MAXI-Q 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.3.F/G and also 500 pF tuning coils. Very suitable for use with a 3 Waveband Coil Pack (CP.3 500 or CP.3/GJ leaving the Log Scale for tuning a V.H.F. F.M. Tuner.
Scale coverage: Long Wave 800-2,000 metres.
Short Wave 10-50 metres.
Log 0-100.
The Scale measures 8½in. x 5½in. and is for a cabinet aperture of 6 in. x 5 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/-
Obtainable from all reputable stockists or direct from works.
SEND 1/- IN STAMPS FOR GENERAL CATALOGUE.

DENC0 (CLACTON) LTD, 357/9 OLD RD., CLACTON-ON-SEA, ESSEX

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 6d.

HOME CONSTRUCTORS 2/6 PACK
In addition to the well-known Home Constructors Pack (containing 190 ft. of 18 s.w.g. 60/40 alloy) a similar pack is now available containing 400 ft. of 22 s.w.g. 60/40 alloy especially suitable for printed circuits.

MULTICORE SOLDERs LTD., MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS. (BOXMOOR S556)

Trace the Trouble in a Trice

PIFCO 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 10/-

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

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/-
Handyman's Carton 6d.

BIB WIRE STRIPPER AND CUTTER

Strips insulation without nicking wire, cuts wire cleanly, splits extruded flex 3/8 each.

November, 1956
SPECIAL OFFER
12 VALVES for 18/-, Post 2/-. LIMITED STOCKS—ORDER NOW.

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 8½ x 8½ x 4½in. Full Kit of Parts down to last nut and bolt.

£9.9.0

Or if you prefer you can build the battery version for only £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.

Chokes
20H, 220 ohm. 50 A. A. Clamp construction, each. 6/6
10H, 220 ohm. 50 A. A. Clamp construction, each. 9/8
10H, 220 ohm. 150 A. A. Clamp construction, each. 12
10H, 220 ohm. 20 A. A. Midget Clamp construction, each. 2/6

Transformer for Battery
220v. Input tapped 0-12 v. 1
220v. Input tapped 0-12 v. 2
50p. each. 4

Heater Auto Transformers
Designed to adapt ordinary construction valves 4, 6 x 3, 5 x 3, at 2 amp., ready tapped and interchangeable. Each 76.

Transformer MT2
Small mains transformer suitable for TV Converters. etc. Primary 220v. secondary 500 v. 20 A. and 600, 1.5 amp. Price 15/- each, 6/6 each.

Westhouse Rectifiers
Type 14/15, 155 each.

Output Transformers
Volt-Blast Type. each. 68
Midget for 264 Output. each. 48
Standard Mains. each. 46
Standard 1000w. each. 46

Charger Rectifiers—All Full Wave
12 volt 1 amp. each. 5.5 each
2 volt 1 amp. each. 5.5 each
6 volt 1 amp. each. 10.6 each

Special offer

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

Heater Transformers—All 1150
1 volt 1 amp. each. 5.5 each
2 volt 1 amp. each. 5.5 each
6 volt 1 amp. each. 10.6 each
10 volt 1 amp. each. 16.6 each
20 volt 1 amp. each. 32.6 each
12 volt 1 amp. each. 5.5 each

Condensers
BYM 500uF 25v. 10
BYF 500uF 12v. 10
TVF 500uF 25v. 10
DULIVER 1000uF 12v. 10
BYC 500uF 25v. 10
TV52 500uF 12v. 10
TV52 250uF 12v. 10
BYC 250uF 12v. 10
BYC 250uF 25v. 10
TV52 250uF 12v. 10
DULIVER 250uF 12v. 10

Volume Controls
Type with Single Pole Switch. 50 ohms. 2k ohms. 2k ohms. 2k ohms. Price 2/6 each.

Tyana Soldering Iron
Lightweight 40-watt iron, with easily replaceable elements. $25.00, price 10/- each.

Turnover Crystal Pick-Up Cartridges
Also Type HOPDST-3a. Long lasting and standard with style for use in latest transmitters. Price 18/- each.

Puretone Tape
12ft. Balsa. Plastic Spool, 12/- each.

Vibrator Unit
32 volt 30 Watt Pull by Mallory, run alone or with V.H.F. 17/- each.

ISOLATION TRANSFORMERS
Acrylic Glass. 11001. 135. Price 10/- each.

Rectifier Unit
32 volt 225 Watt Pull by Mallory, Run alone or with V.H.F. 17/- each.

Useful & Necessary
Also Type 3/4, Electronically tuned, portable type. 25. Price 10/- each.

Amplifiers
Acrylic Glass. 11001. 135. Price 10/- each.

Completeatalogue
Soldering Irons. Price 10/- each, also for use in service with our transformer.

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

LOUD SPEAKERS
All PM Types less Transmitters
Koch
Sinn, Types by Mac, Lambert, Telefunken, etc. 17/8.

Phon, Types by Telefunken, Rocko, etc. 13/8.

Penny, Types by Telefunken, Plessy, E. A., etc. 19/6.

Towers, Types by E. A., Telefunken, etc. 25/6.

Heats, Water Speaker, Telefunken, suitable for our Radios. 20/-.

Elisa, Plessey, Lightweights. 35/6.

Elaborate Speakers, phonographs, etc. 18/-.

5/6 Vinciie Chambers
VICTORIA SQUARE
LEEDS 1.

Terms: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders under 20/- 6d. 20/- to 40/- 9d. 40/- to 75/- 2/- 75/- to 150/- 6d. Under 5/- unless otherwise stated. Minimum C.O.D. £3 and postage 6d.

MAIL ORDER ONLY

Philadelphia Radio Supply Co.
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 kitchen, workshop, etc. All parts, cage, cabinet, chassis and speaker Transformers: Post & 26/6. Data free with parts or available separately 1/6.

THE REALITE

This is a complete fluorescent fitting, stone enameled white with switch and panel. Also red all ready to install. Price 25/- plus 4/6 carriage and packing. Valves 1/2 each. No extra for packing if ordered with fitting

MINIATURE MOTOR

Size only 21ins. long by 1/2 ins. diameter. American made - incandescent type, intended for 24 volt D.C. use containing all components. Suitable for small model cars, motor boats, etc. 2/6.

MULTI-METER KIT

Parts suitable for making a multi-meter to measure voltage, amperes and resistance. Kit No. A contains all the essential items including moving coil, ohm meter, resistors, range selector, calibrated scale, etc. is only 15/- plus post and packing.

W.D. CIRCUIT DETAILS

Wiring diagrams and other information extracted from official manuals. All 16/- per copy, 12/- for 15-.

American Service

A1134 12 receiver 2/12
A1135 12 receiver 2/12
A1136 12 receiver 2/12
A1137 1/12
A1138 1/12
A1139 1/12
A1140 1/12
A1141 1/12
A1142 1/12
A1143 1/12
A1144 1/12
A1145 1/12
A1146 1/12
A1147 1/12
A1148 1/12
A1149 1/12
A1150 1/12
A1151 1/12
A1152 1/12
A1153 1/12
A1154 1/12
A1155 1/12
A1156 1/12
A1157 1/12
A1158 1/12
A1159 1/12
A1160 1/12
A1161 1/12
A1162 1/12
A1163 1/12
A1164 1/12
A1165 1/12
A1166 1/12
A1167 1/12
A1168 1/12
A1169 1/12
A1170 1/12
A1171 1/12
A1172 1/12
A1173 1/12
A1174 1/12
A1175 1/12
A1176 1/12
A1177 1/12
A1178 1/12
A1179 1/12
A1180 1/12
A1181 1/12
A1182 1/12
A1183 1/12
A1184 1/12
A1185 1/12
A1186 1/12
A1187 1/12
A1188 1/12
A1189 1/12
A1190 1/12
A1191 1/12
A1192 1/12
A1193 1/12
A1194 1/12
A1195 1/12
A1196 1/12
A1197 1/12
A1198 1/12
A1199 1/12
A1200 1/12

THE "CRISPION" PORTABLE RADIO

A 4-valve truly portable battery set with very many useful features as follows. Receiver, red lights, 1 watt consumption, valves, superhet, built with A.V.C. inductors, Y.L.C. built-in together with a Y.L.C. circuit. Stop a wave, get a good signal. zurück. Great features, really well built. Ideal for average use. All parts, including speaker, cabinet and chassis available separately or if all ordered together the price is 27/- 15 complete, post and insurance 2/6, ready built, chassis 28/6, extra. Instruction booklet free with parts or available separately price 1/6.

OFFICE INTERCOM.

This is a 2 station master and unit comprising an A.V.C. mains operated push pull amplifier with built-in P.M. speaker, which acts as a microphone or loudspeaker depending on whether switch is set to "talk" or "listen." Complete in polished cabinet ready to work. Price only 24/6 free 3/6 carriage and insurance. Sub-stations 10/- each.

PRODUCTION INCREASED—CIRCUIT IMPROVED—PRICE REDUCED

To-day's best value in Band III Converters suitable for your T.V. or broadcast. Mains or battery. Complete ready to operate, 26/- 6 but no mains or 60/- 6 mains, post and insurance, 3/-.

THIS MONTH'S SNIP.

THE WOLSEY 4-VALVE SUPERHET

This excellent little receiver employs standard turns and is ideal as a second receiver for bedroom, kitchen etc. It has a broad band, and receives with only a few feet of aerial all stations of reasonable local strength. With a longer aerial hundred stations can be received. Complete, ready to work in modern-looking cabinet limited quantity offered this month at 25/- 10/- plus 3/6 carriage and insurance. Overall size approximately 11 x 7 x 4.

RECORD PLAYER £4/10/0

3-speed Gramophone 3/6-4/6
Latest, rim drive 3-speed motor with metal turn-table and rubber mat. Small model makes speed easily variable for special effects and double work.

Hi-Fi PICKUP

Uses famous Cosmocord 11/- G turn-over crystal. Separate sapphire for each speed. Neat bakelite case with pressure adjustment.

SPECIAL BONUS OFFER THIS MONTH

The two units for £2/10/-, plus 5/- post and insurance, or made up on board as illustrated £2/10/-, plus 5/- post and insurance.

ELECTRIC BLANKET WIRE

Waterproof P.V.C. covered so blanket is washable. 16S ohms per foot 1/- 6 per yard 14/- yards ideal for average blanket, 5/- post free.

THERMOSTATS

Useful for controlling R.F. appilances such as convector, etc. etc. etc. Adjustable to operate over the temperature range 50-80 deg. 11/- 11/- 5 amp. 8/- 2 amp. 13/- 2 amp. 19/- 5 amp. QMB, 19/-.

HIGH-SPEED RELAY

This is a miniature type relay with change-over platinum contacts. Both are 250 Ohms and are ideal for new limited duty or for emergency 2/6, each post 1/-.

MAINS-MINI

Uses high-efficiency coils covering long and medium waves and fits into the neat white or brown bakelite cabinet—limited quantity only. All parts, including cabinet, valves, in fact, everyting 2/- 16/- post 26/- plus 3/- post. Constructional data free with the parts or available separately 1/6.

CAR STARTER CHARGER KIT

All parts to build 6 and 12 volt chargers with the conventional "flat" battery and will enable the car to be started instantly. Kit comprising the following—

Mains transformer, 5/12, 4-amp rectifier, 5/- Resistor Stool Switch, 5/- Resistance Former, 2/- Mains on/off Switch, 5/- Moving Coil Meter, 5/- Contactors, 3/-, etc., or bought all together price 5/- 6/- plus 2/- post and packing.

BABY ALARM

Unlike most baby alarms, this unit is designed to help you hear baby but also to talk to him. Price complete with one microphone and twin flex. £2/10/-, carriage 3/-, additional microphone, 5/-.

www.americanradiohistory.com

November, 1956
Cabinets For All

This is the "Empress," undoubtedly a beautiful piece of furniture, elegantly veneered in walnut and in white stringmore. The radio section is raised to a convenient level but is not drilled or cut. The former "desk arts as the motor board, again is unlined. It measures 24" x 14" and has a clearance of 6" from the lid. There is a compartment for the storage of recordings. Overall dimensions of this essentially modern cabinet are 30", wide; 26", high and 14", deep. Price £14.14.0, carriage and insurance 2/-.

THE UNI-T.V.

Undoubtedly the most up-to-date television for the home constructor. You can build all or only part of the set which 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 circuit.
* Multi-vibrator time bases.
* Ferrarxube, E.H.T. and scan coils.
* 34/38 Mcs 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/-.

AM/FM RADIOGRAM CHASSIS

This is a T-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 circuit employing full A.C.C. feed-back, etc., etc. Unquestionably one of the finest A.M.F.M. chassis available today. Chassis size 14" x 8" x 12". Price £33 17/6. Carriage, packing and insurance 10/- extra.

NEW CIRCUIT

OCCASIONAL 56—we have evolved a new T.R.F. circuit and have had really good results, equal in fact to many superhet. You really should try this circuit. All parts including valves G674, G856 and Mc's are available. Basic kit with back cost only £5.10.0—plus 2/- 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 mc/s—10 tubes—metal case—robust receiver—cost over £10 to make—v. 1 1/2 yrs. of service, very little used. Price £10 or 5 payments of £2. (Car. & Board cost 15/-.)

SOMWEAVE

This really lovely loud-speaker fabric was noted at approximately a third of the price. Mc's are 42" wide and are priced 1/- 12" per yard, or panels 12" x 12"—10/- each. This is also very suitable for covering plain wooden cases, for portable radio amplifiers, etc.

INDUSTRIAL OVERHEAD HEATER

Garages, large workshops, and places difficult or impossible to heat by normal means can now have their spot at relatively low cost per unit. The infrared heater gives light as well as heat and has controls giving four variations. Consumption at full power is 1 kw, Price complete with controls ready to work £7.10.0, carriage and insurance 5/-.

ELECTRONIC PRECISION EQUIPMENT, LTD

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

Post enquiries to Eastbourne with stamped envelope, please.

42-46, Windmill Hill, 192-3, Peel Street, 28, Strand Green Rd., Post orders to Eastbourne with stamned envelope, please.

294, Killburn High Road, Kilburn.


Phone: RUSH IN 6780. Phone: F.F.15.2833. Phone: AGSWAY 1049.

Half day, Wednesday, half day, Saturday.

www.americanradiohistory.com
JASON
In
high
supplyd
Tuner (Data Publications), price
miles
277/EF91 valves
Jason
outstandingly
stability characterise this
TUNER
Two
JASON
22
Gun Sight
Germanium Diode,
(New),
Crystal,
Tran
TORS.
DINGHY
COMMUNICATION
maker's cartons.
Brand
RF24
Bendix
Bell
Mic.,
F.M.
580
case
-fidelity
QUALITY
s.w.g., eight
Bank Switchbox,
6.3
available. The book
V.A.C.,
D
TA2G TX
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, 200 Ke
Crystal, 8/6. London A.C. Relays,
230 V.A.C., 8/6. L.R. Earphones
(News), 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.

<table>
<thead>
<tr>
<th>VALVE LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AG7 9/-</td>
</tr>
<tr>
<td>6J6 5/-</td>
</tr>
<tr>
<td>D1 2/-</td>
</tr>
<tr>
<td>6V6 8/6</td>
</tr>
<tr>
<td>6K8 11/-</td>
</tr>
<tr>
<td>6SL7 8/-</td>
</tr>
<tr>
<td>6SN7 9/-</td>
</tr>
<tr>
<td>6K7 6/-</td>
</tr>
<tr>
<td>5Z4 8/-</td>
</tr>
<tr>
<td>VU120 5/-</td>
</tr>
<tr>
<td>VU39 8/6</td>
</tr>
<tr>
<td>5U4G 8/6</td>
</tr>
<tr>
<td>6X5 7/6</td>
</tr>
<tr>
<td>6X4 7/6</td>
</tr>
<tr>
<td>6X5 9/-</td>
</tr>
<tr>
<td>EF36 4/6</td>
</tr>
<tr>
<td>EL32 5/6</td>
</tr>
<tr>
<td>EF54 5/6</td>
</tr>
<tr>
<td>6B4 4/-</td>
</tr>
<tr>
<td>6SA7 8/-</td>
</tr>
<tr>
<td>6C4 7/-</td>
</tr>
<tr>
<td>1T4 7/-</td>
</tr>
<tr>
<td>1A3 7/-</td>
</tr>
<tr>
<td>UAF42 6/-</td>
</tr>
<tr>
<td>6AM6 8/6</td>
</tr>
<tr>
<td>EF50 4/-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONDENSERS</th>
</tr>
</thead>
</table>
| Assorted, 100 Mixed
| 15/- |

<table>
<thead>
<tr>
<th>RESISTORS</th>
</tr>
</thead>
</table>
| Assorted, 100, 1, 1, 1, 2w.
| 12/6 |

<table>
<thead>
<tr>
<th>RESISTORS CARBON</th>
</tr>
</thead>
</table>
| 1/2 watt, 4/6 doz. 1 watt, 5/6 doz. 2 watt, 7/6 d.o.z. Welwyn Wire
Wound Variable, 1/- each. Electro-lytic Condensers, all 450 volts, w.g.
8 mfd., 2/6. 8 + 8 mfd., 3/9. 16 mfd., 3/6. 18 + 18 mfd., 3/-
16 +
4/6. 20 mfd., 3/- 32 + 32 mfd., 6/- 25 mfd. 25 volt, 10
mfd., 50
volt, 2/- each. Potentiometers, values to 2 meg. 2.6 each
100 K. 1, 1, 1, 2 meg., w/s/switch, 4/-
R.E.P. Crystal Coil (with circuit).
2/6. Dual Range T.R.F. Coils, 4/-

<table>
<thead>
<tr>
<th>VALVE HOLDERS</th>
</tr>
</thead>
</table>
| 1 Octal, M. Octal, 6d. each. B7G.
Ratings A.C.-D.C. to 6,000 volts
Resistance to 5 megohm. Output
Meter and Decibel range.

<table>
<thead>
<tr>
<th>MULTI METER</th>
</tr>
</thead>
</table>
| U.S.A. manufacture
Brand £7. 10. 0
New
Ranges A.C.-D.C. to 6,000 volts

<table>
<thead>
<tr>
<th>VINERS (MIDDLESBROUGH)</th>
</tr>
</thead>
</table>
| 26, EAST ST., MIDDLESBROUGH
TEL.: MID 3418 |

<table>
<thead>
<tr>
<th>JASON “ARGONAUT”</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW/FM TUNER UNIT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JASON F.M. KITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUALITY DESIGNS . EASY TO BUILD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JASON F.M. TUNER</th>
</tr>
</thead>
</table>
| Ease of building and complete stability characterise this
outstandingly successful
Jason design. It uses four
277/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 2/4, gives complete
building and operating instructions. Chassis
supplied ready punched. 0.5 v. output suits all
high-fidelity-amplifiers. Power pack kit also
available. Detailed price list, etc. on application.

<table>
<thead>
<tr>
<th>FROM LEADING STOCKISTS EVERYWHERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>In case of difficulty please write direct to the makers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JASON MOTOR &amp; ELECTRONIC CO.,</th>
</tr>
</thead>
<tbody>
<tr>
<td>328, CRICKLEWOOD LANE, LONDON, N.W.2</td>
</tr>
<tr>
<td>Phone: SPEEdwell 7050</td>
</tr>
</tbody>
</table>

TWO OUTSTANDING
JASON F.M. KITS

FOR BUILDING
AS A TUNER OR RECEIVER

For those wishing to enjoy selected reception of
overseas transmissions as well as the super-
relative quality of F.M., the Jason "Argonaut"
will be found ideal. It is recommended partic-
ularly 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 straight-
forward. 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 complete receiver,
self-powered, £11.10.0.

www.americanradiohistory.com
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 to use. Note these brief details: Two mics, 7 and 57m. Two Half-track Heads by Wearite. Power output: 2-4 watts. Fast forward, 60 secs. Fast rewind, 45 secs. Overall dimensions, 101 x 12.5 in. approx. Gross weight 26 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 £50.0.8
LASKY'S PRICE 33 GNS.

NEW BATTERY PORTABLE FOR HOME CONSTRUCTION ON PRINTED CIRCUIT

Use all latest innovation, superior grade of construction with fine quality. The PRINTED CIRCUIT completely eliminates wiring errors.

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. CYCL.
- 6-valve Superhet, med. end long wave.
- Low Consumption. Valves: Double Battery 61C.
- Ferite Rod Indoor Ant.
- 4 or 5 m. P.M. Moving Coil Speaker. Walnut.

CIRCUIT DIAGRAM, assembly data, all instructions and shopping list. DEMONSTRATION MODELS AT BOTH OUR ADDRESSES

JASON "ARGONAUT" AM/FM TUNER

Complete parcel with power supply £13.19.6 Post & packing £1.9.6. Book, with price list 2/-, Chassis Assembly 57/9, Post 2/-, I.F. and Coil Set 78/-, Post 10/-.

JASON F.M. TUNER

Special Parcel containing data book, chassis, front end, dial drive, tuning comb., full set of coils, move detector, etc... £8/9. Book, with price list 2/-, This tuner can be built for £9/9/6, plus 10/- post.

3-SPD. AUTO-CHANGERS
Brand new in makers' carousels CARRARD RC110. STILL FURTHER REDUCED. Complete with 6-o. crystal pick-up. Cream, brown finish. List £14.15.0.

Lasky's Price £17.19.6
Carr. 5/-.

CARRARD RC69. Full length unit with two Deluxe AMS heads.

Lasky's Price £13.19.6
Carr. 5/-.

Also available with GEC crystal, p.n. at same price. COLLARO RC54, with Studio O.E. crystal p.n.

Lasky's Price £8.19.6
Carr. 5/-.

SINGLE RECORD PLAYERS


Two speeds, separate tone arm, and design. Available separately.

Lasky's Price 92/-, Post 0/-.

CONSTRUCTOR PARCELS

Each complete with your choice of Cabiner, 12 x 61 x 84in. deep, walnut or ivory plastic or wood with walnut veneer.

PARCEL NO. 1. Everything to build a 4-valve, 3-wave superhet for 200-300 A.C. mains. Uses 6C6, 6C59, 6F7, 6V6, 581. CAN BE BUILT FOR £7.19.6.

PARCEL NO. 2. Everything to build a T.R.F. 4-valve set for 200 A.C. and long wave. Uses 6XG6, 6J7, 6V6 and metal rectifiers. CAN BE BUILT FOR £5.10.0.

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

3-WATT MIDGET AC/DC AMPLIFIER

PUSH-PULL, HIGH GAINS 3-volts 250, 1000, or 1500 p.e.m. 1 UC602 and 1 UAP26. Input voltage 100000 A.C./D.C. Easily converted to 220 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 £50.0.0
Carr. 5/-.

SPECIAL OFFER!

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

10 watts. Limited quantity. List £10.15.0. LASKY'S PRICE 97/6 Post free.

5-VALVE RADIO CHASSIS

Brand new. A.C./D.C. 200/500 r.m. 6F. 6G ke's A.V.C., 4-watts output, 3 station pre-set, frame-serial, fully aligned. Chassis 19 x 51in., max. height 51in. Wired ready for use with the addition of a speaker and output trans., 2 controls, 3 pre-set voltmeter section switch. Valves used: 6CI, 106P or UF1, 10L01, 10P14, 10U4 or CV4.

Lasky's Price, less valv., 52/6
Post 5/-.

AMAZING OFFER OF BRAND NEW, PERFECT

16" METAL CONE C.R.T.

60 c. heater, Iron trap, H.K., E.B.T., wide angle 3D, standard 38 m.m. iron based base, magnetic focus and deflection. Length 17 1/36in. Gives large black and white picture 11in. x 11in. Unused in original cartons. Guaranteed by us 3 months if full data, connections and suggested time bases supplied with every Tube.

LISTED AT £23.9.10
LASKY'S PRICE £8.9.6
Carr. & Insur. 22/- extra.

LASKY'S (HARROW ROAD) LTD.
42. TWICKENHAM COURT ROAD, W,1.
Telephone : MC1500.
379. HARROW ROAD, PADDINGTON, W.9.
1A Uxbridge 105 and CUN1917.
Open all day every day, early closing Thursday.

MOVING COIL P.M. SPEAKERS

3in. and 7in. M. £2.0.0
9in. 17 5/6in. 25 - 30in., 26/6.
12in. 29 6/-
15in. with trans. 21/-
7 X 8 Elliptical, 19/6.
10 x 10 Elliptical, 22 3.

ALL MAIL ORDERS TO HARROW ROAD PLEASE

www.americanradiohistory.com
R.S.C. BATTERY CHARGING EQUIPMENT

ASSEMBLED CHARGERS
6 v. or 12 v. 1. lamp. .......... 10.9
6 v. or 12 v. 1 lamp, 111.5
6 v. or 12 v. 2 lamps. 39.9
6 v. or 12 v. 4 lamps. 56.9
Among the best. With mains and output leads.

HEAVY DUTY KIT
12 v. 1 lamp for Garage or firm with a number of vehicles. Made by 200-250-v. 50 c/s.
Outputs: 1 lamp. 12 v. 1.5 amp. twice.
Consists of Mains Trans. 2 Metal Rectifiers, 4 Terminals, 2 Rheostats and circuit. Only 9 gns., carr. 15.9

BATTERY CHARGER KITS
Consisting of Mains Transformer, F.W. Bridge Rectifiers, well ventilated steel case, Fuses, Holders, Grommets, panels and circuit. Plug for 6 v. or 12 v. 1.5 amp. 22.9
6 v. or 12 v. 2 lamps. 31.6
6 v. or 12 v. 4 lamps. 39.9
Among the best. With mains and output leads. Double Fused. Only 45.9.

R.S.C. MAINS TRANSFORMERS

Interleaved, and impregnated. Primaries 200–250–350 v. 50 c/s. Screened. TOP SHROUDED DROP THROUGH 6, 12, 24, 36, 48, 60, 72, 84, 96, 120, 144 v. 2 a.
200–250–350 v. 100 a, 63.5 v. 3 a.
200–250–350 v. 60 a, 63.5 v. 3 a.
200–250–350 v. 30 a, 63.5 v. 3 a.
200–250–350 v. 15 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
200–250–350 v. 10 a, 63.5 v. 3 a.
NOW IS THE TIME . . .

To start building your F.M. tuner and enjoy the thrills of really High Fidelity crystal clear reception. We can confidently recommend the JASON F.M. TUNER as the most successful home constructor design ever produced.

SIMPLE — EASY TO BUILD — INEXPENSIVE — SUPERB QUALITY

Book giving full constructional details, wiring diagram, circuit, parts list, etc., 2/-.

CHASSIS and DIAL ASSEMBLY (as illustrated) comprising punched chassis, tuning condenser, front panel, s.m. drive, scale and knob, etc.

Price £2.5.0 ready assembled.

VALVES, 4 type EF91, 10/6 each. RESISTORS, complete set 5/-, all marked. I.F. TRANS., pre-aligned, 6/- each. RATIO DISCRIMINATOR, 12/6. DIODES, GEX34, 4/- each. CONDENSERS, complete set, 1/4/, carded. VALVEHOLDERS B7G with screens, 1/9 each.

COMPLETE KIT (down to last nut and bolt), £7.7.6, post paid.

Demonstration model working in our showroom.

We can supply detailed price lists of this kit and the following kits on request:—

ARGONAUT A.M. F.M. RECEIVER, MULLARD FIVE-TEN, MULLARD "3-3", MULLARD F.M. TUNER, G.E.C. 912 PLUS, HIWAYMAN BATTERY PORTABLE.

HOME RADIO (MITCHAM) LTD.
187, LONDON ROAD, MITCHAM, SURREY. Telephone: MIT 3282.

UNDoubtedly the best value yet offered

Stern's "Fidelity" Tape Recorder

ASSEMBLED & READY FOR USE

£43

The Truvox Tape Deck and the Quality Amplifier are supplied tested and ready for use. The actual assembly of the Recorder is simple and only involves a few connections (a connection chart is supplied for this purpose). The items illustrated and described form the complete equipment and each are available for sale separately.

TRUVOX TAPE DECK
MODEL MK. III/ TR714
This is Truvox's new "small" design being only 14in. x 11in. The whole instrument is built to close engineering limits resulting in the minimum of "wow" and "flutter" values. It will play the NEW PRE-RECORDED TAPES and takes all standard tapes up to 1,200ft. £23.12.0.

SCOTSOY MAGNETIC RECORDING TAPE
Supplied complete with a 1,200ft. reel of Scotsoy Tape. Price 35/-.

MODEL MIC33/1 ACOS CRYSTAL MICROPHONE
A highly sensitive Mike which accurately matches the input arrangement of the Amplifier. Price £2.10.0.

Stern Radio Ltd.
109 & 115, Fleet Street, E.C.4
Tel.: Fleet 5812-3-4.
BUILD AN INEXPENSIVE QUALITY RADIO!

Total building cost including choice of beautiful walnut veneered cabinet or ivory or brown bakelite. This is the lowest possible price consistent with high quality. No radio knowledge whatever needed... can be built by anyone in 2-3 hours, using our very simple easy-to-follow diagrams. This terrific new circuit covers all medium and long waves with optional negative feedback, has receiver selectivity, and exceptionally good tone. Price also includes ready drilled and punched chassis, set of simple easy-to-follow plans—in fact, everything! All parts sparking brand new—no junk. Every single part tested before despatching. Uses standard octal-base valves: 6AK7 high-frequency pentode feeding into 6156 anode-bend detector triode, coupled to 6UG1 powerful output beam-power tetrode, fed by robust rectifiers. For A.C. mains, 240-250 Volts (low running costs—approximately 1 in Watts). Size 12in. x 8in. x 5in. Build this long range powerful midget NOW. All parts and set of plans, £2.7/6. Post and packing 2/6. Priced Parts List 2/6.

BUILD THIS POCKET RADIO FOR ONLY 37/6

AT LAST! In response to many requests we now present the DOUBLE TRIODE "SKYPOCKET," a beautifully designed precision POCKET RADIO. No radio knowledge needed.—EVERY SINGLE PART TESTED BEFORE DESPATCH: our simple, pictorial plans take you step-by-step. This set has a remarkable sensitivity due to painstaking design. Covers all medium waves 200 to 650 Metres. Size only 5in. x 3in. x 2in. In brown, Transparent case with panel, cover and ivory dial. A really personal-phonograph pocket-radio WITH DETACHABLE ROD AERIAL. Self-contained all-day battery operation. Average building time 1 hour. Total building cost—including Case, Double Triode Valves, etc. In fact, everything down to the last nut and bolt.—ONLY 37/6, with Postage, etc., £2.7/6. (Parts sold separately). Priced Parts List 1/6. Demand is certain to be heavy—so SEND TODAY!

CONCORD ELECTRONICS (Dept. P.W.C), 69, PRESTON STREET, BRIGHTON, 1


POST THE COUPON TODAY FOR OUR BROCHURE ON THE LATEST METHODS OF HOME TRAINING FOR OVER 150 CAREERS & HOBBIES

PRIVATE AND INDIVIDUAL TUITION IN YOUR OWN HOME

City and Guilds Grouped Certificates in Telecommunications: A.M. Brit. I.E.E. Examination, Radio Amateur's Licence, Radio and Television Servicing Certificates, General Radio and Television Courses, Radar, Sound Recording, etc. Also Courses in all other branches of Engineering and Commerce.

The advantages of E.M.I. training ★ The teaching methods are planned to meet modern industrial requirements. ★ We offer training in all subjects which provide lucrative jobs or interesting hobbies. ★ A tutor is personally allotted by name to ensure private and individual tuition. ★ Free advice covering all aspects of training is given to students before and after enrolling with us.

Courses from 15/- per month

POST THIS COUPON TODAY

Send without obligation your FREE book. E.M.I. INSTITUTES, Dept. 32K
43 Grove Park Road, London, W.4.
Phone: Chiswick 4417/8.

NAME
ADDRESS
NOV.
SUBJECT(S) OF INTEREST

www.americanradiohistory.com
Transistors save space power & weight

These long-life transistors in your circuits will save space and power and incidentally save weight. Exhaustive tests by our unique triple-test process have proved their reliability over a long period.

Their small size and low consumption permit the design of light, compact equipment and, since the cases are of metal, there is little danger of accidental fracture.

The BRIMAR TP1 and TP2 are point contact type, germanium transistors. Type TP1 may be used in control and switching circuits at frequencies up to 100 Kc/s and will work consistently and reliably within this range. Type TP2 may be used as an amplifier or oscillator at frequencies up to 2 Mc/s. Collector dissipation 150 mW max. at 20°C. The BRIMAR TS1, TS2 and TS3 are p.n.p. alloyed junction transistors intended for use in low frequency applications up to 500 Kc/s. These transistors are fully hermetically sealed. They are thus immune from the effects of humidity and noxious atmospheric conditions. The collector dissipation of these types is 50 mW at 20°C. The TJ1, TJ2 and TJ3 are similar to the TS1, TS2 and TS3, but have a collector dissipation of 200 mW at 20°C, and are somewhat larger in size.

Send for data sheets of these transistors to

Standard Telephones and Cables Limited FOOTSCRAY, SIDCUP, KENT

PREMIER RADIO COMPANY

B. H. MORRIS & CO. (RADIO) LTD.

OPEN TILL 6 P.M. SATURDAYS

(Dept. P.W.) 207, EDGWARE ROAD, LONDON, W.2

Telephone: AMBASSADOR 2032

BUILD THESE NEW PREMIER DESIGNS

3-BAND SUPERHET RECEIVER
MAY BE BUILT FOR £7.19.6

Plus 3/- Pk. & Carr.

2 Band T.R.F. Receiver may be built for £5.15.0 plus packing & post 6d. These two receivers use the latest type circuitry and are fitted into attractive cabinets 12in. x 6½in. x 5½in. in either walnut or ivory bakelite or wood. Individual instruction books 1/- each, post free.

MULLARD AMPLIFIER KIT

Why not make the Best?

All the components for model 331, PLUS preamplifier on one chassis (total six valves) may be purchased for £12.12.0, plus pkg. & post 7½d, or preamplifier and tone control in a separate unit, £14.14.0 plus pkg. & post 7½d.

COMPACT GRAM AMPLIFIER

Suitable for any type of Pick-up. Volume and tone control fitted with knobs. Overall size 7½in. long x 3½in. wide x 2½in. thick. Complete and ready for use.

BRIMAR 4-Speed
Autochanger.

H.R.H. £10.00 plus 2/- pkg. & post

H.R.H. £6.19.6 plus 2/- pkg. & post

A NEW TAPE RECORDER

CREDIT TERMS DEPOSIT £5 and 8 monthly payments of £4.15.6

H.P. TERMS 1 DEPOSIT £20 and 12 monthly payments of £1.17.1

Cash price £40 plus packing and carriage 2/6. Care finished in Brown and Antiqua Pva'n. Size 15in. x 10½in. x 7½in. with the very latest type Continental fittings. For A.C. mains 200-250 volts, 50 cycles.

SAND FOR LEAFLET

www.americanradiohistory.com
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 cost 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.
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.

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Postal</td>
<td>1,297,303</td>
</tr>
<tr>
<td>Home Counties</td>
<td>1,288,887</td>
</tr>
<tr>
<td>Midland</td>
<td>1,008,249</td>
</tr>
<tr>
<td>North Eastern</td>
<td>1,312,989</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>971,660</td>
</tr>
<tr>
<td>South Western</td>
<td>823,825</td>
</tr>
<tr>
<td>Wales and Border Counties</td>
<td>516,188</td>
</tr>
<tr>
<td>Total England and Wales</td>
<td>7,245,406</td>
</tr>
<tr>
<td>Scotland</td>
<td>930,541</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>206,008</td>
</tr>
<tr>
<td>Grand Total</td>
<td>8,381,955</td>
</tr>
</tbody>
</table>

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

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 mobile studio weighs nearly 4¾ 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.

By “QUESTOR”

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 Telegraphy 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...
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 £15.1 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, communication equipment, navigation aids, etc... £1,388,000

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 Is. 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 Parodys, near Bloemfontein. Marconi's have supplied nine 20kW H.F. broadcast transmitters to the South African Broadcasting Corporation's new station.
Chassis Details

The whole device is mounted on a chassis bent from a single sheet of 18 s.w.g. aluminium measuring 6in. by 8½in. 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 ⅛in. 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 ⅛in. 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 also 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.
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 “back-lash” 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.

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 3/4 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.

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.
THE idea behind the construction of this radio-gram 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 1 lin. × 1 lin. and 1 1/2 lin. × 1 lin. obeche or similar wood, with the exception of the two 4 in. × 1/4 in. × 3 1/2 in. 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 4 in. × 1/4 in. 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 1 1/2 lin. × 1 lin. obeche bottom members, again cutting all notches necessary and also the 1/4 lin. 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 1 lin. × 1 lin. 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 1 lin. × 1 lin. 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 1 lin. × 1 lin. 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 3\(\text{in.}\) 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 3\(\text{in.}\) thick faced plywood to a finished size of 34\(\text{in.}\) by 18\(\text{in.}\), 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 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 3in. 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 1in. 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 the 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 C-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 3\(\text{in.}\).
chestnut and is 56in. 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 §in. plywood cut from the front panel is employed. This is cut to width, §in. 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

---

**LIST OF MATERIALS REQUIRED**

<table>
<thead>
<tr>
<th>Member</th>
<th>Material</th>
<th>Size required</th>
<th>Finished size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>Light h/wood (oceanich or similar)</td>
<td>16ft. run</td>
<td></td>
</tr>
<tr>
<td>1in. x 1in.</td>
<td></td>
<td>11ft. run</td>
<td>2/36in. x 4in. wide</td>
</tr>
<tr>
<td>1in. x §in.</td>
<td></td>
<td>5in. run</td>
<td>2/36in. x 4in.</td>
</tr>
<tr>
<td>Top frame members</td>
<td>§in. thick chestnut</td>
<td>36in. x 6in. wide</td>
<td>36in. x 6in. wide</td>
</tr>
<tr>
<td>Panelling</td>
<td></td>
<td>20in. x 16½in. wide</td>
<td>36in. x 16½in. wide</td>
</tr>
<tr>
<td>Bottom</td>
<td>§in. chestnut</td>
<td>36in. x 20in.</td>
<td>34½in. x 18½in. high</td>
</tr>
<tr>
<td>Ends (2)</td>
<td></td>
<td>36in. x 13in.</td>
<td>18in. x 12in. wide</td>
</tr>
<tr>
<td>Top</td>
<td></td>
<td>36in. x 13in.</td>
<td>18in. x 12in. wide</td>
</tr>
<tr>
<td>Front</td>
<td>§in. birch-faced ply</td>
<td>8in. x 12in. wide</td>
<td>8in. x 12in. wide</td>
</tr>
<tr>
<td>Fascia</td>
<td></td>
<td>-do. -</td>
<td></td>
</tr>
<tr>
<td>Motor board</td>
<td>§in. chestnut</td>
<td>-do. -</td>
<td></td>
</tr>
<tr>
<td>Feet (2)</td>
<td>§in. ply</td>
<td>-do. -</td>
<td></td>
</tr>
<tr>
<td>Speaker panel</td>
<td>1in. ply</td>
<td>-do. -</td>
<td></td>
</tr>
<tr>
<td>Back panel</td>
<td>1in. ply</td>
<td>-do. -</td>
<td></td>
</tr>
<tr>
<td>Sundries</td>
<td>1in. x 2in. walnut</td>
<td>7 feet run</td>
<td></td>
</tr>
<tr>
<td>Trim to fret</td>
<td></td>
<td>27in. x 16½in. high</td>
<td></td>
</tr>
<tr>
<td>Fret</td>
<td>E.M.L.</td>
<td>24in. long</td>
<td></td>
</tr>
<tr>
<td>Piano hinge</td>
<td>Brass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Gram stay</td>
<td></td>
<td>2 lengths. 16½in. each</td>
<td></td>
</tr>
<tr>
<td>3/16in. x §in. strip</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Cut from one sheet.
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 µF 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 807's 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 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 OP/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 most 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 better 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.
Every gramophone pick-up has a head. It may even have two—one for Standard Records and one for L.P. And if your record player is more than a year or two old it is more than likely that you are not getting the reproduction (or the record life) that you could do. All on account of the pick-up head. Replacing this one small component with an ACOS Hi-g Head will make all the difference in the world. We cannot be too emphatic about it. Thousands of critical listeners have already proved the point for themselves.

There is a whole range of Hi-g Replacement Heads and cartridges that just plug in or screw in to existing pick-up arms by Garrard, Collaro, B.S.R. and other famous manufacturers. Or you can buy complete Hi-g Pick-ups and Arms. If you are considering new record playing equipment altogether make sure that it incorporates an ACOS Hi-g Head (or Heads).

**FREE** The subject of Hi-g cannot be adequately explained in an advertisement, so we have produced an interesting booklet—"The ABC of Hi-g." May we send you a copy?
I.C.S. training supplies the spark you need to further your career. The Courses I.C.S. offer are practical and up-to-date, they recognise the present emphasis on Frequency Modulation, and can help you attain one of the many well-paid posts that exist today in the radio world. Prepare yourself now, at home and in your own time, with the expert help of I.C.S. tutors. The cost of an I.C.S. Course is moderate and includes all books.

Among the I.C.S. Courses available are:

- FREQUENCY MODULATION ENGINEERING
- T/V ENGINEERING
- RADIO SERVICING
- RADIO ENGINEERING
- RADAR ENGINEERING
- BASIC ELECTRONICS
- INDUSTRIAL ELECTRONICS
- ELECTRONIC ENGINEERING

Complete the coupon below and post it to us today for further details of the Course which interests you.

Write to: Dept. 170E, I.C.S., 71 Kingsway, W.C.2.

INTERNATIONAL CORRESPONDENCE SCHOOLS
DEPT. 170E, INTERNATIONAL BUILDINGS, KINGSWAY, LONDON. W.C.2.

Please send FREE book on ..............................................................................
NAME.................................................................................................. AGE.............
(Block letters please)
ADDRESS ..........................................................................................................................

OCCUPATION 31.56

INTERNATIONAL CORRESPONDENCE SCHOOLS

L. F. HANNEY
77, LOWER BRISTOL ROAD, BATH
Tel.: 3811

"You can rely on us"

LARGE STOCKISTS OF RADIO AND ELECTRONIC COMPONENTS

H.P. on INSTRUMENTS, "912" and MULLARD AMPLIFIER KITS, SOUNDMASTER, VIEWMASTER, Etc., Etc.

RESISTORS — STANDARD, MIDGET, HIGH STABILITY, PRECISION; TAPPED VOL. CONTROLS, Etc., Etc.

SEND FOR LIST.

Proprietary catalogues available to Manufacturers' Laboratoires, Education Authorities, etc.

RADIO SERVICING CO.,
82, SOUTH EALING ROAD,
LONDON, W.5.
EAL 5737

HANNEY of BATH offers:—

VIEWMASTER 3-STATION TV TUNER (P. Television).— Denco colset with screens, cam and switches, 80.; Denco switch. Fine Tuner, Coll mounting plates and tag panel. 27.; Kit of resisters 16.; TCC condensers. Kit with 2 printed circuits, valveholders, etc., 43.; Gain controls. 3/ each. Co-ax P/Skt. 28. 6.— Valve canes. 3/ each. Complete kit of parts for the TUNER, with the 2 Genuine MULLARD Valves, nuts, bolts, wire co-ax, etc., 25 18. 6.

Denco Collset for conversion of the V-Master S V chassis to the I.P. amplifier. 29. or Complete kit of S V conversion components. 39.6. All Standard V-Master items in stock. Full list available.


MULLARD 510 AMPLIFIER.—Erie Resistors. 27.; TCC Condensers. 45.; Elstoe Mains Trans. 96. (100 m.a.). 42.6 (120 m.a.).—Output Trans. 40. 6.—Gilson mains trans. 60. (140 m.a.).—Output Trans. 47.6 (6K).—Ultra linear type. 52.6.—Partdick Mains Trans. 65.6.—Output trans. P.361. 35.6.—Partdick Ultra Linear type P.504. 88.6.—Denco punched chassis. 19.6. with base plate. Printed front panel. 46. Type "A" and "B" Chassis (panel not printed). 8.6 and 12.6 respectively; condensers. "A" 15.6; "B" 24.6; Resistors. "A" 17.6; "B" 35.6 (with pots). Full list available, giving details of complete kits.

OSRAM 912 PLUS AMPLIFIER.—Erie resistor kit. 17.4; Eire m. pot. 4.4 each; TCC condenser kit. 55.; P.P. RIDGE components with lead trimmings: (Includes packing chasse). Mains trans. 65.6; choke 34.6. Output trans. 85.6. Valveholders. Choke 19.6; output trans. 30.; Denco drilled chassis. 14.6; Denco 512 Plus printed panel. 7.6; preamp or passive chassis. 6. Full list available.

COMPONENTS are still available for the following F.M. Tuners: Wireless World, Mullard, Osram 912, Denco Maxi-Q. List available.

WIDE ANGLE COMPONENTS. ALLEN, Teklos, Chassis, 50.; Collset (T/K and Super-Vision). 44.8; LO.338. 40.; FO.558. 31.; DC.350. 36.; FC.350. 31.; GL.16 and 18, 74 each; SC.31a. 21.; AT.310. 30.; OP.117. 9.; BN.314. 15.—Dенко Chassis Magnaview. 37.4; Chassis Super-Vision. 61.; Collset Magnaview. 41.2; WA.1CA. 43.; WAF.1CA. 31; WA.LCI. and SCI. 76 each; WA.FMAL. 21.; WA.LOTI. 42.; WA.1FB. 10. Send stamp for lists. Please add 2/- postage to all orders under £1 (excess refunded).

L. F. HANNEY
77, LOWER BRISTOL ROAD, BATH
Tel.: 3811
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—yet 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, perversion 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 emigres 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 spoilt 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, in 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.
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 manufacturer will specify, and if the pick-up output is less than about 0.2 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 valve holders 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 1 1/2 in. deep with a 1 in. flange at the back for mounting, similar to the chassis previously used in this series. As before, the valve holder 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)
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 jin. 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 valveholder (1 jin.) 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 valveholders, switches, volume control and warning light (see Figs. 5 and 6 for approximate positions of main components).

The 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. | S1 = R’S “Standard” O/T. |
| S2 | 1P, 2W. | S2 = 250/0/250 v. 100 mA 6.3 v. |
| S3 | 2P, 6W. | 4 a, 5 v, 2 a. |
| S4 | SPST toggle. | 2 Germanium diodes. |
| LFC | 10 Hys. 100 mA. | 1 Osmor QA8 coil. |

1 indicating lamp panel mounting.
1 .15 a. bulb M.E.S.
1 crocodile clip.
1 v.d. coaxial cable.
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 be marked on a piece of paper 4 in. by 2 in. and pasted on the front panel as shown in Fig. 3. Next cut out three circular discs of paper (1½ in.) and mark out the switch positions on them after sticking them 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 loudspeaker 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 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. 5 and 6.—Component Layout.

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

Fig. 2.—Panel drilling details.
November, 1956

PRACTICAL WIRELESS

605

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.

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.

**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.

![Fig. 7.—Further chassis data.](image)

![Figs. 11 and 12.—Complete panel and chassis assembly.](image)

![Figs. 3 and 4.—Panel layout and switch setting panel.](image)
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 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 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 cutoff 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.

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 MΩ. 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.

<table>
<thead>
<tr>
<th>Meter Readings (Scaled 0-10)</th>
<th>Input at Aerial (Approx. µV).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>10</td>
</tr>
<tr>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>2.0</td>
<td>30</td>
</tr>
<tr>
<td>2.5</td>
<td>50</td>
</tr>
<tr>
<td>3.0</td>
<td>150</td>
</tr>
<tr>
<td>4.0</td>
<td>750</td>
</tr>
<tr>
<td>5.0</td>
<td>4,000</td>
</tr>
<tr>
<td>6.0</td>
<td>15,000</td>
</tr>
<tr>
<td>7.0</td>
<td>50,000</td>
</tr>
</tbody>
</table>

Fig. 2.—Plotted signal strength readings.
COMpletely BUILT SIGNAL GENERATOR

Metal case 15 in. x 11 in. x 4 1/2 in. Size of scale, 9 in. x 3 1/2 in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. modulated or unmodulated R.F. output continuously variable 100 milli-volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Black crackle finished case and white panel. Accuracy plus or minus 2%. £419/6 or £34 - deposit and 3 monthly payments £25 - P. & P. 4/6 extra.

COMMERCIAL TELEVISION CONVERSION SUITABLE ANY T.V. ALL CHANNELS NO ALTERATIONS TO SET.


Heater transformer. Fri 230-250 v. 6 v. 11 amp. 65/.

Extension Speaker cabinet in polished walnut, complete with 3 in. P.M. P. & P. 8/6. £2/6 each. P. & P. 9d. each.

8 in. P.M. Speakers, removed from chassis, fully guaranteed. All by famous manufacturers. P. & P. 12/6.

Volume Controls. Long spindle less switch, 50, 100 K., 1 meiz., 2/6 each. P. & P. 9d. each.

Volume Controls. Long spindle and switch, 1, 1 and 2 meg., 4- each. 10 K. and 50 K., 3/6 each. 1 and 1 meg. Long spindle, double pole switch, miniature.

Standard Wave-change Switches, 4-pole 3-way, 1/2: 5-pole 3-way, 1 3/4. Miniature 3-pole 4-way, 5-pole 3-way, 2 1/4. 2-pole 11-way twin water, 5%- 1-pole 12-way single water, 4-.

1,000 ft. High Impedance recording tape on aluminium spool 12/6 post paid.

Polishing attachment for electric drills. Quarter-inch spindle, chromium-plated. 3 in. brush. 3 polishing cloths and one sheepskin mop. Mounted on a 3 in. rubber cup. 12/6. P. & P. 1/-.

Spare sheepskin mops, 2/6 each.

COLLARO RC54

3-speed automatic changer, will take 10 records mixed.

Studio "O" pickup.
A.C. mains 200/250v.

£7.9.6 P. & P. 5/-.

GARRARD RC/110

3-SPeed AUTOMATIC MIXER CHANGER

Will take 10 records, 7 in., 10 in. or 12 in. mixed, turnover crystal head, brand new, current model. A.C. mains 200/250 v. (List price £11.10s.-)

£7.19.6

P. & P. 36.

RADIO & T.V. COMPONENTS (AcIon) LTD.
23, HIGH STREET, ACTON, LONDON, W.3

...
FOR VALVES—GUARANTEED NEW AND BOXED

£5 T.V. TUBES
16" - 15" - 14"
GUARANTEED 3 MONTHS

P.M. SPEAKERS 8" 8/9
IDEAL XMAS GIFTS. If fitted in small cabinet. TREAT THE LADY AT HOME. Fit one in kitchen or cupboard door, let her follow that T.V. or radio programme. AT THIS PRICE you can have one in every room. Post 1/6.

PRACTICAL WIRELESS
November, 1956

LEEDS VICTORIA SQUARE

5/6 VINCES CHAMBERS

LEEDS

FOR VALVES—GUARANTEED NEW AND BOXED

£5 T.V. TUBES
16" - 15" - 14"
GUARANTEED 3 MONTHS

P.M. SPEAKERS 8" 8/9
IDEAL XMAS GIFTS. If fitted in small cabinet. TREAT THE LADY AT HOME. Fit one in kitchen or cupboard door, let her follow that T.V. or radio programme. AT THIS PRICE you can have one in every room. Post 1/6.

IT'S NEW!
BUILD THIS FRYING-PAN RADIO FOR
NO RADIO KNOWLEDGE WHATEVER NEEDED!
Can be built by anyone in an evening using our step-by-step, easy-to-follow plans. Total building cost including mirror finish frying-pan and everything down to the last nut and bolt only 79/6. Post Free. It is a REAL ELECTRIC RADIO with normal size speaker, etc. Exceptionally sensitive circuit covering all Medium and Long Waves and operating IN HOME. "LIGHT" "LUXEMBOURG," "A.F.N." Etc, Etc, really beautiful tone due to "wall-baffle" effect. Size only 9in. Diameter, 2in. Deep, and handle 7in. Long. Handsome anywhere—IDEAL FOR KITCHEN, BEDROOM, ETC. (Mains lead passes unnoticed through the hollow handle.) AMPLE VOLUME. RUNNING COSTS ONLY ID. FOR 75 HOURS! Only 2½ lb for A.C. Mains 200 to 250 Volts. Robust design and should last a lifetime. EACH PART TESTED BEFORE DESPATCH, AND YOU CAN'T FAIL BECAUSE OUR READY-TO-BUILD LAYOUTS TAKE YOU STEP-BY-STEP. BUILD ONE OF THESE AMAZING LOW-PRICED SETS—NOW! Total building cost including full set of 79/6 Post Free. (Parts may be bought separately. Parts Lists 2/6.) LIMITED QUANTITY. Send Cheque or Postal Order Today! Please cross Postal Orders. (C.O.D. 2/- extra.)

Concord Electronics
(Dept. PW1) 68 PRESTON STREET, BRIGHTON.

1956
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 μA 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 ½-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.

**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 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.

![Fig. 1.—Circuit of the device.](image1)

![Figs. 3 and 4.—The former and the slotted pen top.](image2)

![Details of the Pen-top Mounting element originally used.](image3)
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-

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 1½ volt cell, a silver coin and an aluminium disc held in the mouth are 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

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

<table>
<thead>
<tr>
<th>LIST OF PARTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 3.3k Deaf-aid type</td>
</tr>
<tr>
<td>R2 330k</td>
</tr>
<tr>
<td>R3 470k</td>
</tr>
<tr>
<td>R4 15k</td>
</tr>
<tr>
<td>C1 1.00 μF 100v. Duhl</td>
</tr>
<tr>
<td>C2 1.00 μF 150v. Duhl</td>
</tr>
<tr>
<td>C3 0.01 μF 250v. ex-W.D. (Type 76/ZF/0103)</td>
</tr>
<tr>
<td>TR1, TR2, Henry’s or Hivac XFT2.</td>
</tr>
<tr>
<td>D21 cell Ever-Ready</td>
</tr>
</tbody>
</table>

Ideal for The Beginner

WIRELESS TRANSMISSION

By F. J. CAMM

6/-, by post 6/4

From

GEORGE NEWNES, LTD.,

Tower House, Southampton Street, Strand, W.C.2.
NOTHING is more thrilling, perhaps, to the average enthusiast than exploring the very interesting short wave bands. Operating over these frequencies, even with comparatively simple equipment, is a most interesting and educative pastime, in which various transmissions from nearly every country in the world, may be heard. No "den" is complete without a short-wave receiver, however simple or, at the other end of the scale, however complex. Before embarking on a short-wave receiver design, however, several very important points have to be considered by the home constructor. These are outlined below so that the reader may obtain a clearer understanding of the points involved, before commencing with the construction of the receiver.

Design Considerations

With a receiver designed specifically for the
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 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 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.

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 88A 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

<table>
<thead>
<tr>
<th>Resistors</th>
<th>CA 100pF, variable, Eddy</th>
<th>CB 12.5pF, variable, Eddy</th>
<th>CB 1.00pF, variable, Eddy</th>
<th>C2 100pF, Mica</th>
<th>C3 0.01 µF, Tubular, TC</th>
<th>C4 0.1 µF, Tubular, TC</th>
<th>C5 100pF, Ceramic</th>
<th>C6 0.05 µF, Tubular, TC</th>
<th>C7 25 µF, Electrolytic, F type, CE16DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 1M 0.5 watt.</td>
<td>R2 39k 0.5 watt.</td>
<td>R3 100k 0.5 watt.</td>
<td>R4 250k 0.5 watt.</td>
<td>R5 50k Potentiometer.</td>
<td>R6 10k 0.5 watt.</td>
<td>R7 500k Potentiometer.</td>
<td>R8 270k 0.5 watt.</td>
<td>R9 15k 0.5 watt.</td>
<td>R10 5k 0.5 watt.</td>
</tr>
<tr>
<td>V1 EF41 Mullard.</td>
<td>V2 6BW6 Brimar.</td>
<td>V3 EZ41 Mullard.</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
</tr>
<tr>
<td>Speaker</td>
<td>5in., Rola, Elac, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LIST OF COMPONENTS**

**Resistors**

- CA 100pF, variable, Eddy
- CB 12.5pF, variable, Eddy
- CB 1.00pF, variable, Eddy
- C2 100pF, Mica
- C3 0.01 µF, Tubular, TC
- C4 0.1 µF, Tubular, TC
- C5 100pF, Ceramic
- C6 0.05 µF, Tubular, TC
- C7 25 µF, Electrolytic, F type, CE16DE

**Capacitors**

- C8 16 µF, Electrolytic, 400V
- C9 16 µF, Electrolytic, 400V
- C10 0.02 µF, Tubular, 600V

**Coils**

- CE16DE types 706/L.
- Eddystone types 706/W, 706/P.

**Potentiometers**

- CE16DE type 706/R.
- Eddystone types 706/L.

**Valves**

- Mullard EF41
- Brimar 6BW6
- EZ41

**Other Components**

- Condenser: Eddystone types 706/L.
- Potentiometer: CE16DE type 706/R.
- Electrolytic: 706/W, 706/P.
- Coils: CE16DE types 706/L.
- Eddystone types 706/W, 706/P.

**Diagrams**

- Fig. 2: Development plan.
- Fig. 3: Condenser mounting bracket.
- Fig. 4: Under view of the chassis.
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
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
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

3.—Full chassis data.

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
Eddystone type 708 (for CB).
Mains Transformer.
Ellison, type MT162.
Tag Strips, Nuts and Bolts, etc.
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 8-inch 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, and will be obtained component and one that is ideal for this type of small receiver. C8 and C9, both of $16uf$, 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 4-inch 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 epiclyclic 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-cast, easily obtained component 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 are 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 first and input tagging 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 8in. in diameter, and each must be fitted with a suitably sized rubber grommet.

(To be continued)

---

**PRACTICAL TELEVISION OCT. ISSUE NOW ON SALE PRICE 1/3d.**

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. B.T.S147, 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.
**CABINET CAT. No. CAB/01**
A very high quality Cabinet in a modern design. Exterior veneered in a highly figured Walnut. Solid Birch board lift-up top with all interiors veneered in Beech- wood. Full width front. 37in. x 16in. x 23in. high.

CASH ONLY £8
Packing and Carriage 12/-

**CABINET CAT. No. CAB/02**
A well designed Bureau-type cabinet in a modern size. Veneered in a highly figured Walnut. Outside dimensions, length 20in., depth 11in., height 35in. Sliding control panel on right-hand side approx. 13in. x 12in. Large record compartment inside the cabinet, located at the top on left-hand side.

CASH ONLY 12 Gns.
Packing and Carriage 20/-

**F.M./V.H.F. TUNERS**
Self-powered. Six valves with grounded grid R.F. stage followed by additive mixer using a F.C.C. or twin triode in sealed permeability tuned unit. Two F.T. stages ensure maximum gain with 6AL5 double double-throw as ratio detector. Frequency coverage of 800-1100 megacycles allows adequate overlap. Very high quality throughout.

**RADIO and RADIOPHOTO CHASSIS**
Superhet. Chassis of Latest Design and Technique. General Specifications applicable to all models. A.C. 200/250 volts 50 cycles only. Suitable for multi-directional glass dial of the horizontal type. Slow motion tuning drive. Full provision of Automatic Volume Control. Negative feed-back from output transformer secondary. Socket provided for Aerial, Earth, Gram, Pick-up and Extension Motor controlled by Chassis On-Off switch. All induc tances have an exceptionally high Q value. The Radio section is designed for fine tuning reproduction on Radio and Gramophone. The tone controls have been given an extra wide range to embrace all types of recordings.

**RADIO and RADIOPHOTO CHASSIS**
CAT. No. CR/AFM47. 7-valve Superhet with FM/TV Band (4 wavebands). or on Credit Terms. Packing and Carriage 23 ½ Gns.

**AUTOMATIC RECORD CHANGERS**
All automatic Record Changers are of the latest types and models.
CAT. No. RO/A. This is the latest multi-speed changer incorporating 16 r.p.m. for "talking-books," and arrangement for manual control. Fitted with high fidelity Crystal Turnover Pick-up Head. A.C. mains 200/250 volts, 50 cycles only.
CASH £9.15.0
Packing and Carriage 12/6.

**LOUDSPEAKERS**
Gram Amplifiers, etc. Available at keenest prices.

**DOMESTIC**
DIRECT SALES LTD.
90 JUDD ST., LONDON, W.C.1. TER. 9876

3 MARLBOROUGH RD., ALTRINCHAM, CHeshire
Telephone enquiries: ALTRINCHAM 4045

**MAYLIT LTD**

Dealers supplied at full discount. Send for complete catalogue.

All enquiries (excluding Northern Area) to:
- Northern enquiries only (not Scotland & N. Ireland) to:
Great Britain's Valve Mail-Order House

ART armstrong

www.americanradiohistory.com

AM/FMADIOGRAM CHASSIS

PB409

ARMSTRONG quality at an economical price

★ 9 valves-6 watts peak output Within 2db, 20,000 cps at 4 watts (double normal room volume)

★ Full VHF band (88-108 Mc/s) plus Long, Medium and Short

★ Push-Pull Output with Negative Feedback

★ Quick-action "Piano-Key" selectors

★ Independent Bass and Treble controls

★ "Magic Eye" tuning

★ Latest MULLARD preferred-type valves

ARMSTRONG WIRELESS & TELEVISION CO., LTD.
WARTLERS ROAD, LONDON, N.T. NOR 3213

Post this coupon for descriptive literature and details of Hire Purchase, Home Trial facilities and Guarantee

BLOCK CAPITALS PLEASE.

NAME

ADDRESS

PW409

DEMOBED VALVES MANUAL

Girling equivalents of British and American Service and Cross Reference of Commercial Types with an Appendix of B.V.A., Equivalents and Comprehensive Price List. We have still some Valves left at very old Budget Rates (25%c.) which are actually sold at the old price. (1951 rate.)

Chassis Cutters with Keys

The easiest and quickest way of cutting holes in sheet metal. The cutter consists of three parts: a die, a punch and an Allen screw. The operation is quite simple. Price incl. key: Rigs 14/-. 13½. 10½. 8½. 7½. 6½. 5½. 4½. 3½. 2½. 1½. 10/-. 9/-. 8/-. 7/-. 6/-. 5/-. 4/-. 3/-. 2/-. 1/-.

All prices are with keys

-.001-"MICROMETER

Brand new 10/- Instrument Bargain

28 GUINEAS DIMENSIONS : 13" x 9½" x 8" high

We have been making replacement radiogram chassies for nearly 25 years and have concentrated exclusively on the requirements of those who want the best. This is your guarantee of first class performance and reliability. We shall be pleased to give you a full demonstration of this and other models at our Warlbers Road Showroom (open 9-6 weekdays and Saturdays).
The R.1155 Communications Receiver
MODIFICATIONS TO THIS POPULAR EX-GOVERNMENT UNIT
By K. A. Brook
(Continued from page 538 October Issue)

A NOOTHER 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.

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Value (μF)</th>
<th>Position in circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C25</td>
<td>0.001</td>
<td>Anode of V6 to chassis.</td>
</tr>
<tr>
<td>C29</td>
<td>0.1</td>
<td>H.T. side, primary of I.F. transformer in anode circuit of V3 to chassis.</td>
</tr>
<tr>
<td>C32</td>
<td>0.1</td>
<td>H.T. side, primary of I.F. transformer in anode circuit of V2 to chassis.</td>
</tr>
<tr>
<td>C38</td>
<td>0.1</td>
<td>H.T. side, primaries of anode transformers of V1 to chassis.</td>
</tr>
<tr>
<td>C93</td>
<td>4</td>
<td>Paper block capacitor near DFI and DF2 valveholders. (H.T. to chassis.)</td>
</tr>
</tbody>
</table>

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 anticlockwise 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.

SIGNS 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 circuit to chassis.

Fig. 14.—Bias network (simplified).

COMPONENTS (Fig. 14)

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>2 K.</td>
</tr>
<tr>
<td>R11</td>
<td>150 K.</td>
</tr>
<tr>
<td>R3</td>
<td>1.2 K.</td>
</tr>
<tr>
<td>R12</td>
<td>27 K.</td>
</tr>
<tr>
<td>R4</td>
<td>120.</td>
</tr>
<tr>
<td>R64</td>
<td>100.</td>
</tr>
<tr>
<td>R8a</td>
<td>50 K Pot.</td>
</tr>
<tr>
<td>R68</td>
<td>56 K.</td>
</tr>
<tr>
<td>R9</td>
<td>2 M.</td>
</tr>
<tr>
<td>R69</td>
<td>100 0.</td>
</tr>
<tr>
<td>R10</td>
<td>150 K.</td>
</tr>
<tr>
<td>C1</td>
<td>2.5 μF.</td>
</tr>
</tbody>
</table>
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 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 =

\[ \frac{100 \times 220}{1,000} + 6.3 \times 3 + 5 \cdot 2 = 18.9 + 10 \text{ W.} \]

= 25 W (approx.).

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

Primary power \( W_p = \frac{100 \times 220}{1,000} = \frac{64 \text{ W}}{80} \), approx.

For an input of, say, 230 volts,

Primary current \( I_p = \frac{64}{230} = \frac{280 \text{ mA}}{230} \), approx.

For this value of primary current, and allowing a current density in the wire of 1000-1,300 A/sq.in., the wire size is 26 s.w.g. enamelled copper.

For the laminations, core area

\[ A = \frac{\sqrt{W_p}}{5.6} = \frac{\sqrt{5.6}}{5.6} = 1.43 \text{ sq. in.} \]

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

\[ \text{Size of stack} = \frac{1.43 \times 16}{15} = 1.526 \text{ in.} \]

So our laminations will be a 1½ in. stack of No. 4A Silcor 11.

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 0.002 in. paper. (If desired, Presspahn may be used for this, although it is thicker.)

At the end of each winding wind on three turns of 0.005 in. Empire Tape, and also after the electrostatic screen. The exception to this is when completing the transformer, wind on four turns of 0.01 in. 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 \( \times \) 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 + 1,050 + 105 turns.

The insulation can now be fitted.

Electrostatic screen: One turn of 0.01 in. copper foil. This single turn must be suitably insulated when actually completing the transformer, 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. 440 volt winding.

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

Secondary II: 6.3 volts at 3 A. 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 2 A. 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.

So on completion of this section the transformer will be as shown in Fig. 16.

Fig. 15.—Transformer connection colour code.

Fig. 16.—A clamp for the transformer.
Below we give details of a small section of our extensive stock of Radio and Television Components. All items are usually held in stock and all orders are normally dealt with on the day they are received.

**COMPONENTS**

- CERAMIC: Ceramic, 1.12, 1.5, 1.8, 2.3, 3.9, 4.5, 6.8, 6.12, 10, 15, 22, 25, 50, 100, 150, 180, 220, 330, 390, 500, All 94 each.
- MICA: Mica, 1800, 10, 180, 22, 33, 47, 68, 75, 100, 150, 150, 180, 330, 390, 500, 680, 680, 1.000, 1.200, 1.800, 2.000, 2.700, 3.300, 3.900, 5.600, 6.800, 7.500, 8.200, 5.000, 8.000. All 94 each.
- COPPER COILS: 0.12, 0.15, 0.20mfd., 0.02mfd., 350v., 0.33mfd., 500v., All 94 each.
- SOLDER: Multicore Emr, 60/40 Radio Grade, 5/2, 5/6 and 6/4. Each, 1 lb. Reels, 100/. 15/4. ARAX (not for radio), 6d.
- EDDYSTONE COMPONENTS: Wide range. Eddystone illustrated catalogue, 1/-.

**TOOLS**

- SCREWDRIVERS: Insulated with pocket clips.
- Pliers: Pointed nose, 8in., 5/6.

**SPECIAL OFFER OF RECORD CHANGERS**

- B.S. RAC3D: Research. The latest four speed model fitted with AGC cartridge. List Price £19.10. Special price £17.10. We have a complete stock of all the above.
- GARRARD RCD104. The latest four speed version of this high class Garrard changer. Fitted with the G2 Crystal Cartridge. List Price £31.10. Special price £28.8. Credit Terms: Deposit £13.10 and seven monthly payments of £1.10.

**TRANISTORS**

- MILLWARD—QCT, 15v., QCT—24v., QCT—25V.

**LOUD SPEAKERS**


**NEW GOODMANS**

- Treble Tweeter, £5.8.3. Midax Middle Speaker, £11.16.0.
- WHITELEY H.F. RANGE—All with universal speech coil. 5in. HFS12, 51/2. £9.19.6. HFS13, 6in. £11.15.6. HFS15, 8in. £15.6. Also the new 8in. units, HFS16, £16.17.0, TIS16, £16.10.0. Tweeter T12, £4.4.3. Tweeter 12, £4.4.3. Also the new “Special Cross Over” units, TIS16, TIS18.
- BURHILL. 12.57. £1. £9.16.0. Cross Over box for Tape Deck or Record Changer and amplifier with storage space, £12.11.0. [Illustrated leaflet available on Whiteley Speakers.]

**NEW WHITELEY CABINET—Junior Bass Reflex Box.**

- G.E.C.—The famous Metal Cone Speaker. £9.5.0. We now have the new Precision Unit Speaker. £11.15.6. Special price for all owners of the Metal Cone Speaker. £11.15.6. Also the new 6in. units, HFS16, £16.17.0, TIS16, £16.10.0. Tweeter T12, £4.4.3. Tweeter 12, £4.4.3. Also the new “Special Cross Over” units, TIS16, TIS18.

**TEST INSTRUMENTS**

- AVO—Model 8, £29.10.0. Model 17, £19.10.0.
- TAYLOR—Model 71, £13.15.0. Montrose, £19.10.0.
- PULLIN—Series 100, £13.15.0. Miniature, £9.15.0.
- PhD—32-6.
- DPOINT—Signal Generator, P1, 125.5.0.
- RADAR. Kilo-Voler. For B.H. measurements. Reads up to 30 KV. £3.15.6.

**RECORDING TAPE**

- PLEASURES. Special Offer, 1.300ft. Paper Base Tape. Normally £1. Special Price £0.75.
- LONG PLAY TAPE—1.800ft. on 7in. reel. Scotch Repro. £12.6. Scotch Repro 9-Inch, £7.5. Scotch Boy, £5.0. SPEAKER, £0.5.

**CRÉDIT TERMS 3/- IN THE £ DEPOSIT**

Any thing we sell can be supplied on Credit Terms. The Deposit is 3/- in the £ and the balance in seven monthly payments. Send details of your requirements and we will send you our Credit Terms.

**TERMS OF BUSINESS**

Cash with order or C.O.D. Please postage to orders under £3. We charge C.O.D. fees on C.O.D. orders under £5.

**WATTS RADIO**

8 APPLE MARKET
KINGSTON-ON-ThAMES, SURRY

**PHONE:** KINGston 4099

**SHOP HOURS:** Monday, Tuesday, Thursday—9 a.m. to 5.30 p.m. Wednesday—9 a.m. to 1 p.m. Friday, Saturday—9 a.m. to 6 p.m.
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), 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...
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\(\frac{1}{2}\) 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 recommended, that is 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.
THE SUPERIOR BUREAU
PRICE £17.0.0
Plus 25/- carriage
Very elegant in highly figured walnut veneer with internal panels in sycamore. Sloping radio panel size 16in. long x 10\(\frac{1}{2}\)in. high. Uncut motorboard size 15\(\frac{1}{2}\)in. long x 13\(\frac{1}{2}\)in. back to front. Lid panelled in beige leatherette. Two large storage cupboards. Speaker chamber large enough for 12in. speaker, overall cabinet size 35in. high, 34in. long, 16\(\frac{1}{2}\)in. deep.

SUPEREX "55"
BATTERY PORTABLE
A first class receiver, equal in appearance and performance to any commercial model. Cabinet size 10\(\frac{1}{2}\)in. x 8\(\frac{1}{2}\)in. x 4\(\frac{3}{4}\)in. All parts are available separately.

- 4 Valve Superhet
- Long, med. Wave
- Large Speaker
- BTG 1.4V Valves
- Simple construction

BUILDING COST
£7.15s. plus 4/- postage
SEND 1/6 FOR CONSTRUCTION BOOKLET

RADIO AND RADIOGRAM CHASSIS
SUPERHET CHASSIS OF LATEST DESIGN (Fully Guaranteed)

General Specification applicable to all models.

- MAINS: A.C. 200/250 volts 50 cycles only.
- DIAL: Suitsably lit multi-coloured glass dial of the horizontal type
- SOCKETS: Sockets provided for Aerial, Earth, Gram, Pick-up and Extension Speaker.
- AUDIO SECTION: The Audio Section is designed for first rate reproduction on Radio and Gramophone.

TYPE AM5: 5 valve Superhet (3 waveband) ... ... ... 12 gns.
TYPE AM7: 7 valve Superhet with push-pull output (3 waveband) ... 16 gns.
TYPE AM/PM47: 7 valve Superhet with FM/VHF Band (4 waveband) ... 23; gns.
TYPE AMP49: 9 valve Superhet with FM/VHF Band (4 waveband).
- Push-pull output including two speakers ... ... ... 26 gns.
Carriage and Packing 12/6 extra.

Audiophiles all over the world are demanding Mullard audio valves for their high quality sound equipment. And who can blame them when they know that the Mullard World Series of Audio Valves is the finest in the world. Fill in the coupon below for free data on Mullard World Series Audio Valves.

* Audiophile—Enthusiast for high quality sound reproduction who is satisfied with nothing but the best.

This popular book is available now from most dealers, price 3 6d. It contains designs and full constructional details of the new Mullard EL34 High Quality 20 Watt Amplifier, a Mullard Band II F.M. Tuner, pre-amplifiers for the Mullard EL34 Amplifier and for the popular Mullard 5 Valve 10 Watt Amplifier, together with other useful technical information.

Mullard
WORLD SERIES
AUDIO VALVES

Mullard Ltd., Publicity Division, Century House, Shaftesbury Av., London, WC2

COUPON
To Mullard Ltd., Publicity Division
Please send me, free of charge, leaflets on the Mullard World Series of Audio Valves, and details of "High Quality Sound Reproduction".

NAME ____________________________

ADDRESS __________________________

MVM 349

www.americanradiohistory.com
COMPLETE KITS of PARTS for the "Hi-Fi" ENTHUSIAST

The MULLARD "E-10" MAIN AMPLIFIER

This is the ideal Amplifier for the Hi-Fi enthusiast and needs no recommendation from us. Out Kit is complete to Mullard's specification, including the latest GI3004 ULTRA LINEAR OUTPUT TRANSFORMER and the entire MULLARD Valve line up. ALL SPECIFIED COMPONENTS are supplied. PRICE OF COMPLETE KIT OF PARTS £11.11.0.

The full SPECIFICATION and PRACTICAL BUILDING INSTRUCTIONS for these Units are available for £1.0.0. SPECIAL PRICE, REDUCED TO £1.0.0. • We supply your kit complete with MULLARD E-10 and "Fidelity" Pre-amplifier—for £16.16.0. We also supply both fully assembled and ready for use for £19.18.6.

MODERNISE YOUR OLD RADIOGRAM AUTOCHEMERS with modern A.M. and F.M. RADIOGRAM CHASSIS and matched (H.P. Terms available). A good varied selection is available—SEND S.A.E. for ILLUSTRATED and DESCRIPTIVE LEAFLET.

TWO REALLY GENUINE PRICE REDUCTIONS OFFER THESE RECEIVER CHASSIS AT SUCH LOW PRICES, and FULLY GUARANTEED. Each is Brand New.

The MODEL AWA-7 A 7-valve 3 waveband Superhet Chassis having a push-pull stage for approx. 6 watts output.

PRICE £12.19.6.
H.P. TERMS Deposit £6.09 and 6 monthly payments of 19.0.

RECORD PLAYERS THE VERY LATEST MODELS ARE OFFERED AT GREATLY REDUCED PRICES

• TRANSCRIPTION UNITS • 3 and 4 SPEED AUTOMATIC • AUTOMATIC WITH MANUAL CONTROL POSITION. Send S.A.E. for ILLUSTRATED and DESCRIPTIVE LEAFLET. This Leaflet also contains data on a PORTABLE TYPE GRAM AMPLIFIER which has separate CBS and 1.5 amplifier. £11.11.0.

NEW! A COMBINED AM/FM RADIO CHASSIS of EXCEPTIONAL HIGH QUALITY and very pleasing appearance. Provides complete F.M. coverage and Long, Medium and Short Wavebands.

PRICE £21.10.0.

LESIONS FOR THE HOME CONSTRUCTOR

THE COMPLETE SPECIFICATIONS OF THE FOLLOWING UNITS ARE AVAILABLE FOR £1.00 EACH. THESE MANUALS ALSO INCLUDE THEORETICAL and simple PRACTICAL WIRING DIAGRAMS and A COMPLETE COMPONENT PRICE LIST. ALL OF WHICH ARE AVAILABLE FOR SALE SEPARATELY.

STERN'S E.M. TUNING UNIT... A 5-valve Tuner incorporating the most Mullard Permability Tuning 'Heart' and a "Marlin Eye" Tuning Indicator and can be completely built for £10.0.0. • STERN'S COMBINED A.M., F.M. TUNING UNIT... Featur- ing a single valve F.M. Tuner, but also incorporating the MEDIUM WAVEBAND. It can be completely built for £13.10.0. • STERN'S HIGH QUALITY 8-WAY AMPLIFIER... Designed for High Quality reproduction up to an output level of 10watts at an attractive Waveband and incorporating noise feedback. It is one of the most successful Amplifiers (in the lower price range) yet offered to the Home Constructor. We supply the complete Kit ex-stock for £7.10.0.

STERNS "COMPACT 5-2"... (b) The "COMPACT 5" AMPLIFIERS

A two-stage high sensitivity Amplifier having SEPARATE BASS and TREBLE CONTROL and designed to give an output of 5 watts with very pleasing quality. PRICE £8 15.

Expressly developed for very high quality reproduction of Gram, Records and particularly suitable for high quality reproduction of the F.M. transmitters. Two models are available: A separate POWER SUPPLY UNIT to operate with these amplifiers is available for £2 10.0. We also supply a complete unit for the Radio Tuner, etc.

STERNS "COMPACT 5" AMPLIFIERS

A Three-valve version of the "5-2" model, but in this case having an additional stage and incorporating Noise Feedback. PRICE £9 10.0.

AN EXCEPTIONAL OFFER FOR CASH ONLY

The B.S.R. MONARCH 3 SPEED AUTOMATIC. NORMAL PRICE £29 10.

• Complete with High Fidelity Crystal "Turn- over" Head which incorporates separate stylus for L.P. and 78 r.p.m. records. • A MIXER unit that will accommodate 4 in. 10in. and 12in. records.

NEW! A COMBINED AM/FM TAPE RECORDER which we can still supply to Mail Order Customers. Our extensive stocks were not affected and are available as usual to Collier—Only.
Modifying the Sound Master Tape Recorder

CUTTING DOWN BACKGROUND NOISE

THE design of the Sound Master tape recorder, as reviewed in the PRACTICAL WIRELESS some months ago, gives very good results, especially at 33 1/3 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 under modulation 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 db, 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 1/2 and 15 i.p.s. the tone obtained on playback, with both treble and bass controls at maximum, definitely lacks the lower frequencies. I think this also applies to 33 1/3 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 MC1111 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 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 µF: 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. 1.—Original top-boost circuit of the Sound Master.](image1)

![Fig. 2.—The improved circuit.](image2)
An Electrostatic Speaker

HOW TO MAKE AN EXPERIMENTAL H.F. UNIT

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 µF 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) ½in. 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 µF 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 ½in. 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 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)
BAND 3 T.V. CONVERTER—185 Mc/s - 199 Mc/s
Suitable for London, Birmingham and Northern Transmissions

£2.50 - 50 post free

A highly successful unit (\(W/World\) circuit), incorporating variable capacitors above 30\(\mu\)F, Midget BVA valves, etc. Chassis size 7 x 4 x 3\(\frac{1}{2}\)in. Thousands already in use. Suitable for most types of T.V. sets. TRF or Superhet. Kit of parts 45/-, Blueprint 1/6, Power pack kit 30/-, Switch kit (Band 1-Band 3 A.C. switching).

6/-—All Post Free. Wiring and aligning of above kit.


TRUS RADIO COMPONENT SPECIALISTS

(1946)

70 BRIGSTOCK ROAD, THORNTOIV HEATH, SURRY (THO 2188)

50 yards Thornton Heath Station.

Buses 130A, 133, 139, 166 & 190

Listed above are only a few items from our very large stock.

Hours : Mon-Sat. 9-12, 2-6 p.m. 

Terms C.O.D. or C.O.D. Only. Weekly working charges, 5% on, 30 days, payable at T.D. Post P.O. up to 7/6, 7/-, 11/-, 15/-, 20/-, 25/-, 30/-, 35/-, 40/-.

www.americanradiohistory.com
**UNIVERSAL TEST METER**

**£5-17-6**

**THIRTEEN RANGES.**

- Voltage D.C. 0-5, 0-25, 0-500, 0-1000 Volts.
- Voltage A.C. 0-5, 0-25, 0-500, 0-1000 Volts.
- M.A, D.C. 0-5, 0-10, 0-100 mA.
- Resistance 0-10, 0-100, 0-1000, 0-5000, 0-10000 Ohms.
- Operated by 11 v. Pentoline battery (5 x 45). In handsome plastic case.

**MINIATURE LF. STRIP TYPE "373" 6-72 mg.**

Brand new miniature LF. Strip size 10 x 1/2 x 1/8 in. high. Valve line-up: 2-EF82, 2-EF91, 6EF1. With circuit. Price (new valves) 7s. 6d. P. & P. 1/6.

This LF. Strip is part of above equipment.

**U.S.A. INDICATOR UNIT**

Complete with 3BP1. C.T. high range valve-2-8SN7GT, 2-866GT, BC6, 2X2, 6X5G, volume controls, condensers, F.E.T., and portable "scope. In black cricket case size 11 x 9 x 2.5 in. **BRAND NEW.** 6s. 6d. or similar.

**30\(^{\frac{1}{2}}\) SHORT-WAVE RADIO**

- Covers 10-100 metres.
- World-wide reception.
- Low drain valve.
- Picture diagram and instructions for beginners.
- Assembling time 1 hr.

This 1 valve S.W. receiver can be built from our list of components for 30\(^{\frac{1}{2}}\), including valve and 1 coil covering 20-40 metres. Provision is made only for 2 or 3 valves if required. All components can be purchased separately and are colour-coded so that the beginner can build this set quite easily.

Post and Packing: Under 10\(^{\frac{1}{2}}\) add 9d.; under 1s. 3d.; add 1s.; over POST FREE

Send 1s. 2d. for specification, wiring diagram, layout and price list to —

R.C.S. PRODUCTS (RADIO) LTD

11 OLIVER ROAD, LONDON, E.17.

**HENRY'S**

(RADIO LTD.)

5, HARROW ROAD, PADDINGTON, LONDON, W.2.

TEL.: PADDINGTON 1008-9, 0401

**CONSTRUCTORS build these at DOWN-TO-EARTH PRICES**

**PERSONAL PORTABLE RADIO**

This little set was designed to give you a real personal portable radio that you can enjoy anywhere without disturbing others. Use it on camping trips, in bed, in your office, or just anywhere.

Send 2s. 6d. for layout, wiring diagram and Components Price List.

**6X INDICATOR UNIT**

Containing VC617 Cathode Ray Tube, complete with Mu-Metal screen, 3-EF50, 4-EF82, 4-6AS0, 2-BR54, Plus Pots, Switches, H.V. Cond., Resistor, Mu-Hall S.M Dial. Double Deck Chassis and Crystal. BRAND NEW ORIGINAL CABS 67.6. Carr. 74s.

**GARRARD 3-SPEED MIXER AUTO-CHANGER**

Model 1010.


**CRYSTAL MICROPHONE INSERTS**

Ideal for Tape Recording. Can be mounted on Microphone Amplifiers (Push pull or FET), etc. Very sensitive. Guaranteed and Tested. 5/-, (3 in a box). Brand new and boxed.

**6X INDICATOR UNIT**

Containing VC617 Cathode Ray Tube, complete with Mu-Metal screen, 3-EF50, 4-6AS0 and 1-645, 3 miniature valves, 9-12V (sensitive) for volume controls and quantity of resistances and condensers. BRAND NEW Offered BRAND NEW (less postage) 7.5/-.

**TRANSMITTING RECEIVER**

R.F. Transformers, 6, 25, 100, 1000. Sensitive. Operated with Transistor R.F. TRANSISTORS (Blue-Spot).

**MINIATURE COMPONENTS FOR TRANSISTOR CIRCUITS**

Fortiphone sub-miniature inter-valve P.F. each Trans. ..... 12s. 6d.

Fortiphone miniature Int. valve push-pull Trans. ..... 15s.

Fortiphone miniature push-pull output ..... 15s.

-2-gang 35 P.F. miniature condensers. ..... 11s.

-FC 10 W.W 11/2 K V Control. ..... 7s. 6d.

Ferrite Rod, double size 4 x 3 x 2.5 in. ..... 10s.

Transistor miniature oscillator coils. ..... 6s. 6d.

Transistor miniature I.F.T. coils 86 kc. ..... 8s. 6d.

TRANSMISTORS

**FUNCTION TYPE (Red Spot) OFFERED AT LESS THAN HALF-PRICE.**

Designed for A.F. application, up to 900 kc/s and is suitable for use in Radio Control, Signal Tracers, Local Station Receivers, Oscillators, Transistor Voltmeters, Microphone Pre-Amplifiers, etc.

**10/-**

(9s. 6d. per dozen)

N.B.—These Transistors may be used in place of Milliard OC71 or similar Transistor.

R.F. TRANSISTORS (blue spot) 1.6 Mc/s. 15 each.

**BUILD THE "TELEVISION" TRANSISTOR SUPERHET**

Complete Kit of Parts with 4 Transistors and 3 pin Speaker. I.F.T.s, 2 gang miniature cond. V.C. Ferrite Rod. Cond. and Res. £10-0-0.

**MINIATURE TELEGRAPH KEY**

Complete kit of parts with 3 Transistors & R.F. Transformer. £5-0-0.

**UNIT CONTAINING VCT507**

Cathode Ray Tube, complete with Mu-Metal screen, 3-EF50, 4-6AS0 and 1-645, 3 miniature valves, 9-12V (sensitive) for volume controls and quantity of resistances and condensers. BRAND NEW Offered BRAND NEW (less postage) 7.5/-.

**INDICATOR UNIT TYPE 6X**

Unit contains VC617 Cathode Ray Tube, complete with Mu-Metal screen, 3-EF50, 4-6AS0 and 1-645, 3 miniature valves, 9-12V (sensitive) for volume controls and quantity of resistances and condensers. BRAND NEW Offered BRAND NEW (less postage) 7.5/-.

**GARRARD 3-SPEED MIXER AUTO-CHANGER**

Model 1010.


**INDICATOR UNIT TYPE 6X**

Unit contains VC617 Cathode Ray Tube, complete with Mu-Metal screen, 3-EF50, 4-6AS0 and 1-645, 3 miniature valves, 9-12V (sensitive) for volume controls and quantity of resistances and condensers. BRAND NEW Offered BRAND NEW (less postage) 7.5/-.

**GARRARD 3-SPEED MIXER AUTO-CHANGER**

Model 1010.

Automatic Switching for a Tape Recorder

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

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 will 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 in that, when the instrument is to be switched off in the ordinary course of events, the new relay will still hold it on. The procedure is, of course, to operate the trip switch manually at the same time.

**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.

**Fig. 2.** The dotted connections show an alternative method of feeding a receiver. In this case the relay need have only one make contact.
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," for 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. Morton 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 immobility 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 compiled by David Climpie. This is a new weekly feature programme, which promises to be very interesting and amusing. It started off with delightful excerpts from "Hucklebery Finn" and "Nicholas Nickleby," and included a bizarre grand guignol kind of reading of an American husband wheeling 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 combined to site its one blemish—some truly abominable "music" by Stanley Myers, with 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, 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 "drosos de signeur" and the efforts of a fair Colleen to thwart them. The shillelough cracked and the borgorras rapped 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." "I'm glad I'm not there!" This was particularly evident when "the brain of Britain" was found.

The Waters

Elise and Doris Waters' weekly feature, "Tlogits," 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.
Background to Reliability

Behind the world-wide popularity and reliability of the Pullin Series 100 Multi-Range Test Set, with 182 ranges from 100 microamps to 1,000 volts and sensitivity of 10,000 ohms per volt, are the considerable research, manufacturing, development and service resources of M.I.P., one of the great Pullin Group of Companies.

Get your Pullin Series 100 Multi-range Test Set ON EASY TERMS

Here’s a grand opportunity for the amateur radio-man or the service engineer. We will send your Pullin Test Set by return of post, post free, on receipt of £2.10.0 deposit. Thereafter, you pay nine monthly payments of £1.4.6. The cash price is £12.7.6. WRITE TO-DAY!

Tick Here

☐ Please send descriptive leaflet.
☐ Please supply 1 Pullin Series 100 Test Set. I enclose 5/- deposit and promise to pay 9 further monthly payments of 24/6.

Signed:

Address:

If over 21: Occupation:

Post to

FRITH RADIOCRAFT LTD

69-71 CHURCH GATE LEICESTER
& 28 HIGH ST NEWPORT PAGNELL BUCKS
A REALLY SELECTIVE 5-VALVE SUPERHET

Our "know-how" shows you the easy way to surprise friends with this Superhet. NO RADIO KNOWLEDGE NECESSARY. Easy to read step-by-step instructions. We guarantee it to work. Only tools needed are Pliers, Screwdriver and Soldering Iron.

IDEAL FOR BEGINNERS ... A TRF.

Let us show you how simple a TRF Valve Receiver can be to make and how amazed you will be. Easy-to-follow instructions take the headaches out of construction. Hundreds already working all over the country, plus 2/8 post and packing.

A PROFESSIONAL JOB MADE SIMPLE

Nothing to lose—Our MONEY-BACK guarantee covers you. Parts available for the above receivers in Cream or Brown cabinets, write to-day and get started on the fascinating Hobby of Electronics.

EASY INSTRUCTIONS WITH OUR "KNOW-HOW".

1 POST FREE, SEND TO-DAY.

NORMAN H. FIELD, Electronics
Dept. PW, 68, HURST STREET, BIRMINGHAM, S
Birmingham's Largest Constructors Store

Best Buy at Britain's

TWO-WAY MORSE TRAINING SETS. W/F. Mk. 3. Consists of two valve transmitters (ARPBE 2) (one with pitch control), for one or two operators. Has provision for creating a "kangaroo" in polished oak case 12in. x 10in. x 8in., wt. 16 lb. Complete with valves, leads, 2 keys, 7-way terminal board, circuit and instructions, but, less batteries and boxes. Ideal for Cadets, Scouts, etc. SNIP.

HEADPHONES for above, 10/6 pair.

RECEPTORS. Latest miniature insulated Dubullier 1 watt type P9S. Wire ends. Useful values. ONLY 10/- for 100 assorted: 4, 1 and 1 watch. Etc., etc., 1 from assorted. 10/-.

FIELD TELEPHONES. Army Type D, Mk. 5. Buzzier calling. Ideal for building farms, shops, etc. Complete with handset and batteries. Tested before dispatch. 38/- each.

SOUND-POWERED HANDSETS. Similar to telephone. Balanced armature microphone and earphones. No batteries required, 10/- each. Breast mike and pr. headphones, as above. 12/- set.

L.H.AN INDICATOR CHASSIS. Complete with SCFU CRT. T.R.F. and screen, but less valves and crystal. New condition, 29/6.

RT37/PP92 BEACON TRANSMITTER-RECEIVER. 21/-23/-

Moss. Size 16in. x 10in. x 6in. Contains 5 S.A.S., 3 L.S., 1 L.B.S., and 2.2v. synchronous vibrators. Operates from 2v. accumulator via 2 built-in vibrators. Complete with telescopic mast, battery system (lift.), lightweight, great headphone, Technician's quality, super-quality carrying haversack, cords, co-ax cables, plugs, etc. Total wt. 2lb 6oz. BRAND NEW, boxed. American equipment, 72/-.

THREE-CORE CABLE. 23/-6/-, ribbon ins., circular, padded, cotton covered, maroon, 12 yrs. 9/- or 100 yrs 58/-.

RCA SPEAKERS. An 8in. F.M. unit contained in beautiful black crank cabinet, suitable for ARTE, etc. BRAND NEW. Price only 45/-.

DUAL VOLTAGE BLOWERS. 12- and 24 v. Ideal for hair dryer car heaters, etc. 5/- plus 2/- postage.

INSTRUMENT TRANSFORMERS, Paramoko. 230 v. A.C. input, 6-45-150-500 v. a.m. 5/5, 5-5 Amp, 6.5 v. 3 Amp output. Shaved, 3in. x 3in. x 2in. Wt. 6oz. Well made. HEAVY DUTY L.T. TRANSFORMERS. 300-250 v. A.C. 14 in. 10 v.30 v. input at 10 v. 30 Amps output. 5in. x 6in. x 7in. high, wt. 23 lb. 6oz.

TECHNICAL TRADING Co.


TAPE RECODER CASES. Blue velvet. Mingled 2id, carrying handle, size 6x6 x 10in., 9, 10 lb. 6/6. 25. Light, beige, de luxe, top famous make. 45/- carr. 4/-.

RECORDAT TURBO SUPERHET, Complete with and Long (both aerial and case) Valves with full instructions. 8/- 10/- Quality Mingled 2id, 45/-.

ALUMINIUM CHASSIS. SMS, 15 oz., 4in. x 6in. 2in., 40/- 5in. x 6in. 2in., 5/- 6in. x 6in. 2in., 6/6. Post 6/-.

INFORMATION. 4F., 22/-6/-6/-, 23/-.

SOUND RECORDING TAPE. Well-known make. 1.25ft. Reel. Big Purchase enables us to sell at 15/- each. Post 6/-.

AVO VALVE TESTERS, 10/6.

TECHNICAL TRADING CO. OPEN 9-12, 1-5, 7, 12. Half Day and Saturday. Please enquire about selecting 6 valves. oscillator, tone generator, sensitivity test 300 mah. meter. 200/250 v. A.U. Power Pack in transit case unused. 5/-12, carr. 7/-.

R.F.M. RECEIVERS—Consisting of same 6 valve sensitive chassis, latest miniature valves, 2 x 4 Elliptical speaker, beautiful cabinet. Listed 6/8, our price 21/- complete, carr. paid. CESSORE D. B. SCOPE, very good condition, 11/-.

RESPONDER RECEIVERS. Listed T.F. M. in our new list, 7/- 9-valve, 10/-15/-, 12/6, 12/-6/2. etc. Price 8/-.

TRADING Co. OPEN 9-12, 1-5, 7, 12. Half Day and Saturday. Please enquire about selecting 6 valves. oscillator, tone generator, sensitivity test 300 mah. meter. 200/250 v. A.U. Power Pack in transit case unused. 5/-12, carr. 7/-.

R.F.M. RECEIVERS. Consisting of same 6 valve sensitive chassis, latest miniature valves, 2 x 4 Elliptical speaker, beautiful cabinet. Listed 6/8, our price 21/- complete, carr. paid. CESSORE D. B. SCOPE, very good condition, 11/-.

TECHNICAL TRADING Co.
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 "Suitable for" 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 uF 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 cracking. When the capacitors have failed completely it will be found impossible to peak the I.F. transformers at the correct I.F.
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 counteract this fault.

(Continued on page 637)
NEW! THE PRACTICAL WAY
of learning RADIO · TELEVISION · ELECTRONICS
AMATEUR S.W. RADIO · MECHANICS · PHOTOGRAPHY · CARPENTRY · ETC.

DO IT YOURSELF!
IN YOUR OWN HOME – IN YOUR OWN TIME

An entirely new series of courses designed to teach Radio, Television and Electronic more quickly and thoroughly than any other method. Specially prepared sets of radio parts are supplied, and with these, we teach you, in your own home, the working of fundamental electronic circuits and bring you easily to the point when you can construct and service radio receivers, etc.

Whether you are a student for an examination; starting a new hobby; intent upon a career in industry; or running your own business—these Practical Courses are ideal and may be yours at very moderate cost.

With these outfits, which you receive upon enrolment and which remain your property, you are instructed how to build basic Electronic Circuits (Amplifiers, Oscillators, Power Units, etc.) leading to designing, testing and servicing of Complete Radio and Television Receivers.

Photograph of E.M.I. factories at Hayes—our industrial background.

OTHER COURSES WITH PRACTICAL EQUIPMENT INCLUDE:
- RADIO (Elementary and Advanced)
- TELEVISION MECHANICS
- ELECTRICITY
- CHEMISTRY
- PHOTOGRAPHY
- CARPENTRY.

Also Draftsmanship · Commercial Art · Amateur S.W. Radio · Languages · Simple Electrical Repairs in the Home · Painting and Decorating · Etc · Etc.

With these outfits, you are given instructions that teach you the basic principles in the subject concerned.

NEW TELEVISION COURSE including a complete set of equipment dealing with the design, construction and servicing of a high quality television receiver.

COURSES (with equipment) also available in many other Engineering subjects.

COURSES FROM 15/- PER MONTH

To E.M.I. INSTITUTES, Dept. 32, 43 Grove Park Road, London, W.4.

NAME
ADDRESS

[PROSPECTUS]

SUBJECT(S) OF INTEREST
NOV. (We shall not worry you with personal visits)
MODEL 120A
A small 19-vane instrument ideal for the enthusiastic amateur. Sensitivity is 1,000 p.p.v. A.C. and D.C. Accuracy: 2½ D.C.; 3½ A.C.

RANGES
Volts D.C.: 0-25-50-250-500-1,000, 2,500
Volts A.C.: 0-10-50-250-1,000-2,500

REMARKS
D.C.: 0-10-50-250-1,000-2,500

Resistances: 0-2,000 ohms, 0-200,000 ohms.
Can be extended to 20 megohms. Automatic overload protection fitted to meter movement.

PRICE £9.15.0

PROMPT DELIVERY

CREDIT TERMS: Nine monthly payments of £1.4.4.

TAYLOR ELECTRICAL INSTRUMENTS LTD.
Montrose Avenue, Slough, Bucks.
Telephone: Slough 21381. Cables: Taylins, Slough
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 µF 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 µF 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 µF 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 drafting the "live" generator lead in proximity to the cabinet. On no account must a direct connection be made to the frame aerals 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 200 m 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.

SOMETHING DIFFERENT IN CHRISTMAS GIFTS

Send your friends who are radio-enthusiasts an original and really acceptable Christmas present this year—send a year's subscription for PRACTICAL WIRELESS. For twelve whole months your gift will bring them repeated pleasure, and each new issue will be a renewed reminder of your good wishes.

And no gift could be easier to arrange! Just send your friends' names and addresses with your own remittance to cover (an annual subscription for PRACTICAL WIRELESS—12 issues, including postage, 5/-) to Subscription Manager, PRACTICAL WIRELESS, 123, Southampton Street, Strand, London, W.C.2. We will despatch first copies to arrive in good time for Christmas, together with an attractive Christmas card, made out in your name, to announce your gift.
TELETRON SUPersonic OSCILLATOR COIL
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.

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 (F) and dual cone (M). The prices are:

9710/00 £6.26 (tax paid).
9710/M £6.12.6 (tax paid).
9762/00 £10.0.0.
9762/M £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

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

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 plastic material its hooked ends enable flex to be wrapped round it and held firmly, unwrapping as required. The price is 7d.—F. E. Conway, 3, Mayfair Road, Marion, Blackpool.

NEW 4-WAY SELECTOR
A NEW miniaturised 4-way voltage selector, type BMVS/4, developed from the B9A (Noval) Valveholder, is announced by the McMurdo Instrument Co., Ltd.

The socket is a standard moulded B9A Valveholder in which certain contacts are omitted. The moulded plug is engraved with the appropriate mains voltage figures and is captive to the socket so that it cannot be completely disengaged.—McMurdo Instrument Co., Ltd., Victoria Works, Ashstead, Surrey.
The Tape Recorder
you've been waiting for!

The

TAPE RECORDER

Only

55 gns.

Three hours' recording and playback.

Controllers: knob, 7m; tuning dial, 5m; volume, 3½ in.; trimmers, 3½ in.; and 7m on per second.

Electronic eye. Four erase and record heads. Completely automatic with push-button controls. Lightweight and compact, fitted in handsome suitcase in simulated pigskin, with continental fittings.

This recorder is available on the M.O.S. Personal Credit Plan, providing easy repayment terms and low service charges, payments being over any period up to a maximum of 18 months. Alternatively, CREDIT SALE TERMS are available, repayment being by 9 equal monthly instalments. Send for details.

E. & G. MAIL ORDER SUPPLY CO.

33, Tottenham Court Road, London, W.1.

BENSON'S TUBE BARGAINS

MORSE KITS, large, 7½; small, 5½; Switcher,Knife, large, 10/-; G.P.O. type HANDSETS, new, 10/-; Condensers, BUTTERFLY, 1½ p.; E.C. SPEAKERS, new, 6½ in.; wound metal, grey case, with onoff switch, 2½/- each; Dipole handset, Preface, by Jenkins, 3½/-.

Radio c and d.c., with 10 terminals, 2 knife switches, 2 B.C. holders, 2 fuses, wired, 18½/- (post free).

BRAND NEW Command receivers, 1½-3 mark with 6 valves, 5½/-.

BRAND NEW TACHOGRAPH, S.V. 12 VA. Premium, 7½/-.

Travels 12 to 150 v. 30 mA synch., unmounted, 10½/-; 12 to 250 v., 60 mA, mounted, 10½/-.

(5 P.P. 30/- each). RXS 111-114, (triple valve with 3/F91). 2/F91, 2 gang tuner, new, 3½/-.

Central Motor, tuning, 7½-10½ v. 1400 v. 2500 r.p.m, 7½ p. r. m. with governor (Gardner). 3½/- (post 3½/-).

RHYTHM, 2½ in. geared to 1 r.p.m, final, new, 2½/-; Synch., 100/250 v. 15vA, 10/-.

SEPTEMBER radio interference, ex-A.M. 5½/- post 5½/-.

BRAND NEW UNITS, TYPE F94 or 27, 27½, 276, RFP1, RFP5, 10½/- (post 7½/-).

DYNA MOTORS (Post 3½/-).

HODDSSTONE 1½ v. 190 v. 75 mA., used, 15½/-.

15½/- new, 10½/- R.M. 1½ v. 250 v., 50 mA., used, 15½/-.

15½/- new.

2½ A. 10½/- CLOCKWORK Contacts, 2 impellers per sec. 2½/-.

USA type, small, 6½/-.

Throat nets, U.S.A., new, 2½/-.

METAL RECTIFIERS, Lead, 2½ v. 600 mA., 4½/-.

Carm, 2½ v. 600 mA., 1.25 v. 600 mA., 5½/-.

1½ v. 600 mA., 1½/-.

9½/-.

1½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.

9½/-.

1½/-.
I CAN'T FIND WHAT I'M LOOKING FOR - WE'VE WASTED MY TIME AND I'M JUNK!

I can't DO our NEVER BEFORE ADDRESS. Please send me, J & E. Eye superhet 406.

CONSTRUCTOR'S HANDBOOK

Our latest issue is beautifully printed on glossy art paper with a full colour cover! Packed with technical data, set building and servicing hints, facts and formulae, resistance, colour code, soldering hints, etc., together with descriptions, full parts lists and circuits of 22 famous outfits as listed below. Send 2/6 (plus 6d. post.)

- 3-valve superhet Feeder Unit.
- 5-valve superhet Feeder Unit (R.F. stage), with hi-fi and claim, switchable.
- Amplifier/Power pack, for both above.
- 5-valve Superhet A.C. with gain.
- 5-valve Superhet A.C.D.C.
- Simulated Communication Tester.
- Magic Eye unit.
- Modified 40 Feeder Unit Circuit.
- 6-valve Superhet A.C. Superhet.

Our renowned "Easy-as-A.B.C." FULL SIZE Construction Sheets are available FREE with orders enabling even the beginner to get professional results first time!

RODING LABORATORIES
(Dept. TC10) Bournemouth, Poole, Christchurch, Hants

SOUTHERN RADIO'S WIRELESS BARGAINS

TRANSMITTERS. Type "38" (Walkie-Talkie). Complete with 5 Valves. In Metal Carrying Case. Ready for use. Less external attachments, 30/- per set. ATTACHMENTS for use with 38" ; 8-Watt Receiver ; 10-Watt Phone with Lead & Plug, 4/6; JUNCTION BOX, 2/6; AERIAL, 2/6.

TRANSMITTERS. Type "18" Mark III. TWO UNITS (Receiver & Sender) contained in Metal Case. Complete with Six Valves, Microammeter, etc. LESS EXTERNAL ATTACHMENTS, 3/-4d.

RECEIVERS. Type "109" B-Valve S.W. Receiver with VIBRATION PACK for 6 Volts. Built-in Speaker, METAL CASE, £8. BOMBESIGHT COMPUTERS, Ex-R.A.F. BRAND NEW. A Wealth of Components, GYRO MOTORS, REV. COUNTERS, GEAR WHEELS, etc., Ideal for Model Makers, Experimenters, etc., £1.

LUFBA HOLE CUTTERS. Adjustable 3½ in to 3½ in. For Metal, Wood, Plastic, etc., 7/-.

RESISTANCES. 100 ASSORTED USEFUL VALUES. Wire Ended, 10½ per 100. 2½/-. CONDENSERS. 100 ASSORTED. Mica, Metal Tubular, etc., 1½/- per 100. 2½/-. PLASTIC CASES. 14½, x 10½ in. Transparent. Ideal for Maps, Display, etc., 5/-.

STAR IDENTIFIERS. Type I A-N. Covers both Hemispheres, in Case, 5/6.

CONTACTOR TIME SWITCHES. In Sound-proof Case, Clockwork Movement. 2 Impulses per sec. Thermostatic Control, 1½/-.

REMOTE CONTACTORS for use with above, 7½/-. MORSE PRACTICE SET with Buzzer on Base, 6/9. Complete with Battery, 9½/, MOVING LEAD, 6/-; TELEGRAPH METERS & AIRCRAFT INSTRUMENTS. Only need Adjustment or with broken Cases. TWELVE INSTRUMENTS, including 1 brand new Aircraft instruments. 35/-193. 17½, 13½, 10½, 6/-.

CRYSTAL MONITORS. Type 2. New in Transit Case. Less Valves, 8/-.

Postage or Carrie extra. Full List of RADIO BOOKS, 2½d.

SOUTHERN RADIO SUPPLY LTD, 11, LITTLE NEWPORT ST, LONDON, W.2.

GERRard 6653
A 3½in. Oscilloscope

SIR.—The writer was interested in the comments on the push-pull amplifier for the 3½in. 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 added to 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 dealing 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, then in the case of a long-tailed pair where a pentode is used for the coupling resistor, one half of the output voltage 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.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 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.—T. S. BANDERS (Ilford).

SIR.—Regarding "F.M. Results," by G. Prentis, of Ektree, 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. In addition, 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

We CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. WE REGRET THAT WE ARE UNABLE TO SUPPLY DIAGRAMS OR PROVIDE INSTRUCTIONS FOR MODIFYING COMMERCIAL OR SURPLUS EQUIPMENT.

OVER THE TELEPHONE.

WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. WE REGRET THAT WE ARE UNABLE TO SUPPLY DIAGRAMS OR PROVIDE INSTRUCTIONS FOR MODIFYING COMMERCIAL OR SURPLUS EQUIPMENT.

While 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.
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. Prénis waits a little time, he, too, will hear the amazingly clear transmissions, when one can hear music, talks and other programmes, clearly from Q.R.M. I am 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 listeners that he 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 W6 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 metallised 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 (this can be done 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 (G3MHC) (Edinburgh).

Radio Amateurs' Examination

SIR.—Grafton Radio Society announce that they have again made arrangements with the Islington L.C.C. Man Evening Institutes for an official course of instruction for the Radio Amateurs' Examination to be held this winter at Grafton School, Ebune 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 148, 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 spatial sound distribution.
Convert your existing S.W. or broadcast receiver into a first-class communications receiver for the amateur bands. Designed by the manufacturers of the famous R.F. AMMETER, 6J5, NEW AMERICAN MADE MINIATURE VALVE 37, Full manufacturers’ guarantee. \( \text{www.americanradiohistory.com} \)

**PRICE £17 0s. 0d., carriage paid**

Full details on request. Send S.A.E. to THE MINIMITTER COMPANY

37, Dollis Hill Avenue, London, N.W.2

---

**FIRST-CLASS RADIO COURSES**

**GET A CERTIFICATE!**

QUALIFY AT HOME—IN SPARE TIME

After brief, intensely interesting study—undertaken at home in your spare time—**YOU can secure your professional qualification.** Prepare for your share in the post-war boom in Radio. Let us show you how!

---

**FREE GUIDE**


Write now for your copy of this invaluable publication. It may well prove to be the deciding point in your career.

**FOUNDED 1885—OVER 150,000 SUCCESSES**

**NATIONAL INSTITUTE OF ENGINEERS**

(Dept. 461), 148, HOLBORN, LONDON, E.C.I


OSMOR would like you to have Free Practical Wiring Diagrams of the latest 1200, 3200, etc. Shears with full lists of components required. Send 7d. (stamps) to OSMOR RADIO plc., 15, Beverley Rd., Hammersmith, W.6. Croydon. (Croydon 5148.) (See advert., page 631.)

AMERICAN RADIO Plans and Devices: Now available, Hundreds of new and startling devices you can make using devices of this kind. Available in UK. Receivers, Walkie-talkies, Recorders, Radios, etc. Illustrated, Free for stamp. Send to American Radio, (P.W.), Bridgeford, King's Lynn.

LOUDSPEAKERS required promptly. MODEL LOUDSPEAKER SERVICE, Bullington Rd., Oxford.


EX. AIR MINISTRY Identification Units, type RDF No. 5, for sale as new. 326 each unit, each paid. All steel chassis in steel case. with controls, fitted in, plus - only, measurements, 11in. x 7in. x 12in., weight 23lbs. Each unit contains many useful components and following valves: 1 2SK4/1, 1 VR54, 5 VR56, 3 VR60, 3 VR157. From J. A. B. JACOBSEN LIMITED 22, Ritherdon Rd., Baildon, Huddersfield, West Yorks.

ALL TYPES OF unused Valves required for sale. Contact HERMES RADIO, Gloucester, u., Manchester.

B.S.R. Monarch 3-speed Autocarriage Units, new, in maker's sealed carton, guaranteed, complete with instructions, template suspensions. £9 15/- each carriage paid, immediate delivery. TOMLINS, 137, Brucey Rise, Forest Hill, S.E.23.

TELEVISION, 9in. Models. £6 10/-; 13in. Models, £15; all makes working; carriage paid. TOMLINS, 129, Brucey Rise, Forest Hill, S.E.23. (PO 4927.)

BILLHEAD VALUE £8 5 x 5 Blue Cun. £20 7 6s. 3d., 225 0 0 cash payments. £11 6s. 9d., 275 0 0 post paid. £3 11s. 6d., 325 0 0 post paid. £10, 50v. £1, 25v. 

OSMOR NEWS. P.W. Switch-tuned BCB Receiver. £24. Carrying all 'new' circuitry and full information. Available shortly on request. OSMOR RADIO PRODUCTS LTD., 418, Brighton Road, S. Croydon.

IF YOU READ P.W., you should also get the new "WANTED" and "FOR SALE" columns. P.W. £1 first 250 words, 1d per word, thereafter. 1d per word extra. P.W. from the Budget section.

THE HIWAYMAN. A new super Portable Radio for the home constructor: all dry 4-valve superhet and easy wiring diagrams and instructions. 1/6 post paid. D. TAYLOR, 124, Newmarket Rd., Preston.

FOR SALE, 2 VCR Cb Chassis, P.T. 12in. Chassis, valves, etc. Call at 11 Newall Ave, Sandbach, Chesh., after 7 o'clock.

SEND TO-DAY for your stock list of T.V. and Radio Parts, C.R.Z. Valves, Spokers and all Components. Any number of the cheapest people in the trade. All replies are guaranteed. VIDEO ELECTRONICS (LONDON) LTD., 3 Euston Road, W1, 18/22, Euston Road, London, N.W.1.

COSSOR 243 Ganging Oscillator. Pre P.C.R. 25% to AC mains. Box No. 278, c/o PRACTICAL WIRELESS.

FOR SALE, 2 VCR 97 Chassis, P.T. 12in. Chassis, valves, etc. Call at 11 Newall Ave, Sandbach, Chesh., after 7 o'clock.

SEND TO-DAY for your stock list of T.V. and Radio Parts, C.R.Z. Valves, Spokers and all Components. Any number of the cheapest people in the trade. All replies are guaranteed. VIDEO ELECTRONICS (LONDON) LTD., 3 Euston Road, W1, 18/22, Euston Road, London, N.W.1.

COSSOR 243 Ganging Oscillator. Pre P.C.R. 25% to AC mains. Box No. 278, c/o PRACTICAL WIRELESS.

EX. AIR MINISTRY Identification Units, type RDF No. 5, for sale as new. 326 each unit, each paid. All steel chassis in steel case. with controls, fitted in, plus - only, measurements, 11in. x 7in. x 12in., weight 23lbs. Each unit contains many useful components and following valves: 1 2SK4/1, 1 VR54, 5 VR56, 3 VR60, 3 VR157. From J. A. B. JACOBSEN LIMITED 22, Ritherdon Rd., Baildon, Huddersfield, West Yorks.

ALL TYPES OF unused Valves required for sale. Contact HERMES RADIO, Gloucester, u., Manchester.

B.S.R. Monarch 3-speed Autocarriage Units, new, in maker's sealed carton, guaranteed, complete with instructions, template suspensions. £9 15/- each carriage paid, immediate delivery. TOMLINS, 137, Brucey Rise, Forest Hill, S.E.23.

TELEVISION, 9in. Models. £6 10/-; 13in. Models, £15; all makes working; carriage paid. TOMLINS, 129, Brucey Rise, Forest Hill, S.E.23. (PO 4927.)

BILLHEAD VALUE £8 5 x 5 Blue Cun. £20 7 6s. 3d., 225 0 0 cash payments. £11 6s. 9d., 275 0 0 post paid. £3 11s. 6d., 325 0 0 post paid. £10, 50v. £1, 25v. 

OSMOR NEWS. P.W. Switch-tuned BCB Receiver. £24. Carrying all 'new' circuitry and full information. Available shortly on request. OSMOR RADIO PRODUCTS LTD., 418, Brighton Road, S. Croydon.

IF YOU READ P.W., you should also get the new "WANTED" and "FOR SALE" columns. P.W. £1 first 250 words, 1d per word, thereafter. 1d per word extra. P.W. from the Budget section.

THE HIWAYMAN. A new super Portable Radio for the home constructor: all dry 4-valve superhet and easy wiring diagrams and instructions. 1/6 post paid. D. TAYLOR, 124, Newmarket Rd., Preston.

FOR SALE, 2 VCR 97 Chassis, P.T. 12in. Chassis, valves, etc. Call at 11 Newall Ave, Sandbach, Chesh., after 7 o'clock.

SEND TO-DAY for your stock list of T.V. and Radio Parts, C.R.Z. Valves, Spokers and all Components. Any number of the cheapest people in the trade. All replies are guaranteed. VIDEO ELECTRONICS (LONDON) LTD., 3 Euston Road, W1, 18/22, Euston Road, London, N.W.1.

COSSOR 243 Ganging Oscillator. Pre P.C.R. 25% to AC mains. Box No. 278, c/o PRACTICAL WIRELESS.
November, 1956  PRACTICAL WIRELESS CLASSIFIED ADVERTISEMENTS 645

THE NEW COLLARO automatic twin track, 2-speed 'Tintin' (and 'Chiffer') is available at PHOTO-OPTIX (LONDON) LTD., Tape Registration Office, 19 Grafton St., Piccadilly, W.2. (P.A.D. 2801.)


FOR SALE

CAR CIGARETTE LIGHTERS, 6 or 12 volt. 7/6 net. 1/2d. postal. ELECTRICAL PRODUCTS. 18, Woodrow Close, Perivale, Middlesex.

WANTED, Valves, EY51, ECL80, KT61, 6U4GT, PL81, 3524, etc, etc., prompt cash. WM. CARVES LTD., 103, North Street, Leam.

ALL TYPES of Valves required for cash. State quantity and condition. RADIO VALVES. 19, Hertford Road, W.Lot 1621. 5/- each. Catalogue free.

VALVES

GUILDS OF RADIO TELEVISION, 10, Clyde Road, London, W.8.

SITUATIONS VACANT

CHIEF TECHNICIAN required by POSTS AND TELEGRAPHS DEPARTMENT, NIGERIA FEDERAL GOVERNMENT. Closing date for receipt of application for appointment is 1st November, 1956.

EDUCATIONAL


CITY AND GUILDS (Electrical, etc.) on "no pass—no fee" terms. Over 95% successes. For details of exams, and courses in all branches of engineering, building, etc., write for 144-page handbook free. B.I.E.T. (Dept. 242A), 29, Wright's Lane, London, W.8.

FREE! Brochure giving details of Home Study Training in Television, and all branches of Electronics. Courses for the Hobby Enthusiast, or those who have a fund of personal mental knowledge of radio or radar wish to give some practical experience. Training courses are provided to give familiarity with the types of equipment used, including practical tests to 2671. The rates are somewhat lower in the U.S.A. Write to GUILDS OF RADIO AND AIR NAVIGATION, 242A, placed on "no pass—no fee" terms. Over 95% successes. Details of exams, and course in all branches of engineering, building, etc., write for 144-page handbook free. B.I.E.T. (Dept. 242A), 29, Wright's Lane, London, W.8.


WIRELESS. See the world as a Radio Officer in the Merchant Navy at short training period; low fees; scholarships, etc., available. Booking and Day Student Stamps. For prospectus WIRELESS COLLEGE, Colwyn Bay.

INCORPORATED Practical Radio Engineers home study courses of Radio and TV Engineering are recognized by the Department of Employment and Labour. Moderate fees to a limited number of students only.

NEW BOOKS

Correcting T.V. Picture Faults, by J. Cura. 3/6, postage 4d.


Amateur Radio Call Book, by R. S. G. B. 2/6, postage 4d.

Beginner's Guide to Radio, by Camm, 7/6, postage 6d.

Radio Reproduction, by Briggs. 17/6, postage 1/3.


UNIVERSAL BOOK CO.

12, Little Newport Street, London, W.C.2 (radioing Little Street)

F M and H IF Components

DENC0 F.M. TUNER circuits 1/6. d.

RADIO CONSTANT M. 2a. 6d.


G.E.C. 912 PLUS AMPLIFIER 4/6. 6d.

G.E.C. F.M. TUNER 2a. 6d.

Separate prices are available on request.

J. T. FILMER

MYAPPLE ESTATE,

BEXLEY, KENT.

Tel. Bexleyheath 7267.

TRANSFORMERS

Singly or in quantity for radio and T.V. 30% Prompt Delivery.

H. W. FORREST (former) Ltd.

Shirley, Solihull, Warwickshire

EST. 30 years

SHI 2483
ELECTROSURF

In the 1956 EDITION of Our Supa. Handbook "The Home Constructor" incorporating

* R.F. UNIT—Details for Converting your receiver to r.f. operation (full details)
* L.F. STAGE—Adding an L.F. and Selectivity to increase your set's performance
* SIDEBAND—Details for Incorporating a Tone Modulating Indicator for
* CR 100 - Superhet, Unit, Tuning Equipment, etc.
* SUPERHET—Full construction, layout and point-to-point wiring diagrams for building a variety of receiving sets.
* COIL PACK—Full construction superhet coil for building a
* C.W. RADIO—Full construction
* ATTUNER—Details for building a "CHEAP" tuner
* H.F. TRANSFORMER, - Pagae of Information, Construction, Scale. Cables and H.F. Transformers
* CATALOG—Fully illustrated price list of components, for your copy to post.

SUPACOILS (D-99. P. 91.)
21, Markhouse Road, London, E.17

Phone: KEY 8868

Copper Wire
ENAMELLED, TINNED, LITZ, COTTON, AND SILK COVERED. RESISTANCE WIRE, Rotating Iron, 1oz., 2 oz., 8 oz. REELS. All gauges available. B.A. SCREWS, NUTS, WASHERS, soldering tags, eyepins and rivets. ERONITE AND BAKELITE PANELS, TUNNOL ROD, PAXolin TYPE COIL FORMERS AND TUBES. All diameters. Latest Radio Publications. SEND STAMP FOR LISTS.

SPECIAL OFFER
G.E.C. & B.T.H.
GERMANIUM CRYSTAL DIODES
1/- each. Postage 2d.

Diagrams and three Crystal Set Circuits Free with each diode. A large purchase of these fully GUARANTEED germanium diodes by the manufacturers enables us to make this attractive offer.

CRYSTAL SET
INCORPORATING THE 'SILICON CRYSTAL'

Adjustable iron Cored Coil.
RECEPTION GUARANTEED
Polished wood cabinets, 15/-, post 1/3.
A REAL CRYSTAL SET, NOT A TOY.

POST RADIO SUPPLIES
33 Bourne Gardens, London, E.4

ILLUSTRATED CATALOGUE No. 10
6d. Post free

New, guaranteed components by the leading makers. 56 pages illustrated on art paper. Over 2,000 items listed. Special features for service work. Orders dealt with day received.

SOUTHERN RADIO & ELECTRICAL SUPPLIES
SORAD WORKS, REDLYNCH, SALISBURY.

Telephone: Downtown 207.

Morse Code operating . . . . . . . . . . as a PROFESSION
45 years of teaching Morse Code is proof of the efficiency of the Candler System. Send 2d. stamp for Paper and Full Details of All Courses.

CANDLER SYSTEM CO. Dept. 140
205, 1st. Ave., Denver, Colorado, U.S.A.
**PRACTICAL WIRELESS**

**GRAM-PAK AMPLIFIERS**
Complete £3.19.6 P & P 29d.
This midget 4-watt amplifier fits neatly into any record player leaving ample room for needle and T.C. Plus. Suitable with any speaker and all modern crystal 3-speed pick-ups. Per 200-200 o/a C: Perfect, distortionless, quality guaranteed.

**ACCESSORIES:**
- T x 4' elliptical speakers, 19d. 6d.
- BSR 3-speed player unit with above P.U. £2.12.6d.

The complete outfit ready for your cabinet, £10.0.0 post free.

**ELECTRO-AcouSTIC LABS.**
TAIN: ROSS-SHIRE: SCOTLAND

**SPARKS’ DATA SHEETS**

**CONSTRUCTIONAL SHEETS OF GUARANTEED TESTED RADIO DESIGNS.**

**FOUR NEW DESIGNS.**

**CONSTRUCTIONAL SHEETS OF GUARANTEED TESTED RADIO DESIGNS.**

**AN ALL TIMES FIRST BY K & M:-**

Push pull Direct coupled amplifiers with the following features:
- Direct coupling over three valves.
- Simple, heavy negative feedback.
- Zero phase shift from lowest to highest frequency.

The construction of two amplifiers of the above specification are described in our new book.

**DIRECT COUPLED PUSH-PULL AMPLIFIERS BY OUR TECHNICAL STAFF.**

Price 2/6 from local bookseller or 2/9 post free.

All components for 10 W or 20 W models available from stock.

**KENDALL & MOUSLEY LTD.**
18, Melville Road, Edgbaston, Birmingham, 16.

**T.C.R.C.**

**POSTAL COURSES**

**RADIO TELEVISION MATHEMATICS**

Backed by 23 years’ success

Write for free booklet W

**T/C RADIO COLLEGE**

DUART HOUSE, AYSHFIELD, NEW MILTON, HANTS.

**FIDELIA**

**HAND BUILT RADIO UNITS**

**THE FIDELIA MAJOR**

AM/FM models give reception of AM, F.H. high quality transmissions plus normal wavebands. Major £21.12.0 valves, £12.0.0.

AM/FM £11 valves, £3.12.0 F.M. Tuner, £1.10.0. Data sheets free.

Electro Acoustic Development Ltd.

**ALL CORRESPONDENCE TO THE TELETRON CO. LTD.**
266, Nighthingale Road, London, N.W.2527

**TELETRON FERRITE ROD AERIALS**

Wound on high permeability ferric oxide rod. MW, 8/9; Dual-wave, 12/9.

**TRANSISTOR COILS.**
- 315 kcf, I.F. & Oxo coils in cans (1 1/4 in.). £4/6 each, MW. Transistor Ferrie Aerial (type FMA12), 10/- each.

Stamps for complete list and circuits.

**THE TELETRON CO. LTD.**
266, Nighthingale Road, London, N.W.2527

**GRAM-PAK AMPLIFIERS**
Complete £3.19.6 P & P 29d.

This midget 4-watt amplifier fits neatly into any record player leaving ample room for needle and T.C. Plus. Suitable with any speaker and all modern crystal 3-speed pick-ups. Per 200-200 o/a C: Perfect, distortionless, quality guaranteed.

**ACCESSORIES:**
- T x 4' elliptical speakers, 19d. 6d.
- BSR 3-speed player unit with above P.U. £2.12.6d.

The complete outfit ready for your cabinet, £10.0.0 post free.

**ELECTRO-AcouSTIC LABS.**
TAIN: ROSS-SHIRE: SCOTLAND

**SPARKS’ DATA SHEETS**

**CONSTRUCTIONAL SHEETS OF GUARANTEED TESTED RADIO DESIGNS.**

**FOUR NEW DESIGNS.**

**CONSTRUCTIONAL SHEETS OF GUARANTEED TESTED RADIO DESIGNS.**

**AN ALL TIMES FIRST BY K & M:-**

Push pull Direct coupled amplifiers with the following features:
- Direct coupling over three valves.
- Simple, heavy negative feedback.
- Zero phase shift from lowest to highest frequency.

The construction of two amplifiers of the above specification are described in our new book.

**DIRECT COUPLED PUSH-PULL AMPLIFIERS BY OUR TECHNICAL STAFF.**

Price 2/6 from local bookseller or 2/9 post free.

All components for 10 W or 20 W models available from stock.

**KENDALL & MOUSLEY LTD.**
18, Melville Road, Edgbaston, Birmingham, 16.

**T.C.R.C.**

**POSTAL COURSES**

**RADIO TELEVISION MATHEMATICS**

Backed by 23 years’ success

Write for free booklet W

**T/C RADIO COLLEGE**

DUART HOUSE, AYSHFIELD, NEW MILTON, HANTS.

**FIDELIA**

**HAND BUILT RADIO UNITS**

**THE FIDELIA MAJOR**

AM/FM models give reception of AM, F.H. high quality transmissions plus normal wavebands. Major £21.12.0 valves, £12.0.0.

AM/FM £11 valves, £3.12.0 F.M. Tuner, £1.10.0. Data sheets free.

Electro Acoustic Development Ltd.

**ALL CORRESPONDENCE TO THE TELETRON CO. LTD.**
266, Nighthingale Road, London, N.W.2527

**TELETRON FERRITE ROD AERIALS**

Wound on high permeability ferric oxide rod. MW, 8/9; Dual-wave, 12/9.

**TRANSISTOR COILS.**
- 315 kcf, I.F. & Oxo coils in cans (1 1/4 in.). £4/6 each, MW. Transistor Ferrie Aerial (type FMA12), 10/- each.

Stamps for complete list and circuits.

**THE TELETRON CO. LTD.**
266, Nighthingale Road, London, N.W.2527
BUILD YOUR OWN TAPE RECORDER NOW with the "ASPDEN" Tape Deck and Amplifier Kits

TAPE DECKS
Compact model 521, 5 in. reels £7 10s.
Standard Model 721, 7 in. reels, kit. £8 10s.
Two speed, twin track, precision machined parts, easy to assemble, full assembly drawings and instructions, finest motor. Either deck fully built and tested, 27½ extra.

AMPLIFIER:
Record/replay, 21 watts, neon indicator, 2 recording positions, kit. £5 18s.
Power pack for above kit, £2 18s (both without valves).
Carr. & packing extra.

"Congratulations on this excellent Tape Deck at such a low price." — GD3UB, I.O.M.
Send stamp for full details to:
W. S. ASPDEN 10, Market St., Wesham, KIRKHAM, LANCs.

FREE To AMBITIOUS ENGINEERS!
This 144-page Book
Have you sent for your copy?

"ENGINEERING OPPORTUNITIES" is a highly informative guide to the best-paid Engineering positions. It tells you how you can quickly prepare at home on NO PASS—NO FEE terms for a recognised engineering qualification, outlines the widest range of modern Home-Study Courses in all branches of Engineering and explains the benefits of our Employment Dept. If you're earning less than £1 a week you cannot afford to miss reading this unique book. Send for your copy to-day—FREE.

FREE COUPON
Please send me your FREE 144-page "ENGINEERING OPPORTUNITIES"

NAME.

ADDRESS.

Subject or Exam. that interests me

British Institute of Engineering Technology 49B, College House, 23-31, Wright's Lane, Kensington, W.8.

G2AK This Month's Bargains Don't miss this one!
CRYSTAL HAND MICROPHONES
As illustrated, in silver hammer case with polished grlile, handle & 4 feet screened lead ONLY 21s.

ABSORPTION WAVE METERS 3.00 to 35.00 Mc/s in 3 switched bands, 3.5, 7, 14, 21 and 28 Mc/s Ham bands marked on scale. Complete with indicator, b.f. MUST for any Ham Shack.
ONLY 15s. each p. & p. 1s.

AERIAL WIRE. Copper, 7/25 stranded : 140ft., 10-70ft., 8/-; Hard Drawn 14g., 140ft., 17-70ft., 8/- B & P. & 2/


CONDENSERS. Bf 600 v. Tropic. 750 v. normal condensers. NEW, ex.W.D. stock, 5/-, 8/-, 1/-.


FLASH!!! EDDYSTONE 888.
New Ham Band only Receiver.
JUST OUT! Send s.a.e. for details.

COMMUNICATIONS RECEIVER 1155.—The famous Bomber Command Set. Covers 15-7.5 Mc/s, 2.5-3.0 Mc/s, 1,000-600 k.c/s, 500-200 k.c/s, 200-25 k.c/s. B-Model with slow motion tuning. ONLY £10.10.0, tested workshop before dispatch and supplied with 74-page book with which gives technical information, circuits, etc. (available separately 1/6.)

A.C. MAINS POWER PACK UNIT STAGE. In black metal case. Each chassis receiver to be operated immediately by hand plugging in. Supplied with built-in speaker £5.5.0 or LEIS speaker £4.15.6. Deduct 10/- if purchasing RECEIVER & POWER PACK TOGETHER.
Add carriage costs of 10/6 for receiver, 5/- for power pack.

AMERICAN "COMMAND" RECEIVERS.—Large purchase from the Air Ministry. These famous domestic receivers which can be used for a variety of purposes are offered at ridiculously low prices while stocks last. Complete with 6 metal valves per sub-group, 1 of each of 12AS7, 12BA, and 3 of 12AT7. In aluminium case size 11" x 8" x 6". Used, but in very good condition, although cases may be somewhat dented. Circuits supplied. Five come first served. Choice of models. BCO45 (60-watt), BC604 (125-watt). £10.10.0, the renowned "Q" (Five), £5.10.0, and a few of the 1-5.0 mola. model 658. (Carrige, etc., 9/6.)

COLLINS T.S.S TRANSMITTER.—Special offer of these famous American Transmitters. Frequency ranges 1-1200 m.e. in 9 bands. Employs 7 valves, 3 of 1228 in P. A. Stage, 12B6 buffer and 12LD modulator Stage, 20 LD4A in oscillator Stage. Radio telephone or radio transmitter. Provision for VFO or Crystal Control. Pays plate and serial current meters. IN BRAND NEW CONDITION. ONLY £12.10.0. Matching receivers available £8.10.0, THE PAIR £20. (Carriage, etc., 10/6.)

CLASS D WAVE-METER
Another purchase of this famous crystal-controlled wave-meter which has been repeatedly reviewed and recommended in the "B.A.R.B." Bulletin as being suitable for amateur Transmitters. Covers 1-900 Mc/s. and is complete with 100/1000 inch crystal, 3 valves E50CE, two 6-volt vibrations and instruction manual. For 125/- (FOC), D.C. operated by battery. "A.C. COMPARE BRAND NEW IN. MARKET'S TRANSMIT CASES. ONLY £5.10.0. Transformer for A.C. modulation 7/-."

U.E.I. CORPORATION (185, Grey's Inn Road, London, W.C.1, Phone: TEM/8790)
Open until 1 p.m. Saturday (14th), 2 mins. from High Holborn (Chancery Lane Station), and 5 mins. by bus from Kings Cross.
# Practical Wireless

## Practical Wireless Service

### PRACTICAL WIRELESS

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>BLUEPRINT NUMBER</th>
<th>CRYSTAL SETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1st ed. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1937 Crystal Receiver PW93*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The &quot;Pyramid&quot; One-valver (HF Pen) PW93*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Modern One-valver PW93*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Signet Two (D &amp; LF) PW76*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modern Two-valver (two band receiver) PW98*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summit Three (HF Pen, D Pen) PW26*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The &quot;Rapide&quot; Straight 3 (D, 2 LF (RC &amp; Trans)) PW82*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. J. Camm’s &quot;Sprite&quot; Three (HF, Pen D) PW87*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The All-dry Three PW97*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Four-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fury Four Super (SG, SG, D Pen) PW34C*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mains Operated Two-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selectone A.C. Radiogram Two (D, Pow) PW19*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three-valve: 3s, 6d. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A.C. Band-Pass 3 PW99*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Four-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A.C. Fury Four (SG, SG, D, Pen) PW20*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A.C. Hall-Mark (HF Pen, D, Push Pull) PW45*</td>
</tr>
</tbody>
</table>

### SHORT-WAVE SETS

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>BATTERY OPERATED</th>
<th>SHORT-WAVE SETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Battery Operated</td>
<td>One-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simple S.W. One-valve PW88*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mulget Short-Wave Two (D, Pen) PW38A*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experimenters Short-wave Three (SG, D, Pow) PW30A*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Prefect 3 (D, 2 LF (RC and Trans)) PW63*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Band-spread S.W. Three (HF, Pen D, Pen) PW68*</td>
</tr>
</tbody>
</table>

### PORTABLES

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>PORTABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1s. 6d.</td>
</tr>
<tr>
<td></td>
<td>The &quot;Mini-Four&quot; All-dry (4-valve superhet)</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>MISCELLANEOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2s. each</td>
</tr>
<tr>
<td></td>
<td>S.W. Converter-Adapter</td>
</tr>
<tr>
<td></td>
<td>(1 valve)</td>
</tr>
<tr>
<td></td>
<td>The P.W. 3-speed Autogram (2 sheets) 7s. 6d.</td>
</tr>
<tr>
<td></td>
<td>The P.W. Monophonic Electronic Organ (2 sheets) 7s. 6d.</td>
</tr>
</tbody>
</table>

### TELEVISION

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>TELEVISION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The &quot;Argus&quot; (6in, C.R. Tube) 2.6</td>
</tr>
<tr>
<td></td>
<td>The &quot;Super-Visor&quot; (3 sheets) 7.6</td>
</tr>
<tr>
<td></td>
<td>The &quot;Simplex&quot; 3.6</td>
</tr>
<tr>
<td></td>
<td>The P.T. Band III Converter 1.6</td>
</tr>
</tbody>
</table>

### AMATEUR WIRELESS AND WIRELESS MAGAZINE

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>AMATEUR WIRELESS AND WIRELESS MAGAZINE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BATTERY OPERATED</td>
</tr>
<tr>
<td></td>
<td>One-valve: 2s.</td>
</tr>
<tr>
<td></td>
<td>B.B.C. Special One-valve</td>
</tr>
<tr>
<td></td>
<td>Mains Operated</td>
</tr>
<tr>
<td></td>
<td>Two-valve: 2s. each</td>
</tr>
<tr>
<td></td>
<td>Consolcent Two (D, Pen, A.C.)</td>
</tr>
</tbody>
</table>

### SUPERHETS

<table>
<thead>
<tr>
<th>No. of Blueprint</th>
<th>SUPERHETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Battery Sets: 2s. each</td>
</tr>
<tr>
<td></td>
<td>F. J. Camm’s 2-valve Superhet</td>
</tr>
<tr>
<td></td>
<td>Mains Operated: 3s. 6d. each</td>
</tr>
<tr>
<td></td>
<td>&quot;Coronet&quot; A.C.4</td>
</tr>
<tr>
<td></td>
<td>AC/DC &quot;Coronet&quot; Four PW101*</td>
</tr>
</tbody>
</table>

### SPECIAL NOTE

These blueprints are drawn full size. The issue contains descriptions of these sets are now out of print, but an asterisk denotes that constructional details are available, free with the blueprint.

The index letters which precede the blueprint number indicate the periodical in which the description appears. Thus P.W. refers to PRACTICAL WIRELESS, A.W. to Amateur Wireless, W.M. to Wireless Magazine.

Send (preferably) a postal order to cover the cost of the blueprint stamps over 6d. unacceptable to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

### MISCELLANEOUS

**ENTHUSIAST’S POWER AMPLIFIER** (10 Watts) (3/1) WM387*

**LISTENER’S 5-WATT A.C. AMPLIFIER** (3/1) WM392*

**DE LUXE CONCERT A.C. ELECTROGRAPH (2/1) WM403**

### QUERY COUPON

This coupon is available until Nov 6th, 1956 and must accompany all Queries. We cannot deal with any correspondence with regard to topics which we do not mention. In all cases please give the name of the company, magazine, or periodical that you wish to discuss. This does not include "Amateur Wireless" and "Radio News" which are dealt with in the section "Amateur Wireless and Wireless Magazine."
THE "WEYRAD" AM/FM RECEIVER
A COMPLETELY NEW DESIGN SPECIALLY DEVELOPED
.. FOR THE AMATEUR CONSTRUCTOR ..

This publication gives full information on the Assembly and Alignment of a Four-Band Seven-valve Receiver, including All Chassis details, Circuits and Wiring Diagram.

Up-to-the-minute components and valves provide a high standard of performance (equivalent to an eight-valve circuit) and complete coverage of the sound broadcast bands, ensuring that the set will not "date" for many years.

★ Latest Type Mullard Valves
★ "Weyrad" Coil Pack, I.F. Transformers, Tuning Scale, I.F. Filter, Mains and Output Transformers
★ Aluminium Chassis available with all punching and bending complete
★ All Condensers, Resistors and other components by well-known manufacturers

FULLY ILLUSTRATED BOOKLET, PRICE 2s. 6d.

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