

● THE BEGINNER'S SHORT-WAVE 3 ●

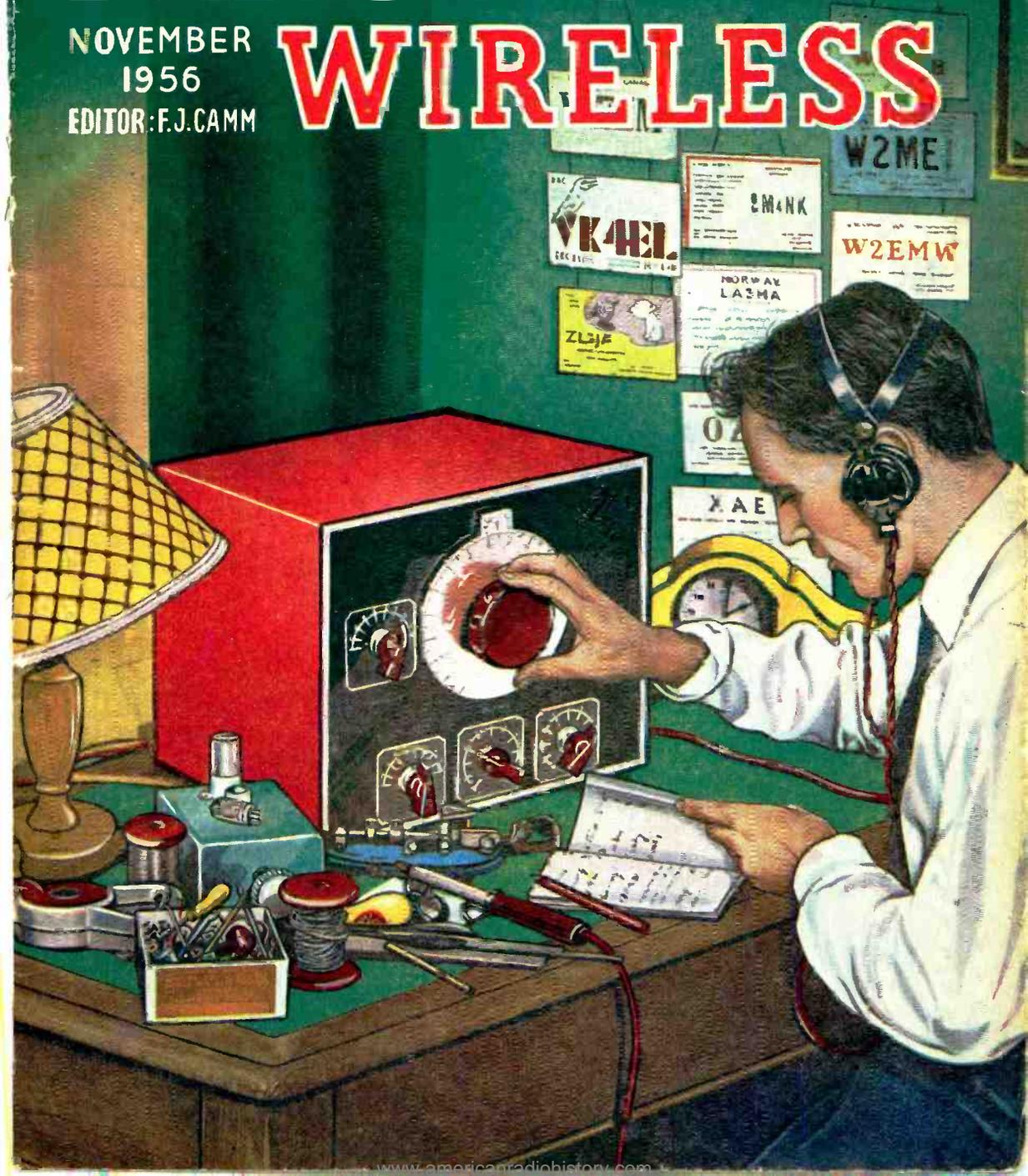
PRACTICAL 1/3

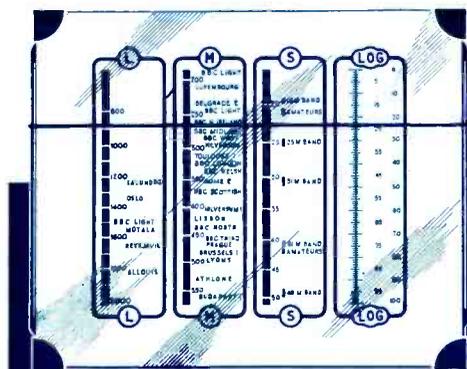
NOVEMBER

1956

EDITOR: F.J. CAMM

WIRELESS





SCALE S2

MAXI-Q REGD. GLASS SCALES

SCALE S2. For use with 500 pF. Tuning Condenser. This Glass Scale is printed in Yellow with Long, Medium and Short Wavebands and a 0-100 Logging Scale. Station names, Amateur and Broadcast Bands are prominently marked. Designed for use with Coil Packs CP.3/500, CP.3/G, CP.3 F, CP.3F/G and also 500 pF tuning coils. Very suitable for use with a 3 Waveband Coil Pack (CP.3/500 or CP.3/G) leaving the Log Scale for tuning a V.H.F. F.M. Tuner.

Scale coverage : Long Wave 800—2,000 metres.
Med. Wave 200—550 metres.
Short Wave 16—50 metres.
Log 0—100.

The Scale measures 8½ in. x 6½ in., and is for a cabinet aperture of 6½ in. x 5½ in.

The Kit comprises of : Glass Scale, Back Plate, Pulleys, Rubber Scale Mounts, Pointer, Drive Cord, 4 B.A. Screws, Nuts, Spacers and Assembly Instructions.

PRICE 15/-

SCALE S1. "MAXI-Q" Basic 5 Waveband Glass Scale as above for use with 315 pF Tuning Condenser.

This five-colour glass scale covers the following bands : Long Wave 150—400 Kc/s. Green : Medium Wave 530—1,600 Kc/s. Red : SW.1 1.5—4 Mc/s. White : SW.2 4—13 Mc/s. Blue : SW.3 10—30 Mc/s. Yellow.

PRICE 15/-

Obtainable from all reputable stockists or direct from works.
SEND 1/- IN STAMPS FOR GENERAL CATALOGUE.

DENCO (CLACTON) LTD, 357/9 OLD RD., CLACTON-ON-SEA, ESSEX

Trace the Trouble in a Trice



PIFICO ALL-IN-ONE RADIOMETER

- ★ Circuit Test
- ★ L.T. & H.T. Tests
- ★ mA Test
- ★ Valve Test

Use the PIFCO All-in-One RADIOMETER for the practical testing of all types of radio and electrical apparatus. You can carry out continuity and resistance tests, check H.T., L.T., and G.B. voltages, also Household Appliances, Car Lighting Systems, Bell Circuits, etc. May be used on A.C. or D.C. mains.

Obtainable from your local dealers.

Write for informative folder to:—

PIFICO LTD., WATLING ST., MANCHESTER 4 and 36-37, UPPER THAMES ST., LONDON, E.C.4

ONLY **32/6** COMPLETE

MAKE SOUND JOINTS SIMPLY BY USING Multicore

ERSIN MULTICORE

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

SIZE 1 CARTON

5/-

HANDYMAN'S CARTON

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



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

ARAX MULTICORE

FOR METAL FABRICATION

(Not wire-to-tag joints)

Contains 2 cores of Arax flux. Flux residue is easily removed with water.

SIZE 8 CARTON

5/-

Handymans Carton 6d.



HOME CONSTRUCTORS 2/6 PACK

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



BIB WIRE STRIPPER

AND CUTTER

Strips insulation without nicking wire, cuts wire cleanly, splits extruded flex 3/16 each



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



SPECIAL OFFER 12 VALVES for 18/-, Post 2/-.

LIMITED STOCKS—ORDER NOW.

These are NOT the usual 2 X 2 EG34 types offered. A good selection of obsolete and older type valves—of great interest to all constructors and service men.

ARE YOU BUILDING THIS POPULAR KIT?

Modern Portable, A.C./D.C. Mains/Battery Receiver. Four valves, DK96, DL96, etc. 2 Waveband Superhet. In an attractive Lizard Grey Case, size 8 1/2 in. x 8 1/2 in. x 4 1/2 in. Full Kit of Parts down to last nut and bolt.



£9.9.0

Or if you prefer you can build the battery version first for £7/17/6 and add the mains components later. Post extra on Kit 3/-.

Full Circuit Diagram. Shopping List. and Point-to-Point Wiring Diagram. 2/6.

CHOXES

201, 250 ohms, 60 M.A. Clamp construction, each.....	6/-
104, 290 ohms, 90 M.A. Clamp construction, each.....	9/3
104, 290 ohms, 150 M.A. Clamp construction, each.....	13
104, 290 ohms, 40 M.A. Midget Clamp construction, each.....	5/3

TRANSFORMERS FOR BATTERY CHARGERS

230 v. Input tapped 6-12 v. 1 amp., each.....	13/6
230 v. Input tapped 6-12 v. 3 amp., each.....	18/-

HEATER AUTO TRANSFORMERS
Designed to adapt common low-tension voltages 4 v., 5 v., 6.3 v. at 3 amps., centre tapped and interchangeable. Each 7/9.

TRANSFORMER MTS
Small mains transformer suitable for TV converters, etc. Primary 230 v., Secondary 250 v., 40 M.A. and 6.0 v., 15 amp. Price 15/6 each, postage 1/6.

WESTINGHOUSE RECTIFIERS
Type 14A96, 13/6 each.

OUTPUT TRANSFORMERS
Multi Ratio Type, each..... 6/6
Midget for 384 Output, each..... 4/6
Standard 5,000 ohms, each..... 4/6
Standard 10,000 ohms, each..... 4/6

CHARGER RECTIFIERS—All Full Wave

12 volt 1 amp., each.....	5/3
12 volt 2 amp., each.....	8/6
12 volt 3 amp., each.....	13/6

SPECIAL OFFER

Indicator Unit Type 6 with Tube, Less Valves. Many useful Components 17/6. Carriage Paid. Antiference Aerial Type C94. Holour with full instructions, etc. 13/6 each. Carriage Paid.

Our NEW 1956-57 Illustrated Catalogue is now ready. 48 pages of interesting reading. Send 1/- for your copy.

HEATER TRANSFORMERS—All 230 V. Input.

2 volt 15 amp., each.....	5
2 volt 20 amp., each.....	5/3
1 volt 15 amp., each.....	5/6
4 volt 15 amp., each.....	10/6
5 volt 20 amp., each.....	10/6
6.3 volt 15 amp., each.....	5/6
6.3 volt 15 amp., each.....	6/6
6.3 volt 20 amp., each.....	9/6
12 volt 15 amp., each.....	5/6

CONDENSERS

REC 100 MFD 25 v.....	1/9
REC 500 MFD 12 v.....	1/9
TCU 25 MFD 25 v.....	1/3
DUBILIER 100 MFD 12 v.....	1/9
REC 50 MFD 50 v.....	2/-
TCU 25 MFD 50 v.....	1/9
TCU 50 MFD 25 v.....	1/9
TCU 250 MFD 12 v.....	1/9
REC 250 MFD 25 v.....	1/6
REC 12 MFD 50 v.....	1/-
TCU 50 MFD 12 v.....	1/9
REC 250 250 MFD 6 v.....	1/6
DUBILIER 50 12 MFD 12 v.....	1/9

VOLUME CONTROLS

Type with Single Pole Switch. 50K ohms; 10K ohms; 20K ohms; 50K ohms; 100K ohms; 1 meg.; 1 meg.; 1 meg.; 2 meg. All 3/6 each.

DUAL VOLUME CONTROL

With Double Pole Switch 500K ohms and 200K ohms. Price 6/9 each.

TYANA SOLDERING IRON

Lightweight 40-watt iron, with easily replaceable elements and bits, 200-250 v., price 16/9 each.

TURNOVER CRYSTAL PICK-UP CARTRIDGES

Acos Type HGP37-3c. Long-playing and standard with stylus (as used in latest radiograms). Price 18/6 each.

PURETONE TAPE

1,200ft. Reels, Plastic Spool, 12/6 each.

VIBRATOR UNIT

12 volt Vibrator Unit by Mallory, complete with vibrator, 17/6 each.

Aerials Band 141 Aerials, 5 element, 702 x 1/2. An array with universal 1/2-in. meshed bracket, suitable channels S, 9 and 10. Price 41/-, carriage 4/6.

Aerialite coaxial outlet boxes at 4/6 each.

Aerialite coaxial plugs and sockets at 1/1 each.

Transmitters TH154N, 25/- each. Transmitters TH154H, 37/- each. Transmitters TH154 in tough condition 15/- each.

Carriage and postage on above transmitter is 12/6.

Meters 0-100 m.a., panel mounting, 7/6 each.

Meters 0-50 amp. R.F. panel mounting, 7/6 each.

PUBLICATIONS

No. 124—Bernard's Radio Manual "AT A GLANCE EQUIVALENTS"	each
*More than 8,000 Valves listed *All Equipments shown on one line *Army, Air Force, Navy types *Complete C V to Commercial Listing.....	5/-
No. 134—F.M. TUNER CONSTRUCTION by W. J. May *Easy to Build. Point-to-Point Wiring *Super High Fidelity Response *32 Pages *All Components for this Circuit available ex stock.....	2/6
No. 138 HOW TO MAKE AERIALS FOR TV (Band 1 and 3) and V.H.F. (Band 2) Data for all Channels. Two different designs for local and fringe areas.....	2/6
No. 135—ALL DRY BATTERY PORTABLE CONSTRUCTION *Simple and cheap to build *Point-to-point wiring *Local Ferrite aerial for high sensitivity.....	2/6
No. 100—A COMPREHENSIVE VALVE GUIDE, Book No. 1	
No. 101—A COMPREHENSIVE VALVE GUIDE, Book No. 2 (Characteristics and Base Connections).....	5/-
No. 103 RADIOFOLDER "A" The Master Colour Code Index for Radio and Television.....	1/6
No. 114 RADIOFOLDER "E" An inexpensive Tape Recorder Please include 4d. postage per copy.	2/6

ORT ISOLATION TRANSFORMERS

NR9A 2 v.; NR9B 4 v.; NR9C 6.3 v.; NR2D 10.8 v.; NR9E 13.2 v. Price 10/6 each, all for use on receivers with own transformer.

NR14 Input 250/240 v., output 2-24-24-22-3 volts at 2 amps, 17/6 each.

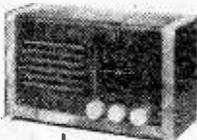
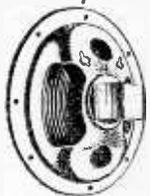
NR12 Input 230/240 v. Multi output 0-24-46-25-7.5-10-13 volts, 25% and 50%, BOOST. 21/- each.

NR15 Input 230/240 v. Output 6.3 v. with 25% and 50% BOOST. Price 17/6 each.

LOUD SPEAKERS

All PM Types less Transformers

5in. Types by Elco, Electrona, Celestion, etc.....	each
6in. Types by Goodmans, Rob. R. & A.....	17/6
5in. Types by Goodmans, Plessey, R. & A.....	13/6
5in. Types by R. & A., Celestion, etc.....	19/6
6in. Water Speaker by Truvox, suitable for Car Radio, etc.....	20/-
12in. Plessey Light weight.....	35/-
Eluded Speakers, Goodmans, 5in. x 7in.....	19/6



ALPHA 3 VALVE T.R.F. KIT

£5.10.0

- * Easy to Build.
- * Valves 6J7 6K7, 6V6GT plus metal rectifier.
- * Walnut cabinet.

Full instructions, point-to-point wiring diagram. Circuit diagram and full shopping list 1/-. All components may be purchased separately.

ALPHA
RADIO SUPPLY CO.



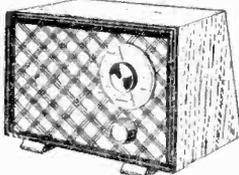
5/6 VINCES CHAMBERS
VICTORIA SQUARE
LEEDS 1.

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 1/-; 20/- add 1/6; 40/- add 2/-; £5 add 3/- unless otherwise stated, Minimum C.O.D. fee and postage 3/-. All single valves postage 6d.

MAIL ORDER ONLY

THE SKYSEARCHER

An all mains set for 19/6



This is a 2-valve plus-metal rectifier set useful as an educational set for beginners, also makes a fine second set for the bedroom, workshop, etc. All parts, less cabinet, chassis and speaker. 19/6. Post & ins. 2/6. Data free with parts or available separately 1/6.

THE REALITE



This is a complete fluorescent fitting. Stove enamelled white, with starter and ballast all ready to install. Price 25/- plus 4/6 carriage and packing. 40 watt tube, 16/-, no extra for packing if ordered with fitting.

MINIATURE MOTOR



Size only 2 1/2 ins. long by 1 1/2 ins. diameter—American made—laminated poles and armature—intended for 28-volt D.C. but O.K. on lower D.C. voltages and A.C. mains, through step-down transformer—price 10/6. Post, etc., 2/-.

MULTI-METER KIT



Parts suitable for making a multi-meter to measure volts, milliamperes and ohms. Kit containing all the essential items including moving-coil meter, resistors, range selector, calibrated scale, etc., etc., is only 15/-, plus 1/- post and packing.

W.D. CIRCUIT DETAILS

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

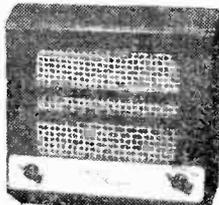
- American Service
- | | |
|---------------------------|---------------------|
| Sheets | R.109 |
| A-134 | 78 receiver |
| EC-398 | 76 receiver |
| EC-312 | R28/ARC5 |
| R-103A | R1116/A |
| EC-342 | RA-1B |
| RA-1B | AR88D |
| R-218 | AN/APA-1 |
| R-1155 | 78 |
| R-1124A | 76 |
| R-1132A/R-1481 | R.T.18 |
| R-1147 | CAY-46-AAM |
| R-1251A | RADAR |
| R-1082 | A.S.B.-3 |
| R-1355 | Indicator 62A |
| B.C.1206-A/B | Indicator A.S.B.3 |
| E-455-A (or-B) | Indicator 62 |
| E-454-A (or-B) | Indicator 6K |
| E-F3-A (or-B) | R.F. unit 24 |
| Transmitter T1154 | R.F. unit 23 |
| Fifty-eight walkie talkie | R.F. unit 25 |
| Frequency meter | R.F. unit 27 |
| E.C.221 | Wireless set No. 19 |
| | Demobbed valves |

The "CRISPIAN" Portable Radio



A 4-valve truly portable battery set with very many good features as follows: Ferrite rod aerials, low consumption valves, superb circuit with A.V.C. ready-built and aligned chassis if required, beautiful two-tone cabinet covered with I.C.I. Resine and Tygan. Guaranteed results on long and medium waves anywhere.

OFFICE INTERCOM.



This is a 2-station "master" unit comprising an A.C. mains operated push-pull amplifier with built-in P.M. speaker, which acts as microphone or loudspeaker depending on whether switch is set to "talk" or "listen." Complete in polished cabinet ready to work. Price only 24/19/6 plus 3/6 carriage and insurance. Sub stations 19/6 each.

PRODUCTION INCREASED — CIRCUIT IMPROVED — PRICE REDUCED



To-day's best value in Band III Converters suitable for your T.V. or money refunded. Complete ready to operate, 49/6 non mains, or 69/6 mains, post and insurance, 3/6.

THIS MONTH'S SNIP. THE WOLSEY 4-VALVE SUPERHET



This excellent little receiver employs standard circuitry and is ideal as a second receiver for bedroom, kitchen, etc. It is a broadcast band set and will receive with only a few feet of aerial all stations of reasonable local strength. With a longer aerial hundreds of stations can be received. Complete, ready to work in modern-looking oak cabinet—limited quantity offered this month at 26/15/0 plus 5/- carriage and insurance. Overall size approximately 11 1/2" x 7 1/2" x 8 1/2".

RECORD PLAYER 24/10/0

3-speed Gramophone Motor

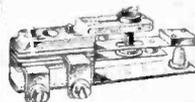


Latest rim drive 3-speed motor with metal turntable and rubber mat. Small motor, makes speed easily variable for special effects and dance work. Hi-Fi Pick-up Using famous Cosmocord Hi-G turn-over crystal. Separate sapphire for each speed. Neat bakelite case with pressure adjustment. Special Snip Offer This Month The two units for 24/10/-, plus 5/- post and insurance, or made up on board as illustrated. 25/10/-, plus 5/- post.

ELECTRIC BLANKET WIRE

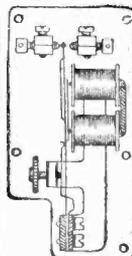
Waterproof P.V.C. covered, so blanket washable. 160 ohms per foot—1/6 per yard, 14 yards, ideal for average blanket, £1 post free.

THERMOSTATS



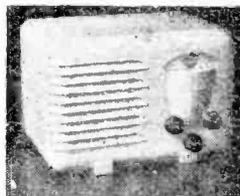
Useful for the control of a pilot lamp, such as convector, electric pots, vulcanizers, hot plates, etc.

Adjustable to operate over the temperature range 50-550 deg. F. 11 amp. 3/6; 5 amp. 8/6; 2 amp. new 5/6; 2 amp. QMB, 15/-.



HIGH-SPEED RELAY

This is a miniature type relay with change-over platinum contacts. Bobbins are 250 ohms each. Brand name limited quantity, 7/6 each, post 1/6.



MAINS-MINI

Uses high-efficiency coils, covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, 24/10/0, plus 3/6 post. Constructional data free with the parts, or available separately 1/6.

CAR STARTER CHARGER KIT

All parts to build 6- and 12 volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following: Mains transformer 19/6; 5 amp. rectifier 17/6; Regulator Stud Switch 2/6; Resistance Wire 2/-; Resistance Former 3/6; Mains on/off switch 1/-; 0-5 amp. Moving Coil Meter 9/6; Constructional Data 1/6 or if bought all together price is 52/6, plus 2/- post and packing.

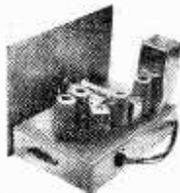
BABY

ALARM



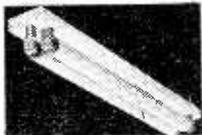
Unlike most baby alarms, this not only enables you to hear baby but also to talk to him. Price complete with one microphone and 103ft. twin flex. 26/19/6, carriage 3/6, additional 26/19/6, carriage 3/6, additional 26/19/6, carriage 3/6, additional 26/19/6, carriage 3/6.

F.M. TUNER



This tuner is based upon the very successful circuit published by Data Publications. We have made up models at all branches and will gladly demonstrate. Stability is extremely good and making and aligning most simple. Cost of all parts, including valves, prepared metal chassis, wound coils and stove enamelled scale, slow-motion drive, pointer, tuning knob, in fact everything needed, is £6.12.6. Data is included free with the parts or is available separately, price 2-.

THE TWIN 20



This is a complete fluorescent lighting fixture. It has built-in ballast and starters—stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the work-bench, and in similar locations. It uses two 20-watt lamps. Price, complete less tubes, 29/6, or with two tubes, 39/6. Post and insurance 5-. Extra 20-watt tubes, 7/6 each.



MULLARD AMPLIFIER "510"

A Quality Amplifier designed by Mullard. Power output exceeds 10 watts. Frequency response almost flat from 10 to 20,000 C.P.S. For use with the Acos "Hi G" and other good pick-ups. Made up and ready to work is £12.10/-, plus 10/- carriage and insurance.



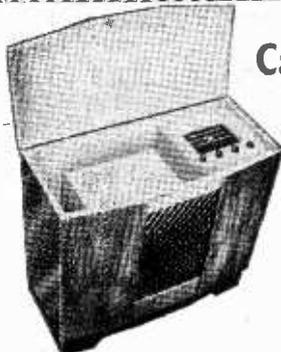
CONNECTING WIRE

P.V.C. covered in 100ft. coils—2 or 4 coil or four coils different colours. 10/- post free.

12in. T.V. CABINET—15/-



We are offering these at not much more than the cost of the plywood they contain. If not wanted for T.V. many useful items can be made—record storage cabinet, Hi F. loudspeaker case, book case, etc., etc. Price 15/-, carriage 3/6.



Cabinets For All

This is the "Empress," undoubtedly a beautiful piece of furniture, elegantly veneered in figured walnut and in white sycamore. The radio section is raised to convenient level but is not drilled or cut. The lower

deck acts as the motor board, again is uncut. It measures 16" x 14" and has a clearance of 5" from the lid. There is a compartment for the storage of recordings. Overall dimensions of this essentially modern cabinet are 3ft. wide, 2ft. 8in. high and 1ft. 4in. deep. Price £14.14.0. carriage and insurance 20/-.

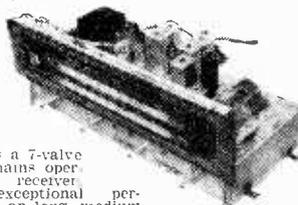
THE UNI-T.V.

Undoubtedly the most up-to-date television for the home constructor. You can build all or only part and the set when finished will be equal to a factory-made equivalent. What other constructor T.V. has all these features?

- * Made up units if required.
- * All miniature valves.
- * Metal rectifier.
- * No expensive transformers.
- * 13-channel circuitry.
- * Multi-vibrator time bases.
- * Ferrucube, E.H.T. and scan coils.
- * 34/38 Mc's I.F.
- * Suitable for any modern 12, 14 or 17in. tube.
- * Modern contemporary cabinet if required.

The building cost (less tube) is only £29.10.0, plus 10/- carriage and insurance. All parts guaranteed 12 months. Full information and data free with parts or available separately price 3/6.

AM/FM RADIOGRAM CHASSIS



This is a 7-valve A.C. mains operated receiver. An exceptional performer on long, medium and short A.M. bands and on the new V.H.F. band. It is an ideal unit for a quality radiogram. Special features include magic eye tuning indicator, extra long scale and pointer travel—latest circuitry employing full A.V.C. feed-back, etc., etc. Undoubtedly one of the finest AM/FM chassis available today. Chassis size 17in. x 6in. x 7in. Price £23.17.6. Carriage, packing and insurance 20/- extra.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to E.P.E., LTD., Dept. 5, Sutton Road, Eastbourne.

Post enquiries to Fastbourne with stamped envelope, please.

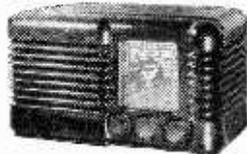
42-46, Windmill Hill, Ruislip, Middx. Phone: RU1SJLP 5780 Half day, Wednesday.

152-3, Fleet Street, E.C.4. Phone: FLEET 2933 Half day, Saturday.

29, Stroud Green Rd., Finsbury Park, N.49. Phone: ARCHWAY 1049 Half day, Thursday.

249, Kilburn High Road, Kilburn, MAIDA VALE 4821.

NEW CIRCUIT



OCCASIONAL 56—we have evolved a new T.R.F. circuit and have had really good results, equal in fact to many superhets. You really should try this circuit. All parts including valves (6K7, 6J7, 6F6, and 6X5) and Bakelite case with back cost only £5.10.0, plus 2/6 post and insurance. Data included with the parts is also available separately, price 2-.

HUGE MINISTRY PURCHASE

R.1155—yours for £2 down
Frequency 75 kc/s to 18 mcs—10 valves—metal case—robust receiver

—cost
—over
£60 to make—
with
give
years of service.
very
little used. Price £10 or 5 payments of £2.
Carriage & transit case 15/-.



SOMWEAVE



This really lovely loud-speaker fabric we offer at approximately a third of today's cost. It is 42in. wide and our price is 19/- per yard, or panels 12in. x 12in., 19 each. This is also very suitable for covering plain wooden case, for portable radio amplifiers, etc.

INDUSTRIAL OVERHEAD HEATER



Garages, workshops, and other places difficult or impossible to heat by normal means can now have "warm spots" at a relatively low cost (1d. per hour where electricity costs 1d. per unit).

The Infray Major gives light as well as heat and has controls giving four variations. Consumption at full power is 1 kW. Price complete with chains, ready to work, £7.10.0, carriage and insurance 5-.

TA12G TX

Bendix Transmitter. New. Complete. Valved,

£4.10.0

RF24 or 25 UNITS

Brand new. Less valves. 9/- in maker's cartons.

New Supply

R1155

COMMUNICATION RECEIVER

£6.0.0

Carriage 10/-

DINGHY TX HAND GENERATORS. X U.S.A., 15/- Throat Mic., 5/6. Heater Transformers, 4 and 6.3 volt 1.5 amp., 7/6. Output Trans. for 6V6, 5/- 200 Kc Crystal, 8/6. Londax A.C. Relays, 230 V.A.C., 8/6. L.R. Earphones (New), 7/6. Relay G.P.O. type 6,000 Ω 8/6. Silicon Diode, 2/- Germanium Diode, 2/- Packard Bell Amplifier, complete, new, 12/6. Gun Sight Lens, in case, £1. 16 Bank Switchbox, 8/6. R.A.F. Heavy Duty Switch, 1/6. P.V.C. 22 s.w.g., eight colours, 2d. per yd.

VALVE LIST

6AG7 9/-	SP41 2/6	6N7 8/6
6J6 5/-	955 5/-	3S4 8/6
D1 2/-	6J7 7/6	1R5 8/6
6V6 8/6	EF39 7/-	DAF96
6K8 11/-	CV66 5/-	11/-
6SL7 8/-	6SK7 4/6	DL96 11/-
6SN7 9/-	Pen46 4/6	DK96 11/-
6K7 6/-	6AG5 7/6	EY51 13/6
5Z4 8/6	1S5 8/6	U25 15/6
VU120 5/-	1L4 7/-	EF80 10/6
VU39 8/6	3V4 9/-	ECL80
5U4G 8/6	R19 12/6	11/-
6X5 7/6	RK34 2/6	PL81 13/6
6X4 7/6	CV201 8/6	PL82 10/6
6J5 5/-	105/30 7/6	PY81 10/6
EF36 4/6	12SH7 7/6	PY82 10/6
EL32 5/6	12SJ7 7/6	ECC81
EF54 5/-	12Q7 9/6	10/6
6B4 4/-	12K7 9/6	ECC82
6SA7 8/-	Pen25 6/-	10/6
6C4 7/-	S130 6/-	ECC83
1T4 7/-	UCH42	10/6
1A3 7/-	10/6	EZ80 9/6
UAF42	6AL5 7/6	UY41 9/6
11/-	SP61 2/6	PCF80
6AM6 8/6	EA50 2/-	10/6
EF50 4/-	VU111 3/-	7H7 8/6

VINERS

(MIDDLESBROUGH)

26, EAST ST., MIDDLESBROUGH

TEL.: MID 3418

CONDENSERS

Assorted, 100 Mixed

15/-

RESISTORS

Assorted, 100, $\frac{1}{2}$, 1, 2w.,

12/6

RESISTORS CARBON

$\frac{1}{2}$ watt, 4/6 doz. 1 watt, 5/6 doz. 2 watt, 7/6 doz. Welwyn Wire Wound Vitreous, 1/- each. Electrolytic Condensers, all 450 volts. wkg. 8 mfd., 2/6. 8 + 8 mfd., 3/9. 16 mfd., 3/3. 8 + 16 mfd., 4/- 16 + 16. 4/6. 20 mfd., 3/- 32 + 32 mfd., 6/- 25 mfd. 25 volt., 50 mfd. 50 volt, 2/- each. Potentiometers, values to 2 meg., 2/6 each. 100 K, $\frac{1}{2}$, 1, 2 meg. w/switch, 4/- R.E.P. Crystal Coil (with circuit), 2/6. Dual Range T.R.F. Coils, 4/-.

VALVE HOLDERS

1 Octal, M Octal. 6d. each. B7G, 10d. 807, 1/- RK34 Type, 1/6. B9A, 1/3. B9G, 9d.

MULTI METER

U.S.A. manufacture

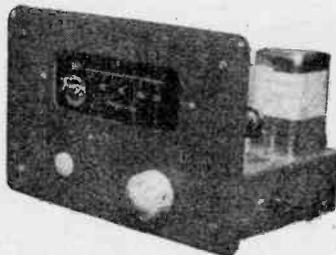
Brand **£7.10.0** New. Ranges A.C.-D.C. to 6,000 volts. Resistance to 5 megohm. Output Meter and Decibel range.

TWO OUTSTANDING JASON F.M. KITS

QUALITY DESIGNS • EASY TO BUILD

JASON F.M. TUNER

Ease of building and complete stability characterise this outstandingly successful Jason design. It uses four Z77/EF91 valves and has a useful range of at least 60 miles from the transmitting station. A fringe-area version is also available. The book of the Jason F.M. Tuner (Data Publications), price 2/-, gives complete building and operating instructions. Chassis supplied ready punched. 0.5v. output suits all high-fidelity amplifiers. Power pack kit also available. Detailed price list, etc. on application.

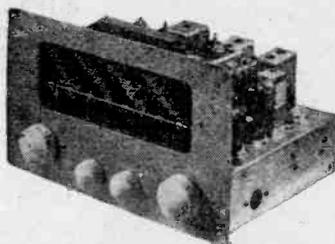


Complete kit of quality components less valves, **£5.5.0.**
Fringe-area version (less valves), **£6.0.0.**
Power-pack kit, **£2.1.9.**

FROM LEADING STOCKISTS EVERYWHERE

In case of difficulty please write direct to the makers

JASON MOTOR & ELECTRONIC CO.,

JASON "ARGONAUT" MW/FM TUNER UNIT**FOR BUILDING AS A TUNER OR RECEIVER**

For those wishing to enjoy selected reception of overseas transmissions as well as the superlative quality of F.M., the Jason "Argonaut" will be found ideal. It is recommended particularly for ambitious builders, and may be built as a tuner-unit, or self-powered unit with quality output stage. The chassis accommodates either version. F.M. sensitivity—15 microvolts. Switching and wiring are absolutely straightforward. Supplied with chassis, dial and tuning condenser ready mounted. Centre front-panel holes are blocked by easily removed plastic discs.

All parts (less valves) to build tuner, **£10.10.0.**
All parts (less valves) to build as complete receiver, self-powered, **£11.10.0.**

328, CRICKLEWOOD LANE, LONDON, N.W.2
Phone: SPEedwell 7050

LASKY'S PAGE OF MONEY-SAVING OFFERS

LASKY'S SCORE AGAIN! GREATEST TAPE RECORDER BARGAIN EVER OFFERED!!

Not a kit, but a first-class, factory-built recorder—the famous high fidelity "CONCERTONE"—completely ready for use. Note these brief details: Two speeds, 7 1/2 and 3 1/2 in. sec. Two half-track Heads by Wearite. Power output 3-4 watts. Fast forward, 60 sec. Fast rewind, 45 sec. Overall size, closed, 10 1/2 x 12 x 7 in. approx. Gross weight 25 lbs. approx.

See and hear the incomparable "Concertone" at either of our addresses, or order by mail with complete confidence. **GUARANTEED BY US FOR 12 MONTHS.** Strictly limited number available.

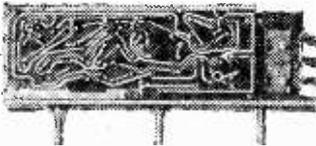
LISTED AT £50.8.0

LASKY'S
PRICE **33** GNS.

Complete with 1200ft reel of Dinitone, take-up Spool and Microphone. Carr. and Insur. 2/- extra.



NEW BATTERY PORTABLE FOR HOME CONSTRUCTION ON PRINTED CIRCUIT



CAN BE
BUILT FOR

£7.7.0

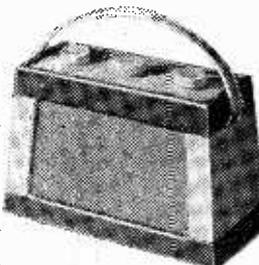
Use all latest innovations, giving simplicity of construction with fine quality. The **PRINTED CIRCUIT** completely eliminates wiring errors.

10 STAR FEATURES make this the finest Portable Radio ever offered to the home constructor. Peak value for money has been obtained without sacrifice of quality or design.

- ★ PRINTED CIRCUIT 7 1/2 x 2 1/2 in.
- ★ 3-valve Superhet, med. and long wave.
- ★ 1.6w Consumption Valves, Double Battery I.H.C.
- ★ Ferrite Rod Internal Aerial.
- ★ 3 or 5in. P.M. Moving Coil Speaker (your choice).

CIRCUIT DIAGRAM, assembly data, all instructions and shopping list. 1/6. post free.

DEMONSTRATION MODELS AT BOTH OUR ADDRESSES



- ★ Brand New T.C.C. Capacitors.
- ★ Automatic Volume Control.
- ★ New Style Contemporary Case.
- ★ Lightweight and of Handsome Appearance.
- ★ Every Component available separately.

JASON "ARGONAUT" AM/FM TUNER

Complete parcel with power supplies. **£13.19.6** Post 3/6.

BOOK, with price list, 2/-. Chassis Assembly, 5/9, Post 2/6. I.T. and Coil Set, 7/8, Post 1/6.

JASON F.M. TUNER

Special Parcel containing data book, chassis, front end, dial, drive, tuning cond., full set of coil, ratio detector, etc., **68/9** Post 2/6.

Book, with price list, 2/-. This tuner can be built for 39/15/0, plus 3/6 post.

3-SPD. AUTO-CHANGERS

Brand new in makers' cartons **GARRARD RC.110, STILL FURTHER REDUCED.** Complete with t.o. crystal pick-up. Cream, brown finish. List £14.13.0. Lasky's Price **£7.19.6** Carr. 6/-

GARRARD RC.80. Full length arm with two Decca XMS heads. List £20.15.0. Lasky's Price **£13.19.6**

Carr. 5/-. Also available with GC2 r.o. crystal p.u. at same price. **COLLARO RC.54,** with Studio O t.o. crystal p.u., **£8.19.6** Carr. 5/-

SINGLE RECORD PLAYERS

COLLARO RC3/554. 3-speed, single record player with studio O t.o. crystal p.u. List £9.9.0. Lasky's Price, **£6.10.0** post free. **B.S.H.** type TU.3, 3-spd. motor, turntable, and HGF.50 t.o. crystal p.u., with two styli.

Lasky's Price **92/6** Post 3/6. Without pick-up, 57/6. Post 2/6.

CONSTRUCTOR PARCELS

Each complete with your choice of Cabinet, 12 x 6 1/2 x 5 1/2 in. deep, walnut or ivory plastic or wood with walnut veneer.

PARCEL NO. 1. Everything to build a 4-valve, 3-wave superhet for 200/250 A.C. mains. Uses 6K8, 6K7, 6J7, 6V6 valves. **CAN BE BUILT FOR £7.19.6.**

PARCEL NO. 2. Everything to build a T.R.F. 3-valve set for 200/250 A.C. mains, med. and long wave. Uses 6K7G, 6J7, 6V6 and metal rectifiers. **CAN BE BUILT FOR £5.10.0.**

Post 2/6. **INSTRUCTION BOOKS,** 1/- each, post free. All components available separately.

3-WATT MIDGET AC/DC AMPLIFIER

PUSH-PULL, VERY HIGH GAINS 4 valves: 2 6U41 in push-pull, 1 6CH42 and 1 6UAF42. Input voltage 100/100 A.C./D.C. Easily converted to 230 volts. Ideal for ships record players, tape recorders, home record players, baby alarms, etc., etc. Supplied fully assembled with 4 valves and circuit diagram. **LASKY'S PRICE 50/-** Carr. 5/-

SPECIAL OFFER!

GOODMANS 12in. Audiom 50 P.M. SPEAKERS.

10 watts. Limited quantity. List £6.15.0. **LASKY'S PRICE, 97/6** Post free.

5-VALVE RADIO CHASSIS

Brand new. A.C./D.C. 200/250 v. B.F. 465 kc's A.V.C., 4-watts output. 3 station preset, frame-arranged, fully aligned. Chassis 10 x 5 1/2 in., max. height 5 1/2 in. Wired ready for use with the addition of a speaker and output trans, 2 controls, volume and station switch. Valves used: 10C1, 10F9 or 10F41, 10L11, 10P14, U404 or UY41.

Lasky's Price, less valves, **52/6** Post 3/6.

AMAZING OFFER OF

BRAND NEW, PERFECT

16" METAL CONE C.R.T.



0.5 v. heater, Ion trap, 14 K.v. E.U.T. wide angle 70°, standard 38 m.m. neck, guodecal base, magnetic focus and deflection. Length 17 1/2 in. Gives large black and white picture 11in. x 14in.

Unused in original cartons. Guaranteed by us 3 months full data, connections and suggested time bases supplied with every Tube.

LISTED AT **£23.9.10** LASKY'S PRICE **£8.9.6**

Carr. & Insur. 22s extra.

Masks, Anti-Corona Rings, Bases and Ion Traps available.

MOVING COIL P.M. SPEAKERS

3in. and 3 1/2in. 19 6 - 5in. 16 6 ; 6in. 17 6 ; 6in. 25 - ; 40in. 22 6 ; 12in. 29 6 ; 6in. with trans. 21 - ; 7 x 4 Elliptical, 19 6 ; 10 x 6 Elliptical, 32 6 .

LASKY'S RADIO

LASKY'S (HARROW ROAD) LTD.

42, TOTTENHAM COURT ROAD, W.1.

Telephone: MCSeum 2605.

370, HARROW ROAD, PADDINGTON, W.9.

1, AdBroke 4075 and CUNningham 1079.

Open all day Saturday, early closing Thursday.

ALL MAIL ORDERS TO HARROW ROAD PLEASE

R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS

- 6 v. 1 amp. 19/9
 - 6 v. or 12 v. 1 amp. 25/9
 - 6 v. 2 amps. 29/9
 - 6 v. or 12 v. 2 amps. 39/9
 - 6 v. or 12 v. 4 amps. 56/9
- Above ready for use. Carr. 2/6.
With mains and output leads.

HEAVY DUTY KIT

12 v. 30 amp. Suitable for Garage or firm with a number of vehicles. Mains input 200/250 v. 50 c/s. Outputs 12 v. 15 amp. twice. Consists of Mains Trans. 2 Metal Rectifiers. 2 Meters, 4 Fuses, 4 Terminals. 2 Rheostats and circuit. Only 9 gns., carr. 15/-.

BATTERY CHARGER KITS

Consisting of Mains Transformer. F.W. Bridge. Metal Rectifier, well ventilated steel case, Fuses, Fuse holders, Grommets, panels and circuit. Carr. 2/6 extra.

- 6 v. or 12 v. 1 amp. 22/9
- 6 v. 2 amps. 25/9
- 6 v. or 12 v. 2 amps. 31/6
- 6 v. or 12 v. 4 amps. 49/9

BATTERY CHARGER KIT

Consisting of F.W. Bridge Rectifier 6/12 v. 5 a. Mains Trans. 0-9-15 v. 6 a. output and variable charge rheostat with knob. Only 45/9.

ASSEMBLED CHARGER

6 v. or 12 v. 2 amps. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case, finished attractive hammer blue. Ready for use. With mains and output leads. Double Fused. Only Carr. 46/9

All for A.C. MAINS 200-250 v., 50 c/s. Guaranteed 12 months.



Assembled 6 v. or 12 v. 4 amps. Fitted Ammeter and variable charge selector. Also selector plug for 6 v. or 12 v. charging. Double fused. Well ventilated steel case with blue hammer finish. **69/6**
Ready for use with mains and output leads. Carr. 3/6

R.S.C. MAINS TRANSFORMERS (GUARANTEED)

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

- 250-0-250 v. 70 mA, 6.3 v. 2.5 a. 13/9
- 250-0-250 v. 70 mA, 6.3 v. 2.5 a, 5 v. 2 a. 18/9
- 300-0-300 v. 70 mA, 6.3 v. 2.5 a. 16/9
- 350-0-350 v. 80 mA, 6.3 v. 2.5 a, 5 v. 2 a. 18/9
- 250-0-250 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a. 22/9
- 300-0-300 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a. 22/9
- 350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a. 22/9
- 350-0-350 v. 100 mA, 6.3 v. 4 a, C.T. 0-4-5 v. 3 a. 23/9
- 350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a. 29/9

FILAMENT TRANSFORMERS

All with 200-250 v. 50 c/s primaries 6.3 v. 1.5 a, 5/9; 6.3 v. 2 a, 7/3; 0-4-6.3 v. 2 a, 7/9; 12 v. 1 a, 7/11; 6.3 v. 3 a, 8/11; 6.3 v. 6 a, 17/6; 12 v. 3 a or 24 v. 1.5 a, 17/6.

CHARGER TRANSFORMERS

All with 200-230-250 v. 50 c/s Primaries: 0-9-15 v. 11 a, 11/9; 0-9-15 v. 3 a, 16/9; 0-3.5-9-17 v. 3 a, 17/9; 0-3.5-9-17.5 v. 4 a, 18/9; 0-9-15 v. 5 a, 19/9; 0-9-15 v. 6 a, 22/9.

SMOOTHING CHOKES

- 250 mA 5 H 100 ohms ... 12/9
- 150 mA 7-10-250 ohms ... 11/9
- 100 mA 10 H 250 ohms ... 8/9
- 80 mA 10 H 350 ohms ... 5/6
- 60 mA 10 H 400 ohms ... 4/11

OUTPUT TRANSFORMERS

Midget Battery Pentode 66 : 1 for 354, etc. 3/9

- Small Pentode, 5,000 Ω to 3 Ω ... 3/9
- Small Pentode 7,8,000 Ω to 3 Ω ... 4/9
- Standard Pentode, 5,000 Ω to 3 Ω ... 4/9
- Standard Pentode, 7,8,000 Ω to 3 Ω ... 4/9
- Multi-ratio 40 mA, 30 : 1, 45 : 1, 60 : 1, 90 : 1, Class B Push-Pull ... 5/6
- Push-Pull 10-12 watts 6V3 to 3 Ω or 15 Ω ... 15/9
- Push-Pull 10-12 watts to match 6V3 to 3-5-8 or 15 Ω ... 16/9
- Push-Pull 15-18 watts, 6L6, KT66 ... 22/9
- Push-Pull 20 watts, sectionally wound 6L6, KT66, etc., to 3 or 15 Ω 47/9
- Williamson type exact to spec. ... 85/-

MANUFACTURERS' SURPLUS MAINS TRANSFORMERS

Primaries 250-250 v. 50 c/s. Fully shrouded upright mounting 425-0-425 v. 150 mA, 6.3 v. 3 a, 5 v. 3 a, 29/11, post 2/9. Wearite, clamped upright mounting, 825-0-825 v. 100 mA, 6.3 v. 2.5 a, 5 v. 2 a, 19/9. Clamped upright mounting, small size, 250-250 v. 70 mA, 6.3 v. 2.5 a, 10/9.

EX-GOVT. TRANSNS. 230/250 v. 50 c/s

8.8 v. 4 a, 9/9; 460 v. 200 mA, 6.3 v. 5 a, 25/9; 300-0-300 v. 150 mA, 4 v. 3 a, 9/9; 0-16-18-20 v. 35 a, 69/6, carr. 7/6.

EX-GOVT. SMOOTHING CHOKES

- 250 mA, 5 H 50 ohms ... 12/9
- 150 mA, 10 H 100 ohms ... 11/3
- 150 mA, 6-10 H 150 ohms Trop. 6/9
- 100 mA, 10 H 150 ohms Tropical. 3/11
- L.T. type 1 amp. 2 ohms ... 2/9

EX-GOVT. METAL BLOCK (PAPER) CONDENSERS

- 4 mfd. 500 v., 2/9; 4 mfd. 1,000 v. 3/9; 4 mfd. 1,500 v., 5/9; 8 mfd. 500 v. 6/9; 8 mfd. 500 v., 4/9; 10 mfd. 500 v., 5/9; 4 mfd. 400 v. plus 2 mfd. 250 v., 1/11.

EX-GOVT. DOUBLE WOUND STEP UP/STEP DOWN TRANSFORMER

10-0-100-200-220-240 v. to 5-0-75-115-135 v. or REVERSE. 80/100 watts. Only 11/9, plus 2/9 post.

EX-GOVT. ELECTROLYTICS

Removed from unused equipment. 8-16 mfd. 550 v., 1/3; 16-16 mfd. 350 v., 1/3; 1,000 mfd. 6 v., with clip, 1/9; 50 mfd. 50 v., with clip, 9d.

EX-GOVT. CASE

Well ventilated black crackle finished, undrilled cover. Size 14 x 10 x 8 1/2 in. high. IDEAL FOR BATTERY CHARGER OR INSTRUMENT CASE. OR COVER COULD BE USED FOR AMPLIFIER. Only 9/9, plus 2/9 postage.

EX-GOVT. VALVES (NEW)

1T4	7/9	6V6GT	6/9	6AT6	7/9
1R5	7/9	6X5GT	7/9	EB91	8/9
1S5	7/9	6L6G	11/9	EF38	4/9
354	8/9	807	7/9	EL32	3/9
6K8G	9/9	12A5	7/9	EL91	5/9
6S7GT	6/9	15D2	4/9	KT68	11/9
6F6G	7/9	25Z4G	9/9	SP61	2/9
EF99	5/9	MH4	4/9	PX25	14/9

EX-GOVT. UNIT RDEL

Brand new, cartoned. Complete with 14 valves, including 5Z4, E.H.T. rectifier, Trans. Choke etc. Only 29/9, carr. 7/6.

ELECTROLYTICS (current production)

NOT Ex-Govt.	Can Types	8 mfd. 600 v.	2 1/11
Tubular Types			
8/7F 450 v.	1/9	16 mfd. 500 v.	9/9
8 mfd. 500 v.	2/6	16 mfd. 350 v.	1 1/11
16/7F 350 v.	2/3	16/7F 450 v.	2/9
18/7F 450 v.	2/9	32/7F 350 v.	2 1/11
18/7F 500 v.	3/9	32 mfd. 450 v.	4/9
32/7F 350 v.	3/9	100 mfd. 450 v.	4/9
25/7F 25 v.	1/3	8-4/7F 450 v.	2/9
50/7F 12 v.	1/3	8-16/7F 450 v.	2/11
50/7F 25 v.	1/6	16-16/7F 450 v.	3 1/11
50/7F 50 v.	1/9	16-32/7F 350 v.	4 9
100 mfd. 12 v.	1/9	32-32/7F 350 v.	4/9
100 mfd. 25 v.	2/3	60-100 mfd.	5/9
1,000-1,000 mfd.		350 v.	6 1/11
6 v.	2/9	64-120 mfd. 350v.	7/9
1,500v.	2 1/11	100-200 mfd.	6/9
6,000 mfd. 6 v.	3/9	275 v.	6/9

Many others in stock.

HUNTS MOLDSALD CONDENSERS

.005 mfd. 400 v., .01 mfd. 400 v., .04 mfd. 500 v., 5/6 doz. (one type); .1 mfd. 350 v., 8d. ea.; .25 mfd. 500 v., 1/3; .5 mfd. 500 v., 1/8 ea.

FULLY SHROUDED UPRIGHT

- 250-0-250 v. 80 mA, 6.3 v. 2 a, 5 v. 2 a, Midget type 21-3-3in. 17/6
- 350-0-350 v. 70 mA, 6.3 v. 2 a, 5 v. 2 a. 19/9
- 250-0-250 v. 100 mA, 6.3 v. 4 v. 4 a, C.T. 0-4-5 v. 3 a. 26/9
- 250-0-250 v. 100 mA, 6.3 v. 6 a, 5 v. 3 a, for R1355 conversion ... 31/-
- 350-0-350 v. 100 mA, 6.3 v. 4 v. 4 a, C.T. 0-4-5 v. 3 a. 26/9
- 350-0-350 v. 100 mA, 6.3 v. 4 a, 5 v. 3 a. 27/9
- C.T. 0-4-5 v. 3 a. 27/9
- 350-0-350 v. 150 mA, 6.3 v. 4 a, 5 v. 3 a. 35/9
- 350-0-350 v. 150 mA, 6.3 v. 2 a, 6.3 v. 2 a, 5 v. 3 a. 35/9
- 425-0-425 v. 200 mA, 6.3 v. 4 a, C.T. 6.3 v. 4 a, C.T., 5 v. 3 a. Suitable Williamson Amplifier, etc. 49/9
- 450-0-450 v. 250 mA, 6.3 v. 6 a, 6.3 v. 6 a, 5 v. 3 a. 69/9

E.H.T. TRANSFORMERS

2,500 v. 5 mA, 2-0-2 v. 1.1 a, 2-0-2 v., 1.1 a for VCR97, VCR517, etc. 36/6

ELIMINATOR TRANSFORMERS

- Primaries 200-250 v. 50 c/s ... 14/9
- 120 v. 40 mA, 5-0-5 v. 1 a. 15/9
- 90 v. 15 mA, 4-0-4 v. 500 mA ... 9/9

SMALL POTTED MAINS TRANSF.

Removed from New Ex-Govt. units. Primary 0-200-250 v. Secs. 250-0-250 v. 80 mA, 6.3 v. 2 a, 5 v. 2 a. Size 31 x 41 x 31in. 11/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all dry battery eliminator. Size 5 1/2 x 4 x 2 in. approx. Completely replaces batteries 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, 39/3, or ready for use, 46/3.



Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v., 90 v. and 60 v., 40 mA. and 2 v. 0.4 a to 1 amp. fully smoothed. Thereby completely replacing both H.T. batteries and L.T. 2 v. accumulator. When connected to A.C. mains supply 200-250 v. 50 c/s. **AVAILABLE FOR ALL BATTERY RECEIVERS** Normally using 2 v. Accumulator. Complete kit of parts with diagrams and instructions 49/9, or ready for use 59/6.

L.T. ELIMINATOR AND TRICKLE CHARGER KIT

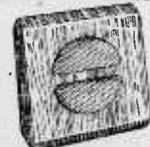
Input 200-250 v. A.C. Output 120 v. 40 mA. Fully smoothed and rectified supply to charge 2v. accumulator. Price with louvred metal case and circuit, 29/6. Or ready for use, 8/9 extra.

EXTENSION SPEAKERS

Ready for use in walnut veneered cabinet.

- 6 1/2 in. 2-3 ohms, 29/6.
- 8 in. 2-3 ohms, 35/9.

Very limited number.



SPECIAL OFFERS

8-9 mfd. 450 v. small can electrolytics in lots of six, 1/6 ea. Small .0005 mfd. 2 Gangs, 4/9 ea.

T.V. CABINETS

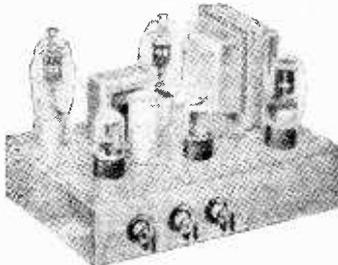
Leading manufacturers surplus. Attractive design. Walnut veneered, with doors for 15, 16, or 17in. Tube, 23-18-6. Carr. 7/6.

VOLUME CONTROLS

With long (1 in. diam.) spindle all values, less switch, 2/9; with S.P. switch, 3/9; with D.P. switch, 4/6.

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

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carrying handles can be supplied for 17.6. Additional input socket with associate Vol. Control so that two different inputs such as Gram and "Mike" or Tape and Radio can be mixed, can be provided for 13.- extra. **TERMS** on assembled two input model. **DEPOSIT 25/6** and nine monthly payments 22/4. **HIGH-FIDELITY MICROPHONES and SPEAKERS** in stock. Keep cash prices or H.P. terms if supplied with amplifier.

R.S.C. 30 WATT ULTRA LINEAR HIGH-FIDELITY AMPLIFIER A6

A highly sensitive Push-Pull, high output unit with self-contained Pre-amp. Tone Control Stages. Complete performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response -3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer with 1500 ohm primary valves. All components are chosen for reliability. Six valves are used, and separate Bass and Treble controls. Minimum input required for full output is only 30 millivolts so that **ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE.** The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. **OUTPUT SOCKET PROVIDES L.T. and I.T. for a RADIO FEEDER UNIT.** Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has outputs for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required cover as for A8 ONLY can be supplied for 17.6. An extra input with associated vol. control so that two separate inputs such as Gram and Mike can be Carr. 10.- built, can be provided for 13.- extra. The amplifier can be supplied factory built with 12 months' guarantee for 50.- extra. **TERMS** for assembled two input model: **DEPOSIT 23/9** and 9 monthly payments of 23/9.

9 GNS.

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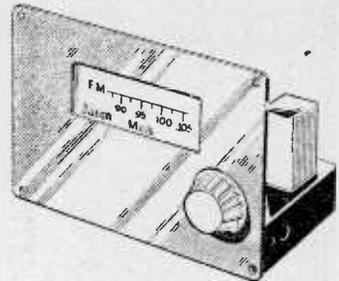
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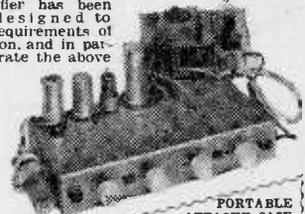
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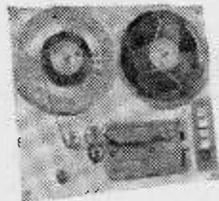
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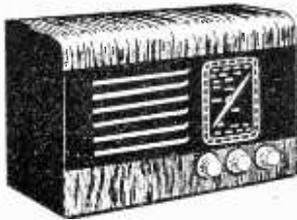
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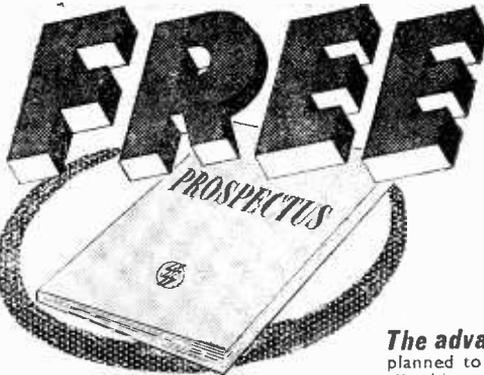


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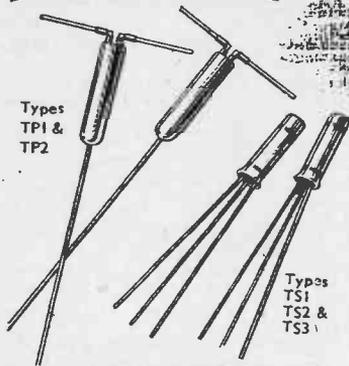
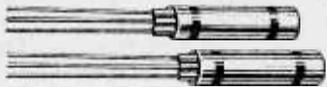
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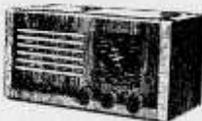
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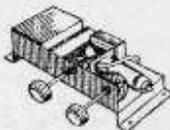
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PRACTICAL WIRELESS

EVERY MONTH
VOL. XXXII, No. 599, NOV., 1956

EDITOR: F. J. GAMM

24th YEAR
OF ISSUE

COMMENTS OF THE MONTH

BY THE EDITOR

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Technical Trends

IF the Radio Show is intended to indicate to the public the general trend of design, the public must this year have been very disappointed, for it indicated beyond doubt that the trade during the past year had not developed anything which could be described as really new. No doubt the credit squeeze and the hire purchase restrictions are a discouragement to the manufacturers to launch anything new whilst they have large stocks to sell in a reluctant market. It may be, therefore, that the industry will consider it wise to run these exhibitions biennially instead of annually. There were, however, one or two indicative straws, which indicated the direction of the technical current. It was noted that there were gramophone motors having a fourth speed of 16 2/3 r.p.m. There are no records in this country for playing at that speed, and so the provision of this fourth speed must mean that sooner or later records will become available. A surprising development was the production of a 4.5 volt dry battery operated gramophone motor. There are many record players now available which make use of transistors, and the production of this battery motor is a possible indication of new developments in the record player market. The makers claim that the motor requires a current of only 80 milliamps at 4.5 volts, speed control being obtained by means of a variable resistance connected in series with a six volt or nine volt dry battery. The battery is automatically connected by means of a switch when the pick-up arm is swung towards the edge of the record. The speed of the motor is controlled by the usual type of centrifugal governor.

In view of the great publicity given to transistors last year, it was expected that there would be a plentiful supply of them this year. In fact, the number of receivers of this type was disappointingly low. It was stated that there are still production difficulties and that the output is by no means equal to demand. Two manufacturers exhibited in prototype form a method of transistorising car radio. They incorporated a push-pull

transistor output stage and made use of special valves operated from a 12 volt H.T. battery providing the high tension supply. It was clear from conversations we had with manufacturers that, due to the shortage of high frequency transistors, there could not be any rapid change over to transistor receivers for some time to come. One manufacturer produced a magnetic disc recorder, which is an addition to their well-known tape recorders. It has a recording head which resembles a pick-up, and if a pick-up is used to replace the recording head the instrument may be used to play gramophone records.

TWO NEW HANDBOOKS

WE have recently published two important handbooks. The first, "The Elements of Mechanics and Mechanisms," deals in a fascinating way with the natural and mechanical forces and the methods of using them. It deals with the laws of motion, horse power, force, energy and power, conduction, convection, radiation and heat, the lever, wheel and axle, inclined plane, wedge, screw, liquid pressure, hydraulics, pumps and water wheels, the Geneva mechanism, intermittent mechanisms, the principle of the gear, transmission methods, whilst a very complete chapter gives practical examples with calculations of a large number of miscellaneous mechanisms. It is an ideal book for the draughtsman, designer and inventor. It contains 432 pages and 481 illustrations and costs 30s., or 31s. by post.

The second volume is entitled "The Home Electrician," costing 12s. 6d., or 13s. by post. It contains 206 pages and 149 illustrations and deals with rules and regulations, house installation, power wiring, electric light, layouts and wiring methods, house circuits, switches and control points, installing domestic apparatus, electric bells, burglar alarms, water heating, motor driven apparatus, accumulator charging and there is a very complete chapter on repairing electrical apparatus.—F. J. C.

OUR NEXT ISSUE, DATED DECEMBER, 1956, WILL BE PUBLISHED ON NOVEMBER 7th.

Round the World of Wireless



By "QUESTOR"

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of July, 1956, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	Total
London Postal	1,297,303
Home Counties	1,288,887
Midland	1,008,249
North Eastern	1,312,989
North Western	997,965
South Western	823,825
Wales and Border Counties	516,188
Total England and Wales	7,245,406
Scotland	930,541
Northern Ireland	206,008
Grand Total	8,381,955

Belgian Radio Taxi Service

PYE, LTD., in association with Messrs. Semobel, their agents in Belgium, recently installed radio-telephone equipment in the Fra-Tax fleet of taxis which operates throughout the city of Brussels—the first permanent radio taxi service in Belgium. Each taxi has a compact Pye "Reporter" mobile radio mounted on the dashboard.

From the 15-watt radio control station, with its 13-metre transmitting aerial on the roof of the company's four-storey headquarters in the Avenue de Scheut, taxis can now be directed straight from one job to another without having to return to base after each journey.

Phototelegram Service Links

Capitals

CABLE AND WIRELESS, LTD., announce the opening of a phototelegram service between Stockholm (Sweden) and Athens (Greece).

It is operated in Athens by Cable and Wireless, Ltd.

BBC's New Mobile Studio

A NEW mobile studio and control room designed by the BBC's engineering division is on the road and recently came into use.

The new vehicle weighs nearly 4½ tons and is 22ft. long, 7ft. 6in. wide and 9ft. high from road level. It contains an acoustically treated studio some 10ft. long by 7ft. wide

together with a control room which provides facilities for controlling the output of the studio and a number of external sources, such as commentators' microphones which may be located at scattered points over the site of a large outside broadcast. Provision is also made for recording and reproducing programmes, for the introduction of effects from gramophone discs and for the reception of speech from commentators using a radio microphone.

Telephones are provided for communication with permanent BBC centres and other points, while the control engineer's and producer's positions are equipped with talk-back facilities enabling them to speak to the studio, or to the commentators for briefing.

V.H.F. in the West

THE BBC's Very High Frequency sound broadcasting station at North Hessary Tor, South Devon, was brought into service on August 7th and transmits the West of England Home Service on 92.5 Mc/s, the Light Programme on 88.1 Mc/s, and

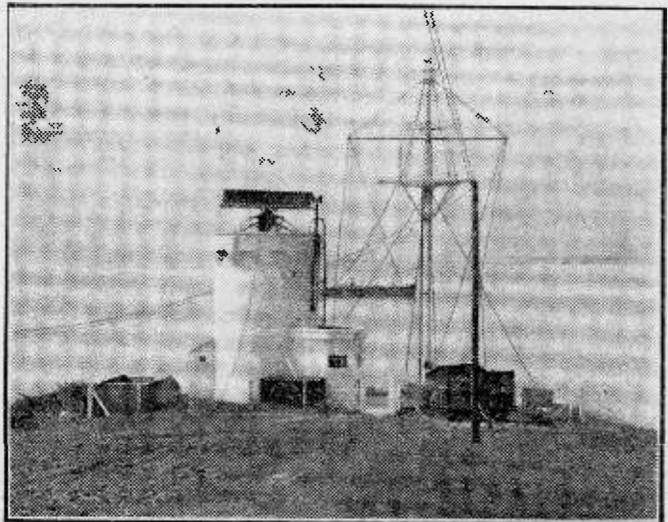
the Third Programme on 90.3 Mc/s, each with an effective radiated power of 60 kW. The transmissions are horizontally polarised. This new station is on the same site as the BBC's North Hessary Tor television station.

Marconi Radar Scanner

MARCONI'S WIRELESS TELEGRAPH COMPANY have recently carried out a series of functional tests on their 20 kilowatt, X-band surveillance radar type SNW.44 on a coastal site. This is one of a complete range of 3 cm. equipments designed to cope with a variety of control and surveillance problems in the maritime and aeronautical fields.

The SNW.44, by virtue of its narrow beam (0.5 degrees in the horizontal plane) and short pulse length (0.1 microseconds on ranges of 3 miles and below), provides a very high definition PPI display. The low power level of the transmitter, coupled with careful scanner design, ensures relative immunity from side-lobe and multiple echo effects, which can prove an embarrassment in the unequivocal interpretation of a picture.

The key to the performance and adaptability of this series is the high-gain, multispeed, power-tilted scanner. To these features can be



The new Marconi radar unit referred to above.

added that of a switchable polariser grid which introduces an impressive degree of discrimination against rain returns.

The illustration shows the radar scanner mounted on a tower overlooking the sea. The V.H.F. transmitting and receiving aerials are on the adjacent pole mast.

Radio Export Record

EXPORTS of British radio, television and electronic equipment set up a new monthly record of nearly £3.4 million in May, it is announced. The previous highest level had been £3.12 million in November last.

The May exports bring the total for the first five months of the year to over £15½ million, representing an annual rate of over £37 million, compared with a record figure of £33 million in 1955.

May exports by main groups are as follows:—

Radio and television receivers	£315,000
Sound reproducing equipment	£731,000
Components	£693,000
Valves and tubes	£264,000
Transmitters, communications equipment, navigation aids, etc.	£1,388,000
	<u>£3,391,000</u>

V.H.F. Radio Changes

THE Postmaster-General has approved the recommendations in the Second Report of the Mobile Radio Committee which advises him on matters affecting the users of V.H.F. mobile radio services. The committee's first report was published in April of last year. The second report incorporates for the record a revised allocation of frequency channels (or wavelengths) amongst the various categories of users of the land mobile services, details of which were approved and sent to users last year. It also contains proposals for introducing improved equipment to permit narrower operating channels in the higher of the two land mobile frequency bands. In brief, they are that 50 kc/s channelling should be adopted as the next stage in the development of the high band, this to become compulsory for new services and new equipment in that band as from January, 1957. It goes on to make certain recommendations about trials related to 25 kc/s equipment and states that early consideration should be

given to the introduction of 25 kc/s equipment in the low band. . . .

Finally the report contains a revised sub-allocation plan for the high band based on 50 kc/s channelling.

The report is published by H.M. Stationery Office, price 1s. 6d.

"Sarah" Rescues Air Force Pilot

AFTER seven years' work on a secret product over a thousand workers in their canteen at Acton met the only customer who has used their equipment. He is Flying Officer Nigel Williams, of North Wales, who was the first member of the Royal Air Force to be rescued by the "Sarah" air-sea rescue system. This new system enables a pilot who has crashed to send signals to a rescue aircraft. It received its first real test when Flying Officer Williams, then a member of 66 Squadron, Linton-on-Ouse, was rescued from the North Sea off Filey Brigg following a parachute jump of 30,000ft. from a Hunter aircraft.

Accompanying Flying Officer Williams to the factory was the pilot of the helicopter which picked him up from the sea, Flight-Lieutenant Thompson, of Dagenham, based at R.A.F. Station, Thornaby, Nth. Yorkshire.

At the works of Ultra Electric, the designers and manufacturers of the equipment, the management and workers presented Flying

Officer Williams with an inscribed silver tankard. The inscription read, "Whose homely guidance saved him from the drink." ("Sarah" sends out a signal which serves as a homing device.)

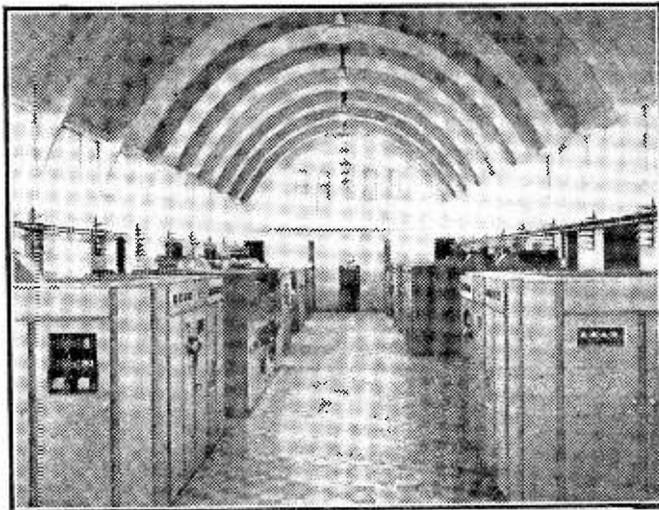
Mr. Edward Rosen, who made the presentation, also gave an Ultra television viewer to Flight-Lieutenant Thompson as a gift for the use of 275 Squadron Crew Room at Thornaby.

Obituary

THE death has occurred, in his sixty-sixth year, of Mr. G. M. Wright, C.B.E., B.Eng., M.I.E.E., who was, until his retirement in 1954, Engineer-in-Chief of Marconi's Wireless Telegraph Co., Ltd.

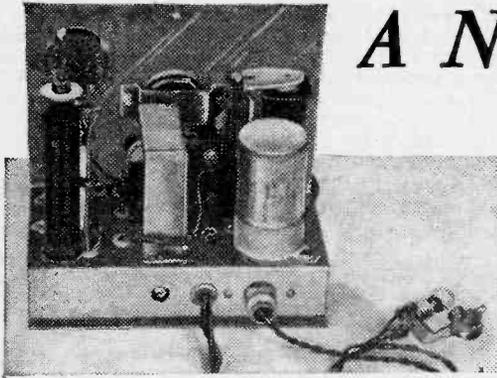
George Maurice Wright was born in September, 1890. He joined Marconi's in 1912, after obtaining his B.Eng. degree at Sheffield University, and was attached to the Research Department, where he assisted C. S. Franklin and Captain H. J. Round, whose names are familiar in radio circles throughout the world.

During the first world war he was attached to the Admiralty for work on direction finding and other special duties, and was granted a temporary commission in the R.N.V.R. He was closely associated with the naval D.F. network, with which close watch was kept on movements of the German naval forces and Zeppelin fleet.



The transmitting hall of S. Africa's largest broadcast station at Paroelys, near Bloemfontein. Marconi's have supplied nine 20kW H.F. broadcast transmitters to the South African Broadcasting Corporation's new station.

A Novel Baby Alarm



USING A VOICE-OPERATED RELAY IN A CIRCUIT WHICH IS ALSO SUITABLE FOR AUDIO CONTROL OF TAPE RECORDERS, TRANSMITTERS, ETC. By Hugh Guy

(Concluded from page 525 October issue)

Chassis Details

THE whole device is mounted on a chassis bent from a single sheet of 18 s.w.g. aluminium measuring 6in. by 8 $\frac{3}{4}$ in. Marking out information is given in the plan of Fig. 3, which shows a top chassis view before bending.

The only additional metalwork required are two brackets; one is for the preset control VR1 and the other is a clip for mounting the crystal microphone on the front of the unit. The dimensions for both these brackets are given in Fig. 4.

If it is decided to use an externally connected microphone, then obviously no clip will be required, and the hole $1\frac{1}{4}$ in. diameter in the front panel can be omitted. It will be necessary to drill an extra hole for the socket for this external connection, however, and a suitable space can be found at the left of the $\frac{1}{2}$ in. diameter hole on the back of the chassis.

The layout of the chassis assumes the use of a heater transformer in the circuit, and the fixing centres for this component will not necessarily agree with those on the drawing; one of these holes was also used to fit the potentiometer bracket.

There is ample room on the chassis for any necessary modifications as the photographic views of the complete unit clearly show.

Assembly and Wiring

The components should be mounted as illustrated. The crystal microphone should be screwed on first as the heater transformer will block access to it otherwise. The screened lead should be wired to it

before mounting the transformer for the same reason. The earth terminal of the microphone is marked E and the screened braiding should be connected to it.

It is preferable to connect the heater and H.T. supplies first so that leads carrying A.C., which should be twisted wherever possible to minimise radiation, can be kept close to the chassis. Any unwanted hum picked up in the amplifier will lessen the sensitivity of the device.

The diagram (Fig. 5) shows the method of wiring the chassis to the circuit of Fig. 1.

Testing, Setting up and Use

When the unit is ready for testing, connect a short length of flex with a 6.3 volt pilot lamp at one end, to the socket SK1. Switch the unit on, remembering that the chassis can be live and therefore observing the normal precautions.

While the unit warms up the pilot light will be on. Allow at least five minutes for complete warming up before attempting setting the unit up. The D.C. amplifiers will need this time to settle down to steady operating conditions.

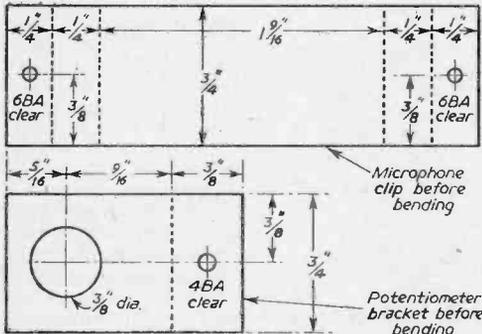


Fig. 4.—Details of the brackets.

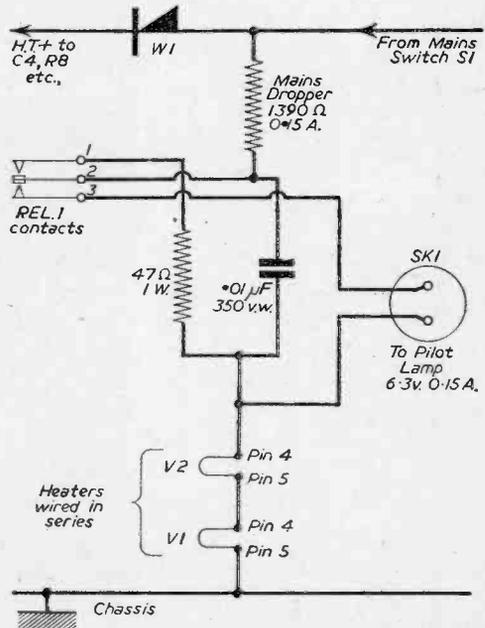


Fig. 2.—Modification for D.C. or A.C./D.C. power supply.

With a screwdriver, turn the preset control fully anti-clockwise when, if the potentiometer has been wired correctly, the relay will be energised, i.e., it will pull in. Now gradually rotate the control in the other direction, being careful to make as little mechanical disturbance as possible. This process should be carried out in relative quiet, too, since any noise may tend to switch the relay over as the control approaches the critical point.

A position will be reached when the relay suddenly drops out. Now the control should be turned back a fraction to energise it again. The amount of "backlash" on the control for the changeover to take place should be very small. A brief whistle or blow into the microphone should now cause the relay to open and close when the signal stops, switching on the pilot light for this duration.

Now it may be that once the critical point has been

found the relay starts to click continuously, only stopping if the mains supply is switched off for a few seconds. This effect is caused by acoustic feedback in the unit. The disturbance caused by the relay pulling in is fed to the microphone as a signal which is amplified, just as any desired signal would be, opening the relay again. The disturbance ceases, the relay closes again with a click which sets off the chain once more.

This effect can be used to advantage if an intermittent form of alarm is required. In this case when the instrument warms up one noise of any description will set the relay off, and the latter will then provide its own signal to keep the alarm going. The pilot lamp will glow continuously if the signal (e.g., the baby's cries) are continuous, but will flicker intermittently thereafter until reset by switching off the alarm momentarily.

Modifications and Precautions

To arrange that signals do not cause intermittent alarms necessitates acoustically screening either the microphone or the relay: preferably the latter. To deaden the click as the relay pulls in adhesive tape may be secured to the pole piece of the relay. This may result in insufficient clearance between the key and the pole piece for the contacts to close. In this case the contacts can be bent slightly or the copper pip on the key filed away. Mounting either the relay or the microphone on "bungy" mounts will also help. For example, two rubber grommets could be used as insulating mounts for the relay. If a cover is available for the relay it should be used, space permitting. Electrically the relay can be quietened by connecting an electrolytic condenser across the coil. A value of 8µF at 150 volts working should prove adequate. This connection may result in a slight loss in sensitivity.

Another method is to connect a 25K wirewound potentiometer temporarily in place of R10, the common cathode resistor to V2. Wired as a variable resistor, this control should gradually be increased until the relay only just pulls in after a signal. This pulling in should be quiet enough not to retrigger the alarm. Once this value has been found a fixed resistor of the same value can be substituted for the control.

However, the most satisfactory method by far is to mount the microphone externally in the manner mentioned previously. This has the added

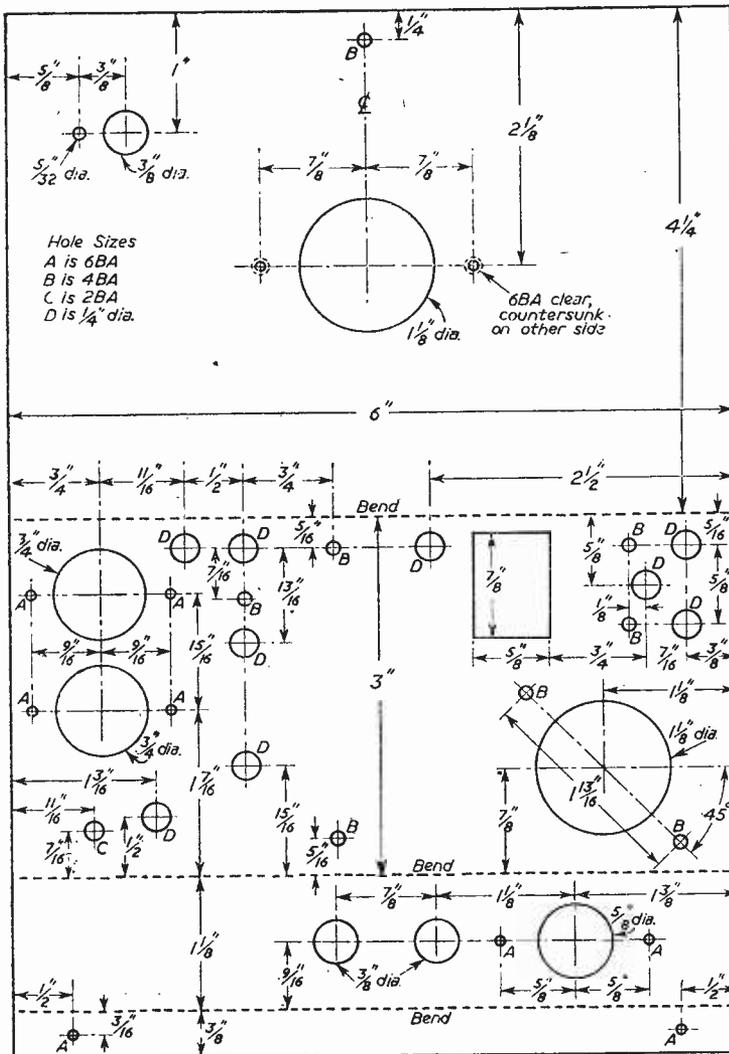


Fig. 3.—Marking out and bending details for the chassis.

advantage that the microphone can be suspended exactly where it is wanted, in particular above the infant's cot. The whole device would obviously be far more sensitive this way. If this is done, then both the microphone and its connections must be thoroughly insulated to avoid the possibility of an electric shock.

For the same reason, the unit must be mounted in an insulated cabinet. Quite a simple case can be made from either stiff board or hardboard if the constructor wishes to avoid a lot of woodwork. A suitable cabinet would be about 3 1/2 in. deep with a 6 in. square front. A 4 B.A. screw holds the front panel at the front of the cabinet and two woodscrews or 6 B.A. screws secure the chassis by means of the mounting flap at the back. Three holes should be cut in the back panel of the cabinet to allow the leads to pass through and to give access to the preset control.

If the device is required to operate the relay once only for an input signal, holding the relay off until reset manually, as for the burglar alarm type of function, then R9 must be increased from 5.6K to 27K.

As a burglar alarm the microphone is best used externally to the device, being hidden at a crucial

point so that a mechanical vibration of disturbance would be the signal that operates the alarm rather than a random noise. This would minimise false alarms.

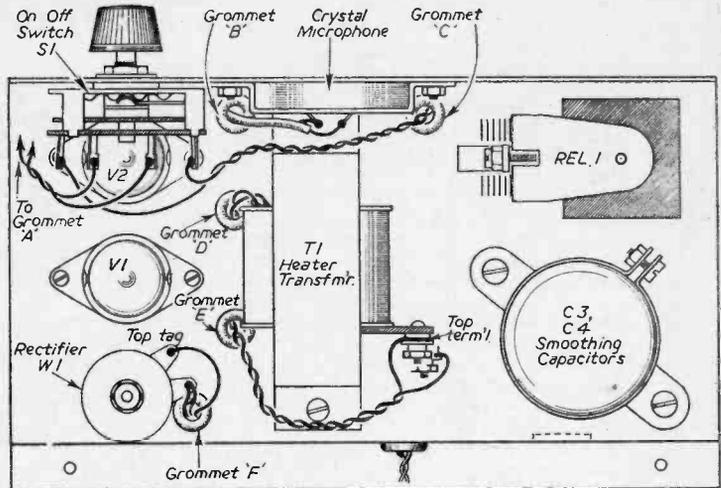
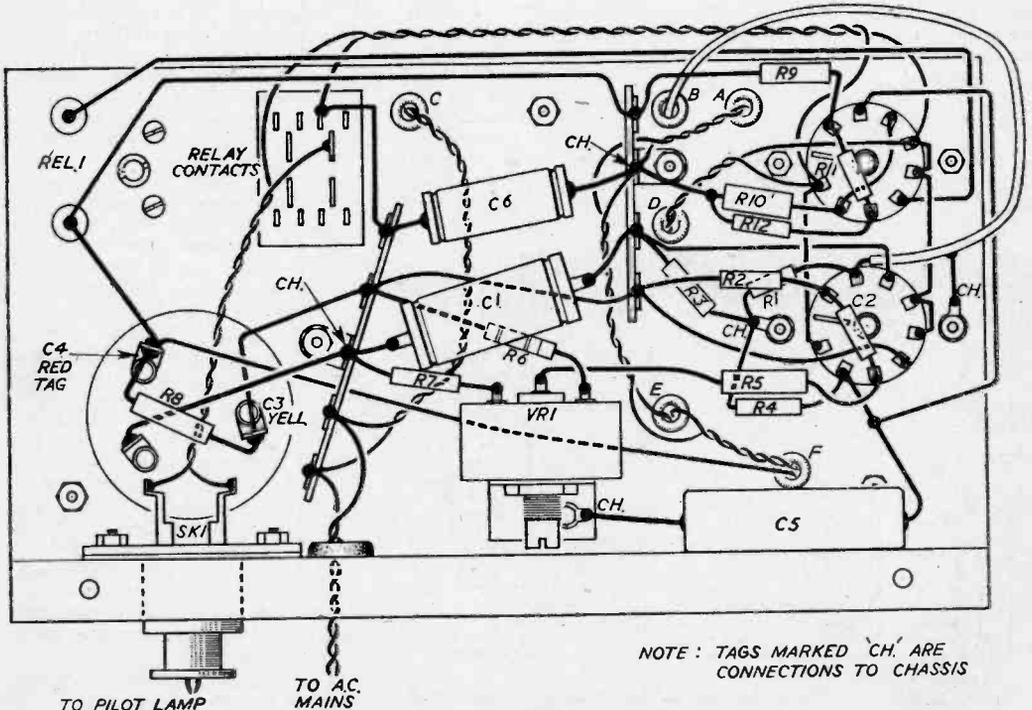


Fig. 6.—Above chassis wiring.

As pointed out in the first article, it should not be a difficult matter for the experimenter to make a device of this nature carry out any desired function where sound picked up by the microphone actuates the relay as a triggering source.



NOTE: TAGS MARKED 'CH.' ARE CONNECTIONS TO CHASSIS

Fig. 5.—Wiring below chassis.



A CONTEMPORARY
DESIGN FOR THE HANDYMAN

By R. J. Applin

Making A Radiogram Cabinet

THE idea behind the construction of this radiogram cabinet was twofold. First, it was an attempt to design a cabinet which would "fit in" with a layout of more modern trends in furniture—a common failing amongst most commercially produced designs—and be pleasing to the eye. Secondly, to construct a cabinet for a minimum sum of money, the resulting cost being approximately five guineas, this being very reasonable in comparison with the ready-made examples available.

The cabinet is of very simple construction, enabling it to be completed in the minimum of time and with no unnecessary loss of temper to such inexperienced cabinet-makers as myself, due to difficult joints occurring everywhere. The colour chosen in the case of the original was basically light in order to tone in with a corresponding furniture lay-out. The woods used being a light hardwood of the obeche family for the basic framing—being easily obtainable and very good to work—chestnut was used for the outer casing, birch-faced plywood for the front and inside top panel, and a trim of black walnut applied around the fret to provide a small decoration. The whole cabinet then being finished with a natural polish to preserve the original colours.

The construction, as said earlier, is very simple and nothing further is required than the tools normally found in an amateur handyman's box. It can be conveniently divided into two sections: the "skeleton" framing and the outer casing.

The Framing

This is constructed completely from 1in. × 1in. and 1½in. × 1in. obeche or similar wood, with the exception of the two 4in. × ½in. × 34½in. lengths of chestnut which form the visible inside faces of the top of the cabinet.

First step in the construction is to cut the two lengths of 4in. × ½in. chestnut to length and notch these members as shown on the drawing where required to accommodate the framing. At this stage it is advisable to work up a finished surface on the inside faces of these two members as they become more inaccessible as the construction proceeds.

The six top cross members may now be cut to size and the whole glued and screwed together, ensuring that it is square and true in all directions.

A cold water resin glue is most suitable for use in this case and 24 hours should be allowed before cleaning up projecting ends of cross-members with a plane.

The next step is to prepare the two long and two short 1½in. × 1in. obeche bottom members, again cutting all notches necessary and also the ½in. deep housing at an angle of 60 deg. on the inside faces in the positions shown on the drawing to accommodate the legs.

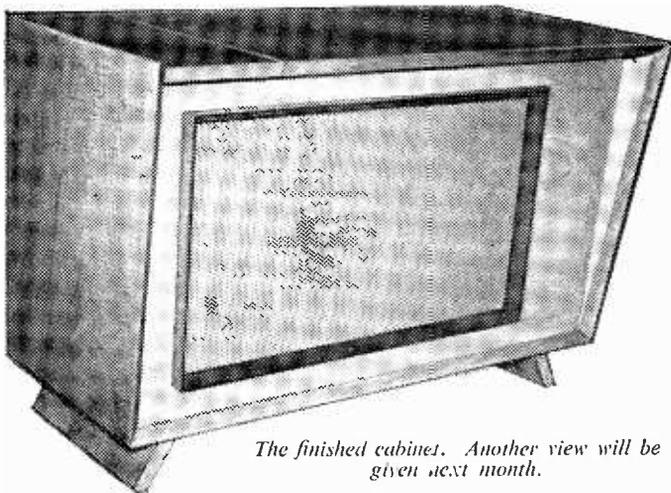
Cut the four 1in. × 1in. obeche corner uprights to length and glue and screw these members to the top framing in their appropriate positions.

The four longitudinal bottom members may now be fixed in a similar manner to the bottom of these uprights, and the whole structure again tested for squareness. This is most important.

It will be seen that the joints used here and at the top are plain butt joints, and a query may arise as to their strength and ability to hold the frame together. However, no doubts need be expressed here, as with the correct application of glue and adequate screws the frame is extremely robust when completed.

The 1in. × 1in. intermediate upright members may now be cut to length, notched at their upper ends as shown and glued and screwed into position.

To complete the basic framing the two intermediate 1in. × 1in. bottom members are now cut to



The finished cabinet. Another view will be given next month.

dead length, and likewise fixed in their respective positions.

The Feet

These are cut from $\frac{3}{4}$ in. thick chestnut and must be splayed at an angle of 60 deg. along their bottom edge. This is not a difficult operation and may be done with a smoothing plane, working inwards from both ends to avoid splitting the wood.

The feet are set in the housings in the bottom framing members to show 4in. below the lower edge of the frame and are glued in position and secured with screws driven in from the outside.

It may be profitable here to mention the advisability of preventing the resin glue used from coming into contact with any exposed faces of the chestnut, as a bright purple stain will result which it is difficult to remove, and is obviously most unsightly.

The Outer Casing

With the "skeleton" framework complete, the outer casing may next be developed and fixed around it. This is done in several operations, the first part to be applied being the plywood front panel.

This is cut from $\frac{3}{8}$ in. thick faced plywood to a finished size of $34\frac{1}{2}$ in. by $18\frac{1}{2}$ in., being the overall size of the framing.

A section of wood 25in. by $14\frac{1}{2}$ in. is then cut out of the panel for the speaker fret. The edges left must be cleaned and squared up to take the small moulding which surrounds the fret, but the fitting of this moulding is preferably left to a later stage in the construction to avoid possible damage.

The section of plywood removed should be

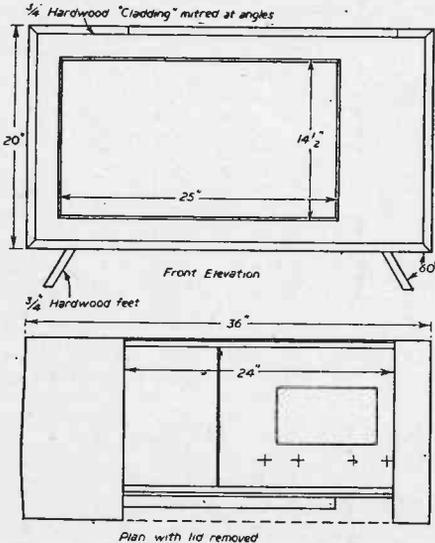


Fig. 3. — Further dimensions and assembly details.

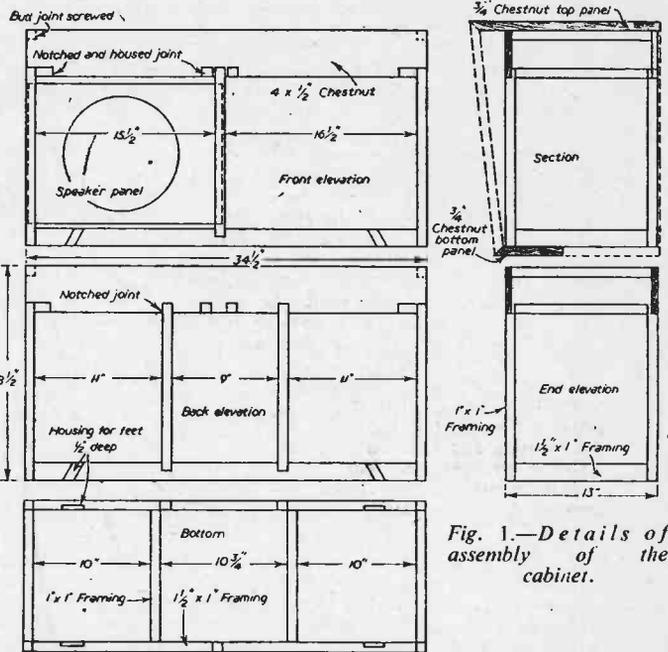


Fig. 1.—Details of assembly of the cabinet.

retained as it is to be used as an in-filling panel to the bottom. As the expanded metal material used for the speaker fret is rather expensive, this is best obtained cut to the exact size needed, and in calculating this lin. should be allowed for fixing all round giving a panel 27in. long by $16\frac{1}{2}$ in. high.

This material may be obtained in various colours to suit individual tastes, that used on the original being B.M.A. finish.

A shallow rebate lin. wide must be formed on the back of the plywood to accommodate the metal fret and this is best done by cutting and stripping off two laminations of the wood—not a difficult operation.

The metal fret may next be fixed into position with washers and very small screws at about 6in. intervals all round.

When this is completed glue may be applied to the front of the framework on the face of all members and the complete front panel pressed firmly into place and held at intervals with small G-cramps until the glue is dry.

Again 24 hours should be allowed before interfering to ensure that adequate strength has developed in the glue.

The bottom panel is the next member to be applied.

As it would be an unnecessary waste of expensive material, this panel does not run the full depth of the cabinet, being only 6in. wide as may be ascertained from the drawing. The remaining gap between the legs being partly covered with plywood.

The bottom panel is cut to size from $\frac{3}{4}$ in.

chestnut and is 36in. long by 6in. wide overall. The first step in the fitting of this member is to cut two slots at 60 deg. and sufficiently deep to accommodate the projecting feet underneath. If these slots are accurately cut they will give added support to the feet to resist spreading.

Next the chamfered front edge must be worked on to the material at an angle of 45 deg., and this may be easily done with a smoothing plane and a guide line. Lastly, two mitres have to be cut on the ends of the panel to form the joint between this and the side panels, and this operation should be most carefully done.

Glue may now be applied to the underside of the framing where in contact with the panel, and the panel slid into position and screwed to the framing.

To fill the void left between this bottom panel and the back of the frame the piece of 3/8in. plywood cut from the front panel is employed. This is cut to width, 1/2in. being allowed to project beyond the back of the framing and screwed into position between the feet.

This panel is not large enough to fill completely the

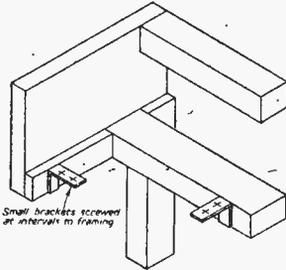


Fig. 4.—How the chassis is housed.

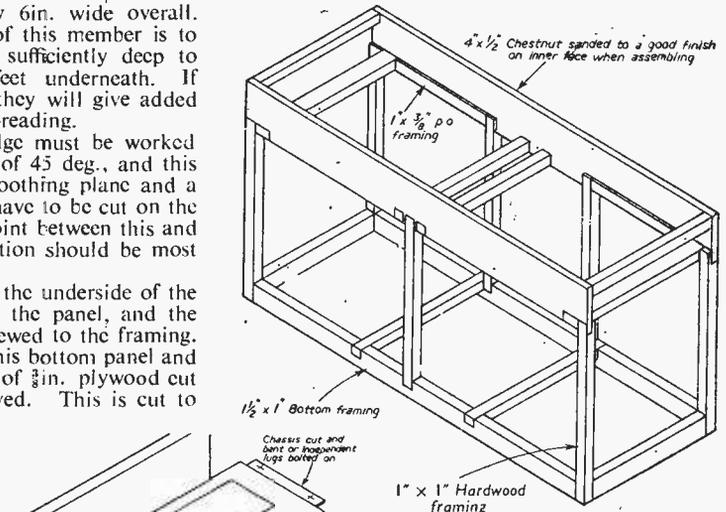


Fig. 2.—Details of the carcass.

void between the feet and the space remaining is left open to allow a current of cool air to circulate around the radio when in operation. Next the two end panels may be cut and fixed in position.

The timber for the end panels and the top should be obtained in one length if possible, so that a continual matching grain is visible in the wood all around the cabinet.

Assuming that this piece of wood is available the end panels will be cut from either end of it, leaving the centre piece for the top.

The first operation, then, is to cut these end panels to an overall size of 20in. high by 14 1/2in. to 16 1/2in. wide at the top. (To be continued)

LIST OF MATERIALS REQUIRED

Member	Material	Size required	Finished size
Frame :			
1in. x 1in. ...	Light h/wood (obeche or similar)	16ft. run	—
1 1/2in. x 1in. ...	— do. —	11ft. run	—
1in. x 3/8in. ...	— do. —	5ft. run	—
Top frame members ...	1/2in. thick chestnut	2/36in. x 4in. wide	2/36in. x 4in.
Panelling :			
Bottom ...	3/8in. chestnut	36in. x 6in. wide	36in. x 6in. wide*
Ends (2) ...	— do. —	20in. x 16 1/2in. wide	20in. x 16 1/2in. to 14 1/2in.*
Top ...	— do. —	36in. x 16 1/2in. wide	36in. x 16 1/2in. wide*
Front ...	3/8in. birch-faced ply	36in. x 20in.	34 1/2in. x 18 1/2in. high
Fascia ...	— do. —	18in. x 13in.	18in. x 12in. wide
Motor board ...	— do. —	18in. x 13in.	18in. x 12in. wide
Feet (2) ...	3/8in. chestnut	8in. x 12in. wide	8in. x 12in. wide
Speaker panel ...	3/8in. ply	16 1/2in. x 12in. (approx.)	—
Back panel ...	3/8in. ply	36in. x 19in.	34 1/2in. x 18 1/2in. high
Sundries :			
Trim to fret ...	1 1/2in. x 3/8in. walnut	7 feet run	—
Fret ...	E.M.L.	27in. x 16 1/2in. high	—
Piano hinge ...	Brass	24in. long	—
*Gram stay ...	— do. —	—	—
3/16in. x 3/8in. strip ...	— do. —	2 lengths. 16 1/2in. each	—

* Cut from one sheet.

TRANSMITTING TOPICS

807s IN CLASS AB2

By O. J. Russell, B.Sc., A.Inst.P. (G3BHJ)



FURTHER to information published upon the use of Class AB2 tetrodes in modulators, considerable "on the air," written and personal discussion has revealed that there is a great deal of interest in more detailed information on this subject. This particularly applies to the use of 807 tubes as Class AB2 modulators, as these popular valves are still freely available at very low prices. Generally speaking, there is a need for precise information upon operating 807s at ratings other than those for which data is available. Thus one well-known handbook quotes the "all-out" operating condition for the 807. This "all-out" condition requires an anode voltage of 750 volts and gives 120 watts of audio. However, no indication is given of the load and operating conditions to give an output of, say, 75 watts, as required to anode modulate the final running at our legal maximum of 150 watts P.A. input.

Before dealing with this point, however, there are some other points. While alarm and apprehension are shown at the question of "exact" matching of loads, many other factors of greater importance are completely ignored. These are essential, however, for correct operation of tetrode stages in Class AB2. The question of power supply regulation is one such point. If the rated output power is to be achieved it is essential to operate with well regulated power supplies. Thus, ideally, the anode and screen supply voltages should not vary by more than 7 per cent. from no signal to full output conditions. When the anode current may swing from 60 mA up to 240 mA under

full output conditions the need for good regulation is apparent. Note, moreover, that the figure of 240 mA is *not* a "peak" figure; it is the actual standing D.C. input to the modulator stage, and will be indicated by a plate current meter if the modulator is operating on a steady sine wave input producing full output conditions! Under similar conditions the quiescent screen current may be, say, 5 mA, and this rises to 21 mA at full signal output conditions.

The use of a choke input power supply circuit will enable the anode potential to be kept reasonably stable. For the screen supply a straightforward dropping resistor is out of the question due to the large fluctuation in screen current, so that a stabilised supply using two 150-volt neon stabilisers is necessary. Fig. 1 shows the set-up for supplying the screen with a stabilised 300 volts supply, when using a 500-volt main-power supply. The 7,000 ohms dropping resistor should be a wirewound unit of at least six watts rating. A 12-watt resistor rating is preferable for a safety margin. The stabiliser tubes should be the Brimar type VR150/30, or some similar tube capable of carrying 40 mA maximum current. If some trifling miscalculation occurs, i.e., a resistor greater than 7 K is used, or if the anode supply regulation is not as good as it should be, so that the anode supply rail drops excessively below 500 volts at peak signal outputs, then the neon tubes may be extinguished on voice peaks. The cure is to reduce

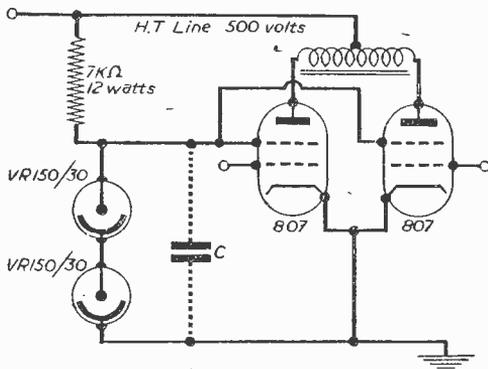


Fig. 1.—A simple stabilising circuit for the screen supply of a pair of 807s. If a higher main power supply voltage is used the dropping resistor must be further increased. Thus for a 600-volt line use a 10 K. resistor. A wirewound 12-watt resistor is recommended. C (8 microfarads) may be required. (See text.)

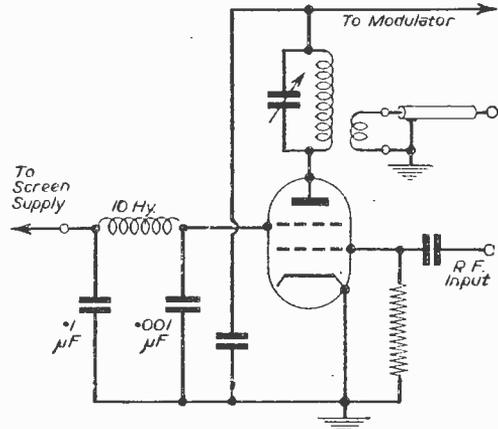


Fig. 3.—Illustrating the "self screen modulation" circuit for obtaining "free" screen modulation power when only the anode supply is modulated in the P.A. stage. A small choke of 10 henries inductance is adequate. The choke should be shunted by a 10 K. to 25 K. resistor if audio "howl" is experienced.

the value of the dropper resistor, but this cannot be carried so far as to permit of passing excessive current through the stabilising neon tubes. A condenser shunted across the screen (dotted lines) may help to prevent the stabiliser tubes extinguishing under these conditions. An 8 μ F electrolytic may be used for this function of holding the voltage drop on transient peaks.

A further point that is important is that Class AB2 involves driving the modulator grids into the positive region, and thus drawing grid current. This means that the virtually infinite impedance of the grids in the negative bias region abruptly changes to a very low impedance, say 500 ohms, in the positive region. It also means that appreciable drive power is required when grid current is drawn. In fact, the Class AB2 807s require a drive power of some 0.2 watts. However, a driver tube capable of far more drive power, e.g., a 6V6 should be used, so there is no fear of the driver stage being overloaded, and also so that distortion can be minimised. Moreover, due to the fact that grid current flows at signal peaks, a driver transformer of suitable characteristic is essential. It is necessary for example that the D.C. resistance of each half of the driver secondary winding does not exceed some 500 ohms. In addition the leakage inductance should not exceed a figure giving an impedance of 700 ohms at the highest audio frequency it is desired to handle. A suitable driver transformer may be obtained commercially, such as the DM5 of Technical Services.

Transformers Backwards

However, certain pre-war "output" transformers, such as the Ferranti OPI/C may be used "backwards" as driver transformers. That is to say the low resistance push-pull primary is used as the secondary, and the "high impedance loudspeaker output" winding is used as the anode winding for the driver valve. Several small push-pull output transformers may be used in this way, but it is desirable in any case to load the transformer secondary

with a resistance of, say, 10,000 or 5,000 ohms in order to minimise the abrupt change of grid impedance when the grid swings into the positive region. Negative feedback in the driver stage is also helpful to minimise distortion in the driver stage due to the varying loading conditions.

In order to present the possible output conditions compactly, these are shown graphically in Fig. 2. These represent a transition (above 600 volts anode potential) from "Continuous Commercial Service" ratings to the more generous "Intermittent Commercial and Amateur Service" ratings. These do not represent the only possible operating conditions, but will be found convenient in practice. Moreover, for British amateurs, the 75-watt output condition may be achieved with a 500-volt power supply, so that the higher ratings are not so important. However, if one operates at, say, the 600 volts condition, then the extra output power in hand does mean that the power regulation need not be so exact, as the valves need not be driven so hard and the peak current requirements will be lessened.

It should be noted that the bias voltage should not vary by more than 3 per cent. While a stabilised bias voltage supply may be used a simpler solution is to use small deaf-aid cells to provide the bias voltage required, as they will have very long life operating as bias batteries. In fact, the grid-current tends to "charge up" the bias battery, so that if (as is not unknown!) a disused deaf-aid battery discarded because of failing voltage is used, it may charge up after a little service, recover its lost voltage, and heavily overbias the voltage modulator tubes! This is important, as there is only a small change of bias voltage to cover the operating conditions ranging

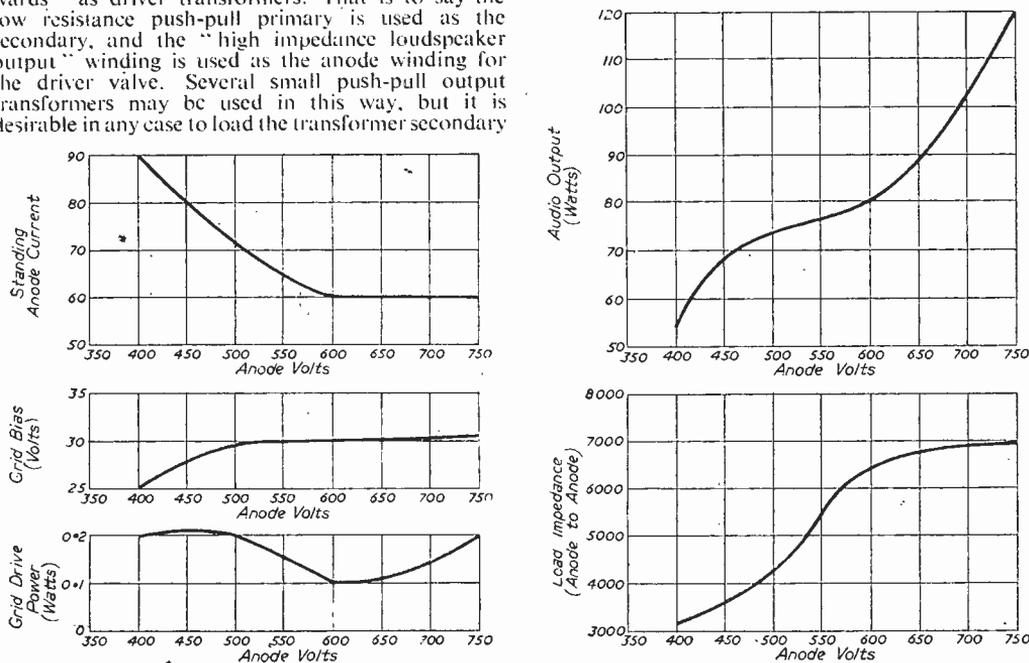


Fig. 2. — The curves show the power output, load impedance, zero signal quiescent current, required grid bias and drive power requirements for a pair of 807 valves in Class AB2 at various anode supply voltages. In all cases the screen potential is 300 volts, and the full signal anode current is 240 mA.

from the 500 volts 75 watts condition to the 750 volts 120 watts condition. This is due to the high mutual conductance of the 807s, and the bias voltages with a 300-volt screen supply should be 29 volts for an anode potential of 500 volts, 30 volts for 600 volts anode potential, rising to 32 volts for 750 volts anode potential. Thus, the bias voltage should be set accurately, and this can be done by checking that the anode current is at the correct value when the screen and anode potentials are as specified.

Correctness of operating potentials can also be checked by operating the modulator with a suitable resistance load and observing waveforms with an oscilloscope (Fig. 3). If, say, six 12-watt resistors each of 500 ohms are used in series, this will give a 72-watt resistor load of 3,000 ohms. This can be matched in to provide the correct modulator load impedance by a suitable multiple ratio modulation transformer.

Monitoring the Waveform

If a double-beam 'scope is available, the grid drive waveform may simultaneously be monitored to see if any distortion occurs in the driver stage, and to decide if output distortion arises in the 807 stage or not. With a sine-wave input the tubes may be run up to full output, and the output waveform carefully watched for peak flattening. Peak flattening may be caused by incorrect load matching, but if this is correct it may be due to poor power supply regulation, incorrect bias or screen potentials, or due to transformer saturation.

Unfortunately, many amateurs conduct modulator tests in a more perfunctory manner. After connecting the modulator to the transmitter, the control is turned up till a monitor receiver or a local contact reports "overmodulation." The control is then eased back slightly, and it is assumed that "full" modulation is occurring. In many cases the splatter ascribed to "overmodulation" may, in fact, be due merely to modulator distortion setting in long before the P.A. is fully modulated! In one case it was found that the imagined "overmodulation" condition was due to an undersized modulation transformer saturating on peaks and thus limiting modulator output. Of course, the results sounded on the air very much like actual overmodulation. However, substituting a generous cored Technical Services TR-10 modulation transformer resulted in an appreciable increase in modulation and a beefier signal, as transformer saturation was eliminated, and the full audio output of the modulator could then be applied to the P.A. stage. Without this transformer substitution, however, a signal much below par would have been radiated under the delusion that a fully modulated signal was being radiated

"because increasing the gain control overmodulates."

It is important therefore to ensure that a tetrode Class AB2 modulator stage is really operating correctly before assuming that full modulation is being obtained. It is necessary also to ensure that the stage is correctly matched into the P.A. load. Much nonsense is talked about "correct" matching however, and generally speaking the match should be made to within 10 per cent. Do not forget also that there is a slight power loss in any modulation transformer, so that an allowance should be made for this. Where a tetrode or pentode P.A. stage is used, the screen circuit of the P.A. also consumes power. However in a tetrode or pentode P.A. stage, the screen power requirement may be overcome by using the "self screen modulation" system. In this system the anode of the P.A. only is modulated. A small choke of say 10 henries is inserted in the screen supply and this develops audio across the screen, as the screen current varies with the modulation voltages on the anode. In some cases a resistor of about 10,000 ohms may be shunted across the choke in order to prevent audio "howl" effects.

Therefore to keep a safe "margin" in hand, the amateur running a full 150 watts input P.A. would probably be well advised to run at least the 600 volt supply condition. An amateur running 120 watts (as from a pair of 807s) would have a comfortable margin at the 500 volt/75 watt audio output condition. Incidentally, while the "drive power" may be taken as a nominal 0.2 watts, for various reasons it is as well to have a driven stage capable of at least 1 watt output. The resistance loading of the driver transformer secondary will waste some of this drive power, but will minimise the impedance variation when grid current conditions are reached.

(To be continued.)

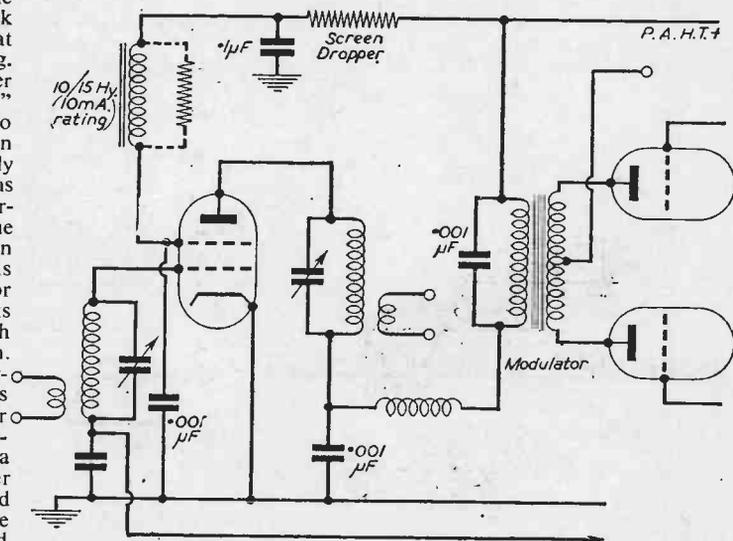


Fig. 4. — "Self screen" modulation. By using a low current L.F. choke in the screen supply line, audio is developed to modulate the P.A. screen. This saves the modulator power that would otherwise have to be supplied from the anode modulator. Thus full plate and screen modulation is achieved without feeding the screen supply from the modulated P.A. supply line. A resistor of 25 to 50 K. may be shunted across the choke if audio singing occurs.

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MULLARD 3-VALVES 3-WATT AMPLIFIER.—Punched chassis, 10/6; Gilson Trans. Mains, 35/-; Output, 25/6; Elstone Trans., Mains, 35/-; Output, 21/-; Condenser kit, 20/-; Resistor kit with 3 pots., 22/6. Complete kit with Genuine Mullard VALVES £8/19/6. Full list available.

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On Your Wavelength

BY THERMION

Long Memory

A QUESTION asked at the recent radio show was: "How many original exhibitors' staff members are present at this exhibition that were at the first ever held? And how many have been coming here regularly without a break ever since?" That means the entire run of shows from 1923 to 1956. At least two members of the staff of this journal, including yours truly have done so. The wild enthusiasms of those early years, however, have long since abated. As the public has grown more knowledgeable, it has become more critical and as it has become more critical firms have realised that they must make goods which live up to their claims, or alternatively that they must not make claims which their goods will not support. My feeling at this year's show was that there was nothing new. It was a strictly commercial exhibition and the side-shows stole the show.

Jamming

JAMMING, especially on the short-wave bands, has now become so serious that it is time something was done about it. The jamming comes from both east and west, and it is certainly destroying the hobby of short-wave listening. D.Xers all over the world complain about it. The cause, of course, is the attitude of one nation towards another. Russia, Poland and other subjugated countries give as the reason for the jamming that they consider the Voice of America broadcast to Russia to be slanderous and an insult to their dignity.

"This is what necessitates this jamming to rid the listening public of this annoyance. We believe that you, too, would slam your window if you heard all sorts of offensive remarks coming up from the street. This is only natural. The Soviet people do the same—they close their windows to all insults and slander that come over the air." Russia, however, forgets her long-continued campaign of slander, denigration, insult and venomous vituperation which she has conducted over a long period of years through their radio network. It was her attitude which caused other nations to reply over the air. She cannot complain, therefore, if her own broadcasts are jammed. At least the programmes from the west are accurate, whereas the Russian propaganda programmes are packed with calumny, prevarication and pure invention.

Bulgaria states that they do not operate jamming transmitters at all. Warsaw admits that the situation has developed to the annoyance of all concerned and is leading to anarchy in the air. Prague says they sympathise with the annoyance caused to short-wave listeners, but states that Czechoslovakia does not jam foreign broadcasts because the European service of the BBC can be heard quite well there. It does, however, on certain programmes, simply because they are programmes directly inciting people against their country and constitute an interference in the internal affairs of Czechoslovakia. They ask

how else can one describe broadcasts in the BBC Czech service in which hostile émigrés among other people call upon listeners "to be firm," to "show themselves courageous" and, they say, go as far as to appeal to certain people and institutions to sabotage. The I.S.W.C. wrote to our Foreign Office asking whether Great Britain is to continue using jamming transmitters.

The Foreign Office, in their reply, said, "In a written answer in the House of Commons, on July 9th, Lord Hope stated that the BBC Russian service is not being jammed at present from within the Soviet Union, but the jamming of BBC broadcasts in satellite and Soviet languages continues." It went on to say that the Government reserved the right to take any counter measures which they may consider necessary and justified to preserve Cypriot and British lives from outrages directly provoked by these broadcasts, which contain incitement without precedent between allies, and for which it would be difficult to find a parallel in the history of broadcasting. The British Government are jamming broadcasts of Radio Athens and the Egyptian Broadcasting Service.

Tape Recorders at the Show

MR. J. WEIR, of Upper Norwood, says that an otherwise pleasurable visit to the Show was spoiled by what he considered to be the poor showing in the field of tape recorders. He thought that this branch of the business was better catered for last year. Several firms who had promising equipment last year did not show this. It will not be long before radiograms are equipped with tape decks instead of turntables, or in addition to turntables, but I suspect that the difficulty at present is the high cost.

Removing the Chassis

A LETTER in a contemporary draws attention to what may be one of the major causes of high service charges. The reader is referring, it is true, to a TV receiver, but the remarks apply equally to radio receivers. He had to replace the tube in a 9in. receiver which was six years old. The chassis, with knobs, could be withdrawn after removing two bolts and unplugging the speaker lead. Two further screws released the tube strap and the whole job took a few minutes. He had a similar task to perform with the latest model of the same make. At the end, he had 76 separate pieces on the bench, excluding the tube itself. These included 32 self-tapping screws, 14 washers, four bolts, three wood packing strips, four mask brackets, four window brackets, rubber mask, glass filter, speaker, baffle, side cover, rubber ring, cabinet front moulding, cabinet, back cover, four knobs, ion trap and the chassis.

Some ingenuity on the part of the production staff could have avoided a great deal of this, which rather savours of hit and miss methods of design.

Push-pull Amplification

AN EXPLANATION AND A PRACTICAL AMPLIFIER EMPLOYING THE CIRCUIT

By R. Hindle

(Concluded from page 566, October issue)

THE effect of C5 is negligible, due to the resistance of VR2, all of which is in series with it. Adjusting VR2 to the upper end of its adjustment C6 becomes comparatively ineffective due to the resistance of the potentiometer being wholly in series with it, whereas the reactance of C5 now favours the passage of the higher audio frequencies giving treble boost; in the middle of its traverse, VR2 renders both capacitors relatively ineffective, giving more or less a straight line response to the upper frequencies. VR3 operates as a bass boost and cut control. When it is adjusted to its upper end C7 is shorted out and C8 is in parallel with the output signal where it bypasses the middle and upper frequencies, thus favouring the lower notes giving bass boost. At its other extreme C8 is shorted out and C7 is operative in series with the output from this limb, attenuating the lower notes to give bass cut.

As an alternative to this pre-amplifier chassis the unit previously described for a two-stage triode amplifier using a double triode could be used if this is already available. Power requirement for either of these pre-amplifiers is derived from the main amplifier.

A crystal pick-up unit is intended to be used with this amplifier; generally no tone compensation input circuit is required for such a unit, which can be fed direct into the pre-amplifier. Another type of pick-up may require a compensating network, which the manufacture will specify, and if the pick-up output is less than about .2 volt it will not fully load the amplifier.

Construction

The main unit is built on an aluminium chassis measuring 12 in. x 6 in. x 3 in. deep. Fig. 7 gives the under-chassis wiring view and also indicates the position of the components. As usual, the holes for the valveholders should be punched in the position indicated; the holders are then inserted and revolved until the pins are in the relative positions indicated and then the positions for the mounting screws are marked and drilled. Note that, though the mains transformer and smoothing choke are shown on the diagram these are actually mounted on top of the chassis and the connections are brought through holes as indicated, preferably lined with grommets. A five-pin power outlet is mounted on the wall of the chassis alongside the hole for the mains lead.

When all components are

mounted wiring should commence by connecting the heaters to the 6.3 volt tags of the transformer, the centre-tap of this winding being ignored: the heater of the rectifier is connected to its own 6.3 volt winding and not to that used for the other valve. These heater connections are run close to the chassis. The rest of the wiring is direct from point to point following the lines of the wiring diagram and should present no trouble.

Construction of pre-amplifier

Fig. 8 gives the under-chassis layout and wiring diagram. This is built on an aluminium chassis measuring 7 in. x 4 in. x 1½ in. deep with a ½ in. flange at the back for mounting, similar to the chassis previously used in this series. As before, the valveholder should be oriented so that the pins are in the position indicated by the diagram. A tag-strip with four tags in addition to earth is provided at the back to anchor the incoming power leads. A second tag-board with two tags plus earth is used near the tone controls to anchor the tone control components as indicated. A five-core input power cable is used to carry heater and H.T. (with common lead to chassis) and to provide two cores for the purpose of switching mains to the main amplifier.

The input side of the amplifier should be screened by the use of coaxial cable. A coaxial input socket is provided for the gramophone input: this is mounted right up to the volume control and consequently this lead does not need screening, but the longer lead from the volume control to the grid pin

(Concluded on page 605)

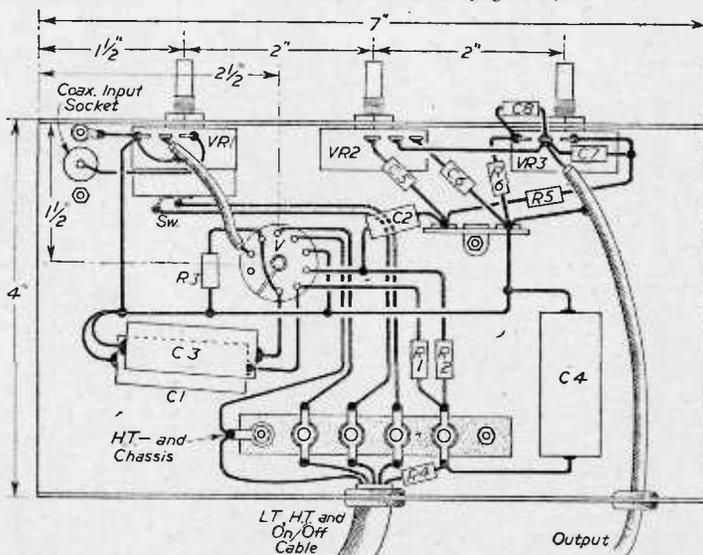


Fig. 8.—Wiring of the pre-amplifier.

A Signal Tracer and Amplifier

ANOTHER INTERESTING SERVICING AID WHICH CAN EASILY BE MADE UP

By T. Hillman

General Description

THIS is a straightforward amplifier which by means of switches can be used for the following purposes.

- (1) Tracing a signal right through a radio set from the aerial to the L.S.
- (2) Substitute power supply output 250 volt 60 mA 6.3 v. 3 amps.
- (3) Stand-by radio set with choice of two programmes.
- (4) Substitute output transformer to suit 2.5Ω, 12.5Ω and 15Ω impedance loudspeakers.
- (5) Substitute loudspeaker.

Construction

First mark out and cut panel (Fig. 2). Next bend the 1/4 in. edges at right angles and proceed to cut out chassis (Fig. 7). The bending should be done in the following order: A, B, C, D, E, F, G, H and I.

Note that bend I is in the opposite direction (see Fig. 11). Now bolt up the section E.F. to form corners of chassis and join section I to front panel with two 4 B.A. nuts and bolts and bolt front panel edges to chassis. The finished chassis should now appear as

Fig. 12. Next cut out the valvholder (1 1/4 in.) as shown in Fig. 5. Positioning V4 as near to L.F.C. and mains transformer as possible after placing mains transformer in one corner, and L.F.C. in other corner. Now fit all valvholders, switches, volume control and warning light (see Figs. 5 and 6 for approximate positions of main components). The

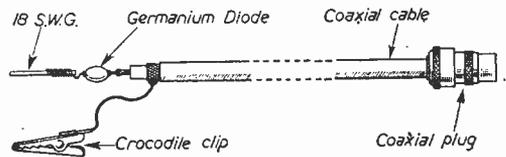
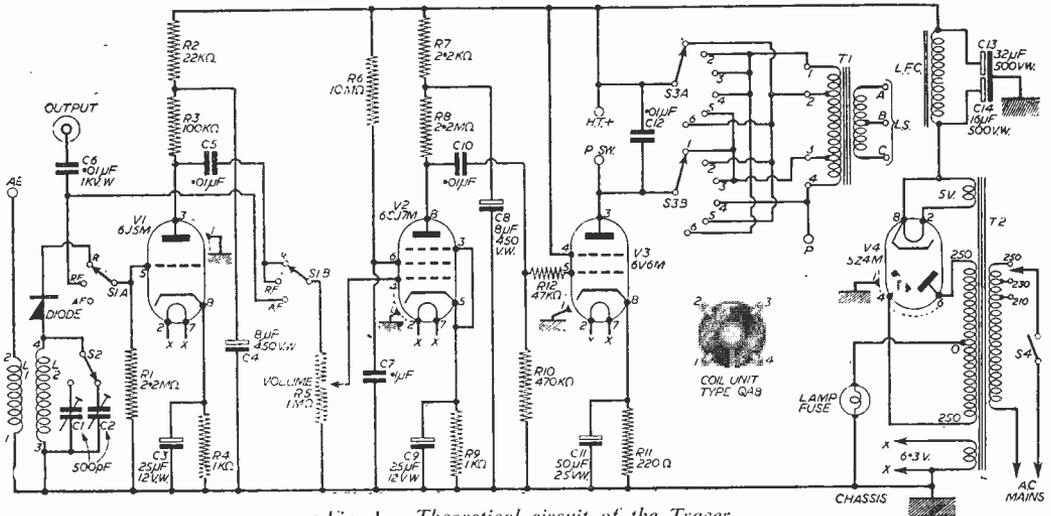


Fig. 10.—Details of the Probe.

warning light is an ex-govt. indicating lamp with a red glass, and by using a .15A bulb this light will indicate when amplifier is on, and will also give a rough guide to the amount of current drawn from the transformer. It will also act as a fuse to safeguard the circuit from overloads. The voltage of the bulb is immaterial, as the current is the main thing in this case.

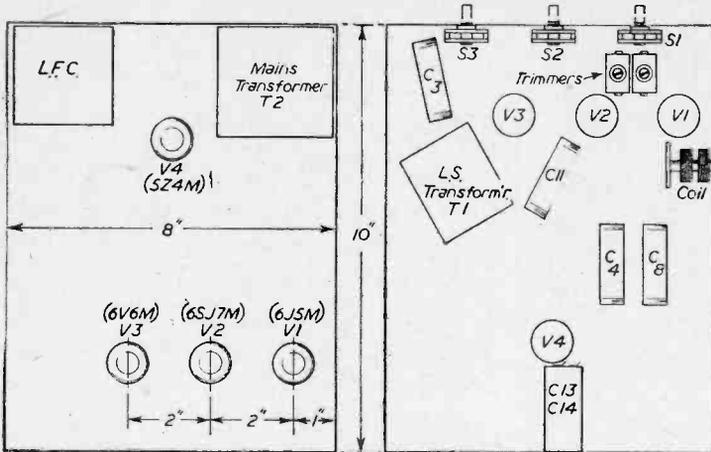
The cover (Fig. 9) is next made and bolted at its



• Fig. 1.—Theoretical circuit of the Tracer.

LIST OF PARTS

- | | | |
|-----------------------|---------------------------------|------------------------------------|
| S1 = 2P 3W. | T1 = R/S "Standard" O.T. | 1 indicating lamp panel mounting. |
| S2 = 1P 2W. | T2 = 250/0/250 v. 100 mA 6.3 v. | 1 .15 a. bulb M.E.S. |
| S3 = 2P 6W. | 4 a. 5 v. 2 a. | 1 crocodile clip. |
| S4 = SPST toggle. | 2 Germanium diodes. | 1 yd. coaxial cable. |
| LFC = 10 Hys. 100 mA. | 1 Osmor Q48 coil. | 4 B.A. nuts and bolts as required. |



different coloured P.V.C. wire for the leads, as this helps to identify the wires at the switch, otherwise difficulty may be experienced in sorting out the wires. Make up a coaxial lead (Fig. 10), using one of the germanium diodes soldered to the inner core, and its other end soldered to a piece of 18 S.W.G. T.C. wire for use as a probe. Wrap insulating tape round the diode and solder a length of flex to the braiding of the coaxial cable, terminating the other end in a crocodile clip.

Testing

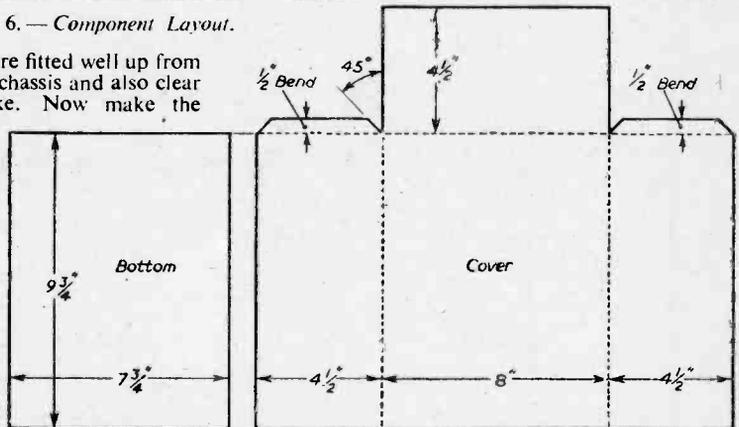
The amplifier is now ready for labelling and a panel can

Figs. 5 and 6.—Component Layout.

corners, making sure the bolts are fitted well up from the edge which will overlap the chassis and also clear of the transformer and choke. Now make the bottom cover (Fig. 8) and paste a copy of the circuit diagram inside for future reference when needed for servicing.

Wiring

Wiring is fairly straightforward, but first position valve holders so that the shortest grid and anode leads can be made, and then wire up. Use screened wire for the lead from pin 4 V2 to R5 and from R5 to S1B. In wiring up T1 use



Figs. 8 and 9.—Chassis and base bending details.

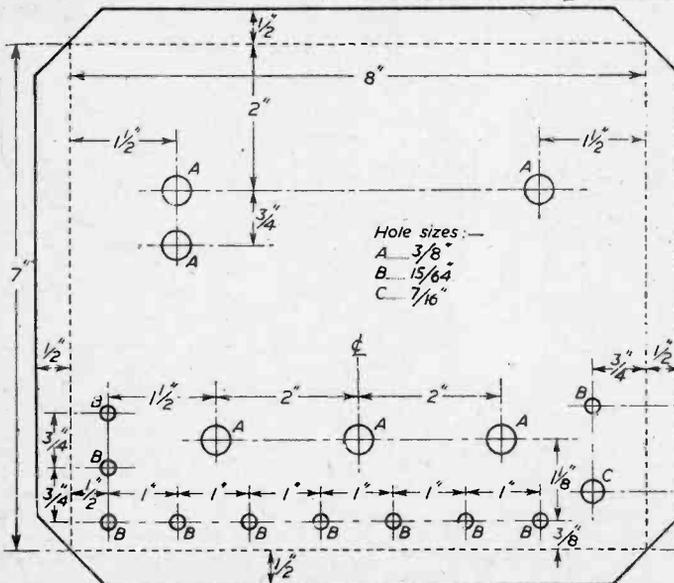


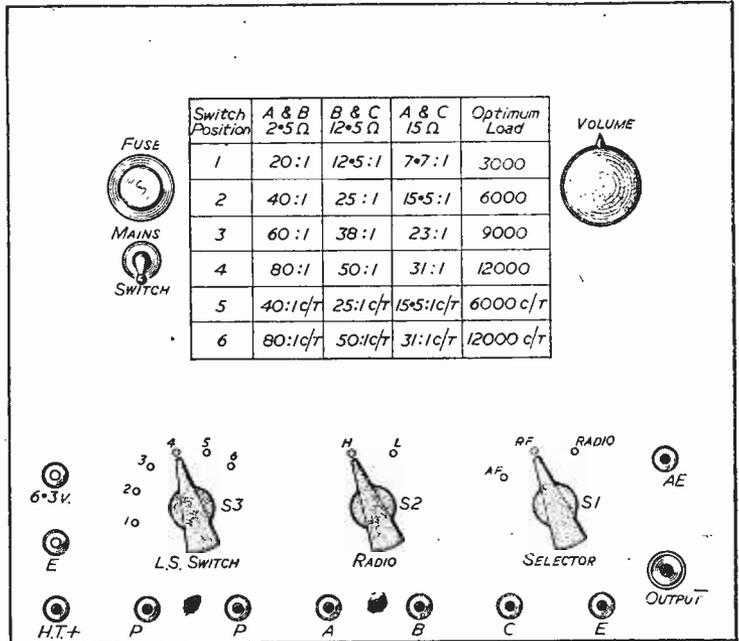
Fig. 2.—Panel drilling details.

be marked on a piece of paper 4in. by 2in. and pasted on the front panel as shown in Fig. 3. Next cut out three circular discs of paper (1 1/2 in.) and mark out the switch positions on the panel. Use small squares of paper for the lettering of the sockets. When the lettering is dry, paint over the paper with a clear varnish to preserve the markings. A separate loud-speaker in its own cabinet is used with this unit and is plugged into sockets A and B, as this makes it more convenient to use when a substitute L.S. is required at a different place in the workshop. Another point in favour of a separate L.S. is that there is then no danger of valves going microphonic giving rise to howling when volume

is increased. The valves used are ex-govt. metal types, as this means that valve screening cans are not required.

The Tracer may now be tested out and undoubtedly the best plan is to use it first as a straight broadcast receiver. Attach an aerial to the AE socket or terminal and try and tune in the local station. Note particularly that this is only a diode plus amplifier arrangement and, therefore, only a strong local signal can be picked up. However, unless you are situated in a very bad spot some signal will be heard and the effectiveness of the amplifying stages may be checked by this signal. It will also enable the volume control to be checked, as well as hum level and other features on the amplifying side.

When these have been checked and you are quite satisfied with the performance the output from a known good receiver may be checked by connecting to the "output" socket and switching to A.F.



Figs. 3 and 4. — Panel layout and switch setting panel.

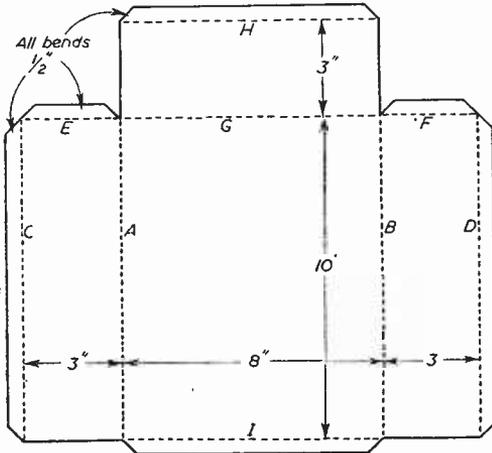
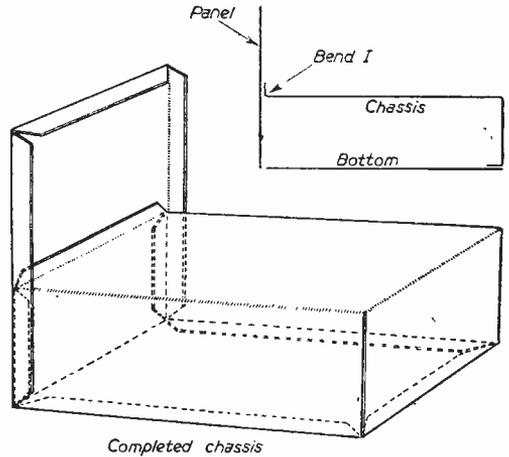


Fig. 7.—Further chassis data.



Figs. 11 and 12.— Complete panel and chassis assembly.

Push-pull Amplification

(Concluded from page 602)

of the valve is a piece of coaxial cable. To wire this chassis first run the heater wires from the tagboard to the valveholder and the mains switching leads from the tagboard to the volume control, keeping these down to the surface of the chassis and away from the input signal leads. A heavy tinned copper busbar is then fitted, running from the earth side of the volume control to one of the unearthed tags of the tagboard adjacent to the tone controls. This busbar is shaped before fitting to run as indicated in the wiring diagram.

An earth lead is now wired from a soldering tag on one of the holding-down bolts of the input socket to the earth busbar at the volume control tag. Note that this is the only earth connection from the busbar to the chassis; at no other point does an earth go to chassis except the earthy side of the heater/H.T. input at the larger tagboard. Now connect the input socket to the volume control and then take each valveholder pin in turn, connecting as indicated. The tone control circuit is then wired, followed by the smoothing components R4, C4, the output lead which also is a length of coaxial cable, and then the power lead, which is terminated by means of a plug to suit the socket on the main amplifier.

A Simple "S" Indicator

A USE FOR A WORN-OUT TUNING INDICATOR

By R. Dunn

THE present scheme was originally part of a general reorganisation of the famous R.1155, but it can quite easily be applied to any receiver with automatic volume control, especially those employing a "magic eye" tuning indicator, the fluorescence of which has faded beyond a useful minimum.

Besides being a cathode-ray tuning indicator, the magic eye is essentially a triode amplifier with variable-mu characteristics, and in this latter capacity it has a useful residual life. Thus, if a current-reading

strength of the signal. The meter will, therefore, read backwards, the signal strength being read from the position of full-scale deflection.

The variable-mu characteristics of the valve render it relatively far more sensitive to weak signals than to strong ones, which is a very desirable state of affairs, as a good reading is obtained for weak stations and it is possible to observe the position of exact resonance of the tuning circuits. The ever decreasing mutual conductance of the valve at the bottom end of its curve makes it virtually impossible for a strong local station to overload the valve to complete cut-off and in practice one never gets a return to zero deflection on the meter. The measurement of signal strength is a very relative matter, depending on a variety of variable factors (e.g., position of receiver and length of aerial, etc.), so that this non-linear characteristic constitutes no material disadvantage. Fig. 2 shows the curve plotted from feeding the signal from a generator direct on to the aerial of the R.1155. The signal strength is in approximate μV at the aerial plotted against the meter reading. The table shows the complete readings obtained from approximately 10 μV .—50,000 μV .

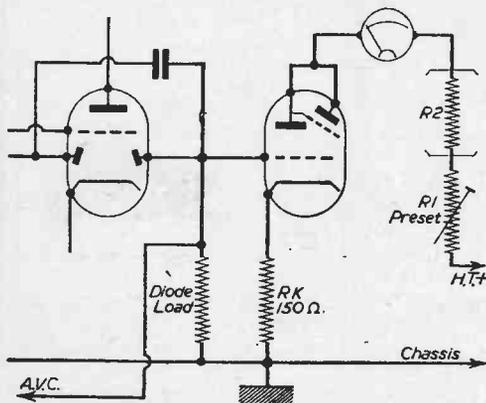


Fig. 1.—Circuit of the tuning indicator.

meter is placed in the H.T. supply it will register any change in grid potential and serve very usefully as an S-meter amplifier.

In the circuit (Fig. 1), it will be seen that the anode and target are strapped together and the H.T. fed via a variable resistor and the meter. Conditions are so arranged that the meter shows full-scale deflection when the negative grid potential is provided solely by the cathode bias resistor. In practice this means that the working conditions are those of "no signal." The grid is connected to the negative end of the diode load of the demodulator valve in the receiver—either the signal or A.V.C. diode. If the receiver already possesses a "magic eye" this connection will already have been made.

When a signal is received it will be rectified by the diode and this will raise the negative potential of the grid and the anode current will fall and be registered on the meter, the decrease being proportional to the

Components

With regard to component values these are far from critical and may be varied so long as the following conditions are satisfied. The meter can be any instrument with a full-scale deflection less than that of the total permissible anode current of the valve. In practice, arrangements are made for a comparatively low current and this is achieved by a variable (preset) resistor. A 1 mA meter would be a good value and in my own case I have used a diminutive 500 μA ex-Government component with $R1=1\text{ M}\Omega$. The limiting resistor $R2$ is optional and serves to protect the meter from possible gross overloading. Rk provides the valve with a resting negative grid potential for no-signal conditions. Its value is about 150 Ω . $R1$ should be placed in a more or less accessible position so that it can receive minor adjustments with a screwdriver to correct for circuit, valve or H.T. fluctuations. It is also useful to place a switch in the H.T. lead so that the meter can be cut out if desired. If an A.V.C. on/off switch is present the two switches should be ganged so that the meter is inoperative when A.V.C. is off. This applies in the R.1155.

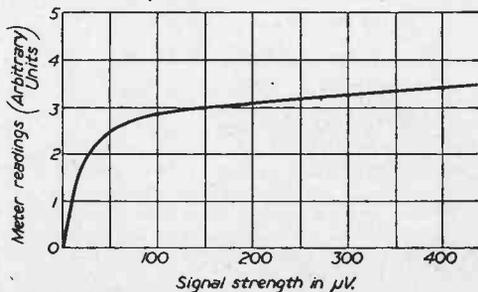
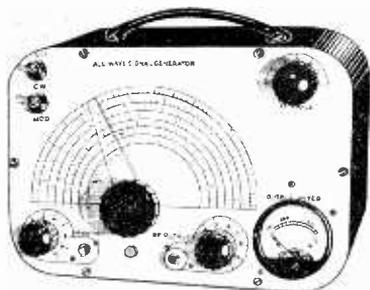


Fig. 2.—Plotted signal strength readings.

Meter Readings (Scaled 0-10)	Input at Aerial (Approx. μV)
1.0	10
1.5	15
2.0	30
2.5	50
3.0	150
4.0	750
5.0	4,000
6.0	15,000
7.0	50,000

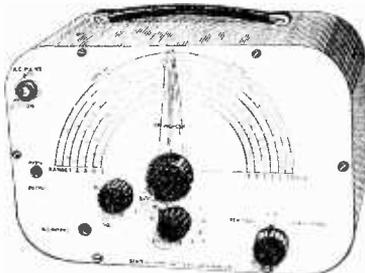


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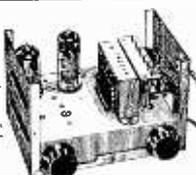
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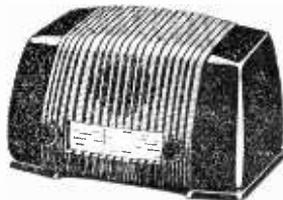
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5R4CV	9/6	6Q7GT	8/-	10P9	11/6	DL66	10/6	P61	3/9	VR34 (EB34)	7/6			
5U4G	8/-	6A7GT	8/-	10P13	11/6	EABC50	10/-	PEN220A	4/-	VR35 (EB33)	7/6			
5Y3GT	8/-	69H7	7/6	10P14	13/6	EAF42	12/6	PC84	10/-	VR36 (EP36)	6/6			
5Z4G	8/9	6KJ7	8/6	12A6	6/6	EB41	9/6	PCF80	9/6	VPF82	12/6			
6A7	11/6	68K7	6/6	12A77	8/6	EB41	9/6	PCL93	12/6	VR37 (EK32)	3 v., 4 v., 6 v., 8 v., 9 v., 10 v., 15 v., 18 v., 20 v., 24 v., each 18/6.			
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6AC7	6/6	68N7	8/6	12A77	8/6	EC91	9/6	PL83	12/-		3/-			
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6AK5	6/6	68R7	8/6	12B26	10/-	EC85	10/6							
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6AM6	7/6	615	8/6	12H6	3/6	ECB42	10/6							
6AQ5	7/6	6174	8/6	12J5	4/6	ECB42	10/6							
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6BE8	8/-	6X54	7/6	12R7	9/6	EP80	10/-							
				12R7	7/6	EP85	12/6							
				12R7	8/6	EP86	12/6							
				12R7	7/6	EP89	12/6							
				12R7	8/6	EL2	12/6							
				12R7	7/6	EL32	6/6							
				12R7	7/6	EL41	10/6							
				12R7	10/6	EL42	11/6							

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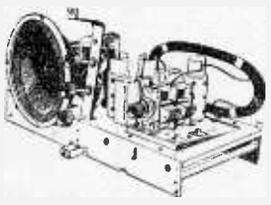
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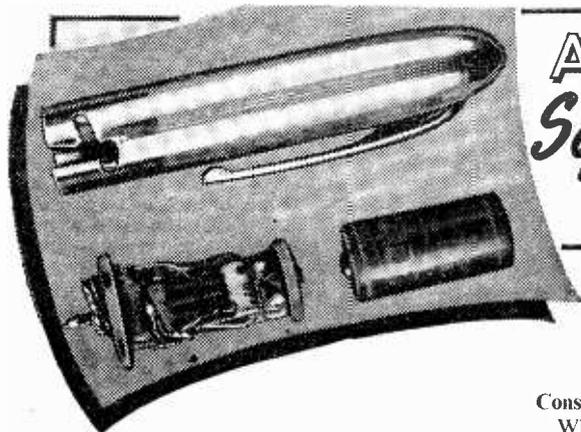
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By P. Cheetham

VALUABLE as a "noise" generator is, its bulk usually prohibits its use in field tests.

However, now that transistors can be bought for only 10s., every amateur has the opportunity of equipping himself with a useful addition to his test gear, the whole thing taking up no more space than the cap from an old ball-point pen.

The circuit is that of a quite straightforward multivibrator, translated into transistor terms, while the current consumption is a mere 120 μ A at 1½ volts, so a simple deaf-aid cell, type D21, provides adequate power, lasting almost as long as the shelf life of the cell.

Individual Requirements

Two types are shown, both having approximately the same circuit values, but using different transistors. The original model, Fig. 5, was built into the top half of a penlight torch of the type now being sold at a reduced price in many shops since the advent of the new slim penlight torch. The newer torch, unfortunately, does not make such a good case as the old one, the top only of which is used, together with its built-in switch.

The cap from an inhaler forms a neat outlet for the test probe. There is ample room in this case for two Mullard or Brimar transistors, together with standard ¼-watt resistors and Mallory cell, and this model might well have more appeal for those who feel they have not the delicate touch required for really sub-miniature work.

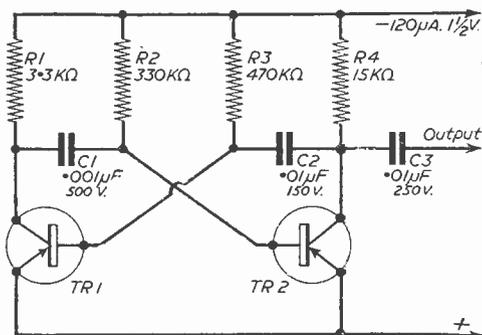


Fig. 1.—Circuit of the device.

Constructional Details

While the original model was built on a Perspex former shaped as in Fig. 2 something more economical of space must be used for the smaller model. The former shown in Fig. 3 was eventually adopted since its bayonet-type fitting into the pen cap provides a simple switch.

One end of each resistor is soldered to one of the needles, the upper end of which is soldered to a short piece of wire which passes round one of the projections of the top end-piece, so that it will be constantly

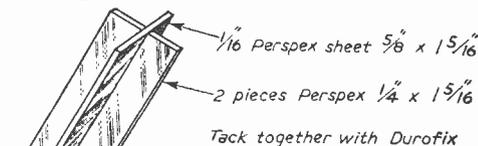
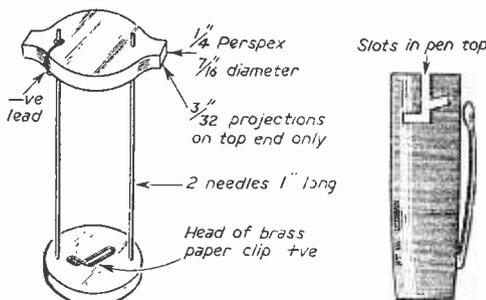


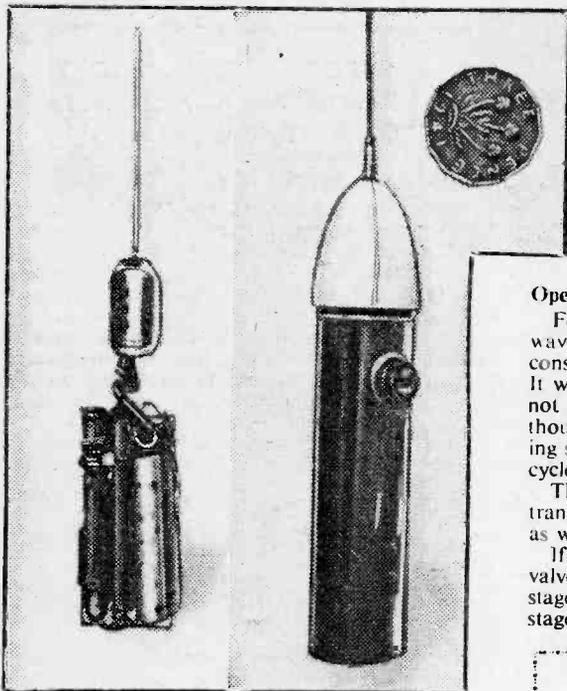
Fig. 2.—Details of the Pen-top Mounting element originally used.

touching the metal pen cap. Since the negative pole of the cell will always be in contact with the pen top we have now to ensure that the wire joining the two emitters can be brought into contact with the brass cap on the cell when required. This can easily be brought about by holding the projections on the Perspex between finger and thumb and twisting, bayonet fashion, until the whole assembly takes up the new position farther into the pen cap, where a brass paper clip, to which the two emitter leads are soldered, presses against the positive pole of the cell.



Figs. 3 and 4.—The former and the slotted pen top.

The needles are held by pliers and firmly pressed against the Perspex and their free ends touched with a hot soldering iron until they sink right in. If they are then allowed a few seconds in which to cool it will be found that the Perspex around them has set and that they cannot be pulled out again. If the needle is found to be a little out of the perpendicular it is a simple matter to repeat this operation until they have been set quite true. A third needle, to act as probe, is "welded" to the centre of the top end-



Figs. 5 and 6.—Detailed illustration of the pen-top generator and on the right an earlier model.

piece in the same way, the output condenser being soldered to its lower end later, taking care not to reheat the needle too much or it will loosen again. Incidentally, if the extreme end of the eye is carefully removed with a pair of pincers the tip of the probe will be forked and thus be easier to hold against thin wires when in use.

A heat shunt must always be used in all sub-miniature work, where component leads have been cut short, for there is otherwise a possibility of damaging the components. A pair of pliers will serve so long as they have a clean grip and these should be held gripping the wire between the component and the iron for at least 10 seconds after the iron has done its job. Heat from the cooling joint is then "shunted" up into the cold and bulky pliers instead of flowing along the thin wire to the component. It is also advisable to make all joints as rapidly as possible.

Since there is no danger of interaction, layout may be made simply a matter of expedience, and components may be actually touching so long as they have a layer of Sellotape between them. Leads should be cut to size and bent before any attempt is

made to connect up. For insulation and protection from damage a liberal coating of Durofix should be applied to the finished job. The same adhesive is also useful for holding the components in place while soldering up.

Resistors are sub-miniature types and the circuit has been dressed to take values which are currently available, but the condensers must have their original insulation broken away and replaced by Durofix—a process which reduces their volume to one half.

The output will depend upon the types of transistors used and the values of the components (none of which is at all critical), but may be increased, at the expense of consumption, by reducing the value of the first transistor load R to anything down to about 100 ohms. This change would also enable an interesting demonstration to be made of the transistor's low power requirements, for oscillation is maintained when, instead of a $1\frac{1}{2}$ volt cell, a silver coin and an aluminium disc held in the mouth and pressed into service as a cell!

Operation

Fourier's analysis tells us that a perfectly square wave may be thought of as a series of sine waves, consisting of all the odd harmonics up to infinity. It will be found that the apparatus described, while not producing a *perfect* square wave, will produce thousands of harmonics, so will appear to be oscillating simultaneously at all frequencies from about 500 cycles per second to several Mc/s.

The output available at the collector of the first transistor is much higher but not as rich in harmonics as when taken from the joint shown.

If the probe is touched on the grid of the output valve a clear tone is heard at the speaker if this stage is working; similarly with I.F. and R.F. stages, regardless of position of wave-change switch

LIST OF PARTS

R1 3.3k	Deaf-aid type
R2 330k	" " "
R3 470k	" " "
R4 15k	" " "
C1 .00 μ F	500 v. Dubilier } Type 400
C2 .01 μ F	150 v. Dubilier } Type 400
C3 .01 μ F	250 v. ex-W.D. (Type Z6/ZF/01031)
TR1, TR2,	Henry's or Hivac XFT2.
D21 cell	Ever-Ready.

or tuning nob, greatly simplifying the location of faults in receivers or amplifiers. The limited power output also makes it quite safe for fault location in transistor sets and equipment.

The output tone may be raised or lowered, according to taste, by adjusting the values of R3 and C2.

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beginner the very first consideration must be the simplicity of the design. This in turn implies that the number of stages must be small; hence, in this receiver there are only two, excluding the power supply.

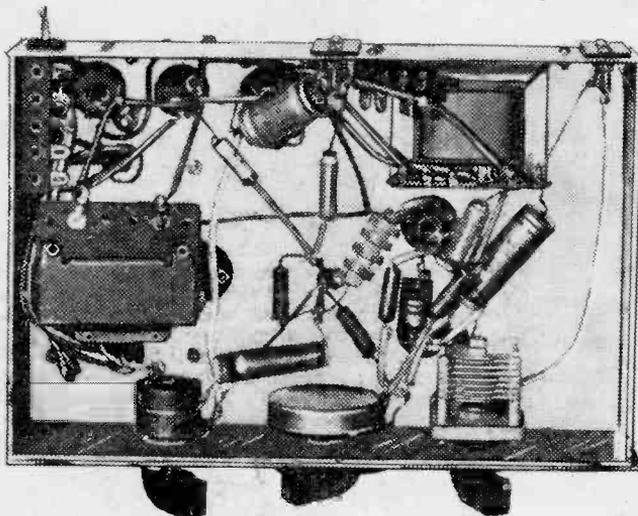
Plug-in type coils are also necessary in order to obviate switching arrangements, with their attendant losses, and, where a coil pack is home-made, to avoid complicated wiring arrangements. A further advantage here is that the coils may be purchased

and cost, the next point of note is the design itself. Miniaturisation being the order of the day, it is of little practical use specifying obsolete valves or components, these soon being confined to the spares box in preference to the modern equivalents.

With a "straight" design it is important that the operator should have complete control of the receiver at all times, and this implies that both the reaction and the aerial controls should be located on the front panel and that both should work with 100 per cent.

efficiency. Both these considerations have been catered for in the design shown.

The final consideration, at least in the writer's opinion, is that important factor known as "eye appeal." The completed receiver should have a clean looking layout throughout—i.e., both above and below the chassis—not to mention the panel itself. A glance at the illustrations will show that this has also been carefully carried out.



Underside view of the chassis.

one at a time, thus making the initial outlay somewhat smaller than would otherwise be the case.

Modern components should be used in preference to the "surplus" variety if maximum efficiency and performance are to be achieved. The valves used in the receiver described, together with the coils and all the other components, are, in fact, not only modern, but also new.

Consistent with a good performance, the number of components used should be kept at a minimum, this also being important in relation to the total cost involved. The average enthusiast, not having a "long pocket," is apt to be rather critical of designs which are costly to construct in relation to the results likely to be achieved. Having dealt with simplicity

Circuit Design

The design itself is shown in Fig. 1, where it will be seen that it is based around the Mullard EF41, the Brimar 6BW6 and the EZ41 rectifier. The EF41 and the EZ41 are both B8A based valves, while the 6BW6 is a noval based type.

The power supply has been incorporated as an integral part of the design and not as a separate item in itself. From the photographs it will be seen that

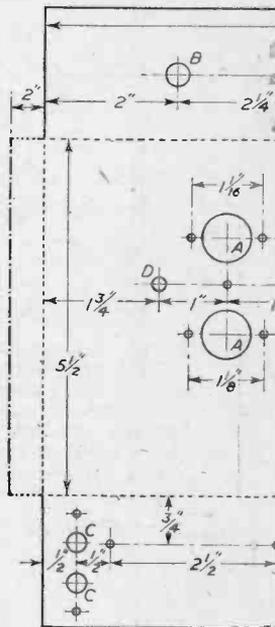


Fig.

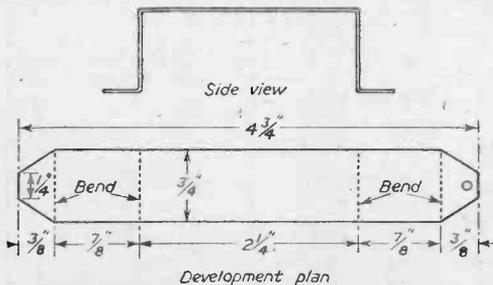


Fig. 4.—Condenser mounting bracket.

LIST OF

- | | | |
|--------------------------------------|------------------------|--|
| Resistors | Valves | Condensers |
| R1 1M Ω $\frac{1}{2}$ watt. | V1 EF41 Mullard. | CA 100pF, variable, Eddy |
| R2 39k Ω $\frac{1}{2}$ watt. | V2 6BW6 Brimar. | CB 12.5pF, variable, Eddy |
| R3 100k Ω $\frac{1}{2}$ watt. | V3 EZ41 Mullard. | C1 140pF, variable, Eddy |
| R4 250k Ω $\frac{1}{2}$ watt. | | C2 100pF, Mica. |
| R5 50k Ω Potentiometer. | | C3 0.01 μ F, Tubular, TC |
| R6 10k Ω $\frac{1}{2}$ watt. | | C4 0.1 μ F, Tubular, TC |
| R7 500k Ω Potentiometer. | | C5 100pF, Ceramic. |
| R8 270k Ω $\frac{1}{2}$ watt. | | C6 0.05 μ F, Tubular, TC |
| R9 15k Ω $\frac{1}{2}$ watt. | | C7 25 μ F, Electrolytic, type, CE16DE. |
| | | C8 16 μ F, Electrolytic, 4 |
| | | C9 16 μ F, Electrolytic, 4 |
| | | C10 0.02 μ F, Tubular, TC |
| | Speaker | Coils, etc |
| | Sin., Rola, Elac, etc. | Eddystone types 706/LB |
| | | 706/W, 706/P. Coil ho |

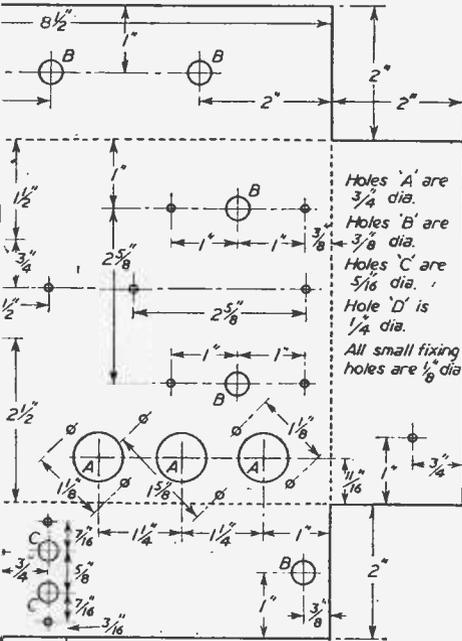
the power pack components are included on the same chassis as the receiver.

The EF41 functions admirably as a detector for the short wave ranges. Here, as a leaky grid detector, with reaction controlled by variation of the screen voltage, it performs extremely well over the entire range of the receiver (32 Mc/s to 730 kc/s).

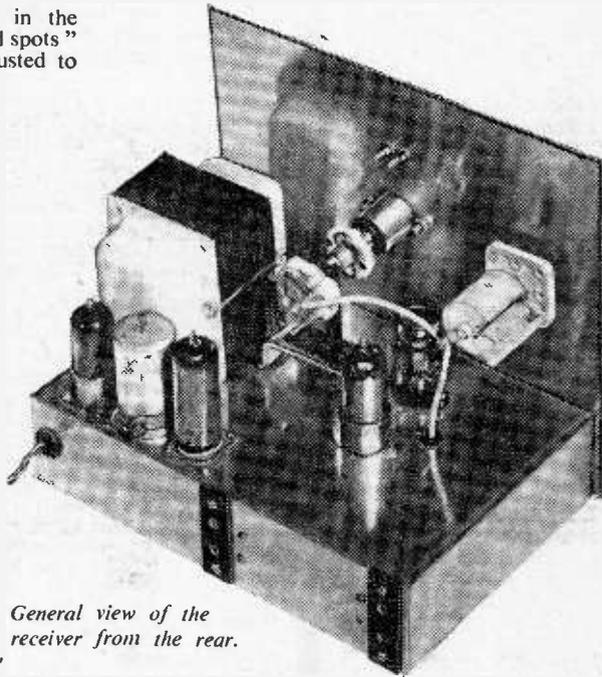
The variable condenser CA is inserted in the aerial input to ensure that there are no "dead spots" with regard to reaction. It should be adjusted to

R4 and to chassis via R6. C4 and C10 act as A.F. and R.F. by-pass, C4 also smoothing out any irregularities in the action of the sliding contact of R5.

The great advantage of this method of obtaining reaction is that it does not alter the tuning of the receiver when being adjusted. It is smooth and



3.—Full chassis data.



General view of the receiver from the rear.

give optimum performance with each coil inserted into the circuit. The feedback condenser C5 should preferably be of the ceramic variety. The potential of the screen grid is controlled by variation of R5, the potentiometer connected to the H.T. supply via

positive in action and, provided the circuit values given are reasonably adhered to, the threshold of oscillation will be clearly defined, i.e., no overlap or backlash will be apparent.

The grid leak R1 and condenser C2 have values

PARTS

- Resistors: Eddystone type 585, Eddystone type 580, Eddystone type 586.
- Capacitors: C type-37N, C type CP45N, C type CP35N, C type V. wkg., TCC, C type 50 V. wkg., BEC., C type 50 V. wkg., BEC., C type CP33N.
- Coils: 706/Y, 706/R, Eddystone type 775.
- Other: Dial and Drive, etc. Eddystone, type 843. R.F. Choke Teletron Co., type RFC4. L.F. Choke 10H, 60 mA (see text). Chassis and Panel 5in. x 7in. x 2in., 7in. x 7 1/2in. Panel Bracket Eddystone type 708 (for CB). Mains Transformer. Ellison, type MT162. Tag Strips, Nuts and Bolts, etc.

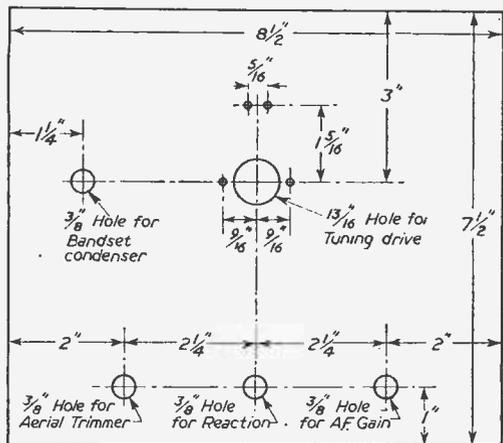


Fig. 2.—Drilling details for the panel.

chosen to give a suitable time constant which contributes to the obtaining of good reaction control. Note that C2 is of the mica type.

R3 is the anode load resistor with simple A.F. decoupling being provided by R2 and C3. The output of the detector is fed, via C6, into the volume control R7, the switch shown in the A.C. mains input line also being an integral part of this latter component.

Bias for the output stage is provided by the combination of R8 and C7. Note that with the 6BW6 the beam forming plates are not connected to the cathode internally. Therefore these must be wired to the cathode connection external to the valve. The speaker transformer used is of the multi-ratio type, but any suitable transformer may be used provided it will fit under the chassis as shown in the photographs.

The speaker, a 5in. type, is connected to the output of the receiver via a paxolin output plug and socket arrangement mounted on the chassis rear.

The power supply, constructed around the EZ41, is conventional, and will be found to supply adequate smoothed H.T. to the circuit. The L.F. choke used was one already to hand, but if one has to be purchased the main requirement, apart from the rating, is that it should be of such a size that it is capable of being fitted under the chassis as shown.

The main transformer is the Ellison type MT162, a small, easily obtained component and one that is ideal for this type of small receiver. C8 and C9, both of 16 μ F, ensure that the H.T. is smoothed and free from A.C. ripple.

Throughout the circuit diagram the numbers shown around the various valves are those of the actual base connections. Coil base connections will be given next month.

The voltage readings shown are those obtained with a Weston meter set to the 250 v. range (H.T. readings) and 10 v. range for the cathode of the 6BW6. All readings have been taken with the reaction control R5 at minimum, the volume control R7 at maximum, under no signal conditions.

Constructional Notes

Apart from the actual circuit itself, the next important consideration with a receiver designed specifically for the short waves is mechanical rigidity coupled with a first-class dial and drive assembly. The vernier slow-motion dial shown in the photographs is the Eddystone type 843, a 4in. anodised satin finished hard aluminium dial with 100 division over 180 degrees, the matching vernier block enabling one tenth of a division to be accurately read. The drive is an epicyclic ball bearing type having a ratio of 10-1. In the prototype shown this is fitted to the bandspread condenser, although there is no reason why this should not be changed over with the bandsetting condenser should individual readers prefer this.

Mechanical rigidity is largely assured by obtaining the chassis specified, this being of a suitable gauge and well made. All components such as the mains transformer, etc., should be securely bolted to the chassis, using nuts and bolts as shown and not screws of the self-threading type.

The chassis and front panel details are shown in Figs. 2 and 3, respectively. Readers constructing this receiver should first drill the front panel, and, having done this, use it as a template for the chassis front with regard to the holes for CA, R5 and R7.

The positions of the main components can be clearly seen from the illustrations, and careful attention to these, together with Figs. 2 and 3, will ensure that no trouble will be experienced with the main assembly work.

It will be noted that the bandspread condenser (CB) is mounted on a metal stand-off bracket (see list of parts). In order to place the main dial in a satisfactory position this bracket must be mounted on an aluminium raised support. Details of this arc given in Fig. 4, although there is no reason why these measurements should not be varied by the constructor to suit individual requirements, and mains transformer used if differing from that shown.

Each stage should have an earthed tag fitted at the same time as the valveholders, these being placed on one of the bolts and securely fastened to the chassis. In addition to this, earthed tags should be fitted to the aerial/earth and speaker output paxolin strips mounted on the rear of the chassis.

Three tag strips are used. The first is mounted over the rectifier valveholder and when wired will contain the mains input wiring; the earthed tag of this strip being used for the mains transformer screen and heater connections to chassis. The second is fixed to the underside of the chassis deck and contains the R.F. choke, R2 and R3, R6, C3 and C6. The third tag is used as an H.T. holding strip mounted on the rear wall of the chassis. Only one tag of this latter strip is used, the remainder being utilised at a later date when a further stage will be added.

Having drilled the chassis and panel, the next step is to mount the main components as shown in the photographs—ensuring that these main items are securely bolted to the chassis. Particular note should be taken of the fact that all leads from the mains transformer have to be taken through the chassis deck. Two holes must be drilled for this purpose, each $\frac{3}{16}$ in. in diameter, and each *must* be fitted with a suitably sized rubber grommet.

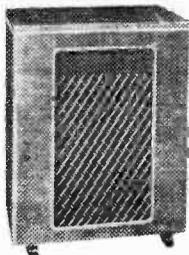
(To be continued)

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In the current issue of our companion paper PRACTICAL TELEVISION, which is now on sale, there is a constructional article on an Infinite Resistance Voltmeter. Although it is generally found that more accurate measurements are required in a television receiver than in a radio set, an instrument of the type described will be found of great value to the experimenter and service man. The article is complete in this issue.

There are also in this issue two articles on the oscilloscope, one dealing with the use of the instrument as an aid in receiver alignment, and the other a general explanation of the method of using this particular type of test set. The servicing article deals with the G.E.C. BT5147, and other general articles deal with the construction of a Television Table; Selenium Rectifiers in Power Supply Circuits; TV Distribution at the Radio Show; Battery-operated TV; a Band I/Band III switch; and Test Card C (the seventh in the new series on a Beginner's Guide to Television). Problems Solved. Underneath the Dipole and Telenews are regular features which also appear in the October issue.

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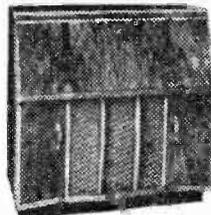


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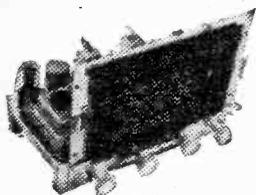
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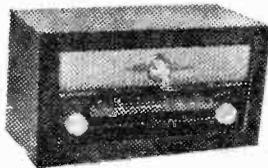
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MODIFICATIONS TO THIS POPULAR EX-GOVERNMENT UNIT

By K. A. Brook

(Continued from page 558 October Issue)

ANOTHER fault is magic eye dim or out. This could possibly mean that H.T. is a partial short circuit to earth. Check C113 and C114. Check the output transformer windings (both 'phone and speaker transformers should be checked). With the power pack disconnected (Fig. 8), measure the resistance of the H.T. rail to chassis. If this reads less than 10,000Ω, check C25, C29, C32, C38 and C93 for short circuit. Details of these capacitors are given below.

Colour	Representation
Red	H.T. Positive
Yellow	H.T. Negative
Blue	L.T. Positive
Black	Earth
Green	Grids

Capacitor	Value (μF)	Position in circuit
C25	0.001	Anode of V6 to chassis.
C29	0.1	H.T. side, primary of I.F. transformer in anode circuit of V3 to chassis.
C32	0.1	H.T. side, primary of I.F. transformer in anode circuit of V2 to chassis.
C38	0.1	H.T. side, primaries of anode transformers of V1 to chassis.
C93	4	Paper block capacitor near DF1 and DF2 valveholders. (H.T. to chassis.)

Note: C29, C32 or C38 being short circuit will show in the overheating of the resistor wired to one end of these components.

(iii) Magic eye O.K.
Switch on "Het. Osc." and tune set to approximately 280 Kc/s. If a strong whistle is heard, check V1—the anode voltage should be 174 volts. With the master switch set at Omni (i.e., the extreme anti-clockwise position), and the volume control at maximum, the screen voltage of V1 should be 57 volts. If O.K., check the output circuit of V6 and V8.

(iv) Magic eye not responding.
Check V2, V3, V4 and their associated circuits.
SIGNALS WEAK OR DISTORTED.
(i) On all ranges.

Check the power supplies, especially the bias supplies. There should be 30 volts across R1. This resistor is located on the 2.5 μF section of the paper block capacitor underneath the magic eye can. In parallel with this resistor are R3 and R4 in series. On ranges 3, 4 and 5 there should be 3.6 volts across R4 and on ranges 1 and 2 there should be 2.4 volts. (See Fig. 14). If not normal, check R1, R3 and R4. An excessive reading is caused by breakdown of C26, C27 and C28 which are in a tubular can situated between V4 and V6. C26 is connected between the cathode of V6 and chassis, C27 is the anode decoupling for V4 and C28 is the screen decoupling of V4.

(ii) Weak signals, weak beat note on B.F.O.
This is usually caused by C11 having developed a short circuit thus feeding a high potential on to the detector diode. This capacitor has a value of 100 pF and is connected between the anode of V5 and the secondary of IFT3.

(iii) Magic eye not responding.
(a) Not closing when a signal is received.
Check C103 for a short circuit. This capacitor is connected between the grid of the magic eye (pin 5) and chassis. Its value is .005 μF.
(b) Not opening when off tune.
Check C19 for a short circuit. This capacitor is connected between a primary tap on IFT3 and the A.V.C. diode and has a value of .001 μF.

(c) Out on switching on the B.F.O.
If the eye goes out when the "Het. Osc." is switched on, and there is no B.F.O., check C12 for a short circuit. This is connected between chassis and the junction of R17 and R18 (1.5 KΩ and 10 KΩ respectively), the other end of R17 being connected to the "Het. Osc." switch. The value of C12 is .1 μF.
(iv) Volume control not operative when master switch is in Omni position.

Check the resistance between H.T. — and chassis. This should be between 750 and 800Ω on either Omni or A.V.C. positions. The fault is due to H.T. — short circuited to chassis.

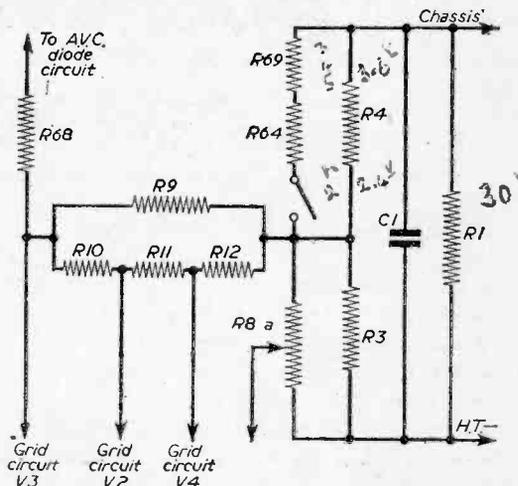


Fig. 14.—Bias network (simplified).

R1—2 K.	R11—150 K.
R3—1.2 K.	R12—27 K.
R4—120.	R64—100.
R8a—50 K Pot.	R68—56 K.
R9—2 M.	R69—100 Ω.
R10—150 K.	C1—2.5 μF.

Note: After removal of the M.F./D.F. circuits the master switch is only operative in the Omni and A.V.C. positions.

This completes the section on fault finding.

Appendix

Mains Transformer Design.

With this particular transformer, several factors have to be taken into account, and some of these factors may not be considered under more ideal conditions. These factors are:

(1) Size of the transformer, since there is a limited amount of space available.

(2) Temperature rise. The transformer must not be run too hot, due to restricted space and ventilation factors.

It is not recommended that a transformer be hand-wound, as this always increases the physical size of the windings and it would be necessary to increase the flux density at which the iron is worked to reduce the number of turns per

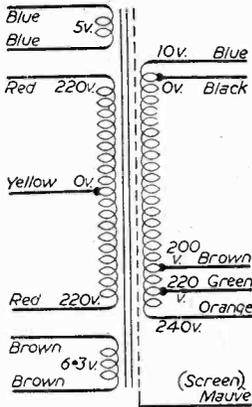


Fig. 15.—Transformer connection colour code.

volt to accommodate the winding on the bobbin.

The required transformer is:

Primary—10-0-200-220-240 volts 50 c/s.

Secondary I—220-0-220 volts at 100 mA.

Secondary II—6.3 volts at 3 A.

Secondary III—5 volts at 2 A.

Assuming a unity power factor, i.e. the load is purely resistive,

Power dissipated in secondary=

$$220 \cdot \frac{100}{1,000} + 6.3 \cdot 3 + 5 \cdot 2$$

$$= 22 + 18.9 + 10 \text{ W.}$$

$$= 51 \text{ W (approx.)}$$

For a transformer of this type the efficiency will be of the order of 80 per cent.

$$\therefore \text{Primary power } W_p = \frac{51 \cdot 100}{80}$$

$$= 64 \text{ W (approx.)}$$

For an input of, say, 230 volts,

$$\text{Primary current} = \frac{64}{230} \text{ A}$$

$$= 280 \text{ mA approx.}$$

For this value of primary current, and allowing a current density in the wire of 1,000-1,300A/sq.in., the wire size is 26 s.w.g. enamelled copper.

For the laminations, core area

$$A = \frac{\sqrt{W_p}}{5.6} \text{ (Flux density } B = 10 \text{ K lines per sq. cm.)}$$

$$= \frac{\sqrt{64}}{5.6}$$

$$= 1.43 \text{ sq. in.}$$

For laminations of size 4A, allow width of 15/16in.

$$\therefore \text{Size of stack} = \frac{1.43 \cdot 16}{15}$$

$$= 1.526 \text{ in.}$$

So our laminations will be a 1 1/2 in. stack of No. 4A Silcor II.

Now the turns per volt $T = \frac{K}{A}$ where K is a constant which depends mainly on flux density.

A suitable value for this type of transformer is 7.5 for the constant K.

$$T = \frac{7.5}{1.43}$$

$$= 5.25 \text{ turns per volt.}$$

For the layer insulation allow one turn of 0.002in. paper. (If desired, Presspahn may be used for this, although it is thicker.)

At the end of each winding wind on three turns of 0.005in. Empire Tape, and also after the electrostatic screen. The exception to this is when completing the transformer, wind on four turns of 0.01in. Empire Tape.

We are now ready to commence the windings.

Primary: 10-0-200-220-240 volts, i.e. a 250 volt winding.

Total number of turns required = 250 · 5.25

1,313 turns of 26 s.w.g. enamelled copper.

Since the winding is tapped, we require 1,313 turns, tapped at 0, 53, 1,103, and 1,208 turns: i.e. 53 + 1,030 + 105 + 105 turns.

The insulation can now be fitted.

Electrostatic screen: One turn of 0.01in. copper foil. This single turn must be suitably insulated when actually completing the turn, otherwise a shorted turn will result and the transformer will not then function correctly, so the insulation must be interleaved with the foil in order to prevent this.

Secondary I: 220-0-220 volts at 100 mA, i.e. a 440 volt winding.

The winding is 2,450 turns of 32 s.w.g. enamelled copper.

Secondary II: 6.3 volts at 3A. To carry this current 16 s.w.g. enamelled copper wire is required.

All the leads from the transformer should come out at one end and not both top and bottom. This facilitates wiring into the set, when the leads can be cut to length.

The winding is then 35 turns of 16 s.w.g. enamelled copper.

Secondary III: 5 volts at 2A. To carry this current 18 s.w.g. enamelled copper wire is required.

The winding is then 28 turns of 18 s.w.g. enamelled copper.

Leads: All leads to be flying leads, colour-coded as shown in Fig. 15.

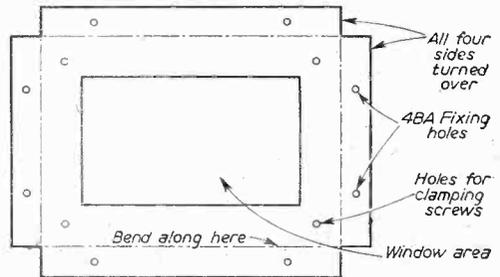


Fig. 16.—A clamp for the transformer.

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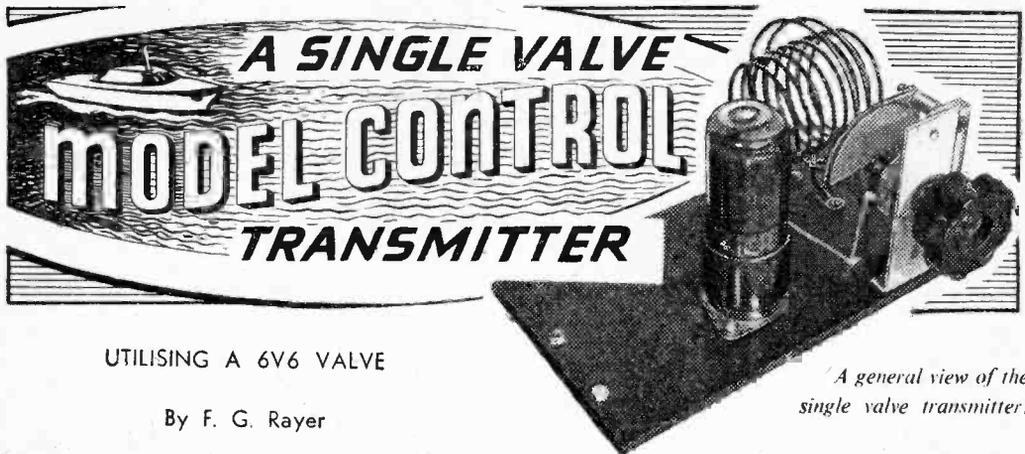
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UTILISING A 6V6 VALVE

By F. G. Rayer

A general view of the single valve transmitter.

THOUGH battery-type valves are frequently employed in model control transmitters, advantages arise from the use of a valve of mains type, in certain circumstances, and the transmitter described here has this type as a self-excited oscillator. The power output from such a valve is much greater than with battery valves, especially when the transmitter is run near maximum rating, with an efficiently resonated aerial. This extra power is very useful when a valveless receiver is being used indoors or for short range outside. In such cases mains will be available and current can be provided by a simple power pack. When mains are not possible, as when controlling a model away from buildings, then a 6-volt accumulator (for heater) and vibrator pack are most suitable. Operation from dry batteries is not feasible, as the H.T. current will be 40 to 60 mA.

The power packs are best made separately, with a socket for easy connecting up of the transmitter. The mains version may employ valve or metal rectifier, according to what is available, and a transformer delivering 6.3 volts for the heater.

The 6V6 is very suitable for this application, but other valves can be used, if to hand. Triodes such as the 6C5 and 6J5 may be inserted without wiring changes, and are particularly suitable for short-range

work, quite a good output being possible if the valve is run up to its maximum anode dissipation (2.5 watts, with the 6J5). The 6V6 may be run up to 12 watts anode dissipation. If a larger valve, such as the 6L6, is used (19 watts maximum anode dissipation)

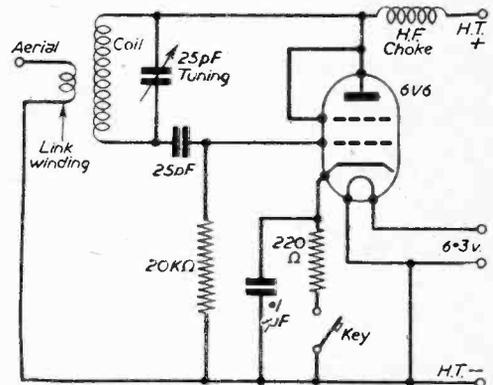
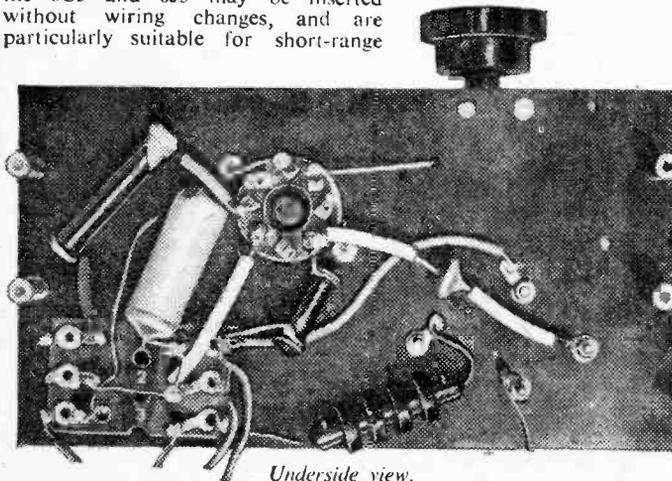


Fig. 1.—Theoretical circuit of the single valve transmitter.

it becomes increasingly necessary to check the aerial current with an R.F. meter to see that the radiated signal does not exceed that permitted. With the smaller valves this will not be so, since only a small part of the anode dissipation can be realised in actually radiated R.F. energy. The aerial current may be reduced, if necessary, by loosening aerial coupling, reducing H.T. voltage or shortening the aerial.

The circuit is shown in Fig. 1, cathode keying being used to avoid H.T. potentials here. For initial testing and setting up the key tags must be shorted. A cathode bias resistor prevents a very high anode current if oscillation should cease. The 25 pF variable condenser is of usual short-wave type. A good quality S.W. choke is required, able



Underside view.

to carry the necessary current. The 25 pF fixed condenser must have mica insulation.

Layout and Coil

Fig. 2 shows a top view of the base which is of paxolin or bakelite to provide the necessary insulation between various points. "M" denotes moving plates tag of the tuning condenser, and "F" fixed plates, this component being on a mounting bracket.

The gauge of wire used for the coil is not important, but should be fairly stout for rigidity, something between 18 and 12 s.w.g. being suggested. A length of the wire is pulled out straight and eight turns are wound upon an object approximately 1 1/2 in. in diameter. The object is then removed and the coil pulled out until it is 2 in. long. The ends are cut 1 in. long and loops formed at the ends so that the coil stands above the baseboard, when secured by 6B.A. bolts. For the aerial loop or link two turns are required, approximately 2 in. in diameter. Loops are formed at such a distance that this coil comes centrally round the eight-turn winding when it is bolted to the base. No wobble or vibration arises in the coils if the wire is sufficiently stout.

Connections and parts under the base will be seen from Fig. 3, a tag-board being used to anchor power leads, etc. One 6B.A. bolt joins 25 pF fixed condenser, one end of coil and fixed plates lead of tuning condenser. A second bolt joins moving plates lead, other end of coil and H.F. choke.

The remaining two bolts support the link coil. The simplest way to energise the aerial is to wire one end of the link to the H.T. negative line and the other to aerial, as in Fig. 3. If an aerial tuning unit is employed a twin flex feeder can be taken from these two bolts instead.

If the key leads are long it may be necessary to include H.F. chokes in these in the usual way. Initially, it is desirable to connect a 0-100 mA meter to these tags, to determine what current is flowing, which will depend on the valve, H.T. voltage and degree of aerial coupling or resonance.

A fairly large control knob or insulated extension spindle is required, and when the transmitter is out of its case it must be remembered that the variable condenser and bracket are at H.T. potential.

Notes on Operation

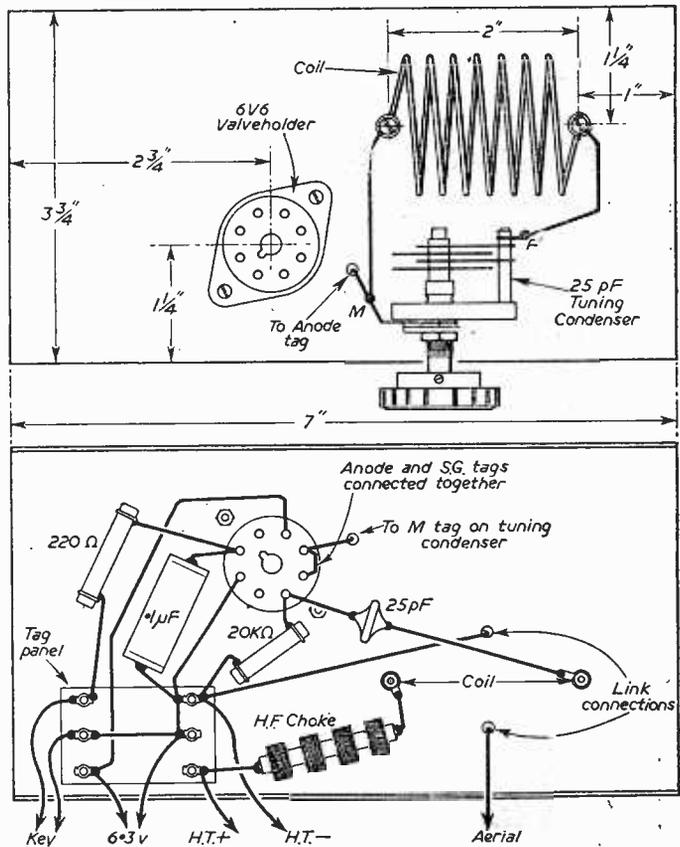
A first oscillation test can be made by soldering a 6.3 volt .3 amp bulb to a loop of one or two turns of wire, and bringing this near the coil, when it should light. Alternatively, an R.F. meter may be temporarily connected to the two-turn loop, when it should show an R.F. current of 1 amp or so, according to valve and H.T.

The transmitter may be tuned into the 27 Mc/s band by means of a

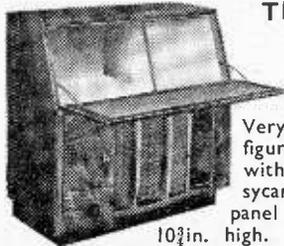
bulb-type frequency meter held near the coil (say, 2 in. to 3 in. away). The meter is tuned to the middle of the band and the 25 pF tuning condenser rotated until the meter bulb lights at maximum brilliance. It should be assured that the frequency meter is accurate and intended for this purpose, as some bulb frequency meters for general checking of transmitters prove so inaccurate that the transmitter may be well outside the band, if tuned by their aid.

Aerial Current

When an aerial is connected a watch should be kept on the H.T. current, which will rise as the aerial draws power. If there is any danger of the maximum rating of the valve being exceeded, then the H.T. voltage should be reduced or a shorter aerial used. Once it has been found that an aerial does not cause an excessive rise in current then it may be adopted, and the 0-100 mA meter may be removed. When using any form of tunable or resonant aerial, current will rise as resonance is approached and it is then essential to see that the maximum figure is not exceeded, as mentioned earlier. With a given H.T. voltage the H.T. current may vary between 20 mA and 60 mA, according to the type of aerial coupling, using the 6V6.



Figs. 2 and 3.—Top and under-chassis layout and wiring.



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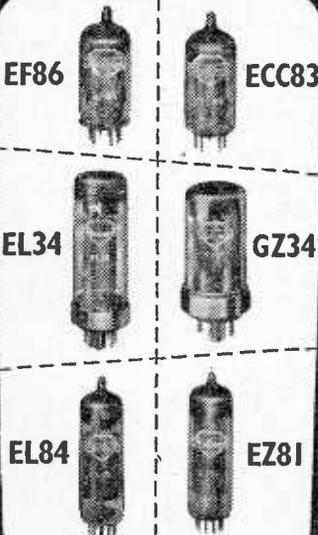
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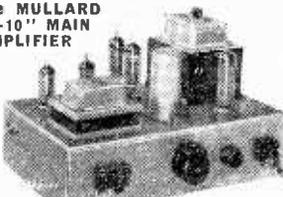
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The MULLARD "E-10" MAIN AMPLIFIER



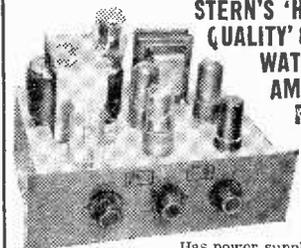
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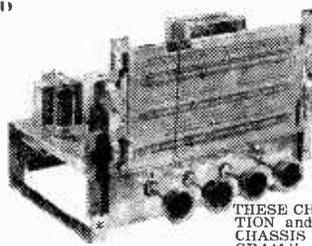
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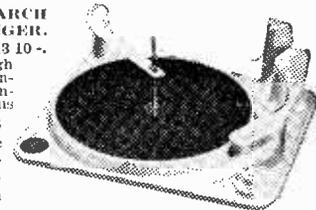
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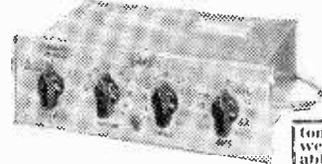
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Modifying the Sound Master Tape Recorder

CUTTING DOWN BACKGROUND NOISE

By P. Kurland

THE design of the Sound Master tape recorder, as reviewed in the PRACTICAL WIRELESS some months ago, gives very good results, especially at $3\frac{1}{2}$ i.p.s., for recordings from a microphone and a radio jack-plug. However, with the introduction of high quality F.M. broadcasts and hi-fi recordings the reproduction has one or two shortcomings, viz., "thin" tone, and high background noise due to undermodulation during recording.

The Modification

After extensive experiment a simple method has been found for eliminating both of these. The modification centres around the resistance-capacitance-inductive circuitry of the top-boost H.F. correction in the record amplifier (Fig. 1). L1, C9 and R14, wired in parallel have an impedance of only 22 K. at 1 kc/s and this rises to 150 kc/s at 10 kc/s. Together with R8, R12 and R13 this stage gives a top lift of about 18 d.B. which falls beyond the frequency of the tuned circuit L1, C9, which is 10 kc/s. This is perfectly satisfactory as the amplification is quite high at the anode of V2. But if the J2 socket is being used and not J1, then there is not so much gain given by V2 alone to allow for the overall loss due to the correction circuit which is placed between V2 and V3a. Thus for inputs of the order of one volt r.m.s., the head can be adequately loaded, but for inputs such as radio-jacks, which cannot be used at J1 due to its low-impedance nature, maximum gain at V2 usually can only just fully load the tape and being of that certain school of thought I like spare extra gain at the volume control. C10 is wired in parallel with R12 thus reducing the impedance at high frequencies of the potentiometer circuit R12, R13 and the R-C-L network, and so also acts as a top-lift.

Higher Speeds

At $7\frac{1}{2}$ and 15 i.p.s. the tone obtained on playback, with both treble and bass controls at maximum,

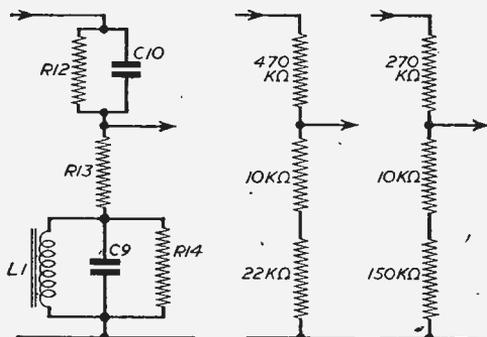


Fig. 1.—Original top-boost circuit of the Sound Master.

definitely lacks the lower frequencies. I think this also applies to $3\frac{1}{2}$ i.p.s., but most decidedly at the faster speeds. With the advent of new tapes on the market, e.g., E.M.I. 88 and B.A.S.F., etc., not so much loss is found in the lower register, and thus not so much treble boost is required to compensate for this loss, such as was the case with E.M.I. 50 and Scotch Boy MCI-111 tapes.

By removing C9 and L1 the gain of the first two stages is greatly increased and by introducing a 10 K resistance in parallel with R12-R13 some of the top lift is lost and the overall result is a more powerful amplifier giving a more "full" tone on playback. This tone tends to suit $7\frac{1}{2}$ i.p.s. but becomes a little "thin" at 15 i.p.s. This can be overcome by replacing C9 or replacing it with a different value, ranging from 10 pF to $0.002\mu\text{F}$; the higher the value the more the bass is emphasised. The new circuit is given in Fig. 2.

Adjustment of VR4

With C9 out of the circuit the bias level control VR4 should be set so that the bass notes sound pure and deep on playback, and there is no distortion due to top cut, which will become apparent if too much bias is applied through C25. The best method of adjusting VR4 is as follows: with a set position of the main volume control VR1, VR4 should be reduced to zero so that excessive bias is applied. Then VR4 is incrementally increased, until by trial and error the maximum volume of recording is obtained on playback with VR1 unaltered. There should be different settings for VR4 for the three speeds, and so it would be beneficial to have a locating mark somewhere on the spindle which could easily be aligned with some other marks on the chassis. It could also be mentioned that by increasing the bias level we also have an effective scratch-filter, which has obvious application.

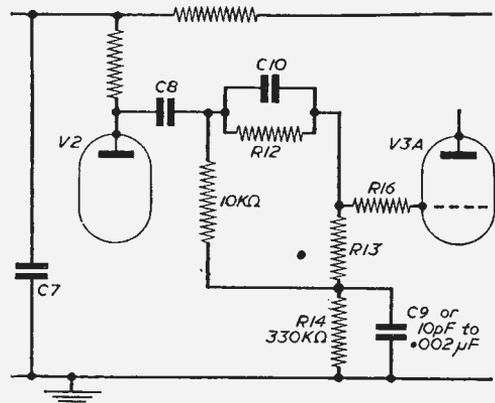


Fig. 2.—The improved circuit.

An Electrostatic Speaker

HOW TO MAKE AN EXPERIMENTAL H.F. UNIT

By N. A. Bargery

AFTER many experiments in this field, the following design proved to be the most promising, and compares very favourably with those on the market at the present time.

The size of the speaker determines its limit of low-frequency response, as well as its radiation coverage. A 6in. square speaker was decided upon as a compromise between ease of construction and useful H.F. response.

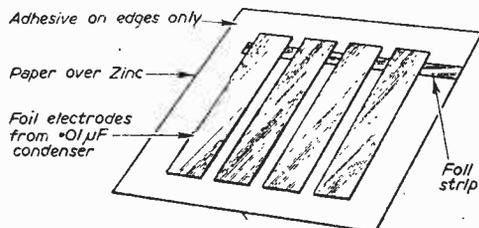


Fig. 1.—Details of construction.

The points which must be watched are that the dielectric material, which carries one set of electrodes, must be as light and thin as possible, but at the same time flexible and possess excellent insulating properties.

Many materials were tried, but one which consistently gave very good results was the paper fabric used to cover model aircraft wings. The other electrode, which also acts as a grille, was ordinary perforated zinc used by builders.

The vibrating electrodes fixed to the dielectric must be of the thinnest metal foil obtainable. It was found that the foil used in a .01 μ F tubular condenser served very well, as also did gold leaf, but the drawback to gold leaf is its fragility.

Construction

Construction proved fairly simple. The case must be taken so that in the finished speaker the electrodes do not short-circuit under load. A 300 volt D.C. supply and an AVO will serve as a reliable test for this defect. In any case, however, the materials used in the construction of this speaker are so cheap and easily obtained that one can afford several experimental hook-ups until the ideal speaker has passed its tests and is ready for use.

The method of construction is by no means critical. The one used by the author is as follows:

On a piece of hardboard 8in. by 8in. a hardboard or plywood frame (square) $\frac{1}{2}$ in. wide is fixed concentric with the edges as in Fig. 2.

In the cavity are layers of soft felt or close-knit woollen material level with the top of the frame.

A piece of builder's perforated zinc is cut to a square 6in. by 6in., and to the back of it is fixed a square of model aircraft tissue paper, at the edges only. Thin foil from a .01 μ F condenser is then fixed to the paper in strips as in Fig. 1, using celluloid cement or adhesive.

Make sure that, when the foil is secure, the paper is free from the zinc by blowing through the front of the metal plate and noticing if the paper leaves

the plate temporarily. The paper carrying the electrodes must be fixed to the zinc at its edges only, and the metal foil strips must occupy only that area of the paper resting on the soft material in the frame.

The next step is to cut a strip $\frac{1}{2}$ in. wide of aluminium foil, such as is used to wrap tobacco, and lay across the top of the material in the recess, leading it in the gap and on to the terminal where it is secured

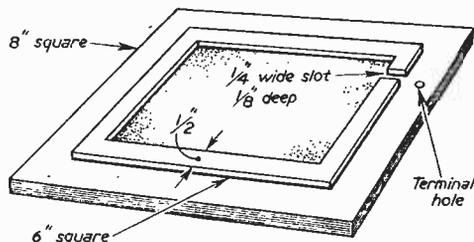
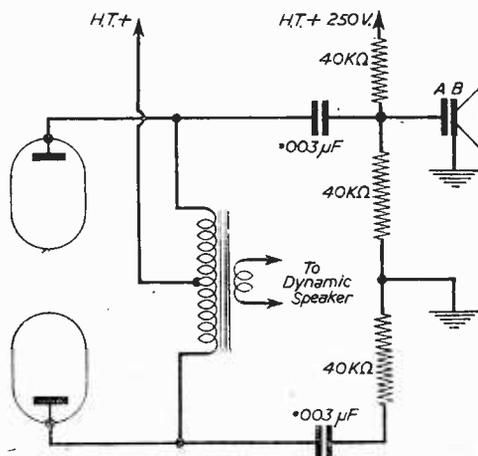


Fig. 2.—Further constructional details.

by nut and washer as shown in Fig. 2. Polythene may be used as a protection to the conducting strip where it might contact the perforated zinc plate.

Next lay the zinc, with paper and foil-electrode side downwards, on to the foil conducting strip, but before securing the zinc to the frame, test the insulation between the zinc and the electrodes with an AVO and a 300 volt D.C. supply. If the insulation is satisfactory, secure the zinc plate to the frame at its edges with wood screws or nuts and bolts. Take a lead from the zinc plate, either from a solder connection to one of its corners, or from the bottom of a nut and bolt securing it to the frame. This together with a lead from the terminal already fixed are the two leads of the speaker.

(Concluded on page 642)



A = Terminal connection of Electrostatic Speaker
B = Zinc plate connection

Fig. 3.—How to wire the speaker in circuit.

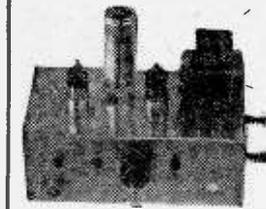
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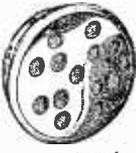
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Automatic Switching for a Tape Recorder

A SIMPLE ADDITION TO SWITCH OFF THE RADIO OR AMPLIFIER WHEN A RECORDING HAS BEEN MADE

By C. Call

IF your tape recorder has a trip switch arranged to switch off the capstan motor when the end of the tape is reached, here is a simple modification to extend the usefulness of your machine.

Many home recordists use their machines to record radio programmes for subsequent re-play. Once the machine has been set up it can be left to record unattended and, when the tape has completely run through, the motor will switch itself off. A disadvantage is that the amplifier and also the radio receiver still remain on, unless some form of remote control or time switch is used to control these as well.

The alterations proposed here involve the addition of a small relay wired in conjunction with the existing stop-switch and arranged so as to switch everything off, if required, when the end of the tape is reached.

The illustration shows the relay as fitted in a Ferrograph Model "2A" recorder. In this machine a solenoid holds the operating lever in the on position, and to stop the capstan this solenoid is shorted out. With reference to the wiring diagram given it can be seen that the connections to this solenoid are broken and the coil of the new relay is wired in series. Note, however, that the leads from the trip-switch must short out solenoid and relay.

The solenoid is normally energised by the H.T. current of the amplifier and so the relay, when the amplifier is on, will also be energised and its contacts will be closed. (In the case of the solenoid, the armature plate is so far away from the coil that the magnetic attraction is too weak to pull it in by itself. It has, therefore, to be operated to the on position manually and will then hold until released by the breaking of the magnetic field.)

The relay has two make contacts. One of these is wired in parallel with the existing mains on/off switch. The other is taken to a socket on the back and is used for remote switching of the receiver.

In operation, once the apparatus has been set up and the recording started, the mains switch is placed in the off position, thus transferring control to the relay contacts and, when the end of the tape is reached, everything is automatically switched off.

A minor complication arises with this modification

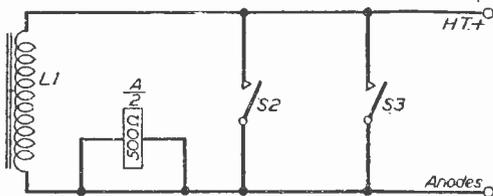
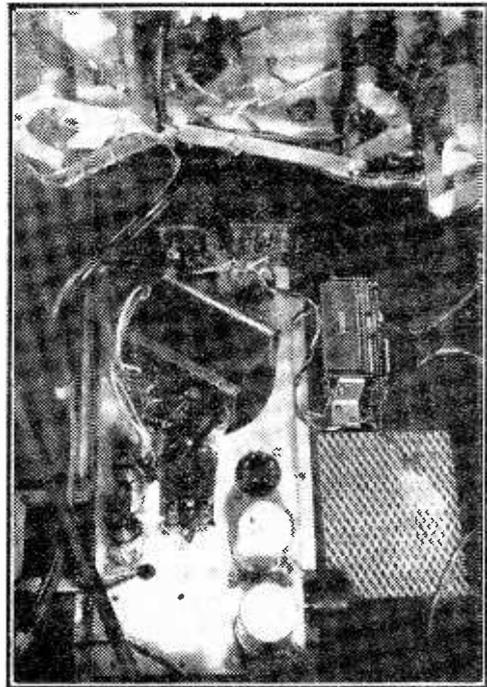


Fig. 1.—The resistance of the relay should be as low as possible consistent with reliable operation. A value of 500 ohms was found suitable, and a P.O. type relay having this value can be readily obtained on the surplus market.

in that, when the instrument is to be switched off in the ordinary course of events, the new relay will still



The Relay in position at the right of the Power Chassis.

hold it on. The procedure is, of course, to operate the trip switch manually at the same time.

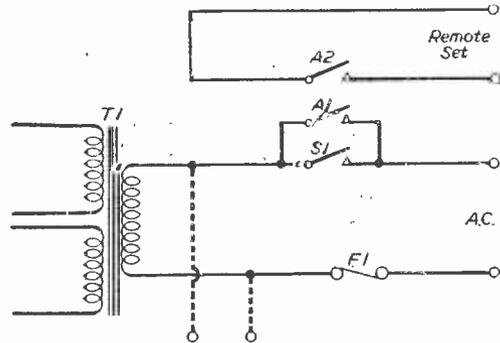


Fig. 2.—The dotted connections show an alternative method of feeding a receiver. In this case the relay need have only one make contact.

Programme Pointers



IT is not often that a world première of a play by a famous dramatist is given over the air. But that was the honour accorded J. B. Priestley's "End Game at the Dolphin" in "Saturday Night Theatre." It aroused much interest and speculation, but there must have been disappointment in many cases.

Built round a slight story of a woman who runs a Cornish coast hotel for herself and a few friends, with complications between the lady and another, both of whom were at one time interested in the same gentleman, the piece could stand comparison with Shaw's "In Good King Charles's Golden Days," with the latter taking all the honours. Each is more of a conversation piece—the similarities begin and end here—but whereas in the Shaw comedy the philosophical wisecracks and the master's inventiveness and verbal jugglery pour out in a ceaseless flow (it was Shaw's last "great" play), in the Priestley play they are much rarer, less spontaneous and too tied up in the contrived plot.

It was far from being vintage Priestley. Valerie Taylor and Peggy Thorpe-Bates played the two chief women with splendid ill-will towards each other. And Eric Anderson made an excellent barman, Marlborough. Norman Wynne, Manning Wilson, Nancy Nevinson, Dorothy Holmes-Gore, Alan McClelland, Beatrice Kane, Monica Gray, Laidman Browne and John Gabriel completed the cast.

Valentine Dyall, as Charles the Second in the Shaw play, gave the part exactly the right touch of cynical yet shrewd wisdom, coupled with endearing romanticism, as the lover of goodness knows how many what we, today, might refer to as "pieces"—not to mention the "little woman" at home. Eric Anderson was again excellent as Newton. Duncan McIntyre foretold his future imbecility as James the Second perfectly. Malcolm Hayes was effective as Godfrey Kneller. Dorothy Holmes-Gore as the little woman, Queen Catherine. Stephen Jack as George Fox, Elsa Palmer as Mrs. Basham and Nancy Nevinson as Sally. Dora Bryan, Belle Chrystall and Peggy Thorpe-Bates were all that a king could possibly require when not in his counting-house counting out his money.

Weekly Feature

"Curiouser and Curiouser": an anthology of Anglo-American off-beat humour, compiled and compered by David Climie. This is a new weekly feature programme, which promises to be very interesting and amusing. It started off with delightful excerpts from "Hucklebeery Finn" and "Nicholas Nickleby," and included a bizarre grand guignol kind of reading of an American husband wheedling and cajoling his wife into the coal cellar with intent to murder her. The excellent performers were Spike Milligan, Pearl Carr, Miriam Karlin, Georgia Brown, Ronan O'Casey and David Jacobs. Duty and truth compel me to note its one blemish—some truly abominable "music" by Stanley Myers, with

Our Critic, Maurice
Reeve, Reviews Some
Recent Programmes

additional abominations by Alfred Ralston. But then, all BBC "feature" music deserves a volume of criticism to itself!

The programme offers endless possibilities for a first-class feature, with unlimited sources for good script writers. But oh, that music!

"The King of Friday's Men," a stage play, by Michael G. Mulloy, adapted for radio by the author (Third), was a grand helping of Irish stew—if Mr. Mulloy will permit the use, as a metaphor, of something we English are very partial to. Full of Irish wit, sentiment and eighteenth century morals, its eccentric characters and rich situations held us in a grip that was a welcome change from the recent past. Briefly, the story told of the now defunct "droits de seigneur" and the efforts of a fair Colleen to thwart them. The shillelaghs cracked and the begorras were rasped out. I thoroughly enjoyed it.

"These Foolish Things," another new weekly feature, presents a difficulty, apparent in the first two numbers of it I listened to. If it can be overcome it should establish itself. Under the skilful direction of Roy Plumley, an everyday occurrence or familiar, noise is reproduced, whereupon each member of the panel tells of an experience he has lived through of which it reminds him. These reminiscences varied greatly in quality, interest and amusement when I heard them. If they can be kept on an average high plane, then all should be well.

Panel Games

"What Do You Know?" now three years old, has developed into what is probably the best of the panel games based on question and answer. It is expertly directed by Franklin Engleman, who imparts to his job just the right dash of professorial discipline, tempered with entertaining sang-froid. It is amusing to watch the luck that the various contestants experience & one gets bowled over by a question on a subject of which he is abysmally ignorant, whilst the next finds himself "right up his own street." Each probably wishes he were in the other's shoes, just as I, listening, keep saying to myself, alternately, "I wish they'd asked me that one" and "I'm glad I'm not there!" This was particularly evident when "the brain of Britain" was found.

The Waters

Elsie and Döris Waters' weekly feature, "Floggits," is rather like an extension to half an hour of their famous, and justly popular, eight or 10 minutes variety turn. There doesn't seem much more in it than that.

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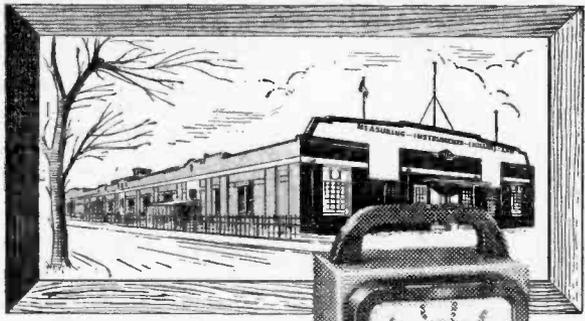
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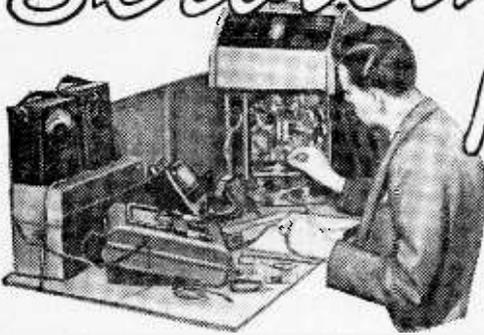
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MARCONIPHONE MODEL T24DAB

By Gordon J. King, A.M.I.P.R.E.

THIS model is an A.C./D.C. mains all-dry battery portable housed in a suitcase type of cabinet. It features a four-valve superhet circuit of high sensitivity and inbuilt frame aerials. For operation on mains it accommodates inputs between 195-255 volts, and for battery operation requires five 1.5 volt U2 cells in series (giving 7.5 volts) for L.T. and a 90 volt layer-type battery (Ever Ready "Batermax" Type B126) for H.T.

The wave range coverage is medium-wave (M.W.) 185-565 metres and long-wave (L.W.) 1,000-2,000 metres. The valve sequence is as follows: Marconi X17—frequency changer; Marconi W17—I.F. amplifier; Marconi ZD17—detector, automatic gain control (A.G.C.) and audio-frequency (A.F.) amplifier; Marconi N18—output.

The Aerial and Frequency Changer Sections

As can be seen from the complete circuit of the receiver at Fig. 1, the frame—or loop—aerials are represented by coils L1 and L2. With the wavechange switch set at L.W. both aerials are in series in the signal grid circuit of V1, and the circuit is tuned over the band by C1 section of the tuning gang. With the switch in the M.W. position, section L2 is short-circuited and L1 acts as the M.W. aerial coil. Trimmer T1 serves for adjustment of the L.W. aerial coil.

The oscillator grid coils, L3 (M.W.) and L5 (L.W.), are tuned by C2 section of the gang. S2 section of the wavechange switch shorts out L5 on M.W. M.W. trimming is provided for by T2, while T3 serves the same function on L.W. Coil L4 is the oscillator feedback—or reaction—winding and is common for both bands. The intermediate frequency is developed in the anode circuit of V1 across the first I.F. transformer (I.F.T.1).

There are several faults which may develop in the first stage. A common one is low emission of the valve itself. The symptom is complete failure of the receiver so far as signal pick up is concerned, though the receiver generally appears quite lively and exhibits the usual effects of microphony on gently tapping V2 or V3. Failure may not occur immediately the receiver is switched on; signals may be received for a short while and then suddenly cut off. The effect may be aggravated by a faulty H.T. rectifier on mains (causing a reduction of H.T. line

voltage), or on battery operation by a worn or exhausted 7.5 volt supply. The effect, of course, is due to failure of the local oscillator.

A similar symptom may be caused by an increase in the value of the 15 K. oscillator feed resistor, or low value of one of the associated capacitors. A worn or dirty wavechange switch may also prevent oscillation, but this can generally be proved conclusively by carefully adjusting the switch to secure temporarily a good contact—the receiver will then burst into life. The application of a few drops of good quality switch cleaner often solves this problem without any difficulty, but if the trouble is caused by badly worn contacts it is necessary to change the switch. This is of a special type—catering also for battery/mains changeover—and, should, therefore, be obtained from the manufacturer via a dealer.

The I.F. Stage

The intermediate frequency on this model is 360 kc/s. The signal across the secondary of the first I.F. transformer is passed to the control grid of V2 for amplification, the amplified I.F. signal being developed across the second I.F. transformer.

Apart from trouble developing in the fixed tuning capacitors across the windings of the I.F. transformers, little goes wrong in the I.F. section.

Low gain has been known to have been caused by open-circuit of the 0.1 μ F screen grid decoupling capacitor, but this is not a general happening. Nevertheless, for low overall sensitivity both this capacitor and the 22 K. screen feed resistor should be checked, as also should the I.F. transformer tuning capacitors.

If the tuning capacitors are suspected, it is generally necessary to substitute the complete I.F. transformer assembly, as the capacitors are integral with the moulding of the former. It should be mentioned that these components also tend to become intermittently defective, giving rise to intermittent loss of volume and crackling. When the capacitors have failed completely it will be found impossible to peak the I.F. transformers at the correct I.F.

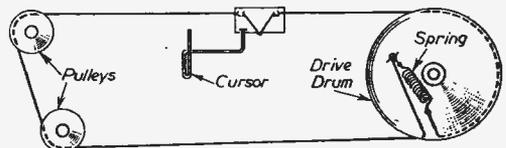


Fig. 4.—Drive cord details.

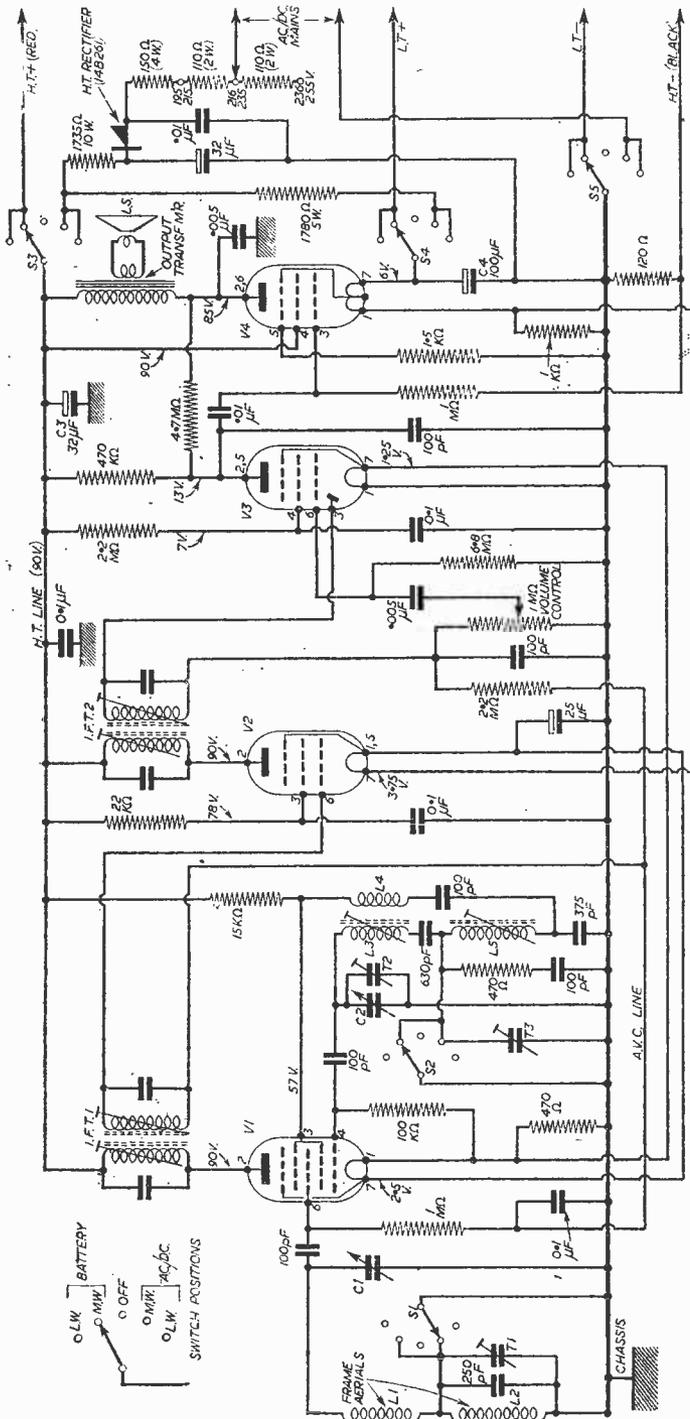


Fig. 1.—Circuit diagram of the Marcomphone T24D.1B

The Detector, A.G.C. and A.F. Stage

The amplifier I.F. is presented to the diode in V3 for demodulation. The volume control acts as the detector load, and the required level of A.F. is conveyed, via a coupling capacitor, to the signal grid of the pentode section of V3. The pentode section amplifies the A.F. which is developed across the anode load resistor (470 K.).

The D.C. potential at the top of the volume control has a magnitude, negative with respect to chassis, which depends on the strength of the signal. It is used, therefore, as an A.G.C. bias, and is fed back, through the 2.2 megohm filter resistor, to the grid circuits of V1 and V2. The gain of these valves thus depends on the strength of the signal—if it is weak then the gain increases correspondingly and, conversely, if it is strong then the gain decreases. This is, of course, a normal A.G.C. action.

Trouble in this section is generally focused on the screen and anode resistors of V3. If these go high in value weak output and distortion often results. V3 itself may develop microphony causing "ringing" when the cabinet is jarred or on loud reproduction. This nearly always necessitates valve replacement, though low L.T. voltage often aggravates the effect with valves which have been in use for any length of time.

The Output Stage

The signal at the anode of V3 is passed by way of the 0.01 μF coupling capacitor to the control grid of the output valve V4. In the anode circuit of this valve is produced the power for operating the loudspeaker.

A frequent fault here, giving rise to low volume and excessive distortion, is a leak in the 0.01 μF coupling capacitor. It is absolutely essential that a component having a very high insulation is used in this position. A slight positive voltage on the control grid of V4 will, of course, quickly coun-

(Continued on page 637)

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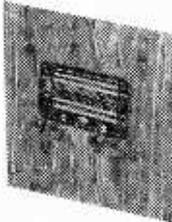
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teract the negative bias and cause the grid to go positive with respect to its filament. The 4.7 megohm resistor between the anode of V3 and the anode of V4 introduces a small degree of negative feedback. Bias for the output valve is developed across the 120-ohm resistor situated in series with the H.T. negative lead.

The Power Circuits

On mains H.T. voltage is supplied by the 14B261 H.T. rectifier in a half-wave circuit. The 1,735-ohm 10-watt resistor, in conjunction with the electrolytic capacitors, smooths the H.T. voltage, while the 1,780-ohm 5-watt resistor serves as a voltage dropper for the valve filaments, which are series connected. A voltage selecting resistor is connected in series with the mains supply at the input side of the rectifier.

A Modification

At one time, on early models, the 100 μ F electrolytic C4 was connected between pin 1 of V4 and chassis. It was found, however, that the surge current of C4 flowing through V4 filament when switching on often resulted in its premature failure. This was overcome by connecting C4 to pin 7 of V4, illustrated on the circuit at Fig. 1. This modification should be carried out on all former receivers of this range and at the same time a 25 μ F 12-volt electrolytic should be added between pin 1 of V2 and chassis.

Alignment

The I.F. stages should be aligned first by applying a modulated 360 kc/s (833.2 m.) signal, via 0.1 μ F capacitors—one in each lead of the generator—between pin 6 of V2 and chassis and adjusting the primary (Fig. 2) of I.F.T.2 for maximum output. The signal should then be altered to 362 kc/s (828.7 m.)

and the secondary (Fig. 3) of I.F.T.2 adjusted for maximum output.

After transferring the signal, still through a capacitor, to the white lead on the frame aerial tag panel, the primary (Fig. 2) of I.F.T.1 should be adjusted at 360 kc/s for maximum output. The secondary (Fig. 3) should be adjusted at 362 kc/s for maximum output. The input signal should always be kept as low as possible consistent with usable deflection on the output meter.

R.F. Alignment

Check the position of the tuning pointer in relation to the scale and adjust if necessary. With the gang at maximum capacitance the pointer should be arranged to coincide with the 2,000-metre mark on the scale.

A signal must be injected either inductively by connecting a loop across the output leads of the generator and setting it up about 2 ft. away from the set or capacitively by draping the "live" generator lead in proximity to the cabinet. On no account must a direct connection be made to the frame aerials as this will tend to detune them and give rise to false alignment.

Adjust generator to 600 kc/s, modulated, and the receiver to 500 metres. Adjust L3 (Fig. 3) for maximum output. Adjust generator to 1,500 kc/s and receiver to 200 metres. Adjust T2 (Fig. 3) for maximum output. These operations should be repeated until optimum tracking over the medium waveband is secured.

Tune the generator to 300 kc/s, still modulated, and the receiver to 1,000 metres. Adjust T3 (Fig. 3) for maximum output. Tune the generator to 160 kc/s and the receiver to 1,875 metres. Adjust L5 (Fig. 3) for maximum output. Tune generator to 210 kc/s and receiver to 1,429 metres. Adjust T1 (Fig. 3) for maximum output. Repeat as above.

General

Valve, coil and trimmer positions are shown in Figs. 2 and 3, while in Fig. 4 are shown details of the cord drive. Nylon or fishing line is suitable for cord replacement; a length of approximately 20in. is required. The lead from the output side of the H.T. rectifier may, if pulled tight, short on to the fins of the rectifier and cause damage to associated resistors. This should be watched out for during servicing.

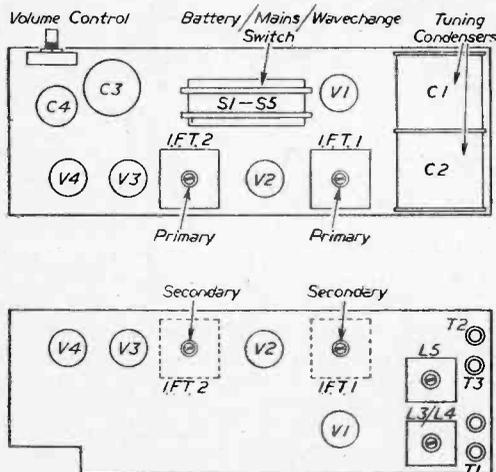


Fig. 2 (top) and Fig. 3 (bottom).—Top and underside views of the chassis.

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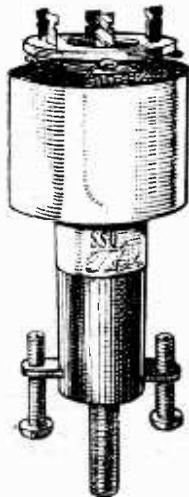
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THE careful filtering of H.T. supplies and the use of humdingers, etc., in the L.T. supply to tape recorder amplifiers often fail to remove residual 50 cycle hum, which, in many cases, may be due to induction between heater and grid of the pre-amplifier valve.

The new teletron coil, type SSO, is designed to overcome this problem by providing a heater supply to the pre-amplifier valve at supersonic frequency, and also supplying record and erase bias from a single oscillator valve with excellent waveform and regulation. Each coil is adjusted during test by means of the iron dust core to a nominal inductance of 9MH. The price is 15s. each.—The Teletron Co., Ltd., 266, Nightingale Road, London, N.9.



Teletron SSO coil.

WALL EDUCATIONAL CHARTS

A VALUABLE set of three wall charts has been issued by Educational Productions, Ltd. These show, in clear diagrammatic form, the basic principles of electronics and of radio. The first chart deals with amplification, showing the movement of electrons and the operation of the valve as an amplifier. This is followed by charts on reception, the valve as a detector and oscillator and the principles of a typical superhet receiver.

These charts (measuring 19in. by 24in.) have been published in collaboration with the E.M.I. Institute, through whose kind generosity they are available to schools in this country at the purely nominal cost of 3s., and as such they are really outstanding value.—Educational Productions, Ltd., East Ardsley, Wakefield, Yorks.

PHILIPS HIGH FIDELITY LOUDSPEAKERS

TWO high fidelity loudspeakers (8in. type 9710 and 12in. type 9762)—the first in a new range—have been introduced by Philips Electrical Ltd. These are each available in two versions—single cone (/00) and dual cone (M). The prices are:

9710/00	£6.2.6 (tax paid).
9710/M	£6.12.6 (tax paid).
9762/00	£10.0.0.
9762M	£10.10.0.

These loudspeakers have been designed to meet the needs of those who require true high fidelity units which provide a wide frequency range, excellent transient response and adequate power handling capabilities under normal domestic conditions.

A number of special design points are incorporated. The air gap is long, so that even at the greatest amplitudes the coil is completely enclosed in a homogeneous magnetic field. The cones are extended rearwards to the apex, which fits into a conical recess giving excellent air damping. A copper ring

is inserted in the air gap and this keeps the voice coil impedance constant over the entire frequency range. The resonance frequency of these loudspeakers is very low, resulting in an extremely straight low note response curve. "Ticonal" steel is used for the magnets. This material makes possible high flux densities from modest sized magnets.

The dual cone M versions of these loudspeakers are claimed to cover the entire audible range. A smaller cone of stiffer material is attached to the main cone; this increases the high frequency response. It is claimed that greatly improved diffusion of sound is achieved by this design. The small cone acts as a diffuser for frequencies below 10 kc/s. generated by the large cone; likewise the large cone reflects frequencies above 10 kc/s produced by the small cone.

Technical Specification

Power handling capacity	9710 (8in.) 10 watts	9762 (12in.) 20 watts
Voice coil impedance	7 ohms	7 ohms
Cone resonance	50 cycles	45 cycles
Efficiency	4.5% at 400 cycles	14% at 400 cycles
Flux density	8,000 gauss	11,000 gauss
Total magnetic flux	97,000 Maxwells	134,000 Maxwells
Magnetic weight	428 gram	1,075 gram

THE "FLEXTIDY"

NOT only experimenters but also many normal domestic users often find that some piece of apparatus is fitted with an unduly long flex, and, when it is required near-by, the unwanted length of flex trails on the floor or, apart from looking untidy, becomes dangerous due to twisted loops, etc. These troubles may be overcome in a simple manner by winding the unwanted length of flex round a strip of material, and a neat device is available from F. E. Conway and is illustrated below. Made in transparent



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plastic material its hooked ends enable flex to be wrapped round it and held firmly, unwrapping as required. The price is 7½d.—F. E. Conway, 3, Mayfair Road, Marton, Blackpool.

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Open to Discussion



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

A 3½ in. Oscilloscope

SIR,—The writer was interested in the comments on the push-pull amplifier for the 3½ in. scope made in a letter by R. Tring in the September issue. Certainly Mr. Tring is correct in a part of what he says—the circuit of the first section can certainly be regarded as a cathode follower with an anode load. However, I do not agree that a cathode follower with an anode load will behave in the same manner as a normal cathode follower. The circuit can be taken as roughly a parallel with an amplifier valve with an unbypassed bias resistor. Certainly if a further resistance is, in the case of a single valve, added between the cathode bias resistor and earth, the gain of the circuit will be reduced until it is just slightly under unity—as in the case of a concertina phase split circuit. However, in this case we are coupling in another valve, so what happens is that the current from the cathode circuit of the second valve offsets a part of the current from the first section. If the impedance of the cathode circuit were to approach infinity, as in the case of a long-tailed pair where a pentode is used for the coupling resistor, one half of the voltage fed to the grid of the first section is developed across the cathode load; thus only one half of the input voltage to the grid of the first half actually appears between grid and cathode. The other half appears between grid and cathode of the second section. Thus with an infinite impedance in the cathode circuit the output is perfectly balanced. The circuit used was a forerunner of the long-tailed pair, and was responsible for its development, and the near approach to perfection is obtained when the value of the coupling resistor is 10 or more times that of the cathode bias resistor. The method suggested for obtaining bias can certainly be used, and where the amplifier is to be directly coupled to the deflector plate is to be thoroughly recommended, but not for any other application, as the circuit drift is liable to set the bias on the two sections so that they are widely different. This would give rise to severe distortion—unless, of course, the balance was carefully set.—JAMES S. KENDALL (Birmingham).

I.F. Frequencies

SIR,—Reference the letter from M. C. Sykes, in your August, 1956, issue.

In the listed frequencies he queries the R1155A I.F. as 280-650 kc/s.

I believe that the correct I.F. for this receiver is 562 kc/s, the B.F.O. operating on 281 kc/s, half of the I.F.—R. L. EDGINTON (ZC4GF) (B.F.P.O. 53).

F.M. Results

SIR,—Recently my wife and I were able to listen, on headphones, uninterruptedly to the opera from Glyndebourne via the BBC's V.H.F. service while a thunderstorm was in progress of sufficient severity to damage houses in the vicinity.

Perhaps it is because I am an ex-wireless operator, but it seems to me that thus to scotch radio's greatest bugbear and to make possible interference-free listening in conditions hitherto thought to be intolerably disagreeable and even dangerous, is the greatest advance in domestic wireless reception ever made. Indeed, I find the A.M. rejection properties of a correctly functioning ratio detector quite uncanny. An unsuppressed hair-dryer running in the next room creates a roar when off tune which is rendered inaudible by simply tuning to one of the Wrotham V.H.F. transmissions. [Suppress it! Ed.]

I do not think that at present the quality of the V.H.F. transmissions is noticeably better than can be got on medium waves with a receiver which makes no concessions to the selectivity problem. But where I live the Third programme, for example, cannot be listened to with pleasure on such a receiver.

In their present state of development F.M. receivers are undoubtedly very difficult to make and adjust, and I would hazard the guess that it is because the home constructor has not so far been able to be the bearer of glad tidings in connection with V.H.F. to the extent that he always has been with other developments in radio that V.H.F. is not yet being taken up to the extent that its merits warrant.—THOS. B. SANDERS (Ilford).

SIR,—Regarding "F.M. Results," by G. Prentis, of Elstree, September, 1956, "Open to Discussion,"

I, for one, have heard good transmissions of F.M., but in Germany. I have just returned after 2½ years, and I can say that over there I only listened to A.M. transmissions, while the F.M. stations transmitted a programme not of my choice.

I am waiting for England to cover all areas on the F.M. side of radio, as my position or location in England is very poor for receiving F.M. I, too, have tried to pull the BBC transmissions through the interference of cars mainly on the receiver I operated in Germany. Whatever the aerial I used in Germany, longwire, short whip, a tap off the earth lines, bed frame and a length of welding rod, I still received very good F.M.; but over here in England I have tried two, three, and four element beams, folded dipoles, plus others, and I receive very poor results, but no fade, my receiver being a push-button wave change, and

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.

separate tuning for F.M. and L.M.S. I can change over to compare transmissions, granted a vast quality, because of the distance in transmitters. I say, if G. Prentis waits a little time, he, too, will hear the amazingly clear transmissions, when one can hear music, talks and other programmes, clear from Q.R.M. I'm waiting and experimenting till the day I can listen to good, clear F.M., also waiting for a law to make motorists fit suppressors and other Q.R.M. makers.—Cpl. RICK GILL (Wallasey).

National Amateurs' Association

SIR.—As a regular reader of "Thermion's" page in your excellent magazine, I should like to pass some comment on his article under the heading of "A National Amateurs' Association."

I fully agree that the listener is not catered for to the extent that the licence holder is, but most listeners start off as such as a stepping stone to getting a licence. The reason, in my opinion, for the dropping off in transmitting is not due to loss of interest, but mainly the technical and Morse examination. Would it not be possible for a novice licence, even if the power allowed was only 2 or 3 watts?

Perhaps if the R.S.G.B. proposed this, or a similar idea, to the powers that be and got this concession they may find a vast increase in membership. What are other readers' opinions on this?—H. F. BARKER (Reading).

Modifying R1155—A Warning

SIR.—In the article by K. A. Brook on modifying the R1155 comms. receiver, September issue, readers should be warned of the following. He states V3 and V4 are EF39 and V5 and V6 EBC33. If these valves are inserted in the receiver and the screening cans fitted it will be found that a dead short to earth of the H.T. supply will follow. Even if the screening cans are not fitted it will be found that all that comes out of the receiver is a loud hiss. The reason is that both the EF39 and EBC33 are metalised valves—that is, they have a metal coating sprayed on their outers to act as a shield; this coating is connected to pin one

of the valve base, which is normally earthed. It will be found in the R1155 that pin one on all the valve bases is used as a tag point for the H.T., consequently this puts H.T. on the coating of the valve, and if perchance the metal screening can comes into contact with the valve a short takes place. It will also be found that if one tries to withdraw one of these valves with the receiver switched on he will receive the full H.T., a most unpleasant experience. Assuming that a short has not taken place it will be found that the inter-electrode capacities of the valves are altered by this metal coating, and in the writer's case caused the I.F.'s to go into oscillation, hence the loud hiss.

The remedy is simple. Take a sharp knife and scrape off the metal coating (it comes away quite easily), finish off by applying Brasso or metal polish to the glass envelope and polish clean. Only then are the EF39 and EBC33 valves substitutes.—JOHN COULMAN (GM3HJC) (Edinburgh).

Radio Amateurs' Examination

SIR.—Grafton Radio Society announce that they have again made arrangements with the Islington L.C.C. Msn's Evening Institutes for an official course of instruction for the Radio Amateurs' Examination to be held this winter at Grafton School, Eburne Road, Holloway, London, N.7 (one minute from the "Nag's Head"). The class will meet on Monday evenings for radio theory 7-9 o'clock, Morse 9-10 o'clock, under the direction of Messrs. S. H. Iles (G3BWQ) and L. Barber, commencing on Monday, September 24th.

Application in the first instance should be made to the Grafton Radio Society, Hon. Secretary, A. W. H. Wennell (G2CJN) at 145, Uxendon Hill, Wembley Park, Middlesex.—A. W. H. WENNELL (G2CJN) (Wembley Park).

AN ELECTROSTATIC SPEAKER

(Continued from page 626)

The method of using the speaker is as follows (deviations in the value of the resistors and condensers may be tried), the values given allow a cross-over of about 7,000 cycles.

A=terminal connection of electrostatic speaker.
B=zinc plate connection.

Refinements to the speaker consist of curving the assembly so as to obtain greater diffusion, or fitting diffuser grilles to it.

The assembly is so light that it can be fitted to most speaker enclosures; it is necessary, however, to keep the leads to this speaker as short as possible.

Do not enamel or treat the zinc plate after assembly. Such action may cause the dielectric to adhere to the underside of the zinc. It is better to cover the zinc with speaker fabric.

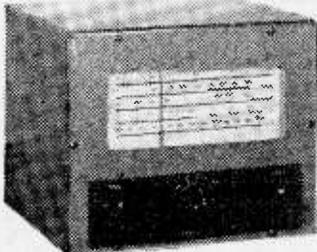
Experimenters may proceed further with this type of speaker. The one described here represents the author's most successful model to date. Two or more speakers may be used in parallel to create spacial sound distribution.

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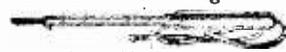
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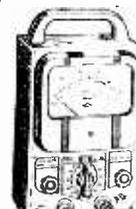
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