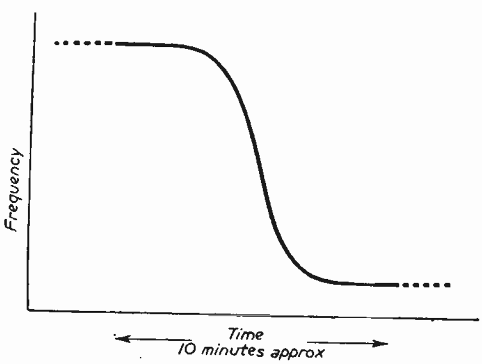
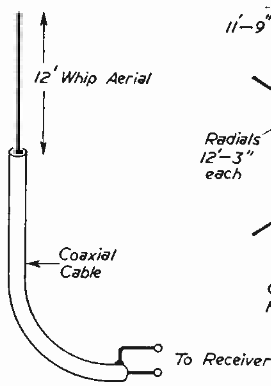


Fig. 5.—Diagrammatic representation of the Doppler frequency shift as a satellite passes overhead. Some ten minutes of audibility may be expected from a satellite at 300 miles altitude. Satellites at greater heights will be audible for longer times.



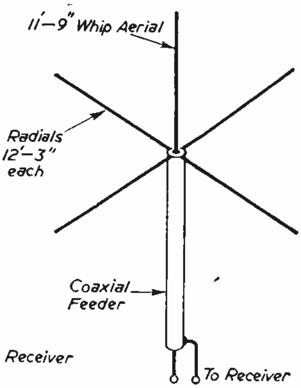


Fig. 6. (left)—A simple vertical whip aerial will give excellent results when receiving the satellite signals. Such an aerial should be mounted at a reasonable height so as to be clear of nearby house wiring, gutters and telephone lines. Fig. 7. (right)—A groundplane aerial will give very good results on satellite reception.

house wiring, telephone lines and other impedimenta of modern life. A simple centre-fed vertical dipole (Fig. 8), or an end-fed vertical (Fig. 9) may also be used. The vertical directivity of such aerial systems is shown in Fig. 10. Thus such aerials have the valuable property of being most sensitive to the low angle

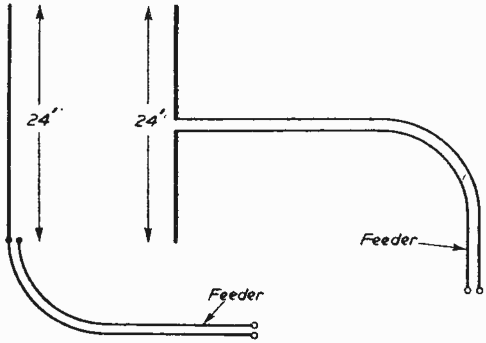


Fig. 8. (right)—A simple centre-fed vertical aerial that may be suspended beneath an existing horizontal aerial wire. Coaxial feeder of any length may be used as a lead-in. Openwire feeder or 300 ohm line in multiples of 12 ft. lengths may also be used. Fig. 9. (left)—An end-fed vertical aerial may be used with good results. Coaxial cable should not be used, but 300 ohm ribbon or open-wire spaced feeder may be used in lengths that are multiples of 12 ft.

distant signals of the satellite transmitters, thus giving the best possible opportunity of receiving signals from maximum ranges. The sort of signal variation that might justly be expected with a well-sited vertical aerial is shown in Fig. 11. When local ground conductivity and absorption are poor, the strength of the distant signals will be attenuated. However, the vertical aerial still gives a good chance of optimum audibility over extreme ranges, and in view of the constructional simplicity of such systems, they may be erected even in the most limited spaces. A simple vertical aerial might be suspended from an existing horizontal aerial for example. Amateurs have found that existing 21 Mc/s aerials may be used for 20 Mc/s reception in many cases, so that many amateurs are already "in business" for efficient satellite reception.

The Receiver

A good receiver is desirable, and some form of communications receiver is preferable. Some forms of amateur communications receiver are in fact "amateur bands only," and some form of converter will then be needed to enable the satellite frequencies to be covered. This also applies to some popular forms of service communications receivers that do not cover the 20 Mc/s satellite channel. To perform an accurate Doppler frequency measurement, a pair of measurements made at the initial and final audibility of the satellite will enable a good estimate to be made. However, an accurate pair of measurements is essential. The tuning control, even of a bandspread receiver, is too coarse to enable a kilocycle shift to be accurately measured. Even the sweep of the B.F.O. control is too wide. However, this may be overcome by fitting a vernier control to the B.F.O., which shifts the B.F.O. frequency only by about 1¼ kc/s for its maximum sweep. A 0-10 Phillips type trimmer may even be used for the vernier condenser, which provides virtually a micrometer action. Otherwise a small receiving type of variable may be made by removing plates from such a condenser, until the total capacity swing is only a pF or so. Such a control must then be calibrated in terms of

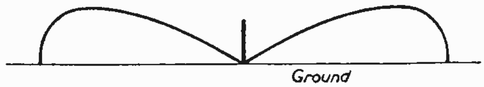


Fig. 10.—Reception pattern for vertical aerial systems described.

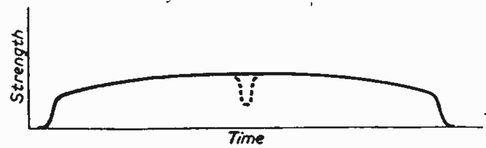


Fig. 11.—Signal strength variation observable with a transit of a satellite when using a vertical aerial. For a very close approach there may be a dip in signal strength when the satellite is directly overhead.

frequency, and while we would like to detail procedures for this, unfortunately our space is limited.

However, assuming one has calibrated such a device, we will consider its use. We should have a vernier B.F.O. pitch control, calibrated over a 1,500 cycles swing. Thus we can "zerobeat" the satellite frequency initially, and observe the change necessary to maintain zerobeat up to the time of disappearance of the satellite. However, note well that as the receiver H.F. oscillator is on the H.F. side of the signal, as the received signal moves L.F. due to Doppler shift, the actual I.F. will move higher. Therefore our B.F.O. control should be calibrated so that the L.F. end is nearly the minimum capacity position of our vernier capacitor. We will then be able to avoid the embarrassment of hearing the satellite drift the wrong side of the B.F.O. setting, so that we cannot take a reading. Practically, we have to move the B.F.O. condenser towards its lower capacity setting to maintain zerobeat. This should be remembered when initially calibrating against standard L.F. frequencies.

Measuring the Speed

We can now imagine the first attempt to measure the Doppler shift. The receiver should have been running well in advance of the expected time so that it has reached a stable state. Also as anomalous propagation effects may be in evidence we may be able to receive the signals well in advance of the published transit time. With average propagation conditions, the W.W.V. transmissions of the American Bureau of Standards will not only enable us to set our watches and clocks accurately, but will provide a convenient marker for the 20.005 Mc/s satellite transmissions. Thus we should be ready at least half an hour in advance. Setting the B.F.O. on

W.W.V.. we detune the receiver H.F. until the W.W.V. beatnote has run up to several kc/s, by which time on most communication receivers W.W.V. will hardly be audible. We sit back listening, anxiously scanning the crawling clock until we imagine . . . no, there it is . . . a weak, fading ionospherically diffused. watery signal filtering in well in advance of the expected time of audibility. This gives us a sporting chance of finalising our adjustments for a good Doppler reading. With the receiver tuning centralised to peak up the signal. we zerobeat the V.F.O., taking care that the zerobeat initially is on a convenient calibration point, say " 100 cycles." Suddenly the signal peaks and steadies as it comes into " optical range," and a noticeable slow drift of frequency occurs. For a couple of minutes the signal drift is really noticeable as we listen to a strong, steady carrier. Finally, after some minutes, the signal dips, and then there is a fading ionospheric signal once more. We measure our shift of the B.F.O. control . . . some 1,030 cycles. Not bad. If we use the " exact " conversion figure of 29.8 cycles at 20 Mc/s for converting this, we get a velocity of 17.280 miles an hour. (Remember that the total frequency shift must be halved, as the total measured relative velocity has been from approaching to receding, i.e.. twice the actual velocity.) The accuracy of this figure will depend on many things. With an accurate calibration of the B.F.O.. this is limited to the delicacy with which we may estimate true zerobeat. By ear this may not be to better than, say, 30 cycles—an error of perhaps 1,000 miles per hour. An experienced amateur could do much better by purely aural estimates of zerobeat. If we used a cathode ray oscillograph method. we have no difficulty in principle in estimating to better than a cycle per second, thus getting velocity figures accurate to a measurement error of only a few miles per hour.

There are a large number of simple refinements, and equally simple corrections to measurements, aerial systems and other exciting possibilities for the amateur.. These open up very interesting and novel activities for amateurs and short-wave listeners alike, particularly as they do not necessarily involve complex or expensive equipment. In fact, much useful and absorbing work may be performed with simple receivers and equipment. However. space allocations do not permit of further description at the present time. We will warn the beginner. however. *not* to confuse the W.W.V. signals with the bleeps. This has happened, as no bleeps were heard after the third day, when transmissions were pure C.W., yet reports of bleeps occurred. At the most a few sporadic bleeps may have been emitted, but observers and the writer have listened for many transits of the first satellite. and have only heard a continuous unmodulated carrier after the first few days. However. W.W.V. emits a timing and a tone signal that under some conditions produces an effect very much like a " bleep-bleep," which has obviously deluded many listeners. This is important. as at the time of writing the second satellite is orbiting and bleeping. Clearly the bleep signal is a feature of the satellite transmissions, but one which may discontinue after a period. One should be on watch, therefore. for *either* a bleep signal or a continuous wave signal. Moreover, other forms of modulation may be impressed on the signal in order to telemeter data to Earth. A tape recorder is therefore a useful and handy means of recording these signals for examination at leisure.

B.R.E.M.A. News

Preferred I.F. for V.H.F./F.M. Receivers

IN a technical bulletin issued to members, the British Radio Equipment Manufacturers' Association states:—

" It will be recalled that with the commencement of the V.H.F. sound radio service in this country an I.F. of 10.7 Mc/s was usually employed since this frequency was in use in the U.S.A. and on the Continent.

" Recently. consideration has been given to the suitability of this frequency for use in this country, mainly with a view to interference to and from other services. Whilst on purely technical grounds certain other frequencies showed a marginal improvement over 10.7 Mc/s. it is considered that those advantages would not justify abandoning this almost universally adopted frequency and the B.R.E.M.A. Executive Council has, therefore, endorsed the Technical Committee's recommendation that 10.7 Mc/s should be confirmed as the preferred intermediate frequency for receivers used in the U.K., with the oscillator frequency on the low side of the signal frequency."

Radio and TV Sales Maintained

Retail sales of radio and television receivers and radiograms for the first ten months of 1957 continued at levels above those for the same period in 1956, according to the latest survey by the British Radio Equipment Manufacturers' Association.

Television receiver sales over the ten months were 2 per cent. higher, radiogram sales were 26 per cent. higher and radio receiver sales 20 per cent. higher.

The B.R.E.M.A. retail surveys, it should be borne in mind, do not include rental or relay transactions.

In the month of October retail sales of television receivers were 198,000, an increase of 19 per cent. on the previous month but a decrease of 13 per cent. on October. 1956; sales of radiograms. 25,000, were 25 per cent. above those for September and 9 per cent. above those for October, 1956, and of radio receivers, 107,000, 10 per cent. above those for the previous month and 16 per cent. above those for October, 1956.

The proportion of hire purchase and credit sales rose for television receivers from 54 per cent. to 55 per cent. in October and for radiograms from 58 per cent. to 59 per cent. For radio receivers the proportion remained the same at 32 per cent.

On Your Wavelength

BY THERMION

An Ancient Set

I WENT round to see a friend the other evening and found him listening in on an ancient one-valver with a pair of headphones. Explanation: the family wanted to watch television and he didn't. Incidentally, the receiver was one described in these pages over 20 years ago, making use of a Cossor Triode. It was a simple Reinartz circuit, which was very popular in the early 'thirties. It is amazing how efficient some of these receivers were. Apart from, as one would expect, a lack of selectivity, the reproduction was as faithful as anything we have to-day. I often receive letters from readers stating that they are still operating some of our older designs.

My Den

FOR the first time in my rather lengthy association with this journal I had a letter the other day from a reader asking what my own private den was like. Very much like yours, I suppose. It is a den I had specially built. It contains, apart from a very complete library and bound volumes of this journal, the usual collection of test gear, receivers, a desk, workbench, tools, wall charts, and a wall board and a variety of plug points. I have spent thousands of happy hours in that private sanctum sanctorum. I often remain in it until the very early hours of the morning, and in the early days of radio the local police often looked in for a coffee and a chat. Large numbers of the police in those days were interested in set construction and my den became a sort of forum and free lending library! I have always maintained that any handyman or radio amateur should have a place in the house set apart, so that he can lock the door without risk of the housewife tidying things away to places where they are seen no more. A den enables you to be untidy tidily, and you can start straight away every evening from the point where you left off the night before. I found it irritating to have to pack up may tools and the work in hand every night, and sort it out again the following evening. And so I had this building put up. It is not large, but adequate, has side and roof lights, heating and simple cooking arrangements. The telephone is, of course, laid on. In those days this brick structure cost only £80 to put up and that included cavity walls.

If, for one reason, you are unable to have such a building put up in the garden, remember that the attic is quite easily converted to a workshop and can be made quite comfortable in the winter, even if a trifle warm in the summer.

This reminiscence encourages me to invite you to send me photographs of your den with brief notes. I will pay a guinea for every photograph reproduced in this journal and will undertake to return unsuitable photographs if a stamped and addressed envelope is enclosed. Incidentally, many of those now famous in radio enjoyed many pleasant hours in my den, in which, may I add, my attention has not been entirely devoted to radio. Every one of my articles for "On Your Wavelength" has, however been written in it. That title has been running without break in this journal, from the first issue of "Amateur Wireless," on which I originally served, and which was subsequently absorbed by PRACTICAL WIRELESS and throughout this present journal. You will remember that when we took over "Amateur Wireless" the title of this journal was temporarily changed to "Practical and Amateur Wireless." The collapse of the older journal was the culmination of a fierce battle put up by our competitors when P.W. was launched. Very naturally, they resented the intrusion of a newcomer into a market which they had held for nearly 10 years and which they had come to regard as their own. I was the only member of A.W. to be taken over. I am entitled, I think, to regard myself as something of an historian of radio. I had myself been running a monthly supplement to a science periodical under the name of "Amateur Wireless," and I presented the idea for the new journal to Cassells. They launched it with a shrug of the shoulders, expecting a circulation of about 30,000. They were unimpressed with my arguments that the circulation would be nearer a quarter of a million. I turned out to be right. When the periodical side of the business was purchased by the Berry Bros. (later to become lords) "Amateur Wireless" was sold to the then editor of the paper, who operated it for a time from a building in Fetter Lane, London. It could not, however, in spite of its eight years establishment, withstand the competition of P.W., and the new policy which it stood for. In those days the specification for one of the receivers described in our competitors' pages read more like a catalogue of the industry. The specifications, I fear, were very much decided by the advertisers. If three valve manufacturers were advertising in one particular issue, those three manufacturers were specified, but P.W. originated the solus specification. Only the parts used in the prototype receiver were specified in our design. We had not one eye on the advertisements, and if it was found that a particular valve or transformer suited the circuits better than others, it was specified whether the makers advertised or not. And that is a policy which has been carried out to this very day. The rightness of that policy was proved by the fact that all of our competitors except one fell by the wayside, and we are the only one of that group left. We built up a loyal and abiding readership which provides the hard core of our circulation and which has remained with us ever since, and is annually augmented by thousands of new readers.

Practical Applications of Negative Feedback

SOME THEORETICAL CONSIDERATIONS DISCUSSED

By T. W. Dresser

GIVEN a circuit like that shown in Fig. 1, few readers would fail to notice the loop from the output transformer secondary to the cathode of the first valve and correctly name it a "Negative Feedback" loop. But a request to define its effect upon the amplifier would probably result in a widely varying series of answers and, in a few cases, perhaps, no answer at all! Negative feedback, unfortunately, is like that: it is a wide and confusing subject and the confusion has not been lessened by some, at least, of the many articles which have been written about it.

For the pedant negative feedback can be defined as feedback which has a component *out* of phase with the input voltage. Positive feedback, on the other hand, is feedback which has a component *in* phase with the input voltage. Put in another way, feedback means taking a voltage derived from one stage (usually the output) of an amplifier and feeding it back in such a way to an earlier stage that it either assists the input voltage (positive feedback) or opposes it (negative feedback).

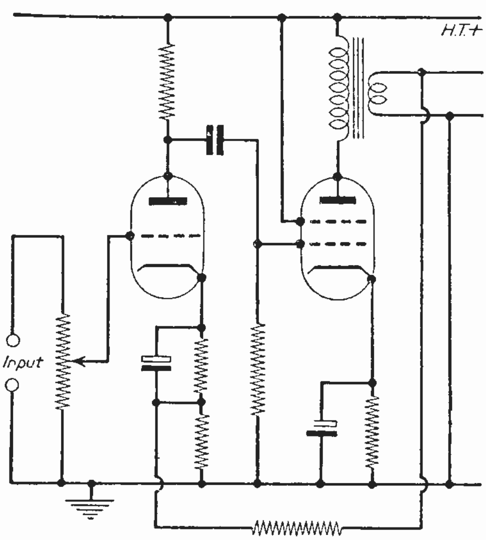


Fig. 1.—A negative feedback loop.

Negative feedback ensures:

(1) An improvement in the linearity of the frequency response.

(2) A diminution in phase distortion.

(3) A reduction in harmonic distortion.

(4) A diminution in noise and in hum voltage.

Additionally it also effects important changes in the input and output impedance of the amplifier, which may or may not be an advantage, and also results in a decrease in sensitivity, which is a definite disadvantage.

Positive feedback increases the sensitivity (or gain) and if carried to excess results in instability. A typical example of this with which most readers will be familiar is the reaction circuit in an ordinary straight receiver; when the control is advanced too far oscillation takes place, in other words the circuit becomes unstable, and there is a noticeable increase in distortion.

Feedback voltages may be obtained by either of two basic methods. It may be developed across a potential divider network connected between the output terminals or by an extra winding on the output transformer and in both of those cases it is termed voltage feedback. That is one method. In the other method the voltage is developed across an impedance in the output circuit, through which the load current flows. It is then called "current feedback." Examples of both are given later.

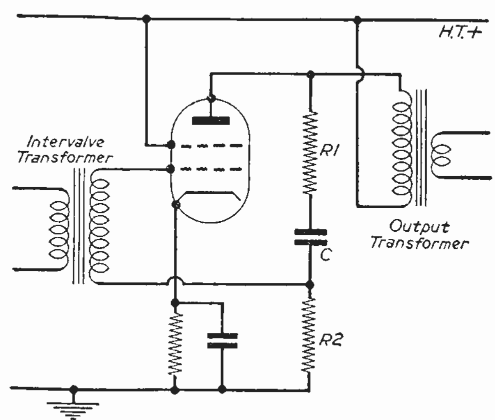


Fig. 2.—Feedback with a transformer in circuit.

With voltage feedback the actual voltage fed back is proportional to the voltage across the output load and *reduces* the effective internal resistance of the amplifier, whereas with current feedback the voltage fed back is proportional to the current through the output load and *increases* the effective internal resistance of the amplifier. Both, however, affect the gain and distortion in much the same way, despite the difference in that respect.

Voltage Feedback

Voltage feedback causes the output impedance Ra of the valve to be decreased to

$$Ra/(1 + \mu\beta)$$

where Ra is the A.C. resistance of the valve, μ its amplification factor before feedback is applied, and β the fraction of output voltage fed back.

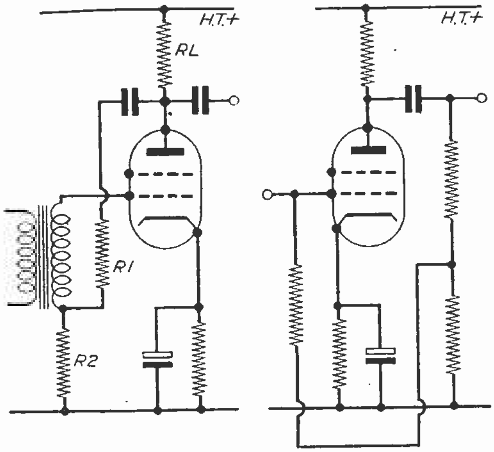


Fig. 3 (Left).—A variation of Fig. 2, and Fig. 4 (Right).—A parallel circuit.

Current Feedback

Current feedback causes the output impedance to increase from Ra to Ra = Ra + (1 + μ) Rfb, where Rfb is the resistance in series with the load across which the feedback voltage is developed.

The gain and distortion reduction with both voltage and current feedback is derived from

$$1/(1 + G\beta)$$

where G is the gain of the amplifier without feedback and β is the fraction of output voltage fed back.

Series connection of the feedback increases the input impedance to Zin = Zin (1 + Aβ), while

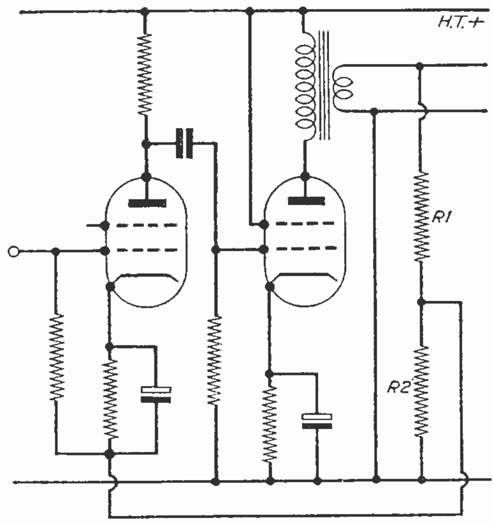


Fig. 5.—A parallel connected voltage feedback circuit.

parallel connection decreases the input impedance to Zin = Zin (1 + Aβ) where, again, A is the amplifier gain without feedback and β is the fraction of the output voltage fed back. This applies whether the feedback is voltage or current derived.

Practical Methods

There are many practical methods of applying negative feedback. One that is not often met,

(Concluded on page 892)

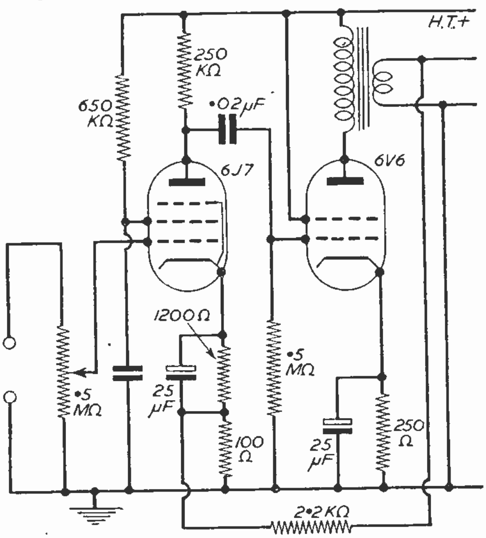


Fig. 6.—A variation of Fig. 5.

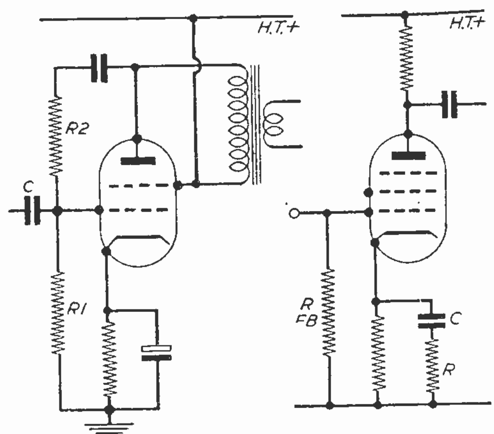


Fig. 7.—A simple parallel circuit, and Fig. 8 (Right) —Discriminating components are included in this circuit.

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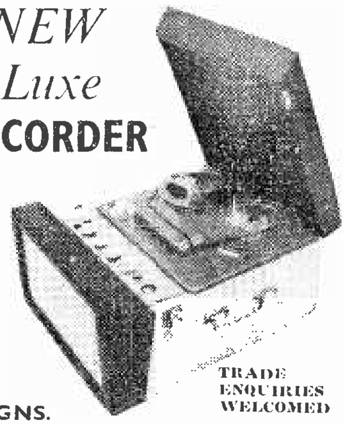

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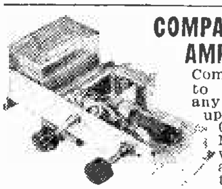

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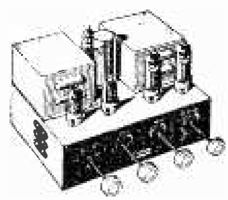

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A Single Valve TRANSMITTER

FURTHER NOTES ON MODULATING THE ONE-VALVE, TWO-STAGE TRANSMITTER

By R. H. Wright

A NUMBER of inquiries have been received regarding the possibility of using a crystal microphone in place of the carbon type, for modulating the transmitter described in our issue dated September, 1957.

As probably most readers are aware the carbon type of microphone operates on the principle of a resistance varying in accordance with the sound waves impinging on the diaphragm and, therefore, when connected in series with a battery and transformer winding, current flowing through the primary of the transformer will be caused to vary as the sound waves strike the microphone diaphragm. As a result of these current variations, alternating voltages will be set up in the transformer secondary, and these will be applied across grid and cathode of the amplifying valve.

In the case of the crystal microphone, alternating voltages are produced by the microphone action and hence neither transformer nor energising voltage are necessary. The microphone element consists of two crystals, having piezo-electric characteristics, cemented together with plated electrodes and connected to a diaphragm. Sound waves will actuate the diaphragm, causing it to vibrate the crystals and to generate corresponding alternating voltages across the electrodes. These voltages are then applied to the amplifying valve.

Unfortunately, these voltages are generally smaller in amplitude than those obtained from the carbon microphone-battery-transformer combination and so will need an additional stage of amplification.

Fig. 1 shows the circuit of this additional amplifying stage, which employs an L63 (or 6J5) type valve, the output of which is resistance-capacity coupled to the grid of the existing carbon microphone amplifier—the 6V6 type valve.

To achieve good quality speech, R1 may be varied—by trial and error—between the value quoted and about 220,000 ohms. Generally speaking the lower speech frequencies become more attentuated as this resistor is decreased in value.

Fig. 2 shows an arrangement giving alternative inputs for either a crystal- or carbon-type microphone.

The pre-amplifier circuit of Fig. 1 may, of course, be used with any modulator unit designed for use with a carbon microphone.

These notes are, of course, an alternative to those given in the November, 1957, issue. The choice as to whether one uses carbon or other type of microphone will depend on the personal preference of the user.

LIST OF COMPONENTS

R1	4.7 megohm, ½ watt resistor.
R2	680 ohm, 1 watt resistor.
R3	100,000 ohm, 1 watt resistor.
R4	47,000 ohm, 1 watt resistor.
R5	0.22 megohm, ½ watt resistor.
C1	25 μF., 12 volt electrolytic capacitor.
C2, C3	0.1 μF., 350 volt working capacitors.
V1	L63 or 6J5 triode valve. International octal valveholder.

For Figure 2.
As above with addition of S1—single pole, double throw switch.

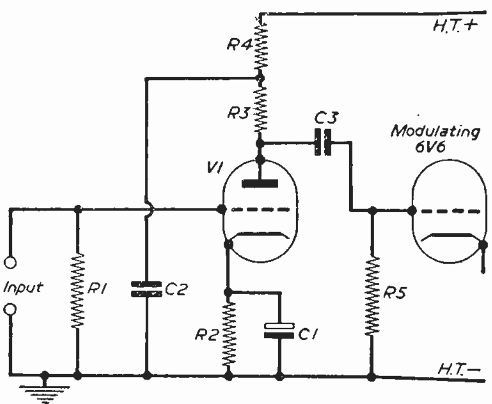


Fig. 1.—The additional stage.

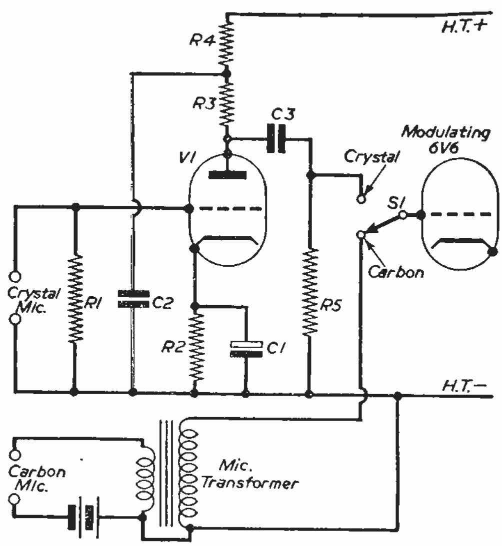


Fig. 2.—Alternative inputs are provided here.

Making a Start

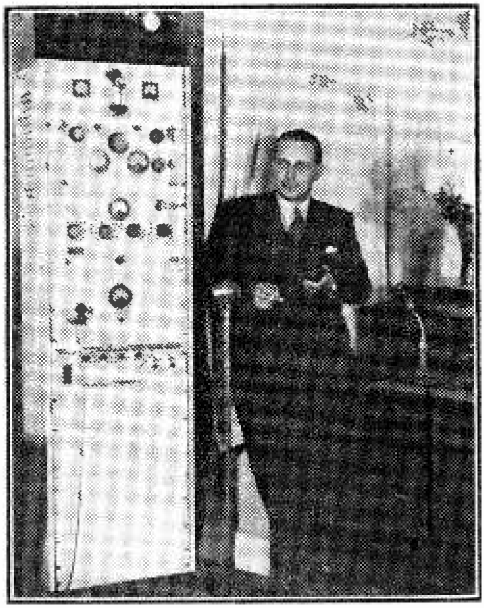
HOW TO BECOME AN AMATEUR TRANSMITTER

By "Old Timer"

IT is clear from many sources that there are a large number of would-be amateurs who are anxious to obtain a radiating permit. There are also many who while having qualified, or intending to qualify for a transmitting licence, are in some confusion as to how to proceed when they have the "all-clear" to proceed on to the air. While the fortunate tyro who is able to call upon the extensive local facilities found in large towns is able easily to surmount the difficulties, it should not be forgotten that such facilities are not available to all. Indeed, correspondence has revealed that several enthusiasts are located in remote areas where is it very difficult indeed to obtain local assistance in tackling the problems involved in becoming an amateur.

While upon the subject of "becoming an amateur" it is as well to remember that there is a voluble minority who are in favour of either a "novice" or a "technician" licensing facility, to enable beginners to operate upon the air without a preliminary morse or technical examination. While an exhaustive review of the often heated arguments pro and con these proposals cannot be entered upon here, the very warmth of the arguments show that there is indeed a large body of would-be amateurs who feel deterred by the initial technical difficulties from applying for a ticket, and indeed who feel that under their own circumstances it is unlikely they will ever be able to qualify.

While the pessimistic view that an enthusiast will "never" be able to surmount the technical examination is untrue, it is largely fostered by the fact that to date there is no beginner's handbook which provides a useful grounding in amateur radio along the lines of the A.R.R.L. Handbook, which is available here. It is hoped that the forthcoming new R.S.G.B. publication will fill this vacuum, as it is possibly true to say that while the various R.A.E. courses do provide all that is needful for obtaining a "ticket," there appears to be a dearth of information to enable the newly fledged amateur to get a really good technical grasp of the finer details of the practical aspects of amateur transmitting techniques. There is, of course, a great deal of material published for the advanced amateur, but little which helps to bridge the gap between the tyro and the experienced amateur. Moreover many of the "advanced" articles are of a "take it or leave it" kind, which provide specific information on duplicating a given circuit arrangement, but gloss



A fine amateur station, this is G8MM of Harrow.

over the logical evolution of the circuit as given. In addition the quality of technical information, due to many causes, among which restriction of space due to economic reasons must be regrettably included, is varied compared with similar American publications.

It is definitely not true that amateur radio articles must also be "amateur" in the bad sense

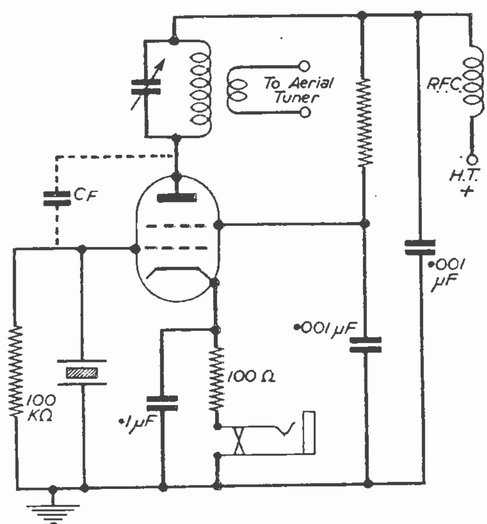
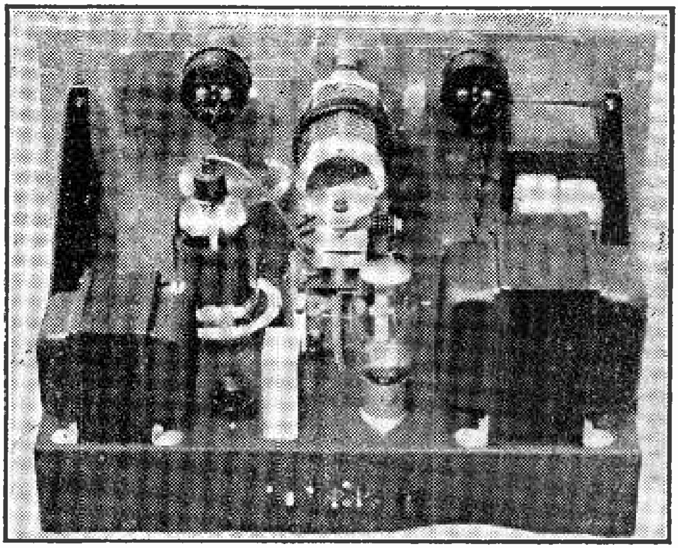


Fig. 1.—A simple crystal oscillator rig that may be used as a complete transmitter, or elaborated as shown in later diagrams to a flexible multistage transmitter. CF may be one to two pFs.

of the word. This particularly applies to the less experienced amateur, who is confused by the conflicting viewpoints often expressed. The experienced amateurs often rush into a critical attack upon the real or imagined weak points of a published article, thus confusing the beginners who, having swallowed whole an article one month, are then bewildered by reading devastating criticism the next. The beginner, in fact, is urgently in need of some stable rock upon which to build a sound understanding of the technicalities of amateur radio, and the high level arguments are merely confusing to him.

"Novice" Licence

The writer finds it very hard to see what practical objection there can be towards some form of "novice" or "technician" class of licence. Thus the V.H.F. bands are very thinly populated, and a limited assignment for low power "technician" class operators using crystal control in a sub-band within the present amateur V.H.F. assignments would offer no difficulty at all. Moreover, with the current International Geophysical Year now in operation, it might prove valuable indeed to attract to the V.H.F. regions a number of enthusiasts who would otherwise not be able to operate. In any case "low power" can be interpreted as, say, a 50-watt limit, which would enable much useful work to be accomplished by "technician" operators. Again, there seems very little reason why a "novice" allocation for 25 watts or so of crystal controlled power should not be permitted upon the 80-metre band at least. This type of permit, for C.W. communication only, provides a useful stepping stone towards the full radiating ticket, automatically teaches proficiency in morse operating under amateur conditions, and removes one objection to the full amateur ticket as now granted. As readers are now aware, immediately upon a licence being granted the amateur may use full power and telephony. A preliminary "novice" licence prior to satisfying the morse and technical examinations, would remove the alleged disadvantage of new licences blasting forth with high power phone from the word go. It is difficult, therefore, to see why a limited "novice" licence is not permitted, especially in view of the great success in the U.S.A. of the "novice" system, which has had the merit of attracting amateur recruits who qualify for full tickets in due course.

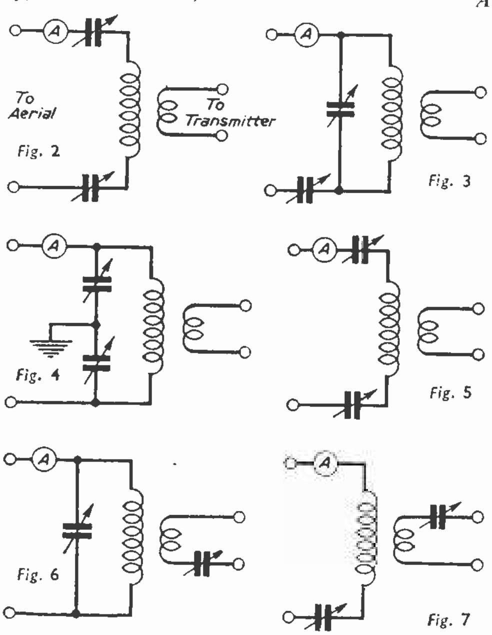


A well-designed and constructed P.A. stage.

The Requirements

However, it is now necessary to examine the possibilities existing for the literal beginner. Those who are resident in large towns are able to join a local radio group, and enjoy facilities such as morse practice and technical tuition which smooth the path greatly. In addition many technical institutes run classes specifically for the requirements of the Radio Amateur Examination (R.A.E.). However, for a large number of enthusiasts, the situation is not so easy. Some, in fact, have even inquired as to the meaning of the initials "R.A.E.," so far are they from fellow enthusiasts where such abbreviations are bandied about in casual everyday conversations.

The isolated enthusiast, however, must endeavour to make the most of what is available.



Figs. 2-7.—Basic ingredients for an aerial tuning network and possible combinations.

If no local radio group exists, it may be possible by means of a letter in a radio journal to get in touch with other beginners in his locality, who may band together to provide enough members for a local technical institute to justify running an R.A.E. course. Even if this is not possible, a number of enthusiasts may band together, and jointly subscribe to a correspondence course on the R.A.E., which expense may be shared between them. Even in the remote areas it is often possible to locate an amateur who would be prepared to assist with morse practice, and with technical problems for the R.A.E. papers. In any case a survey of the previous R.A.E. papers provides enough examples to show the level required, and gives useful training in meeting examination conditions.

For the Lonely Amateur

The enthusiast who is really isolated is a rarity, and he must do his best in the situation he finds himself in. However, even in the absence of any local amateurs, he is indeed isolated if there is not some local schoolmaster who is unable to help him with the very elementary theory required for the R.A.E. examination, while a Naval or other ex-Service signalman who is able to give morse tuition and practice may be found within a few miles of most spots. In any case a set of morse training records may be purchased or borrowed that will enable the morse hurdle to be ameliorated, while the educational facilities of almost any area will reveal some master or retired schoolmaster who would provide the very simple technical knowledge required to pass the R.A.E. requirements. Even if our isolated enthusiast has to make a cycle, bus or train trip to the location of a helpful amateur, schoolmaster or ex-Service signalman, his enthusiasm will make light of this. However, it is clear that enthusiasm without some outside source of help is greatly handicapped, and a little guidance from a friendly amateur or knowledgable enthusiast is a great boost over the hurdles and difficulties that appear. However, from the point of view of the R.A.E., the hurdles are easily surmountable, this particularly if guidance is available. A correspondence course my prove very helpful to those who are really isolated from any personal assistance, and should be considered very carefully indeed, as special R.A.E. courses are now available from several correspondence course institutions.

Going "On the Air"

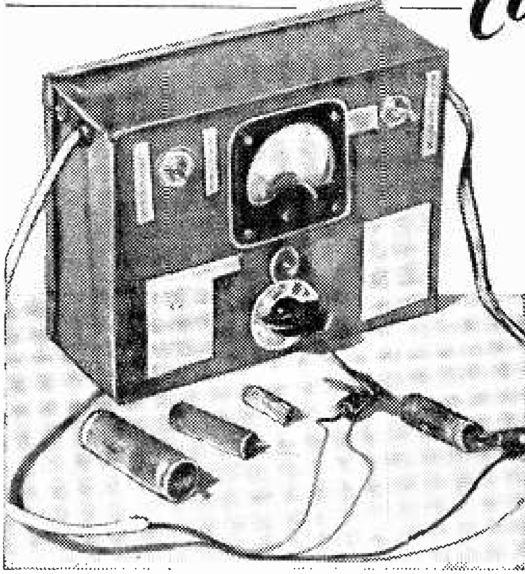
Finally we can consider the beginner who has obtained his radiating permit. "No man is an island," and this applies with some force when he obtains a radiating permit, and technically at any rate is then in a position to communicate with his fellow amateurs, and also finds that he may, through the medium of BCI and TVI, be unwittingly in communication with his neighbours as well! The choice of the rig now becomes an urgent matter. Fashion conscious as most amateurs are to-day, the "rig" is invariably visualised as a VFO controlled band switched rig covering all the usual communication bands. However, the "beginner" may find that with limited time, the mere construction of such a rig may occupy many months, or even nearly two years as in a recent case known to the writer. Furthermore, unpleasant surprises in the form of snags, such as parasitic oscillations in the driver and P.A. stages, and many other annoying phenomena may occur when the rig is completed. The severe internal surgery necessary in effecting a cure may sadly spoil the beauty of the finished rig. Moreover, during this time, the amateur ticket is collecting dust, and pointed enquiries about when one is coming on the air may be heard from the local amateurs. This may also be particularly irritating when another amateur licensed at the same time is already halfway towards DXCC by virtue of a few spells of phenomenal DX conditions. The torments of an amateur struggling in his shack with a partially completed rig, while his receiver tuned to some DX band is resounding with DX can only be imagined. When the same amateur hears a local amateur calling and working some of that DX, the agonies of mind suffered pass beyond endurance.

Practice Rig

It is useful therefore to obtain some practice upon a much simpler rig, not only for operating practice, but for practice in dealing with parasitics, TVI and BCI suppression and other matters. No apology, therefore, is needed for repeating the "simplest rig" of a straightforward crystal oscillator. Even in such a simple case, the beginner may trip up. One aggrieved neophyte waved an earlier article in my face and said "You didn't say what valves could be used in the circuit" . . . this despite an exhaustive list of valves coupled with the repeated assurance in print that "almost any" valve could be used.

(To be concluded.)

A CONDENSER *Condition* TESTER



MAKE THIS USEFUL TEST UNIT WHICH WILL BE FOUND INVALUABLE TO THE EXPERIMENTER AND SERVICEMAN

By J. Brown

IN modern electronic equipment, a large number of components are capacitors. Amongst these are electrolytics, and the material used for the construction of these for some time was secret. The writer understands that the majority are composed of an aluminium electrode around which is a pad saturated in ammonium borate. The method of the working of these capacitors is pure chemical action, as when a D.C. voltage is applied with the correct polarity there is formed on the anode a film of aluminium oxide, which insulates the solution from the anode and acts as a dielectric. Because of this action, during the manufacture a selected capacity is determined by the thickness of the film that is developed with a certain known D.C. voltage. The main feature of these capacitors is the small physical size which will contain the rather large capacities. For example, in the modern television receiver the smoothing condensers may be 200 plus 100 μF; the size, however, is small compared to the size that would be expected. The modern etched foil construction again allows larger capacities in a small case. The case is usually made of aluminium and is the earthy side of the capacitor. Should a capacitor be stored for a period of time there is some deterioration. This is due to the non-application of the required D.C. voltage, and we find that the film will not form. On connecting one of these stored capacitors to a circuit we find there is heavy current being drawn, and sometimes a lot of heat being developed. These capacitors have even been known to burst, due to this heat and expansion. The answer to this storage problem is simple, as due to the construction of these capacitors we are able to carry out a process and to reform this film. To do this we need a variable D.C. supply fed via a limiter resistor; the condition can be visually watched on a meter. We start by connecting a lower voltage than the actual working voltage of the capacitor and increasing till we reach the actual working voltage. Normally a capacitor is marked with two voltages, 1, working voltage, which is the voltage at which the capacitor will safely run without damage, and 2, the peak voltage. This is where the peak is the maximum voltage at which the condenser should be run

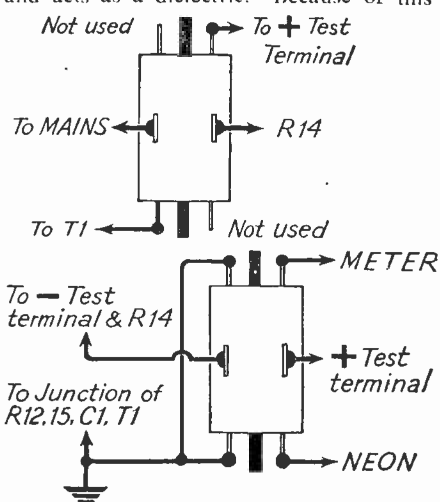


Fig. 2.—Switch connections.

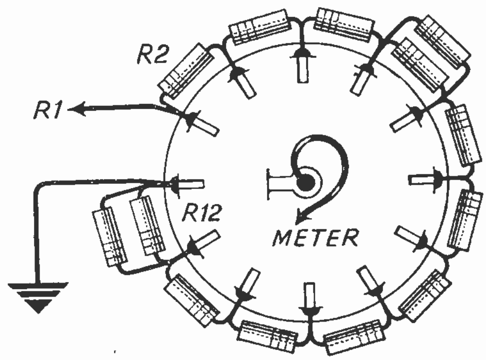


Fig. 3.—Connections to switch S2.

for a short period during the warm-up period, before the load of the equipment is placed on the power supply. If this peak voltage condition is allowed for a very long period the film forms and gets punctured, and very heavy current flows. However, if we quickly remove this voltage and reconnect the capacitor to the normal or working voltage, the film will reform and the punctures will be healed; thus the capacitor is known as self healing.

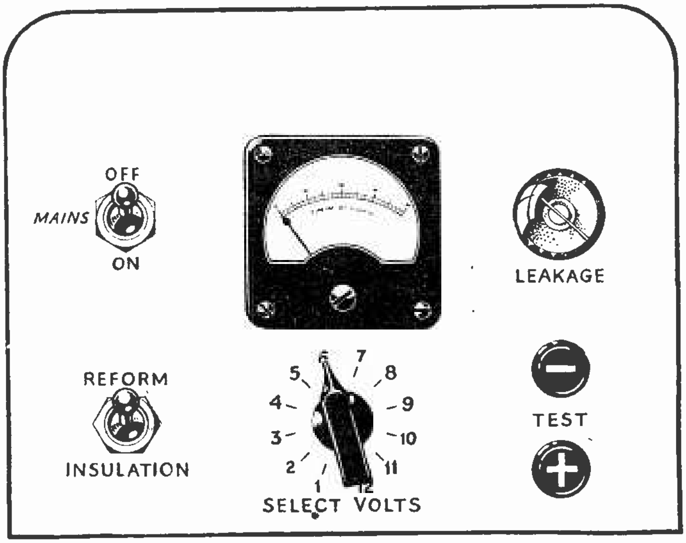
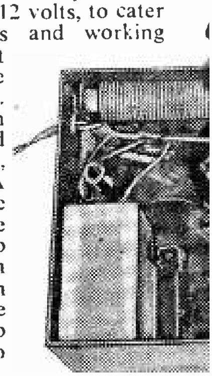


Fig. 4.—A suggested panel layout for the tester.

The Condenser Tester

This little unit is simple, the power supply being a 2½-1 ratio L.F. transformer heavy duty, which is connected as a step-up transformer, that is, the mains is fed to the lowest resistance winding and the other winding is fed to a half-wave metal rectifier (in the prototype an ex-government surplus rectifier was used). Four RM2 rectifiers have been used with success (these have to be connected in series). The D.C. is fed to a 4 μF 600-volt capacitor which acts as a reservoir and for smoothing. This in turn is fed to a potential divider of resistors in series through a limiter resistor which acts on all ranges. S2 selects the voltage required, and taps the voltage down the resistor chain. It has 12 positions, from 600 volts to 12 volts, to cater for all capacities and working voltages. The last position earths the switch and meter. From the switch the voltage is fed to the meter, which has a 5 mA movement, and the other side of the meter is fed to the function switch, S3 section B. This feeds the test terminal to either meter or to the neon circuit. The other section of S3, section A. earths the test terminal negative. One of the features of this instrument is S1A and S1B. S1A is the mains on/off switch, S1B carries out the operation of discharging the capacitor through R14. When the mains section S1A is off, S1B makes contact,



View of the in

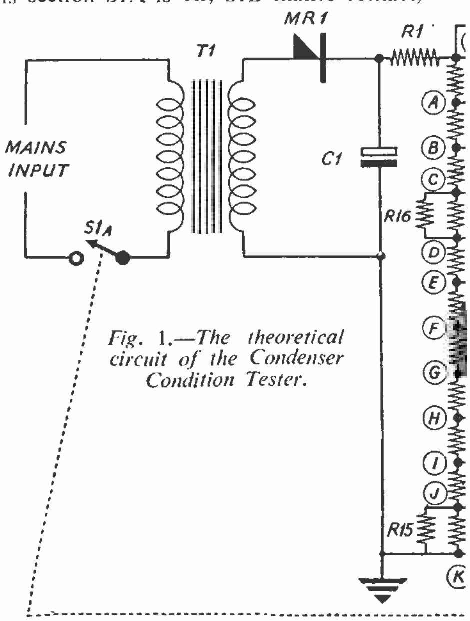


Fig. 1.—The theoretical circuit of the Condenser Condition Tester.

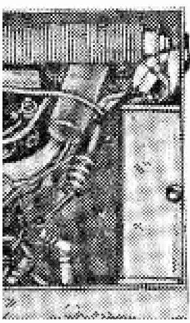
LIST OF COMPONENTS

T1—One 2½ : 1 ratio L.F. transformer.
One metal rectifier 10C/13186 (surplus). MR1 or 4-RM2 in series.
C1—One 4 μF 600 volt condenser.
R1—18 K.
R2-R12—1 megohm
R16—2.2 meg.
R15—4.7 meg.
R13—1 meg.
R14—1 K 3 watt
} All 1 watt except where otherwise stated.
C2—.25 μF 500 volts working.
One 5 mA meter Govt. surplus. Meter.
S2—One 12-way single-pole Yaxley switch.
S1A and S1B—Double-throw changeover.
S3A and S3B—Double-throw changeover.
Two terminals.
1 Neon Lamp. The original was a surplus type CV988 or GE991, although any type can be used if the resistor which is incorporated in some neons is removed. If a commercial neon is going to be used, inquire if it is fitted with a resistor to limit the current.

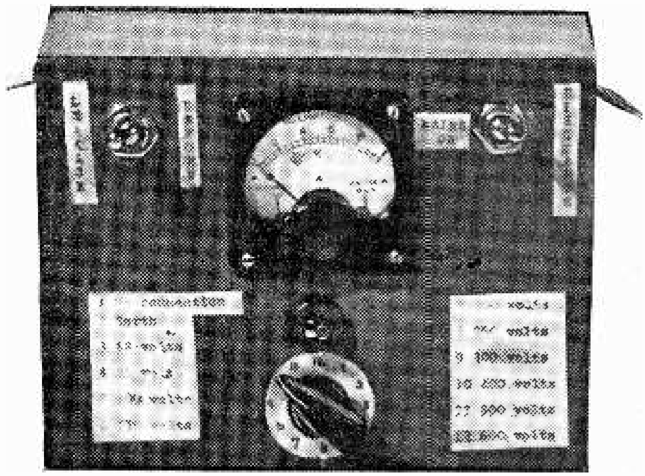
therefore the action is mains off. condenser discharges, mains off. the resistor is disconnected. This resistor and S1B are across the test terminals.

Leakage Test

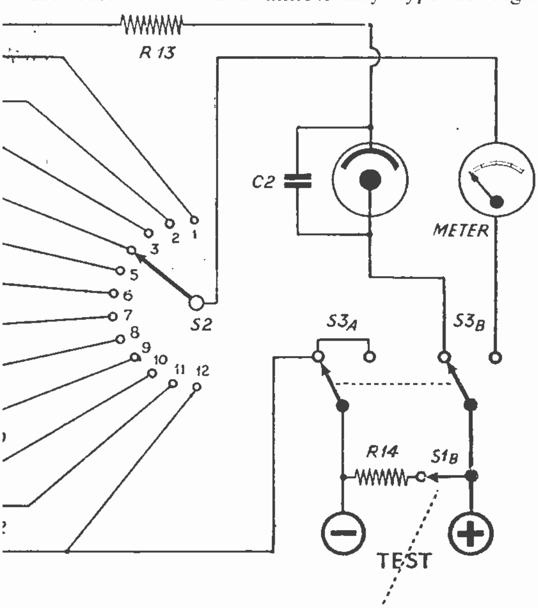
The leakage test side of the instrument is catered for by S3A and B. In the down position we have a neon lamp shunted by a capacitor, fed with H.T. via resistor R13. in series with the test terminals. When S3A and B are in position down. 600 volts are fed to the neon via R13 and appear at the test terminals. When we connect a capacitor, the capacitor charges, giving a glow in the neon. If this glow persists for a length of time, or flashes intermittently, we can safely assume that the capacitor under test has a leakage and is unfit for use. We are, however, referring to the paper types when testing for leakage. Electrolytics and their leakage is determined by the aforementioned procedure, which will be explained later. This neon leakage test can also be applied to test mains transformers for earth faults and almost any type of high resistance testing. A 100 per cent. capacitor should show a light in the neon during the period of charging only. If there is a very slow flash in the neon indicator. the capacitor can be assumed to be



of the prototype.



The sample which was first made up. An improved layout will be seen opposite.



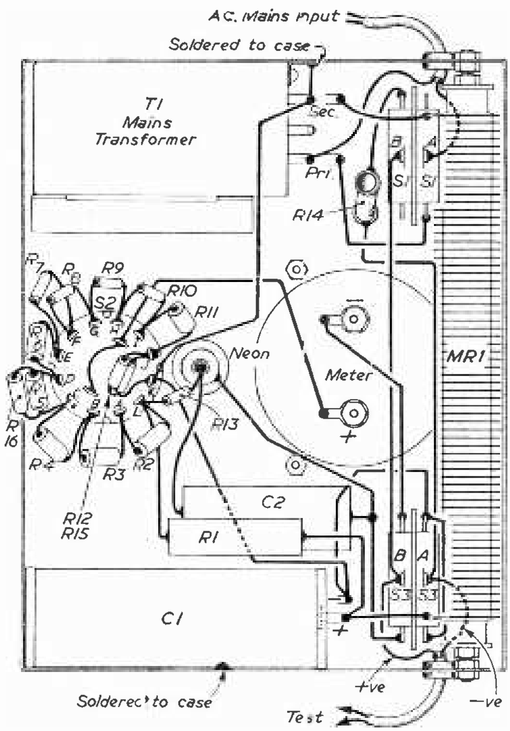


Fig. 5.—Wiring and layout of the tester.

within reason and could be safely used. Insulation may be measured by using the formula **R equals 100 N megohms** where N is the number of seconds per flash of neon.

Operation—Paper Condensers

To test for leakage, connect the capacitor to the test terminals, observe the correct polarity, set S3A and S3B to the down position. Switch the instrument on, watch the neon. If the light shows and dies away, the capacitor is O.K. and free from leakage. If it shows a continual glow there is possibly a short circuit. If the light appears in the neon intermittently as flashes, we can assume there is some leakage. The leakage can be determined by counting the flashes, comparable with the number of seconds taken. To test insulation we have the terminals brought out in rubber insulated leads. If we get a glow in neon we have a low resistance path; if no glow, either very efficient insulation or we are not making good connections with the prods. If an intermittent light, we can determine the amount of leakage in megohms by the formula.

To Reform Electrolytics

Connect the capacitor to be reformed to the test terminals observing correct polarity. S3A and B are now switched to the up position and the voltage selected, say 50 per cent. of the working voltage of the capacitor. Switch the instrument on and watch the meter. It should rise quite high when switching on, as the capacitor is charging, and drop back after. We now watch the meter till the needle drops back to the lowest possible reading and then increase the voltage and reform the capacitor again. Continue this till the working voltage is reached and the lowest possible reading on the meter is obtained. This is the condition where we increase the voltage in steps until the work voltage is reached. The time of this process varies from 2 minutes up to 2 hours for the larger capacities. However, the process and time pays dividends, as we may save the expense of capacitors and possibly of a power transformer should one of these stored capacitors be connected to any equipment. The leakage of an electrolytic capacitor is the *final reading* on the meter after the process has been carried out. The validity of a capacity when tested for leakage has been quoted thus: "a capacitor having a leakage of less than one tenth of a milliamp per microfarad is O.K. and perfectly good to use." Therefore, if we are reforming an 8 μF condenser, if the final reading on the meter is less than .8 mA we can safely say it is in good condition. One thing to point out is—*after reforming any capacitor always switch the instrument off before disconnecting the capacitor.* As already explained, the mains switch also discharges the capacitor, otherwise a nasty shock can be experienced from a charged capacitor if the hands should accidently touch the capacitor terminals.

SWITCH POSITIONS S2

Position	
L1	600 volts
A2	500 "
B3	400 "
C4	300 "
D5	250 "
E6	200 "
F7	150 "
G8	100 "
H9	50 "
I10	25 "
J11	12 "
K12	off

These measurements are taken from the meter connection side of S2 and chassis, with S2 in the corresponding positions. The voltages no doubt will vary with units, but have a tolerance of 4 per cent. In the prototype, the resistors R2-R5 were selected.

BBC Handbook 1958

THE foreword of the BBC Handbook 1958 (published November 30, 1957, price 5s.) says:

"The BBC Board of Governors welcomes public interest in how the BBC is run, and what it is doing and aiming to do."

The handbook goes a long way towards meeting this interest. The latest in the series of BBC handbooks—the first was published in 1928—gives a picture of the complexity of Britain's national broadcasting organisation.

Referring to the big audience that depends on sound broadcasting, the handbook points out that in January, 1958, there will still be some 16 million adults who have radio but not television receivers in their homes. (In addition, there are some 5 million children in the "radio only" homes.) Describing the recent changes in the pattern of radio programmes, the handbook repeats the BBC's assurance that, in making these alterations, the corporation's basic aims and policy remain unchanged.

The handbook shows how, subject to the requirements of the BBC Charter, the corporation enjoys complete independence in the day-to-day operations of sound and television broadcasting.

Looking ahead, BBC News Division forecasts that "pictures on tape" will before long be playing an important part in news programmes. A hint in the engineering section indicates that BBC technical experts are pressing forward with this development.

Music lovers have long been offered rich fare on BBC sound radio programmes—one-third of the combined output was music in the past year —and the handbook reports that BBC television is now bringing music to a new audience. Full-scale operas on television are seen on the average by around 4,000,000 people. Ballet programmes on BBC television are even more popular and reach an average audience of about 6,000,000.

The fact that sound and television drama script sections scrutinise between 500 and 700 scripts each month underlines the endless hunger of broadcasting. "Nothing of value is likely to be written by a committee," says the handbook, describing how the television script section helps writers to meet the special demands of writing for television.

One of the most impressive tables in the handbook lists no fewer than 50 countries throughout the world which regularly rebroadcast BBC overseas programmes. No other broadcasting organisation in the world can show a similar degree of acceptance by overseas listeners.

Quality Radio Tuners

SPECIAL TUNING UNITS FOR USE WITH HI-FI AMPLIFIERS

FOR the best possible reproduction with a high quality amplifier the tuner should provide a signal extending over as wide a band as possible. Many ordinary tuners, though otherwise satisfactory, do not achieve this. The higher frequencies are most often somewhat attenuated, while the full range of bass may also be lost. In such circumstances the final result may be a little disappointing, and the increase in realism obtained with a more suitable tuner will be very apparent. Ordinary superhet tuners are very liable to reduce treble. If a superhet tuner is essential, steps must be taken to increase its frequency band, or

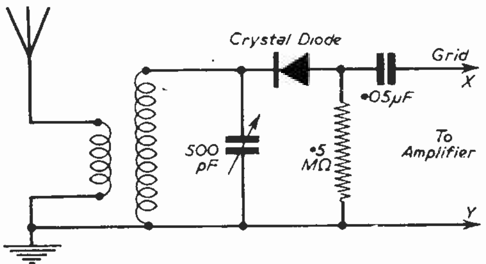


Fig. 1.—A local station tuner.

its output will be so lacking in the upper register that quality amplifiers or tweeter speakers become rather pointless.

The simplest form of tuner able to give a suitable output in favourable circumstances is shown in Fig. 1. Excellent quality can be expected, and no power supplies are required. If a reasonable aerial and earth can be provided one or more local stations may be received satisfactorily, so that such a circuit proves very useful. Stray capacity is usually sufficient to allow satisfactory detection, and any condenser shunted across the .5 megohm diode load should be of very small value—usually not exceeding 50pF. The A.F. coupling condenser must be fairly large to avoid loss of bass, .05μF to .5μF being recommended.

As with the other circuits, lead X is taken to the grid side of the amplifier input, a short connection being preferable to a long, screened wire. With A.C. equipment, Y is taken to the chassis side of the input. With A.C./D.C. amplifiers, or equipment drawing H.T. directly from the mains, an isolating condenser will be required in this connection, and can be .05μF, 750v. working. A similar condenser may be employed to keep mains voltages out of the lead X, or the coupling condenser may be suitably rated and wired in at the amplifier.

With R.F. Stage

When conditions are not favourable, the diode alone gives insufficient volume, or interference

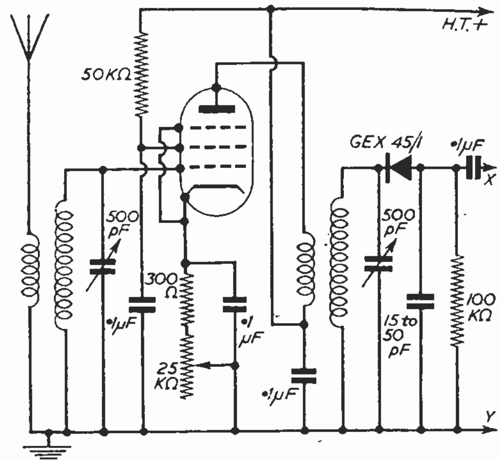


Fig. 2.—A one-valve T.R.F. tuner.

arises from other stations due to the poor selectivity. A tuned R.F. stage will often overcome these difficulties, and a suitable circuit is shown in Fig. 2. The H.T. and heater current for the single valve may often be drawn from the amplifier, so that a separate power pack is unnecessary. Any type of R.F. pentode will be satisfactory, and the screen grid and cathode resistor values indicated will suit valves such as the 6K7, and many other miniature and octal R.F. pentodes.

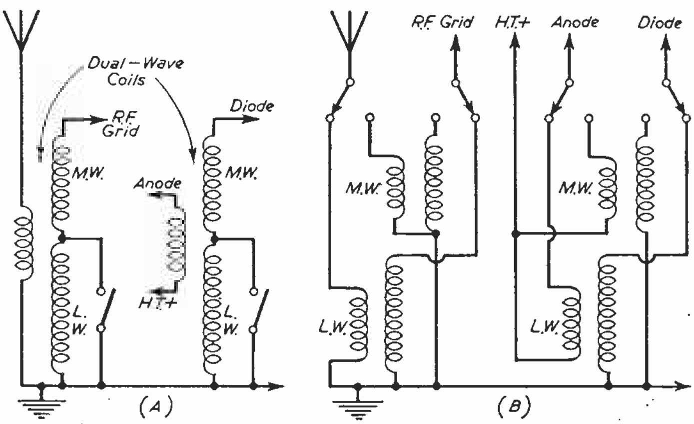


Fig. 3.—Waveband switching.

Two-gang tuning is used, with a pair of coils, usually for medium waves. If the gang condenser does not have trimmers. 50pF trimmers are added in parallel with each section. Dust-cored coils will give good results, the cores being adjusted for maximum volume at a high wavelength in the usual manner.

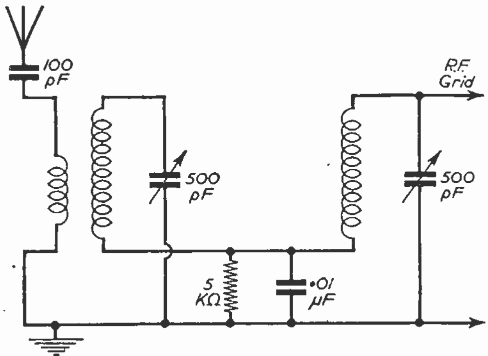


Fig. 4.—Band-pass tuning.

Crystal diodes other than the GEX45/1 will be suitable. A very small by-pass capacity is used to avoid loss of high frequencies. With an efficient amplifier and tweeter, the reduction in top caused by larger values will be apparent.

Such a circuit is much more sensitive and selective than the diode alone, and is excellent for high quality reception under average conditions. It is difficult to achieve quite the same standard with a superhet tuner.

Dual-wave Operation

In many areas two waveband tuning is desirable, and a pair of dual-wave coils, wired as at A in Fig. 3, may be employed. The coils can be standard aerial and detector types, air or dust cored. Switching is very simple, a 3-point on-off type switch being employed.

Slightly better results are achieved with individual coils, switched as shown at B. A 2-wafer switch is most suitable, with one wafer for aerial coil switching and the second for detector circuit switching. Dust-cored coils can be used with advantage.

Very high selectivity is not desirable, as a loss of high frequency output from the tuner will arise. However, this is not likely to become important with any T.R.F. tuner of normal design. Should difficult conditions result in interference from transmitters on adjoining channels proving troublesome, then band-pass tuning can readily be adopted in the aerial circuit, as shown in Fig. 4. Ordinary two-winding coils are satisfactory, with the second coil primary left disconnected.

Bottom impedance coupling is used, and the degree of coupling may easily be modified to sharpen tuning still more if necessary. The capacity of the .01μF condenser may be increased, or the value of the 5K resistor reduced, to increase selectivity. Conversely, smaller capacities, or larger resistor values (especially the former) will flatten tuning. After trimming and aligning the two circuits and detector circuit for maximum sensitivity, the band-pass circuits are staggered slightly above and

(*Continued on page* 871)

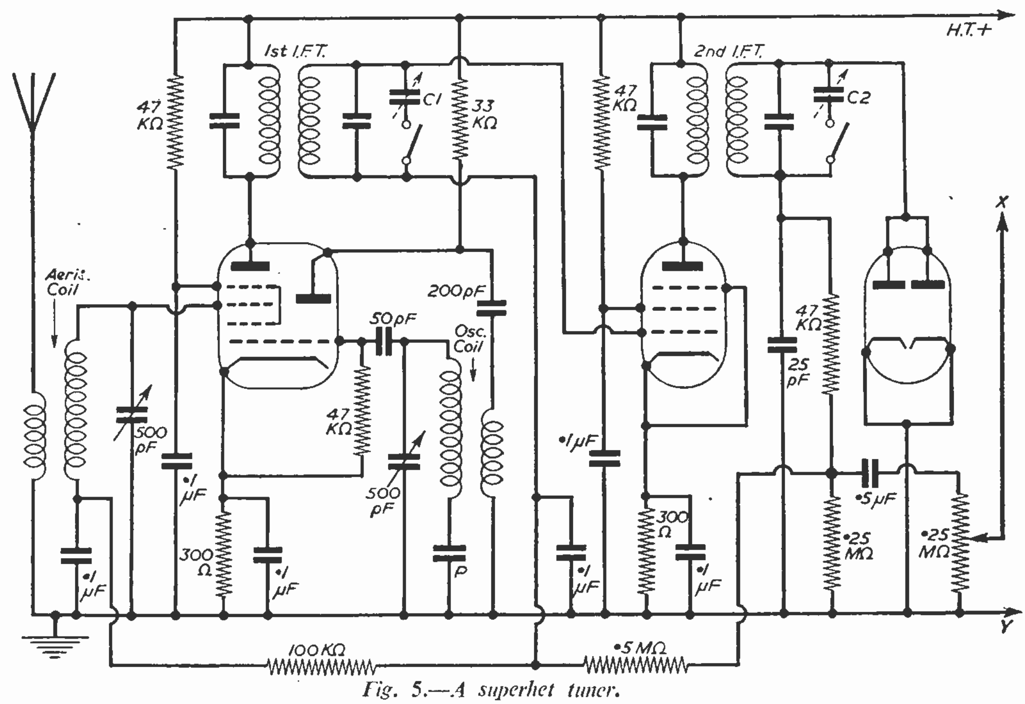
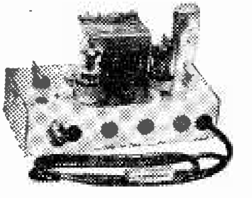


Fig. 5.—A superhet tuner.



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Mk. 2 Model as illustrated. Latest Cascode circuit using ECC84 and EF80 valves giving improved sensitivity (+ 18 db) over standard circuits. Built-in Power supply AC 200-250v. Dimensions only 6¼in. x 3in. Ht. 4in. Simple and easy to fit—only external plug in connections. **Wired, aligned and tested ready for use.** State Channel required. **Guar. Bargain Offer**—good results or full refund, only **£3.19.6.** Carr. & Pack. 2/6.

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Band I-Band III Cross-over Unit, **7/6.** Var. Attenuators 6db-36db., **6/9.** BBC Pattern Filter, **8/6.** Band III Aerials-outside Single Dipole with 4 yds. co-ax., etc., **13/9.** 3 Element Beam, **27/3.** 5 Element, **35/-,** etc.

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Linear Ratio, 10,000 ohms — 2 Megohms. Less switch, 3/- each. **Coax plugs, 1/2. Coax sockets, 1/-.** Couplers, 1/3. **Outlet boxes, 4/6.**

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SPECIAL — Semi-air spaced polythene. 80 ohm **Coax** ¼in. diam. Standard core. Losses cut 50%. Ideal Band 3. **9d. yd.**

TWIN-FEEDER, 80 ohms, **6d.** yd.: 300 ohms, **8d.** yd. **TWIN SCREEN FEEDER,** 80 ohms, 1/3 yd. **TRIMMERS, Ceramic,** 4 pf.—70 pf., **9d.**; 100 pf., 150 pf., 1/3; 250 pf., 1/6; 600 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/- each. **RESISTORS.** Pref. values 10 ohms 10 megohms.

CARBON

20% Type, ½ w., **3d.**; 1 w., **5d.**; 1 w., **6d.**; 2 w., **9d.**
10% Type, ½ w., **9d.**; 5% Type, ½ w., 1/-; 1% Hi-Stab, ½ w., 2/-.

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5 w. / 10 w. / 15 w.	25 ohms—10,000 ohms	1/3, 1/6, 2/-
5 w. / 10 w.	15,000 — 33,000 ohms	1/9, 2/3

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CONDENSERS.—Mica or S. Mica. All pref. values 3 pf. to 680 pf., **6d.** ea. Ceramic types, 2.2 pf. 5,000 pf., **9d.** each. **Tubulars,** 450 v., Hunts and T.C.C., .0005, .001, .005, .01 and .1 350 v., **9d.** .02, .05, 1/500 v. Hunts T.C.C., 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1 2kV., T.C.C. (Simplex), 3/6. .001 6 kV., T.C.C., 5/6. .001 20 kV., T.C.C., 9/6.

SPEAKER FRET.—Expanded Bronze anodised metal 8in. x 8in., 2/3; 12in. x 8in., 3/-; 12in. x 12in., 4/6; 12in. x 16in., 6/-; 24in. x 12in., 9/-, etc.

TYGAN FRET (Murphy pattern).—12in. x 12in., 2/-; 12in. x 18in., 3/-; 12in. x 24in., 4/-, etc.

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Contemporary style rexine covered cabinet in mottled red with cream interior. Size 18¾ x 13½ x ht. 8½in., fitted with all accessories, including speaker baffle board and plastic fret. Space available for all modern amplifiers and autochangers, etc. Uncut record player mounting board 14 x 13in.

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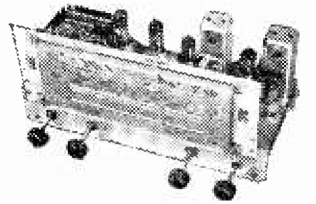
2 VALVE AMPLIFIER (to fit above cabinet), modern circuit with EL84 output, ready built, with 6in. speaker and output transformer, **£3.12.6,** carr. and ins., 2/6.



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6K8	8/6	EB91	6/6	EL41	10 6	PY82	8/6
6Q7	8/6	EBC41	10/6	EL84	11/6	PY83	10/6
6SN7	8/6	ECC83	9/6	EY51	10/6	U22	8 6
6V6	7/6	ECC84	12/6	EZ40	8/6	U25	11/6
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32/500 v. Dub.	5/-	60 + 16/250 v.	11/6
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L.F. CHOKES.—10 H 65 mA., **5/-**; 15 H. 100 mA **10 6**; 10 H. 120 mA. **10/6**; 20 H. 150 mA., **15/6.**

OUTPUT TRANSF.—Standard pentode, **4/6**; push-pull 12 watt, **13/6.** Small pentode, **3/9.** Midget battery pentode (1S4, etc.), **4 6.**

SPEAKERS.—PM-3 ohm. 2½in. Elac., **16/6.** 3½in. Goodmans **18 6**; 5in. R. & A., **17/6**; 6in. Celestion, **18 6**; 7 x 4in. Goodmans, **18/6**; 8in. Rola, **20/-**; 8in. Special Cone G'mans, **21/6**; 10in. R. & A., **25/-.**

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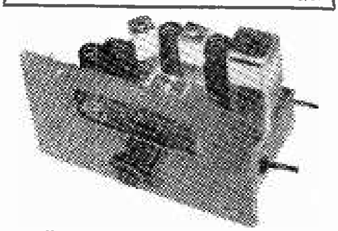
Ex-Mfrs', units, Rola, W.B., Celestion, etc. All reconditioned and guaranteed. Ideal ext. unit 7/6. P. & P. 1/6. Ditto with O/P Trans. **9/6.**



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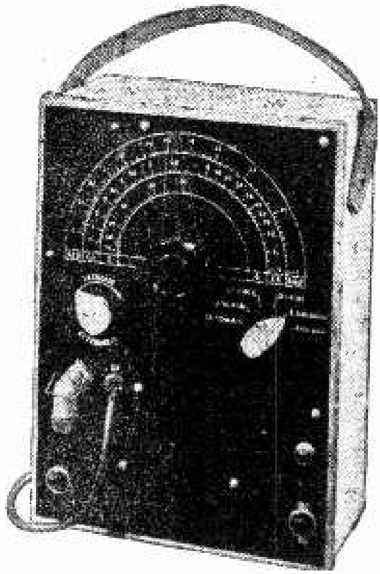

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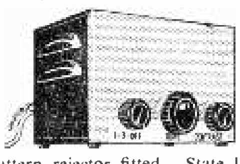

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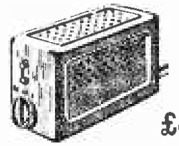

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below the detector frequency. Either of the dual-wave circuits can be used in the same way.

Superhet Tuner

In some areas a T.R.F. tuner will be insufficiently sensitive, and enough selectivity to avoid interference may also be difficult to achieve. In these circumstances, a superhet tuner becomes necessary, and a suitable circuit, with high-low selectivity switching, is shown in Fig. 5. Screen grid and cathode values are suitable for valves such as the 6K8, 6K7 and 6H6, but many other valves will be satisfactory.

The padder is of the value recommended by the coil maker—frequently 500pF for medium waves and 150pF for long waves, which may be provided in addition if desired. Ready-made superhet coil packs will also be satisfactory.

A 2-wafer switch is most suitable for high-low selectivity switching, and the contacts should be situated near the respective I.F.T.s. C1 and C2 are 50pF trimmers, or fixed condensers of about 25pF each, if no adjustment of selectivity is required. The I.F.T.s are aligned in the normal way for maximum sensitivity, with the switch in the open position. This gives a good degree of selectivity, and is useful for transmissions which are much troubled by interference from adjacent stations. With the switch in the closed position, C1 and C2 are adjusted until no further improvement in top note reproduction is apparent. An orchestral programme from a local station will be most suitable for this. The switch is panel operated, so that either position can be selected at will.

If the additional selectivity made available by the switch is not required at any time, then the switch may be omitted and the I.F.T.s staggered sufficiently to allow good high-note response.

An alternative detector suitable for the superhet tuner is shown in Fig. 6, and can give excellent

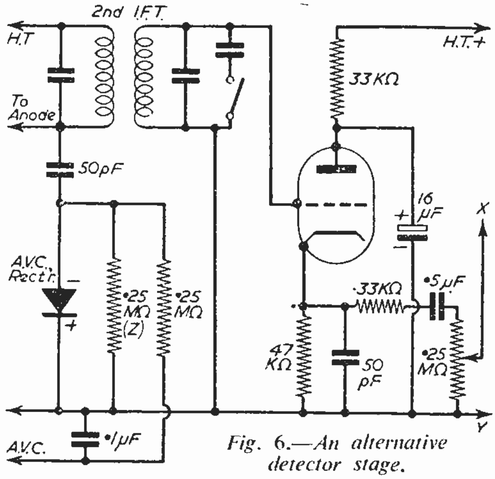


Fig. 6.—An alternative detector stage.

results. Almost any low or medium impedance triode will be satisfactory in this position. The high-low switching described may be omitted if not required, as with the valve diode detector.

A further diode, such as the GEX45/1, is required for A.V.C. and is connected as indicated in Fig. 6. The A.V.C. action can be modified to some extent by adjusting the value of the .25 megohm resistor Z, lower values reducing the A.V.C.

Some BBC Facts and Figures

THERE were three-quarters of a million V.H.F. set owners in 1957.

In March, 1957, over 84 per cent. of the population of the United Kingdom could receive BBC transmissions on V.H.F.

By the end of 1958 96 per cent. of the population of the United Kingdom will be able to receive V.H.F. transmissions.

Over a third of the output of BBC sound radio services was music. Two hundred first performances of musical works were given on BBC sound radio.

The BBC broadcasts in the year 1956/57: 20,120 hours in the Home Sound Radio Services (slightly less than the previous year); 29,561 hours in the External Services (an increase of 506 hours in the year).

The cost per hour in the same period: £575 per hour in the Home Sound Radio Services (an increase of 6½ per cent.); £167 per hour in the External Services (an increase of £8 an hour).

At the end of March, 1957, there were 15,242 staff employed by the BBC, of these: 3,250 engaged exclusively on technical engineering duties; 3,750 engaged exclusively on work for the External Services.

Seventy-five per cent. of all recordings for sound radio are now on tape.

The Effects Library has about 9,000 sound effects.

The Reference Library has a stock of 68,000 books and pamphlets.

The extension of the Arabic Service to 9½ hours a day from March 31, 1957, makes it the largest of the BBC's foreign language services.

Services began in Hausa, Swahili and Somali.

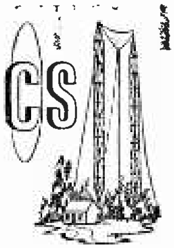
The Afrikaans, Danish, Dutch, Norwegian, Portuguese and Swedish Services ceased following the Government review of Overseas Information Services.

The English by Radio Summer School had an attendance of nearly 60 from overseas.

Over 7,000,000 School Broadcasts pamphlets were sold in a year.

These are some facts and figures given in the BBC Handbook 1958, published by the BBC at 5s.

TRANSMITTING TOPICS



METHODS OF USING THE CLAMP VALVE

By O. J. Russell, B.Sc.(Hons.), G3BHJ

FROM what was stated last month it will be seen that if the screen voltage was half the anode voltage, then the audio voltage applied to the screen should be half the audio voltage applied to the anode, or thereabouts.

Self Screen Modulation

All difficulties associated with special screen windings on the modulation transformer may be obviated by the use of the "self screen modulation" principle. If a suitable L.F. choke is placed in the screen circuit, as shown in Fig. 5, and the screen taken to the unmodulated H.T. line, then audio voltage is developed across the L.F. choke under modulation due to the fluctuation of the screen current, and efficient plate and screen modulation is obtained.

This principle may be combined with the clamp valve system, to give the circuit of Fig. 6, in which the screen and clamp supply are taken from the unmodulated supply, and the screen develops its own modulation power across the L.F. choke. If a choke rated at 10 to 15 henrys or more at 50 milliamps is used, the circuit will work well. As the clamp valve operates effectively, bypassed as far as the audio voltages are concerned, the circuits of Fig. 4 and Fig. 6 will both operate satisfactorily, and the clamp bias control may still be used to control carrier level on telephony.

This control of carrier level by the modified clamp circuits of Figs. 4 and 6 is a valuable feature, as power level may be adjusted quickly and simply without causing splatter, and the modulation capability of the P.A. stage is not affected grossly, as it is with the conventional clamp valve circuits. However, a slightly simpler circuit which sacrifices the ability to alter power level on telephony has been communicated by G3IOR, who is a reader of this feature. In the circuit used by G3IOR, the clamp valve is used as a pentode. While the anode of the clamp valve is connected to the screen of the P.A. stage in the usual way, and while the screen supply to the P.A. stage is modulated in the usual way, the *screen* of the clamp stage is taken to the *unmodulated* supply through a 10K resistor. In the case of G3IOR, the screen supply is taken from a 300-volt line used to supply the exciter stages. However, with a larger screen resistor, the screen supply could be taken from the unmodulated side of the P.A. anode supply line. Fig. 7 illustrates the circuit as used by G3IOR, and might appeal to those who do not mind sacrificing the flexibility of telephony power adjustment of the other circuits.

Further Details

Finally there are quite a number of minor points which should be understood by the amateur using the clamp valve circuit. Firstly, there is no urgent necessity to operate the clamp valve circuit so that the P.A. stage is completely cut off by the clamp valve. In any case, unless the circuit of Fig. 9 is used, it is not possible to obtain anything like a complete cut-off when the P.A. drive is removed, i.e., "key-up" conditions. With a suitable clamp valve, the P.A. standing current may be reduced to a low figure. Thus with a 6L6 clamp valve a single 807 will draw, say, 30mA, and a pair 60mA, while in the circuit of Fig. 7 an 813 will draw perhaps 30mA with 1,000 volts on the plate. Thus in such cases the power drawn by the P.A. stage is a fraction of the total allowable dissipation, and there is little point in reducing this to complete cut-off. Where for some reason complete cut-off is required, the circuit of Fig. 9 will ensure this. When the clamp stage draws enough current to bring the voltage across the bias valve below conduction, the neon goes out, and the screen is isolated from the H.T. supply until the cutting off of the clamp valve under drive allows the neon to strike again. Obviously, in the Fig. 9 circuit, the screen resistor has to be lowered, as there will be a

(*Continued on page 875*)

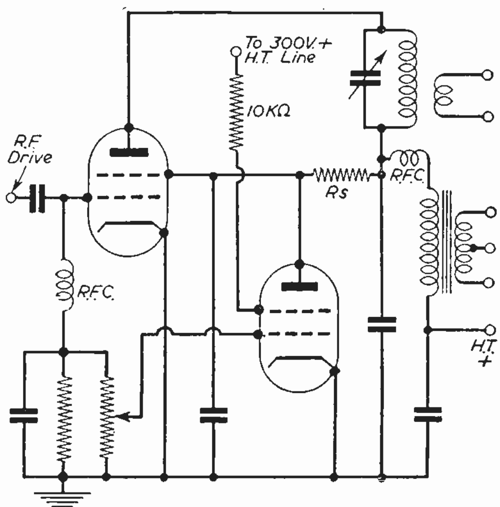


Fig. 7.—The circuit using a tetrode connected clamp valve with the screen fed from an unmodulated supply.

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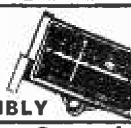

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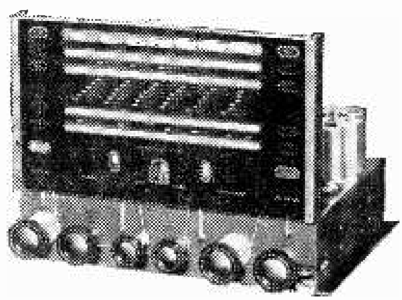

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Demonstrations at our Holloway Showroom 9-6 Weekdays and Saturdays. PWF drop across the neon which must be reckoned with in calculating the screen potential. Thus if a neon striking at 90 volts is used—or rather one burning at a 90-volt potential—then the screen resistor must be reduced to a value that drops 90 volts less than if the neon tube were not there. Also, under *some* conditions, if the clamp valve characteristics do not reduce the screen potential under "key-up" conditions sufficiently to make the neon go out, then a higher voltage neon may have to be used—say a 120- or even a 150-volt neon tube. The use of a higher voltage neon then means a further reduction in the value of the screen resistor, and so on. Where it is desired to reduce P.A. current to the absolute minimum, then the Fig. 9 circuit will enable this to be done. Moreover, the use of the "self-screen" and similar systems for operating the clamp stage effectively under modulation may also be applied to the Fig. 9 circuit. Thus it is possible to have a flexible level of power control, plus almost complete cut-off of the P.A. stage, coupled with full modulation capability by combining the various circuits that have been described. Where the P.A. H.T. is switched off during standby periods, as the writer does, there seems little point in using a complete

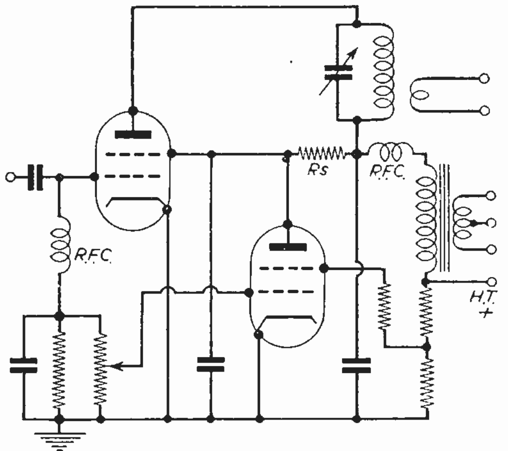

Fig. 8.—The 300 volt supply for the clamp valve screen may be derived from the PA H.T. line via a potentiometer tap.

cut-off circuit, and indeed for telephony, where it is desired that the clamp valve in the simple circuits does not affect the modulation capability on positive peaks, a clamp valve such as a 6V6 may be used that just holds down a pair of 807s to their permissible rating. Thus the clamp valve then acts as a safety device preventing P.A. valve failure should excitation fail, or if H.T. is accidentally left on. However, with the completely screened and enclosed P.A. and driver stages used for TVI reason, it is clearly unwise to leave the P.A. stages dissipating full power during standby periods, as the temperature in the P.A. compartment rises excessively, and thus the reader (like the writer), will be forced to switching off P.A. H.T. during standby periods. The writer uses a switching system that cuts off the P.A. H.T. when the aerial relay is thrown to "receive." and thus save power from the H.T. supply, and enables the P.A. compartment to operate at a comfortable temperature during DX sessions.

It is hoped that the little snags and refinements that are intimately connected with the use of clamp valves have been adequately exposed. Due to the somewhat variable level of amateur articles, many beginners have been genuinely unaware that a clamp valve circuit may introduce appalling peak clipping under "plate and screen" modulation. Moreover, the simple use of the clamp valve to control power level of the P.A. stage has been encouraged in some cases on telephony, despite the fact that this is the surest way of reducing the modulation capability and of introducing gratuitous splatter at levels far short of full modulation! The importance of really adequate drive power for telephony is another point which is essential for the simple clamp valve circuits to operate without excessive degradation of modulation capability. However, even if adequate drive is available, the use of the simple clamp valve circuits as "power level adjusters" will inevitably cause drastic peak clipping on modulation with concommitant distortion and

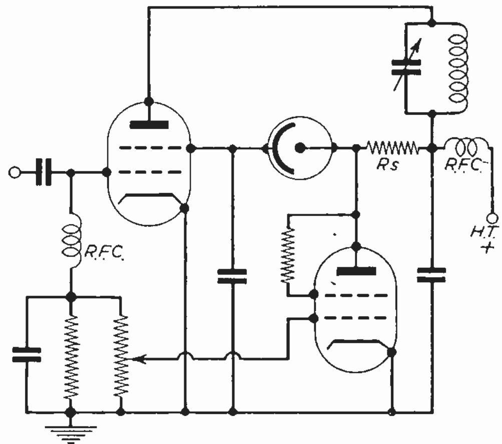

Fig. 9.—A circuit which enables complete cut-off of the PA current under "key-up" conditions.

splatter. It is to be regretted that the writer cannot recollect seeing any British article that poses stern warning of this attribute of simple clamp circuits.

It is hoped by now that readers of this feature will have appreciated our policy of providing sound technical information on points often glossed over or ignored, and of inculcating a healthy distrust of articles describing circuits involving undesirable features. To be sure articles of this latter type clinch the matter triumphantly by saying "despite the objections of the academic theorists the system works, and all amateurs are cordially invited to use this circuit with confidence." To be sure such circuits work—after a fashion," and it has yet to be realised that a transmitter operating at half efficiency will radiate a signal only 3 db down—or one-half of an S point less than a fully efficient transmitter. Thus "by actual test on the air" one would merely prove that a signal "by ear" would sound just about the same from an efficient as from an inefficient transmitter. No one in their senses, however, would campaign for inefficient transmitters on this basis! Moreover, when circuits capable of very high distortion levels or similar faults are proposed for use on the basis that "on the air tests have proved this system radiates a good signal perfectly free from splatter, any many operators while noticing a slight hardness on speech have commented on the clean modulation. In fact the author considers that the 'hardness' noted is due to conditions at the receiving end and confidently recommends, etc. etc. etc." All that has been proved, of course, is the well-known fact that 15 per cent. distortion is hardly noticeable on a speech transmission, and that 25 per cent. distortion is noticed as being rather hard in character, while one soars to 35 per cent. distortion levels before speech is reported as "a touch of roughness on your speech, old man." In fact even at distortion levels of some 50 per cent. speech is still perfectly readable, despite appreciable "roughness." This, of course, is not to say that one should tolerate such high levels as say 15 per cent. distortion, and no sound designer would consider such a thing.

"Clean Speech"

However, the builder of a circuit cheerfully producing high levels of distortion, can easily convince himself that all is well by the fact that distant amateurs may report "clean speech" even at high levels of distortion. Moreover, cautiously keeping to low levels in local "splatter" tests—indeed the audio level can change by as much as ten to one without being noticed in a local test—the impression is gained that splatter is low. Naturally for a more distant contact the mod. level is cranked up to the higher distortion levels, under the comfortable illusion that "the circuit is foolproof and free from excessive splatter." One even hears roughish operators announce they are turning their modulation "to the DX position" whereupon local listeners may notice the interesting spread of splatter for a moderate 50 Kc/s upon either side of the carrier! With such variable and tolerant standards, it is no wonder, therefore, that there is an impressive number of circuit arrangements described for amateur use that are capable either inherently, or with very slight maladjustment, of appallingly poor results. Despite this, many are persuaded that the fact that a signal "of sorts" is radiated, is proof that not only does the system "work," but actually "proof" of the astonishing claims that are made for it. It is this type of nonsense that we have tried not only to avoid, but to explode with sound explanations of circuit operation.

An Experiment

While pondering efficiency the amateur may make a revealing experiment. In a local QSO, adjust the modulation level from an initial value of half the usual audio power down to a quarter the usual audio power, and up to the full level, and back to the half power setting slowly. No one will notice! Naturally if this were done by altering the RF power level an S meter would indicate it. However, under QSB conditions a similar four to one variation in power level of the carrier would go unnoticed in a solid contact—in fact a plus or minus 3 db change when signals may be swinging 20 db under QSB. No doubt an exhaustive analysis would reveal that the full power level would have a definite "edge" under QRM conditions over the quarter power level. However, at any given moment in a QSO the variation of plus or minus 3 db would be obliterated by the fading variations—indeed, by chance, one might actually vary the power level so as to momentarily compensate for a 3 db QSB!

News from the Clubs

NORTHAMPTON SHORT-WAVE RADIO CLUB (G3GWB)
Hon. Sec. : S. F. Berridge (G3ITW), 20, Ethel Street, Northampton.

AT the A.G.M. the following officers were elected : President : B. Sykes (G2HCG); Chairman : I. C. Millar ; Vice-chairman : V. R. Hartopp ; Treasurer : B. Cadd ; Hon. Secretary : S. F. Berridge (G3ITW) ; Committee Member : A. T. Shrewsbury (G3KAN). Certain of the club rules have been amended and copies of the revised rules are being distributed to all members. Although the club is in a healthy financial position, the annual subscription has been increased to 7s. 6d. (half rate for those under 18) in view of extra expenditure foreseen. Meetings will continue to be held each Friday at the club rooms, Allen's Pram Works, 8, Duke Street, Northampton, from 7 p.m. onwards until the first Friday in April, 1958, inclusive.

BRIGHTON AND DISTRICT RADIO CLUB (G3EVE)
Hon. Sec. : R. Purdy, 37, Bond Street, Brighton, 1, Sussex.

THE club continues to meet every Tuesday evening at Club Room, The Eagle Inn, Gloucester Road, Brighton, 1, at 8 p.m. All visitors and new members are welcome.

SPEN VALLEY AMATEUR RADIO SOCIETY
Hon. Sec. : N. Pride, 100, Raikes Lane, Birstall, nr. Leeds.

THE following meetings have been arranged at the George Hotel, Cleckheaton :

January 8th.—Standing Waves and Transmission Lines, J. Schofield (G3KRL).

January 22nd.—Radio Fault Finding, W. Ripley (G4AD).

The Annual Dinner will be held at Kingsway Café, Dewsbury, on Saturday, January 25th, 1958. Tickets 11s. 6d. from hon. sec.

A Northern Mobile Rally is being organised by the Spen Valley Club, supported by Leeds University Union, Leeds and Bradford Societies, to be held at Harewood House, between Leeds and Harrogate. As Harewood House is "open" to the public on that date it will be an added attraction.

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

THE Bury Radio Society holds its meetings on the second Tuesday of the month, at 8 p.m., at the George Hotel, Kay Gardens, Bury.

The meeting on Tuesday, January 14th, will take the form of a debate, "Phone versus C.W."

The society's 1958 programme is now ready and copies may be obtained from the hon. sec.

EDINBURGH AMATEUR RADIO CLUB
Unity House, Hillside Crescent, Edinburgh.

THE Edinburgh Amateur Radio Club meets every Wednesday at 7.30 p.m. in Unity House, Hillside Crescent.

The December lecture was given by A. Henderson on "T.V. Cameras," and a review of a radio subject by Michael Darke.

During January it is hoped to have a lecture on tape and in February a talk on an inexpensive H.V. Power Pack.

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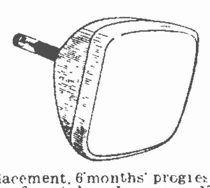

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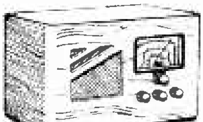

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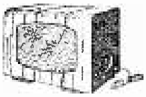

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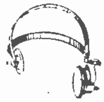

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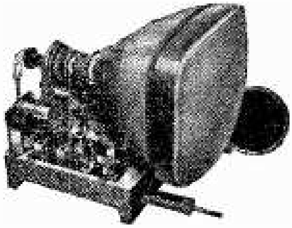

Latest improved circuits. Higher E.H.T. (brilliant picture). Improved sensitivity (for greater range). Chassis easily adapted to any cabinet. 17" rectangular tube on adapated reconditioned chassis. All channels. 12 MONTHS' GUARANTEE on tube, 3 months' guarantee on valves and chassis. Less valves. Valve line up (5 valves):—6SN7G, 6V6, EY51, 2-6D2s. Others: 6L18, EL38, 7-6Fls. Turret Tuner 50/- extra. Chassis size 11½" x 14½" x 11". With 5 valves, **£21.19.6.** With all valves, **£25.19.6.** Ins., carr., 25/6 (incl. tube). State B.B.C. channels (and I.T.A. if turret tuner required).

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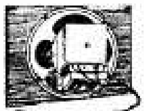

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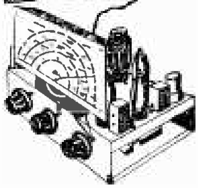

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6B8	3/9	8D3	7/9	ECC81	8/9	EL91	3/9
6F12	7/9	12AU7	5/9	ECH42	8/9	PEN45	6/9
6D2	6/9	12BE6	6/9	EF39	6/9	TT11	6/9
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TRANSISTORS in Practice

3.—A DETECTOR STAGE

By R. Hindle

(*Continued from page* 801, *January issue*)

HAVING satisfactorily completed an audio amplifier the next step is to develop circuits to be used with the audio stages to turn them into a complete receiver. The popular way of doing this has been to use a crystal diode, as in Fig. 18, because such diodes of the readily obtainable variety are quite suitable for working on the usual broadcasting bands. The circuit is relatively insensitive and requires a good outside aerial if satisfactory results are to be obtained, unless an exceptionally strong signal is available. Both aerial and diode are shown tapped down the coil to reduce the load on the tuned circuit that would otherwise damp the signal due to the large aerial and to the input resistance of the diode. If a smaller aerial were to be used this would quite likely give better results with tighter coupling, and the alternative of taking the aerial input lead to the top of the coil, either direct or via a 100 pF capacitor to give an intermediate degree of coupling, could be tried. Perhaps the reason why the diode damps the tuned circuit is not so obvious at first glance because its load is in series with it across the circuit. In practice, however, the diode load is shorted out so far as R.F. signals are concerned by a capacitance as shown in Fig. 18, so the diode damping effect is more or less what it would be if the diode were to be wired directly across the tuned circuit.

Diode Function

The popular explanation of the diode function is that it passes current on half-cycles of the signal going in one direction (say positive—it depends, of course, on which way round the diode is connected, so in practice the designer can choose which half-cycle he wishes to pass), but that it cannot pass current for half-cycles of the signal going in the opposite direction (i.e., in our example going negative). In practice neither half-cycle is cut off, nor is either half-cycle passed without hindrance. The crystal diode has simply a higher resistance to a voltage of one polarity applied to it than to one of the opposite polarity. Assuming, therefore, that a modulated R.F. signal that is symmetrical about zero voltage is applied to the diode stage, that is the type of signal delivered by the usual R.F. or I.F. stage or developed in a tuned circuit coupled to an aerial, and assuming that there is no D.C. applied to move the working point, the half-cycles in one direction are attenuated more than those in the opposite direction, and the signal passed by the diode to its load is therefore lop-sided. Fig. 19 (a) gives the modulated R.F. signal presented to the diode and Fig. 19 (b) illustrates the result of the treatment given to it by the diode. A filter, which may be simply a capacitor of suitable size, or may be a combination of resistance and capacitance, will remove the R.F. fluctuations and there is then left the signal represented by the dotted line in the diagram. This is drawn so that the R.F. fluctuations above the dotted line are equal in amplitude to those below the line. Thus at Fig. 19 (a) the dotted line is straight because the signal is symmetrical, and this indicates that none of the modulating signal (indicated, of course, by the shape of the outside of the envelope containing the R.F.) is left after the process. At Fig. 19 (b), however, after detection, the dotted line takes the form of the modulating signal (though of diminished amplitude) and this is left after R.F. filtering. This is the signal available, therefore, across the diode load.

Now, the greater the clipping of one half-cycle by the diode the more effective the detection. The degree of clipping is understood by considering the diode and the load resistance as being in series across the signal source (Fig. 20). If R has a high resistance compared with the reverse resistance of the diode it will be the governing factor in determining the proportion of signal voltage appearing across the load, and as the resistance of R is the same for either polarity of signal there will be no appreciable difference in amplitude of the half-cycles going positive and going negative, in other words, the efficiency of detection will be very low because the diode has little control. R, in fact, must be low compared with the diode reverse resistance for effective

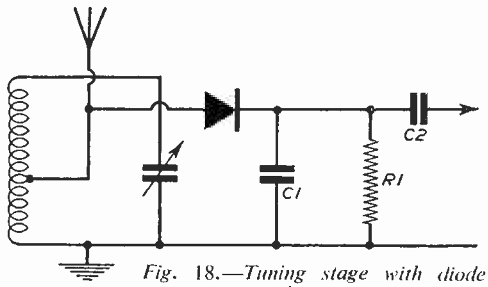

Fig. 18.—Tuning stage with diode detector.

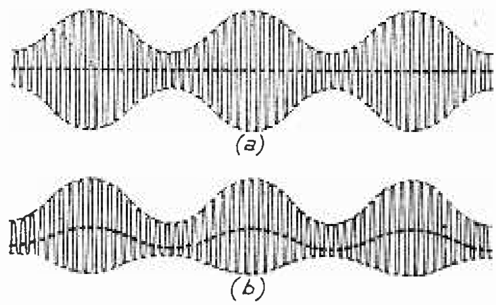

Fig. 19.—Action of the detector.

detection. The crystal diode has generally a lower reverse resistance than the valve diode and so one would expect a lower load resistor than in valve technique.

Crystal diodes vary considerably in their reverse resistance from one type to another and so choice should fall to one of higher resistance, other things being equal, so that R can be made larger and the damping of the tuned circuit reduced, possibly avoiding the need for a tap on the coil for the diode connection.

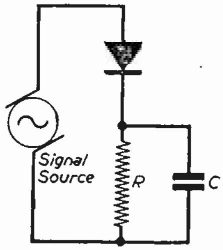

Fig. 20.—Equivalent detector circuit.

C in Fig. 20 represents the R.F. filter and is so small in value of capacitance as to have no appreciable effect on the load at audio frequencies, though its exact value will depend on the size of R, being chosen so that the time constant of C and R (C in pF multiplied by R in MΩ gives the time constant in μ seconds) is long compared with the period of the R.F. signal but short compared with the highest audio frequency to be handled. For example, for medium waveband working the frequency is of the order of 1 Mc/s, which is 10^6 cycles per second. Its period, therefore, is of the order of $1/10^6$ second, or 1μ second. If the highest audio frequency contemplated is 10,000 c/s a period of 1/10,000 second, i.e., 100 μ second is indicated. So R (in MΩ) multiplied by C (in pF) must be somewhere midway between 1 and 100.

Feeding a Transistor

When the diode is to feed a transistor amplifier the purpose is to pass the diode current into the transistor itself. This is in contrast to the need, when feeding a valve amplifier, to convert such current into a voltage in a resistive load before feeding to the valve. The transistor thus becomes the load of the diode and as the transistor has a very low input resistance in the usual circuit arrangement the ratio of load to diode reverse resistance will be satisfactory for detection with any of the germanium diodes offered at present.

Though the aim is to feed the signal current direct to the following transistor, in practice D.C. conditions prohibit this. There is a D.C. component in the current flowing through the diode in conformity with the accepted detection theory —this is the component providing the voltage used for AVC in conventional valve receivers, of course —and this must be prevented from reaching the transistor by means of a capacitor, C2 in Fig. 21. There must be a complete D.C. circuit, however, so R1 is included. The true load is thus R1 in parallel with the transistor input resistance and, for the sake of efficiency, R1 will be made higher than the transistor input resistance. It is possible to design a circuit so that the diode current is the right biasing current for the transistor, and if this is done R1, R2, R3 and C2 can be omitted. This would require that the audio amplification be made of such a value that just the right amplitude of R.F. signal is called for to give the correct D.C. from the diode (which, of course, is proportional to the R.F. signal amplitude) to bias the first transistor and, in order to hold this value, either AVC or a pre-detector volume control would be needed. The diode must also be connected in the correct sense to provide the bias of the right polarity—i.e., so that the current is applied in the forward direction.

High-resistance Input

It might be preferred under certain circumstances to use a larger load than is presented by the common emitter transistor. A common collector circuit (equivalent to the cathode follower valve) could be used in the first audio stage. This has a comparatively high input resistance (roughly α times that of the common emitter circuit—say of the order of 50 KΩ). The price that has to be paid as a result is similar to that of the cathode follower, i.e., the absence of voltage gain in the stage. The factor contributing to power gain previously claimed for transistors is lost also because the output impedance is now lower than the input impedance.

(*Continued on page* 883)

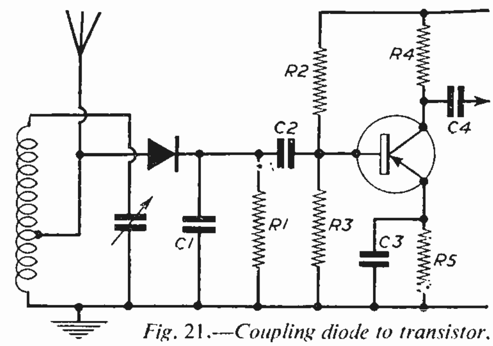

Fig. 21.—Coupling diode to transistor.

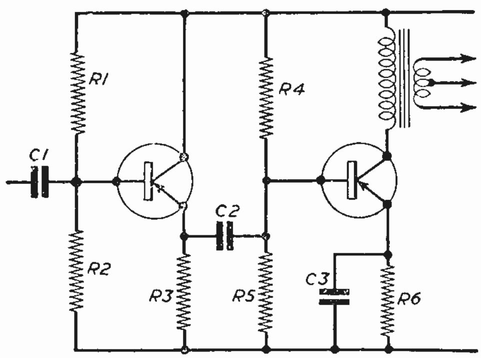

Fig. 22.—Common collector, feeding common emitter circuit.

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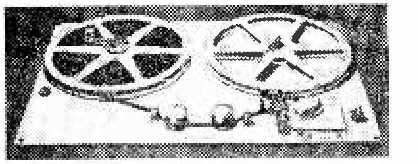

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There is still about the same current gain as with the grounded emitter circuit, however, and as the stage is feeding a following transistor without the use of a transformer, so that current drive conditions are needed, there is little to choose between the two methods of connection from a gain point of view. Choice can be guided, therefore, by the loading conditions needed.

Fig. 22 gives the two-stage circuit using common collector input. The first stage is converted from the original simply by omitting the collector load resistor and removing the emitter by-pass capacitor so that the emitter resistor forms the signal load—signal is extracted from the emitter, of course. A snag arises, however, when considering the base potentiometer. R2 had been chosen to be large compared with the transistor input resistance, but now that the input resistance is so much higher this will no longer apply, and some input signal will be lost. To increase the value of R2 sufficiently to reduce such loss to the same proportions as before (increasing R1 in proportion) would result in a very small potentiometer current (around 5μA) which no longer would satisfy the need from the point of view of stabilisation that this should be large compared with base current. If the amplifier circuit were to be fed from a diode

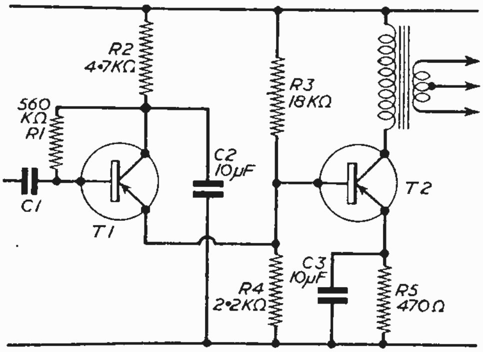


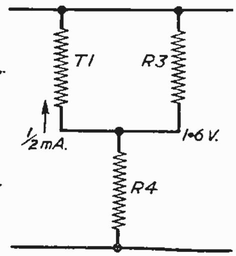
Fig. 23.—D.C. coupled version of Fig. 22.

detector as previously discussed choice would have to fall on a diode with a reverse resistance of the order of ½ MΩ—the Brimar GD5 is a suitable choice.

As the emitter of the first transistor and the base of the second transistor have both to be kept at slightly above earth potential there seems little point in using two separate resistors, R3 and R5, for the purpose and to use C2 for the purpose of keeping them apart. One could simply tap in the emitter of the first stage into R5 at a suitable point or, using a rather more refined technique, design for the same resistance in both circuits. Fig. 23 avoids the dilemma of R2 by using the single base resistor method of stabilisation and shows the D.C. coupling method just discussed. R2 and C2 are introduced to provide the D.C. feedback conditions for this method of stabilisation. C2 is large enough to prevent R2 from acting as a signal load. Note that in this case there is no signal feedback through the D.C. feedback R1 because the collector is at earth signal potential.

A word now about the choice of component sizes for the circuit in Fig. 23. As before, the first stage is designed for a collector current around 500μA and the second stage around 3mA. The potentiometer R3, R4 cannot have the same values as before, however, because the lower limb carries the emitter current of the first stage. Fig. 24 sufficiently represents the situation for the calculation of values. The conditions are that the junction must be at a potential of 1.6 volts as before. R3, R4 must carry a current large com-

Fig. 24.—Interstage D.C. condition.



pared with the base current of T2, which is 50μA, also as before, and R4 carries in addition the ½ mA current for T1 (emitter current being, of course, nearly enough equal to collector current for this purpose).

To satisfy these conditions R4 is going to be quite small. This resistor, as before, causes a loss of signal, but it will be seen that the circuit simplification has removed one of the two resistors in which signal is normally lost, and so R4 can be made lower than the equivalent resistor in the usual common emitter circuit. Supposing it is made 2.2 KΩ. This is still about three times the input resistance of the transistor working at 3 mA current. To produce 1.6 volts at the junction requires a current of $\frac{1.6}{2.2}$ mA, or near enough .75 mA. Deducting the ½ mA due to T1, .25 mA must flow through R3, which is high compared with the base current of 50 μA, as was desired. R3 must drop 6 − 1.6, or 4.4 volts at .25 mA and so its value must be $\frac{4.4}{.25}$ KΩ, i.e., to the nearest value, 18 KΩ.

Practical Application

How then are these thoughts to be put into practice? The circuit of Fig. 18 can easily be wired on to the chassis, using the spare socket not used for the amplifier circuit to support the components and coupling to the amplifier as built to the original design in accordance with Fig. 21. One half of the tuning capacitor is used and a medium wave coil tapped at a third of the windings from the earthy end is required. A suitable coil would consist of 120 turns of 32 D.S.C. wire, tapped at the fortieth turn, wound on a piece of ferrite rod as used for ferrite rod aerials. A Terry clip of appropriate size screwed to the back of the chassis will hold the coil upright. The diode is a Brimar GD5. R1 is 47 KΩ and C1 470pF, making the time constant around 25 by the formula previously quoted, which is nicely within the range of 1 to 100 given. It seems unnecessary to give a layout drawing for these few components. It should be reiterated that the result is only a comparatively insensitive receiver, and a good aerial and earth is necessary unless the signal strength is high.

If desired, now, the amplifier could be rewired to the common collector input circuit and the signal strength and selectivity compared. Remember to remove the transistors from their sockets whilst making the changes in wiring.

An experience of the author whilst working on these circuits indicates the need to remind constructors that there is continuity between input and output circuits of a transistor. If, in a two-stage valve amplifier, one stage fails to work the whole amplifier fails to give results and the fault is obvious. Not so with transistors. Even though the first stage of the transistor amplifier is not operating, say because of the absence of collector current, the second stage will receive some signal and the apparent result will simply be less gain than expected. So, if the amplifier is not giving results as expected do not assume that both stages must be working in some degree.

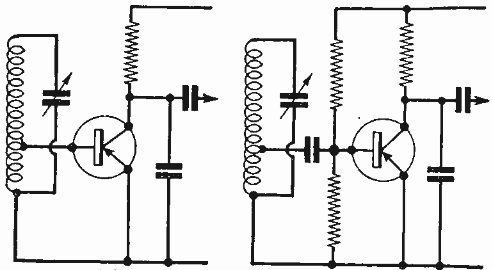


Fig. 25.—A transistor detector stage.

Detector Providing Gain

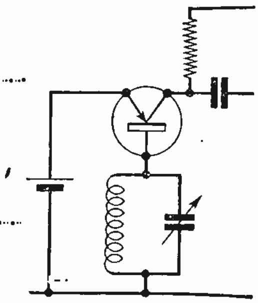
It would be an attractive proposition to use a transistor as a detector if the current gain of the transistor could be used in addition to the diode property of detection. The base/emitter junction improves detection efficiency. Fig. 25 (a) no base D.C. bias is applied, the current through the junction would favour half-cycles in one direction more than those in the other direction. Here is the perfect current coupling, and an amplified version of the R.F. signal with the distortion caused by the detector action appears at the collector. In practice, sometimes it is found that a slight D.C. bias to the emitter/base junction improves detection efficiency. Fig. 25 (a) gives the basic detector circuit and at Fig. 25 (b) a bias potentiometer has been added.

Regeneration

Those who have worked with simple valve circuits will remember that by feeding some of the R.F. back from anode to grid in the correct phase losses in the grid circuit can be reduced, thus effectively increasing the gain of the circuit. If this reaction or regeneration is overdone, of course, the circuit bursts into oscillation. To avoid oscillation the loop gain (i.e., forward through the valve and back to grid via the coupling provided) must be kept below 1, and generally an adjustment is provided so that the maximum feedback can be used short of oscillation. The transistor is sufficiently similar to encourage the belief that similar measures can be taken. The method is to set up a circuit that will oscillate (not quite so easy, it seems, with transistors as with valves) and then provide an adjustment that will either reduce the coupling or reduce the gain of the transistor—the latter method is perhaps easier to adjust to give smooth reaction.

Using a point contact transistor it is possible, in theory, to induce oscillation using a grounded base circuit with the tuned circuit in the base lead, as in Fig. 26. This is because a resistance in this position gives positive feedback (and a tuned circuit is equivalent to resistance at its resonant

Fig. 26.—Point contact transistor oscillator.



frequency) and a grounded base connected transistor of this type has a gain greater than 1. The grounded emitter circuit cannot be used because a resistor in the emitter circuit gives negative feedback, as with valves, so the greater gain of this circuit cannot be used to provide oscillation in this way. The junction transistor is no use, either, because its gain as a common base amplifier is less than 1. So, a circuit reminiscent of the method of obtaining regeneration in the case of a valve is used in the present case. A secondary coil is coupled to the tuning coil in the input circuit and this secondary winding is included in the collector circuit, so that there is inductive feedback. The coil must be connected the right way round, of course, for positive feedback. This coupling is arranged so that the circuit oscillates.

The feedback control is then added so that oscillation can be stopped and the circuit adjusted for optimum sensitivity. The coupling needed will depend on the frequency being operated. If this frequency is fixed, as with an I.F. stage of a superhet, the regenerative coupling can be preset but, if the frequency varies, as when a straight receiver is tuned, the regenerative control is best left in the hands of the operator. The method could be to adjust the relative positions of the coils; this would suit a preset system, but would not be convenient otherwise. Alternatively, a variable capacitance control could be used. The method actually adopted in the present case is to adjust the gain of the transistor by varying the base bias as will be shown next month.

(To be continued)

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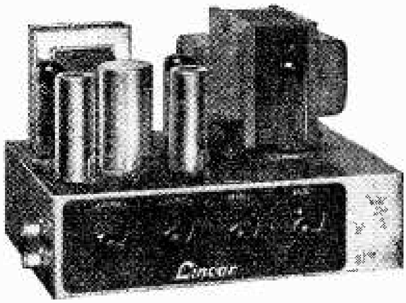

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3V4	7/6	6V6G	7/6	DH150	10/-	EL38	20/-	W76	8/-
5U4G	8/6	6V6GT	7/6	DK91	7/6	EL41	10/-	W77	5/6
5Y4G	7/-	6X4	7/-	DK92	8/6	EY51	12/6	W142	8/6
5Z4G	9/6	6X5GT	6/6	DK96	9/-	EZ35	6/6	X17	7/6
6AL5	6/9	7S7	8/6	EA50	1/6	EZ40	8/-	X18	8/6
6AM6	6/-	8D3	6/-	EABC80	8/6	EZ80	8/-	X142	8/6
6AT6	7/6	12AH8	10/6	EB91	6/9	KT33C	8/6	X150	10/-
6BA6	7/6	12AT6	8/6	EBC41	10/-	KT66	11/-	Z77	6/-
6BE6	8/-	12AT7	8/6	EBF80	9/6	N17	7/6	ZD17	7/6

MATCHED PAIRS

EL84 23/-, 6V6G and GT 17/-, 6BW6 18/- per pair

SETS OF VALVES

DK91, DF91, DAF91, DL92 or DL94 .... 27/6
1R5, 1T4, 1S5, 3S4 or 3V4 .... 27/6
6K8, 6K7, 6Q7, 6V6, 5Z4G 35/-
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Postage and packing, 6d. Over £1 post free C.O.D. 2/6.

A Simple "One Meter" Transistor Test Set

A USEFUL ACCESSORY FOR THE TRANSISTOR EXPERIMENTER

By L. M. Goddard

NOW that supplies of A.F. and R.F. transistors at reasonable prices are readily available, increasingly large numbers of amateurs have decided to commence experiments in this relatively new field.

Unfortunately, the production of transistors has by no means yet become stabilised and it is extremely unlikely that any two transistors of the same type purchased by the experimenter will give identically the same performance.

The first transistor set that the writer constructed proved most disappointing in its behaviour. The output was very low and the level of background noise unduly high. Eventually, after carrying out numerous substitutions of transistors, a vast improvement was obtained. This "hit or miss" method of selecting transistors is, however, most unsatisfactory, not only from the point of view of wasted time and effort, but also because of the risk of causing irreparable harm to the transistors as a result of repeated soldering and unsoldering of the leads.

All the uncertainty involved regarding the relative efficiency of the transistors at the constructor's disposal can be easily eliminated by the use of the simple test unit described in this article. The unit is designed for the testing of p-n-p junction transistors, but can equally well be used in the case of n-p-n transistors provided the connections to the battery are reversed. It has the big advantage of not requiring an expensive micro-ammeter for the measurement of base current, and yet gives reliable information regarding the two transistor characteristics of most concern to the amateur, viz., gain, and collector current when base current is zero. The latter furnishes an indication as to the stability of the transistor being tested.

LIST OF COMPONENTS

1 milliammeter, 0-5 mA.
R1—50 KΩ
R2—200 KΩ
2 On/Off switches.
3 terminals or crocodile clips.
1 battery (6 volts).

The Circuit

It will be seen from the theoretical circuit below that the transistor to be tested is connected with the emitter grounded. This is, of course, the most frequent mode of connection at the present moment. Before connecting the transistor to the terminals or crocodile clips, a check should be carried out to ensure that S1 is in the "OFF" position and that the battery is connected in the correct manner for the type of transistor being tested.

When S1 is switched to the "ON" position, and with S2 open, the 0-5 mA meter will indicate the collector current for a base current of NIL. The reading obtained should not exceed about 0.75 mA. for a battery voltage of 6 volts. However, this value is not critical. Provided the reading does not appreciably exceed this figure and remains steady, then the transistor, in this respect, may be considered as satisfactory.

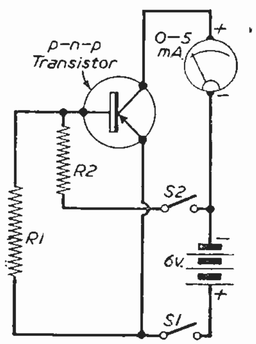
Closing S2 causes the base current to increase from zero to 30 micro-amps. The resulting increase in the collector current is noted and the gain of the transistor may then be calculated as follows:—

$$\text{Gain} = \frac{\text{change in collector current (micro-amps)}}{30}$$

The gain of a good transistor will be at least 10 and may be as high as 45. It will be noticed that this method of calculating gain ignores the emitter/base resistance. However, the error so introduced is for all practical purposes virtually negligible.

The Layout

Fig. 2 shows a suggested practical layout for the test unit, but this may be varied to suit the tastes and ideas of the constructor. The unit made up by the writer incorporated the various components built into the housing of a sloping-panel desk type meter.



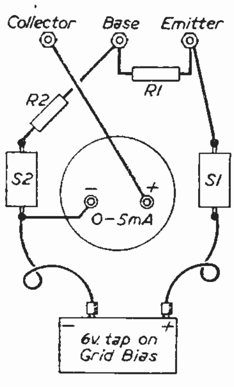


Fig. 1 (left).—The circuit used in the test set, and Fig. 2 (right) the practical layout and wiring.

Programme Pointers

Our Critic, Maurice Reeve, Reviews Some Recent Programmes

GERALD HANLEY'S novel, "The Consul at Sunset," is a best seller. And judging by Stephan Grenfell's radio adaptation, deservedly so. It has all the ingredients both of an exciting as well as a thought-provoking story. After the suppression of a revolt in Somaliland just after its capture from the Italians in 1941, Sole, a political officer, has some pertinent comments to make on Imperialism, war and kindred subjects. Are they worth while? Are there not bigger and more important things to mankind to worry over?

Sole, Milton—another P.O.—Col. Casey—a regular Poona—Capt. Turnbull—as raw a ranker officer as one could meet with, but lifelike none the less—these and others are finely drawn characters. It made an excellent radio play, well acted and produced. Cast: Rupert Davies, Peter Howell, Malcolm Graeme, J. Barron, A. Sachs, June Tobin, I. Catford, L. West, M. Maitland, M. Hayes, G. Matthews, H. Marsh and S. Black. Producer, R. D. Smith

The Goons

I take it to be a critic's function to point out what is praiseworthy or censurable in a production from a strictly objective and dispassionate view. Likes or dislikes are not criticism but merely opinions, and any critic will tell you that, facts apart, what he thinks of a show is only one man's view. This reflection is prompted by yet another tuning-in to "The Goon Show."

I have tried to like them and to grasp their particular brand of humour. But, in spite of the ecstatic praise of friends—whose general level of intelligence is at least as high as mine (others share my views on them)—I can't and never shall. The "musical" side of the programme I deplore out of hand. The humour is to accept or reject according to taste. Therefore I do not "criticise" them, not knowing enough about the technicalities of that kind of show; I only record my opinion of it.

The programme I heard was a skit on the Indian Mutiny—or its period—and was, to me, slightly more amusing than they are usually. But, among many corny lines (the period has been a theme for jokes ever since it happened—why, I can't think) I remember two. One was that the temperature was 130 in the shade. "It was so hot that my sweat dropped into my sizzling curry." The other was to the effect that "the enemy is only as far away from us as we are from him." To which someone replies "The dirty dogs." I quote from memory.

I cannot deny the audience split its sides. Mine, I'm afraid, needed no attention afterwards.

Drama

The BBC is, in my view, rightly generous in its ration of Ibsen. That many of the problems he posed for solution or reform have been resolved doesn't take away one iota of their entertainment value, but only establishes their greatness. Further, as with all great drama, Ibsen's bring out the best in the actors who essay their performance.

Dame Peggy Ashcroft did "Hedda Gabler" in Max Faber's broadcasting version, and well rewarding it was, even if we lose something irreplaceable when we cannot see her as well. David Markham, Gladys Boot, Michael MacLiammoir (an excellent Judge Brack), Rachel Kempson, Michael Warre and Dorothy Dewhurst ably supported.

That charming product of an age in English history not noted for its elegance or the purity of its morals, Gay's "Beggar's Opera" was given a welcome revival in an edition edited by Edward J. Dent and a radio adaptation and production of David Franklin. The frankness of its lyrics and the uninhibited air of its general tenor are wholly delightful and engaging. No one takes them seriously, and the music suits the atmosphere to perfection.

Polly Peachum can rank with Sophia Weston —whom she precedes by a few years—as the darling of her age. She was engagingly played by Ann Dowdall. Macheath was in the "unscrupulous" hands of Bruce Boyce. Ralph Hallett, Edmund Donlevy, Catherine Lawson, Frederick Sharp and Marion Lorne contributed to an excellent show.

Too Much Music

A friend may have put his finger, all unwittingly, on one of the reasons why some people have turned from radio to television. "It's all this damned music," he said. "Every time you turn the beastly thing on, or so it seems, there's a so-and-so sonata, quartet, symphony coming at you from all points of the compass." Whilst not sharing his apparent dislike—to understate the case monumentally—I do feel he may have a point, especially if we include all that goes in under the heading of "good music." What to put in its place is the headache. The thought of that brings back to one's mind the old proverb, "Better the devil you know than the one you don't!"

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

Music and Movement

DEAR THERMION,—With reference to your articles concerning Music and Movement in recent issues of PRACTICAL WIRELESS, I wish to make the following comments:

I have been a teacher in the Primary School for the past sixteen years. During that period quite a few modern theories regarding education have appeared; numbers of them have been tried out, and to-day it has apparently become a serious hobby of many people who have little training, and practically no contact with the school, and the problems of the teacher in the school, to devise this and invent that for the better training of children.

When all has been said and done there can still be only one reason why millions of pounds are spent on school buildings. The school is a place where the child comes to learn something, and if it must be used for other purposes, such as listening to stupid programmes over the radio, playing numerous games and having endless periods of enjoyment (for the child), then one can rest assured—the future of the world has never been less safe.

Not all people are endowed with the same gifts of understanding, and dozens of pupils have to swot languages, geography, history and other related subjects for years, while their minds are continually burning to know what makes a thing tick, what are the secrets of radio, of electricity, and so forth. Their years in school, where they have to learn completely different things are therefore almost wasted. And the tragedy is that so many of them cannot afford a higher education. They have to face the hardships of life straight after school. What have they with which to do it? What are the tools given to them by our system of education? Is the answer very encouraging? Remember, we are living in the "wonderful, enlightened, progressive," twentieth century.

All my life I have been interested in wireless, photography, optics and astronomy, carpentry and mechanics. To none of these subjects did I just give a passing glance. As many details as possible have been studied, and I feel to-day, that if given a "school within a school"—a building which is not skimpily furnished, but is one which contains a solid array of spares, tools and equipment: a place where many pupils spend most of their school time, then I could teach those children a lot. They would certainly have a leg to stand on when they leave school, and it will not be necessary for them to start completely from scratch, as so many of our youngsters of to-day have to do.

Even if that is impossible in our primitive world, where all are concentrating on bigger and better weapons, and millions find enjoyment in all forms of stupid recreation, I still agree with you, Mr. Thermion, that if an effort is to be made at teaching the citizens of to-morrow something in the schools, a very good effort can be made by introducing practical subjects, such as the construction of simple radios.—TEACHER (Mariental, S.A.).

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii *of cover.*

Musical Frequency and the Satellite

SIR,—With due regard to the letter from Mr. Hawkins, in the December issue, I fail to see how anyone could confuse the tone + 1 c.p.s. pulses of W.W.V. and W.W.V.H., with the definite bleep-bleep of Sputnik I. The pulses of W.W.V. last for a mere 6 milli-seconds, whereas the satellite gave a much longer bleep.

Another point which ought to be clarified is that as the Sputnik I gave only a switched carrier (C.W.), it would be inaudible on a receiver not fitted with a B.F.O., unless it happened to give a 5 Kc/s beat note with W.W.V.—T. GLAVE (Bucks).

Carbon Tetrachloride

SIR,—I would like to make a small point regarding the use of the well-known cleaner, which is at present used in most fire extinguishers, and may be purchased under a well-known trade name. Whilst serving in the R.A.F. I found that many of the wireless mechanics made use of the contents of the fire extinguishers for cleaning up wireless switches, etc., as a result of which some serious faults developed. Whilst this material will dissolve away greasy compositions it may also have a very bad effect on thin wires which pass through holes in paxolin. It apparently set up some sort of chemical action which will be revealed after a time by a green deposit round the wire very similar to verdigris. This may eat right through the wire, and if the deposit is not clearly seen, the open circuited connection may result in hours of wasted time trying to locate a fault. Make sure, therefore, when you use this material, that it is not going to have any harmful effect. or, alternatively. purchase a proprietary cleaner made for the job.—H. T. R. (N.W.).

A 'Scope from the 62 Unit

SIR,—If it has not already been noted I should like to point out that the captions for some of the illustrations in the article in the October issue were transposed. The correct captions should be Fig. 5 (a). (b) and (c). "X" Switching system. Fig. 6. Pin connections for the switches. Fig. 7. Circuit of the timebase. Fig. 8, The "Y" amplifier. Fig. 9, The "X" amplifier, and Fig. 10, Theoretical circuit of the Electronic switch.—J. HILLMAN (Belfast).

Earliest Tape Recorder

SIR,—Mr. J. Taylor's letter in your November issue mentions that the earliest type of recording known was mentioned by W. A. Steel around 1913. It should be stressed that all methods of sound recording have a much longer history than is generally realised.

It is just about 70 years ago that the possibility of using permanent magnetic impressions for the registration of sound was discussed for the first time. It took intensive research. under the pressure of wartime conditions, to overcome the limitation which hitherto had impeded commercial development. Pre-war magnetic recording was of poor quality. To-day, due to a variety of developments, reproduction can now satisfy the most fervent "high fidelity" devotee.

Of the early history of sound recording. the first man to record and reproduce sound was Thomas A. Edison. Others had long been interested before Edison. In 1799 the Russian, Kratzenstein. built a machine. which produced the vowel sound of the human voice. Nine years later, in Vienna, von Kempelen, a noted maker of automata, produced a complete sentence. In 1850 Faber, another Viennese, produced a still more remarkable speech-articulating machine. They were all talking machines, creating sound and not reproducing it. Sound was, however, first recorded by Leon Smith in 1859.

Most dictating machines of American origin are traceable to the two fundamental patents which were issued to Chichester Bell and Charles Sumner Trainer in 1885 and 1886. The first covered, broadly, the recording of sound by means of an engraving tool, while the second covered the basic method of recording and reproducing sound by engraving on "Wax."

Alexander Graham Bell won the Volta prize of 50,000 francs awarded by the French Government in recognition of his invention of the telephone. With this money he founded the Volta Laboratory Association. which developed the first dictating machines. In 1887 the American Gramophone Co. was organised for the manufacture and marketing of the machines. It was merged with the North American Phonograph Co. and later into the Columbia Gramophone Co. Originally a distributor which assumed control of the parent company. Columbia. made both musical and business machines. The business machine was known as the "Commercial Gramophone" from 1895 until 1907. when the distinctive "Dictaphone" trade mark was adopted and registered. By 1921 Columbia had passed into the hands of receivers and it was found that the Dictaphone dictating division was the only profitable part of the business. Later a syndicate purchased the assets and patents of the Dictaphone parts and the Dictaphone Corporation was formed. of which my company is part.—DONALD MACPHAIL (managing director Dictaphone Co. Ltd.).

Beginners' Constructional Course

SIR,—I must thank you for your lengthy and very informative letter of the 2nd. in reply to my query about the Beginners' Practical Course: this is the first time I have ever "taken up" a journal on its offer of assistance and I must express my appreciation for the undoubted trouble you have gone to to be of assistance.

I feel. therefore. that you will be interested to know that I had "tapped" my existing aerial to a domestic set. but had omitted to unplug the aerial terminal from the set when testing my transistor set. I was losing signal strength via the domestic set and on trying a quite separate aerial for the transistor set I was able to get much better results.—H. THOMLINSON (Ilford).

PRACTICAL APPLICATIONS OF NEGATIVE FEEDBACK

(*Continued from page* 856)

inasmuch as it involves an intervalve transformer. is that of Fig. 2. It will be noted that the feedback voltage in this case is developed across a potential divider network. as was mentioned earlier. A variation of Fig. 2 is that of Fig. 3. Both these are series connected circuits.

The arrangements shown in Figs. 4 and 5 are parallel connected and are voltage feedback circuits.

Fig. 6 is a variant of Fig. 5. in which values are given.

In Fig. 7 a simple type of parallel feedback circuit is given which has. however, a serious disadvantage in that it lowers the input impedance very considerably and the coupling condenser C must be increased in value correspondingly in order to secure an adequate bass response. while in Fig. 8 is shown a circuit in which frequency discriminating elements are incorporated to give treble lift.

In the majority of these circuits values have not been given for the simple reason that they will vary with the type of valve used. and the amount of feedback required by the individual may vary also. The article is solely intended as an introduction to the fascinating and complicated business of negative feedback, and if it arouses sufficient interest to make readers delve further it will have been well worth while. With the few simple explanations given here feedback circuits appearing in our pages will. it is hoped. be a little easier to follow. Perhaps. in the near future. the writer will prepare a further article on such arrangements as bridge feedback circuits. using a combination of series and parallel loops. and make available values for the circuit.

News from the Trade

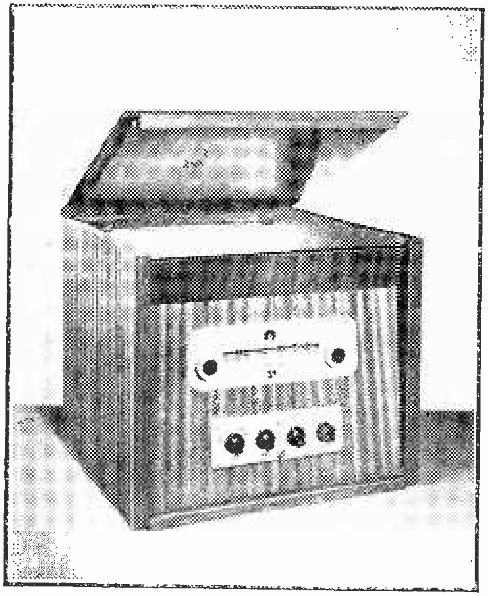
"SCOTCH BOY" C.C.I.R. CALIBRATION TAPE

A "Scotch Boy" test tape for calibrating and checking the performance of tape recorders, at 7½in. per second, is now being marketed by the Minnesota Mining & Manufacturing Company, Ltd., of 3M House, Wigmore Street, London, W.1.

Made on No. 111V, the tape is twin track recorded and presented on a 3¼in. diameter plastic spool.

One track has voice announcements with frequency checks from 10 Kc/s to 40 c/s, and the other has a continuous 7½ Kc/s tone for head alignment purposes.

The list price of No. 111V "Scotch Boy" C. C. I. R. Calibration Tape is 49s. 6d. per reel.—3M Co. (Minnesota Mining and Manufacturing Co. Ltd.).



One of the W. B. "pack flat" cabinets.

NEW W. B. CABINET

THE latest cabinet to be released by Whiteley Electrical is known as the "Prelude." In conformity with other designs, this is a home-assembled cabinet which is sent out packed flat and finished, so that all that has to be done is to screw it together. It matches other cabinets suitable for loudspeaker, etc., and this particular model, which is shown above, is designed to accommodate any make of tape-deck or single record player, amplifier, pre-amplifier, control unit and radio tuner. It is finished in a very neat sapele veneer, with a silky surface—not the usual high gloss cellulose finish, and measures 17½in. by 19¾in. by 18½in. The price is £9 19s. 6d.—Whiteley Electrical Radio Co. Ltd., Radio Works, Victoria Street, Mansfield, Notts.

PRICE REDUCTION BY DYNATRON

DYNATRON RADIO LIMITED announce that heavy demand for their well-known pre-tuned V.H.F. Tuner Unit and associated Power Unit, has enabled them to increase production to such an extent that a reduction in prices is possible.

V.H.F. tuner unit, F.M.2.LV. now retails at £25 0s. 6d., the F.M.2.HV at £29 3s. 9d., and power unit P.1 at £10 15s.—Dynatron Radio Ltd., The Firs, Castle Hill, Maidenhead.

NEW J. B. PRODUCTS

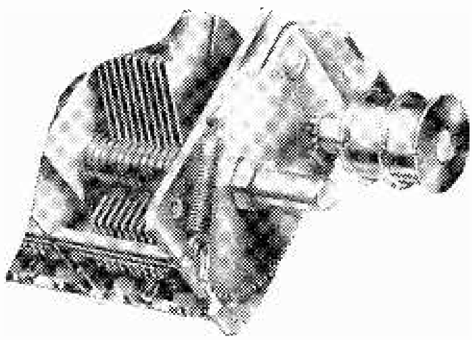
AMONGST some new items announced by Jackson Bros. is a L.G.P. geared drive. An illustration of this is shown below fitted to the standard two-gang L type condenser. This geared drive gives a 9in. pointer travel with only a ¾in. diameter pulley. The LGP2 costs 18s. 9d. complete, and the LGP3 costs 24s.—Jackson Bros. (London) Ltd., Kingsway, Waddon, Surrey.

T.I.M. SNAP ACTION APPLIANCE CONNECTOR

AS a development of the Quick Release Terminal manufactured by Mycalex and T.I.M. Ltd., Cirencester, Glos, that company has now introduced the T.I.M. Snap Action Appliance Connector for use in electrical showrooms, on test benches and, in fact, wherever quick, safe, temporary connections of appliances are necessary.

Three quick release terminals, colour identified for live, neutral and earth, are mounted on a square base, under which is located a two-pole micro-switching system operated by a plastic lid which serves also to cover the terminals. When the lid is opened the live and neutral circuits are automatically broken and complete safety for the connection of wires to the terminals is assured.

The terminals themselves are of a special design for rapid connection. Sideways pressure on the pillar in any direction creates a gap between the contact plates into which the wire is placed.



The new J. B. geared drive.

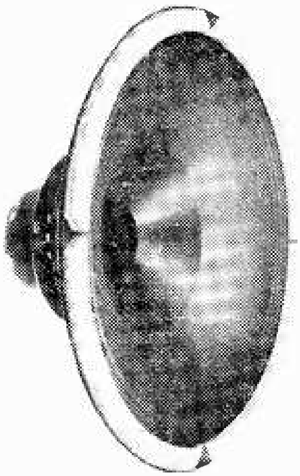
When the pillar is released the lead is firmly held and when all leads are so connected the lid is closed and the mains supply is automatically switched on to the appliance.

With the use of this new product an appliance can be connected for demonstration or test in a few seconds. This connection is equally rapid and simple.

Owing to its safety features the T.I.M. Appliance Connector can be kept permanently plugged into the mains and either fixed to the appliance demonstration counter, for which provision is made, or on a wander lead for taking to other points in the show room.

For the purpose of equipping a complete test panel in workshops, laboratories, etc., the individual terminals can be obtained from the manufacturers.

The list price of the snap action appliance connector is £4 10s., and resale discounts will be quoted by the manufacturer.—Mycalex and T.I.M. Ltd., Ashcroft Road, Cirencester, Glos.



The new Plessey deep-chassis loudspeaker. This is ideal for A.M./F.M. receivers.

NEW PLESSEY DEEP-CHASSIS LOUDSPEAKER

THE advent of V.H.F./F.M. radio, and high quality gramophone records, has produced an increased demand for a loudspeaker with a firm middle note and an extended high note response. As a result, The Plessey Company Limited has now introduced an 8in. deep-chassis speaker, which has been designed to meet these requirements.

Normally, to obtain a smooth, extended high-note response, it is necessary to use a curved section cone, together with a hard basic material. Unfortunately, if sufficient curvature is built into the body of a normal 8in. cone the surface adjacent to the corrugations becomes almost flat. This portion then vibrates out of phase with the central section over the middle range of frequencies, the result being a "hole" in the response characteristic and a hollow tone in the reproduction.

All these disadvantages have been overcome in the new Plessey loudspeaker, which has a very deep cone, so that the surface still meets the corrugations at an appreciable angle: a deep chassis has also been provided to accommodate this cone.

The new 8in. loudspeaker is particularly suitable for A.M./F.M. receivers, radio gramophones and television consoles for which high quality reproduction is required, and the 1in. voice coil can be supplied with any of the Plessey 1in. range of magnets from 7,000 to 12,000 gauss.—The Plessey Co. Ltd., Ilford, Essex.

THE "HUCKEPACK"

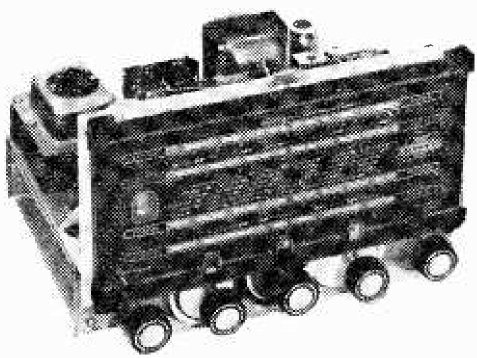
A NEW form of cable clip is now being marketed by Creators Ltd., of Woking. This clip, which is called the "Huckepack," consists of interlocking plastic mouldings, which can be built up to a depth of up to 10 layers and fastened to a baseboard or chassis by a single bolt.

The clips are available in four sizes to suit different types of cable. Apart from the obvious advantage of rapid and easy assembly of cable forms, these clips, by virtue of the fact that they are built up in three dimensions, as opposed to the usual two dimensional layout, allow a very large number of cables to be carried in a very small space.

A further advantage is that the cable layout can quickly be changed if required and cables can easily be traced without the use of conventional identification systems.—Creators Ltd., Plansel Works, Sheerwater, Woking, Surrey.

NEW DULCI CHASSIS

THE latest addition to the Dulci range of units is the new H4PP AM/FM Chassis, with 6-8 watt push-pull ultra-linear output. Four wave ranges F.M., Short, Medium and Long. Independent wide range bass and treble controls giving 15db lift and cut with indicated level position. An ultra-linear output transformer of liberal dimensions is employed and a switching arrangement is provided for matching to speakers of 3, 8 and 15 ohm impedance. Sockets are available on the chassis for connection to a tape recorder, allowing the set to be used with any setting of the controls without affecting the signal to the tape recorder. Price £29 3s. 10d. (tax paid).—The Dulcie Co. Ltd., 97/99 Villiers Road, Willesden, N.W.2.



The new Dulci chassis referred to above.

RECEIVERS & COMPONENTS

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

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

TELEVISIONS NEEDING ATTENTION. 9in-10in. models. £4/10/- each. 12in. models, £6/5/- each. 15in. models and Philips Projection models £11/10/- each: immediate despatch; carriage paid. BARKERS, 325, Brockley Road, S.E.4. (TID 6752.)

NEW SHOP IN LEEDS, 1. We are stocking Spares for Radios and T.V.s. New and Surplus Valves. Bring this ad. for free valve testing this month. We have plenty of reduced Aerials and Convertors in stock for callers only. T.V. SPARES, 41, Call Lane, Leeds, 1.

SPECIAL TAPE OFFER at Great Saving! 1,200ft. of Plastic Recording Tape on 7in. reels, listed 35/-, our price, 22/6, p. and p. 1/6; also 850ft. (long play) Plastic Tape on 5in. reels, listed 28/-, our price 19/6, p. and p. 1/6. PHOTO OPTIX (LONDON) LTD., 73, Praed St., London, W.2. (PAD 2891.)

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"OSMOR NEWS." Components lists for "P.W.," "Consul Car Radio," "P.W.," "The Chorister" and "R. Constructor," "Beginners S. Wave 1 Valver" on request. OSMOR, 418, Brighton Rd., S. Croydon. (CRO 5148.)

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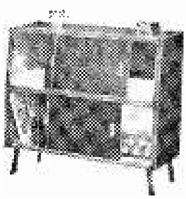

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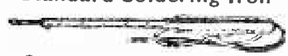

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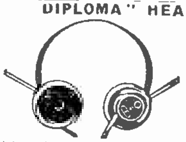

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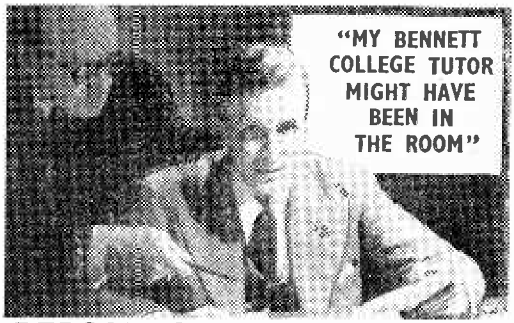

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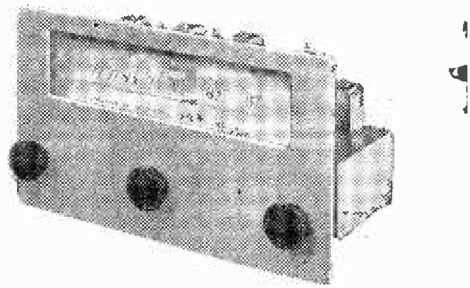

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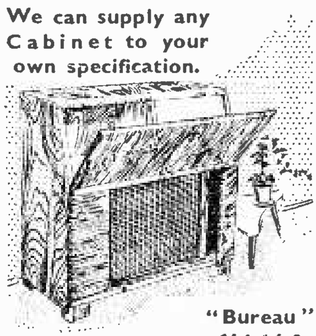

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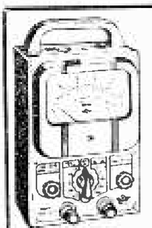

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AMATEUR WIRELESS AND WIRELESS MAGAZINE

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Two-valve : 2/6 each
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Four-valve : 3/6 each
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Standard Four-valver Short-waver (SG, D, LF, P) WM383*

Mains Operated

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

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