

A PERSONAL "MOBILE" RECEIVER

# PRACTICAL 1/6

NOVEMBER  
1959

# WIRELESS



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RADIO SHOW REVIEW  
D.C. TRANSISTOR OUTPUT STAGE  
TRANSMITTER KEYING MONITOR  
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BEGINNERS' TEST METER  
ETC. ETC. ETC.

# ALL BAND RECEIVER R107

## AMATEUR—SHIPPING—BROADCAST

This magnificent 9-valve 3-wave band receiver gives world wide reception over 1.2-17 mc/s (18-250 metres). The sensitivity is 1 micro volt on C.W., and 2-6 micro-volts on R.T. Panel controls include Band width 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. Headphones sockets. Incorporates internal A.C. mains power unit (100-250 v. A.C.) and 12 volts D.C. Vibrator pack. Size 24 x 13 x 17in. These sets are extensively tested prior to despatch. SUPPLIED COMPLETE AND READY FOR IMMEDIATE USE.

**MODEL 1. Slightly used appearance £8.10.** **MODEL 2. Very good appearance £10.10.**  
Carr. 20/- (England and Wales), rest of U.K. extra.



**TRANSMITTER BC625.** Covers 100/156 Mc/s. will deliver 15 watts, consists of seven valves (2-832), 3 for modulation, 4 for R.F. Complete with operating details and circuits. ONLY 25/- P. & P. 5/-.

**VARIAC TRANSFORMERS.** Input 230 volts. Output 0-240 volts, 5 amps, fully variable Brand new, only £8.0.0. Carr. 12/6

**VIBRATOR PACKS.** 12 volt input, 300 volts output at 150 mA. Fully smoothed. ONLY 25/-, Carr. 7/6. Also 6 v. input, 230 v. output at 100 mA. Fully smoothed. 25/- each. P. & P. 3/6.

**TRANSISTOR SPEAKERS** (D.L.R.5 inserts), 5/- P. & P. 1/-.

**HOOVER ROTARY TRANSFORMERS.** 12 v. input, 500 v. output at 65 mA, or 6 v. input, 250 v. output at 75 mA. ONLY 10/6 each. P. & P. 2/-.

**D.M.34.** America's finest little dynamotor offering 12 v. in with 220 v. out at 30 mA. With suppression and smoothing mounting base. Size 4 1/2 x 2 1/2 x 2 1/2 in. Original packing. Only 35/- P. & P. 3/6.

**F.M. TRANS/RECEIVERS B.C.620.** 20-28 mc/s crystal controlled, contains 14 valves, filament plate, alignment and voltage meter, volume control, 6 and 12 volt supply unit and dry battery case. Complete station, 28.10.0. carr. 20/- U.S.A. Hand Set. 20/- extra.

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

**V.H.F. MOBILE AERIAL** and base, as used by Taxis, Police, etc., 7/6. P. & P. 2/6.

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

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

**R.C.312 RECEIVER.** 1,500 kc. to 18 mc/s. 6 Bands continuous tuning. Internal 12 volt supply unit. S.A.E. for details.

### BUILD AN F.M. TUNER

with this miniature 9.72 mc/s I.F. Strip, has 6 modern miniature valves, I.F.T.'s, etc., supplied with full F.M. Tuner conversion details. Hailed by all our previous purchasers as a wonderful F.M. Tuner. Brand new, only 40/- P. & P. 3/6.



### POCKET TEST METER

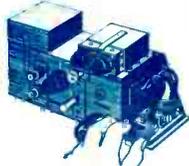


Multi range, 6/30/120/300/1200 v. A.C., ditto D.C. 0-1 K., 0-1 megohm : 400 MicroA., 12 mA., 300 mA., -00 to +6Ω DB 5 ranges : 3in. x 4 1/2 in. x 1 1/2 in. Large clear dial, leads.

**LIST PRICE £6.19.6**  
**OUR PRICE £4.15.0**  
Saving You £2.4.6.  
P. & P. 2/6.

### COMPLETE MORSE TRAINING UNIT

Complete Code Set. contains key, buzzer, headphones, pitch control, operating internal battery, housed in portable wooden case. Brand New, only 12/6, carr. 5/-, battery 1/6 extra.



### CONVERT TO V.H.F.

Within minutes you can extend the frequency of your receiver to cover V.H.F. by using our brand new V.H.F. Converter. R.F.26 covers 50-65 mc/s, vernier calibrated tuning, 20/- R.F.25 covers 40-50 mc/s. Switched tuning, 8/6. Circuits supplied. P & P. 3/6 on each.

### OSCILLOSCOPE !!

**MONITOR, TYPE 61.** Employs 3 1/2 in. C.R.T. type VCRI38A. Panel controls : 3 speed time base, Focus, Brightness, Horizontal shift, R.F., tuning, Sync., Internal H.T. and E.H.T. mains power pack. Brand new with circuit. Size 10 1/2 in. x 12 1/2 in. x 19 in. deep.

**£8.10.0**  
CARR. 10/-



**ACCUMULATORS.** 2 volts 16 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc. Brand new. Original cartons. Size 1 in. x 7 in. x 2 in., 5/6 each. P. & P. 1/6. 3 for 15/- P. & P. 3/6. 6 for 27/6. P. & P. 5/-.

**HI-FI CO-AX SPEAKERS BRAND NEW—U.S.A. MADE** 12in. Coaxial Speaker. The woofer uses 6.8 oz. Alnico 5 magnet. Has 3in. tweeter and an electronic crossover network to separate the speaker functions. Frequency response : 40-1700 cycles. Output 12 watts, impedance 8 ohms. ONLY 160/- 8in. 2 1/2 in. tweeter, 10 watts, etc., 90/- P. & P. 4/- on each.

**CONTROL BOX—B.C.602.** Complete push-button control box, 4 position and on/off, with dual coloured indicators for instant channel check. In black crackle case 9 1/2 in. x 3 1/2 in. x 1 1/2 in. Bargain price, 5/- each. P. & P., 1/6. Two for 8/- P. & P. 2/6.

**4ft. 8in. U.S.A. TELESCOPIC CAR AERIALS.** Heavily chromium plated, rustproof, ratleproof. Complete with lead and standard plug. ONLY 27/6 post paid.

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

**TELEPHONE SETS.** Brand new, fully portable—hand generator, bell, hand set, Morse key, lamps instructions. Only 60/- a pair. Carr. 10/-.

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

**A.R.C.-5 VHF RECEIVER.** 100-156 Mc/s. The smallest VHF receiver ever made, only 14 x 7 1/2 x 4 1/2 in., weight 14 lbs. The ARC-5 is a 10 valve superhet, crystal controlled on 4 channels between 100-156 Mc/s. I.F. frequency 6.9 Mc/s. Audio output 300 ohms. Brand new. Limited quantity. ONLY 70/-, carr. 7/6.

**MINE DETECTOR No. 3.** Complete equipment comprising 2 search heads, amplifier, headset, control box, haversack. Operates from standard batteries. Will detect all ferrous and non-ferrous metals. Fully portable and sensitive. New in original transit case 65/-, carr. 15/-.



Callers: 87, TOTTENHAM CT. RD., LONDON, W.1.  
Mail orders: (DEPT. P), 32a, COPTIC STREET, LONDON, W.C.1.  
Telephone: MUSeum 9607.

WOT ! You don't own a Relda catalogue ! It's terrific and fully illus. Only 1/3.

# Stern's "fidelity" TAPE EQUIPMENT

## THE FINEST RANGE OF TAPE EQUIPMENT FOR THE HOME CONSTRUCTOR

### A SELECTION OF HIGH FIDELITY PORTABLE TAPE PREAMPLIFIERS

Add "Hi-Fi" TAPE RECORDING TO YOUR EXISTING AUDIO INSTALLATION

IN ALL MODELS WE INCORPORATE THE TYPE "C" PREAMPLIFIER

AND OFFER IT COMPLETE IN CASE WITH ...

- (a) The new COLLARO "STUDIO" 3 Speed Deck **£35.10.0**  
Deposit: £7.2.0. 12 months £2.12.1
- (b) The COLLARO Mk. IV "Transcriptor" 3 Speed Deck **£43.10.0**  
Deposit: £8.14.0. 12 months £3.3.10
- (c) The New TRUVOX Mk. VI. Tape Deck **£43.10.0**  
Deposit: £8.14.0. 12 months £3.3.10
- (d) The BRENNELI Mk. V 3 Speed Deck **£51.10.0**  
Deposit: £10.6.0. 12 months £3.15.7
- (e) The WEARITE MODEL 4A. Tape Deck **£59.10.0**  
Deposit: £12.0.0. 12 months £4.7.1

### STERN'S MULLARD TYPE "C" TAPE PREAMPLIFIER-ERASE UNIT

INCORPORATING THE NEW FERROXUCUBE POT CORE PUSH-FULL OSCILLATOR and 3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE POT CORE INDUCTOR. PRICES INCLUDING SEPARATE SMALL POWER SUPPLY COMPLETE KIT **£14.0.0** ASSEMBLED AND TESTED **£17.0.0** Deposit £3.8.0 and 12 months of £1.4.11.

ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT FOR £11.15.0 and £14.10.0 respectively. (Carriage and Insurance is 5/- extra).

WHEN ORDERING PLEASE STATE MAKE OF TAPE DECK TO BE USED. We present this "Hi-Fi" Preamplifier strictly to Mullard's specification incorporating ONLY NEW HIGH-GRADE COMPONENTS and the SPECIFIED NEW MULLARD VALVES. It comprises a COMPLETELY SELF-CONTAINED UNIT, all components and valves being contained in a well-ventilated Box-Chassis neatly finished in Hammered Gold with a very attractively engraved PERSPEX FRONT PANEL.

### FOR PERMANENT HIGH QUALITY INSTALLATIONS WE ALSO OFFER (excluding case)

- (a) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PREAMPLIFIER & Power Unit assembled, tested **£35.0.0**  
H.P. Deposit £7 and 12 months £2.11.4.
- (b) As in (a) above but the Type "C" supplied as COMPLETE KIT OF PARTS **£32.0.0**
- (c) The TRUVOX Mk. VI TAPE DECK and the assembled Type "C" Preamplifier and Power Unit **£37.10.0**  
H.P. Deposit £7.10.0 and 12 months £2.15.0.
- (d) As above but the Type "C" supplied as complete KIT OF PARTS **£34.10.0**
- (e) The BRENNELI Mk. V DECK and the assembled Type "C" PREAMPLIFIER and POWER UNIT **£46.0.0**  
H.P. Deposit £9.4.0 and 12 months £3.7.6.
- (f) As above but the Type "C" supplied as complete KIT OF PARTS **£43.0.0**
- (g) The WEARITE 4A DECK with TYPE "C" assembled and tested **£55.0.0**  
H.P. Deposit: £11.0.0 and 12 months £4.0.3

(Carriage and Insurance on above quotes 10/- extra.)  
PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE.

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



YOU CAN BUILD A COMPLETE HIGH QUALITY RECORDER LIKE THIS for **£39.15.0**

Deposit: £8.0.0.  
12 months: £2.17.5.

#### WE OFFER THIS SELECTION

- (a) The COLLARO Mk. IV TAPE DECK with the assembled and tested HF/TR3 Amplifier **£34.10.0**  
H.P. Deposit: £6.18.0 and 12 months £2.10.8
- (b) As above but the HF/TR3 supplied as KIT OF PARTS **£30.15.0**  
NOTE: Messrs. Collaro when supplying the Mk. IV Deck do not wire up the Deck Switch backs. We will do this for £1 or supply a wiring diagram to the Home constructor.
- (c) The TRUVOX Mk. VI TAPE DECK with the assembled and tested HF TR3 amplifier **£37.0.0**  
H.P. Deposit £7.8.0 and 12 months £2.14.3.
- (d) As above but the HF TR3 supplied as KIT OF PARTS **£33.10.0**
- (e) The BRENNELI Mk. V DECK with the assembled and tested HF TR3 amplifier **£45.0.0**  
H.P. Deposit £9 and 12 months £3.6.0.
- (f) As above but the HF TR3 supplied as KIT OF PARTS **£42.0.0**
- (g) The PORTABLE CASE illustrated here (55) 1.200fl. EMITAPE (35-), ACOS CRYSTAL MIKE (35-), ROLA 10 x 6in. LOUDSPEAKER (30-) ALL FOR **£9.0.0**

Carriage and Insurance on each above 10/- extra.  
**WE HAVE THE NEW 2 SPEED TWIN TRACK TRUVOX MK VI TAPE DECK IN STOCK £26.5.0**  
DEPOSIT: £5.5.0 12 MONTHS: £1.18.6

### THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING 3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCUBE POT CORE INDUCTOR.

PRICE FOR COMPLETE KIT OF PARTS **£12.15.0**  
PRICE FULLY ASSEMBLED & TESTED **£16.10.0**

HIRE PURCHASE. Deposit £3.6.6 and 12 monthly payments of £1.4.2. A very high-quality Amplifier based on the very successful TYPE "A" design completed in the MULLARD LABORATORIES. ONLY NEW HIGH-GRADE COMPONENTS are incorporated including MULLARD VALVES and a GILSON OUTPUT TRANSFORMER. Other features are—Magic Eye Recording hand indicator—Effective Tone Control—Monitoring and Extension Speaker Sockets—Has own Power Supply and can be used as independent Amplifier for direct reproduction of Gram Records or from Radio Tuner. Overall size 11in. x 6in. x 6in. Can be supplied for use with Truvox—Collaro—Lane—Brenell or Motok Decks. Please specify which. Send S.A.E. for leaflet or 2/6 for complete Assembly Manual.

### The New B.S.R. "MONARDECK"

INCORPORATING A CORRECTLY MATCHED PREAMPLIFIER  
Deposit £3.12.0 **£17.17.0**  
12 months £1.6.2

Designed to operate through the Pick-Up Sockets of the standard RADIO RECEIVER through which first-class results are obtained. It consists of a single-speed Twin Track Tape Deck incorporating matched Pre-amplifier, and operates at 3 1/2 in. Carr. & Ins. 10-

The equipment is supplied fully tested and completely assembled on an unpolished wood plinth. It can therefore be "dropped" directly into an existing Cabinet and only requires connections to the mains supply and the Pick-Up Sockets, for which purposes "floating" leads are incorporated on the Preamplifier.



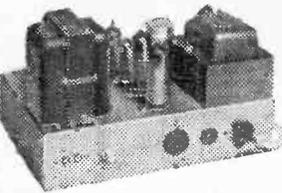
# MULLARD DESIGNS

*Still by far the finest value*

Designed by MULLARD—presented by STERNS strictly to specification.  
**COMPLETE KIT OF PARTS—**

## MULLARD "5-10" MAIN AMPLIFIER

For use with the MULLARD 2-stage pre-amplifier (described below) with which an undistorted power output of up to 10 watts is obtained. This combination is thoroughly recommended to "Hi-Fi" enthusiasts who contemplate a versatile and very high quality home installation. We supply SPECIFIED COMPONENTS AND NEW MULLARD VALVES, including PARMKO MAINS TRANSFORMER (which has extra Power available to drive Radio Tuner) and the choice of the latest Ultra-Linear PARMKO or the PARTRIDGE Output Transformer.



PRICE COMPLETE KIT (PARMEKO) **£10.0.0** Alternatively we supply ASSEMBLED and TESTED, **£11.10.0**. ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER, **£1.8.0** EXTRA.

## MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT



Employing two EF86 valves, and designed to operate with the MULLARD 3-3 and 5-10 MAIN AMPLIFIERS, but also perfectly suitable for other makes. PRICE, COMPLETE KIT OF PARTS, ASSEMBLED AND TESTED **£8.0.0** (Carriage & Insurance, 5/- extra.) Our kit is strictly to MULLARD'S SPECIFICATION and incorporates:

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

## COMPLETE MULLARD 5-10



The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Input channels for high output pick-ups, and all modern Radio Tuning Units only Specified Components and new MULLARD VALVES are supplied, including PARMKO MAINS TRANSFORMER and choice of the latest PARMKO or PARTRIDGE ULTRA-Linear Output Transformers. Adequate power available to drive Radio Tuner. **£11.10.0** Alternatively we supply ASSEMBLED and TESTED HIRE PURCHASE (Assembled Amp. only) DEPOSIT: **£2.14.0**. 12 MONTHS: **£9.10** ABOVE Incorporating PARTRIDGE OUTPUT TRANS., **£1.6.0** extra.

## COMPLETE MULLARD 3-3

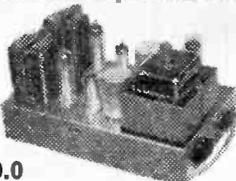
THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION. COMPLETE KIT OF PARTS **£7.10.0** Alternatively supplied ASSEMBLED and FULLY TESTED **£8.19.6**

(plus 6/6 coverage and insurance) H.P. Terms: Deposit **£2.0.0** and 8 Months at **£1.0.0**. Developed from the very popular 3-valve 3-watt design. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMKO OUTPUT TRANSFORMER. Send S.A.E. for leaflet or 1/6 for ASSEMBLY MANUAL.

Only new HIGH GRADE Specified Components and MULLARD VALVES are supplied.

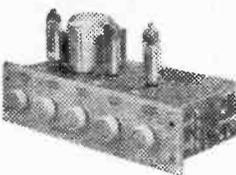
# MULLARD — STERN STEREO DESIGNS

## DUAL "3-3" MAIN AMPLIFIER



Comprises two "3-3" MAIN AMPLIFIERS (described above) on one chassis and is designed to operate with our DUAL CHANNEL PRE-AMPLIFIER for high STEREOPHONIC or MONAURAL operation. PRICE: COMPLETE KIT OF PARTS **£10.0.0** Alternatively ASSEMBLED AND TESTED **£11.15.0** H.P. Terms: Deposit **£2.11.0** & 12 months at 17/- Its output power is 6 watts (3 watts per channel) and together with our PRE-AMPLIFIER provides a very acceptable STEREO installation.

## COMPLETE STEREO AMPLIFIER



A thoroughly recommended design that very effectively meets the many requests for a low-priced but good quality DUAL CHANNEL STEREOPHONIC AMPLIFIER. COMPLETE KIT OF PARTS ASSEMBLED AND TESTED **£10.10.0** Two MULLARD ECL82 Triode Pentode Valves are incorporated in the design; they form a "CLASS A" single-ended output stage in each channel. The input sensitivity is 300 mvolts, therefore when used with most STEREO Crystal Pick-Ups, or Radio Tuning Units, an output of 2 watts per channel is achieved, or similarly when switched to MONAURAL Pick-Up position a combined output of 4 watts is produced.

## DUAL CHANNEL PRE-AMPLIFIER

This model incorporates two 2-valve Pre-Amplifiers (described above) combined into a Single Unit, enabling it to be used for both STEREOPHONIC or MONAURAL operation. It is designed primarily to operate with our range of MULLARD MAIN AMPLIFIERS but will also operate equally well with any make of Amplifiers requiring an input of 250 mvolts.

COMPLETE KIT OF PARTS **£12.10.0** ASSEMBLED AND TESTED **£15.0.0**

It will operate equally well for MONAURAL only operation with one "3/3" or one "5/10" Main Amplifier to which the second Main Amplifier can at any time be added, thus very easily providing for both STEREO or MONAURAL reproduction. Recommended combinations for STEREO operation:

- (a) The DUAL CHANNEL PRE-AMPLIFIER together with the Dual "3/3" MAIN AMPLIFIER.
  - (b) The DUAL CHANNEL PRE-AMPLIFIER together with two "5/10" MAIN AMPLIFIERS.
- FULLY DESCRIPTIVE LEAFLETS available mid October.

Please enclose S.A.E. if ILLUSTRATED and DESCRIPTIVE LEAFLETS are required ... alternatively the COMPLETE ASSEMBLY MANUALS containing component Price Lists and practical Drawings, etc., are available at 1/6 each.

# STERN RADIO LTD.

# Stern's "fidelity" TAPE RECORDERS

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

- MODEL CR3/S.** Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-Speed Deck H.P. Terms: Deposit £8.4.0 and 12 months of £3.0.2.
- MODEL CR3/T.** Incorporates the very popular 3-Speed COLLARO Mk. IV "TRANSCRIPTOR" Deck which has both upper and lower tape tracks..... **£49.10.0** H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.
- MODEL TR3/Mk. VI.** Incorporates the New TRUVOX Mk. VI TWINTRACK 2-Speed Tape Deck ..... **£49.10.0** H.P. Terms: Deposit £9.18.0 and 12 months of £3.12.7.



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

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

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

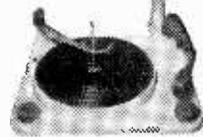
## "MODERNISE YOUR OLD RADIOGRAM"

**IT IS CHEAPER AND BETTER VALUE TO REPLACE YOUR OLD CHASSIS AND GRAM UNIT !! RADIOGRAM CHASSIS !! !! RECORD PLAYERS !!**

- ARMSTRONG "STEREO TWELVE"..... £37.16.0**  
The most complete AM/FM unit yet produced for Stereo, giving 6 watts high-fidelity push-pull output on each channel, 12 watts for monaural.
- ARMSTRONG "JUBILEE" ..... £29.8.0**  
An AM/FM chassis with nine valves and with push-pull output stage providing 6 watts.
- ARMSTRONG AM/FM "STEREO 44" ..... £28.7.0**  
Provision is made for Stereo and monaural playback from pick-up or tape. Outputs provided for Stereo or Monaural tape recordings.

**THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES !!**

SEND S.A.E. FOR ILLUSTRATED LEAFLET  
B.S.R. MONARCH UAS  
4-speed mixer Autochanger  
with Crystal Pick-up  
**£6.12.6**



- RADIO TUNING UNITS**
- DULCI MODEL FMT/2..... £19.17.6**  
A complete self-powered F.M. Tuner incorporating automatic frequency control.
- ARMSTRONG "S.T.3" AM/FM UNIT..... £27.6.0**  
A self-powered high-fidelity Tuner covering full VHF, medium, and long wavebands with automatic frequency control on VHF.
- DULCI "H/4T" AM/FM UNIT ..... £23.15.8**  
A 4 waveband self-powered high-fidelity tuner covering the VHF/FM transmissions plus the long, medium and short wavebands.

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

- The COLLARO "CONQUEST" 4-speed Autochanger, Studio Pick-up ..... **£7.10.0**
- The latest COLLARO "CONTINENTAL" 4-speed MIXER Autochanger Studio "O" Pick-up **£8.10.0**
- The COLLARO 4-speed Single Record Player, Studio Pick-up..... **£6.6.0**
- THE NEW B.S.R. Model UA12 is In Stock. A 4" "SPEED" MIXER AUTOCHANGER ..... £8.7.6**
- UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records ..... **£10.10.0**
- B.S.R. MODEL TU9 4-speed Single Record Player, complete with separate Crystal Pick-up ..... £4.4.0**

**NEW HIRE PURCHASE TERMS are available on all above. Illustrated leaflets available—send S.A.E.**  
**THE DULCI DUAL CHANNEL STEREO PREAMPLIFIERS**  
**THE "STEREO EIGHT" PREAMPLIFIER £23.2.0**  
**THE "STEREO TWO" PREAMPLIFIER ..... £9.9.0**  
(Carr. and Ins. 5 - extra.)

### A SPECIAL CASH ONLY OFFER !!

This very attractive **PORTABLE AMPLIFIER CASE** together with a good quality **GRAM AMPLIFIER** and a matched **P.M. SPEAKER**.  
ALL for **ONLY £8.7.6** (Plus 7/6 Carr. & Ins.)  
The Amplifier consists of a 2-stage design incorporating modern B.V.A. valves and has separate **BASS** and **TREBLE CONTROLS**. The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Rexine.  
**WE ALSO SUPPLY SEPARATELY—**  
(a) The 2-stage (plus Rectifier) **AMPLIFIER £4.2.6** (b) The **PORTABLE CARRYING CASE £3.17.6**  
(c) **P.M. SPEAKER 18/9** Carriage and Insurance 4/- extra.



### STERN'S MK. II "fidelity" F.M. TUNING UNIT

**PRICE £14.5.0** (Plus 5/- Carr. and Ins.)  
**HIRE PURCHASE:** Deposit £2.17.0 and 12 Monthly Payments of £1.0.11.  
Incorporates the latest **MULLARD PERMEABILITY TUNING HEART** and the corresponding **MULLARD VALVE LINE-UP**. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps. at 6.3 volts and 25 m/a at 250 volts.  
**HOME CONSTRUCTORS! YOU CAN BUILD THIS TUNING UNIT FOR ONLY £10.10.0** (Plus 5/- Carr. & Ins.) Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6.



### HIGH-FIDELITY UNITS ARE ALSO IN STOCK . . . as follows :

- GARRARD MODEL 301 . . . 4HF . . . TA/Mk.II . . . RC98 . . . RC12/4 . . . T.P.A.12 PICK-UP . . . etc.

Send S.A.E. For Leaflet.  
**NEW HIRE PURCHASE TERMS ARE AVAILABLE ON ALL EQUIPMENT VALUE £9.0.0 AND OVER.**

### SPECIAL CASH ONLY BARGAIN

A bulk purchase enables us to offer this very useful

**INTERCOM SET OR BABY ALARM** for only **£5.5.0** (Plus 5 - carriage & Insurance.)



Consists of **MASTER UNIT** (Illustrated) and one **EXTENSION** providing 2-way **TALK-LISTEN** facility. Complete in polished wood cases, size of each only 7 1/2 x 4 1/2 x 6 in. high.

### HOME CONSTRUCTOR

A RANGE OF "EASY TO ASSEMBLE" **PREFABRICATED CABINETS** Designed by the **W.B. STENTORIAN COMPANY** for "Hi-Fi" Loudspeaker systems or to accommodate high-quality equipment. The acoustically designed **Bass Reflex Cabinets** containing the very successful "Stentorian" Speakers give really first-class reproduction and are well recommended. Models are also available to accommodate high-quality Amplifiers, Preamplifiers, Tuning Units, Record Players, etc. All models are very easily assembled, in fact, only a screwdriver is required. Fully illustrated leaflets are available, including complete specifications of the various **STENTORIAN LOUDSPEAKERS. PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE.**



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

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

**REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN 1 HOUR.**  
The Recorder incorporates the Latest Collaro Mark IV Tape Transcriber listed \$25. The Linear L745 High Quality Tape Amplifier listed \$12.12.0. High Flux P.M. Speaker listed 30/-, empty Tape Spool, a Reel of Best Quality L.P. Tape (850ft.) listed 28/6, and a Handsome Portable carrying Cabinet finished in veneered walnut, size 18in. x 13in. x 9in. high, listed \$4 10.0, and microphone. Total cost if purchased individually over £45. Performance equal to units in the £60-£80 class.

**29 1/2 GNS. H.P. TERMS.** Deposit £1. Carr. 3 gns. and 12 monthly payments 53/9.

### HI-FI 8 WATT AMPLIFIER

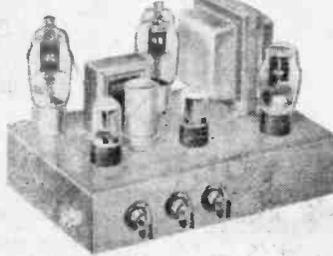
Special Purchase due to Cancelled Export Order.  
For 200-250 v. A.C. A limited number is available of these highly sensitive Push Pull units guaranteed brand new and in working order and with separately controlled inputs for 'mike' and gram, etc. LATEST B.V.A. VALVES. Excellent performance.

**£4-19-9**

Carr. 7/6.

### R.S.C. A8 HIGH FIDELITY 12 WATT AMPLIFIER

Ultra Linear Push-Pull Amplifier with "Built-in" Tone Control. Pre-amp stages, high sensitivity, includes 5 valves (607 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** "Life" and "Cut". Frequency response 10 db. 30-30,000 c/s. Six negative feedback loops. Hum level 71 db. down. ONLY 70 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and practically all microphones. Comparable with the very best designs.



carrying handles can be supplied for 18/9. Additional input sockets, with associated 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 18/9 and 12 monthly payments, 18/9.

**HIGH FIDELITY MICROPHONES and SPEAKERS** in stock. Keep cash price or credit terms if supplied with amplifier.

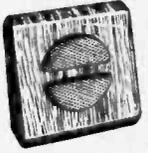
For STANDING or LONG - PLAYING RECORDS. For MUSICAL INSTRUMENTS such as STRING BASS, GUITARS, etc. OUTPUT SOCKET with plus provides 30 v. 30 mA. and 6.3 v. 1.5a. For supply of a RADIO FEEDER UNIT. Size approx. 12x7in. For A.C. mains 230-250 v. 50 c/s. Outputs for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Unapproachable value. at £7/15/- or factory built 45/- extra. Carriage 10/-

If required louvered metal cover with 2 ACOS CRYSTAL 'MIKE' INSERTS. Approx. 1in. square. Fly lead connections. Only 5/11 each. Brand New.

PICK-UP ARMS complete with HI-FI turnover crystal head. Acos GP34. Limited number brand new, perfect, at approx. half price. Only 35/9.

ACOS CRYSTAL MICROPHONES. Type 31-1. hand or desk. List price 50/- Brand new, cartoned. 35/9. 35-1 Stick type, list price 5 gns. Brand new. 39/6.

EXTENSION SPEAKERS Ready for use in walnut veneered cabinet. 6in. 2-3 ohms, 29/11. 8in. 2-3 ohms, 35/9. 10in. 2-3 ohms, 55/9. Very limited number



10 WATT AMPLIFIERS. Unused and in good order but slightly tone soiled. For 200-250 v. A.C. mains input. Output for 15 ohm speaker. Inputs for "mike" and Gram. Limited number, complete with Mullard valves. Only £6.15.0 carr. 5/-.

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

Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s. Screened. TOP SHROUDED UPRIGHT HI 250-0-250 v. 70 mA. 6.3 v. 2a. 5 v. 2a. ... 16/9  
350-0-350 v. 80 mA. 6.3 v. 2a. 5 v. 2a. ... 18/9  
250-0-250 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 23/9  
300-0-300 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 23/9  
350-0-350 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 23/9  
350-0-350 v. 100 mA. 6.3 v. 4a. 4a. C.T. ... 23/9  
0-4-5 v. 3a. ... 23/9  
350-0-350 v. 150 mA. 6.3 v. 4a. 5 v. 3a. ... 29/9

FULLY SHROUDED UPRIGHT  
250-0-250 v. 60 mA. 6.3 v. 2a. 5 v. 2a. ... 17/6  
Nidget type 2f-3-3in. ... 25/9  
250-0-250 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 26/9  
300-0-300 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 26/9  
350-0-350 v. 100 mA. 6.3 v. 4a. 5 v. 3a. ... 26/9  
300-0-300 v. 130 mA. 6.3 v. 4a. 6.3 v. 1a. ... 35/9  
For Mullard 510 Amplifier ... 33/9  
350-0-350 v. 150 mA. 6.3 v. 4a. 5 v. 3a. ... 33/9  
350-0-350 v. 150 mA. 6.3 v. 2a. 6.3 v. 2a. 5 v. 3a. ... 35/9  
425-0-425 v. 200 mA. 6.3 v. 4a. C.T. 6.3 v. 4a. C.T. 5 v. 3a. Suitable Williamson Amplifier, etc. ... 49/9



### A SIX TRANSISTOR "POCKET" SUPERHET RADIO

All parts including Transistor, Printed Circuit, A attractive Cream or Coloured Plastic case. Ferrite aerial. 21in. P.M. Speaker, etc., etc. and full instruction booklet. Size 5 1/2 x 3 1/2 in. completed. Long and Medium Wavebands 250 M.W. push-pull output. Demonstrated at our counter premises.

**£9.19.6**

### R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. APPROX. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 v. and 90 v. This includes latest low consumption types. Complete kit with diagrams. 39/9. or ready to use. 46/9.

Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120v. 90 v. and 60 v. 40 mA. and 2 v. 0.4 a. to 1 amp. fully smoothed. Therefore completely replacing both H.T. batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s. SUITABLE FOR ALL BATTERY RECEIVERS normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions 49/9. or ready for use. 58/6.

<b>ELIMINATOR TRANSFORMERS</b>	
Primaries 200-250 v. 50 c/s.	
120 v. 40 mA. 5-0-5 v. 1 a. ...	15/9
90 v. 15 mA. 4-0-4 v. 500 mA. ...	9/9
<b>SMOOTHING CHOKES</b>	
150 mA. 7-10 H 250 ohms ...	11/9
100 mA. 10 H 200 ohms ...	8/9
80 mA. 10 H 350 ohms ...	5/9
60 mA. 10 H 400 ohms ...	4/11
<b>CHARGER TRANSFORMERS</b>	
All with 200-230-250 v. 50 c/s Primaries	
0-9-15 v. 1 a. 11/9. 0-3-15 v. 3 a. 16/9	
0-9-15 v. 5 a. 19/9. 0-9-15 v. 6 a. 23/9.	
<b>AUTO TRANSFORMERS. 50 watt</b>	
0-110-115-230/250 v. 8/11 each.	
<b>COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. Brand new. Cartoned. For 200-250 v. 50 c/s. A.C. mains. Our price £7.13.3. Carr. 5/6.</b>	
<b>GARRARD 4-SPEED AUTO-CHANGERS Type R.C.120H. Very limited number at 9 gns. (approx. half price). Carr. 5/6.</b>	
<b>FILAMENT TRANSFORMERS</b>	
All with 200-250 v. 50 c/s. primaries 6.3 v.	
1.5 a. 5/9; 6.3 v. 2 a. 7/8; 0-4-6.3 v. 2 a. 7/9; 1.2 v. 1 a. 7/11; 6.3 v. 3 a. 8/11; 6.3 v. 6 a. 17/6; 12 v. 3 a. or 24 v. 1.5 a. 17/6.	
<b>OUTPUT TRANSFORMERS</b>	
Nidget Battery Pentode 661 for 35A. etc.	3/9
Small Pentode, 5000Ω to 3Ω ...	3/9
Small Pentode 78,000Ω to 3Ω ...	3/9
Standard Pentode 5,000Ω to 3Ω ...	5/6
Standard Pentode, 78,000Ω to 3Ω ...	5/6
10,000Ω to 3Ω ...	5/6
Push-Pull 10-12 watts 6V6 to 3Ω or 15Ω ...	16/9
Push-Pull 10-12 watts to match 6V6 to 3-5-8 or 15Ω ...	18/9
Push-Pull EL94 to 3 or 15Ω ...	16/9
Push-Pull 15-18 watts. 6L6, KT66 ...	22/9
Push-Pull for Mullard 510 Ultra Linear ...	29/9
Push-Pull 20 watts. sectionally wound 6L6, KT66, etc., to 3 to 15Ω ...	47/9

**R.S.C. A12 STEREOPHONIC AMPLIFIER KIT**

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

**£3-19 6**

**STEREO EQUIPMENT OFFER.** Comprising A12 Kit, 2 matched 8in. L/Speakers, and Acos T10 Stereo head suitable most pick-ups. Carr. 7/6

**£6-19 6**

**LINEAR L145 HIGH QUALITY TAPE DECK AMPLIFIER.** With "built in" power pack and oscillator Ready for stage. For Tape Decks Use ONLY with High or Low Impedance. Playback and Erase Heads, such as Lane, Truvox, Collaro, Brennel, Carr. 7/6 etc. For A.C. Mains 230-250 v. 50 c/s. Linear frequency response of  $\pm 3$  db. 50-11,000 c/s. Negative feedback control for 31, 71 and 151m. per sec. Output 4 watts. Send S.A.E. for leaflet.

**12 GNS.**

**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  $\pm 3$  db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used, EP96, EP98, EC83, 807, 807, CZ33. 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, 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/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of 30 valves with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built with 12 months' guarantee, for £13.19.6. TERMS: DEPOSIT 24/9 and 12 monthly payments of 24/9.

**11 GNS.** Carr. 10/-

**LINEAR 'DIATONIC' 10-14 WATT HIGH FIDELITY PUSH-PULL ULTRA LINEAR AMPLIFIER.** For 200-250 v. A.C. mains. Valves EC83, ECC81, EL94, EL84, EZ81 miniature Mullard. Self-contained Pre-amp. Tone Control stage and separate Bass and Treble Controls. Independent 'Mike' and Gram input sockets are provided. Output Matchings for 3 and 15 ohm speakers. Only 12 valves. Or Deposit 22/3 plus 10 c/c. and 12 monthly payments of 22/3. Send S.A.E. for leaflet.

**LINEAR L10 HI-FI 10 watt Amplifier and separate Pre-amplifier.** 15 GNS. Complete. Send S.A.E. for leaflet.

**LINEAR L50 50 WATT P.A. AMPLIFIER.** High quality and sensitivity. 19 GNS. Send S.A.E. for leaflet.

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

For 200/250 v. 50 c/s. Mains input. Appearance and Specification. With execution of output wattage, as A5 amplifier. Complete Kit with diagrams. £35.10.0. Carr. 3/6.

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

**LINEAR L45 MINIATURE 4/5 WATT QUALITY AMPLIFIER.** Suitable for use with any record playing unit, and most microphones. Negative feedback 12 db. Separate Bass and Treble Controls. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Three miniature Mullard valves used. Size of unit only 6-5-5 1/2 in. high Output for 2-3 ohm speaker. Guaranteed for 12 months. Only £5/19 6. Send S.A.E. for illustrated leaflet. Terms: Deposit 22/6 and 5 monthly payments of 22/6.

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

A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. down, 15 db. of negative feedback is used. H.T. of 300 v. 25 mA. and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4/15/-, or assembled ready for use 25/- extra, plus 3/6 carr. - or Deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

**R.S.C. PORTABLE GUITAR AMPLIFIERS**

Junior 5 watts High Quality output. Separate Bass and 'Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v., High Flux 8in. Loudspeaker 'built-in'. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carrying handle. H.P. Terms. Deposit £1 and 9 monthly payments of £1.

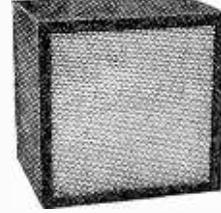
**£8-19 6** Carr. 7/6

**SENIOR 10 WATTS HIGH FIDELITY OUTPUT**

Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12 in. for Bass notes and a 7 x 4 in. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 8 in. H.P. Terms. Deposit 23/6 and 12 monthly payments of 23/6. Both models for 200-250 v. A.C. mains. Carr. 10/-

**13 GNS.**

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



Gauss 12,000 lines. Speech coil 5 ohms or 15 ohms. Only £4.19.6 Carr. 5/- Terms: Deposit 11/- and 9 monthly payments of 11/-

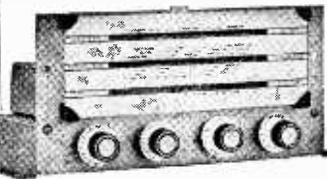
**12 in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS.** Size 18 x 18 x 8 in. Finish as above. Terms: Deposit 19/10 and 12 monthly payments of 19/10. Only £7.19.8. Carr. 8/6.

**COLLARO 4-SPEED SINGLE PLAYER.** Separate pick-up (GP54). Only £3.15.0. Twin sapphire styl. 200-250 v. A.C. mains.

TERMS: C.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2; 2/9 extra under £5. Open 9 to 6; Weds. until 1 p.m. Trade supplied. S.A.E. with all enquiries.

**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 c/s. Or Deposit £2.12.0 and 9 monthly payments of £2.12.0.



**PLESSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER (12,000 lines)**

with built-in tweeter (completely separate elliptical speaker with choke, condensers, etc.), providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rated 10 watts. Price only 25/17/6.

**ACOS HI-FI Crystal Cartridges.** Turn-over type with sapphire stylus. HGP59. Standard replacement for Garrard and B.S.R. Only 19/9. B.S.R. Full-r, 17/9. Garrard GC2. 19/9.

**COLLARO Mk. III 3-SPEED TAPE - 15 GNS. TRANSCRIBPTORS** Carr. 7/6

Limited number brand new cartoned.

**P.M. SPEAKERS.** 2-3 ohm. 2 1/2 in. Perdit 25/9. 5in. 17/9. 6in. 16/9. 8in. 19/9. 8 x 5in. 25/9. 10in. 26/9. 10 x 6in. 29/9. 12in. 29/11. 10in. W.P. 'Stereoran' 3 or 15 ohms type HF1012 10 watts hi-fidelity type. Recommended for use with our A8 Amplifier. 4 gns. 12in. Plessey 3 ohms 10 watts (12,000 lines). 59/6.

**TWETERS.** Plessey 3 ohms 19/9. Rola-Celestion 15 ohms 25/9.

**LG3 MINIATURE 2-3 WATT GRAM AMPLIFIER.** For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Over-all size 6 1/2 x 4 1/2 in. Controls: Vol and Tone with switch. Guaranteed 12 months. Only 57/9.

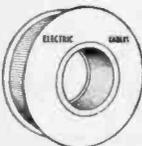
**SUPERHET FEEDER UNIT.** Design of a high quality Radio Tuner Unit (specially suitable for use with any of our Amplifiers). Delayed A.V.C. employed. The W.Ch. 3w. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size of unit approx. 9-6-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration. 2/6. Total building cost £4/15/-. For descriptive leaflet send S.A.E.

**GARRARD 4-SPEED SINGLE RECORD PLAYER UNITS** with turn-over crystal head. Current model. List price around £10. Only £6.19.6. Carr. 4/6.

TERMS: C.W.O. or C.O.D. No C.O.D. under £1. Post 1/9 extra under £2; 2/9 extra under £5. Open 9 to 6; Weds. until 1 p.m. Trade supplied. S.A.E. with all enquiries.

Mail Orders to 29-31 Moorfield Rd., Leeds 12. Callers to 5 and 7 County (Maccs) Arcade, Briggate, Leeds 1, and 8-10 Brown St. (Market St.), Manchester 2, or 55, Morley Street, Bradford.

### Versatile Wire



Single-strand 18-gauge with P.V.C. covering which makes it rustproof. Extra strong and will stand tremendous strain. Ideal for gardening, clothes lines, in-door aerials, etc.

etc. Also being steel alloy and having a resistance of approximately 1/2 ohm per yard this can be used for electrical work, soil heating, wrapping round water pipes, etc. New on drum containing 3,000ft. Price 8/6 plus 3/6 carr.

### Medresco Hearing Aid

As supplied by National Health completely overhauled and in good working order with six months' guarantee. Only £3.15.0 plus 2/6 post and ins. Complete with ear-phone and new ear plug but not batteries, these can be supplied as an extra for 5/- per set. Ardent model, as new, higher gain and self-contained batteries £7.10.0 or 10/- deposit and 16 fortnightly payments of 10/-.



### "Dim and Full" Switch

Particularly useful for controlling photofood lamps which have only a short life at full brilliance. This toggle switch has three positions; the first position puts two lamps in series at half brilliance for setting up, the second position is off and the third position full brilliance for the operation shots. Also useful for controlling night lights, heaters, etc. etc. Price 2/6 each. Plus post 9d. Circuit diagram included.

### For Portable Radio or Player



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

### Miniature Microphone

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



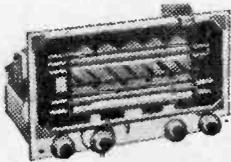
### Unique Opportunity to build Fine Transistor Set

Constructor's parcel : to build Pocket 6 Transistor Set as currently being sold at £17.17.0. Parcel comprises Modified two-tone cabinet as illustrated, tuning dial, two gang tuning condenser, combined bakelite chassis / printed circuit and easy to follow circuit. Costing value 57/6—offered while supplies last at only 29/6 plus 2/6 post. Suitable for your own circuit or to build original circuit. All parts available at highly competitive prices. Do not miss the tremendous bargain.



### Dulci AM/FM Radiogram Chassis

Chassis Model H.3. This has three wavebands, P.M. 87-101 Mc/s. Medium Wave 187-540 metres and Long Wave 1,000-2,000 metres, uses 7 of the latest miniature valves and built-in ferrite aerial. "Why not modernise your Radiogram, get the best from modern records with this hi-fi 4 watt output chassis." Price, £19.17.6 or £2 down and 20 fortnightly payments of £1.0.8. Hi-Fi Model H4 PP. £27.16.6 or £2.16.6 down and 26 fortnightly payments of £1.2.0. (Note : Hire-purchase figures include insurance for 12 months.)

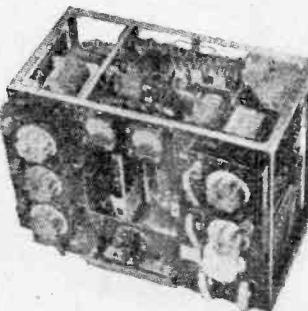


B.B.C. Television Transistor Set. All parts available—total cost, including two transistors, with copy of circuit diagram and instructions. £12.19.6. Postage 2/- extra.

### Special Introductory Offer

Introducing our new 'Inductor 40' Fluorescent fitting. This is a battery type fitting nicely finished, white enamel. Suitable for chain suspension or direct fixing, uses fully compounded choke ballast and radio suppressed starter. Offered at a special price this month to introduce it, namely 39/6, complete with tube. Carriage up to 150 miles 5/6; up to 250 miles, 7/6.

### £100 worth of Equipment for 19/6



The famous R1154—unused but slightly soiled and not tested. Covers 200-500 kc/s. 3-5.5 Mc/s and 5.5-10 Mc/s. Has unique click stop mechanism (7 stops) and permits selected frequency to be held, returned to, etc. Hartley oscillator, power amplifier, keying and speech. Wonderful breakdown value meters, relays, switches. Complete with valves—real bargain at 19/6, plus 10/- carriage.

FOR ADDRESS  
SEE NEXT PAGE

### 1960 All Mains Amplifier



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

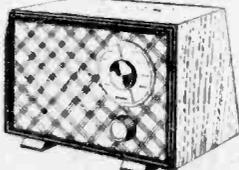
### BEGINNER'S SUPERHET

All the components including metal chassis, valves, metal rectifier, coils, tuning condenser, etc. etc., required to build the "Beginner's Superhet" as described in the January, 1958, issue, are available as a parcel. Price £3, plus 3/- post and insurance.



### Stereo Outfit

Stereo Amplifier outfit comprising 7 watt twin channel amplifier for A.C. mains working and two 8in. P.M. Speakers on veneered and polished corner baffles. Whole outfit giving really terrific reproduction and amazing 3-D effects. £14 complete, plus carriage and insurance. Or £1 down and 28 weekly payments of 10/-.



### New Improved Circuit for the 1960 Skysearcher

This is a three valve receiver kit using modern circuitry. Ideal as a second set for the bedroom, workshop, etc. All parts including mains transformer, valves, resistors, coils, etc., but not cabinet, chassis or speaker, 29/6, plus post and ins. 3/6. Data free with parts or available separately 1/6.

### A.C./D.C. Multimeter Kit

Ranges : D.C. volts 0-5, 0-50, 0-100, 0-500, 0-1000. A.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000. D.C. milliamps 0-5, 0-100, 0-500. Ohms 0-50,000 with internal batteries. 0-500,000 with external batteries. Measures A.C./D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions, price 19/6, plus 2/6 post and insurance.



**Hi-Fi Snip  
Infinite Wall Baffle**

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

**Speaker Bargain**

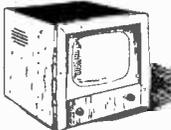


12in. Hi-fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 32/6, plus 3/6 post and insurance.

**For Your Lab.**

Resistance substitution boxes are great time savers and you really cannot have too many of them: here then, is an opportunity to acquire these at a very low rate. Our R.S. kit available for only 8/6, plus 1/6 postage, comprises one 50 W. precision variable resistor 0-100 K., six 2-3 watt fixed resistors, one 6-position switch, one pointer knob and one ordinary knob and instructions. This unit when made up will give an infinite variability over the range 100 ohm to 2 meg.

**14in. T.V. Cabinet**



14in. T.V. cabinet of the latest styling—beautifully veneered and polished. Limited quantity, sale price 15/- each. Carriage and packing 3/6 extra. Masks 10/- extra.

**Band III Converter**



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

**ASSURE YOUR FUTURE**

The ownership of a good instrument has been the turning point in many a career. It could easily be yours, for you can own the latest Avo Test Instrument for the initial payment of only 10/-. This test instrument is ultra-modern, has a sensitivity of 10,000 Ohms per Volt, measures A.C. Volts 0-1,000 in 5 ranges. D.C. Volts 0-1,000 in 7 ranges, D.C. current at 1 Amp. in 5 ranges and resistance up to 2 Megs. in two ranges. Free Gift. To extend the uses of this instrument, for instance, to measure capacity, inductance, E.H.T., etc., we have developed a range extender scale and operating notes, these will be sent free to purchasers of this instrument. All sent immediately for 10/- deposit, balance by 21 payments of 10/-, which includes free insurance against accidental damage for 12 months. Non-callers add 3/6 post and insurance. Cash price, 29.10.0.



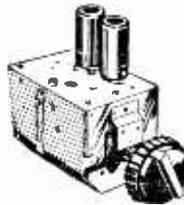
**THIS MONTH'S SNIP**

Car Starter Battery Charger—due to a fortunate purchase we are able to offer you a fine ready-made high output battery charger in stove enamelled sheet steel louvered case. New, complete and ready to work, this charger is rated at 12 V, 4 Amps and has a variable rate selector for trickle charging, also a meter to show charging rate. Suitable for 230/250 A.C. mains. Made to sell at 85/-, but offered this month at special snip price of 55/-, plus 3/6 post and insurance.

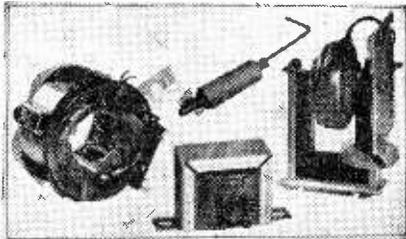


**12-CHANNEL TURRET TUNER**

Ideal for converting an old or building into new T.V. These are brand new stock, not surplus, supplied complete with valves and coils for local Band I and Band III stations. Model 1. I.F. Output 33/38 Mc/s series heaters (parallel heaters, 5/- extra). Model 2. I.F. Output 16/19 Mc/s parallel heaters (series heaters, 5/- extra). With instructions and circuit diagram, 79/6. Knobs 3/6 extra, postage and insurance 2/6.

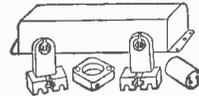


**FOUR ITEMS FOR PRICE OF ONE**



Set of modern T.V. parts suitable for modernising old television or for a new one. For wide angle 14in. or 17in. tubes comprises: (1) Line output E.H.T. transformer. (2) 700 scanning coils on ferrite yokes. (3) Width control with ferrite core. (4) Frame output transformer. (5) Circuit diagram of a modern television. Offered at the price of the Line output transformer only, namely, 57/6, plus 2/6 post and insurance.

**Fluorescent Lighting**

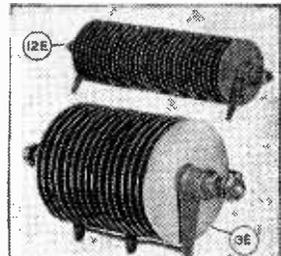


For customers wishing to use fluorescent lighting without metal work for shop window lighting, etc. We offer complete kits of parts. Five items as illustrated comprising best quality choke ballast, canister starter and white bakelite holders. 40 watt kit, 22/6, 80 watt kit, 26/6, plus 2/- post and insurance.

**Miniature Fluorescent Kits**

Kit of parts including tube, two holders, starter, starter holder and choke together with wiring diagram. Price as follows: 6in., 9in. and 12in., 29/6; 21in., 35/-. Post and insurance 2/6 per set.

**Rectifier Bargains**



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

**Tube Tester and Reactivator**



We can supply all the main components for making this unit which will not only test Cathode Ray Tubes but also will reactivate them, supplied complete with full instructions. Price £3, plus 2/6 post and ins.

**T.V. Service Sheets**

200 sheets covering most popular post-war televisions by leading makers—Cossor, Ekco, Ferguson, Pye, etc., £2, post free. PREVIOUS PURCHASERS OF THESE SHEETS PLEASE NOTE: WE CAN SUPPLY SHEETS Nos. 100-200, £1, or 150-200, 10/-.

**Connecting Wire**



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

All items advertised can be obtained from the following Companies. If ordering by post, address your order to the Company nearest to you and please include postage.

Electronics (Manor Park) Ltd.  
520, High St. North, Manor Park, E.12.

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

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

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

# RETURN-OF-POST SERVICE

## NEW ILLUSTRATED LISTS

New illustrated lists are available on all the following. Any will be sent free upon request.

**GRAMOPHONE EQUIPMENT.** Details of many types of Auto Changers, Single Record Players and Transcription Units including all the latest models. Many at special prices.

**TEST GEAR.** Test meters, Signal Generators, etc., by AVO, Jason, Pullin and Taylor.

**LOUDSPEAKERS.** Full details of Goodmans, Whiteley, Wharfedale and Elac types.

**TAPE DECKS.** All popular makes with a special offer.

**RECORDING TAPES.** A very wide range of all tapes and accessories.

## LATEST AVO TEST METERS



**AVOMETER MODEL 8.** The finest multi-range meter available. 20,000 ohms per volt on D.C. ranges. Eight D.C. Voltage ranges 2.5 v. to 2,500 v. Seven D.C. current ranges 50 microamps. to 10 amps. Seven A.C. Voltage ranges 2.5 v. to 2,500 v. Four current ranges 100 mA. to 10 amps. Three resistance ranges. Fully detailed leaflet available. Price £23.10.0. H.P. Deposit £4.14.0 and 12 monthly payments of £1.14.6. Price with leather carrying case, £26.10.0. H.P. Deposit £5.6.0 and 12 payments of £1.18.10.

Other AVO Meters available include the Model 7, £19.10.0. H.P. Deposit £3.18.0 and 12 payments of £1.8.8 and the Multiminor price £9.10.0. H.P. Deposit £1.18.0 and 12 monthly payments of 14/4.

## CRYSTAL DIODES

Brimar. GD3, GD4, GD5, GD6, GD8, 7/6.  
G.E.C., GEX34, GEX35, 4/-. Surplus type, 1/3.  
Mullard. OA79, OA81, 4/-.

## TRANSISTORS

All at the new reduced prices.

**AUDIO.** B.T.H. Red Spot. 7/6. G.E.C. Yellow/Green. 7/6.  
BRIMAR. TS1, 10/- TS2, 21/- TS3, 13/6.  
EDISWAN. XB102, 10/- XB104, 10/-  
MULLARD. OC70, 14/- OC71, 14/-  
GOLDTOP. V10/15A, 15/-

**AUDIO OUTPUT.** Matched Pairs. Mullard OC72, 34/-  
Ediswan KC101, 32/-  
RP. G.E.C. Yellow/Red. 15/-

EDISWAN. XA101, 23/- XA102, 26/- XA103, 15/- XA104, 18/-  
MULLARD. OC49, 26/- OC45, 23/-

All transistors post free.

## TRANSISTORISE YOUR CRYSTAL SET

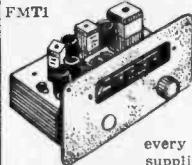
A kit to construct a single transistor amplifier for any Crystal Set. Increases the volume many times. No soldering required and full instructions supplied. Complete kit with brand new transistor, 21/6. Post free.

## VALVES

All available types by Mullard, Brimar, Mazda, G.E.C., Osram, Cossor or Emitron can be supplied. Many types have been recently reduced in price. Any type sent C.O.D. or quotation given as you prefer.

## JASON FM TUNER

FMT1



There are no less than five different Jason FM Tuner Kits now available to the Home Constructor. Brief details are given here and individual lists on any are available free.

**MOST IMPORTANT.** We take great pains to see that the kits we supply are absolutely complete in every detail and also that all components

supplied are

entirely suitable in every way. This accounts for differences in price you may notice between our prices and those of some of our competitors. THIS SHOULD BE BORNE IN MIND WHEN COMPARING PRICES.



FMT2 & 3

## STANDARD TUNERS

**STANDARD TUNER, FMT1.** The very popular tuner which is supplied with a chassis assembly fitted with a gold hammer finish front panel and glass dial. Employs four EF91 valves. External power supply is required. Complete kit £6.19.6. Power pack kit, 39/-.

**STANDARD TUNER IN SHELF MOUNTING CASE, FMT2.** This is a new version of the above tuner. The circuit has been brought up-to-date and is built into the very attractive shelf mounting case of the new Fringe Tuner mentioned below. The circuit uses four EF80 valves and the power supply can be built into the case if desired. Complete Kit £7.17.6 without power supply components. £9.16.0 with power supply.  
**MERCURY SWITCHED TUNER.** This is a tuner in chassis form which has a three position switch for the three BBC programmes. Uses one ECF40 and four EF80 valves. External power supply is required. Complete Kit £9.19.0. Power Pack Kit 39/-.

## FRINGE TUNERS

**NEW FRINGE TUNER IN SHELF MOUNTING CASE, FMT3.** This is an entirely new Fringe Tuner and is supplied complete with a very attractive green shelf mounting case with Perspex dial. The tuner is fitted with variable AFC. Internal power supply is desired. Valves used are one ECC81 and five EF90. Complete Kit £9.19.6 without power supply components. £11.18.0 with power supply.

## TV SOUND FM SWITCHED TUNER

This tuner, also supplied in an attractive shelf mounting case, has a TV type Coil Turret fitted to provide TV sound from any BBC or ITV Sound channel as well as the three BBC FM programmes. Fitted with internal power supply. Valves: one ECC84, one ECF80, one EF90, one EF89, one EM81 and one E780. Complete Kit £15.15.0.

## INSTRUCTION MANUALS

All our kits include the appropriate instruction manual. All available separately as follows:— Manual covering both Standard Tuners and the new Fringe Area model, 2/10 & "Mercury," 2/3; TV Sound/FM, 3/- All post free.

## MULLARD TAPE PRE-AMPLIFIER

This unit is intended for use with an existing amplifier and provides all the circuits necessary for tape recording and playback. Instruction manual, giving full constructional information is available price, 2/10, post free.

**COMPLETE KIT** containing every item required down to the last nut and bolt. First class items only included. £14.7.0. H.P. Deposit £2.17.0 and six monthly payments of £2.2.6. Kit less valves, £10.19.6. H.P. Deposit, £1.19.6 and six payments of £1.13.4. Power Unit kit, £3.19.6.

## MULLARD AMPLIFIER BOOK

The new Mullard publication "Circuits for Audio Amplifiers" gives details of 20 and 10 watt Amplifiers. Two and Three valve Pre-Amplifiers, Tape Amplifier and Pre-Amplifier, Stereo Amplifiers and Pre-Amplifiers. Price 8/6, plus 10d. postage.

## AMPLIFIER KITS

**MULLARD 510.** All items for the latest versions and now in stock and our detailed list is available.  
**GEC 912 P.I.U.S.** All items stocked and lists available. Instruction manual 4/-, plus 6d. postage.

# WATTS RADIO (MAIL ORDER) LTD.

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

**GRAMOPHONE EQUIPMENT**

ALL LATEST MODELS	Cash Price	Deposit	Hire Purchase Mthly. Pmts.
<b>RECORD CHANGERS</b>			
COLLARO Conquest (Studio O PU) ...	£7.19. 6	£1.12. 0	12 of £1. 4/7
GARRARD RC121 (GC8 PU) ...	£9.19. 6	£1.19. 6	12 of 15/-
GARRARD RC88 (GC8 PU) ...	£16. 8. 0	£3. 6. 0	12 of £1. 4. 0
GARRARD RC98 (GC8 PU) ...	£18.12. 8	£3.15. 8	12 of £1. 7. 3.
B.S.R. U48 Monarch (TC8 PU) ...	£7. 5. 0	£1. 9. 0	6 of £1. 2. 8
BSR UA12 Monarch (TC8 PU) ...	£9.19. 6	£1.19. 6	12 of 15/-
BSR UA12 Monarch (TC8S Stereo PU) ...	£10.17. 6	£2. 3. 6	12 of 16/2
<b>SINGLE RECORD PLAYERS</b>			
GARRARD TA (GC8 PU) ...	£8.10. 0	£1.14. 0	12 of 13/-
BSR TU9 (TC8 PU) ...	£4.10. 0	£1. 5. 0	3 of £1. 5. 0
COLLARO RP584 (O. P. or T. PU) ...	£8.18.11	£1.15.11	12 of 13/7
COLLARO RP594 (O. P. or T. PU) ...	£9.18. 9	£1.18. 9	12 of 15-
<b>TRANSCRIPTION UNITS</b>			
COLLARO 4T/200 (TC88 PU) ...	£18.13. 0	£3.15. 0	12 of £1. 7. 4
COLLARO 4TR/200 Motor only ...	£13.18. 3	£2.15. 3	12 of £1. 0. 5
GARRARD 4HF (GC8 PU) ...	£18. 9. 9	£3.15. 9	12 of £1. 7. 0

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

**GRAMOPHONE STYLI**

ACOS. GP15, GP25, GP27, GP29, GP59, GP81, HGP33, HGP35, HGP37, HGP39, HGP41, HGP45, HGP65, HGP57, HGP63. All 6/8 each.  
 B.S.R. TC4, TC8, TC8S. All 5/9 each.  
 DECCA. XMS. 14/-  
 GARRARD. GC2, GC8, 5.7; TOMI, TOM2, 17.11. Miniature Magnetic, 7/-; HI-FI PU, 12.1.  
**IMPORTANT.**—Please state Std. or LP when ordering.

**STEREO PICK-UP CARTRIDGES**

RONETTE DC284. For all Collaro Models to replace the Studio Cartridge. Turn-over for 78-LP Stereo. £3.19.6.  
 B.S.R. M'8S. Will replace the TC8H or TC8M in any Monarch Changer. Plays 78-LP Stereo records. £3.6.0.

**LOUDSPEAKERS**

GOODMANS	Cash Price	Deposit	Hire Purchase Mthly. Pmts.
New Axiom 110 10" ...	£5. 0. 0	£1.10. 0	3 of £1.8.8
New Axiom 112 10" ...	£5.10. 0	£1.14. 0	6 of £1.6.0
Axiom 300 12" ...	£11. 5. 9	£2. 5. 9	12 of £1.6.0
Axiom 400 12" ...	£16. 1. 0	£3. 4. 0	12 of £1.3.7
Axiote 8" ...	£6.12. 0	£1. 6. 0	6 of £1.1.0
Trebax Tweeter ...	£6. 4. 0	£1. 4. 0	6 of £1.0.0
N05000 Crossover Unit	£1.19.0	—	—
<b>WHITELEY</b>			
HF1018 10" ...	£7.12. 3	£1.10. 3	6 of £1.3.8
HF1012 10" ...	£4.15. 0	£1.14. 0	3 of £1.5.0
HF816 8" ...	£6.10. 6	£1. 6. 6	6 of £1.0.8
HF817 8" ...	£10.16. 6	£2. 3. 6	12 of 16/-
HF16 Cone Tweeter	£6. 3. 9	£1. 3. 9	6 of £1.0.0
HF19 Tweeter ...	£4. 4. 0	£1. 4. 0	3 of £1.3.4
1359 Cone Tweeter	£1.13. 3	—	—
Crossover CN3000	£1.10. 0	—	—
Crossover CN1500	£1.18. 3	—	—

Other Goodmans and Whiteley Speakers available. also full Wharfedale range.

**CATHODE-RAY TUBES**

**BRAND NEW STOCK. NOT REBUILDS.**  
**12 MONTHS GUARANTEE**  
 We can supply all BVA branded tubes at the new reduced prices. This includes Brimar, Cossor, Emiscope, Emitron, Ferranti, G.E.C., Mazda and Mullard.  
**MULLARD.** 12in. and 14in. types. £10.10.0. H.P. Deposit £2.2.0 and 12 monthly payments of 15/8. 17in. Types (except MW43/43) £12.0.0. H.P. Deposit £2.8.0 and 12 payments of 17/8. 17in.. MW43/43 £14.0.0. H.P. Deposit £2.16.0 and 12 payments of £1.0.8. 21in. Types £18.0.0. H.P. Deposit £3.12.0 and 12 payments of £1.6.6.  
 Ask for quotation on any other make. All tubes sent carriage free and safe delivery guaranteed.

**LATEST CABY TEST METERS**

Now in stock. CABY SUPREME MULTI-RANGE METERS. Made abroad. We can confidently recommend these meters as being accurate, well made and very good value for money.

**MODEL A-10.** Sensitivity 2,000 ohms per volt A.C. and D.C. Five voltage ranges 10-1,000 volts A.C. and D.C. Three D.C. current ranges .5-250 ma. Two resistance ranges. Size 5 1/2 in. x 3 1/2 in. x 1 1/2 in. Price, £4.17.6. H.P. Deposit £1.7.6 and three monthly payments of £1.6.8.



**MODEL B-20.** Sensitivity 4,000 ohms per volt A.C. and D.C. Voltage ranges—Five D.C. 10-1,000 volts. Four A.C. 10-1,000 volts. Four D.C. current ranges. .5-250 ma. Four resistance ranges. Price £6.10.0. H.P. Deposit £2 and three monthly payments of £1.13.4.

Illustrated leaflet giving full details of both models free upon request.

**RECORDING TAPE**

**DOUBLE PLAY**  
 BASF. 300ft. (3in.). 14/-; 600ft. (4in.). 25/-; 1,200ft. (5in.). 42/-; 1,800ft. (5 1/2in.). 52/6; 2,400ft. (7in.). 77/6.  
 SCOTCH BOY 200. 400ft. (3 1/2in.). 17/-; 1,200ft. (5in.). 45/-; 2,400ft. (7in.). 80/-  
 TELEFUNKEN. 1,200ft. (5in.). In plastic container. 35/-; 2,400ft.. 72/6.

**LONG PLAY**  
 BASF. 210ft. (3in.). 9/-; 850ft. (5in.). 28/-; 1,200ft. (5 1/2in.). 35/-; 1,800ft. (7in.). 50/-  
 EMIPAPE 99. 250ft. (3in.). 9/6; 850ft. (5in.) 28/-; In Emiscope. 30/8; 1,200ft. (5 1/2in.). 35/-; In Emiscope. 37/6; 1,800ft. (7in.). 50/-; In Emiscope. 52/6; 2,400ft. (8 1/2in.). 72/6.

**GILOSONO.** 430ft. (3 1/2in.). 16/-  
**GRUNDIG.** 1,200ft. (5 1/2in.). 35/-; 1,800ft. (7in.). 50/-  
**MSS.** 225ft. (3in.). 8/6; 450ft. (4in.). 14/6; 850ft. (5in.). 28/-; 1,200ft. (5 1/2in.). 35/-; 1,800ft. (7in.). 50/-; 2,400ft. (8 1/2in.). 70/-  
**PHILIPS.** 850ft. (5in.). In plastic container. 28/-; 1,800ft. (7in.). 50/-  
**SCOTCH BOY 150.** 200ft. (3 1/2in.). 9/6; 900 ft. (5in.). 28/-; 1,275ft. (5 1/2in.). 35/-; 1,800ft. (7in.). 50/-  
**SPECIAL OFFER.** 1,200ft. Standard Tape. Brand new. Famous maker. Fully guaranteed. 25/-; Four for 95/-  
 Full range of standard tape and accessories also stocked. Send for list. All tape post free.

**TRIPLE TONE AMPLIFIERS**

We particularly recommend the Tripletone ready-built Amplifiers. The performance is very good, construction excellent and they represent excellent value for money.

**HI-FI MAJOR.** Push-Pull stage gives 12 watt output. Separate tone controls for Treble, Middle and Bass. Input for Microphone. Frequency response 15-20,000 cycles.  
 Price £15.18.9d. H.P. Deposit £3.3.9 and 12 monthly payments of £1.3.5.

**POPULAR.** Three valve amplifier giving three watts output. Separate tone controls for Bass, Middle and Top.  
 Price. £6.19.6. H.P. Deposit £1.0.6 and six monthly payments of £1.3.2.

**HIRE PURCHASE**

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

**Terms of Business.**—Cash with order or C.O.D. Postage extra under £3. We charge C.O.D. orders as follows. Up to £3, postage and C.O.D. fee minimum 2/8. Over £3 and under £5, C.O.D. fee only 1/6. Over £5 no charge.

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

PLEASE NOTE: POSTAL BUSINESS ONLY FROM THIS ADDRESS.

# BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS. 38 CHALCOT ROAD, LONDON, N.W.1. Telephone: PRIMROSE 9090

EXPRESS POSTAL SERVICE! ALL ORDERS DESPATCHED SAME DAY AS RECEIVED. C.O.D. ORDERS BY PHONE OR WIRE ACCEPTED UP TO 3.30 P.M. FOR IMMEDIATE DESPATCH.

		ANY ORDER INSURED AGAINST DAMAGE IN TRANSIT FOR ONLY 6d. EXTRA.																
0B2	17/6	6C8	12/6	6X4	6/6	19H1	10/-	AC/PEN	DL94	7/6	EL33	12/6	KT263	10/6	QP25	15/-	UCH81	9/6
0Z4	6/-	6C9	12/6	6X5GT	6/6	20D1	15/3	5-pin 23/3	DL96	9/-	EL34	15/-	L63	6/6	QS150/15		UCL82	11/6
1A3	3/-	6C10	10/6	6/30L2	10/-	20F2	26/6	7-pin 15/-	DL510	10/6	EL38	26/6	LN152	10/6		10/6	UCL83	19/3
1A5	6/-	6CD6G		7A7	12/6	20L1	26/6	AC2PEN	DM70	7/6	EL41	9/-	MH4(C)	7/6	R12	9/6	UF41	9/-
1A7GT			29/10	7B6	12/6	20P1	26/6		EA50	2/6	EL42	13/11	MHL4	7/6	R18	14/-	UF42	12/6
				7B7	8/6	20P2	23/3	AC2PEN	EABC80	9/-	EL81	12/6	MHL6D	12/6	R19	19/11	UF80	10/6
1C5	12/6	6D3	19/11	7C5	8/6	20P5	23/3	DD	EAC91	7/6	EL84	8/6	ML4	12/6	SD6	12/6	UF85	10/6
1D6	10/6	6D6	6/6	7C6	8/6	25A6G	11/-	AC4PEN	EAF42	9/6	EL85	13/11	MU14	9/-	SP4(7)	15/-	UF86	17/11
1H5GT	11/-	6E5	12/6	7D8	23/3	25L6GT	10/-		EB34	2/6	EL91	5/-	MX40	15/-	SP41	3/6	UF89	9/-
1L4	6/-	6F1	26/6	7H7	8/6	25U4	16/7	AC5PEN	EB41	8/6	EL95	10/6	N37	19/11	SP42	12/6	UL41	9/-
1LD5	5/-	6F6G	3/6	7H7	12/6	25Y5	10/6		EB91	5/6	EM34	10/-	N78	19/11	SP61	3/6	UL44	26/6
1LN5	5/-	6F6GTM	8/-	757	10/6	25Y5G	10/6	AC6PEN	EB93	2/6	EM71	23/3	N108	19/11	SU25	26/6	UL46	14/6
1NSGT	11/-	6F8	12/6	7V7	8/6	25Z4G	9/6	AC/PA	EB93	7/-	EM80	9/6	N308	20/7	SU61	9/6	UL84	8/6
1RS	7/6	6F11	17/3	7Y4	8/6	25Z5	10/6	AC/SG	EB32	8/6	EM81	9/6	N339	29/10	T41	23/3	UM4	7/6
1S4	9/-	6F12	5/6	7Z4	18/7	25Z6G	10/-	AC/TP	EB32	8/6	EM84	10/6	OA70	4/6	TDD4	24/7	UR1C	9/6
1S5	7/6	6F13	11/6	8D2	3/6	25Z6GT	10/-	AC/VP1	EBF80	10/-	EN31	3/6	OA71	7/6	TH4B	4/6	UJ6	19/11
1T4	6/-	6F14	26/6	8D3	5/6		16/7	7 pin	EBF83	13/11	EY51	9/6	OC71	17/2	TH41	26/6	UJ7	16/7
1U5	10/-	6F15	13/6	8BV6	5/6	27S5U	19/11	AC/VP2	EBF89	9/6	EY83	16/7	P61	3/6	TH233	33/2	UJ8	26/6
2A7	10/6	6F16	9/6	9D2	4/-	28D7	7/-	ATP4	EBL21	23/3	EY84	14/-	PABC80		TH232	20/-	UJ9	7/6
2P	26/6	6F17	12/6	10C1	12/-	30C1	8/6	AZ1	EBL31	23/3	EY86	10/-		13/11	TP22	15/-	UY1N	18/7
2X2	4/6	6F32	10/6	10C2	26/6	30F5	7/-	AZ31	EC52	5/6	EZ35	6/6	PCC84	8/-	TP25	19/6	UY21	16/6
3A4	7/-	6F33	7/6	10D2	12/6	30FL1	10/-	AZ41	EC54	6/6	EZ40	7/6	PCC85	9/6	TP2620	33/2	UY41	7/6
3A5	10/6	6G6	6/6	10F1	17/6	30L1	8/6	B36	EC70	12/6	EZ41	7/6	PCC88	23/11	TY86F	13/3	UY85	7/-
3B7	12/6	6H6GTG	3/6	10F9	10/6	30P12	8/6	BL63	EC92	13/3	EZ80	7/6	PCC89	14/-	U12/14	12/-	VMS48	23/3
3D6	5/-	6H6GTM	3/6	10LD3	8/6	30P16	8/6	C1	ECC32	10/6	EZ81	7/6	PCF80	8/6	U16	12/-	VP2(7)	12/6
3Q4	7/6	6J5G	5/6	10LD11	3/6	30P11	11/6	C1C	ECC33	8/6	FC2A	24/7	PCF82	11/6	U18/20	9/-	VP4(7)	15/6
3Q5GT	9/6	6J5GTG	5/6		15/11	31	7/6	CBL1	ECC34	24/7	FC4	15/-	PCL82	12/6	U22	8/-	VP2B	14/6
354	7/6	6J5GTM	6/6	10P13	15/6	33A/158M		CBL31	ECC35	8/6	FC13	26/6	PCL83	11/6	U24	29/0	VP4B	23/3
3V4	7/6	6J6	5/6	10P14	19/3		30/6	CH35	ECC40	23/3	FC13C	26/6	PCL84	12/6	U25	12/6	VP13C	7/6
5R4GY	17/6	6J7G	6/6	11D3	24/7	35/51	12/6	CK506	EC81	8/6	FW4/500		PEN4DD		U26	10/6	VP23	6/6
5U4G	8/6	6J7GT	10/6	12A6	6/6	35A5	21/3	CL33	EC82	7/6				U31	9/6	VP41	6/6	
5V4G	11/-	6K6GT	8/6	12AC6	15/3	35L6GT	9/6	CV63	EC83	8/6	FW4/800		PEN25	19/11	U33	26/6	VR75/30	
5X4G	12/6	6K7G	5/6	12AD6	17/3	35W4	7/6	CV271	EC84	9/6			PEN36C		U35	26/6		17/6
5Y3G	8/6	6K7GT	6/6	12AE6	13/11	35Z23	10/6	CV428	EC85	8/6	GZ30	10/6		10/6	U37	26/6	VR105/30	
5Y3GT	7/6	6K8G	8/6	12AH7	8/-	35Z24	6/6	CY1	EC91	5/6	GZ32	12/-	PEN40DD		U43	9/6		9/-
5Y4	12/6	6K8GTG	8/6	12AH8	12/6	35Z25GT	9/6	CY31	ECF80	11/6	GZ34	14/-		25/-	U45	9/6	VR150/30	
5Z3	12/6		12/6	12AT6	7/6	41MTL	8/6	D1	ECF82	10/6	H30	5/6	PEN44	26/6	U50	8/6		9/-
5Z4G	10/6	6K25	19/11	12AT7	8/6	42	23/3	D15	ECF83	26/6	H63	12/6	PEN45	19/6	U52	8/6	VT61A	5/6
5Z4GT	12/6	6L1	23/3	12AU6	23/3	43	12/6	D63	ECF84	23/3	HABC80		PEN45DD		U54	19/11	VT501	5/6
6A7	26/6	6L6G	9/6	12AU7	7/6	50C5	12/6	D77	ECF85	9/6				26/6	U76	6/6	W61M	26/6
6A8	10/6	6L6M	12/6	12AV6	12/7	50CD6G		DAC32	ECF86	10/6	HL23	10/6	PEN46	7/6	U78	6/6	W66	6/6
6AB7	8/6	6L7GT	12/6	12AX7	8/6		29/10	DAF91	ECF87	7/6	HL23DD		PEN383	23/3	U107	16/7	W81M	6/6
6AB8	10/6	6L18	13/6	12BA6	8/6	50L6GT	9/6	DAF96	ECF88	13/11		17/3	PEN453DD		U191	16/7	W107	15/3
6AC7	4/6	6L19	23/3	12BE6	10/6	53KU	19/11	DC90	ECF89	13/11	HL41	12/6		33/2	U201	16/7	W729	18/7
6AG5	4/6	6L23	8/6	12BH7	21/3	55	4/6	DD41	ECF90	10/6	HL41DD		PEN/DD		U251	14/-	X24M	24/6
6AK5	8/-	6LD20	15/11	12E1	3/6	75	24/7	DDT4	ECF93	19/3		19/3	4020	33/2	U281	19/11	X31	26/6
6AL5	5/6	6N7	8/6	12SGT	4/6	77	8/6	DF33	EF9	11/6	HL42DD		PL33	19/3	U282	22/3	X41	15/6
6AM6	5/6	6P1	19/3	12TGT	10/6	78	8/6	DF66	EF22	14/-		19/3	PL36	14/6	U301	23/3	X42	15/6
6AQ5	8/6	6P25	12/6	12K5	17/11	80	9/6	DF70	EF36	6/6	HJN309	24/7	PL38	26/6	U329	14/-	X61(C)	12/6
6AT6	8/6	6P28	26/6	12K6GT	6/6	83	15/6	DF91	EF37A	8/6	HVR2	6/6	PL82	8/6	U403	16/7	X63	10/6
6AU6	10/6	6Q7G	8/6	12K7GT	14/6	83V	12/6	DF96	EF39	5/6	HVR2A	6/6	PL83	9/6	U406	8/6	X65	12/6
6AV6	12/6	6Q7GT	11/-	12Q7GT	6/6	85A2	15/6	DF97	EF40	15/6	KF35	8/6	PL84	9/6	U409	16/7	X66	12/6
6B7	10/6	6R7G	10/6	12SA7	8/6	85B2	15/6	DH63	EF41	9/6	KK32	21/11	PL84	12/6	U801	29/0	X66	12/6
6BB8	4/6	6SA7GT	8/6	12SC7	8/6	185BT	33/2	DH63(Met)	EF42	11/6	KL35	8/6	PL820	18/7	U4020	16/7	X78M	14/6
6BB8GT	5/-	6SC7	10/6	12SG7	8/6	185BTA	33/2	EF50(A)	7/6	KL32	24/7	PM2B	12/6	UABC80		X78	21/3	
6BE6	7/6	6SG7GT	8/6	12SH7	8/6	304	10/6	EF50(E)	5/-	KT2	5/6	PM12	6/6		9/6	X79	21/3	
6BAE	7/6	6SH GT	8/6	12S7	8/6	305	10/6	DH77	EF54	5/-	KT33C	10/6	PM12M	6/6	UAF42	9/6	X101	33/3
6BG6G	23/3	6S7GT	8/6	12SK7	8/6	402Pen(A)		DH101	EF73	10/6	KT36	29/10	PM24M	21/3	UB41	12/-	X109	17/3
6BH6	9/6	6SK7GT	8/6	12SQ7	12/6		23/3	DH107	EF80	7/6	KT41	26/6	PX4	26/6	UBC41	8/6	XDC(1.5)	6/6
6BJ6	7/6	6SL7GT	8/6	12SR7	8/6	807	7/6	DK32	EF85	21/11	KT44	15/6	PX25	59/8	UBC81	11/4	XFG1	18/-
6BQ7A	15/-	6NS7GT	6/6	12Y4	10/6	956	3/6	DK40	EF86	12/6	KT61	12/6	PY31	16/7	UBF80	9/6	XYF34	17/6
6BR7	23/3	6OS7GT	9/6	14H7	23/3	1821	16/7	DK91	EF89	9/6	KT63	7/6	PY32	11/6	UBF89	9/6	XH(1.5)	6/6
6BV6	10/6	6SS7GT	8/6	1457	27/10	5763	12/6	DK92	EF91	5/6	KT66	15/6	PY80	7/6	UBL21	23/3	XSG(1.5)	
6BW7	7/6	6U4GT	12/6	15D1	26/6	7193	5/6	DK96	EF92	5/6	KT88	22/6	PY81	9/6	UCC84	14/7		6/6
6BX6	7/6	6USG	7/6	18	23/3			DL33	EF97	13/3	KTW61	8/6	PY82	7/6	UCC85	9/6	Y63	7/6
6C4	7/6	6U7G	8/6	19A5G	10/6	7475	5/6	DL66	EF98	13/3	KTW62	8/6	P					



**8-WATT PUSH-PULL AMPLIFIER**

**COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER**

A.C. mains 200-250 v. Size 10 1/2 in. x 6 1/2 in. x 2 1/2 in. Incorporating 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and type of pick-up and mike. Negative feed back. Two inputs, mike and gram., and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 Kcs. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as **£4.19.6** Plus P. & P. 7/6. Or 35/- deposit Plus P. & P. 7 6, and 3 monthly payments of 25/-.

+ 2 db : 4 db down to 20 Kcs. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as **£4.19.6** Plus P. & P. 7/6. Or 35/- deposit Plus P. & P. 7 6, and 3 monthly payments of 25/-.

**6-WATT PUSH-PULL AMPLIFIER**

A.C. Mains 230/250 v., incorporating 4 valves and metal rectifier. 2 inputs, h1zn and low, and controls for same. Separate controls for Bass and Treble lift. Size of chassis 11 in. x 4 1/2 in. x 2 1/2 in. **59/6** Plus P. & P. 5/-.

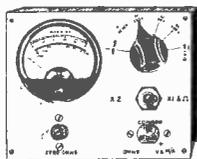
**2-TRANSISTOR POCKET RADIO**

Plus Germanium diode fully tuneable over medium and long waves. Size 3 1/2 in. x 4 1/2 in. x 1 1/2 in. Complete set of components including case and 2 transistors, earpiece and wiring diagram (less batteries). **19/6** Plus P. & P. 1/6.

**PUSH-FULL OUTPUT STAGE**

Inclusive of transistors with input and output transformers to match 3 ohm speech coil, suitable for use with the above kit. Complete kit of parts including transistors and wiring diagram. **19/6** Plus P. & P. 1 6.

**AC/DC POCKET MULTI-METER KIT**



Comprising 2 in. moving coil meter, scale calibrated in AC/DC volts, ohms and milliamps. Voltage range AC/DC 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wire-wound pot (for ohms zero setting), toggle switch, resistor and rectifier. In grey hammer finish case. **19/6** Plus P. & P. 1/6. Built and tested 7 6 extra. Point to point wiring diagram 1/-, free with kit.

**MAINS TRANSFORMERS**

All with tapped primaries, 200-250 volts, 0-160, 180, 200 v., 60 ma., 6.3 v. 2 amps, 10 6, 320-0-320 v. 75 ma., 6.3 v., 2.5 amp., 5 v., 2 amp., 10 6, 200-0-200, 80 ma., 6.3 v., 2 amp., 6.3 v., 1 amp., 10 6. Postage and packing on the above 3/-.

**F.M. TUNER UNIT**

Permeability tuned, by famous German Manufacturer. Coverare 88-100 Mc s. Complete with ECC85. Size 4 in. x 2 in. x 2 in. **25/-** Plus P. & P. 3 6.

**IMITATION LOG FIRE EFFECT**

Size 14 inches x 11 inches **19/6** Plus P. & P. 2 6.

**13 CHANNEL TUNER**

34 to 38 Mc/s. Complete with PCF80 and PCC84. These have been removed from chassis. **23/-** Complete with knobs. Plus P. & P. 3 6 extra.

as above, 16-19 Mc/s, complete with knobs less valves. 13- Plus P. & P. 2 6.

**PLAYER CABINET**

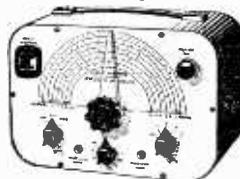
Finished in 2-tone leatherette, will take B.S.R. UA8, with room for amplifier and 7 in. x 4 in. speaker. Overall size, 15 1/2 in. x 13 1/2 in. x 9 1/2 in. **39/6** Plus 5/- P. & P.

Similar to the above in POLISHED WALNUT will take Collora **39/6** Plus 5/- P. & P.

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

23 HIGH STREET, ACTON, LONDON, W.3. All enquiries S.A.E. Goods not dispatched outside U.K.

**SIGNAL GENERATORS**

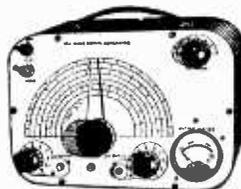


Cash **£6.19.6** or 25/- deposit and 6 monthly payments of 21/6. Post and Packing 5/- extra.

Coverage 100 Kc/s-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Metal case 10 1/2 in. x 8 1/2 in. x 5 1/2 in. Grey hammer finish. Incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250 v. Internal Modulation of 400 c.p.s. to a depth of 30% ; Modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Incorporating magic eye as output indicator. Accuracy plus or minus 2%.

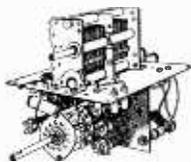
Cash **£4.19.6** or 25/- deposit and 4 monthly payments of 21/6. Plus Postage and Packing, 5/-.

Coverage 120 Kc/s-84 Mc/s. Metal case 10 1/2 in. x 6 1/2 in. x 4 1/2 in. Size of scale, 6 1/2 in. x 3 1/2 in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30% ; modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.D. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%.



**4-WAVE BAND COIL UNIT**

Complete with tuning condenser. Separate sections for Short Wave. Coverage 10-21 m., 21-45 m., 44-100 m. and 190-545 m. I.F. 470 Kc. BRAND NEW, by famous manufacturer. Completely assembled on sub-chassis. With circuit diagram. **19/6** Plus P. & P. 2 6.



**B.S.R. MONARCH UA8 WITH STEREO HEAD**



4-speed plays 10 records 12 in., 10 in. or 7 in. at 33, 45 or 78 r.p.m. Inter-mixes 7 in., 10 in. and 12 in. records of the same speed. Has manual play position ; colour brown. Dimensions: 12 in. x 10 1/2 in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Full-FI turnover crystal head.

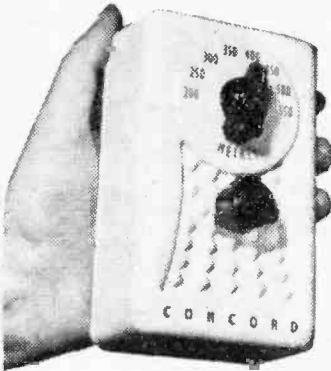
**£7.19.6** Plus 5/- Postage & Packing.

**CONSTRUCTORS' PORTABLE PARCEL**



Comprising case, chassis, top plate, scale, 5 in. P.M. speaker with O.P. trans., twin gang, 2 470 Kc/s. I.F.s., trimmers, four valve holders, wave-change switch and volume control with switch. **39/6** Plus 3/6 Postage & Packing.

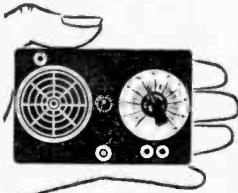
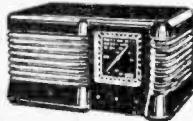
# NEW! EASY-TO-BUILD AND



The new, exciting De Luxe "Gold Star" Pocket Radio in beautiful moulded plastic case—choice of four lovely colours, Red, Green, Blue and Pink. This model is a highly sensitive, self-contained set covering all medium waves. Uses modern miniature "button-base" valve and specially designed high efficiency coil. Exceptionally easy to build from our step-by-step plans—the case is supplied ready drilled! Size of radio only 4 1/2 in. x 2 1/2 in. x 1 1/2 in. —and batteries fit inside. We can supply all parts including case, detachable aerial, instruction book, screws, wire, etc., for only 48/- plus 2/- Post and Packing. C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/9.)

Choice of beautiful walnut veneered cabinet or ivory bakelite. This is the lowest possible price consistent with high quality. No radio knowledge whatever needed

... can be built by anyone in 2-3 hours, using our very simple, easy-to-follow diagrams. The terrific new circuit of the "Ocean-Hopper" covers all medium and long waves, has razor-edge selectivity and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple-to-follow plans—in fact everything! Parts tested before despatch! Uses standard octal-base valves. (Low running costs—approximately 18 watts.) Size 12 in. x 6 in. x 5 in. Build this long-range powerful midget NOW. TOTAL BUILDING COST INCLUDING PLANS, ETC., 25/7/6. (Post and Packing 3/6.) Parts sold separately. Priced parts list and plans, 1/9. C.O.D. 2/- extra.



**THIS TRANSISTOR SET Can Be Built For Only 29/6.** The "Sky-Scout" Pocket two-stage transistor set, size only 4 in. x 3 1/2 in. x 4 1/2 in. Covers all medium waves and works entirely off tiny "penlight" battery which costs 6d. and fits inside case. All parts tested before despatch. Can be built for 29/6, plus 2/- Post and Packing, INCLUDING CASE, TRANSISTOR, STEP-BY-STEP

PLANS FOR ABSOLUTE BEGINNERS, nuts, bolts, etc. (C.O.D. 2/- extra.) Parts sold separately, priced parts list and plans, 1/6. VERY SIMPLE TO BUILD.



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



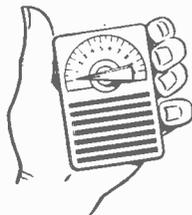
This amazing "Tiny-Tim" model—no larger than a matchbox—costs nothing to run—ever! No batteries! No Valves! No electricity! Will never run down or burn out. Uses the latest TRANSISTOR TYPE GERMANIUM DIODE, receives local stations anywhere—without extra aerial. Clear, Crisp Tone. No snags, anyone can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



Learn Electricity by building a low cost Concord Model! Concord models include the latest electronic advances and are constantly being modernised by Concord's own research department. Concord designs are years ahead. Every latest advance finds its way into the educational and highly practical Concord Models. Special instruction books describe minutely every step in the assembly. Build, Learn from AND USE Concord Designs. TRADE ENQUIRIES INVITED. WE BULK PURCHASE ELECTRONIC COMPONENTS AND EQUIPMENT.

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# FUN-TO-MAKE CONCORD RADIOS



Postage, etc., 2/-  
(C.O.D. 2/- extra.)  
(Parts sold separately. Priced parts list and plans 1/6.)  
R U S H Y O U R  
ORDER TODAY!

**TWO-TRANSISTOR POCKET SET.** Can Be Built for 45/- BUILD THE "SKYGNOME" VEST-POCKET TWO TRANSISTOR RADIO which gives a superb performance and is highly sensitive. Weight under 7 ozs.—yet it is a THREE-STAGE receiver covering all medium waves, working entirely off a "penlight" battery. Every part tested before despatch! SPECIAL STEP-BY-STEP PLANS FOR ABSOLUTE BEGINNERS. Total building cost including case, transistors, etc.—everything down to the last nut and bolt—ONLY 45/- with plans.

## BUILD THIS POCKET RADIO

Can Be Built for 39/6.

Anyone can build this beautiful precision Pocket Radio in an hour or two. No knowledge whatever needed. Our simple pictorial plans take you step-by-step! Remarkably sensitive—covers all medium waves, inc. Luxembourg, Home, Light. Size only 2in. x 3in. x 5 1/2in.—Not a Toy! But a Real, Personal-phone, Valve Radio With Detachable Aerial! IDEAL FOR BF ROOM, GARDEN, etc. We supply ALL parts necessary, together with plans, etc., for the special price of 39/6, plus 2/6 post and packing. (C.O.D. 2/- extra.) BUILD YOURS NOW! (All parts sold separately, priced parts list 1/9.) Send Today! Money refunded if parts returned intact within 7 days.



## The "COMPANION" PRINTED CIRCUIT POCKET SET.

BUILD THIS 3 TRANSISTOR POCKET RADIO... PRINTED CIRCUIT VERSION! The "Companion" is comparable in sensitivity to a three-valve battery set. It is exceptionally small in size (4 1/2in. x 3in. x 1 1/2in.) and is a self-contained pocket radio that does not need aerial or earth. It has built-in speaker and covers medium and long waves. This unique little set can be built FOR ONLY 97/6. EVERYTHING INCLUDED! (Plus post and packing 2/6.) All parts sold separately, price list, etc. 6d. C.O.D. 2/- extra.



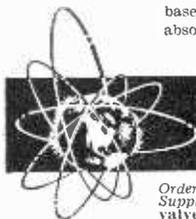
The sensational "Silvertone" model! A highly compact self-contained miniature "button-base" valve pocket radio at absolute "rockbottom" build-

ing cost! Covers all the medium waves with the very latest circuitry bringing in stations from all over Europe—without fuss. Easy as A.B.C. to assemble, using our step-by-step instruction manual. Size only 4 1/2in. x 2 1/2in. x 1 1/2in.—a fascinating little pocket radio. We can supply all the parts including beautiful two-tone case, detachable aerial, instruction book, screws, wire, etc., for only 29/6 (plus 2/- post and packing). C.O.D. 2/- extra. (Parts sold separately, priced parts list 1/9.)

**LIMITED QUANTITY ONLY!**—Never before such amazing value! A high grade universal testmeter. Large scale (3 1/2in.), highly sensitive movement (500 MicroAmps!) Measures A.C. Volts, D.C. Volts, D.C. Current, Ohms, Decibels, Inductance and Capacitance! Ranges: D.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v. A.C. Volts—0-10 v., 50 v., 250 v., 500 v., 1,000 v. D.C. Current—0-500 MicroAmps, 25 MilliAmps, 250 MilliAmps, Resistance—0-10 K ohms and 1 Megohm. Decibels—-20 dB. to + 22 dB. and -20 dB. to -36 dB. Capacitance—100 pfd. to 0.6 mfd. Inductance—10 to 1,000 Henries (also with external D.C. voltage will measure to 100,000,000 ohms!). A beautiful, strongly-made instrument. Brand New, not a kit, at only 97/6, including test prods, instruction book and internal batteries (replacements cost only 6d. each). Plus 2/6 Post and Packing. (C.O.D. 2/- extra.)



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



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PW12

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

Brand new, individually checked and guaranteed  
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AC/DD	2/6	DH76	4/9	EL84	8/6
AC/HL	2/6	DLS10	4/6	EL91	7/6
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AC/PI	2/6	EA50	1/6	EZ40	7/6
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AR8	5/-	EC54	3/6	H63	3/6
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ARP4	3/6	ECC82	6/9	KF35	5/-
ARP12	2/9	ECC83	6/9	KT30	7/-
ARP31	5/6	ECC84	7/9	KT31	8/-
ARP24	3/6	ECC91	4/-	KT33C	7/-
SRP34	4/6	ECL80	10/3	KT66	8/-
STP4	2/9	EF8	6/-	KT241	9/-
ATP7	5/6	EF22	7/3	KTW63	6/6
AUI	5/-	EF32	5/-	L30	4/-
AW3	4/-	EF36	3/6	MH4	4/-
B30	3/6	EF39	4/9	MH40	6/6
BL63	6/-	EF50	3/-	MH41	6/6
D41	3/3	EF52	5/-	MHL4	2/6
D42	4/-	EF54	5/6	MHLD6	4/6
D77	4/3	EF55	6/-	M4	4/6
DA30	20/-	EF80	6/9	ML6	6/6
DD41	4/6	EF85	6/10	MC/PEN/6	6/-
DD620	4/6	EF89	8/9	MC/PENB6/-	6/-
DETS	20/-	EF91	4/10	MS/PEN/T	6/-
DET18	30/-	EF92	5/-		6/-
DET19	2/6	EL32	3/9	N34	8/-
DET20	2/6	EL41	8/3	NR15A	3/-

NR61	7/-	U19	7/-	3Q5GT	9/-	6L6GA	6/6	39/44	6/-	954	2/-
MT37		U27	8/-	4A1	4/6	6L34	4/6	41FP	1/9	956	2/9
(4033A)	14/-	UU4	4/6	4D1	2/6	6N7GT	7/-	524G	8/-	1619	6/-
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OD4	5/-	VP23	5/-	5V4	7/-	7SA7	6/9	58	6/-	1626	3/6
OZ4A	5/-	VR99	8/-	5Y3GT	6/9	6SC7GT	6/-	59	6/-	1629	4/6
P61	2/6	U27	8/-	5Z3	8/6	6SG7	5/-	71A	4/6	4242A	6/-
FCC84	8/-	VR105/30		5Z4G	8/-	6SH7	5/-	77	6/-	7193	1/9
FCC85	8/-			6A6	5/-	6S7	6/9	80	6/3	7475	5/-
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FEN46	5/9	VS110	4/-	6AC7	5/-	6SL7GT	6/9	83	12/-	8020	6/-
FEN141	4/-	VT25	8/6	6AG5	4/6	6SN7GT	4/6	83V	12/-	9001	5/-
FEN220A	4/-	VU111	3/-	6AG7	10/-	6SQ7	6/6	84	12/6	9003	5/6
		VU120	3/3	6AK6	7/6	6SR7	6/6	89	6/-	9004	4/-
PEN1340	3/-	VU133A	3/-	6AK7	10/-	6SS7	6/6	89	3/-	9006	4/-
PENDD/		W31	7/-	6AM5	5/-	6V6G	5/6	210VPT	3/-		
1360	9/6	W42	7/-	6AM6	6/3	6X5GT	5/6	217C	17/6		
PL82	8/3	Y66	8/-	6B4G	4/6	8D2	2/6	220VSG	3/-		
PLM3	9/-	Z31	6/-	6B8	5/6	9D2	3/-	350B	8/-		
PM4DX	3/-	1A3	3/6	6B8G	2/6	11E5	5/-	393A	25/-		
PT25H	7/6	1A5GT	5/-	6C4	4/-	12A6	5/-	446A	14/-		
PY82	8/-	1B23	11/-	6C5	4/-	12AH7	7/-	446B	14/-		
QP1	6/-	1B24	11/-	6C6	4/6	12CB	7/6	705A	17/6		
QP25	5/3	1B26	11/-	6CBG	5/-	12E1	22/6	715B	97/6		
RG1-240a		1B32	10/-	6F6	7/-	12H6	2/6	717A	8/6		
		1D8GT	6/-	6F8H	6/6	12J5GT	3/6	801	6/6		
RG3-250		1L4	4/-	6F12	5/-	12SC7	4/6	803	22/6		
		1LD5	3/6	6G6G	3/-	12SG7	6/6	805	30/-		
RG4-1250		1R5	6/9	6H6M	2/3	12SH7	4/9	807AMER			
		1S5	6/-	6H6GT	1/9	12S7	6/-	5/3			
RK34	2/6	1T4	4/-	6I5	3/6	12SK7	5/-	807BR	3/9	2/31	45/-
RL37	3/6	2A3	8/-	6I6	4/3	12SL7	7/-	813	70/-	3/MOE	£3.10
SP4B	7/6	2A6	7/-	6K6GT	6/6	12SR7	6/-	815	80/-	3/192E	
SP13C	4/6	2C34	2/6	6K7G	2/3	15D2	6/-	816	30/-		
SP41	2/9	2DA4	4/-	6K7GT	5/3	15E	8/-	829A	£0.14	723AB	52/6
SP61	2/9	2X2	4/-	6K8G	6/6	15R	7/6	833A	£1.76	726N	27/6
SU2150A	4/9	3A4	6/6	6K8GT	8/-	19E2	5/-	843	7/6	VX710	15/-
T41	19/-	3B34	3/-	6L5G	6/-	28D7	8/-	866A	10/-	WL417A15/-	
TT11	3/-	3E29	6/-	6L6	10/-	35T	30/-	872A	35/-	WL417A	15/-
U18	6/-	(829B)	60/-	6L6G	6/6	35Z3GT	7/-	930	8/-		

**Cathode**

**Ray Tubes**

3BP1	25/-
5CP1	42/6
5FP7	45/-
VCR517	19/-

**Special Valves**

2/31	45/-
3/MOE	£3.10
3/192E	
723AB	52/6
726N	27/6
VX710	15/-
WL417A15/-	
WL417A	15/-

All U.K. Orders below 10/-, P. & P. 1/-; over 10/-, 1/6; Orders over £2 P. & P. free. Overseas Postage extra at cost.

**Brand new original spare parts for AR88 Receivers.**

**Tuning Mechanism (gear), £2/10/-, post free.**  
Please write your other requirements.

**High Resistance Headphones, 4,000 ohms.** Brand new, ex W.D. boxed, 10/6 per pair. P. & P. 1/6.

**Low Resistance Headphones, brand new, type CLR, 5/-.** Balanced Armature, 7/6, P. & P. 1/6.

**Microphone Transformers.** Balanced input 30 or 250 ohms. U.S.A. manufacture, 7/6, P. & P. 1/6.

**813 Ceramic Valveholders, 3/- each.** P. & P. 1/6.

**Vacuum Condenser 32,000 V. 50 pF 25/-.** Post free.

**Telephone Handset.** Standard G.P.O. type. New, 10/-, P. & P. 1/6.

**Modulation Transformers (U.S.A. Collins), primary imp. 6,000 ohms.** C.T., secondary 6,000 ohms, 20 W., 9/6 each. Post free.

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

**Telescopic Aerial Masts, 7 sections,** total 11 yards. Immediate erection. £4/10/- each or £8 per pair. Post free.

**Light Headgear Assembly.** Ideal for mobile use. Headphones 600 ohms carbon microphone, 18/-, P. & P. 3/6.

**Signal Generator Type TS. 14/AP.** 3,200-3,370 mc/s. Fully guaranteed. £85.

**I.F. TRANSFORMERS 4.5 mc/s,** American Made in black crackle finish housing, 6/-, P. & P. 1/6.

**Thermo-Couple Heating Element.** 0.75 Amp in bakelite housing. Made for aerial current meters D.V.52 (G.E.C. made) or other purposes. 10/-, P. & P. 1/6.

**Axominors.** In leather case, with leads, fully tested, £5/10/-, Packing and carriage 2/6.

**Headphone Matching Transformers.** To match L.R. Headphone to H.R. output (6,000 ohms), price 5/6. Seated in small moulded case. 1in. x 1in. x 2in., easily mounted on cord.

**RI09 Receiver.** Covering 2-8 mc/s 6 v. D.C. New and Tested, £4/5/-, Carriage paid.

**RI09A Receiver.** Covering 2-12 mc/s 6 v. D.C. New and Tested, £5/5/-, Carriage paid.

**SCR.522. Transmitters.** (BC625), including all valves, 22/6. P. & P. 5/-.

**SCR.522. Receivers (BC624),** including all valves, 25/-, P. & P. 5/-.

**Vibrator Unit.** 12 v./180 v. 60 mA. Exceedingly well filtered and smoothed, excellent for car radios. New, including one OZ4 valve and vibrator, 19/-, P. & P. 5/-.

**P. C. RADIO LTD.**  
170 GOLDHAWK RD., W.12  
8H Epherds Bush 4946

**No. 62. Transmitter-Receiver.** 1.6-12 mc/s in two ranges. Ideal for mobile use. Total 11 valves. Rx—A super with separate mixer and local oscillator. Tx uses QV04-7 as power amplifier VFO or switched selected crystals. C.W., phone (grid modulation), metered for operation and valve testing, Pi output to match rod aerials or long wire. Press to send operation from mike. Size 8 1/2in. x 17 1/2in. x 13 1/2in., weighs only 29 lbs. Completely self contained with internal power unit for 12 v. operation. Power consumption 4.4 amps on send, 3.4 amps on receive. As new condition, tested, complete with operation instructions. Price, £17/10/-. Delivery included.

**Transceivers.** 68T mc/s together with aerial rods, microphone, H.R. headphones. Key in full working order. £6/15/-, P. & P. 5/-.

**Famous U.S.A. Field Telephones** in canvas or leather case, type EEB, £9 per pair. Post free.

**Complete V.F.O. Unit** from TX53. Free range in 4 switched bands from 1.2-17.5 Mc/s. Two V.T. 501s as oscillator and buffer, 807 as driver, two 5130s as voltage stabilizers. Output sufficient to drive two 813s in parallel. Slow motion drive directly calibrated in Mc/s. Provision for crystal control, metering of buffer and driver stage. Power requirements 400 v. and 6.3 v. D.C. Can also be used as low power transmitter. In excellent condition with valves and circuit diagram, £5, P. & P. 15/-.

**AR88D and L.F. Receivers,** completely overhauled and tuned, £60 and £57/10/- respectively. Completely rebuilt with P.V.C. wiring, £85.

**PERSONAL CALLERS WELCOME**

# ***BUILD YOUR OWN***

## **20,000 OHMS/VOLT**

# **MULTIMETER**

The TAYLOR MULTIMETER 127A is available, from the College, as a kit of parts with comprehensive instructions on soldering and assembly compiled by a very experienced member of the College staff.

**EASY ASSEMBLY,  
NO ADJUSTMENTS,  
NO CALIBRATION NECESSARY—**

**BUILD these outstanding features into your meter:**

Sensitivity: 20,000 ohms per volt D.C., 1,000 ohms per volt A.C., 20 Ranges.

D.C. Current:  
0-50 $\mu$ A, 1mA, 10mA, 100mA, 1A.

D.C. Volts:  
0-0.3, 2.5, 10, 25, 100, 250, 1000V.

A.C. Volts:  
0-10, 25, 100, 250, 1000V.

3 Resistance Ranges from 0-20 Megohms (Self-contained).

*As available to our full-time students.*

*Kit of parts with full instructions —  
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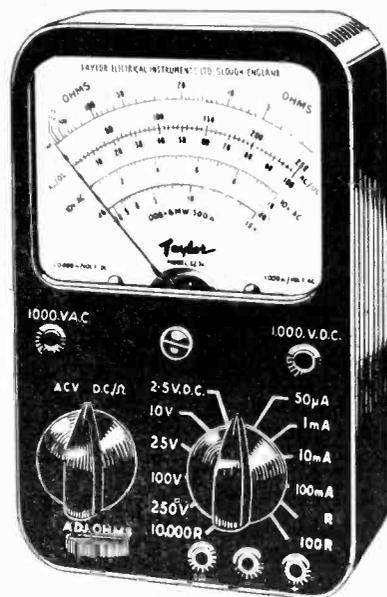
*Factory assembled multimeter 127A  
also available — £10.0.0d. cash with order.*

*Postage and packing 3/- (U.K. only).*

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**SINGLE PLAYER CABINET 19/6** R.P.7

Smart cabinet. Size 14½ x 12½ x 6½ in. deep. Various 2-tone colour schemes with white handle and piping. Takes T.U.9, B.S.R., single player unit, 7 x 4 in. elliptical speaker and amplifier D.1, or D.2. Carr. & Ins., 4/6.



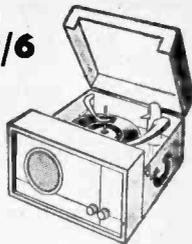
R.P.4 **79/6**



Stylish cabinet by famous manufacturer. Cloth covered in contrasting colours (red and grey). Grilled front controls panel. Size 15 x 19 x 8½ in. deep. Beautifully made—a cabinet you can be really proud of. Takes 4-speed B.S.R. Autochanger. 6½ in. round or 7 x 4 in. elliptical speaker. Room for any amplifier of your own choice. Carr. & Ins., 4/6.

A delightful looking cabinet R.P.3  
14½ x 17½ x 8½ in. in 2-tone leatherette. Will take a B.S.R. Monarch 4-speed autochanger and 6½ in. round speaker. Carr. & Ins., 4/6.

**69/6**



R.P.2  
**69/6**



A beautifully styled cabinet. Made by a famous manufacturer. In polka dot cloth with clipped lid and carrying handle. Size 16 x 14½ x 8½ in. deep. Will take a B.S.R. Monarch 4-speed Autochanger and 7 x 4 in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins., 4/6

**STEREOPHONIC CABINET 99/6**

Continental style cabinet, including extra clip on speaker cabinet. 15½ x 10½ x 24½ in. deep. Takes B.S.R. 4-speed stereo autochanger. Printed circuit amplifier. Two Bin. speakers. Carr. & Ins., 12/6.

**AMPLIFIERS**

12 months' guarantee.

**PORTABLE AMPLIFIER Mk. D.1, 59/6.**

Brand new. Latest design with printed circuit. Dimensions 7 x 2½ x 5 in. A.C. only. Mains isolated. 2-3 watts output. Incorporating EL84 as high gain output valve. Volume and tone controls. Knobs, 2/6 extra. P. & P. 3/6.

**PORTABLE AMPLIFIER Mk. D.2, 79/6.**

Printed circuit. Latest design. Dimensions 7 x 2½ x 5 in. A.C. only. Mains isolated 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve, giving higher undistorted output. Volume and tone controls. Knobs, 2/6 extra. P. & P. 3/6.

**PORTABLE AMPLIFIER Mk. D.3, 89/6.**

De luxe model. Printed circuit. Latest design. Dimensions 7 x 2½ x 5 in. A.C. only. Mains isolated 3-4 watts output. Incorporating the latest ECL82 triode pentode output valve giving higher undistorted output. Volume, treble and bass control. Knobs 3/6 extra. P. & P. 3/6.

**TAPE RECORDER CABINETS, 19/6.**

Suitable for the Truvox Tape Recording deck. Less front cast speaker panel. Size 13½ x 15 x 8½ in. deep. Detachable lid with compartment for spare tape. Covered in green washable plastic material. P. & P. 4/6.

**PORTABLE AMPLIFIER Mk. D.5, 39/6.**

Simple circuit employing ECL80 triode pentode output valve giving 2-3 watts output. A.C. only. Mains isolated. Single control for volume and on/off switch with knob. P. & P. 3/6.

**B.S.R. FUL-FI CRYSTAL TURNOVER CARTRIDGES, 19/6.**

Brand new. Including sapphire needles for L.P. and standard, giving fullest range and finest tone obtainable for any player. Can be fitted to all standard pickup arms. P. & P. 9d.

**HERE'S UNREPEATABLE VALUE**

**29/6**



R.P.6

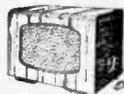
Elegant cabinet, cloth covered in grey or red with sunken control panel and speaker fret. Size 13 x 17 x 7 in. Bin. Takes a B.S.R. Monarch 4-speed Autochanger: 7 x 4 in. elliptical speaker and most of the modern portable amplifiers. Carr. & Ins., 4/6.

to fit. Knobs 3/6 per set extra. P. & P. 3/6.

**IDEAL FOR STEREOPHONIC SOUND:—**

Bin. P.M. speakers, 8/9. With O.P. trans., fitted, 10/-.  
6½ in. P.M. speakers, 12/6. Postage 2/6.  
7 x 4 in. elliptical speakers, 19/6.  
9½ x 4½ in. elliptical speakers, 22/6. Postage 2/9.

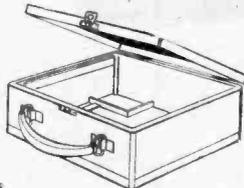
**EXTENSION SPEAKERS, 19 9**



Polished oak cabinet of attractive appearance. Fitted with Bin. P.M. speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms). Switch and flex included. Ins. Carr. 3/9.

**STURDY CASE, 12 6**

8½ x 7½ x 3½ in. deep. Covered in burgundy and grey washable rexine. Strong clasp, hinges and handle. Ideal for portable radio chassis or transistor set. Can be adapted as a record carrying case to hold 18 seven-inch long-playing records. P. & P. 2/6.



**World's Finest AUTOCHANGER**

**U.A.8. B.S.R. MONARCH 4-SPEED AUTOCHANGER £6.19.6**



**COLLARO CONQUEST 4-SPEED AUTOCHANGER £6.19.6**  
**U.A.12. Lat-st B.S.R. MONARCH 4-SPEED MIXER £8.9.6**  
**COLLARO CONQUEST STEREO AUTOCHANGER 11 gns.**  
**T.U.9. B.S.R. 4-SPEED SINGLE PLAYER 89/6.**

P. & P. on all the above 5/6.

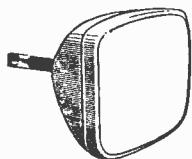
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RE-BUILT  
T.V. TUBES**  
Cash price **£8.10.0**

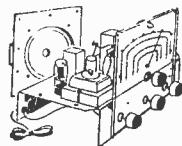
OR Yours for 8/6 initial payment (plus Carr. & Ins.) and 19 weekly payments of 8/6.

12 months' full guarantee.

All sizes except 10in. Completely re-built gun assembly new cathode heaters, etc., giving the high standard required for long picture life quality and value. Carr. & Ins., 15/6.

**EXPRESS DESPATCH SERVICE**

Please phone to confirm tube in stock. Send Telegraph Money Order. Tube despatched Passenger Train same day. This service only available with remittance by a Telegraph Money Order and cash sales—not terms.



**SUPER CHASSIS 79/6**

5 valve superhet chassis including 8in. P.M. speaker and valves. Four control knobs (tone, volume, tuning w/change switch). Four w/bands with position for gram. p.u. and extension speaker. A.C. Ins., Carr., 5/6.

**SOLO SOLDERING TOOL, 12/6**

110 v., 6 v. or 12 v. (special adaptor for 230/250 v. 10/- extra). Automatic solder feed including a 20ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 3/6



**SUPER SUPERIOR  
RADIO 89/6**

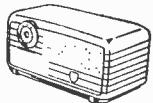
4 waveband. 5 valve superhet radio. 2 tone covered metal cabinet size 24½ x 12 x 10in. deep. 4 control knobs. Positions for gram p.u. and extension speaker. A.C. only. Ins., Carr., 8/6.

**FAMILY RADIO, 99/6**

5 valve (octal) superhet. A.C. 3 waveband and gram. position. 4 controls. Modern attractive cabinet size 15½ x 18 x 10½in. in cream and brown. Carr. & Ins., 8/6.

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0-12U



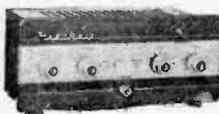
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S-88



UJR-1



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# Practical Wireless

VOL. XXXV, No. 633, NOVEMBER 1959

Editorial and Advertisement  
Offices:  
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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.

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## TRANSISTORS v. VALVES

IN recent issues we have published several letters concerning the rival merits of transistors and valves. From this, and unpublished correspondence, it is clear that there is still a great interest in conventional circuits using valves; far more interest, in fact, than in circuits using transistors. We say this because a few readers have written to us saying, although not in so few words, that we should publish only transistorised circuits. Such readers should realise that at the moment they are in a minority. Many amateurs cannot afford to spend money on two or three transistors, when a careless mistake could prove very costly.

Another factor which deters many constructors from building transistorised equipment is that they are familiar with valves and not with transistors. Most have learnt all their radio knowledge in terms of valve circuits, and it is difficult for them to adapt their way of thinking to transistor circuits. (For the newcomer to radio construction, of course, this difficulty does not exist.) To many, there are no points of resemblance between valve and transistor circuits, and it is difficult to know the liberties which may be taken with transistors, especially as factors such as sensitivity to surges, light and heat have been exaggerated.

The feeling has grown, therefore, that transistors are out of the amateur's world, and until this feeling is eradicated and transistors are no longer looked upon with awe and wonder, we do not feel justified in increasing the number of articles on the subject, although it goes without saying that we shall try to satisfy those readers who take a keen interest in transistors.

### A MESSAGE TO READERS

THOSE of you who have been with us from the first issue already know that PRACTICAL WIRELESS has always endeavoured to serve its readers in every possible way. We try to present articles which have a bearing on the latest developments in radio and electronics and which can be readily understood by the "practical" man. This is a practical magazine and our policy is to cater for the amateur constructor rather than the theoretician—a policy which we are sure carries your full approval.

We also have a free advisory service which is unrivalled; not only questions on articles in our pages are answered, but also problems on almost every other aspect of radio.

Our service to radio clubs and societies is well known; we give considerable space in our pages to reports of club activities including details of past and future events.

Unfortunately, the steadily increasing costs of both paper and production make it necessary for us to increase the price of the magazine or to reduce its size. We know from views expressed by many of you in the thousands of letters which reach our offices that the latter course would not be approved, and accordingly we have decided to make a slight increase in price. With this, and subsequent issues, PRACTICAL WIRELESS will cost 1s. 6d.

We are sure you will agree that, at the new price, this magazine represents very good value and you may be sure that we shall strive to keep the editorial content at its present high standard.

Our next issue, dated December, will be published on November 6th

# ROUND THE WORLD OF WIRELESS

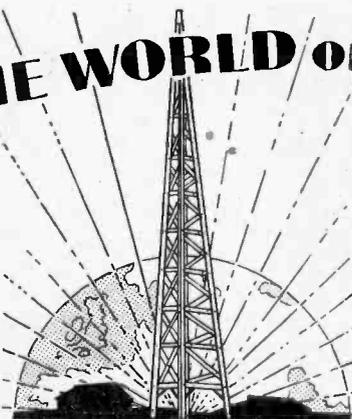
## Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of July, 1959, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	Total
London Postal ... ..	879,044
Home Counties ... ..	879,236
Midland ... ..	651,450
North Eastern ... ..	750,240
North Western ... ..	599,099
South Western ... ..	524,622
Wales and Border Counties ... ..	323,569
Total England and Wales ... ..	4,607,260
Scotland ... ..	560,376
Northern Ireland ... ..	157,047
Grand Total ... ..	5,324,683

## 1959 Radio Hobbies Exhibition

OF special interest to radio enthusiasts will be this year's International Radio Hobbies Exhibition at the Royal Horticultural Society's Old Hall, Westminster. A novel feature will allow visitors to operate and compare communication receivers of the world. Sections will be devoted to amateur construction of all items of radio equipment. Demonstrations of high-fidelity amplifiers and of transistor components, receivers and power supplies will be featured. This annual event is sponsored by the Radio Society of Great Britain, who award prizes for outstanding examples of home-constructed equipment and display many items of interest to amateurs. The commercial exhibits will include kits and components in great variety for home construction and a variety of aerials for home assembly. Kits for car radios, oscilloscopes, etc., will also be on show, together with test equipment and accessories. The show will be open from Wednesday November 25, to Saturday November 28, the hours of opening being 11.00 a.m. to 9.00 p.m.



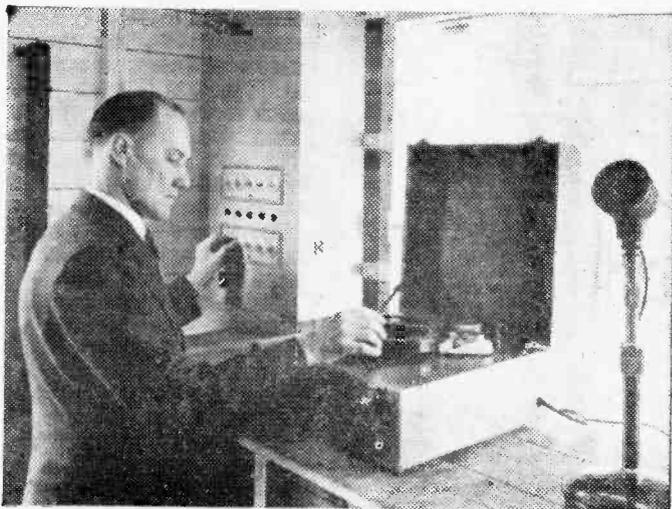
control unit are lined up for speech, the other pair for music, the changeover being effected by a special switch which changes over both input and output leads.

## Broadcasting House Extension

THE BBC has awarded a contract to F. G. Minter Ltd., 4, Buckingham Gate, London, S.W.1, for the formation and completion of technical and special areas in the new building, Nos. 10-22, Portland Place, London, W.1, which is to form the extension to Broadcasting House. The work covered by the contract includes the main control room and continuity suites on the first floor together with the associated subsidiary areas. Also included is accommodation for the Outside Broadcast Department, workshops for London Station and a large private automatic branch telephone exchange. New recording suites are being formed on the fifth floor and it is

## Hi-Fi Equipment for Public Address Work

A TRIAL installation of high-fidelity sound reproduction equipment for outdoor public address work has now been completed by BTH Sound Equipment Ltd., a subsidiary of the British Thomson-Houston Co., at the ground of the Rugby Town Association Football Club. The amplifier installation consists of two standard 20-watt, single-channel amplifiers, with their control units, mounted in a moderately sized metal cabinet with a separate turntable attachment and a microphone. To ensure acceptable quality in the reproduction of both speech and music, one amplifier and its



An operator using the music amplifier of the public-address system at the Rugby Town Football Club.

expected that the new areas covered by this contract will all be operational by the late spring or early summer of 1961.

#### New Admiralty W/T Station

THE supply and installation of the transmitting equipment for the new Admiralty W/T station at Inskip, near Preston, Lancs, has recently been completed by Marconi's Wireless Telegraph Co. Ltd. Thirty transmitters, ranging in output power from 40kW to 3½kW, have been installed, together with 49 drive units, a co-axial line exchange, an open wire automatic aerial exchange and a considerable amount of ancillary equipment.

#### Printed Circuit Boards

PRINTED CIRCUITS LTD., of Borehamwood, Herts, a company within the A.E.I. Group, are currently producing what are claimed to be the largest printed circuit boards ever made, thereby opening up new fields of application as well as improving the production rate of smaller units. The photograph illustrates part of the automatic equipment recently installed in the factory at Borehamwood. In this instance, 1,100 separate circuits, incorporating inductors, are being processed on one board 5ft. X 5ft.

#### E.M.I. Computer for B.E.A.

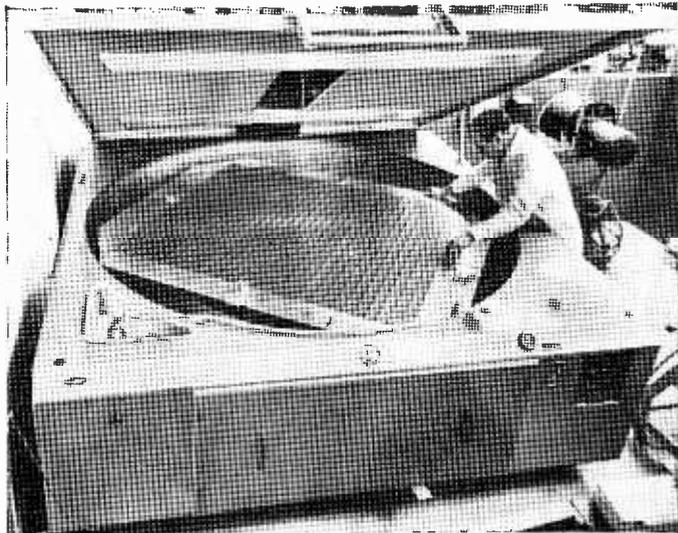
BRITISH EUROPEAN AIRWAYS have placed an order for an electronic computer costing over a quarter of a million pounds to aid efficiency and meet growing demands on its ground organisation. The computer, an EMIDEC 1100, is being manufactured by E.M.I. Electronics Ltd., at Hayes, Middlesex, and when completed will be one of the largest electronic data processing systems in the country. Capable of carrying out tens of thousands of arithmetic calculations a second, the EMIDEC computer will provide B.E.A. executives with fuller information of passenger and freight movements and will enable future flight schedules to be planned for the greatest convenience of the public and highest operational efficiency. The EMIDEC 1100 is an all-transistor machine employing the

most advanced techniques and the use of cores and transistors throughout ensures a greater degree of reliability.

#### BBC Engineering Publication

MR. C. G. MAYO, a member of the Institution of Electrical Engineers, and Mr. R. E. Jones, of the Research Department, BBC Engineering Division, are the authors of "A Quality-

sound transmitters from September 21. The new station is situated at Morborne Hill, six miles south of Peterborough, and a 560ft. steel lattice mast carries the aerial for the V.H.F. sound service. Peterborough will radiate the BBC's three sound services on V.H.F. It will transmit the Home Service on 94.5Mc/s, the Light Programme on 90.1Mc/s and the Third Pro-



Processing a 5ft. x 5ft. printed circuit board at the Borehamwood factory of Printed Circuits Ltd.

checking Receiver for V.H.F./F.M. Sound Broadcasting," published as BBC Engineering Division Monograph No. 25, price 5s. The authors describe the development of a quality-checking receiver for F.M. sound broadcasts in Band II (87.5-100Mc/s). The results of tests on the original and final prototype models are given; both have a high standard of performance, the main advantage of the final model being its simpler design. This publication can be obtained from BBC Publications, 35, Marylebone High Street, London, W.1. post free.

#### Peterborough V.H.F. Station

THE BBC's new Peterborough V.H.F. sound broadcasting station is now nearing completion. It was brought into regular programme service on October 5. Test transmissions were radiated from the V.H.F.

gramme and Network Three on 92.3Mc/s, each with an effective radiated power of between 1kW and 22kW depending on direction.

#### Obituary—Mr. L. O. Sparks

IT is with the deepest regret that we have to record the death of Mr. L. O. Sparks. A former member of the staff of *Amateur Wireless*, he joined us when that paper was taken over by PRACTICAL WIRELESS, and contributed many constructional articles and designs for the home constructor. Shortly after the war he resigned from this journal and set up his own business as a supplier of home-constructor designs under the title of Sparks Data Sheets, and moved to Dorset for health reasons. In spite of the move, however, he was unable to combat the effects of asthma to which he eventually succumbed.

# A Personal "Mobile" Receiver

THIS SET USES TWO VALVES  
AND OPERATES FROM A  
12 VOLT BATTERY

By F. G. Rayer

THIS receiver uses two of the new miniature valves which are designed to draw both heater and H.T. current directly from a 12V accumulator. As a result, no vibrator or other means of obtaining a higher voltage is required. This allows a receiver of small size to be made, and running is economical, consumption being approximately 0.3A. Long periods of listening are thus possible without danger of running down the accumulators, even when these are of the small capacity type fitted in scooters. When camping, or using a caravan, a twin flex



lead can be taken to scooter or car accumulator circuit to obtain current.

## Circuit

The circuit is shown in Fig. 1, and uses two pentodes; as detector and amplifier. This is a straightforward arrangement which needs few parts and gives very good results. Regeneration increases sensitivity, so that a short rod or wire aerial is sufficient. Both medium and long waves are tuned, but if the long wave Light Programme transmission is not required, or if the Light Programme can be received on medium waves, the L.W. coil and wavechange switch can be omitted.

When using the set, almost any aerial will be satisfactory. Rod aerials can be self supporting. A short wire aerial can be stretched on insulators beneath the vehicle, or an insulated wire may be used as a "throw-out" aerial. Generally, the aerial should not be entirely inside the body of the caravan or vehicle, because of the screening effect of the metal. A few experiments with a yard or so of insulated flex will soon show how the position of the aerial influences reception.

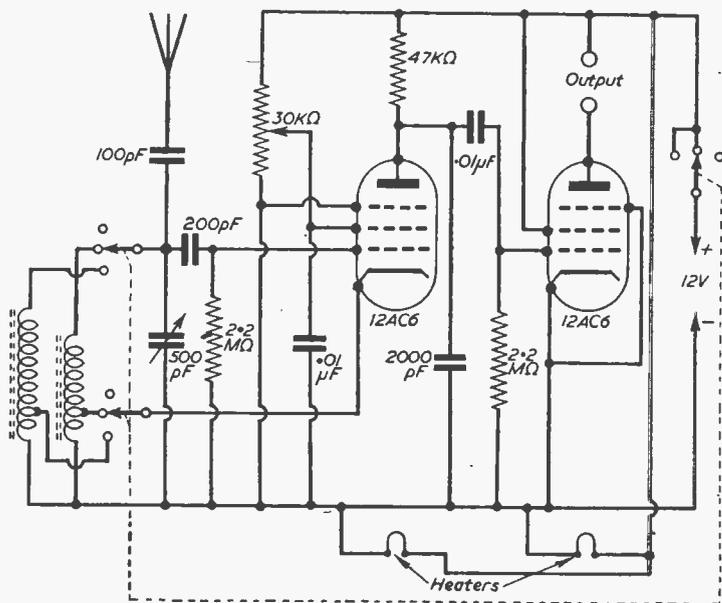


Fig. 1.—The circuit diagram.

### Cathode Windings

A cathode tap is needed on each coil, and this is most easily provided by adding a few extra turns to the original winding. If the coils are examined, the beginning of the winding will be found near the coil former. This is the "grid" side of the coil, and goes to the 200pF condenser (via switch). The outside end of the winding is finished at a second tag. At this tag a short piece of 36 s.w.g. or similar thin insulated wire is soldered on. The extra turns are then wound on top of the existing coil, in such a direction as to form a continuation of the original winding, as shown in Fig. 2. The outside end of the original winding and beginning of the cathode winding provide the cathode connection. The end of the cathode winding is taken to a spare tag, and to chassis.

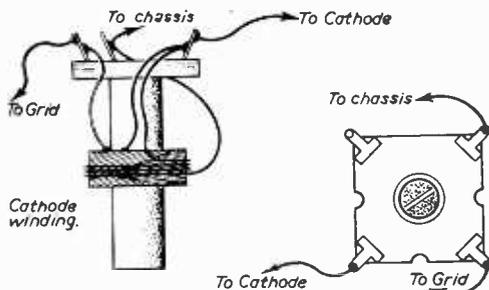


Fig. 2.—Winding extra turns on the coils.

For the M.W. coil,  $3\frac{1}{2}$  turns will be suitable. With the L.W. coil,  $5\frac{1}{2}$  turns are used for this section.

It will be found that the actual number of turns is not very critical. But if too few turns are used, it will not be possible to bring the detector to the threshold of oscillation, which is essential for maximum sensitivity. Too many turns will also reduce sensitivity, because the detector will begin to oscillate at a very low screen grid voltage. No oscillation at all will be obtained if the turns of the cathode windings are reversed. Touches of wax or adhesive will keep the winding in place.

### Chassis, Panel and Case

The dimensions of the required items are given in Fig. 3, the chassis being cut from thin aluminium, with a flange to screw to the panel. The sizes given for the 3-ply are for  $\frac{3}{16}$ in. wood, and will need modifying slightly if the  $1\frac{1}{8}$ in.  $\times$   $4\frac{3}{8}$ in. pieces are made of wood of a different thickness. The back and four small pieces are fixed together with panel pins, glue being spread over meeting

#### COMPONENTS LIST

30k midget potentiometer.  
500pF compression trimmer.  
M.W. and L.W. aerial coils.  
Three-way, four-pole wafer or switch.  
Fixed condensers: 100pF, 200pF, 2,000pF, two 0.01 $\mu$ F.  
Resistors: 47k, two 2.2M.  
Two 12AC6 valves.  
Two B7G valveholders.  
Small knobs, etc.

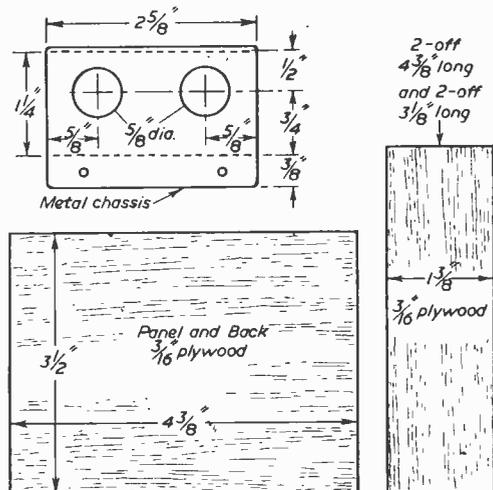


Fig. 3.—Dimensions of the case.

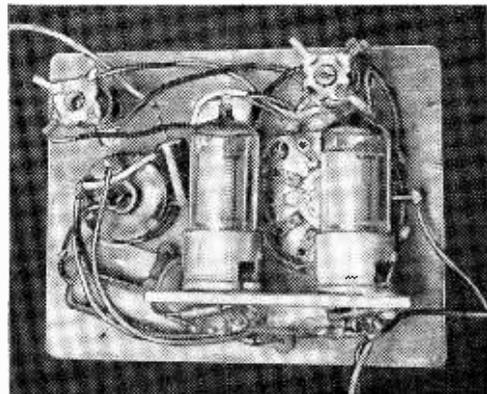
surfaces first. When the receiver is completed, it is placed in the case, and the panel fixed by four small wood screws. Outside dimensions of the complete set are  $4\frac{3}{8}$ in.  $\times$   $3\frac{1}{2}$ in.  $\times$   $1\frac{1}{8}$ in., plus the projecting knobs.

Leads pass through holes in the case, the aerial lead being kept separate from other connections. A few  $\frac{1}{16}$ in. holes should also be drilled in the back of the case for ventilation.

The 500pF condenser is placed centrally, with the switch to the right, and potentiometer to the left, when viewing the panel from the rear. The chassis is attached after wiring up the switch and 500pF condenser.

### Switch

The switch is a 4-pole 3-way wafer, fixed to the panel with wood screws, spacing washers being used under these. One pole is used for grid switching, one for the cathode circuit, and the remaining two, wired in parallel, for battery switching. The switch thus has "Off," "L.W.," and "M.W."



Rear view of the receiver.

positions. The wafer is coupled to the control knob by shaping a short piece of  $\frac{1}{4}$  in. diameter ebonite rod, dowel, or metal rod, so that it fits the flat sided spindle hole in the rotating centre piece of the wafer. A hole is drilled through this short spindle and a securing pin passed through, so that the spindle cannot be drawn out. The spindle turns in a  $\frac{1}{4}$  in. hole in the panel, and is fitted with a knob, a washer being placed on under this.

**Condenser**

The tuning condenser is of the compression type, as used in many transistor sets. This has a small bush, to allow fixing to the panel, a little wood being cut away to receive the nut. The trimmer screw is then removed, and a longer 6 B.A. bolt inserted in its place, care being taken not to omit the large washer and mica disc. A small knob is fitted to the end of the bolt, being held by means of a lock nut.

Because of the relatively high minimum capacity of this type of condenser, full coverage from 200 to 550 metres is not possible. However, adjustment of the position of the core of the coil will allow tuning from about 200 to 450 metres, or from 250 to 500 metres, so a required station near the extreme end of the band

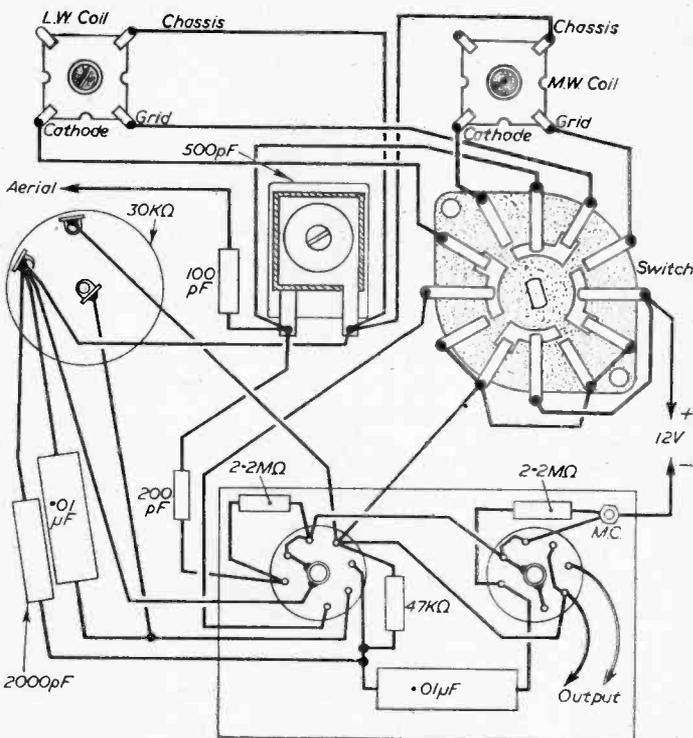
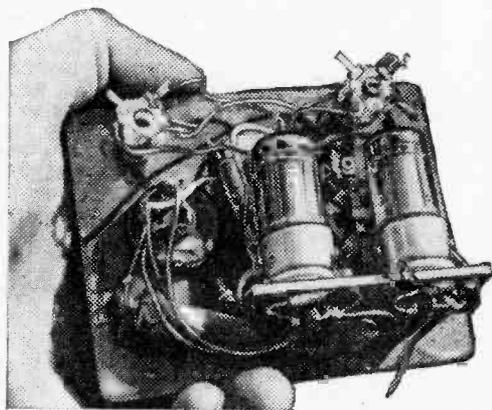


Fig. 4.—Wiring diagram.

centre, M.C.: 4, battery positive (via switch), 30k potentiometer, and 47k resistor; 5, 2,000pF, 0.01μF, and 47k; 6, potentiometer slider and 0.01μF; 7, cathodes (via switch). Right-hand holder, 1, 0.01μF and 2.2M; 2, 3, 7, and centre, M.C.; 4 and 6, battery positive; 5, output. Some holders do not have centre tags, and this is of no importance. "M.C." indicates connections to a tag bolted to the metal chassis.

If long-wave tuning is not required, wiring is somewhat simplified. The M.W. coil is permanently connected in circuit, as shown in Fig. 5. An on-off switch is then joined in series with one battery lead, as shown. This switch can be located between the valves. There is also

(Continued on page 580)



View showing the wiring.

can be brought in. On the L.W. band, the coil core is simply adjusted to bring 1,500 metres near the middle setting of the trimmer.

**Wiring**

All wiring is shown in Fig. 4, the valveholders being seen from below. Counting pins clockwise from the space, connections are as follows: Left-hand holder, 1, 200pF and 2.2M; 2, 3 and

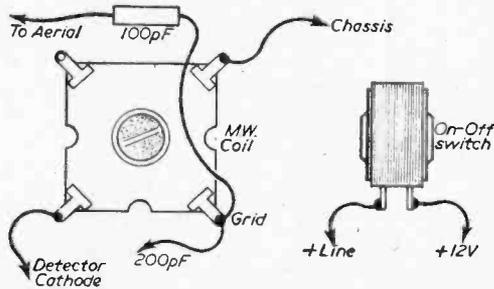


Fig. 5.—If long waves are not required the M.W. coil may be connected in circuit permanently.

# A Simple Transistor Portable

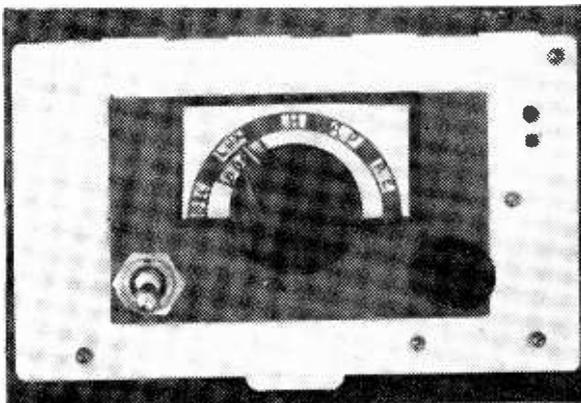
A CIRCUIT FOR PERSONAL LISTENING

By L. Baker

THIS receiver, covering the medium and long wavebands, serves as a useful stand-by receiver in the event of a failure of the normal receiver or in the event of a power failure which makes the mains set inoperative. It is also useful for camping trips and being small in size and weight it can be carried easily. It is not a miniature receiver but it is nevertheless quite small: 5½ in. × 3¼ in. long × 1 in. deep. Most of the parts will already be to hand in the average spares box, and the others will be readily available at most radio shops. No specialised miniature components are used in the construction.

## Circuit Description

The circuit diagram is shown in Fig. 1. From this it will be seen that the receiver has a simple circuit with M.W./L.W. tuning coils with separate coils and switching for the aerial and tuned windings. A D.P.D.T. switch serves as the wavechange switch: one side switches the aerial to the appropriate aerial coil, the other side connects the appropriate tuning coil to the tuning condenser which is a 0.0005µF solid dielectric type of the kind frequently used in receivers employing reaction circuits. The coils are wound on a piece of ferrite rod and it will be found that only a short aerial will be required, and in good reception areas reasonably good signals can be obtained with no aerial at all. The coil and condenser are built and wired as one unit. The signal detector is an OA70 crystal diode, the



the output of which is taken directly into the base of the first transistor of the three-stage audio amplifier. The signal is fed from the collector of Tr1 via the coupling condenser C2 to the base of Tr2. Likewise the collector of Tr2 is taken via the coupling condenser C3 to the base of Tr3, the output of Tr3 being fed into a deaf aid earpiece or earphones.

## The Coils

The long wave coil is made from a discarded I.F. transformer. The ferrite rod, 4½ in. long, is first fitted with a cardboard sleeve 1 in. long. This sleeve should be a sliding fit on the ferrite rod. One winding from the I.F. transformer is then fitted to the sleeve, removing some turns from the inside of the coil if necessary. The other coil is fitted to the sleeve in a like manner, spacing the coils roughly 1 in. apart.

The coils should not be cemented in place until the final adjustments are made on the completion of the wiring. The medium wave tuned winding consists of 75 turns of wire close wound on a former 1½ in. long. This former should be also a sliding fit on the ferrite rod. The medium wave aerial winding is again part of a discarded I.F. coil fitted on a separate former. This coil should have rather more than

half the number of turns of the long wave aerial coil. This is achieved by removing approximately half of the winding, stripping off the wire from the outside of the coil. The ferrite rod is fixed to the frame of the 0.0005µF tuning condenser by means of a securing bracket of stout cardboard. At this stage a tag strip of seven tags should be fixed to the other terminal of the condenser (see Fig. 2 which shows the wiring).

## The Amplifier

The case for the set is made from a plastic box such as sold in multiple stores. Other types of case

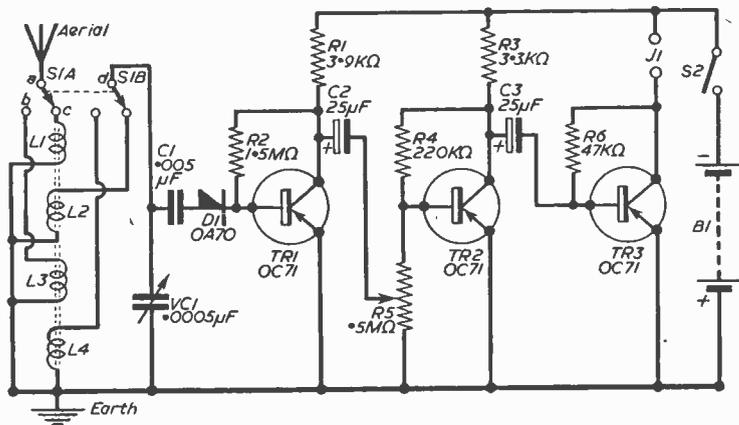


Fig. 1.—The circuit diagram.

may be employed provided they are not of metal, the actual size being a matter for individual requirements. Holes should be drilled for the tuning unit, the wavechange switch and the volume control, on/off switch. Holes should also be drilled for the A and E sockets and the output jack J1. All parts can then be installed and the wiring can be completed from Fig. 2 leaving the transistors until last. When all other wiring has been completed, the diode and transistors should be installed using a heat shunt to prevent damage to these components. Before connecting the battery, all wiring should be checked for mistakes (which could possibly ruin the transistors).

In the original model, OC71 transistors were used. If surplus types are used, the values of R2, R4 and R6 may have to be changed slightly for best performance from the amplifier. A good way to do this is to wire the circuit temporarily on a piece of pegboard and adjust the values of R2, 4, 6 by trial and error.

### Adjusting and Testing

With battery connected, the amplifier can be tested by plugging in the carpiece and switching on. Touching the base connection of Tr3 should produce a buzzing noise in the carpiece. The noise should become louder on touching the base

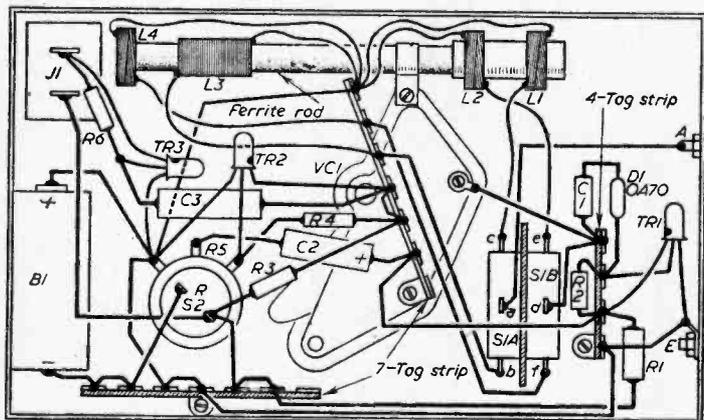


Fig. 2.—The internal layout and wiring.

connection of Tr2, and should be louder still on touching the base of Tr1.

### Adjusting the R.F. Section

The diode connections should be checked to see that the cathode of the diode is connected as shown in the circuit diagram. A short aerial should be connected to the set, and the wavechange switch should be set to Long Wave. Condenser V1 should be set at about the centre of its travel where the BBC Light Programme should be heard. If the station is heard with V1 almost open, wire should be removed from the L.W. tuned winding until the station is heard with V1 in the correct position. With the station tuned in accurately, slide the long wave coil former along the ferrite rod until the loudest

and clearest signals are heard and finally cement it in place.

Switch now to the medium waveband (it is best to adjust this band at night when more stations are on the air to serve as useful check points). It may be necessary to remove a turn

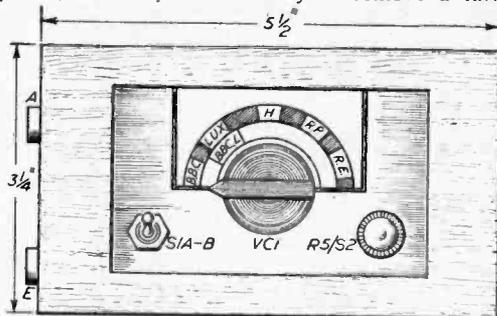


Fig. 3.—The dial of the receiver.

or two from the M.W. tuned winding in order to receive stations on about 200 metres, with V1 almost open. The Home, Light and Third programmes can then be checked, sliding the coils on the ferrite rod as before. Finally, adjust the spacing between the aerial and tuned coils for the best signal strength consistent with good selectivity and seal in the final position as with the L.W. coil.

### Dial

A small dial can be made from stout cardboard marking an arc to suit the pointer knob and the stations usually heard. A knob of the pointer type is used for the dial and a small circular knob for the volume control and switch.

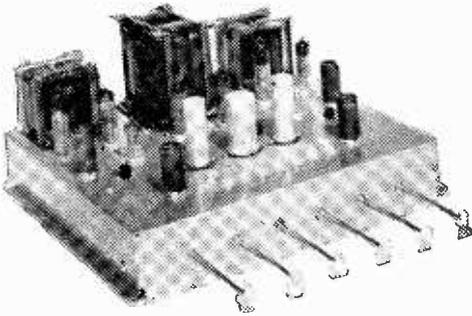
As the current consumption of this set is in the region of 3.5mA it will be found that many months of useful service will be obtained from the battery before it has to be renewed.

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# Radio Show Review

## A SUMMARY OF THE TRENDS AT THIS YEAR'S EXHIBITION



A complete stereophonic amplifier by Airmec.

THE most prominent and popular feature at this year's Radio and TV Show was undoubtedly the "slim line" TV receiver. Details of this and other TV features are fully covered in our companion journal *Practical Television*. However, stereophonic apparatus was a close second to the "slim line" and most of the demonstration rooms were crowded by enthusiasts of all ages. Probably the other focus of interest was on the applications of transistors to portable receivers of all dimensions. It is, of course, very difficult to pick out any individual receiver or firm for particular reference, but the accompanying illustrations give an idea of some of the apparatus which was on view and of modern designs in the fields mentioned above.

### Stereophonic Sound

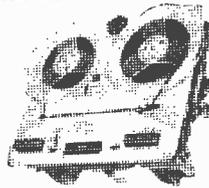
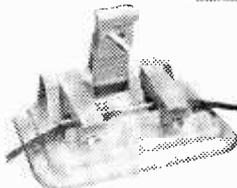
The accepted principle for stereo reproduction is to have two speakers separately placed in a room. However, criticisms have been levelled against the system both on the lines of expense and on the space occupied by these fittings. Two or three firms have tackled this problem by producing a single cabinet, very

little larger than a normal radiogram, into which both the speakers have been incorporated, being placed at the extreme ends of the cabinet. This approach is typified by the Pam receiver at the top of page 552 and the Peto-Scott model at the top of page 553.

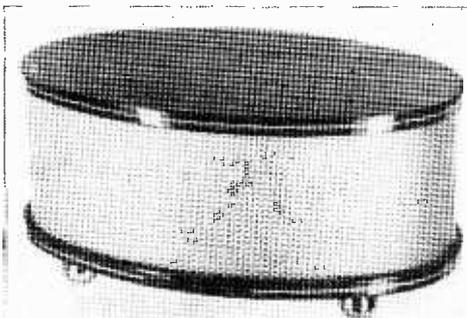
In some models, one of the speakers is removable so that it may be placed in the usual manner at a distance from the main assembly. In certain designs, arrangements have been incorporated so that the complete apparatus may be used for mono or stereo reproduction, while in others the equipment which is fitted is primarily for mono, but provision has been made in many instances for the additions required for stereo.

### Amplifiers

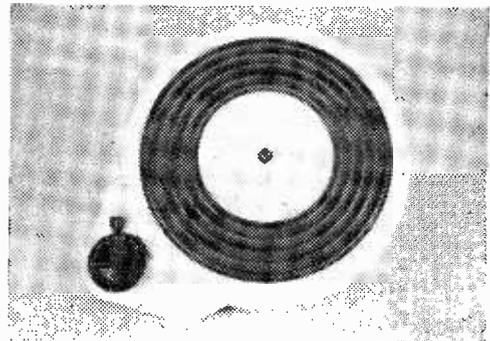
Amongst the separate amplifiers which were available for the assembly of stereo apparatus may be mentioned the amplifier shown at the top of this page. This is an Airmec product consisting of two identical power amplifiers and two identical pre-amplifiers on a single chassis. These are fed from a common power pack and the amplifier is suitable for fitting into a cabinet with a record player and radio tuner of any desired form. The output is rated at 10 watts on each channel and there are separate inputs for radio, pick-up and tape.



At the top is a Labgear signal generator, and below are (left) a tape recorder editing accessory and on the right Collaro's Mark IV tape transcriber.



The Stereovox loudspeaker from K.B.

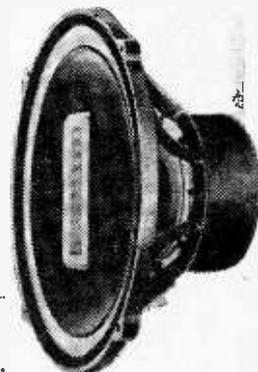
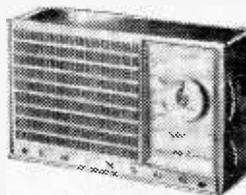


The Collaro Junior four-speed gramophone unit.



*An imposing stereophonic radiogram from the Pam range—model 627, costing 60gns.*

Amongst the speakers shown by Whiteley Electrical Radio Co. were some specially designed for stereo, and in their demonstration room these were connected to switches so that various com-



*On the left is the Pam push-button tuner, in the centre the Emerson transistor personal radio, and on the right a Rola wide-range speaker.*

binations could be connected to the amplifier and the results clearly demonstrated

The K.B. Stereovox loudspeaker shown at the foot of page 551 was one of the most unusual seen at the exhibition.

and black. It is tunable over long and medium waves and is provided with a socket for a car aerial. The price is 19 guineas.

### Tape Recorders

Following radio and amplifying equipment in importance, undoubtedly came the tape recorder, and in addition to complete recorders there were a number of accessories. One of these is shown on page 551, and is an editing device by Tape Recorders (Electronics) Ltd. This is a splicer, similar in appearance and use to a standard film splicer, in which the tape is gripped on each side, cut at the centre, painted with adhesive (or a piece of tape used) and then clamped for a few minutes to make a satisfactory join which may be played without difficulty. The jointing of tape is, of course, a simple matter when a device of this type is used, but without it it may be found difficult to join the tape in line so that it will pass over the heads on the recorder without noise and without running off the guide rollers or spool. In addition to this splicer Tape Recorders exhibited a complete splicing outfit consisting of the splicer, three spools of leader



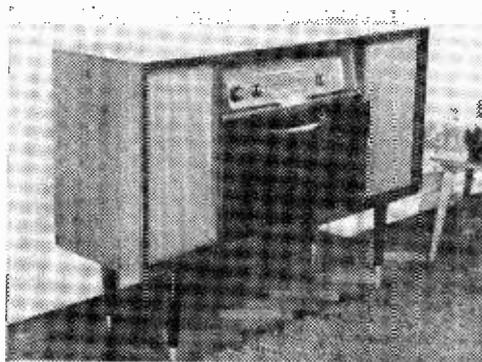
*Two transistor portables from the Dynatron range. On the left the "Romany" at 22gns., and on the right the "Nomad" at 24½gns.*

tape, jointing tape, jointing compound, ten safety clips and spare parts.

The deck to the right of the splicer is a Collaro tape transcriber (Mk. IV). This is a two directional, twin-track instrument, incorporating two sets of magnetic heads, inter-connected brakes and a microswitch for the motors. It has three speeds and is provided with a three digit counter and a pause control. The two blocks of push-buttons on each side of the deck are for record, playback and fast speeds on the two tracks of the tape, with a large bar in the centre for a stop switch.

In the centre strip on this page, the left-hand recorder is the "Prince" by Tape Recorders, and that on the right is a Brenell. The "Prince" is a twin-track instrument, single speed (3½ in./sec) with 4½W output. The recording level indicator is of the magic-eye type. It accommodates reels up to 5½ in. in diameter.

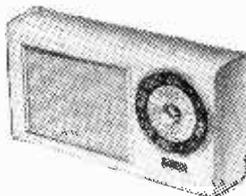
The Brenell model is the "Three Star" which was selected by the Design Centre when they displayed items of outstanding British design and



Another stereophonic radiogram. This model DRG68 by Peto-Scott covers F.M. as well as A.M. It costs 75gns.

and a normal radio receiver. The player is known as the Romany and is a four-transistor, four-speed, battery-operated unit available in three colours. The price is 22 guineas, and the speaker in this model is a 9in. X 4in. elliptical model, to ensure good quality. A full 500mW output is available, and the power is provided by three 9V batteries.

The "Nomad" is a seven-transistor set with



On the left is the Emerson Vanguard pocket radio and reading from left to right are the "Prince" tape recorder, the Pam "Gayplay," and a Brenell tape deck.

manufacture. It has three speeds (7½, 3½ and 1½ in./sec) and is provided with different frequency correction for each speed. Push-buttons are employed also in this model and there is a simple and robust interlocking of the control unit to prevent accidental erasure, tape breakage and spillage. The brakes are self-adjusting, and there is a pause control and revolution counter. The deck accommodates reels up to 7in. in diameter and the amplifier is of the printed circuit type utilising the latest valves developed for low noise and high gain. The price of this instrument is 58 guineas, which includes microphone, radio lead, 1,200ft reel of tape and an empty spool.

#### Portable Receivers

Amongst the standard types of portable, the Roberts is probably one of the best known, and one of these is shown at the foot of this page. This is a transistor model, and also incorporates a printed circuit. It is available in six colours, costs 22 guineas and a carrying cover may be obtained at 30/- extra.

At the foot of the opposite page are two portables from the Dynatron range: a record player

push-pull output stage, built-in twin ferrite aerials and has a turntable fitted to the base. This is powered by two 9V batteries and it covers both medium and long waves. It costs 24½ gns.



Roberts-Radio transistor portable which costs 22gns. and is available in six attractive colours.

# An Aerial-powered Transistor Receiver

A ONE-TRANSISTOR CIRCUIT WHICH USES NO BATTERIES

By Capt. R. F. Graham

THIS novel circuit will be of interest to experimenters who have a really good aerial and earth. In Bedford, a river valley fringe area some 50 miles from the BBC, it works a loudspeaker without any kind of battery—not very loud, obviously, but quite clear even in the next room when tuned to BBC Third (647kc/s) and a suitable transformer is used to match a good loudspeaker, instead of the high resistance phones shown in the circuit. BBC Home (908kc/s) gives good phone reception but quiet speaker output because the aerial used is definitely poor. It is lower than the gutters, only 22ft. high and consists of 114ft. of disused tele-

(+) points shown in the circuit. When both L and C are so adjusted that the meter shows maximum reading, then the ratio of C to L will be correct for loudest output. For a station of longer wavelength it will be necessary to add a small condenser across C as well as extra turns on L, or to insert the ferrite rod farther. Voltage readings should be more than one volt when the carrier is not modulated or 1.5 volts when the audio is loud. Half a volt is the minimum and this from a poor aerial.

## Transistor

The transistor may be any audio type having good gain and small  $I_{co}$  leakage. If near to a BBC station it may be an output type instead of a small signal type and the aerial can be shorter to avoid overloading and damaging the transistor.

Capacitor C1 ( $1\mu F$ ) feeds A.C. carrier to D3 and blocks D.C. It also completes the audio input to "b" and "c." Hence, it is large, but since it should be a ceramic or paper type,  $0.1\mu F$  may be used.

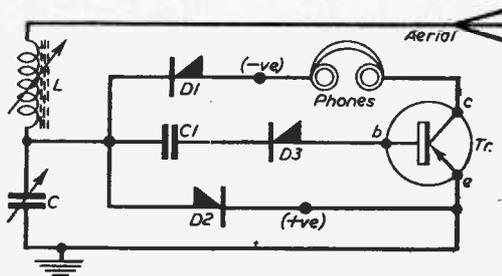


Fig. 1.—The circuit diagram. In some instances, it may be found that the omission of D1 improves results.

phone wires. Even so reception is very much louder than from a crystal set on the same aerial.

## Inductance

Coil L, for a medium-wave station, may have 50 to 60 turns of 22 s.w.g. wire on a 3in. to 4in. diameter former. A simple large coil with spaced turns gave better results than small high Q types tried. Insulated flex may be close wound (on a large bottle) and tuned by unwinding turns. This is better than a coil with tapped turns. A Litz-wound variometer at near its maximum inductance is still better, or Litz wire can be space wound on a tube into which a ferrite rod is inserted for adjusting the tuning.

## Tuning

Tuning condenser C ( $500pF$ ) is in series with L. If the earth or its connection is bad, then C becomes useless and no power will be delivered even if the aerial is very good. This acceptor tuned circuit tends to tune the aerial wire as part of L; therefore, the input to "b" and "c" of the transistor is from across C, necessitating the aerial to be on good insulators and the down-lead well away from walls to avoid all stray capacity losses. Even the coil should have little capacity between turns. Exact tuning is possible by using a high resistance voltmeter across the (-) and

## New Radio Aid

AFTER spanning the Atlantic with radio messages via the Moon, Pye has developed the equipment used in this experiment into a commercial application for long-range, ground-to-air radio control of aircraft.

Until recently the range of voice communication to aircraft from, say, London Airport has been limited to about 150 miles. In an installation undertaken for Pan American Airways at Shannon Airport the new Pye equipment has attained consistent ranges four times greater and reliable two-way communication is available up to approximately 450 nautical miles.

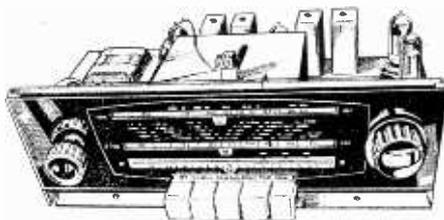
## Atlantic Gap

Under favourable atmospheric conditions, ranges have at times been achieved up to 1,000 miles. This goes a long way towards bridging the great Atlantic "black-out gap" where until now voice communication has been unsatisfactory.

The distance from Shannon to Gander in Newfoundland is 2,000 miles, so the possibility of continuous radio-telephone coverage to trans-Atlantic aircraft is in sight for the first time. Further extensions of the range will be the subject of future tests.

The communication of 1,000 miles range was obtained with a Boeing 707 flying at 38,000ft over the Atlantic. A high-powered Pye transmitter, similar to that used in the Moon experiment, is sited near Ballybunnion, 30 miles west of Shannon, and is automatically controlled by a Pye radio link from Shannon Airport.

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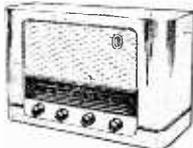
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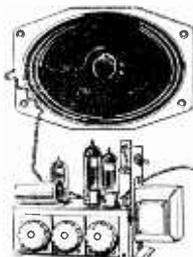
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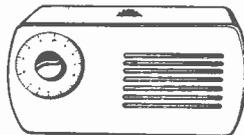
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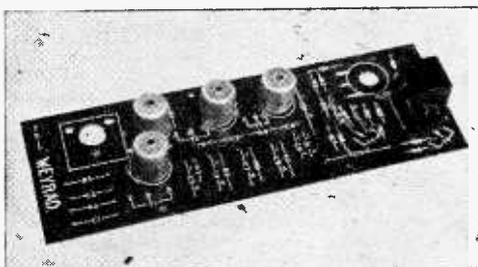
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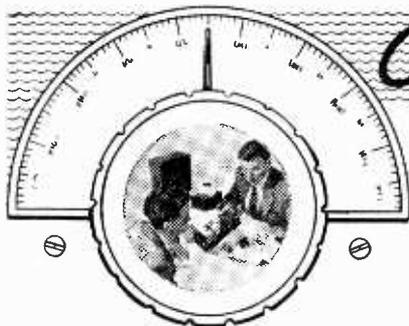


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# On Your Wavelength

BY THERMION

## Radio Clubs

RECENTLY I happened to meet an acquaintance of mine who is the secretary of a local radio society. Naturally, we talked of the world of amateur radio in general and particularly of his society. I was interested to learn that most of the members fall into one of two categories; the old hand and the teenager. It appears that between these two age groups enthusiasm wanes or disappears entirely. I wonder why this is so? Could it be that domestic activity proves so much a burden that the social advantages of belonging to a club are forgotten?

My friend also told me that the most interest was displayed by the younger members of the club, who naturally did more constructional work than the older members who were more content to discuss and often advise.

On the whole I think it is surprising that more radio constructors do not belong to a society; out of all my acquaintances, comparatively few are members of their local club. I often ask them why they do not join. They reply, that they haven't the time to spare and accuse the members of clubs they have visited of banding together in cliques, and keeping newcomers out of the conversations and general discussions at meetings. I point out to them that in any society, members get to know each other and do tend to gather in groups, but generally if sufficient interest is displayed, the newcomer soon becomes a member of the circle.

I am of the opinion that too many societies are content to sit back and wait for new members rather than try to influence local enthusiasts to join. In my travels round the country, I have often found that many are not even aware of the existence of a local radio club. This is astonishing; club committees should ensure that fullest publicity is given to the club activities both by their members and possibly by the local press. This magazine devotes a large amount of editorial space to club news—space for which no charge is made—yet very few clubs take advantage of this publicity. So many clubs complain that they cannot recruit new members: I would suggest that insufficient effort has been made in many instances.

## The Show

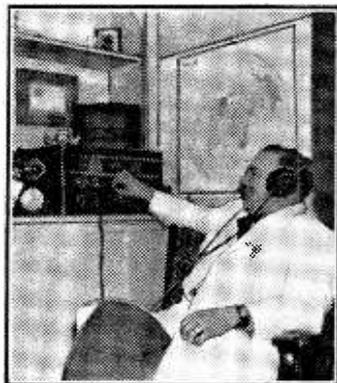
THE Radio Show proved very successful this year. For my own part I enjoyed very much looking round the show on the several days I

was there. Of course, the emphasis was on the design of the modern television receiver, and particularly on the use of the 110deg. deflection cathode-ray tube, but, nevertheless, there was much of interest to the amateur radio enthusiast. A greater number of sets for V.H.F./F.M. was on display; I have thought for a long while now that apart from the BBC, few concerns have given enough thought to the selling of these high quality receivers. The man in the street does not understand what is meant by "greater quality of reproduction," "greater dynamic range," etc., but with recorded illustrations he can realise that the V.H.F./F.M. service means that there will no longer be the irritating interference by foreign transmitters and electrical and "static" interference—will be almost or completely eliminated.

The hi-fi man also found many stands to view; the enlarged audio hall this year was very popular—and very hot, although at least one or two enterprising manufacturers had the good sense to install air conditioning. I often found myself unaccountably gravitating towards one of these stands!

Stereo this year was all the rage, although as I have said previously, I would just as soon have a mono system as a stereo system. I thought that my own equipment—ten watt amplifier and multiple speaker system with a 10cu. ft. corner reflex cabinet—gave better results than any I heard at the show. I realise, though, that it was impossible to judge results fairly in the small demonstration rooms, especially with the high level of ambient noise, which was certain to mask many good effects (and some bad ones, too, no doubt).

As I said, I was present at the show on several days, and once more I gained much pleasure from conversing with readers of PRACTICAL WIRELESS and *Practical Television*. Many came ready to argue with me, but after a short while, most of them came over to my view or conceded several points. One person refused to believe what I said on a certain matter and went away in high dudgeon. I did not see him again; perhaps he had my statement confirmed and decided to say no more.



5WL, P. I. Park, of Strichen, Aberdeen, in his den.

# Becoming an "Amateur"

AMATEUR RADIO FOR BEGINNERS—3

By J. D. Pearson, G3KOC

A RECENT correspondent wished to know if amateurs like to receive reports or cards from SWL's. A great deal has been written on this subject and it is not intended to go too deeply into it here. The writer feels,

## THE QSA/R SYSTEM

### READABILITY SCALE

- QSA1—Unreadable.
- QSA2—Readable at times.
- QSA3—Readable with difficulty.
- QSA4—Readable.
- QSA5—Perfectly readable.

### STRENGTH SCALE

- R1—Unintelligible.
- R2—Weak, barely readable.
- R3—Weak, but can be copied.
- R4—Fair, reasonable copy.
- R5—Fairly good copy.
- R6—Good signals.
- R7—Moderately strong signals.
- R8—Strong signals.
- R9—Extremely strong signals.

Table I.—The system used when reporting on phone signals. A perfectly readable, extremely strong signal is said to be Q5 R9, or simply "5 and 9."

however, that a few words of advice would not be out of place in a beginners' series of the present nature.

### Writing for Cards

Many SWL's set out to acquire a card from every station they hear, and are disappointed when, after long waiting periods, it becomes obvious that the percentage of replies received to cards sent out is going to be very small. At this stage they either give the whole thing up in disgust, or carry on hopefully without ever attempting to discover the reasons for the low percentage returns.

The writer once received a card which bore the bare inscription: "Heard you on 20m. last week. Would like your QSL card." The sender was obviously interested in amassing as many QSL cards as possible. There is nothing basically

wrong with this practice except that it shows lack of consideration for other people. During the course of a year, licensed amateurs who are regularly active on most bands receive a large number of reports from listeners. The cost involved in replying to all of these can become excessive.

### Send Useful Reports

There is a great deal which the SWL can do to ensure that most, if not all, of the reports he sends out will receive replies. The first rule is never to send a report to a station unless you feel certain that it will be of some use to him. There's not much point, for instance, in sending a report to a French station whom you have just heard working a station in this country.

Now let us suppose you heard the same station working into Equatorial Africa and stating that he was using a beam aerial. After listening for some time you discover that the African station is giving him very poor signal strength reports; and yet, you are hearing him strongly. Clearly there is something wrong—either his beam is not pointing in the right direction or its "front-to-back ratio" is very poor indeed. In any event the French station would probably welcome confirmation that he was at least putting out a good signal somewhere.

### Reporting Signal Strengths

There are two methods in current use by amateurs for conveying information regarding strength and quality of signals. These are the QSA/R system for telephony, and the RSF system for CW (morse). Both are given in tables I and II respectively.

(To be continued)

## THE RST SYSTEM

### READABILITY.

- R1—Unreadable.
- R2—Barely readable.
- R3—Readable with difficulty.
- R4—Readable with slight difficulty.
- R5—Perfectly readable.

### STRENGTH

- S1—Barely perceptible signals.
- S2—Very weak signals.
- S3—Weak signals.
- S4—Fair signals.
- S5—Fairly good signals.
- S6—Good signals.
- S7—Moderately strong signals.
- S8—Strong signals.
- S9—Extremely strong signals.

### STONE

- T1—Extremely rough note.
- T2—Rough A.C. note.
- T3—Rough A.C. note, musical.
- T4—Rough A.C. note, greater musicality.
- T5—Musically modulated note.
- T6—Modulated note, slight whistle.
- T7—Near D.C. note, smooth ripple.
- T8—Good D.C. note, slight ripple.
- T9—Purest D.C. note.

Table II.—The system used for reporting telegraphy signals (C.W.). If the note sounds to be crystal-controlled an "X" is added after the Tone figure. If the note is chirpy add a "C."

# A Transmitter Keying Monitor

USE THIS OSCILLATOR TO CHECK YOUR TRANSMISSIONS

By R. Wright, B.Sc. (G3IBX)

**M**ANY newly licensed amateurs are troubled by the fact that on many QSO's they are unable to hear the note of their transmission and so have no check on the quality of their telegraphy. Further, there is probably nothing more lowering to morale than numerous mistakes—with subsequent erasures—when working a station operated by a first-class telegraphist.

The frequency of oscillation will usually lie somewhere between 700 and 1,400c/s. well within the audio range. C1 and R1 provide sufficient bias for the valve. R2 not only limits the H.T. current through the valve, but together with C3 decouples the oscillator from the H.T. line.

## Choice of Valve

Almost any valve of the R.F. pentode type operated as a triode (i.e., anode, screen grid and suppressor grid wired together on the valveholder) seems to oscillate satisfactorily. For the sake of compactness, an EF91—or equivalent—is suitable and such a valve is in use at the writer's station.

The cathode of the oscillator valve should be connected to the keyed line of the transmitter so that the oscillator is keyed simultaneously with the transmitter. The output from the oscillator is capacitively coupled through C2 to the receiver phones or loudspeaker. In most receivers one side of the phones will be earthed and the oscillator output is coupled to the other side of

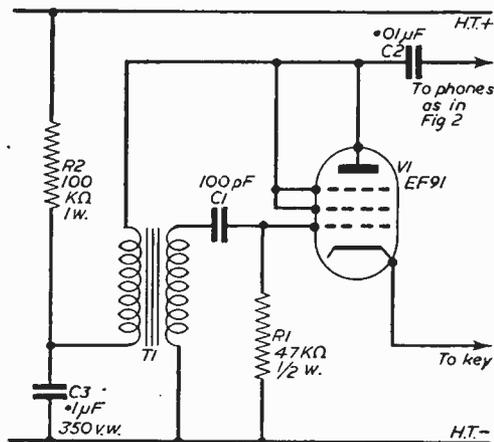


Fig. 1.—Circuit of the oscillator.

(It might, perhaps, be added here that a "first-class" telegraphist is not necessarily the man who can send fast. Correct formation and spacing of letters and words are far more important. Once these have been thoroughly mastered, speed will come with practice.

## Function

The purpose of the oscillator, the circuit of which is shown in Fig. 1, is to provide sidetone irrespective of the transmitter and receiver frequencies in order that a constant check can be kept on keying.

T1 is an ordinary interval coupling transformer and provides the tuned circuit and coupling necessary to sustain oscillations—the oscillatory circuit capacitance being provided by the self-capacitance of the transformer winding.

## COMPONENTS LIST

- R1—47,000 ohm,  $\frac{1}{2}$  watt resistor.
- R2—100,000 ohm, 1 watt resistor.
- C1—100 pF capacitor.
- C2—0.01μF capacitor.
- C3—0.1μF capacitor, 350 volt working voltage.
- T1—Interval coupling transformer.  
(Ratio 5 : 1 or 3 : 1.)
- V1—Oscillator valve, EF91, etc. (See text.)
- Valveholder to suit valve used.

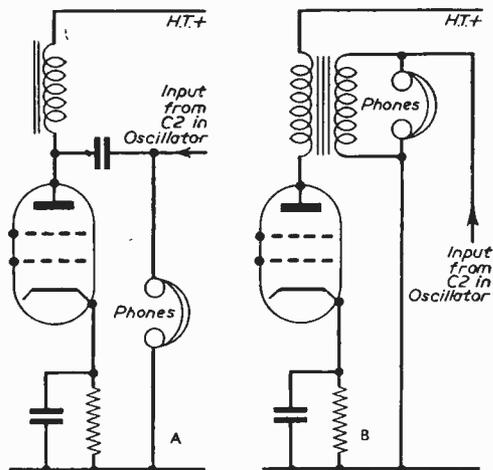


Fig. 2.—Injecting the A.F. from the oscillator into the headphone circuit. Two types of output stage are shown: the one on the left is for high resistance headphones and the one on the right for low resistance headphones.

the phones. Figs. 2 (a) and (b) show the more usual arrangements for connecting (a) high resistance phones and (b) low resistance phones to the receiver output valve. The correct point for connecting the A.F. from the oscillator is also shown. With this method of connection, the A.F. note from the oscillator will be heard in the phones even if the H.T. of the receiver is normally switched off during transmission.

### Construction

In receivers such as the R1155, the oscillator can usually be built into the set. However, if room does not exist in the receiver, the oscillator may be constructed on a small chassis, approximately  $2\frac{1}{2}$  in.  $\times$  3 in., and mounted in any convenient position, taking H.T. and L.T. from any suitable point in either the receiver or transmitter. The H.T. requirements are extremely modest, being 200-250 volts at 2-5mA, depending upon the type of valve used. L.T. will be 6.3V

at, probably, 0.3A, again depending upon the valve used.

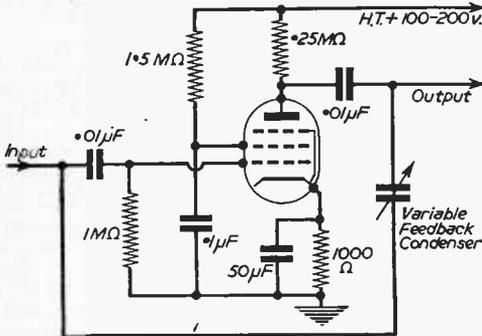
### Practice Oscillator

If the oscillator is powered from the receiver it may, of course, be used as a morse practice oscillator being keyed via the transmitter key but with the transmitter power switched off. Finally, should the oscillator fail to function when constructed and all connections appear to be satisfactory, try reversing the connections to one side of the A.F. transformer.

## A Noiseless Organ Control

MANY experimenters find difficulty in adapting ordinary radio volume controls for use in electronic organs—chiefly on the grounds of noise caused by wearing of the track. Requests are frequently received for details of a noiseless control and the following data were published by us in 1956, but the issue concerned is now out of print and in response to many requests we are reprinting the data here.

The following is the result of many experiments



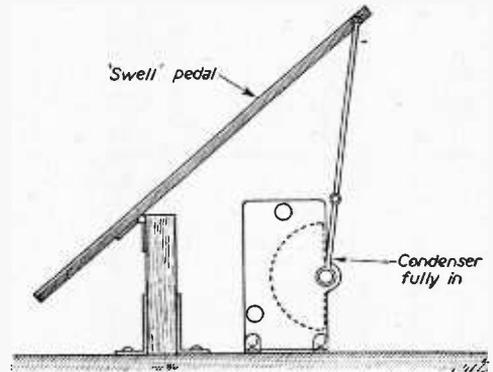
Theoretical circuit of the control.

conducted on an electronic organ to find a swell control which did not require constant attention. The basis of this control is to provide a completely frictionless, and therefore non-wearing, control.

In this circuit a variable condenser is connected between anode and grid of the pre-amplifier stage; this provides feedback which tends to cancel the incoming signal. It is essential that this stage should be a pentode so as to keep the capacity of

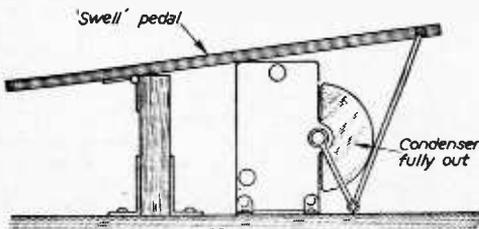
the variable condenser within reasonable limits. A great asset of this circuit is that it provides a progressive "top" cut very similar to the shutters of an organ swellbox, and has been found to be effective with diapason tone down to 16ft.

The essential components are a pair of three-gang variable condensers with the shafts coupled together. Economy in space could be effected by using miniaturised condensers (variable). The possibility of using variable condensers with paxolin dielectric should not be ruled out.



The control "off" or in the position of minimum volume.

No originality is claimed for the above as a similar idea is used on the Novachord, but the writer has never seen any constructional details concerning this type of control and, after having made up every type to be found in any publication, has found the above to be perfect.—J. H.



The control in "maximum" or loudest position.

### COMPONENTS REQUIRED

- 2—Three-gang .0005 variable condensers.
- 1—Valve (SP61, EF36, EF50, etc.). Any equivalent.
- 1— $\frac{1}{2}$  Meg. anode load resistance.
- 2—.01  $\mu$ F condenser
- 1—1,000 ohm resistance.
- 1—50  $\mu$ F bias condenser.
- 1—1 $\frac{1}{2}$  Meg. resistance.
- 1—.1  $\mu$ F condenser.
- 1—1 Meg. resistance.

# A Direct-Coupled Transistor Receiver

FURTHER NOTES ON THIS NOVEL RECEIVER DESCRIBED IN THE MAY AND JUNE ISSUES

By W. Cleland

THE widespread interest that exists in miniature radios was revealed once again in the number of queries dealing with this set, which was described in the May and June issues.

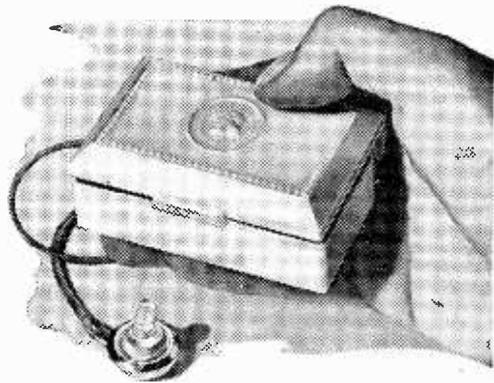
## Circuit

The receiver was an experimental one, not ideally suited to beginners, who would find it easier to make a conventional type of circuit work. It is probably best in direct-coupled circuits to make the feedback resistance variable, so that it can be readjusted from time to time.

Transistors differ so much in characteristics that it is hardly possible to guarantee good results with every batch of transistors, especially in a direct-coupled circuit. The R.F. transistor in particular has to be biased rather critically to make it sensitive as a detector, and this low current condition does not yield a high R.F. gain. The gain can be increased by applying positive feedback, but the degree to which this can be done depends upon the stability of the basic gain, and upon the need to avoid excessive attenuation of the outer side-bands containing the higher audio frequencies.

## Stability

A milliammeter placed in the collector circuit of a transistor shows that the current continues to increase for some time after switching on. The accompanying change in gain would tend to produce instability if reaction has been adjusted close to the threshold of oscillation. Thus, more



reaction can be used in a stabilised circuit than in one where no precautions are taken.

Conditions are less critical if the functions of R.F. amplifier and detector are separated, and it is hoped later to give details of an improved receiver which uses an R.F. stage followed by a separate crystal detector.

## Crystal Set

It might be as well to point out that an ordinary crystal set followed by an A.F. amplifier is not a sensitive receiver. A crystal set requires a good aerial and earth and receives only local stations. Thus an R.F. amplifier of some kind is essential. The transistor receivers that are manufactured are practically all superheterodynes, and so have a chain of I.F. stages preceding the detector.

As signal strength is reduced, a detector becomes less and less efficient, until for a very small signal, the detector almost completely ceases to function. The so-called first detector or mixer in a superheterodyne is of course worked differently, being in effect an amplifier or attenuator with its gain or loss varied by the cycle of oscillator voltage. Thus it can work just as well for a small signal as for a larger one, which partly accounts for the sensitivity of a superheterodyne. However, the kits of parts available for superheterodynes are for rather larger receivers incorporating loudspeakers and the smallest receivers, down to wrist-watch size, tend to employ comparatively simple regenerative circuits.

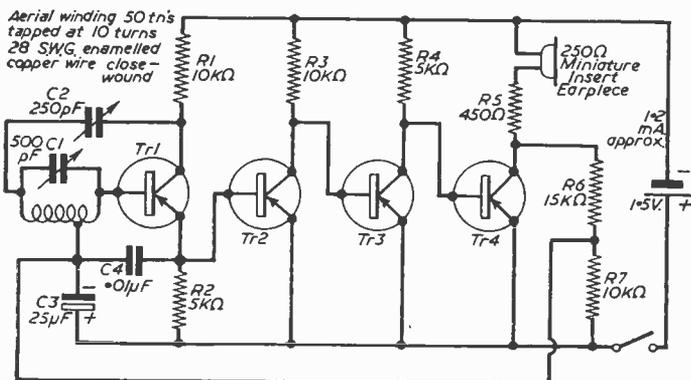


Fig. 1.—The original circuit diagram.

### Distortion

A low signal input to the detector involves not only insensitivity, but also increased distortion, whilst elsewhere in a radio set, distortion is least for small signals.

Owing to the unusual circuit and compact assembly, some difficulty may have been found in following out parts of the wiring of the receiver, especially those leads that pass through the panel.

In Fig. 8 (page 302, June issue) the transistor leads can be identified as follows. The leads as they emerge from each transistor are, from top to bottom of the diagram: emitter, base, collector, in that order, for each transistor.

Two errors occurred. One was referring incorrectly to R6 as R8; there being, of course, only seven resistors in the receiver. The other

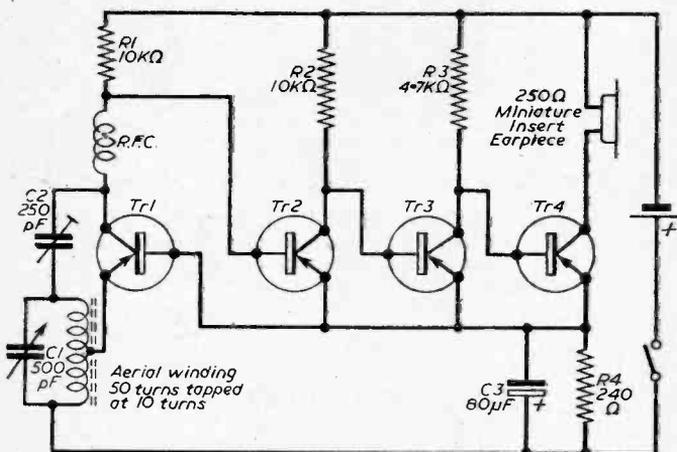


Fig. 2.—Circuit of the modified direct-coupled receiver, using fewer components, but less highly stabilised. Most of the components are the same as in the original circuit.

error was the omission from Fig. 8 of the connection between the emitters of transistors 2, 3 and 4 and the junction of R2 and R7, and C3.

### Wiring

The two end leads of the aerial winding pass through holes under the ferrite slab direct to the tags of the 500pF trimmer, and the adjacent tags of the two trimmers are connected together. The other tag of the 500pF trimmer is taken to the base connection point of Tr1. The twisted aerial tapping is taken through a hole at the edge of the slab and goes to the junction of C3, C4 and R7. (The aerial lead going to the base of Tr1 is the end closer to the tapping.)

The positive connection from the 1.5V cell passes through a hole next to that for the tapping and is taken to the push-button switch. This, by the way, is luminous and glows brightly in the dark. The wire from the negative pole passes through both panels and connects to the end of R1 linked with R3 and R4. One earpiece lead is connected to the negative pole, and the other lead passes through both panels to R5.

### Components

Some of the components proved more difficult to obtain than had been anticipated. The plastic box has become difficult to obtain, but as it was rather fragile, a more robust container would be preferable.

Some difficulty was also encountered with the 500pF compression trimmer, as the 250pF and 750pF appear to be more readily obtainable. However, a 750pF trimmer would probably serve in place of 500pF, although a few turns might have to be taken off the aerial winding.

The ferrite slab was actually taken from a commercial component which had become damaged in the course of experiments, but slabs believed to be similar had been seen in one or two shops. However, as ferrite rods appear to be stocked almost exclusively, for those who require to wind their own aerials, the choice of a rectangular section was inconvenient.

### Earpiece Flex

The use of an improvised earpiece flex in the receiver was a dubious economy, as the proper type of cord is more flexible and has a better appearance. There is no need for this flex to be screened. In fact, in one American midget receiver, the earpiece cord also serves as an aerial, being isolated for this purpose by means of R.F. chokes. This can be accomplished equally well without the chokes, if a double-wound tuning coil is used to carry the earpiece currents.

In the smallest radios, where every stratagem has to be adopted to conserve space, a ferrite aerial becomes less practicable, and an external aerial will probably give a larger input. However, an earth is then of importance, and it might be that a separate aerial wire is best, with the earpiece flex taking the place of an earth.

### Direct Coupling

Direct coupling, also useful in conserving space, has its drawbacks. Occasionally it produces "motor-boating" especially when unsuitable values of collector resistances are employed. If the emitter-base voltage becomes larger than the emitter-collector voltage, a phase reversal occurs, which converts the negative feedback of the stabilising circuit into positive feedback. In such cases it may help to alter the order in which the transistors are used.

The circuit of a modified type of direct-coupled receiver with which experiments have been made is shown in Fig. 2. This circuit contains only four resistors, three capacitors and a small R.F. choke. It avoids some of the gain reductions that take place in the other circuit, but is less highly stabilised and more critical in adjustment. The resistor R4 has to be varied to find a suitable value.

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6/12 v. 4 a.	12/3	250 v. 80 m.a.	5/11
6/12 v. 6 a.	15/3	250 v. 100 m.a.	12/9
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1C3 6/9	6F1 11/9	8D3 6/9	69 14/11	EB41 6/9	EZ82 6/9	PE43 6/9	UB41 11/9
1L4 5/11	6F12 6/9	807 7/6	71DDP 8/9	EB91 5/9	FW4500 9/9	PL33 9/9	UBF80 9/6
1FD1 6/9	6F13 11/9	9D2 3/9	31SU 8/9	EBC33 6/9	GZ30 9/9	PL38 16/9	UCC# 10/6
1FD9 6/9	6F14 11/9	9U8 6/9	441U 9/9	EBC41 9/9	GZ32 11/9	PL41 13/9	UCH# 10/9
1F1 6/9	6F15 11/9	954 1/9	451PT 7/9	EBC90 11/9	GZ33 10/9	PL82 9/9	UCL82 14/9
1F2 6/9	6H6 2/3	10C1 1/9	ACSPEN 9/9	EBC91 8/9	GZ34 13/9	PL83 10/9	UF42 8/9
1F3 5/11	6J5 4/9	10F1 12/9	ACHL 5/9	EBF89 9/6	GZ37 8/9	PY31 11/9	UF89 9/9
1P1 6/9	6J5G 4/6	10LD3 7/9	B36 8/9	ECC35 7/9	HL4DD1L 9/9	PY80 7/9	UL41 9/9
1P10 6/9	6J6 4/9	10LD12 15/9	B65 7/3	ECC81 7/9	IW4350 9/9	PY81 9/9	UL46 14/9
1P11 6/9	6J7G 5/9	10LD14 15/9	B13 8/9	ECC82 7/3	IW4500 9/9	PY82 8/9	UL84 9/9
1R5 6/9	6K7G 4/9	812 9/9	B36 8/9	ECC83 9/9	K732 9/9	PY83 8/9	U83 9/9
1S5 7/9	6K7MET 5/9	10P14 9/9	B39 8/9	ECC84 9/9	K733 9/9	PZ30 10/9	U84 9/9
1T4 5/11	6K8C 8/9	10P18 9/9	B329 8/9	ECC85 9/6	K736 9/9	R2 9/9	U85 9/9
3A4 6/9	6L3D 8/9	12A6 5/9	B339 9/9	ECC91 4/9	KT44 14/9	R3 9/9	UY41 4/9
3C4 6/9	6LD2 9/9	12AT7 7/9	B719 8/9	ECC90 12/9	KT45 9/9	SD61 1/9	UY85 10/6
3S4 7/3	6LD20 8/9	12AU6 7/9	D1 2/3	ECF82 12/9	KT61 11/9	SP6 8/6	VP#22 3/9
3V4 8/9	6L12 8/9	12AU7 6/9	DAF91 5/11	ECH81 8/9	KW83 4/9	SP42 13/9	W110 3/9
4D1 5/9	6L18 11/9	12AX7 8/9	DAF96 9/9	ECL80 10/9	KTZ41 7/9	SP61 2/9	W120A 9/9
5U4G 6/9	6L6G 8/11	12XNTG7 9/9	DF91 7/9	ECL82 11/9	L63 4/9	SP64 8/9	VU7 5/11
5Y3G 7/9	6L19 11/9	12SPA 3/3	DF92 9/9	EF39 5/9	LN152 9/9	T41 16/9	W170 5/9
5Z4G 9/9	6M1 6/9	13VP4 3/9	DF96 9/9	EF41 8/11	MH4 5/9	U18/20 9/9	W54 9/9
6A8B 12/9	6M2 8/9	12A6 6/9	DF96 9/9	EF50 12/9	U12 9/9	U24 9/9	W179 9/9
6AC7 5/9	6P25 11/9	16A5 9/9	D77 5/11	EF54 5/11	MU14 9/9	U27 9/9	W272 9/9
6AG6G 11/9	6P28 9/9	16A6 9/9	D152 8/9	EF80 7/9	N17 7/3	U25 13/9	WD142 9/9
6AJ8 8/9	6Q7G 9/9	17Z3 9/9	DD6 11/9	EF85 7/3	N19 9/9	U31 9/9	WD700 9/9
6AK8 8/9	6S67 6/9	19X3 9/9	DD41 8/9	EF86 16/9	N37 18/9	U35 9/9	XL7 9/9
6AL5 5/9	6SK7 6/9	19Y3 9/9	DH63 6/9	EF89 9/9	N77 4/9	U46 9/9	XL42 9/9
6AM5 6/9	6S17GT 7/3	20D1 14/9	DH77 11/9	EF91 11/9	N142 9/9	U50 8/9	X77 9/9
6AM6 6/9	6S17GT 7/3	20F2 8/9	DH109 10/6	EF93 9/9	N144 4/9	U52 8/9	Y63 5/9
6AQ5 7/9	6U4GT 12/9	20P1 12/9	DH142 8/9	EK90 9/9	N148 7/9	U54 10/9	Z63 8/9
6AQ8 7/9	6U5G 6/9	21A6 13/9	DH147 8/9	EL32 4/9	N152 13/9	U78 9/9	Z77 7/6
6AT6 7/9	6U8 8/9	25L6 9/9	DH150 8/9	EL33 11/9	N154 9/9	U139 9/9	Z142 9/9
6B5 3/9	6V4 8/9	30L1 8/9	DH19 8/9	EL34 16/9	N323 9/9	U142 9/9	Z146 9/9
6BE6 9/9	6V6GT 7/9	30P16 9/9	DK91 7/9	EL36 19/9	N709 9/9	U152 9/9	Z152 5/9
6BE6 16/9	6V6G 7/9	35Z4 6/9	DK96 9/9	EL41 10/9	N727 9/9	U153 9/9	Z159 5/9
6BQ5 3/9	6V6G 7/9	41MHL 6/9	DL92 7/3	EL84 9/9	OM4 6/9	U154 9/9	Z179 18/9
6BX6 6/6	6X4 6/9	53K1 10/9	DL93 7/9	EL90 9/9	P61 2/9	U159 9/9	Z179 18/9
6BY5 9/9	6X5 5/11	53K1 10/9	DL94 8/9	EL91 4/9	PC84 2/9	U319 8/9	ZD17 9/9
6BY7 7/9	7AN7 8/9	54K1 11/9	DL96 9/9	EM80 9/9	PCF90 12/3	U381 9/9	ZD152 5/9



used for manual tuning. If space permits, it is in order to use a two or three band coil pack. This would be more feasible in a caravan radio for operation from the car supply than in a compact car radio.

An alternative to manual tuning is to provide two or three stations which can be selected by means of a rotary switch (or a push-button switch unit, if this is to hand). A circuit for three pre-set stations is shown in Fig. 2. There is no need for a gang condenser or tuning drive. The long wave Light Programme can also be provided, in addition to medium wave stations. Other parts of the receiver circuit remain unchanged.

With pre-set tuning, the oscillator coils may be used without padders. In these circumstances, it is possible to tune the M.W. oscillator coil to such a frequency as will allow reception of the 1,500m long wave transmitter. An additional oscillator coil for long wave reception is then unnecessary. However, this is not possible with manual tuning.

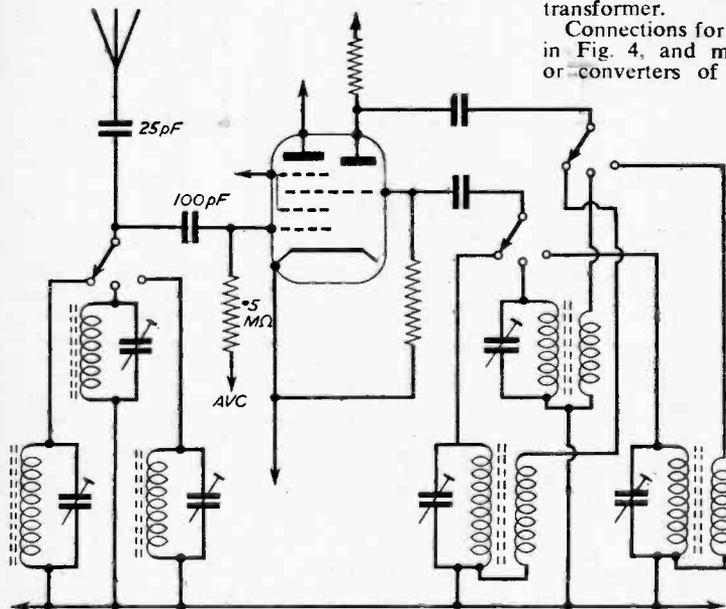


Fig. 2.—Circuit for pre-set tuning.

If required, the 2-gang condenser can be switched into circuit in one position, for manual tuning. Stations other than the pre-selected locals can then be received when wanted.

#### A T.R.F. Circuit

It will be found that a T.R.F. circuit such as that shown in Fig. 3 will give adequate volume in reasonably favourable conditions. There is no automatic volume control, as employed in the circuit in Fig. 1 and, therefore, a 3-valver of this type is most suited for camping or a stationary caravan. It is very much simpler to build than the superhet. For a 6V supply, the 12A6 would need replacing by a 6V6 or 6BW6,

with all heaters in parallel. Other valve types are, of course, quite satisfactory.

The receiver may tune medium waves only, or both medium and long waves, or pre-set tuning may be arranged, a rotary switch bringing in pairs of pre-set condensers, adjusted to the required stations. If maximum range is not wanted, reaction may be omitted. Screening is necessary between the coil circuits, to avoid instability. This is most easily arranged by placing the aerial coil (or coils, with dual-wave tuning) above the chassis and the detector stage coil below the chassis.

#### Power Supplies

Methods of arranging the heater circuit for 6V or 12V running have been mentioned. For H.T., some 180 to 250V will be needed, and can be obtained from a vibrator pack or rotary transformer. Surplus vibrator units are sometimes available, but the vibrator may prove noisy if worn or in bad condition. Current consumption is, however, lower than with a rotary transformer.

Connections for a rotary H.T. supply are shown in Fig. 4, and many small rotary transformers or converters of this type are available. The output is D.C., so no rectifier is needed. A reasonably effective smoothing circuit, such as that shown, is generally required, or at least one large capacity smoothing condenser.

#### Chassis Polarity

Most vehicles have positive taken to chassis, but this is not universal. It is thus wise to check this, and the polarity of the H.T. output, or the rotary or smoothing condensers will be damaged.

To keep down interference, by-pass condensers of 0.1  $\mu$ F to 2  $\mu$ F can be wired across the brushes, or from brushes to chassis. These may be necessary with both input and output circuits. Electrolytic condensers are not suitable for interference suppression, but a large capacity condenser of, say, 200 to 1,000  $\mu$ F, in parallel

with the 12V supply to the receiver, may prove helpful in obtaining a quiet background. It is also helpful to position the converter so that there is little chance of direct pick up of interference by the receiver or aerial. A multi-pin plug will allow easy interconnection of receiver and power unit.

When interference arises, and its cause is not known, systematic investigation should allow the trouble to be cleared. If the interference ceases when the aerial lead is disconnected at the receiver, the aerial or lead is responsible. But if interference continues, it may be carried to the set by the power supply leads. If so, further by-pass condensers should be added at the receiver. Screening, and a suitable choice of position, will

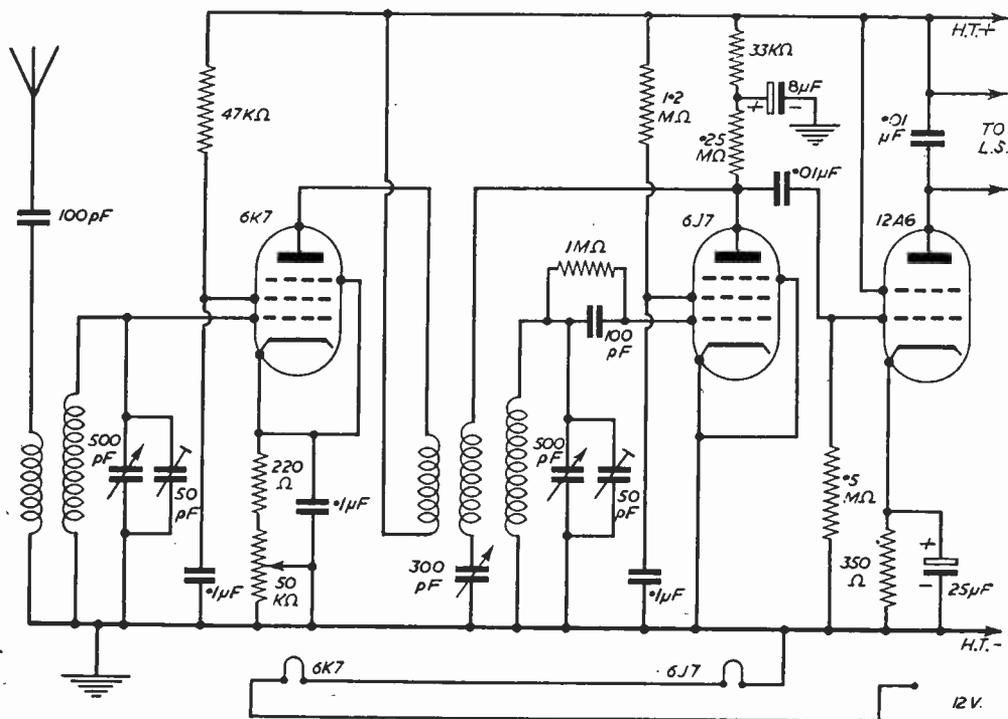


Fig. 3.—A simple T.R.F. circuit.

avoid troublesome pick up of interference by the receiver wiring itself.

**12V H.T. Circuit**

If valves of the type intended for a 12V H.T. supply are used, no vibrator or rotary power unit will be needed. A circuit of this type will be given next month, two I.F. stages again being used in the interests of good sensitivity.

sistor stage, which may best be incorporated with the loudspeaker. This stage is necessary because the reduced H.T. voltage makes the output from the 12K5 insufficiently powerful for speaker listening. In addition, sensitivity equalling that obtained with a circuit such as the one in Fig. 1 must not be expected. Various power output transistors may be used, with values adjusted according to the maker's recommendations. The total current demand is much less than when a vibrator or rotary transformer is required.

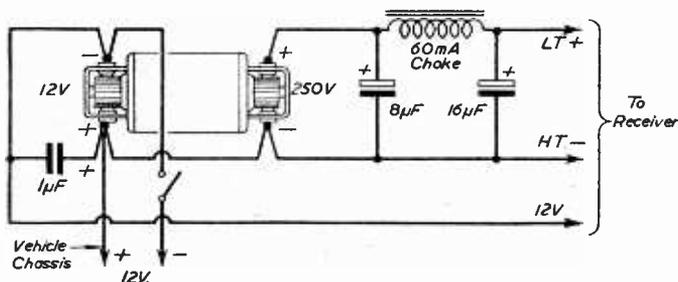


Fig. 4.—Rotary converter power pack.

When compared with a circuit such as that in Fig. 1, it will be seen that somewhat fewer components are required, because S.G. dropper resistors and similar items are not necessary. Bias is obtained by grid rectification, so that values are best as shown. Dual-wave or pre-set tuning may, of course, be used if preferred. A very compact receiver may then be built, except for the tran-

**Using a Portable**

A battery-operated set is quite convenient for occasional use in a caravan, or when camping. With portable receivers, it is often helpful to add an external aerial, because the signal pick-up of a frame aerial, inside a metal caravan or vehicle is very small. (To be continued)

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# Controls for Stereo

TWO USEFUL DEVICES FOR STEREOPHONIC RADIO TRANSMISSIONS

By G. Gray

WHEN listening to the BBC stereophonic radio transmissions it is necessary to adjust the receivers to give as near the same volume as possible, and to have the loudspeakers operating in the correct phase. Checking one speaker phase against the other is not easy when speaker connections are reversed by changing over the leads, because of the time required to do this. Trial and error adjustment

necting wire or flex, joints being covered with sleeving or tape. If a negative feedback loop is included from the speaker, connections to this must not be modified, but only those going to the actual unit itself.

When the receiver is used by itself, this switch can be in either position. For stereo listening, reception should be tried with the switch in each position in turn, to see which is correct.

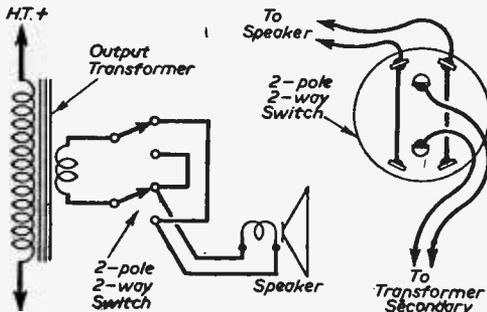


Fig. 1.—Wiring a speaker phasing switch.

of the volume controls is also troublesome, because it is necessary to move back to the correct listening point each time. To overcome these difficulties, a speaker phasing switch and extension volume control may be added to one receiver. These items will not interfere with the normal use of the receiver.

## Positioning

The positions of the two receivers will often be dictated by the layout of the room, but the loudspeakers should normally be about 6ft. to 8ft. apart, with the listener approximately the same distance from each loudspeaker. Each loudspeaker, and the listener, may be imagined to occupy the points of a triangle in which each side is approximately equal. The BBC TV sound transmitters are used for the right-hand channel, and the M.W. and V.H.F. Network Three carries the left-hand channel. A V.H.F. receiver is preferable for this channel, but not essential.

## Phasing Switch

If the speaker cones are out of phase, results are not satisfactory. Fig. 1 shows wiring for a speaker phasing switch, the switch itself being fitted at a convenient point at the back of the receiver. A 2-pole 2-way rotary switch is shown, but other types of switch will be satisfactory.

Assuming that the sound receiver is to have the switch, the output transformer secondary connections will be located passing from the transformer to the speaker speech coil tags. These leads are cut and extended by soldering on con-

## Volume Control

A speaker volume control tends to upset matching, while an A.F. control may easily cause hum. For these reasons a variable gain control is introduced into the cathode circuit of one I.F. stage, in Fig. 2. It is only necessary to break the cathode resistor chassis connection, and wire these points to a closed circuit jack. With no plug inserted, the receiver operates as usual.

The extension volume control will require some 8ft. or so of twin flex, and the potentiometer itself can be included in a small case or box. The degree of control afforded is not so great as that obtained with the usual receiver volume control, but is normally sufficient for final adjustment.

With the jack plugged in, the extension volume control is set to a value which allows approximately correct volume to be obtained by adjusting the normal receiver volume control. The listener

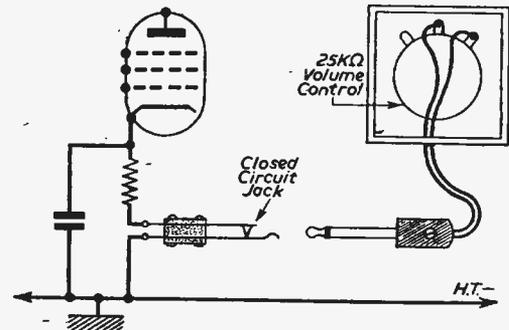


Fig. 2.—Wiring a gain control in the cathode circuit of an I.F. stage.

can then occupy the correct position, some 6ft. to 8ft. from each loudspeaker.

## Adjustment

When the announcer or performer is occupying a central position, the extension control is turned until this effect is achieved. If the left-hand (sound receiver) channel is being controlled, insufficient volume will appear to make the sound source move to the right, while excess volume will move it to the left. The TV receiver volume control (right-hand channel) is left set at some intermediate position giving suitable volume.

# D.-C. Transistor Output Stage

THE APPLICATION OF DIRECT COUPLING TO TRANSISTORS

By J. S. Kendall

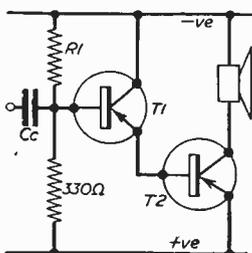
**I**N the early days of radio it was customary to take a high impedance speaker and feed it directly from the anode of the output valve. Then, with the introduction of the moving coil speaker, it became a necessity to have an output transformer between the valve and the speaker. Over the last few years Direct-Coupled (D.-C.) amplifiers have become more and more popular, but always there has been a matching transformer between the valve and the speaker, introducing its own problems and phase shift. With the modern power transistor, further steps forward have been made possible. Now, the load impedance required is approaching the impedance of a moving coil speaker. The match may not be perfect, but at least it is reasonably good.

### Impedances

Transistors differ in action from the conventional valve. There is always a tendency to try to find similarities between the transistor and the thermionic valve. It must be remembered that the transistor is a current operated device, whereas the valve is voltage operated. Thus, the input resistance or impedance of a power transistor is very low.

### Circuit

For the circuit described here, a V15/30P transistor was chosen. It is a power transistor, and has a maximum dissipation, when correctly mounted, of some 10W. The makers recommend



COMPONENTS LIST	
Cc	50 $\mu$ F 12 v.
R1	See text.
	330 ohm $\frac{1}{2}$ W resistor.
T1	V10/30A.
T2	V15/30P.

Fig. 1.—The circuit diagram.

that it should be mounted on a heat sink 7in. square made of 16 s.w.g. aluminium. For the full rating, the metal body of the transistor must be clamped directly, without insulation, to the heat sink. If, however, the transistor has to be insulated from the plate, then a mica washer 0.002in. thick is used. Then the maximum power dissipation is reduced to some 5W.

The circuit developed by the writer, shown in Fig. 1, with the correct value of R1, can be used with battery voltages of between 1.5, at which good volume is available, and 6, at which it will give over 1W output. For the 6V version, R1 can consist of a fixed and variable resistor in

series. Thus with 6V applied, the standing current through T2 can be set at 1.5A—or just under. Under no circumstances must the transistor be allowed to pass more than 3A or be allowed to dissipate more than 10W (and then only when the correct heat sink is used). T1 can be mounted in the wiring. For 1 to 3V,

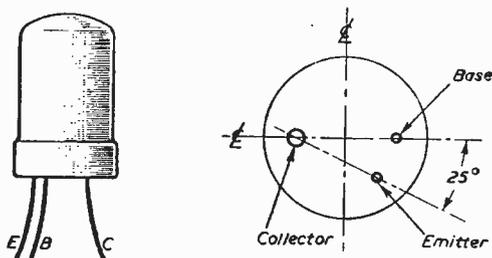


Fig. 2.—Transistor base connections.

working. R1 can be 1,000 ohms, and for use above 3V, it is suggested that the same resistance be used with a 5,000 ohm variable in series.

### Loudspeaker

For the original circuit a 3 ohm elliptical speaker was used with very good results. Normally, the polarity of the connections to a moving coil speaker matters little but on D.-C., as in this circuit, there is a right and a wrong mode of connection. The correct method is to connect the coil so that the D.-C. through it moves the coil away, or out of, the magnet.

When dealing with transistors, one must not let soldering heat reach the body of the transistor. An accidental touch with a soldering iron can ruin a transistor very quickly. It is a good plan to hold the wires in place with the fingers when making joints—if the wires become too hot to hold, then you are too slow in soldering! With the power types, the soldering to the large solder tag must be done with it removed from the transistor, and suitable clips must be devised for the connections to the two pins. Remember, too, that a reversed battery can be disastrous.

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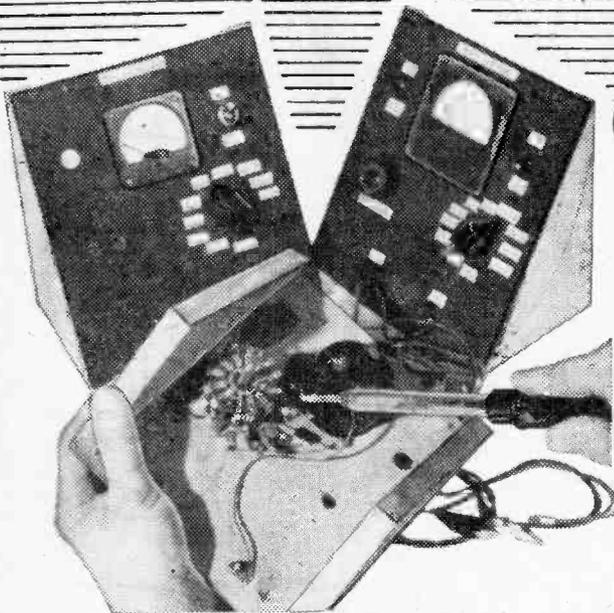
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Tower House, Southampton Street, Strand, W.C.2

# A Beginner

## No. 3.— TESTING POWER PA CURRENT RANGES TO



shown in Fig. 11 test first at CS (11) and then at CR (12). Both readings should be almost the same if a choke is fitted. If a resistor is used instead of a choke a drop of at least 40V and often as much as 150V may be expected. Checks at points (13) to (18) cannot be made with the meter at present, but a low wattage lamp may usually be employed for testing. No harm can come to the set from such a procedure, but under some circumstances the lamp may burn out (if the transformer gives a very high voltage, say, 450V). Heater ranges are A.C. and cannot be checked at present but one can always observe if the valves

**I**N the previous article, the circuit of a typical pentode valve amplifier was given together with details of simple tests of voltage. Now, in Fig. 9 (last month), if no H.T. were present on the far side of RA you would proceed to check the power pack which may be of two types. The cheaper A.C./D.C. type with live chassis is shown in Fig. 10 and may be checked as follows. Test between earth and positive of Cs and positive of Cr. Both readings should be between 200 and 300V on British sets. The point five readings should be 20 to 60V lower than the point six test if all the valves are drawing H.T. Tests on the other side of the rectifier (7), (8), (9) and (10) are concerned with the arrival of A.C. mains to the rectifier and chassis. This cannot be checked on your meter until A.C. ranges are added. Meanwhile, use a low wattage lamp bulb (15 watts is suitable).

*On no account should you touch any part of an A.C./D.C. receiver when it is connected to the mains, even if it is switched off.*

### Conventional Power Packs

If the power pack is the conventional type

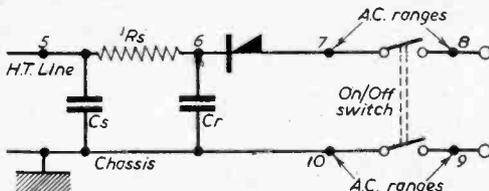


Fig. 10.—A.C./D.C. power pack (live chassis).

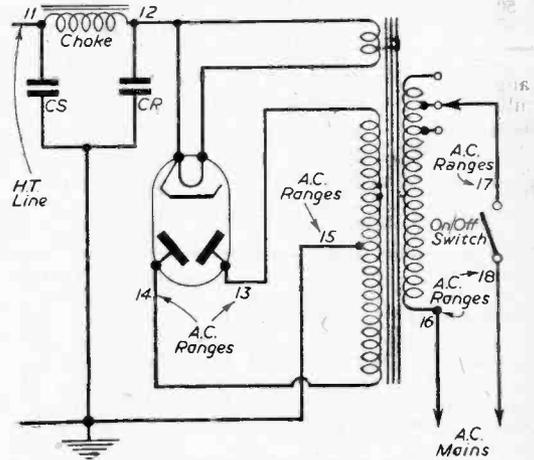


Fig. 11.—Conventional A.C. power pack.

are alright.

The beginner is advised to check home-made receivers in working order, as stated, to gain confidence. The testing of commercial receivers is difficult (but possible) without a service sheet. If the reader is likely to want to service a commercial receiver he should take steps to hire or buy a service sheet (if the former, copying out all the data he may require in the future, including the circuit).

### Current Ranges

It is now intended to extend the usefulness of

# Test-Meter

AND DETAILS OF THE DIRECT  
ADDED By E. V. King

the instrument so as to include ampere and milli-ampere ranges. It is very unlikely that ampere ranges will ever be used by the amateur in the ordinary way but the author has fitted a one amp.

### PARTS REQUIRED

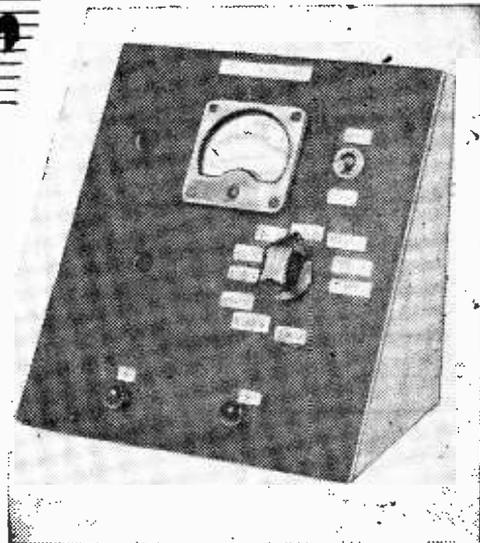
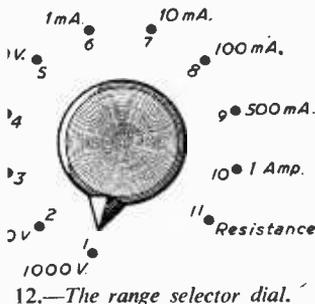
- 1 yard (approximately) of 26 gauge resistance wire (the gauge is not of great importance but this is the most suitable).
- 4 yards (to allow for breakages, etc.) of approximately 41 gauge insulated resistance wire (an old wire-wound pot. of 25k would provide this).
- 4½ volt flat battery.
- 1,000 ohm potentiometer (will also be used in the meter).
- Parts needed temporarily for calibration, etc.
- Flashlamp bulb and holder (3.5V .3 amp).
- 10,000 ohm, ½ watt resistor—any tolerance.
- 500 ohm, ½ watt resistor—any tolerance.
- 47 ohm resistor, ½ watt—any tolerance.

range for the following reason: When testing milliamperes, as in testing volts, you should always start on a very high range and work downwards to avoid damaging the meter. Now, some power packs will easily give a surge of 500mA; therefore, a one amp. range is fitted and if a wrong connection were made by the beginner the meter would not be burnt out, for no ordinary power pack will deliver over 1,000mA.

The range switch is already in position and you have probably marked in the ranges as suggested last month. To be quite sure they are marked correctly check them with Fig. 12. If you do not wish to mark the panel permanently at this stage, stick paper labels on with gum. These can be removed later with warm water. On no account proceed without marking the switch positions.

### Shunts

You are probably wondering how we are going to make the meter read up to 1A because it is impossible to use the meter as it stands to measure currents greater than 1mA, which is its full scale deflection. However, if we connect a resis-



The meter after the current ranges have been added.

tance (known as a "shunt") across the meter and the resistance of this shunt is less than the resistance of the meter (which is usually 100 ohms) then more current will flow through the shunt than through the meter. Thus, if we want to measure up to 1A (that is to say, 1,000mA) then we arrange the value of the shunt so that 999mA flow through it and 1mA through the meter. (The reader who is interested in the mathematics involved should read the article "Meter Shunts and Multipliers" which appeared on page 139 of the April issue.)

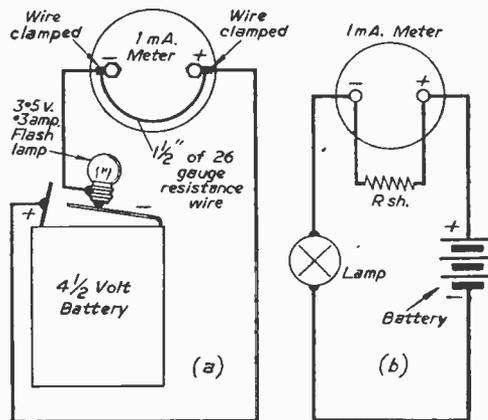


Fig. 13.—(a) Wiring a temporary shunt across the meter to make a trial ammeter; (b) the theoretical circuit.

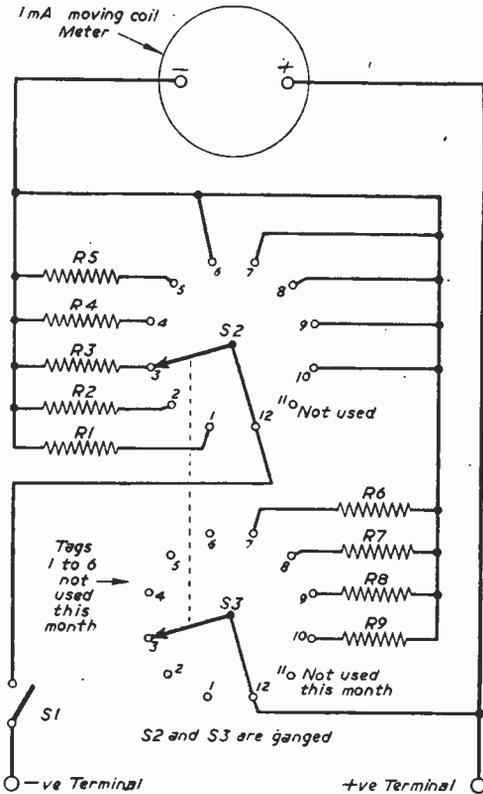


Fig. 14.—Wiring the two banks of the range selector switch.

### Materials Required

The main items required to make shunts for the milliamp. ranges are two sizes of resistance wire. Very little is required and it is not worth while to buy 4oz. reels. The gauges stipulated are by no means essential as the lengths of wire are made up individually by experiment. The gauge of wire suggested for the 10mA range is 41 enamelled silk covered, but any fine hairlike resistance wire, enamelled or silk covered, will serve. In order to make sure about this, the author used an old 10,000 ohms wire-wound potentiometer which had once been a volume control. This was stripped and the wire was used in one of the prototypes. An ordinary wire-wound resistor could also furnish the necessary few inches of wire. The other ranges use 26 gauge Contra, Eureka or Constantan wire. The author took some wire from a 600W fire element and it worked well but rather more was needed than expected. The wire from an old low value potentiometer (say, 100 ohms) would be suitable.

### A Simple Ammeter (Uncalibrated)

The beginner is advised to follow this series very carefully so that he understands his instrument when it is finished. The understanding man is most likely to use his meter sensibly

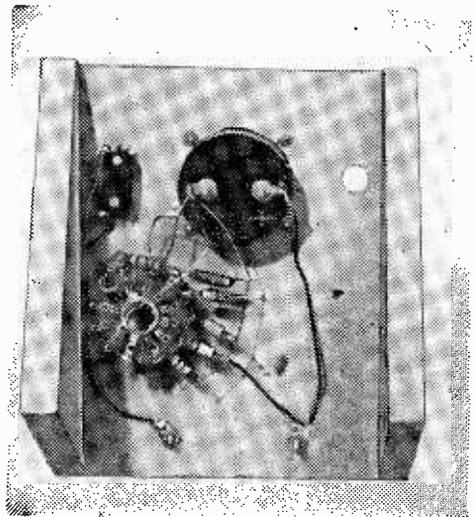
and is unlikely to damage it. It is intended to use the one milliampere meter as a simple ammeter in the first instance so that you may understand how the "shunts" work.

### An Experiment

Refer to Figs. 13 (a) and (b) as you follow the text. Disconnect or unsolder all wires to the meter temporarily. Take a flashlamp battery of 3 or 4½ volts and wire up a flashlamp bulb to the battery to make sure battery and bulb are all right. Now take 4in. of 26 gauge Contra (or wire as suggested above) and wrap it round the meter terminals so as to leave about 1½in. between them. Attach two leads of insulated copper wire and screw down the nuts. Now check that the resistance wire is tightly held at each end with not more than 1½in. in a loop behind the -meter. Give the loop a sharp pull to make sure the wire is not broken. When you are quite sure all is well, connect the lamp, battery and meter as shown in Fig. 13. The lamp will consume about ½ amp., that is about 300mA and the meter will go over about ¼ of the full scale deflection.

### Diverting the Current

This experiment should illustrate the principle of wiring shunts across the meter. The shunts have to be of such a resistance that they pass a definite proportion of the total current. Thus if we wish the meter to read 10mA full scale deflection, then the shunt must be of such a resistance that 9mA flows through the shunt and 1mA through the meter. Meters vary somewhat in resistance and the leads and solder in the shunt circuits make quite a difference, so the shunts are made up for this meter by trial and error. No harm can come to the meter if the directions are followed and no other meter is required for the calibration.



Rear view of the meter with the shunts in position.

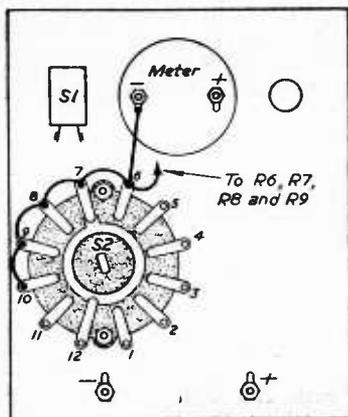


Fig. 15.—The extra wiring needed on S2 (see Fig. 6 last month).

Bottom Bank of switch (nearest panel)  
Switch on 10mA. range

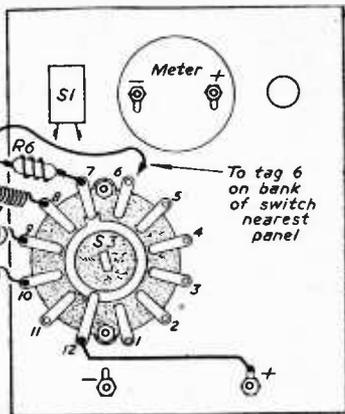


Fig. 16.—Wiring the top bank of the switch.  
R6 R7 R8 and R9 are bent sideways for clarity. They are actually upright over the top of the switch.

Top Bank of switch  
Switch on 10mA. range

**The Milliampere Ranges**

The trial meter just made is now dismantled. The correct leads are soldered or screwed back on to the milliammeter and the voltmeter again tested. When you are satisfied that your meter again looks like Figs. 6 and 7 (last month) proceed as follows.

Refer to Fig. 14 and note how it differs from Fig. 7 (last month). You will note that the only differences are additions, no wire already fixed has to be moved or unsoldered. Refer to Figs. 14, 15 and 16 and proceed with the wiring plan here given:—Take meter negative to tag 6 of the bank of the range switch nearest the panel, that is the bank which had the series resistors soldered to it last month. Then wire tag 6 to tag 7, tag 7 to tag 8, tag 8 to tag 9, and tag 9 to tag 10. Tag 11 is not wired in but is left without any connections.

**Shunt Wiring**

Check that resistors are soldered to tags 1 to 5 and all the other tags except number 11 are soldered together and to the negative terminal of the meter. Now solder a wire about 3in. long, of bare copper, to tag 6 of the same bank you have just wired. Tag 6 will now have three wires on it, one going to meter negative, one to tag 7 and a spare copper wire which is for the shunts.

The next stage deals with the bank nearest to you when the panel is viewed from the back. Tag 12, the one which feeds the contact ring of the switch, is connected to the positive terminal of the meter. Now refer to Fig. 17 and make sure your circuit complies in every detail with the diagram except that R6, 7, 8 and 9 are omitted for the moment, but the copper wire is ready in position.

Before doing any more, test the voltage ranges to make sure you have not upset any previous wiring.

**Testing the One Milliamp Range**

It is assumed that the above wiring has been carried out and that the voltage ranges are working correctly. Turn the range switch to position 6. Here is the test procedure: do not depart from it unless you are experienced. Clip the

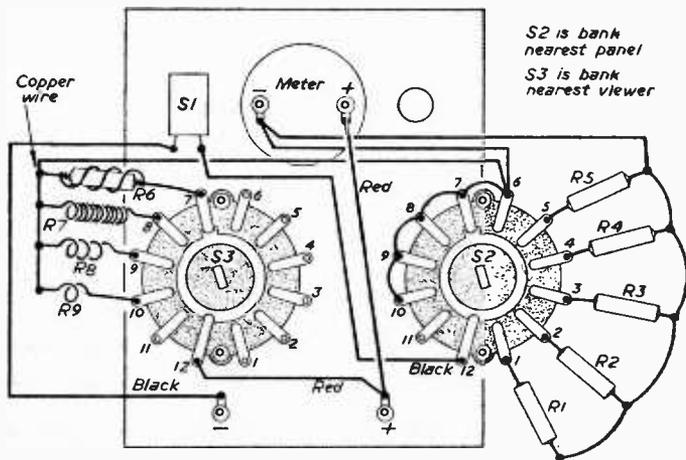


Fig. 17.—The complete wiring for the range switch (the two banks are shown separated for clarity).

positive crocodile clip to the short (positive) tag of 4½V flat battery. Now clip the negative crocodile on to one end of a 10,000 ohm resistor, and very gently and quickly flick the free end of the resistor on to the long tag of the battery. The meter will move. While testing verify that the needle does not go right over to the stop. If it does something is amiss and it must be found before proceeding.

(To be continued)

# SELECTIVITY

OBTAINING IMPROVED RESULTS FROM T.R.F. RECEIVERS

By R. Morgan

**A**LTHOUGH most people buy commercially-built receivers many still prefer to construct their own—thereby deriving great enjoyment and at the same time saving money. Some amateur constructors build superhet receivers quite successfully but newcomers prefer simpler T.R.F. types. These can give highly satisfactory results but their chief disadvantage, compared with superhets, is their

## "Q" of Coils

The selectivity of a coil is measured by its "Q" and modern dust-iron cored coils have a Q value up to 200 or 300. If this value of Q could be obtained when the coil is in use in a receiver, the selectivity would be good. The coil is however connected to other components such as tuning capacitors and trimmers, to RC circuits (such as aerial-earth systems) or to valve circuits (such as amplifiers and detectors), all of which take power from the coil and inevitably reduce its effective Q value. The effect of tuning capacitors is generally very small but that of aerials and valve circuits can be disastrous and it is with the effect of such circuits that this article is primarily concerned.

We shall deal first with the effect of losses, commonly known as damping, due to valve circuits. The chief losses are those due to detectors; the damping due to amplifying stages is usually very small. Fig. 1 illustrates the essential connections for a leaky-grid detector. If the valve grid is regarded as a diode anode, this is also the circuit of a diode detector. Such a circuit is capable of very serious damping, the magnitude of which is determined largely by the value of the resistor R1. Although this may have a reasonably large value such as 250k $\Omega$ , the effective resistance of the detector circuit across the tuned circuit is only one third of this, approximately 80k $\Omega$ . Such a resistance value connected across a medium-wave circuit with a Q of 200 is sufficient to reduce the Q to 60, i.e., it reduces the selectivity to less than one third the value of which the tuned circuit is capable. To keep the Q high, R1 should preferably not be less than 1M $\Omega$ ; even this will reduce the Q by 15 per cent. C1 has little effect on the Q value but to

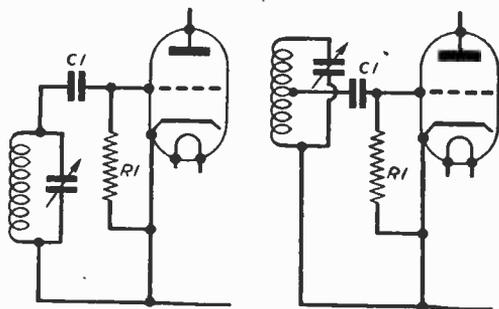


Fig. 1 (left).—The leaky-grid detector. Fig. 2 (right).—Feeding the detector from a tapping point on the coil.

inferior selectivity; that is to say they have difficulty in separating closely-spaced signals such as those in the medium waveband. This difficulty is most apparent when attempts are made to receive a weak signal when there is a stronger signal on a nearby frequency.

## Straight v. Superhet

Although it is true that the selectivity of a T.R.F. receiver (with its 2 or 3 tuned circuits) can never equal that of a superhet (with its 5 or 6 tuned circuits) a T.R.F. is nevertheless capable of a very good performance, if it employs high-Q coils, and provided the selectivity inherent in these coils is used to its fullest extent in the circuit employed. Unfortunately, there are many ways in which some of the energy in the coils can be lost, thereby reducing their efficiency and degrading the performance of the receiver. This article describes the commonest sources of such losses and gives suggestions for reducing their effect or eliminating it entirely. Constructors who feel that they do not obtain the maximum selectivity of which their receiver is capable, will almost certainly be able to effect an improvement by adopting one or more of the circuit techniques described below.

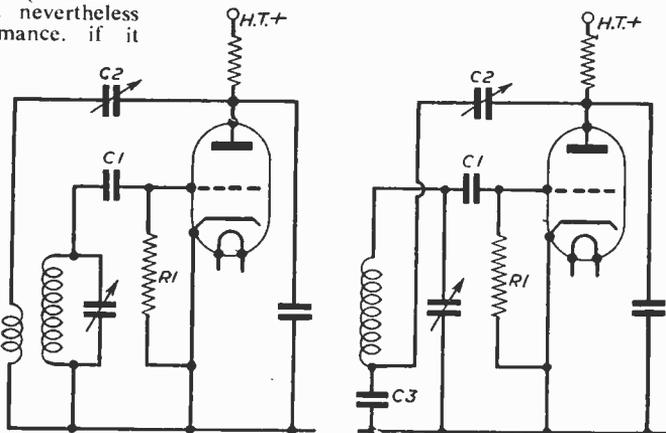


Fig. 3 (left).—Circuit with reaction coil. Fig. 4 (right).—An alternative reaction circuit.

give reasonable quality should be approximately 20pF if R1 is 1M $\Omega$ .

### Using a Tapping

If, for some reason, it is impossible or undesirable to increase the value of R1, the detector can be fed from a tapping point on the coil as shown in Fig. 2. This, of course, reduces the signal applied to the detector but it also considerably lessens the load on the tuned circuit and the resulting increased selectivity may more than compensate for the loss in signal. If the tapping

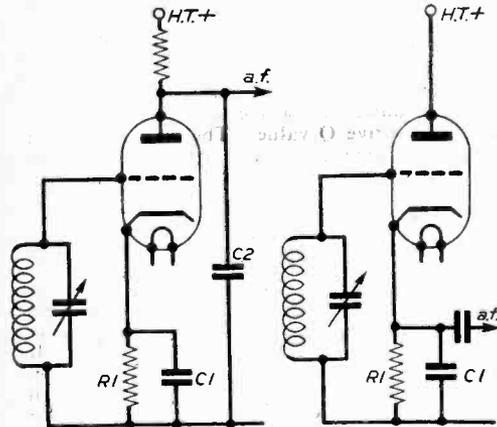


Fig. 5 (left).—Anode-bend detector.

Fig. 6 (right).—Cathode-follower detector.

point is at the centre of the coil, a resistance of 100k $\Omega$  connected across half the coil is equivalent in damping to 400k $\Omega$  connected directly across it.

If the detector valve is a triode, the tuned circuit may be quite heavily damped by negative feedback (Miller effect) from the anode circuit of the valve to its grid circuit through the anode-grid capacitance which is commonly a few pF for a triode. This can be eliminated by using an R.F. pentode as detector (which has a much lower anode-grid capacitance) or by the application of positive feedback (reaction) either of which will result in a considerable improvement in selectivity. There are many ways of applying reaction to a tuned circuit and Fig. 3 represents the most usual circuit which employs a separate coil magnetically coupled to the tuning coil. The degree of feedback can be controlled by adjustment of C2 but if this is advanced too far the circuit will oscillate.

An alternative method of applying positive feedback is illustrated in Fig. 4; this circuit has the merit of not requiring an additional coil. Suitable values for C2 and C3 are 100pF and 1,000pF respectively.

### Alternative Detectors

Although the complication of positive feedback is considered undesirable, high Q is essential, an alternative type of detector can be used. The anode-bend detector (illustrated in Fig. 5) and the cathode-follower detector (Fig. 6) do not reduce the Q of the tuned circuit feeding them.

For this reason the cathode-follower detector is often termed an "infinite-impedance" detector. In fact this detector may even increase the Q of the tuned circuit feeding it and, if C1 is particularly small, it is not unknown for a cathode-follower to oscillate! The cathode-circuit components in Figs. 5 and 6 may consist of a 47k resistor and a 200pF capacitor. The anode load resistance in Fig. 5 is commonly 1M and the valve is often an R.F. pentode employing a screen-feed resistor of 3M and a screen decoupling capacitor of 0.1 $\mu$ F.

Apart from the damping due to detector valves, the principal cause of loss of selectivity is the aerial connection. The aerial-earth system is, of course, the source of input signal for the receiver and must, therefore, be connected to the first tuned circuit in some way. No matter what method of coupling is employed, this connection inevitably lowers the effective Q value of this tuned circuit. The effect of aerial damping can, however, be minimised by suitable design of the aerial-coupling circuit.

### Conflicting Requirements

The aerial-coupling circuit should ideally give good voltage gain from aerial to the grid of the first R.F. amplifier and good selectivity. These requirements are, to some extent, conflicting because a circuit designed to give maximum voltage gain necessarily gives only half the selectivity inherent in the coil whereas one designed to give maximum selectivity gives zero voltage gain. There is, however, one degree of coupling which gives 80 per cent. of the maximum possible voltage gain and the same percentage of the maximum possible selectivity; this is a very good compromise and in most forms of aerial-coupling circuits attempts are made to obtain this value of coupling. Unfortunately it is only possible to obtain this performance at one frequency in the band; at other frequencies the gain (or selectivity) suffers on comparison with the selectivity (or gain). The best solution to this difficulty is to design the circuit to give this particular value of coupling at the centre of

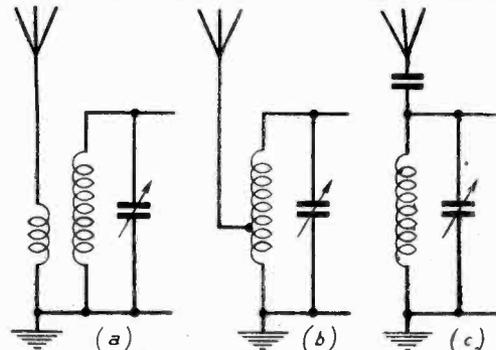


Fig. 7.—Three methods of coupling the aerial to the tuned circuit.

the waveband, say at 1Mc/s for the medium waveband.

There are many circuits which can be used to give the required degree of coupling and Fig. 7

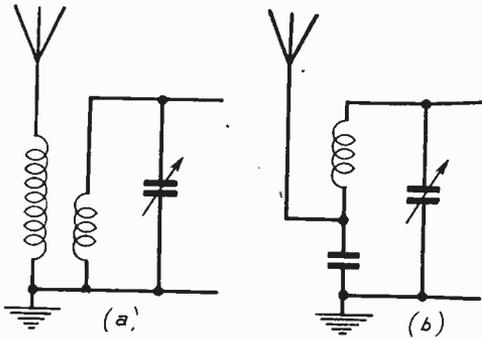


Fig. 8.—Aerial coupling circuits giving little variation in gain or selectivity over the band.

illustrates three of them. Fig. 7(a) illustrates an R.F. transformer with a small primary winding. Fig. 7(b) shows the aerial connected to a tapping on the tuning coil and Fig. 7(c) illustrates the use of series capacitance coupling. All these circuits give substantially the same performance characterised by large variations in gain and selectivity over the waveband; in fact the voltage gain for all three circuits is directly proportional to the square of the frequency and thus varies by 9 : 1 over the medium waveband. Nevertheless such circuits are extensively used for aerial-coupling purposes.

In the R.F. transformer, best performance is achieved with a small primary inductance of approximately  $40\mu\text{H}$  and tightly coupled to the tuning coil. In Fig. 7(b) the optimum position for the tapping is such that the number of turns included between the tapping and earth is approximately one quarter the total number on the coil. In Fig. 7(c) best results are obtained with a capacitance of the order of 10 or  $20\text{pF}$ .

**Constancy Over Range**

Good though the performance can be from these circuits they do suffer from variation of gain and selectivity over the band. Better constancy is possible from the circuits illustrated in Fig. 8; in these there is very little variation in

gain or selectivity over the band but, in general, the voltage gain is inferior to that obtainable from the circuits of Fig. 7, particularly at the high-frequency end of the band. Fig. 8(a) shows an R.F. transformer but it differs markedly from that of Fig. 7(a) because it has a large primary winding of approximately  $2\text{mH}$  which is loosely coupled to the secondary, tuned, winding.

Fig. 8(b) gives the circuit for shunt-capacitance aerial couplings; a suitable value for the coupling capacitance is  $0.002\mu\text{F}$ . Larger values will reduce the voltage gain and smaller values will prevent full coverage of the waveband by reducing the effective maximum tuning capacitance in parallel with the tuned winding.

**Extra Tuned Circuit**

It may happen, even when all possible measures to increase selectivity have been taken, that the selectivity of a two-tuned-circuit receiver

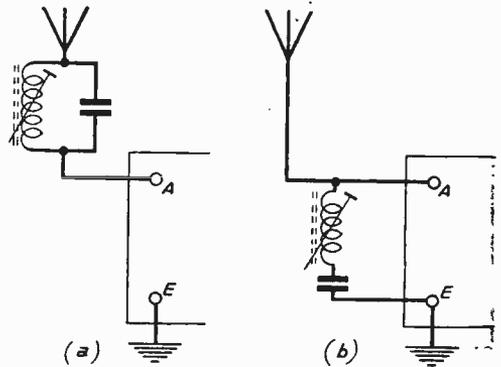


Fig. 9.—Wavetrap circuits.

is inadequate to cope with conditions in a particular locality or to permit interference-free reception of a certain favourite station fairly close to a powerful local station. There is only one solution to this problem, namely to employ a further tuned circuit. The simplest method of doing this is to employ the additional circuit as a wavetrap connected in the aerial circuit and tuned to the local station to reduce its magnitude at the aerial terminal of the receiver.

The wavetrap may be connected in either of the two ways illustrated in Fig. 9. Circuit (a) should be used when the receiver input impedance is low and circuit (b) when the impedance is high.

Aerial coupling circuits giving a low input impedance are those in which an R.F. transformer with a small primary inductance is used, those in which the aerial is connected to a tapping point on the tuned winding and those in which shunt-capacitance coupling is employed. Aerial-coupling circuits giving a high input impedance are those in which an R.F. transformer with a large primary inductance is used and those employing a small series capacitance.

**Inclusion in Receiver**

A wavetrap is usually fixed-tuned and aid selectivity only over a comparatively narrow

(Continued on page 600)

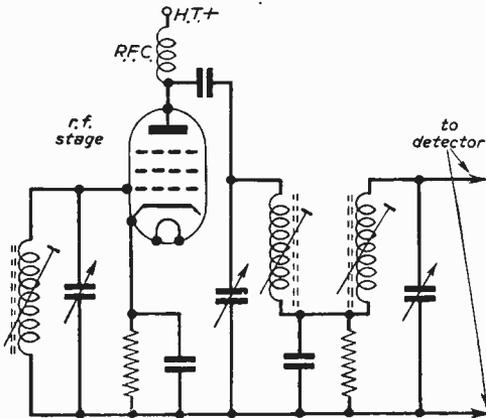


Fig. 10.—Using a bandpass filter.

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# Increasing Gain

ADDING AN EXTRA STAGE TO TRANSISTOR PORTABLES

By R. Hindle

SOME of the small transistor portable receivers that have been sold in the past few years have worked quite reasonably, but have seemed to those accustomed to handling the usual valve portable receivers to be somewhat lacking in gain. They have attracted purchasers by their compactness, but when the first enthusiasm has waned the owner has wished for just that little extra. This is not intended to be a reflection on the designers of such receivers. No doubt the owner is asking more than the designer intended to give. Transistors were very expensive and for the receiver to be an attractive sales proposition the cost had to be kept down, so that the number of transistors used was kept down. Because of the small size of the receiver only a small ferrite rod aerial is normally provided so that the signal picked up is small. Many purchased such a receiver after having heard it perform in a location enjoying good signal strength and then took the receiver home where, perhaps, the signal strength available was considerably less. Another possible contributory cause was the considerable spread of characteristics of available transistors. A receiver in which marginal transistors were fitted would have measurably inferior performance to the average specimen.

## Additional Stage

The author had just such a set to deal with recently. The obvious solution is to add an extra transistor stage, and this was the line taken. The question is, where in the receiver should the extra stage go? Considering the addition of a

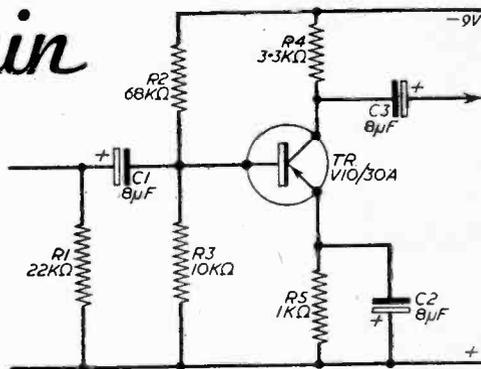


Fig. 1.—Circuit of the added stage.

The first of the alternatives is not very attractive. Obviously, it is impossible to provide an additional section on the ganged tuning capacitor and an extra control for a separate tuning capacitor is not likely to be acceptable even if room can be provided. An extra I.F. stage seems the best in theory, but this can set some problems to ensure stability and will be a little bulky. An audio stage is much easier to add, and can be made very compact. A test to see if such a stage will be acceptable is to see if the receiver before alteration, when run at maximum volume, brings up the background hiss to an audible level. An extra audio stage will increase this noise, and if this would be intolerable, clearly there is no point in making such a change. Make sure that such hiss is controllable by the volume control. If this is not so it is probably coming from one of the audio transistors and the replacement of this will quite likely give the better results desired.

## Positioning

The receiver that is the subject of this article left no doubt where the extra stage should be put. For its size, only  $6\frac{1}{2}$  in.  $\times$   $4\frac{1}{2}$  in.  $\times$   $2\frac{1}{2}$  in., it had quite a large speaker, and the receiver was compactly built on two panels, one at each side of the speaker. On neither panel was there any spare room for additional components, but a slim extra chassis could be fitted behind the speaker. Interconnecting leads between the two panels passed below the speaker. Obviously one of these carried the signal; this could be broken with no disturbance to the receiver panels and the extra stage placed here. What signal was passing between the panels then? This would determine the type of stage to be fitted. An examination of the receiver indicated that this lead terminated on the volume control and therefore was carrying the audio signal from the detector diode which was situated on the tuner panel; the other panel had all the audio circuits. An audio amplifier could certainly be made slim enough to sit behind

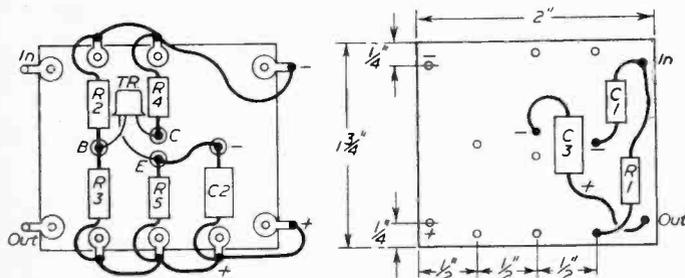


Fig. 2.—The wiring diagram.

stage to an already completed receiver is quite different from the consideration of a change in circuit whilst the receiver is in the design stage. The physical design of the original receiver, particularly in these very small units, is almost certain to dictate where the stage can be inserted.

There are three possible alternatives, in theory. The extra stage could be in the R.F. part of the circuit, or in the I.F. part, or in the A.F. part.

the speaker and with the volume control at maximum the background hiss was low so clearly an audio stage was indicated.

### Circuit

Fig. 1 gives the circuit of the amplifier used. This is quite conventional. The usual form of

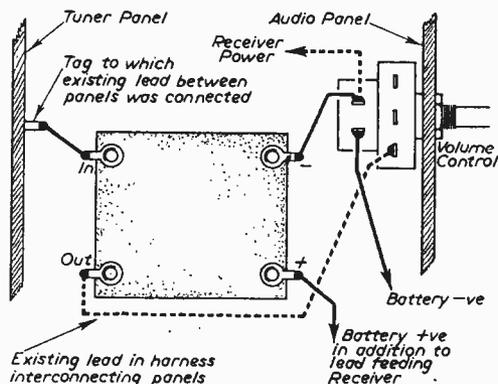


Fig. 3.—Installing the paxolin panel.

stabilisation using a base potentiometer and a bypassed emitter resistor is provided. The single transistor is a V10/30A. There would be no virtue in using a two-stage amplifier because the one stage brings up the background noise to a level that indicates a maximum usable audio gain. C1 has to be provided to isolate the previous stage from a D.C. point of view or otherwise the operation of the base potentiometer would be upset. R1 provides the D.C. path for the earlier stage that the volume control had supplied before the alteration. C3 is necessary to isolate the volume control from the D.C. point of view.

### Construction

It will be seen from Fig. 2 that the whole amplifier is fitted on a paxolin board measuring only 2in.  $\times$  1½in. This board is fitted with small riveted soldering tags in the position indicated. The tags are wired as shown, the upper row all going to the battery negative tag and the lower row to the positive tag. The "E" tag (intended for the emitter connection to the transistor) is connected to the upper tag provided for C2. The components are then soldered to the appropriate tags, some on the front and some on the back as indicated.

The last component to be connected on to the board is the transistor. The usual precautions are necessary to prevent damage to the transistor whilst soldering. The leads should not be cut too short (½in. to ¾in. is reasonable) and pliers should be held on these to act as a heat shunt whilst soldering. The transistor then sits snugly against the board between R2 and R4.

### Wiring

Fig. 3 shows how the amplifier is connected into the receiver. The lead from the tuner panel

to the volume control on the audio panel was soldered to a tag at the tuning panel end. This was carefully unsoldered from the tag and resoldered on to the output tag of the extra amplifier. A new wire was fitted from this tag to the input tag of the amplifier. In connecting the battery leads from the amplifier, it is necessary to ensure that the amplifier's supply is controlled by the receiver switch. In the present case the switch on the volume control unit was in the negative supply line. The connections to this switch were accessible and consequently the negative lead from the amplifier was connected to the pole of the switch remote from the battery. It was convenient to take the positive lead directly to the battery case which had accessible soldering tags.

The complete amplifier board was very light. The new sub-miniature electrolytic capacitors were used, these being little bigger than the resistors. Polarity has to be observed when connecting these, of course, and this is indicated. As a result of this small size and weight it was unnecessary to provide any means of securing the amplifier panel which was held in place simply by the connecting leads.

The result of this modification was quite satisfactory in boosting up the signal strength of the receiver and proved to be well worth while.

## A PERSONAL "MOBILE" RECEIVER

(Continued from page 548)

sufficient space for a separate on-off switch for battery, and a 2-pole 2-way rotary switch for wave-changing, if this is preferred.

### Using the Set

A single earpiece of a complete headset will be most suitable for listening. Several headphones may be operated if required. Phones of the type used with crystal sets or battery one-valvers will be satisfactory, and will normally be of medium or high impedance. The anode current is very small, so no isolating transformer is required. Low impedance phones will, however, need a transformer of suitable ratio for matching purposes. Without this, volume will be much reduced.

If the polarity of leads is not marked, battery connections should be reversed if the set does not operate. Wrong polarity will not cause damage with this circuit, but it is preferable to fit a polarised plug, to allow easy connecting up to the vehicle. Vehicle chassis are often positive, but not universally. The valves are designed to operate within the normal range of voltages experienced with a vehicle (12V accumulator, or two 6V accumulators in series).

Rotating the potentiometer will increase sensitivity until oscillation occurs. With a poor aerial, or distant station, the setting of this control is fairly critical. The most sensitive position for the control is just below the point of oscillation. The set requires about half a minute to warm up after switching on.

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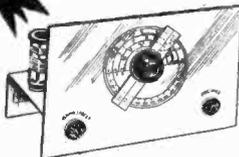
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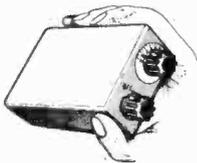


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# Working with "Live" Chassis

THE HAZARDS ELIMINATED  
USING A SIMPLE SAFETY  
CIRCUIT

By Hugh Guy

**T**HE risks associated with working with live equipment are too often ignored, the more so by the individual whose everyday working brings him (literally) into contact more often than the casual hobbyist.

## Supply Earthing

How does the danger arise in the first instance—or rather how does the chassis become "live"? To be live, and hence to be a danger to life, the chassis must somehow acquire a potential difference with respect to some other exposed conducting surface within its vicinity. Fig. 1 makes this a little clearer.

At the sub-station the supply mains is redistributed at the consumer's voltage level; 200V upwards is normal in the U.K. Of the two wires feeding the supply, one is at earth potential at the sub-station, being referred to as the neutral conductor, whilst the other is known as the line conductor. (Readers will be familiar with the "L" and "N" seen associated with the pins of certain types of plugs and sockets.)

## Universal Receiver

Now most TV sets, and indeed a large number of radio sets, manufactured these days are of the "universal" type, that is they are designed for operation on either A.C. or D.C. mains. It is customary for the negative side of the H.T. supply in these sets to be connected directly to the chassis. Now, because the H.T. in turn is derived directly from the mains supply, the chassis must be connected to one terminal of the mains supply as shown in Fig. 1. When the set is plugged into the mains supply (unless a correctly connected three pin plug is used) there

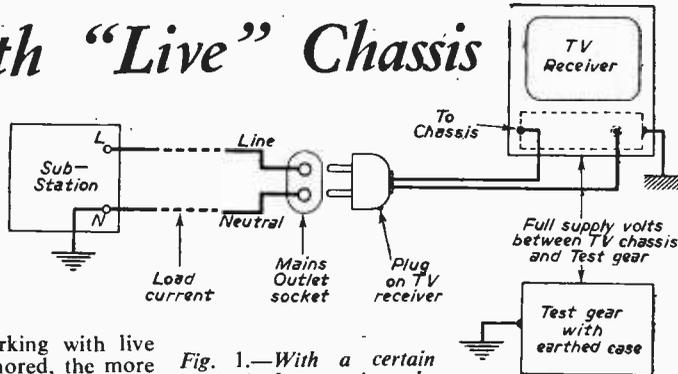


Fig. 1.—With a certain method of connection, the chassis of some TV receivers and radio receivers can become live with respect to earth.

is a 50 per cent. chance that the two pin plug wired to the set may be plugged in in such a way that the chassis lead is connected to the live (i.e. "line") terminal on the outlet plug.

Unless the mains outlet socket is carefully marked and due care taken to connect the plug of the set the correct way round, a live chassis will result. Consequently, if a piece of earthed apparatus is used in conjunction with the chassis of the set, there is a danger at least of the fuses being blown, and the more serious danger of the user being electrocuted by providing a conducting path to the flow of current between the chassis at line potential and the earthed apparatus.

## Checking

A cautious worker will check the polarity of the set connected to the mains supply, either by connecting a voltmeter or lamp between the chassis of the set and an earthed point, say conduit, or by using one of the special screwdrivers now available with a small neon lamp built into the handle. When the screwdriver is connected to a live point the minute current which flows through the neon lamp and the person holding the handle is enough to illuminate the neon lamp without harming the holder, whilst giving a visual indication of the polarity of the mains.

With the polarity reversed the chassis of the set will be at the potential of the neutral line with respect to earth. It is unusual for the neutral to be more than one or two volts from earth potential and the fact that there is any P.D. at all can be explained with the aid of Fig. 1 again.

Current drawn from the main supply and feeding a load via the supply socket must then return, as indicated by the arrow, along the neutral line. In doing so, there is a small potential drop between the neutral pin and the actual earthed point at the sub-station owing to the resistance of the line between these two points. Nevertheless, the potential drop developed in this way is usually far from lethal.

## Safety Precautions

In a well equipped A.C. supplied establishment devoted to the servicing or handling of a large

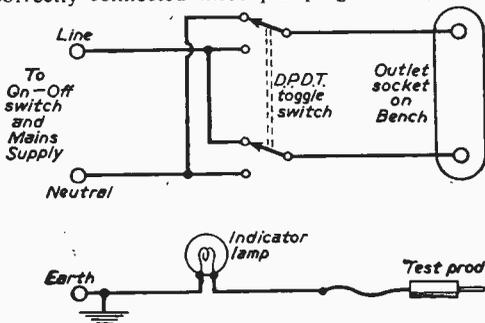


Fig. 2.—A mains reversing switch circuit and a simple indicator lamp.

number of TV and radio sets, an isolating transformer is very often used to supply the benches. This will be a 1:1 ratio transformer of anything up to 5kVA rating. Neither terminal of the secondary of the transformer feeding the benches is earthed: such a supply is said to be floating and owing to small similar leakage currents from both terminals to earth, each terminal usually acquires a similar potential with respect to earth. Provided that only one set is being examined at a given time the polarity of the connection to the mains is of no importance and to protect the worker a lead is connected between the nearest true earth point and the chassis of the set.

To the reader running his own small service bay the use of such a transformer is highly recommended. However, these transformers are by no means inexpensive, and the earlier safety precautions, if observed, should remove any hazards from the task.

### Alternative Precautions

There are two further alternatives which should appeal to many readers, one being entirely automatic in operation. Both solutions are based on the fact that to protect the person working with a "wrong-way-round" and hence live chassis, the polarity of the connection to the mains must be reversed. This polarity can either be reversed by reversing the plug connection in the socket, or by reversing the mains supply to the socket itself.

The first alternative is simple enough if the plug used is of the two pin variety, but is tiresome if a three pin plug is encountered. Admittedly, in the latter instance, the three pin plug should have been connected correctly in the first instance, but so often little attention is given to the significance of the letters "L" and "N" inside a three pin plug, particularly by the domestic handyman.

Under such conditions and because it is easier to operate, a reversing switch connecting the mains supply to the outlet socket on the servicing bench provides a neat solution.

### Test Prod

In use the nature of the polarity is established by an insulated test prod, which is momentarily connected to the chassis. This prod is wired to a main pygmy lamp, the other side of which is taken to earth. If the chassis is live the current flowing between the chassis and earth will light the lamp giving a visual indication of the fact and the reversing switch is operated accordingly. The circuit arrangement is shown in Fig. 2.

It is a simple enough matter to connect such a switch in circuit with each of the outlets on the bench; though it is only necessary, of course, to use one test prod. The switch used should be of the snap action toggle variety with "break-

before-make" contacts, to avoid shorting out the mains during the change-over.

The indicator lamp is mounted conveniently on the socket board so that only a lead with its associated test prod is visible as a flying lead. The indicator lamp itself can be either one of the small bayonet cap filament types as used in electric oven switch-box pilot lamps, or one of the even smaller neon indicator lamps. If the latter type is used a resistance must be wired in series as a ballast—a value of 100k is suitable for the miniature bayonet cap type 188 made by G.E.C.

### D.C. Supplies

The above circuit and the one that follows are, of course, usable with both A.C. and D.C. supplies, but one reservation should be made in connection with certain D.C. distribution systems.

In some of them the positive feeder is earthed. Now in the universal set, used on D.C. supply mains the H.T. negative lead is always returned to the negative line of the supply mains while, of course, it is connected to the chassis of the set. Since the set will only function with the polarity of the mains connected in this way, the

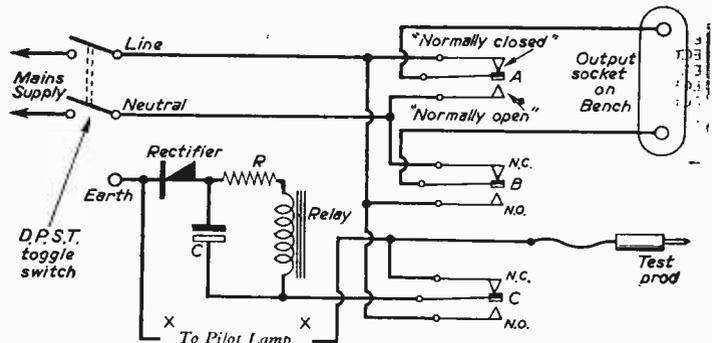


Fig. 3.—The addition of a relay to the reversing switch enables the operation of switching over wrongly connected mains to be carried out automatically when the polarity of the chassis is "sensed" with the test prod.

chassis, with a positive-earthed D.C. supply, will always be live with respect to earth. Although D.C. distribution systems are obsolescent these days, this fact must be borne in mind.

The circuit that follows is arranged so that automatic reversing of the mains polarity is restricted to A.C. mains and negatively earthed D.C. mains only.

### Automatic Polarity Control

The addition of a relay to the reversing switch enables the operation of switching over wrongly connected mains to be done automatically while the polarity of the chassis is "sensed" with the test prod.

Fig. 3 shows the fundamentals of the circuit. The relay has three separate sets of changeover contacts labelled A, B and C respectively. All sets are of 5A rating and of the "break-before-make" type.

(Continued on page 587)

FOR VALVES - TUBES AND COMPONENTS - BY RETURN POST SERVICE



AC6PEN 6/6	ECL80 10/-	EL32 5/6	PCF84 9/-	UAF42 9/6	UF89 9/-	3Q4 8/-	6J5GT 5/-	7D6 13/6	25Z5 8/-
ATP4 3/6	ECL82 12/6	EL33 14/-	PCF82 12/6	UBC41 9/6	UL41 10/-	3Q5GT 9/6	6J5M 6/6	7H7 9/-	25Z6 10/-
AZ1 10/-	EF22 8/6	EL38 26/6	PCL82 12/-	UBF89 9/6	UL44 26/6	3S4 7/6	6J6 6/-	7Q7 9/-	30C1 10/6
B36 15/6	EF36 15/-	EL41 10/6	PCL83 14/6	UBF90 9/6	UL46 26/6	3V4 8/6	6J7G 6/6	7S7 9/6	30F5 10/6
CBL31 23/3	EF39 5/9	EL42 10/6	PL36 15/-	UCF84 14/7	UL84 9/-	D41 3/-	6J7M 9/-	7Y4 8/6	30FL1 10/6
CCH35 23/3	EF40 14/6	EL81 7/6	PL38 17/6	UCF85 10/6	UL89 19/11	5R4GY 9/6	6K7G 4/-	8D2 2/9	30L1 10/6
CL4 12/6	EF41 9/9	EL84 9/6	PL82 8/6	UCF86 10/6	U008 26/6	5U4G 7/-	6K7M 6/9	9D2 3/6	30P4 20/7
CL33 19/3	EF42 11/-	EM80 10/6	PL83 11/6	UCH42 10/6	UYIN 12/6	5V4 11/6	6K8G 7/6	10F3 26/6	30P12 12/6
CY31 16/7	EF50 4/-	EM81 10/6	PX25 12/6	UCH81 10/6	UY41 8/6	5Y3G 8/-	6K6GT 7/-	12A6 6/6	30P16 9/6
DAF96 8/9	EF50SYL 7/-	EM85 9/6	PY80 7/6	UCL81 10/6	UY85 7/-	5Y3GT 8/-	6K7GT 5/9	12AH8 10/-	30P11 12/6
DF96 8/9	EF54 6/-	EY86 10/-	PY81 8/6	UCL82 16/7	VP13C 3/6	5Z4G 9/-	6K8GT 10/-	12AT6 10/6	35L6GT 10/-
DLH63 9/9	EF55 10/-	EZ80 7/6	PY82 7/-	UCL83 12/6	VP23 6/6	5Z4M 10/-	6L6G 8/-	12AT7 7/6	35W4 8/6
DK96 8/9	EF80 8/-	EZ81 7/-	PZ30 19/11	UF41 9/6	VP41 8/6	6A7 12/-	6L6M 9/6	12AU6 8/-	35Z4GT 8/-
DL96 8/9	EF85 13/-			UF49 8/6	VR105/30	6A8G 9/6	6L7G 7/6	12A07 8/-	35Z5 16/7
DM70 7/6	EF86 13/-			VR116 4/-		6AC7 5/6	6L8 11/6	12AX7 8/-	35Z5GT 9/-
EA50 1/6	EF89 8/9			VR150/30		6AG5 5/6	6M7GT 7/6	12BA6 9/-	42 8/-
EAB80 9/-	EF91 5/9					6AK5 6/6	6Q7G 7/6	12BE6 9/-	50C5 11/6
EAF42 10/6	EF91(BVA)					6ALS 6/6	6Q7GT 9/6	12C8 9/-	50CD6G
EB34 2/-						6AM5 12/6	6SA7GT 8/-	12J5GT 3/-	29/10
EB41 8/6						6AM6 6/-	6S7 7/6	12J7GT 10/6	50L6GT 8/6
EBC33 6/9						6AQ5 7/9	6S7 7/6	12K7GT 7/6	75 11/6
EBC41 9/6						6AT6 8/9	6S7 8/6	12K8GT	77 7/6
EBF80 9/9						6AU6 10/6	6SK7 6/-		80 8/6
EBF89 9/6						W76 7/6	6SL7GT 8/-		83 10/-
ECC81 8/6						W77 8/6	6SN7GT 7/6		142BT 3/6
ECC82 9/6						X78 16/-	6SQ7 9/3		185BT 33/2
ECC83 9/6						Y63 9/-	6U4GT 12/-		210DDT 4/6
ECC84 10/-						1A5GT 6/-	6U5/6G5		210VPT 3/6
ECC85 9/6						1A7GT 12/6	17/3		301 10/6
ECC86 12/-						IC2 11/6	6U5G 8/6		302 10/6
ECC87 12/-						IC5GT 12/6	6U7G 8/6		304 10/6
ECH21 23/3						1D5 12/6	6V6G 6/6		305 10/6
ECH42 9/6						ID6 12/6	6V6GT 7/9		306 10/6
ECH81 9/-						1H5GT 10/6	6X4 7/6		807 6/6
						IL4 6/6	6X5G 7/-		954 2/8
						ILD5 3/6	6X5GT 7/-		954 4/-
						IN5 10/6	6/30L2 12/6		23/3 955
						IR5 8/-	7B6 10/6		20P1 26/6 956
						IS4 10/6	7B7 8/6		25A6G 10/6 5763
						IS5 7/6	7B8 6/-		25L6T 10/- 9002
						IT4 6/6	7C5 8/-		25Z4 9/6 9004
						3A8GT 6/-	7C6 8/-		9086 5/6
						3D6 5/-			

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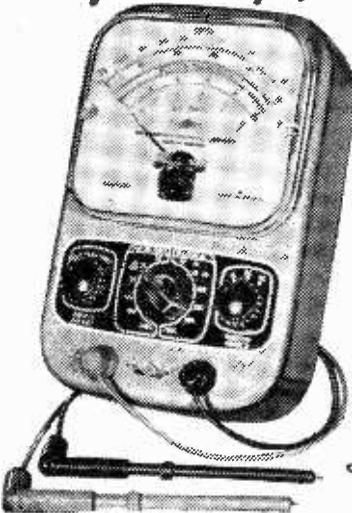
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Sets A and B constitute the reversing switch while set C works in conjunction with a test prod. similar in construction to the one discussed earlier.

### Operation

When the prod is touched on a chassis, if it is live, then current will flow via the "normally closed" contacts of set C through the parallel

### COMPONENTS LIST

Indicator lamps : See text.  
 Relay : GPO type 3,000, 5,000 to 10,000 ohm type.  
 3 sets 5A C/O contacts B.B.M.  
 Rectifier : 30mA. 250V.  
 Condenser : 8  $\mu$ F 250VW electrolytic or higher value.  
 Resistor R. : Series current limiting. Value depends on relay :  
 4.7K. 5W w.w. for 5,000 ohm-relay.  
 10K 1W w.w. or carbon for 10,000 ohm relay.  
 Sundry outlet sockets, lamp holder, test prod, wire, etc.

combination of the relay coil and condenser C, then through the rectifier to earth. A current limiting resistor R is connected in series with the relay.

When condenser C is charged the relay will be energised and the contact sets will change over. The mains polarity is thus reversed by means of sets A and B, while at set C current is now fed to the relay coil from the line to maintain it closed.

Condenser C acts both as a smoothing element on A.C. mains to prevent the relay from chattering, and also as a device to enable it to pull in while the contact set C is momentarily open during the transition phase.

If at the outset the chassis is not live then no potential difference will be provided across the relay when the prod is initially connected and hence the switching action will not take place.

On D.C. mains the rectifier will only conduct current from a live chassis which is positive with respect to earth and therefore on supplies with a positive earth the circuit will not provide its safety function, leaving the mains connected to the set in such a way that the set will operate but provide no protection to the worker. This is an unavoidable situation with this type of mains.

### Indicator Lamp

Human nature being what it is, there is always some doubt about the satisfactory functioning of an automatic device in the mind of the user if it fulfils its function by not working. This is the case in the above circuit when a set is plugged in the right way round since testing the chassis with the prod will produce no thud from the relay.

However, to reassure the user of the apparatus, a pilot lamp can easily be fitted. The two points marked XX on the diagram of Fig. 3 show the connections to which a lamp of the types described earlier may be wired.

In fitting the circuit, the components can be mounted directly on the wooden batten holding the outlet socket or sockets.

The circuit is quick to assemble and the com-

ponent parts, on which there is a fair degree of latitude, are fairly readily found in the average constructor's spare parts box.

### Conclusion

In conclusion one final application of the circuit might be of interest to users of portable A.C./D.C. public address equipment. Very often, particularly in outdoor environments, an unpleasant tingle is felt when handling, say, the microphone or pickup on such equipment. This is almost always due to leakage through the insulation isolating exposed metal surfaces from the live chassis of the amplifier, and can usually be cured by reversing the polarity of the mains. It is not a difficult task to connect either of the circuits described to the amplifier, thereby removing the cause of the nervous twitch to which some announcers and M.C.s are prone, when using "hot" equipment.

## 1959 RADIO SHOW

TOTAL attendance at the Radio Show, Earls Court, London, which closed its ten-day run on Saturday (September 5) was 310,161, compared with 334,502 last year, the slight reduction being attributed by the organisers to the exceptionally fine weather this year.

The attendance of buyers from home and overseas was considerably higher. There were 4,109 overseas visitors in all, including 679 classified as buyers, the latter figure being 25 per cent. up on last year.

Manufacturers' sales were described by the chairman of the exhibition (Mr. F. W. Perks) as the best ever at any Radio Show.

Of more than 100 countries represented, most visitors were from: Union of South Africa, nearly 400; India, over 350; Australia, about 275; Pakistan, over 200; New Zealand, about 175; and Ceylon, over 150.

Comparative (paid) attendances were as follows:

	1959	1958
Wednesday .....	15,754	19,548
Thursday .....	26,801	32,373
Friday .....	23,945	28,673
Saturday .....	37,282	42,185
Monday .....	25,362	27,300
Tuesday .....	36,160	32,523
Wednesday .....	40,288	39,571
Thursday .....	36,305	41,337
Friday .....	28,186	26,976
Saturday .....	38,924	38,245
	<u>309,007</u>	<u>328,731</u>

About 1,300 inquiries were made at the special careers display from young people wanting jobs in the radio and electronic industry.



#### BRIGHTON AND DISTRICT RADIO CLUB

Hon. Sec.: Mr. E. M. Large, School House, Frant Road, Hove 4, Sussex.

THE club has now moved to new headquarters at the following address:—Home Guard Club, British Legion, 76, Marine Parade, Brighton.

#### BRITISH SOUND RECORDING ASSOCIATION

##### FORTHCOMING events:

October 31st.. Stereo Symposium to be held at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

The Annual Dinner, originally planned for Saturday, 19th September, has had to be postponed and will now take place on the 21st May, 1960, the same date as the Annual General Meeting and the Amateur Competition.

#### THE BRITISH INSTITUTION OF RADIO ENGINEERS

##### MEETINGS for October, 1959.

###### London Section:

October 7th at 6.30 p.m.—Computer Group Meeting. "Some Reflections on Computer Design", by W. Renwick. M.A., B.Sc. (Member).

October 14th at 6.30 p.m.—Students Meeting. "The Use of Transistors in Communication and Control", by E. Wolfendale B.Sc.

October 21st at 6.30 p.m.—Medical Electronics Group Meeting. "Aviation Medicine", by P. V. Byford.

October 28th at 6.30 p.m.—Radar and Navigational Aids Group, inaugural meeting. Short addresses will be given on "Radio—its Impact and Shipping", by Capt. J. D. F. Elvish, C.B.E. and "A Historical Survey of Radar and Radio Aids to Aircraft Navigation", by Air Marshal Sir Raymond G. Hart, K.B.E., C.B., M.C. (Member).

Bristol—South Western Section. (Meetings are held at the School of Management Studies, Unity Street.)

October 7th at 6 p.m.—Annual General Meeting, followed at 6.30 p.m. by chairman's address, "The Drift of Electronics", by Capt. L. Hix, R.N., N.Sc. (Member).

Cardiff—South Wales Section. (Meetings are held at the Cardiff College of Advanced Technology.)

October 28th at 6.30 p.m.—"Stereophonic Sound and Electrostatic Loudspeakers".

Edinburgh—Scottish Section. (Meetings are held at the Department of Natural Philosophy, The University, Drummond Street.)

October 23rd at 7 p.m.—"True Motion Radar", by J. H. Beattie.

Glasgow—Scottish Section. (Meetings are held at the Institution of Engineers and Shipbuilders, 29, Elmbank Crescent.)

October 22nd at 7 p.m.—"True Motion Radar", by J. H. Beattie.

Malvern—South Midlands Section. (Meetings are held at the Winter Gardens.)

October 27th at 7 p.m.—"Superconducting Computer Stores", by Mrs. Lois Roberts.

Newcastle-upon-Tyne—North Eastern Section. (Meetings are held at the Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road.)

October 14th at 6 p.m.—"True Motion Radar", by A. Harrison, B.Sc.

Western-super-Mare—South Western Section. (Meetings are held in conjunction with and at the R.A.F. Radio Apprentices School, Locking, Nr. Weston-super-Mare.)

October 7th at 10.30 a.m.—4.30 p.m.—Symposium on "The Training of Radio Apprentices". Further information on Symposium from Flt. Lt. D. R. McCall, B.Sc., A.M.Brit., I.R.E., c/o 27, O.M.Q., R.A.F., Locking, Weston-super-Mare, Somerset.

#### DERBY AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: F. C. Ward (G2CVV), 5, Uplands Avenue, Little-over, Derby.

PROGRAMME until August 14th, 1960. (Meetings will be held in Room No. 4, 119, Green Lane, Derby, unless otherwise stated. Alterations will be announced over R.S.G.B. News Service (BBR2s)—3.6 Mc/s on Sundays at 10 a.m.)

October 14th at 7.30 p.m.—Open evening in the sub-basement rooms.

October 21st at 7.30 p.m.—Demonstration of stereophonic equipment.

October 28th at 7.30 p.m.—Open evening in the sub-basement rooms.

November 4th at 7.30 p.m.—"Perspex and its uses for the Amateur", by A. Hitchcock (G3ESB).

November 7th and 8th at 7.30 p.m.—Second top band C.W. contest, R.S.G.B. This is an ideal opportunity for members to gain experience for N.F.D.

November 11th at 7.30 p.m.—Open evening in the sub-basement rooms.

November 18th at 7.30 p.m.—Film show.

November 25th at 7.30 p.m.—Open evening in the sub-basement rooms.

November 28th at 7.30 p.m.—Annual trip to London.

December 2nd at 7.30 p.m.—Sale of member's surplus items.

December 9th at 7.30 p.m.—Open evening in sub-basement rooms.

December 11th at 7.30 p.m.—Christmas party.

December 16th at 7.30 p.m.—Electronic gadgets for amusement from the junk box.

December 23rd and 30th.—Club rooms closed. Top band net will operate Christmas Eve and New Year's Eve for exchange of greetings.

##### 1960:

January 6th at 7.30 p.m.—Open evening—collection of 1960 subscriptions. Seniors 5s., Juniors 2s. 6d.

January 13th at 7.30 p.m.—Members' exhibition—three sections: juniors; home constructed; kit assembled.

January 20th at 7.30 p.m.—Open evening in sub-basement rooms.

January 27th at 7.30 p.m.—Quiz night.

February 3rd at 7.30 p.m.—Annual general meeting.

February 7th at 7.30 p.m.—Proposed date for contest, for G5YY.

March 18th at 7.30 p.m.—Proposed date for annual dinner and dance.

August 14th at 7.30 p.m.—Third annual mobile rally.

#### HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

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

THE Annual General Meeting was held on September 1st. It was decided to hold future A.G.M.s in May instead of September. A vote of thanks was proposed to the retiring officers and officers for the coming year were elected: chairman, Mr. R. Smith, G3NBI; secretary/treasurer, Mr. A. Robinson, G3MDW; minute secretary, Mr. G. Sunter; librarian, Mr. P. Hopkinson.

#### LEEDS AMATEUR RADIO SOCIETY

MEETINGS are held each Wednesday at 7.45 p.m., at Swarthmore Educational Centre, 4, Woodhouse Square, Leeds, 3. Programme includes Lectures, demonstrations and film shows. New members are always welcome. Apply to D. Binsdale, 8, Quarry Mount Street, Leeds, 6, for details and a copy of the programme.

#### THE READING AMATEUR RADIO CLUB

Hon. Sec.: R. J. Nash (G3EJA), 9, Holybrook Road, Reading, Berks.

DESPITE the holiday period the meeting held on August 28th was well attended when G3DXJ gave an interesting talk and demonstration on single side band reception.

On October 31st G3DXJ will give a lecture on "SSB from the transmitting angle" for those members who were away on holiday.

#### COURSE OF INSTRUCTION

A CLASS for radio amateurs will be held at Croydon Technical College if a minimum number of students (15) enrol. Enquiries to The Registrar, Croydon Technical College, Fairfield, Croydon. Telephone: CR0ydon 9271.

The illustration on page 493 of the September/October issue was of the rig of Mr. R. Turner, of Wolverhampton, Staffordshire, and not of Mr. N. E. A. Rush.

**C.R.T. ISOLATION TRANSFORMERS**  
TAPPED MAINS PRIMARIES  
TYPE A. OPTIONAL 25% and 50% BOOST.  
2 V. OR 4 V. OR 6.3 V. OR 10.8 V. OR  
13.3 V. 12/6.  
**OUR LATEST SUPERIOR PRODUCT**  
TYPE A2. HIGH QUALITY, LOW CAPACITY.  
TYPE B. MAINS INPUT, MULTI OUTPUT 2,  
4, 6.3, 7.3, 10 AND 18 VOLTS. BOOST 25%  
AND 50%. LOW CAPACITY. 21/-.  
TRIMMERS, Ceramic, 39, 50, 70 pf., 9d.; 100 pf.,  
150 pf., 1/3; 250 pf., 1/6; 500 pf., 750 pf., 1/9.  
RESISTORS, Preferred values, 10 ohms to 1 meg.,  
1 w., 4d.; 1/2 w., 4d.; 1 w., 6d.; 1 1/2 w., 8d.; 2 w., 1/1.  
HIGH STABILITY, 1 w., 1/6; 2 w., 2/-. Preferred values,  
100 Ω to 10 meg. Ditto, 5%, 100 Ω to 5 meg. D. 9d.  
5 watt) WIRE-WOUND RESISTORS 1/3  
10 watt) 25 ohms-10,000 ohms 1/8  
15 watt) 2 w. 2/-.  
15,000 ohms-50,000 ohms, 5 w., 1/9; 10 w., 2/3.

**GEVAERT GEVASONOR**  
50% extra long play plastic tape, 1,700 ft. 7in.  
Reel, 35/-; 350ft. 3in. reel, 21/-.  
**SUPERIOR 1,200 ft. Plastic Tape on 7" Plastic**  
Reels. Quality Guaranteed, 24/-.  
**SPARE REELS. ALL SIZES, 3/-.**  
"Instant" Bulk Tape Eraser and Head De-  
fluxer, 200/250 v. A.C., 27/6. Leaflet, S.A.E.

**O.P. TRANSFORMERS**, Heavy Duty 50 mA., 4/6.  
M.U. ratio, push-pull, 7/6. Miniature, 38/4, etc., 4/6.  
L.F. CHOKES 15/10 H. 60/65 mA., 5/-; 10 H.  
81 mA., 10/6; 10 H. 150 mA., 14/-.  
**MAINS TRANSFORMERS 200/250 v. A.C.**  
STANDARD, 250-0-250, 80 mA., 6.3 v. 3.5 a.  
tapped 4 v. 4 s. Rectifier 6.3 v. 1 a. 5 v.  
2 a. or 1 v. 2 a. ditto, 30-0-300 ... 22/6  
MINIATURE, 200 v. 30 mA., 6.3 v. 1 a. 10/6  
MIDGET, 220 v. 45 mA., 6.3 v. 2 a. ... 15/6  
SMALL, 250-0-250, 100 mA., 6.3 v. 3.5 a. 18/6  
STANDARD, 250-0-250, 65 mA., 6.3 v.  
3.5 a. ... 17/6  
HEATER TRANS. 6.3 v. 1 1/2 amp. ... 7/6  
Ditto, tapped sec. 2, 4, 6.3 v. 1 1/2 amp. 8/6  
Ditto, sec. 6.3 v. 3 amp. ... 10/6

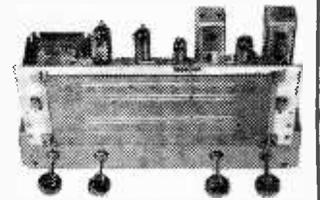
**ALADIN FORMERS** and core, 1in., 8d.; 1in., 10d.  
2in., FORMERS 5837/8 and Cans TV12, 7in. sq.,  
3.1in. and 1in. sq., 1 1/2in., 2/- ea., with cores.  
DYWIDAJE.—Midget Soldering Iron, 230 v., 10 w., 16/9.  
REMPLOY Instrument Iron, 230 v., 25 w., 17/6.  
**MAINS DROPPERS**, 3in. x 1 1/2in. Ad. Sliders,  
0.3 amp., 750 ohms, 4/3. 0.2 amp., 1,000 ohms, 4/3.  
LINE COILS, 3 amp., 60 ohms per foot, 2 amp., 100  
ohms per foot, 2-watt, 8d. per foot, 3-watt, 7d. per ft.  
LOUDSPEAKER P.M. 3 OHM, 5in. Rola, 17/6.  
Min. Plessey, 19/6. 6in. x 4in. Rola, 18/-; 6 1/2in. Rola,  
18/6. 8 x 5in., 21/-; 10 x 6in., 27/6. 10in. Rola, 30/-.  
H.P. Tweeter, 25/-; 12in. E.A., 30/-; 12in. 15 ohm  
10 w. Plessey, 45/-

**STERTORIA** REF102 10in. 3 to 15ohm 10 w., 95/-  
12in. Baker 15 watt 3 ohms, or 15 ohms, 185/-  
CRYSTAL DIODE G.E.C., 2/-; GEX34, 4/-.  
**HIGH RESISTANCE PHONES**, 4,000 ohms, 16/6 pr.  
MICKIE TRAMP, 501, 3/9 ea.; 1001, Potted, 10/6.  
SWITCH CLEARER, Fluid solvent, 4/3 tin.  
**TWIN GANG TUNING CONDENSERS**, 365 pf.  
miniature 1in. x 1 1/2in., 10/-; .0005 Standard  
with trimmers, 9/-; less trimmers, 8/-; midget, 7/6.  
SINGLE, 50 pF., 2/6; 80 pF., 100 pF., 180 pF., 7/-.  
-5014 dielectric 100, 300, 500 pF., 5/6.  
**SPEAKER FREE COLD CLOTH**, 17in. x 25in., 5/-.  
25in. x 35in., 10/-; Tyanex 4ft. 6in. wide, 10/-; 2ft.  
3in. wide, 5/-; Samples, S.A.E.

**NEW and Bored VALVES 90-day Guarantee**

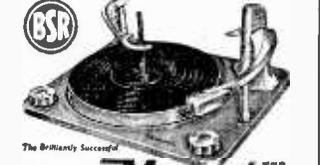
1R5	8/6	6K8G	8/6	EABC80	10/6	HABC90	10/6
1S5	8/6	6L6G	10/6				10/6
1T4	8/6	6N7G	7/6	EB91	6/6	HVR2A	7/6
2X2	3/6	6Q7G	10/6	EBCC38	8/6	MU14	10/6
2X4	8/6	6A4T	7/6	EBCA11	10/6	P81	6/6
3V4	8/6	6BF7M	10/6	EBF50	10/6	PCCR3	8/6
5U1	8/6	6SN7	8/6	ECC84	12/6	PCFR8	11/6
5Y2	8/6	6V6G	7/6	ECP80	11/6	PLC82	11/6
5Z4	10/6	6X4	7/6	ECH42	10/6	PBN25	6/6
6AG6	8/6	6X5	7/6	ECL82	12/6	PL82	10/6
6BE	5/6	12AU7	8/6	EP29	7/6	PR30	8/6
6BE6	7/6	12AU7	8/6	EP41	10/6	PY81	10/6
6BH6	10/6	12AX7	8/6	EPF50	5/6	PY82	8/6
6BW6	10/6	12BE6	10/6	EF80	10/6	SP61	5/6
6D5	7/6	12K7	8/6	EPF91	8/6	UBC41	10/6
6F90	7/6	12Q7	8/6	EPF92	5/6	UCH42	10/6
6ED	8/6	35L6	9/6	EL23	5/6	UL41	10/6
6G5	6/6	18Z4	9/6	EL84	10/6	UL10	10/6
6J6	7/6	80	10/6	EM81	12/6	UY41	8/6
6J7G	8/6	807	8/6	EZ40	8/6	U22	10/6
6K6GT	8/6	954	1/6	EZ80	8/6	VR105	8/6
6K7G	8/6	EA50	1/6	EL148	1/6	VR130	8/6

**FINEST VALUE**



**1959 RADIOGRAM CHASSIS**  
**THREE WAVEBANDS. LATEST VALVES**  
S.W. 16 m.-50 m. LATEST MULLARD  
M.W. 200 m.-550 m. ECH81, EP89, EBC81,  
L.W. 800 m.-2,000 m. EL84, EZ80,  
12-month guarantee.  
A.C. 200/250 v. 4-way switch; Short-Medium-  
Long-Trans. A.V.C. and Negative feedback  
4.2 watts. Chassis 1 1/2 x 5 1/2 x 2 1/2in. Glass dial  
horizontal or vertical size 10in. x 4 1/2in.  
2 Pilot Lamps. Four Knobs, Walnut or Ivory.  
Aligned and calibrated. Isolated Chassis.

**£9.10.0** (Carr. & Ins. 4/6.  
TERMS: Dep. £5.5.0 and five monthly of £1.  
MATCHED SPEAKERS FOR AUTO CHASSIS.  
Sln. 17/6; 10in., 25/-; 12in., 30/-.



**UAS World's Finest 4-Speed Autochanger**  
**OUR PRICE £6.19.6**  
TERMS: Dep. £3.10.0 and four monthly of £1.  
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**COLLARO LATEST MODEL**  
**HIGH-FIDELITY AUTOCHANGER**  
4-SPEEDS-10 RECORDS  
With Studio "O" pick-up  
**BRAND NEW IN MAKER'S BOXES**  
**OUR PRICE £7.19.6** post free.

**BUILD THIS REPRODUCER**  
**BARGAIN SINGLE PLAYER KIT**  
Ready for immediate assembly.  
4-speed Collaro "Junior" Unit ..... £4 12 6  
Handsome case, 17 1/2 x 12 1/2 x 7in.,  
with room to play 12in. records ..... £2 5 0  
Ready-built 3-watt amplifier with  
two valves and loudspeaker ..... £3 12 6  
or **£9.15.0** complete kit post free.

**ALUMINUM CHASSIS**, 18 s.w.g., mid-filled.  
With 4 sides, riveted corners and lattice fixing  
holes, 2 1/2in. sides, 7 x 4in., 4/6; 9 x 7in., 5/9;  
11 x 7in., 6/9; 13 x 9in., 8/6; 14 x 11in., 10/6;  
15 x 14in., 12/6; 18 x 16 x 3in., 16/6.

**TRANSISTORS, GENUINE EDISWAN**  
R.F. 4 M's, 18/-; 2 M's, 15/-; Audio, 10/-.  
Complete data sheets supplied.

**CRYSTAL MIKE INSERT** by Acus, precision  
engineered. Size only 1in. x 3/16in., 6/6.  
**HI-GAIN BAND 3 I.T.A. PRE-AMP KIT**  
Cascode circuit with valve ECH84. Price 29/6.  
With Power Pack, 49/6. Plans only 6d.  
Band 1 B.B.' version same price.

**TELETRON "TRANSDIENE"**  
**MIDGET SUPERHEAT PORTABLE** 6" x 4" x 1 1/2"  
6 transistors, printed circuit, Ferrite aerial.  
All parts and cabinet, £11.19.6.

We include 6 Ediswan or Mullard Transistors  
for maximum performance. Details 9s.  
**BBC T.V. TRANSISTOR RADIO**, M. & L. wave.  
(Complete kit 32/6, phones 7/6 extra. Dead Aid  
Earpiece 12/6. Special Lead 2/6. Details 6s.)

**GARRARD 4SP. SINGLE PLAYER**

**AUDIO PERFECTION**  
Designed to play 16, 33, 45, 78 r.p.m. Records 7in.,  
7 1/2in., 10in., 12in. Lightweight Xtal pick-up.  
GC2 turnover head, two separate sapphire styl.  
**OUR PRICE £7.10.0** each. Post Free.  
Model T4 Mk. II £9-10-0. Model 4HF £18-0-0.  
With Plug-in Normal Heads.  
(Stereo heads £2 extra).

**Volume Controls 80 ohm COAX**  
Long spindles. Guaranteed 1 year. Midget  
5K ohms to 2 Meg. Stranded core, 9d. yd.  
No Sw. D.P.N.W. Louses cut 50%.  
3/- 4/9 Fringe Quality  
Linear or Log Tracks. Air Spaced. 1/6 yd.

**COAX PLUGS** 1/- LEAD SOCKET 2/-  
**PANEL SOCKETS** 1/6  
**CONNECTED TWIN FEEDER** yd. 6d. 80 or 300 ohms  
**DITTO SCREENED** per yd. 1/6. 80 ohms only  
**WIRE-WOUND POTS, 3 WATT**. Pre-set Min.  
T.V. Type. All values 25 ohms to 25 K. 3/- ea.  
30 K, 50 K, 4/-, (Carbon 30 K., to 2 meg., 3/-)  
**WIRE-WOUND 4 WATT**. Pre-set 50 ohm  
Values, 100 ohms to 50 K, 6/6; 100 K, 7/6.  
**CONDENSERS**. New Stock. .001 mfd. 7 kV.  
T.C.C. 5/6; Ditto, 20 kV. 9/6; 1mfd. 7 kV. 8/6;  
Tubular 500 v. 0.01 to 0.5 mfd., 9d.; 1, 1.2, 25.1 8/6;  
3.50 v. 1, 1.5, 1.25 v. 9d.; 1, 1,000 v. 1.11;  
0.02-0.005 v. 1.9; 1 mfd. 2, 3,000 v. 22. 22. 3/6.  
**CERAMIC COND.** 500 v. 3 pf. to 0.1 mfd., 9d.  
**SILVER MICA CONDENSERS**. 10% 5 pf. to 500  
pf., 1/-; 600 pf. to 3,000 pf., 1/3. Close tolerance  
(±1 pF.) 1.5 pf. to 47 pf., 1/6. Ditto 1% 50 pf.  
to 815 pf., 1/8; 1,000 pf. to 5,000 pf., 2/-.

**I.F. TRANSFORMERS 7/6** pair.  
465 Kc/s Sing Tuning Miniature Can. 2in. x  
1in. x 1in. High Q and good bandwidth.  
By Pye Radio. Data sheet supplied.  
Wearite M800 I.F. 465 Kc/s, 12/6 per pair.  
Wearite 650 I.F. 465 Kc/s, 12/6 per pair.

**NEW ELECTROLYTICS. FAMOUS MAKES**

**TUBULAR TUBULAR CAN TYPES**

1/350v.	2 1/2-14/350v.	5/8	8/800v.	3/-
2/450v.	2/8 10w/25v.	2/8	16/1500v.	4/-
4/450v.	2/3 25w/25v.	2/6	32/350v.	4/6
8/450v.	2/3 50w/25v.	3/1	10w/270v.	5/6
8/500v.	2/8 8+8/450v.	4/6	2 500/35v.	4/6
16/450v.	3/6 8+8/500v.	5/6	6,000/6v.	5/6
16/500v.	4/1 8+1/450v.	5/6	32+22/350v.	4/6
32/450v.	5/6 8+16/500v.	5/6	50+60/350v.	7/6
75/25v.	1/8 16+16/450v.	5/6	64+120/275v.	7/6
50/25v.	2/1 32+32/350v.	4/6	64+120/350v.	11/6
50/50v.	2/1 32+32/500v.	7/6	100+200/275v.	12/6

**KENTON RECTIFIERS**. E.H.T. TYPE FLY-  
BACK VOLTAGE. K3.25 2 kV., 6/-; K340 3.2  
kV., 7/-; K345 3.6 kV., 7/6; K350 4 kV., 8/-;  
K3100 8 kV., 14/6; 50 c.p.s. voltage, 30% or above.  
**MAINS TYPE SELENIUM** 300 v. 85 mA., 7/6.  
**CONTACT COOLED** 250 v. 80 mA., 7/6; 60 mA., 8/6;  
85 mA., 9/6; 200 mA., 21/6; 300 mA., 27/6.  
**COMPLETE JASON P.M. KIT** with case, Osmon Midget  
COILS Wearing "CP" type, 2/- each, Osmon Midget  
"Q" type adj. dust core from 4/-. All ranges.  
**TELETRON**, L. & Med. T.R.F., with reaction, 3/6.  
**FERRITE ROD AERIALS**, M.W. 8/8; M. & L., 12/6.  
**T.R.F. COILS A.H.P.** 7/6 pair. H.F. (CHOKES, 2/6.  
**FERRITE ROD**, 7in. x 3/8in. dia., 2/6.

**JASON P.M. TUNER COIL SET**, 26/-, H.F.  
coil, aerial coil, Oscillator coil, two I.F. trans.  
10.7 Mc/s. Ratio Detector and heater choke.  
(Circuit book using four 6AM6, 2/6)  
**COMPLETE JASON P.M. KIT** with case, Osmon Midget  
COILS, 15/-; Fringe area kit, 22/6 extra.  
**MULLARD 3-3 AMPLIFIER READY BUILT**.  
Spare Power for Tuner, etc., £7.17.6.

**FULL WAVE BRIDGE SELENIUM RECTIFIERS** -  
6 or 12 v. 1 1/2 amp., 8/9; 2 a., 11/3; 4 a., 17/6.  
**CHARGER TRANSFORMERS**. Tapped input 200  
250 v. for charging at 2, 6 or 12 v., 1 1/2 amp., 15/6.  
2 amp., 17/6; 4 amp., 22/6. Circuit included.  
**VALVES** and T.V. Tubes, equivalent books, 5/-.  
**TOGGLE SWITCHES**, S.P. 8/-, D.P. 3/6, D.P. 0.1/4/-.  
**WAVECHANGE SWITCHES**  
1 p. 4-way 2 water long spindle ..... 6/6  
2 p. 2-way, or 3 p. 2-way short spindle ..... 2/6  
2 p. 6-way, 4 p. 2-way, 4 p. 3-way long spindle ..... 3/6  
3 p. 4-way or 1 p. 12-way long spindle ..... 3/6  
**VALVEHOLDERS**. Pax. Int. Oct., 4d. EP50, EA50,  
6d. B12A, CRT, 1/3. Eng. and Amer. 4, 5, 6, and  
7 pin, 1/-; MOULDED MAZDA and Int. Oct., 4d.  
6/6, BNA, B9G, B9A, 9d. B7G with can., 1/6.  
B9A with can., 1in. CERMIC EP50, B7G, B9A,  
Int. Oct., 1/6; 3/6 (ans. B7G, B9A) 1/-.

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The famous Bomber Command receiver known the world over to be supreme in its class. Covers 5 wave ranges 18.5 to 7.5 Mc/s, 7.5 to 3 Mc/s, 1.500 to 600 kc/s, 500 to 200 kc/s, and 200 to 75 kc/s, and is easily and simply adapted for normal mains use. Full details being supplied. All sets thoroughly tested and in perfect working order before despatch, and on demonstration to callers. Fitted latest type super slow-motion tuning assembly. Have had some use but in excellent condition. ONLY £7/19/6.

**A.C. MAINS POWER PACK OUTPUT STAGE**, in black crackle case to match, enabling it to be operated immediately, by just plugging in, without any modification. With built-in 6in. P.M. speaker, £5/10/-, or de-luxe with 8in. speaker, £6/10/-, DEDUCT 10/- IF PURCHASING RECEIVER AND POWER PACK TOGETHER.

Send S.A.E. for illustrated leaflet, or 1/3 for 14-page booklet which gives technical information, circuits, etc., and is supplied free with each receiver. Add carriage 10/6 for Receiver, 5/- for Power Unit.

**RECEIVER R107**, A further purchase since our "sell out" last year. 9 valves, 3 wavebands, covering 1.2-17.0 Mc/s (18-250 metres), incorporating built-in speaker and power packs for 100-250 volts A.C. and 12 volts D.C. Size 24in. x 13in. x 17in. Complete, ready to switch on, thoroughly tested and checked before despatch. IN NEW CONDITION. ONLY £13.10 (carr. 20/-).

**RCA AR85 RECEIVERS**, Reconditioned and in perfect working order. "I.F." Model, covers 75-19 kc/s and 1.2-30 Mc/s. ONLY £50. "D" Model, covers 500 kc s-31 Mc s. ONLY £55 (carriage, etc., 25/-).

**RCA 8in. P.M. SPEAKER**, in heavy black crackled metal case, designed for use with above receiver, or can be used as normal 3 ohms extension. Size 11in. x 10in. x 6in. NEW IN MAKER'S CARTONS. ONLY 45/- (post 3/6).

**"Q FIVER" COMMAND RECEIVER**, The famous American BC453, covering 190-550 kc s, I.F.s being 85 kc/s. Complete with all 6 valves and circuit. NEW IN MAKER'S CARTONS. ONLY \$9 6 (post 3/6).

**AIRBORNE TRANSMITTER-RECEIVERS TYPE 1988**, 10 Channel Mobile Units, complete (less external attachments) in metal case, with all 21 latest type midget valves and 24 volt Rotary Power Unit. Crystal controlled. IF Bandwidth 23 kc/s. Size 15 1/2 in. x 7 1/2 in. x 6 1/2 in. weight 26 lbs. Used but in first-class condition. ONLY £8.19.6 (carriage, etc. 10/6).

**MONITOR TYPE 61**, for conversion to an Oscilloscope. Employs 3in. C.R.T. type VCR138A, and built-in A.C. Mains Power Unit for 115/230 volts. Modern design. Full modification data supplied. Condition as new. ONLY £7.19.6 (carriage, etc. 15/-).

**TCS TRANSMITTERS**, These magnificent American units cover 1.5-12.0 Mc/s in 3 switched bands. Complete with 7 valves; 3 of 12A6 Osc.; 1625 Buffer; 2 of 1625PA; 1625 VFO. Provision for Crystal Control, C.W. or R.T. Has Plate and Aerial Current meters. New condition internally, but externally store soiled. £7.19/6 (carriage, etc., 15/-).

**HIRO MAINS POWER UNITS**, Input 115/230 volts A.C./D.C. Output (fully smoothed) 230 volts 75 mA., and 6.2 volts 3.5 amps. Complete in black crackle case. ONLY 60/-.

**POWER UNITS TYPE 234**, Primary Input 200 250 v, 50 cycles. Outputs of 250 v, 100 mA., and 6.3 v, 4 amps. Fitted double smoothing. For normal rack mounting (or bench use) having grey front panel size 19in. x 7in. BRAND NEW. ONLY 59/6 (carriage, etc., 7/6).

**12 VOLTS AMERICAN DYNAMOTOR**, Delivers 220 volts at 100 mills. Ideal for running Car Radio or Electric Shaver, etc., from Car Battery. ONLY 32/6.

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

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

**HIT 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.).

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

**CRYSTALS**, British Standards 2-pin 500 kc s, 15 - . Miniature 200 kc/s, 10/-.

**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).

**SPRAGUE CONDENSERS**, Metal cased, wire ends. New 01 mfd. 1,000 volt, and 1 mfd. 500 volt, 7 6 per dozen. Special quotes for quantities.

**HARRIS ELECTRONICS**

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British and Foreign Pats.

Reg. Designs, etc.

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At last! A specially selected and designed HI-FI Sound Installation for your home at really reasonable cost!



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# SUPER-REGENERATION

LIKE VALVES, TRANSISTORS MAY ALSO BE USED IN CIRCUITS WHICH GIVE SUPER-REGENERATION

By E. G. Bulley

**S**UPER-REGENERATION is really a steady oscillatory condition which is interrupted by another frequency. This condition is known as quenching and can be performed by the transistor being switched by itself or by the application of an auxiliary signal.

## Logarithmic Mode

The former is known as self-quenching and such operation is termed logarithmic mode, and it is in this mode that the length of the pulse is logarithmically proportional to the signal. That is to say, as the received signal varies in amplitude, so will the oscillatory condition.

In the latter case, however, where an auxiliary signal is injected, the oscillatory condition of the circuit is quenched by this signal before it is limited by the supply voltages of the circuit.

## Linear Mode

This type of mode is linear and is known as forced quenching, and it can be stated as being the means by which the biasing of the oscillator transistor can be adjusted to a particular value, whereby the gain of the oscillation itself is too

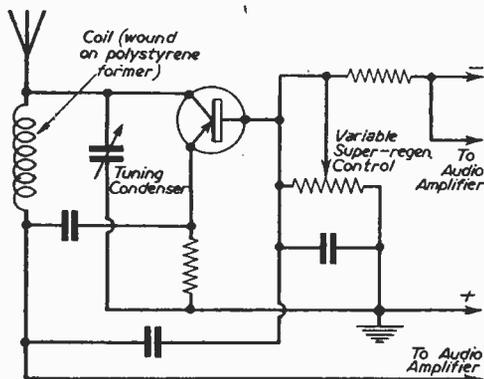


Fig. 1.—Basic super-regenerative circuit.

weak to maintain an oscillatory condition. Therefore, the auxiliary or quench signal is modulated and the oscillations will start and stop. The modulated quench signal is usually obtained by the rectification of R.F. pulses by a semiconductor diode.

A basic super-regenerative detector circuit is shown in Fig. 1. This circuit can form the basis for experiment, whereas Fig. 2 is a typical circuit used for injecting a quench signal. Many of the novel types of miniature transistorised receivers for use on the higher frequencies which have been developed in the U.S.A. have employed super-regeneration and such applications should prove very interesting to the constructor.

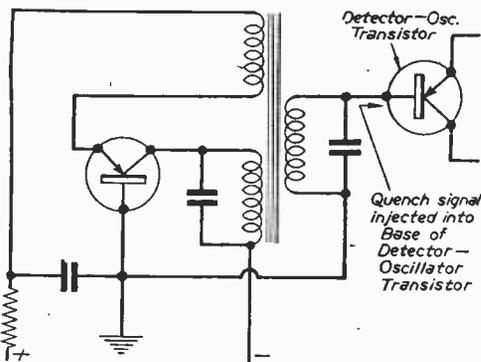


Fig. 2.—Circuit for injection of the quench signal.

## Swinging Chokes

**T**HESE components are available upon the surplus market, and to the newcomer to radio they seem to cause confusion as to their application. These chokes are used as the input component of choke input filters associated with mercury vapour power supplies.

The swinging choke is so named because of its varying characteristic, that is to say, the effective inductance varies with the direct current. The inductance of swinging chokes usually lies between 5 and 20 Henrys, and as previously mentioned, they are the first component in the input filter. This is, of course, followed by a choke having a constant inductance.

## Calculations

In the first place, one must determine the current taken from the power pack at no signal. This D.C. is the product of both the load and bleeder currents. Now this current value must be substituted in Ohm's Law to calculate the load resistance. The voltage is the D.C. output from the filter to the load, so with two known values the third, namely  $R$ , can be evaluated.

With the load resistance now known, this in turn can be substituted in the equation  $L = \frac{R}{1130^2}$

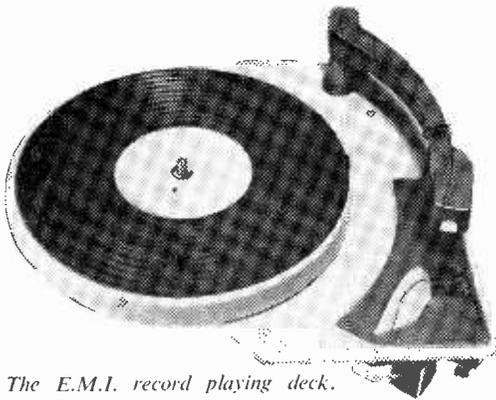
where  $L$  is the required inductance in Henrys for a swinging choke at zero signal. This approximate value is the high figure of inductance, and likewise the same method can be applied to determine the inductance at the other end of the swing, that is at full signal. First, the D.C., followed by the load resistance, must be calculated, as previously explained, and substituted in the inductance equation.—E. G. B.

# NEWS FROM THE TRADE

LATEST DEVELOPMENTS  
IN RECEIVERS AND  
COMPONENTS

## "FELGATE" ELECTRONIC INVERTER

**R**ADIO MAILING LTD., of Studlands Hall, Studland Street, Hammersmith, London, W.6, are now manufacturing the "Felgate" Electronic Inverter (Mark II). This is a power source to run A.C. equipment from 210/250 volt D.C. mains, and has been introduced to meet the demand for a higher power output than that of



The E.M.I. record playing deck.

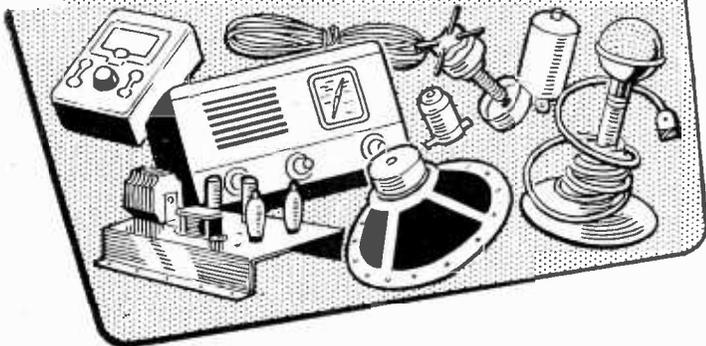
the first "Felgate" Inverter. It has a rating of 20 to 100 watts and can be used with most types of tape recorders, radiograms and record players and, although primarily intended for such equipment, is equally suitable for many other kinds of apparatus. The inverter uses a multi-vibrator circuit driving four valves 50CD6 (two valves in parallel). The overall dimensions are 10in.  $\times$  7 $\frac{1}{2}$ in.  $\times$  6 $\frac{1}{2}$ in.

## E.M.I. RECORD PLAYING DECK

**A** NEW record playing deck for the home constructor record enthusiast which is of practical design and incorporates a novel form of speedchange mechanism has been introduced by E.M.I. Sales & Service Ltd., of Hayes, Middlesex. It is supplied in mains or battery versions and for stereo or mono reproduction. The cartridge fitted is an Acos GP73 turnover stereo pick-up with a diamond stylus. Full mounting instructions and template are included with each unit. The prices for mains or battery are: Mono £6 18s. 6d., stereo £7 17s. 6d.

## "PRECISION" SOLDERING IRONS

**A**NTEX LTD., announce that they have moved from 3, Tower Hill to 7/8, Idol Lane, London, E.C.3, in order that they may deal more



efficiently with home and export orders for their "Precision" miniature soldering irons. All irons are now fitted with a new type of handle which is fully heat resistant and designed to make the soldering iron robust enough to be used by unskilled labour on production lines.

## POCKET-SIZED TRANSISTOR RADIO

**A** NEW pocket-sized transistor radio called the "Sky Personal" is now made by the Eveready Co. (Great Britain) Ltd. It measures 5 $\frac{1}{2}$ in.  $\times$  3 $\frac{1}{2}$ in.  $\times$  1 $\frac{1}{2}$ in. and weighs 19oz. (complete with battery). The cabinet is of robust polystyrene and the superhet printed circuit uses six transistors and a germanium diode. Battery life is given as 25-30 hours. The receiver tunes medium



The Sky Personal pocket-sized radio.

wave (192-555m) and the long wave Light Programme is pretuned. The price is £21 including purchase tax.

## MINIATURE EDGEWISE METER

**T**AYLOR ELECTRICAL INSTRUMENTS LTD., of Montrose Avenue, Slough, announce a new miniature Edgewise Meter (Model 220) which will be of interest to design engineers and manufacturers. It is one of the smallest meters of this type manufactured in this country and occupies a minimum amount of front-panel space for equivalent scale lengths. This model has been developed for use in a modern,

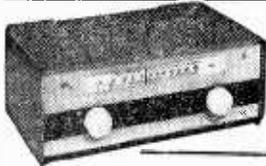
(Continued on page 595)

# HOME RADIO OF MITCHAM

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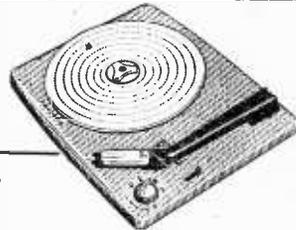
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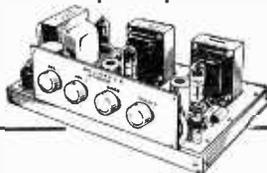


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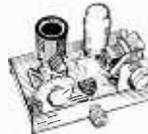
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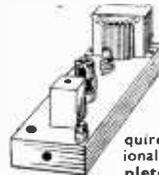
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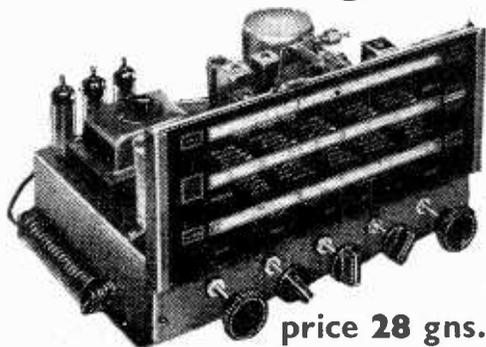
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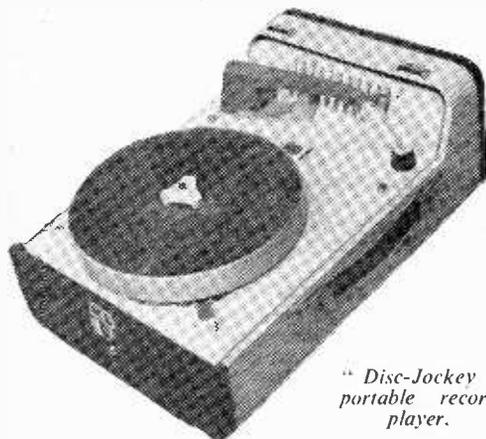
complex control panel where front space is at a premium. An important application in computers and multi-channel installations, etc., is the ability to mount several meters close together to facilitate comparative readings. The meter is supplied as a voltmeter, milliammeter or micro-



*The miniature Edgewise Meter*

ammeter and is available with right hand zero, left hand zero displaced, or centre zero pointer position and is suitable for either horizontal or vertical mounting. It occupies a space frontage of 2.5in. X 0.62in.

**PHILIPS "DISC-JOCKEY" TRANSISTORS**  
PHILIPS ELECTRICAL LTD., announce the introduction of the "Disc-Jockey" Transistor (Model AG9147) which is a 4-speed portable battery operated record player with



*"Disc-Jockey" portable record player.*

transistorised amplifier. It sells at 19 guineas, including tax. It weighs 9lb. and plays all standard sizes of records at all four speeds. The carrying case is covered in ivory and green washable leathercloth. Incorporating a 4in. high-efficiency loudspeaker, it is operated by four transistors and powered by four torch batteries which give more than 40 hours playing time. The speed selector has a mechanical "off" position in which the drive wheel is automatically freed from the turntable and drive spindle.

#### NEW TRANSISTOR PORTABLE RADIO

THE BC501, a new transistor portable radio suitable for all domestic, outdoor and travelling conditions, is announced by The General Electric Co. Ltd., of Magnet House, Kingsway, London, W.C.2. With a sloping front control panel and a standard car aerial socket, in addition to its 8in. ferrite rod aerial, this model can be

used in the home or in the car for touring. It uses a single long life layer-built battery and retails at 19 guineas. The printed circuit uses six germanium transistors and one crystal diode, and provides long and medium wavebands with



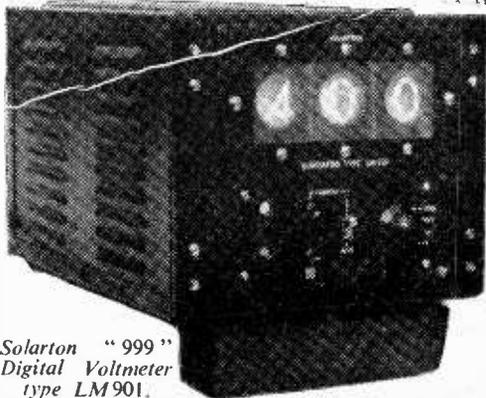
*The BC501 portable radio.*

push-button selection. A 7in. X 4in elliptical speaker is used for good reproduction. The wood cabinet is covered with washable Vynair in contrasting shades of Autumn Tan and Lichen Grey with gilt embellishment.

#### DIGITAL VOLTMETER

THE new Solartron "999" Digital Voltmeter Type LM901 displays measured voltages in large, plain figures, which may be read at a considerable distance from the instrument and, if necessary, by untrained personnel.

Manufactured by The Solartron Electronic Group Ltd., Thames Ditton, Surrey, the LM901 is lightweight and of compact and robust construction. Being transistorised, it is rugged though small, and may be used on the laboratory bench, in the factory, control room or in the field. It is completely self-contained, and its power consumption is extremely small. The voltage range is from zero up to 99.9V in three sub-ranges, or 109.9V when using the range extension facility,



*Solartron "999" Digital Voltmeter type LM901.*

# Open to Discussion



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

## Amateur Bands

SIR,—I am absolutely appalled at the conditions on the amateur bands. It seems that the ambition of every commercial station and jamming station is to get into these already overcrowded bands. Some bands are legally shared with these stations, but it appears that they can encroach on exclusively amateur bands. The latest addition to 40 metres is "Outlook Able testing for circuit adjustment purposes." This is more or less continuous and I have heard many people commenting on it. Can newcomers to the ham bands look forward to clear areas to transmit when they come on to the air next year? Will the Frequency Allocation Conference ban these pirates or will they ignore the protest and allow this encroachment to continue? I hope to become an amateur next year and I look to those who allocate transmitting frequencies to clear just a kilocycle or two on each band for me and the many other newcomers to use when we obtain our transmitting tickets. Is it too much to ask for this privilege?—I. JACKSON (Alnwick).

*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.*

## Meter Multipliers

SIR,—I note with interest J. C. Alldred's method of obtaining accurate meter multipliers in the July issue of P.W., but see that in order to apply his method one must either rely on a new battery being "up to scratch" or already have an accurate voltmeter at one's disposal. Bearing this in mind may I suggest a much simpler method of achieving the desired result. From the formula quoted by Mr. Alldred, calculate the required resistance, and obtain a 20 per cent. carbon resistor of the nearest preferred value below R. Note the resistor must not be of the porcelain enclosed type. The meter will then, of course, read high. The reading may be corrected by connecting an accurate voltmeter in parallel and applying a suitable P.D. for the range. As the resistance is proportional to the cross-sectional area of the carbon, file a small nick in the resistor until the readings are the same on both meters. It will be found that little carbon need be removed in order to raise the resistance to the required value. Therefore, the physical strength of the component is not seriously impaired. The same method may be employed for higher ranges of voltage providing the neces-

sary precautions are taken in order to be able to handle the resistor with a large P.D. across it.—J. OLIVER (Madeley).

## Transistors v. Valves

SIR,—I have been reading, month by month, the argument on the above and feel that I must butt in. I have found that many of my friends and myself started out in the hobby of amateur radio with transistors. However, I have inevitably found that most of us have, after a time, all turned over to using the valve. We have agreed that if one is armed with the following valves, a beginner can make quite a few, odds and ends including amplifiers, receivers and, with a few additions, transmitters. The valves are: 6V6G, 6J5, 6J7, 6K8 and a full wave rectifier for a suitable power unit. It is a matter of opinion whether the valve sets are better than the transistor sets, but I personally have gained much more experience and fun building the valve sets.—J. FULLER (Dorset).

SIR,—I am surprised to hear any amateur speak slightly of transistors and am sure this attitude is due to ignorance. The primary virtues of these devices, from a radio point of view, is the pocket size receiver that can be made with them and the cheap running costs of a standard size portable. In many cases this is the only type of transistor receiver your dissatisfied readers have listened to so they must not run away with the idea that this is the best that can be done with transistors—not by any means! In a way, transistor receivers have started to run before they have learned to walk. All these small receivers use ferrite rod aerials and must have small loudspeakers with inefficient acoustic housing. If a straight simple transistor circuit is connected to a good aerial, signals quite free from any background noise at all can be obtained, and if the signal is put into a normal substantially housed speaker a quality of reception can be obtained which is quite unequalled by any type of valve circuit. There is something wrong with any radio amateur who is not thrilled by the advent of transistors. America, Japan and Australia already have them working F.M. and communication receivers.—B. WALLACE (S.W.16).

*(Continued on page 599)*

# TUBES

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# VALVES

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2A7	8/6	6B4G	6/6	6E6M	2/-	6E97	5/6
2D21	4/6	6E6E	6/6	6E35	4/6	6E87	4/6
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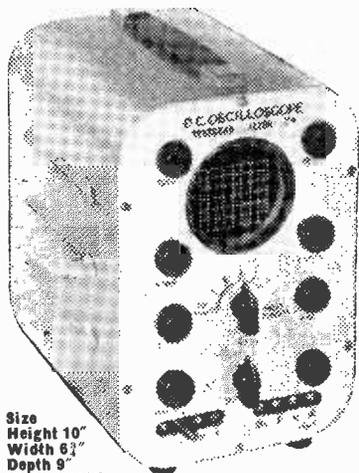
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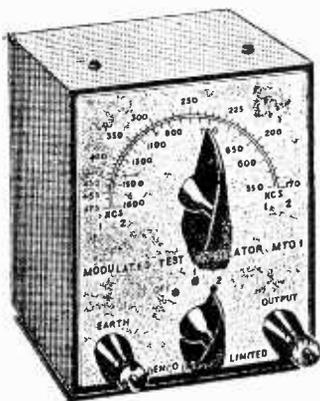
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**SIR.**—I, as a member of the "young radio set" feel it my duty to pass on the views of my friends and myself on transistors. Only one of my friends who tried transistors sticks by them, all the others gave up disillusioned. On comparing a two transistor plus crystal set with a valve set I see why valves are so popular. Although there was little to choose between the two as regards volume and sensitivity, I found the valve set much more stable for, although both were built as portables any change in aerial/earth capacity meant a tremendous cut in volume on the transistor set. The valve set only used 1ft. of aerial and even if this was on the ground the set worked. —"OLD FASHIONED?" (Hereford):

**SIR.**—As a member of the younger generation which is supposed to be pro-transistor and anti-valve, I shall now try to support the case for the valve. With transistors one has to be very careful not to overheat them, give them the wrong electrode polarity, keep the junctions in the light (in the case of glass walls) and take great care with the circuitry to prevent surges. Valves, on the other hand, are more robust and are not so easily damaged. The reversal of the power supplies will not ruin them at once, surges don't bother them except in A.C., D.C. series heater chains. They can become very hot (a 6V6 heats up to 250°C). The supporters of transistors live in a delusion that transistors mean midget receivers. I have seen a valve set half the size of a transistor set in the same shop window. These supporters also state that valves are expensive to run and that "it only costs 4d. to run a set for so many months, etc." If they want to save money on power why don't they revert to a crystal-set which has no running costs at all. Valve upkeep is, in my opinion, worth every penny. It is a joy to listen to more or less natural-sound emanating from a 5-valve superhet, but it is an ordeal to suffer scratchy sound from a midget 2½ in. loudspeaker.

To the transistor fanatics I say this, try to drive a 6 in. speaker with as many transistors as you like at decent volume. It can be done easily with one valve (e.g., PCF80) at very moderate cost. It will be very difficult indeed to obtain the same results with transistors.—R. KERR (Lanarkshire).

#### Correspondents Wanted

**SIR.**—I am 23 years of age and would like to correspond with amateurs of my age who are interested in anything that comes under "Electronics."—W. S. A. PERERA (Inspector of Telecommunications, Wattedgedara, Minuwangoda, Ceylon).

**SIR.**—I am 13 years old and very interested in radio, especially short-waves. I hope in the near future to obtain an amateur's licence and would like to correspond with other boys of my age.—G. BARRETT (Kestrel's, East Anstey, N. Devon).

**SIR.**—I am 20 years of age and am interested in radio, amplifiers, tape recorders, etc. I am totally blind and, as you will realise, there are

many difficulties for me in this field. For example, having literature read to me on the subject, and soldering. I would like the chance to correspond with any of your readers whose interests are the same, as I am sure in this way many of my problems will be solved. Fortunately I have someone who will read the letters to me and write my replies.—L. BALL (80, Fenwick Road, Aspley, Nottingham).

**SIR.**—I am 15 years old and very interested in amateur radio. I would like to correspond with radio enthusiasts of my own age.—S. HOSKINS, JNR. (6, Etherbridge Green, Loughton, Essex).

**SIR.**—I am 13 years of age and very interested in amateur radio. My favourite bands for listening are 20, 40 and 160m, and I would like to correspond with amateurs of my own age.—PAUL BROWN (6, Ripon Street, Preston, Lancs).

#### Valve Types

**SIR.**—As an old-hand who has just come back to the home-constructor fold after some years absence, I am appalled by the many types of valves which now appear to be necessary for an experimenter. It would appear that in the past a circuit has been designed without any recourse to valves which may be available, and then the designer has requested the valve maker to make a valve for his circuit. How else can one account for the many types—some of which seem very close to each other. Surely, there should only be a few what might be called "standard" types, and circuits should be designed round them and not vice versa.—K. A. SEMSTER (Folkestone).

#### An Efficient Aerial

**SIR.**—For many years I have been using the bell-wire from my front door as an aerial and it has served magnificently. The bell was disconnected a long time ago, but the wire, which runs through the wall of the house, seemed to be ideal and did not appear to be directional in any way. A few weeks ago I was messing around and tried one or two alternatives, without any improvement, until I thought of using a disused lead-in from a large garden aerial. This was a heavy rubber-covered wire running up to the eaves from downstairs and has egg insulators at top and bottom. I was astounded at the improvement of what I had thought was a remarkably efficient aerial. Many more stations came in loud and clear, and I can hardly think that is due to the fact that most stations nowadays are vertically polarised. Can there be any other explanation for such an efficient aerial?—H. F. NICKOLDS (N.W.10).

#### Commercial Set Design

**SIR.**—I was very disappointed after my visit to the Radio Show to note that manufacturers appear to have stood still in one direction in designing the modern radio receiver. We are continually reading that radio is dead, and comedians and others on TV crack jokes about the "steam radio," etc., yet what have the makers

done to make people radio conscious or want radio? The general look of the sets is still too "scientific" or laboratory-like for the home, and reproduction did not seem to be all that good. Also, why is there no provision on any set (so far as I could see) for TV sound? I would have thought that would have been one of the first things the makers would have done to try to sell TV sets.—G. BARTON (Matlock).

#### Loudspeaker Design

**SIR.**—Can any one tell me what has happened to the ribbon loudspeaker? Some years ago we had a boom in speaker design all directed to giving overall frequency range, but now it appears that the use of tweeters and woofers has taken the place of designing one really good speaker to cover the entire range. Has it been found impossible to do this? Why has the ribbon not been brought out? Has it been found too fragile after its very popular use as a microphone?—F. SANDREY (Hove).

#### Radio Pick-up

**SIR.**—Has any reader found a satisfactory way of overcoming radio pick-up on long leads used with a tape recorder? I have a recorder and amplifier connected to my speaker and radio in the normal lounge, but run a long lead to an upstairs room with mike to hear when the baby cries. When I switch over to the mike I can hear quite clearly a background of short-wave stations, and I understand from my dealer that others find this difficulty also. The long lead is

in coaxial and both ends are earthed. Has any other reader experienced the trouble and found a satisfactory, easy cure?—G. E. R. TRUEMAN (Hoddesdon).

#### Variometers

**SIR.**—I have been given some very old numbers of PRACTICAL WIRELESS and *Amateur Wireless* which had been kept as treasures by one of my relatives. I read in some of these that adequate selectivity could only be obtained by means of a variometer, and there were several interesting types of this component in the issues. Some of these were very large, and there were also some sets described using home-made coils, over 3in. in diameter. What has happened to these components? Today there are coils only half an inch across and about 1in. in length, whilst I do not remember seeing a variometer in any issues since the war. It appears from notes accompanying some of these articles that the purpose of them was to obtain and maintain a high "Q." As this is still necessary, why are these components not used today?—H. J. BARRINGER (Glasgow).

#### Earth Connections

**SIR.**—The mains sets of today are usually fitted with a two-way flexible cable, and the points in the house are of the three-pin type. One of these pins is for earth, but as most electrical apparatus is usually fitted with a three-core cable (one being green for earth), why are not radio and TV sets so fitted? It seems that it would be much more efficient to make use of the "mains" earth, and would it not be safer if the makers took steps to fit the necessary isolating condenser in A.C./D.C. sets with the earth correctly connected? The correct connection of the "L" and "N" sockets of mains apparatus is one which I feel should be more stressed in your pages and it does not appear to be well known even by many servicemen.—G. Y. KINGDON (Norbury).

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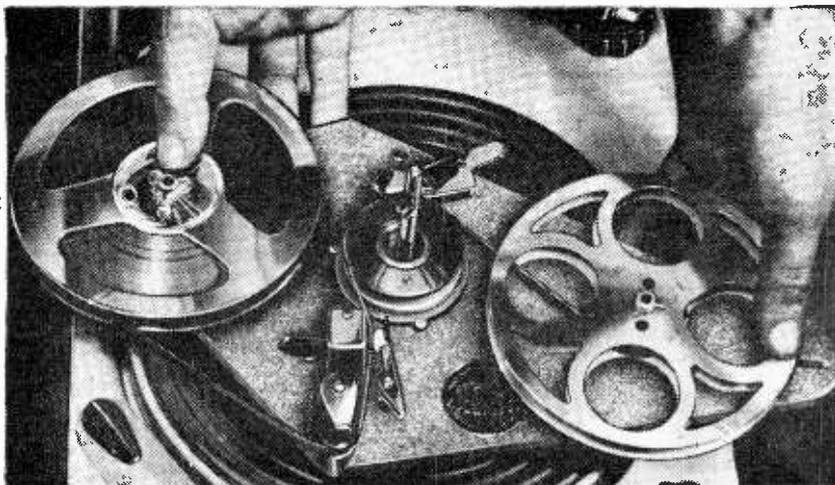
#### SELECTIVITY

(Continued from page 576)

tuning range near its resonant frequency. A better method of employing an additional tuned circuit is to include it in the receiver proper, tuning it with an additional section of the tuning capacitor. This, of course, involves a major redesign of the receiver because it necessitates the substitution of a 3-gang for the original 2-gang tuning capacitor. If the receiver has more than one waveband, additional contacts will also be required on the wave-range switch. Of the three tuned circuits the receiver now contains, it is preferable to combine two in what is known as bandpass filter. One method of doing this is illustrated in Fig. 10 which is a "skeleton" circuit showing essential components for one waveband only. In this the bandpass filter is used as an inter-valve coupling element but it could alternatively be used between the aerial and R.F. amplifier.

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6AL5	5/6	10C1	14/6	DF39	14/-	EF42	11/6	PEN36C	9/6	U42	8/6
6AM5	5/-	10C2	17/6	DF96	8/6	EF80	6/6	PCL82	10/6	UCH81	9/-
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6AQ5	7/-	10F9	10/6	DH77	7/3	EF86	11/6	PCL84	11/6	UCL83	14/3
6AT6	7/3	10P13	15/9	DK32	14/6	EF89	8/6	PEN44	11/-	UF41	9/3
6BA6	7/6	12A8G	10/9	DK40	14/-	EF91	4/9	PEN45	8/-	UF42	8/6
6BE6	7/-	12A7T	8/-	DK91	7/6	EF92	5/-	PEN45	8/-	UF89	7/6
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6BJ6	7/-	12AX7	8/-	DK96	8/6	EL38	21/6	PL36	13/6	UL44	21/6
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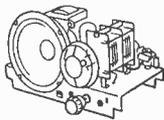
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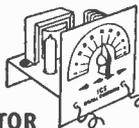
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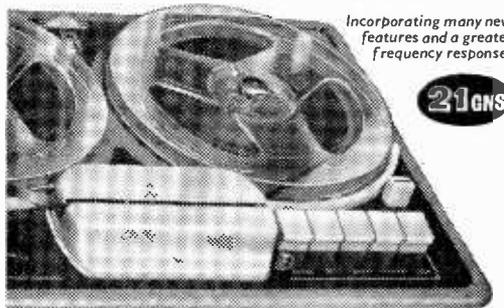
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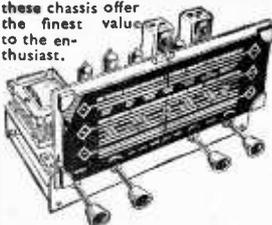
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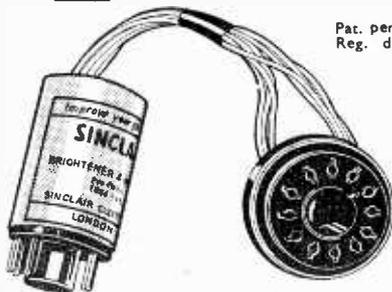
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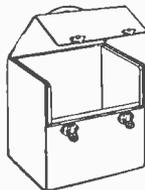
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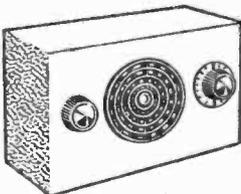
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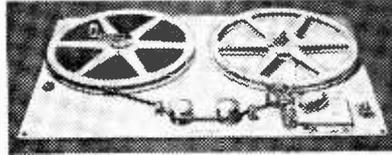
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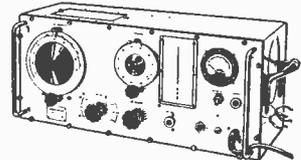
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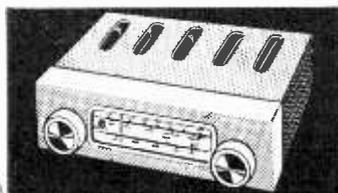
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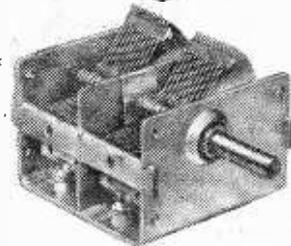
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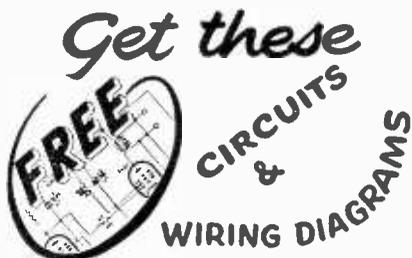
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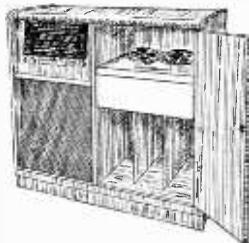
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