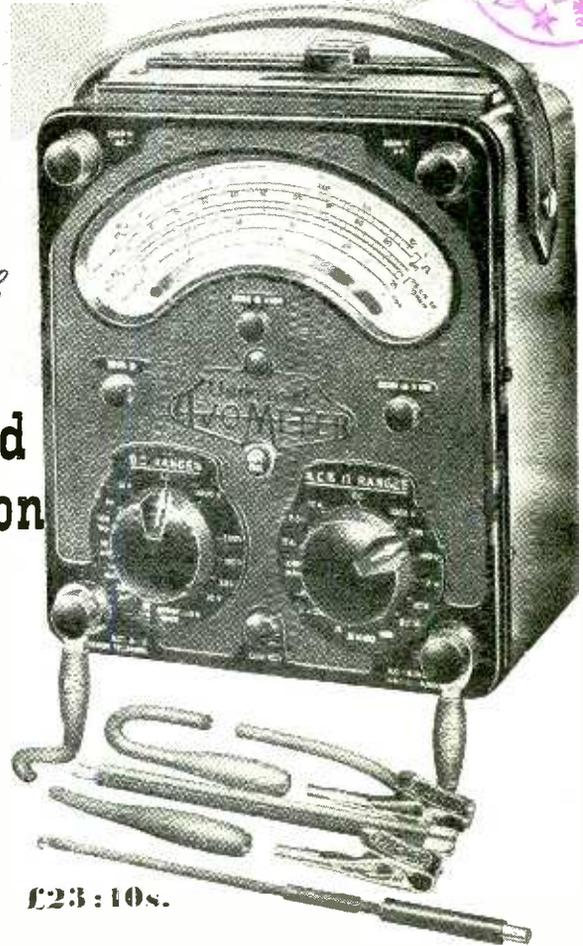


**20,000 ohms
per volt plus
AUTOMATIC Overload
Protection**

Produced in response to a demand for a high sensitivity version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability.

It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100V. upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials, both positive and negative, about a common reference point. A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.



£23:10s.

Size $8\frac{1}{8}'' \times 7\frac{1}{2}'' \times 4\frac{1}{2}''$
Weight $6\frac{1}{2}$ lbs. (including leads)

For your Valve Characteristic Meter or Valve Tester

Owing to the very large number of valves which have been issued within the last two years, no further amendments will be issued for the original "Avo" Valve Testing Manual. A new, completely revised and fully up-to-date Valve Data Manual is now available from the Company at 15/- post free.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT
2.5V.	50μA.	2.5V.	100mA.
10V.	250μA.	10V.	1A.
25V.	1mA.	25V.	2.5A.
100V.	10mA.	100V.	10A.
250V.	100mA.	250V.	—
1,000V.	1A.	1,000V.	—
2,500V.	10A.	2,500V.	—

RESISTANCE	
First indication 0.5Ω.	{ using internal batteries. } { using external batteries. }
Maximum indication 20MΩ.	
0—2,000Ω	
0—200,000Ω	
0—20MΩ	
—20MΩ	

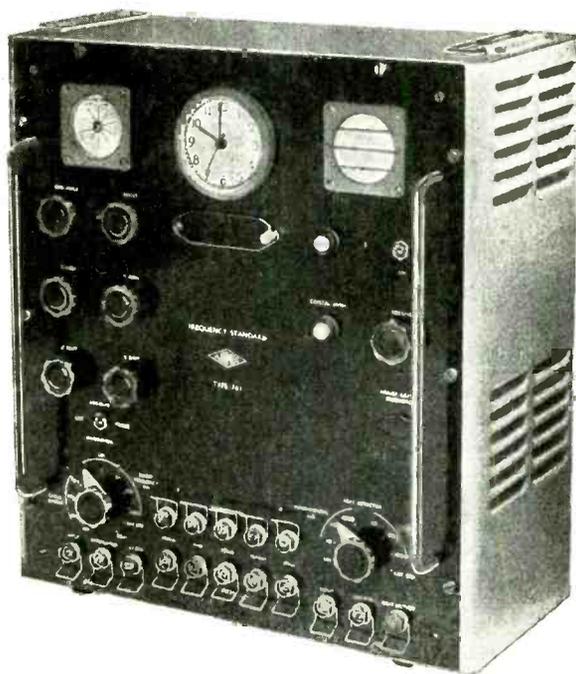
THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON S.W.1 Telephone VICTORIA 3404-9





FREQUENCY STANDARD

TYPE 761



THE AIRMEC FREQUENCY STANDARD TYPE 761 has been designed to fill the need for a self-contained frequency standard of moderate cost and high accuracy. It incorporates an oscilloscope for visual frequency comparison, and a beating circuit and loudspeaker for aural checking. A synchronous clock, driven from a voltage of standard frequency provides a time standard and enables long time stability checks to be made.

- **Master Oscillator :** Crystal-controlled at a frequency of 100 kc/s. The crystal is maintained at a constant temperature by an oven.
- **Outputs :** Outputs are provided at 100 c/s, 1 kc/s, 10 kc/s, 100 kc/s and 1 Mc/s.
- **Waveform :** The above outputs are available simultaneously with sinusoidal or pulse waveforms from separate plugs.
- **Stability :** Four hours after switching on a short term stability of better than 1 part in 10^6 is obtained.

Full details of this or any other Airmec instrument will be forwarded gladly upon request

AIRMEC LIMITED

HIGH WYCOMBE : BUCKINGHAMSHIRE : ENGLAND

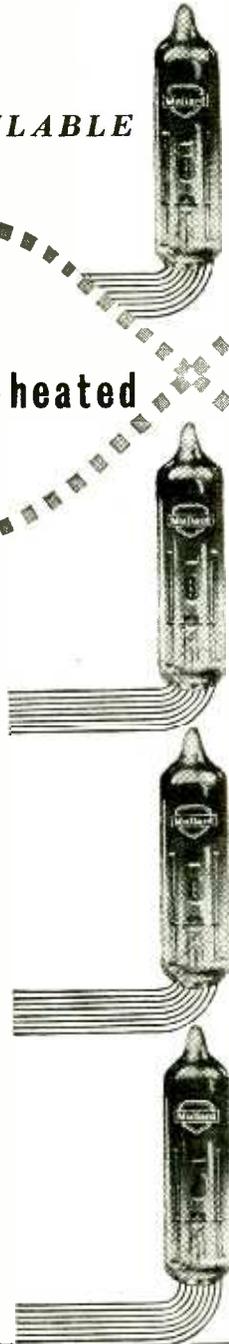
TEL. HIGH WYCOMBE 2060

CABLES: AIRMEC. HIGH WYCOMBE

AVAILABLE SOON FOR COMMERCIAL PURPOSES

indirectly-heated

subminiatures



These new Mullard indirectly-heated subminiature valves, characterised by their extremely robust construction, excellent electrical performance, low heater consumption and small physical dimensions, will shortly be made available for commercial electronic equipments.

Developed originally for Service applications such as guided missiles and fire control systems, they will provide designers with types specially suited to all electronic applications where space is limited and where shock of impact or high g vibration is encountered.

The electrical performance of these subminiatures is equal to, and in certain cases even better than, that expected from valves of a much greater size. The EF72 R.F. amplifier, for example, which is suitable for use in the first stage of telecommunications receivers, combines many of the qualities of larger low-noise receiver input valves, with the ability to work at higher frequencies.

To enable experimental and development work to be carried out with these indirectly-heated subminiatures, a limited number of samples can be made available now. Designers who require further information are advised to send their enquiries to the address below as soon as possible.

Type No.	Description	Filament or Heater (V) (mA)	$V_a = V_{g2}$ (V)	$-V_{g1}$ (V)	I_a (mA)	I_{g2} (mA)	g_m (mA/V)
EA76	Single diode (5 mm. bulb)	6.3 150	150 (max.)	—	9.0 (max.)	—	—
EC70	U.H.F. triode oscillator	6.3 150	100	2.0	13	—	5.5
EF70	High slope R.F. pentode with short suppressor grid base	6.3 200	100	2.0	3.0	2.5	2.5
EF71	Variable- μ R.F. pentode	6.3 150	100	1.2	7.2	2.2	4.5
EF72	High slope R.F. pentode	6.3 150	100	1.4	7.0	2.2	5.0
EF73	High slope pentode for industrial applications	6.3 200	100	2.0	7.5	2.5	5.25
EY70	Half-wave rectifier	6.3 450	250 (max.)	—	45 (max.)	—	—
DY70	High voltage rectifier (directly heated)	1.25 140	10KV (P.I.V.)	—	2.0 (max.)	—	—

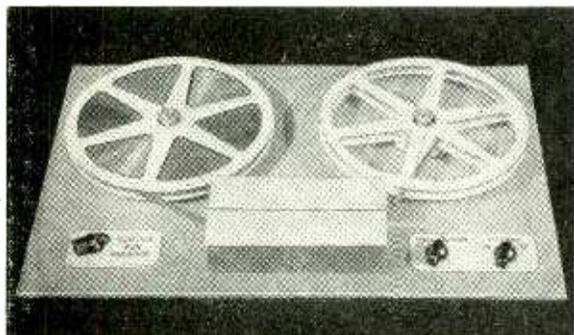
Mullard



Designed for Critics—by Critical Designers

THE
MUSIC MASTER
 T A P E D E S K

- ★ TWO SPEEDS
- ★ INSTANT SPEED CHANGE
- ★ SINGLE SLOT LOADING
- ★ NO TAPE HANDLING
- ★ FAST FORWARD AND REWIND
- ★ TWIN TRACK RECORDINGS
- ★ H.F. ERASE
- ★ HIGH FIDELITY HEADS
- ★ POSITIVE BRAKES
- ★ PRECISION ENGINEERED



	MODEL A	MODEL B
Tape Speeds	15in. & 7½in./Sec.	7½in. & 3½in./Sec.
Track Width		0.1in.
Number of Tracks		Two
Rewind and Forward Time		50 secs.
Playing Time Total	½ hr. & 1 hr.	1 hr. & 2 hrs.
Top Frequency	17 kc/s-10 kc/s.	10 kc/s-5 kc/s.
Bias and Erase Frequency		45-55 kc/s.
Consumption		45 watts.
Cyclic Speed Variations		0.25% max.
Loading		Single Slot.
Motors		Three
Dynamic Range		Better than 60 db.
Supply Voltage		200-250 v. A.C. ONLY.
Top Plate		16½in. x 11½in.

Each MUSIC-MASTER tape desk is supplied with complete operating instructions, and a recommended circuit enabling optimum performance to be secured.

THE **MUSIC MASTER** MODEL A OR MODEL B **£15.15.0**
 T A P E D E S K
 (Carr. & Pkg. 5/- extra)
 Delivery Ex-Stock

FURTHER INFORMATION AVAILABLE ON RECEIPT OF STAMPED ADDRESSED ENVELOPE

DEMONSTRATIONS

We shall be pleased to demonstrate equipment—without obligation—to callers at our Hounslow Showroom.

EXPORT

An expert packing department specialises in prompt despatch by air or sea of all overseas orders.

Export enquiries receive immediate attention and your enquiries are cordially invited.

THE ABOVE PRODUCT IS ONLY OBTAINABLE DIRECT FROM THE MANUFACTURERS.

TRUSOUND LTD.

Manufacturing Electronic Engineers.

OFFICES & SHOWROOM: 196, Kingsley Road, Hounslow, Middx. Telephone: HOUnslow 7947.

WORKS: Willesden, London, N.W.2.

(All orders and enquiries should be sent to the offices as above.)

Terms of business: remittance with order only.



FAULTLESS FLUXING

GIVES

PRECISION SOLDERING

DEMANDS **Superspeed**

* Enthoven Superspeed has a continuous stellate core of ACTIVATED Rosin which gives an exceptionally high wetting and spreading power, enabling the flux and solder to be drawn rapidly by the force of capillary attraction into restricted spaces, even in the vertical plane. The activating agent volatilizes at soldering temperature.

* The distinctive stellate core ensures a more rapid release of flux and therefore immediate wetting by the solder, at moderate soldering-bit temperatures that lessen the risk of alteration to the

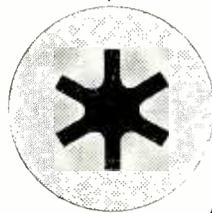
electrical and mechanical properties of components.

* The flux in Enthoven Superspeed is always released in exactly the correct proportion. Dry and H.R. joints due to under-fluxing or overfluxing cannot occur. One application of Superspeed always does the job effectively.

* The residue from Superspeed flux is non-corrosive and non-hygroscopic. It solidifies immediately to a hard, transparent film of high dielectric strength and insulation resistance.

SAVES TIME, CUTS COSTS

Superspeed

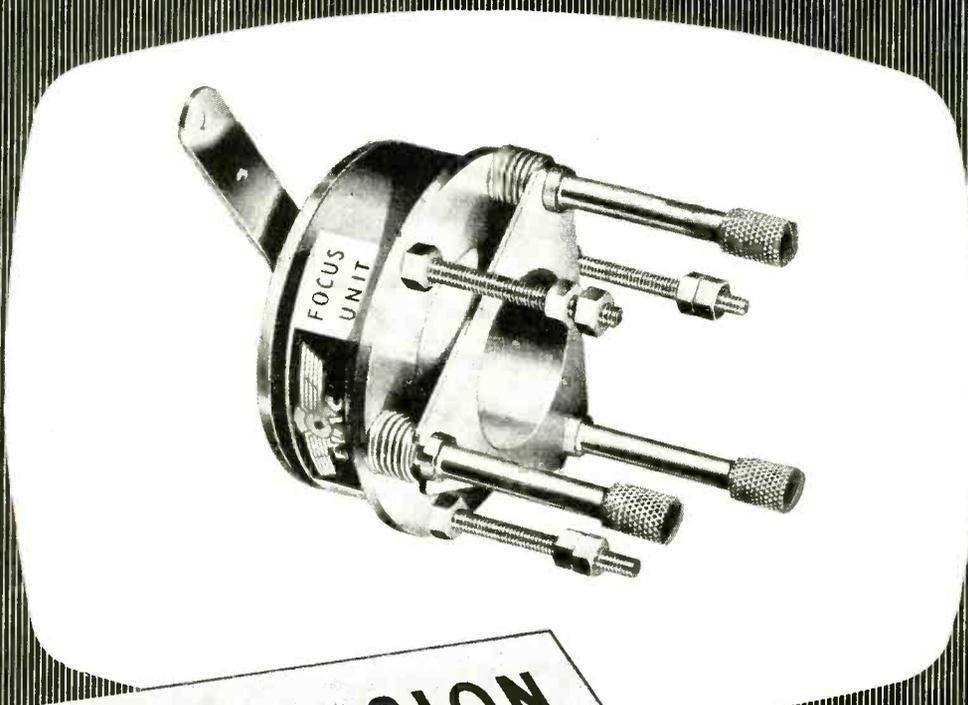


AN ENTHOVEN PRODUCT

"WHITE FLASH" activated rosin-cored solder for general electrical, electronic and telecommunication work, and all standard uses. A.I.D. and G.P.O. approved. Complies with M.O.S. Specification DTD 599.

ENTHOVEN SOLDERS LTD.

Enthoven House, 89, Upper Thames Street, London, E.C.4, Tel: Mansion House 4533 will gladly send you their comprehensive Superspeed booklet. Technical advisers are available for free consultation.



TELEVISION COMPONENTS

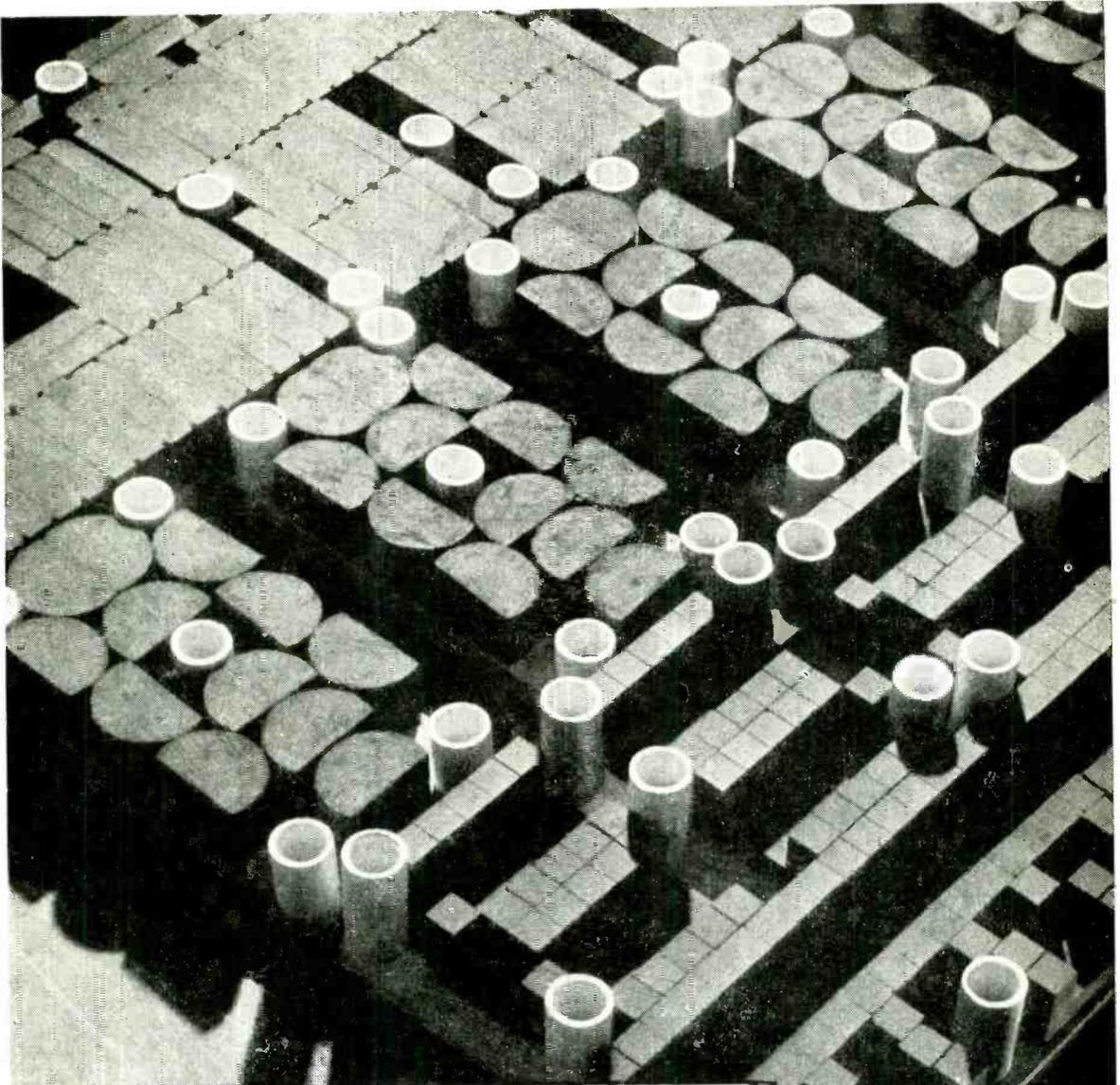
MARK II SERIES "THIN LENS"

P.M. Focus Units provide even focus over the whole tube face giving accurate picture positioning and easy vernier focus adjustment.

TYPE R17/MK.II	for	MULLARD	MW 22-16, MW 31-16, etc.	28/6 LIST
TYPE R20/MK.II	for	BRIMAR	C9B FERRANTI T92, T12/2, etc.....	30/- LIST
TYPE R25/MK.II	for	MAZDA	CRM 121, etc.	32/6 LIST
TYPE W20/MK.II	for	MULLARD	MW 36/22	50/- LIST
TYPE W22/MK.II	for	MULLARD	MW 41/1 ENG. ELEC. T.901	52/6 LIST
TYPE W25/MK.II	for	BRIMAR	C14 BM, C17 BM	57/6 LIST

ELECTRO ACOUSTIC INDUSTRIES LTD.

STAMFORD WORKS, BROAD LANE, TOTTENHAM, N 15 Tel: STAMford Hill 5606-8



MAGNETIC MATERIALS Extensive research and manufacturing facilities have established Mullard as the leading producers of magnetic materials. They were the first, for example, to introduce Ferroxcube, the world's most efficient magnetic ferrite; 'Ticonal' anisotropic permanent magnets, renowned for their high stability and high energy output; and Ferroxdure, an entirely new type of permanent magnet with the insulating properties of a ceramic.

The wealth of experience gained from these developments is available to all users of magnetic materials through the Mullard advisory service. An enquiry to the address below will put a team of specialised engineers at your disposal.



Mullard

'TICONAL' PERMANENT MAGNETS · FERROXDURE PERMANENT MAGNETS
FERROXCUBE MAGNETIC CORE MATERIAL

MULLARD LTD., COMPONENT DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON W.C.2.

Mullard Ferroxdure permanent magnets ready for firing.

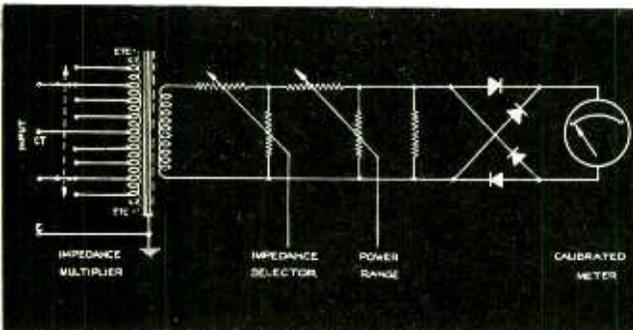
Exceptional impedance range

With forty-eight impedance steps from 2.5Ω to $20,000\Omega$ for balanced inputs—and a similar number for unbalanced at one-quarter the impedance—the instrument is ideal for optimum load matching. Two important design features play a great part in this meter's excellent performance over so wide a range of impedance. First, the use of a resistance network* to select the significant figures of the input impedance value. Second, decade multiplication of impedance by a transformer with a wound-strip core of anisotropic alloy.

* Brit. Pat. 648,944



Audio Frequency Output Power Meter TF893



RANGE

Power :

20 μ W to 10W in five ranges

Impedance :

0.625 Ω to 20,000 Ω

Frequency :

Practically flat response over range exceeding 500:1

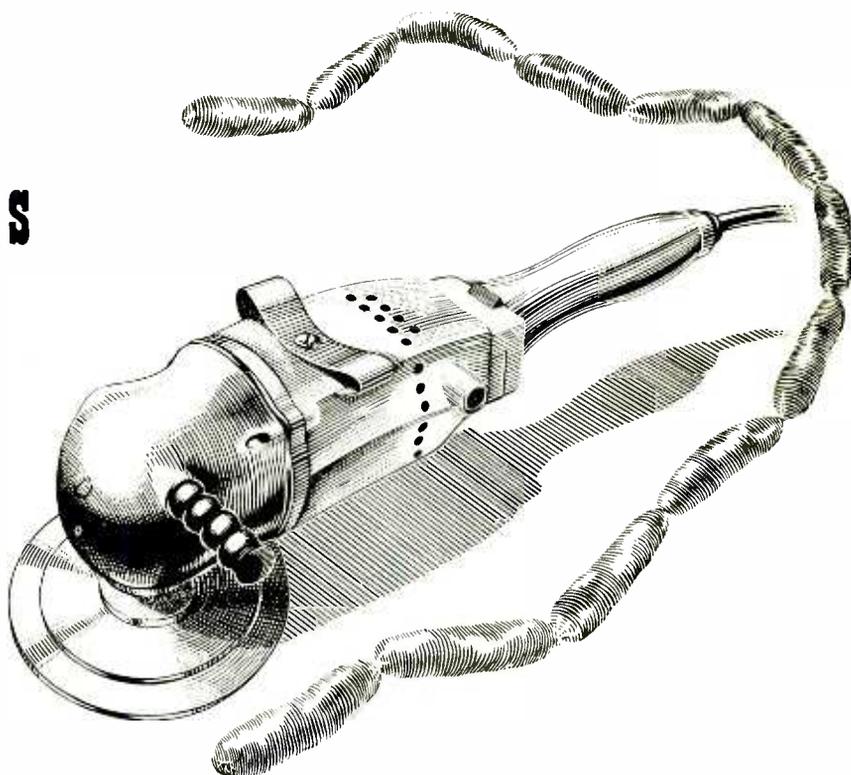
MARCONI INSTRUMENTS

Signal Generators • Valve Voltmeters • Frequency Standards • Bridges • Wave Meters • Wave Analysers • Beat Frequency Oscillators

MARCONI INSTRUMENTS LIMITED • ST. ALBANS • HERTS • Telephone: St. Albans 6161/7

Midland Office: 19 The Parade, Leamington Spa. **Northern Office:** 30 Albion Street, Hull. **Export Office:** Marconi House, Strand, London, W.C.2

Sausages and Sanders



Here, in the sausage and the sander, there is no similarity in appeal or use, yet in this modern age, when electricity is the universal handmaiden, there is a common bond — the switch.

Whether in the preparation of food or in industrial processes, the basic control of electrical appliances can be effected with complete dependability by one of the range of N.S.F.-Cutler Hammer Switches. †

In electronic and electrical equipment involving circuit selection, the N.S.F.-Oak Switch has achieved equal success under the most exacting conditions of operation.

For similar duties, where remote control is necessary, the combination of the N.S.F.-Ledex Rotary Solenoid and N.S.F.-Oak Switches will provide automatic circuit selection unequalled in flexibility and scope.

The N.S.F. - Ledex Rotary Solenoid can also be used successfully in a wide variety of mechanical devices requiring a high torque, snap action, rotary movement applied through an angle of up to 95°.

Full details of all N.S.F. products are available on request.



Switch to N.S.F. for better switching



N.S.F. LIMITED
KEIGHLEY • YORKS

Phone: Keighley 4221/5

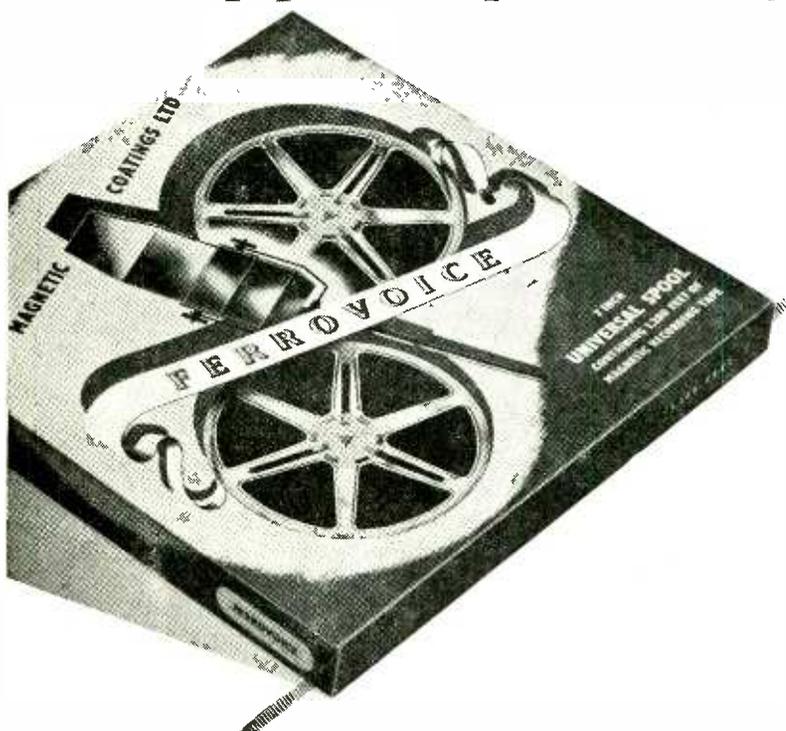
Grams: ENESEF, Keighley

LONDON OFFICE: 9 Stratford Place, W.1. Phone: Mayfair 4234

Sole licensees of Oak Manufacturing Co., Chicago, and G. H. Leland Inc., Dayton, U.S.A.
Licensees of Igranic Electric Co. Ltd, for the above products of Cutler-Hammer Inc., Milwaukee, U.S.A.

The LATEST and IMPROVED TAPE

For all popular tape recording machines



Specially wound on transparent perfectly balanced plastic spools which fit easily to all popular types of tape recorders.

The advantages of FERROVOICE are now available to all.

FERROVOICE improves the performance of all recorders. It provides twin-track recording of the highest standards of quality and faithfulness. Tape wear and rotation noises are reduced to the minimum.

FERROVOICE is the most modern and most efficient tape available.

It brings to all tape recorders the highest standards of recording and reproduction.

NOTE THESE OUTSTANDING FEATURES

- ★ TWIN TRACK RECORDING WITH UNIFORM RESPONSE
- ★ HIGH PLAY-BACK LEVEL AND LOW NOISE COMPONENT
- ★ LIGHT WEIGHT PRECISION BALANCED SPOOL
- ★ FERROVOICE SPOOLS KEEP WEAR, TEAR AND ROTATION NOISE TO A MINIMUM

TECHNICAL FEATURES:

Super Calendered Kraft Paper—breaking strain approximately 4 lbs.—Tape width 0.247 in. ± 0.001 in. Medium coercivity—Ease of erasure—Frequency response 50 c/s to 10 Kc/s at 7½ ins per second

PRICE

22'6

RETAIL

FERROVOICE REGD

The Tape YOU will ultimately use

Trade enquiries invited

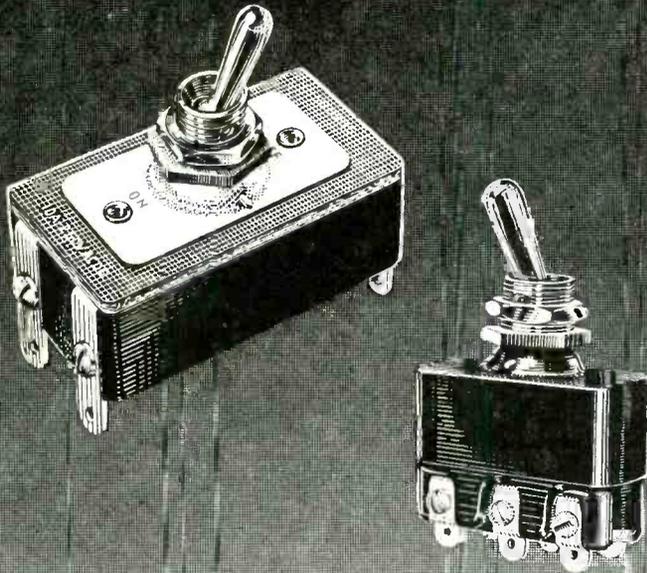
MAGNETIC COATINGS LTD 38 GROSVENOR GARDENS LONDON SW1

phone SLOane 9129



By Appointment to the Professional Engineer...

ATTENUATORS · FADERS · STUD SWITCHES AND TOGGLE SWITCHES
 WIREWOUND POTENTIOMETERS · HIGH STABILITY CARBON RESISTORS
 WIREWOUND RESISTORS · PLUGS AND SOCKETS · TERMINALS
 KNOBS DIALS AND POINTERS



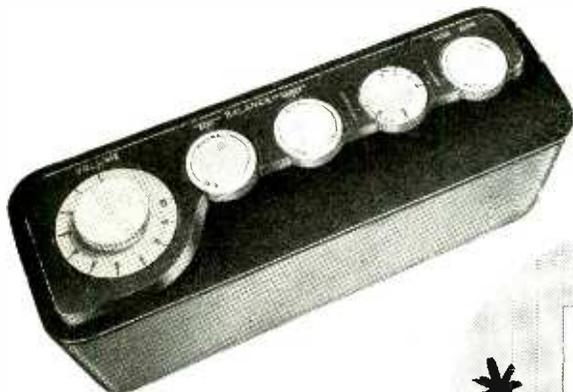
TOGGLE SWITCHES

10 Amps./250v. AC/DC Range
 Double Pole ON/OFF Operation
 Fully R.C.S.C. Approved

Type 501085
 6 Amps./250 v. AC/DC
 Double Pole Change-over Operation

PAINTON
Northampton England

A POINT OF DETAIL No. 3



SLOPE...

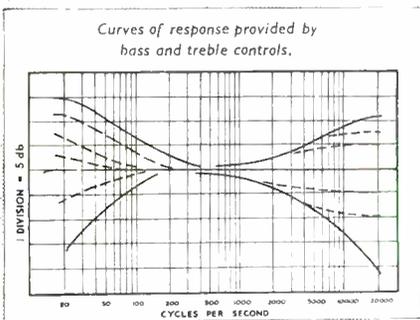
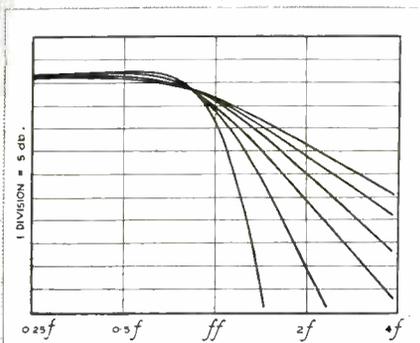
and its rate of change

The present possibility of using wide range loudspeakers for the reproduction of commercial programmes inevitably involves some control over bandwidth if the highest quality is to be obtained at all times.

The three main desirable variables are
 (a) control of final slope of attenuation,
 (b) control of rate of change of slope,
 (c) control of frequency of turnover.

In the Q.U.A.D. amplifier, the final slope and the rate of change of slope are combined in a single continuously variable control with a range as shown.* The whole characteristic may be switched into the harmonic range at two frequencies. In this way the rate of change need be no more than is required by the programme.

The above is just one more reason why the Q.U.A.D. amplifier will give you the closest approach to the original sound from the programme to be reproduced.



THE Q.U.A.D. AMPLIFIER

COMPLETE IN TWO UNITS
 AS ILLUSTRATED

£ 3 5

Write for the Q.U.A.D. booklet . . .





IT'S NEW-IT'S TRUVOX

TRUVOX TAPE DECK MARK III

These are the main features:—

1. Three motor drive.
2. "Drop-in" Tape loading.
3. Push-button control, electrically and mechanically interlocked.
4. Separate push-button brake.
5. "Fast-forward" and "fast-rewind" without tape wear.
6. Silent drive eliminating "wow" and "flutter."
7. Half-track working, and two Tape speeds of $7\frac{1}{2}$ inches per second, or $3\frac{3}{4}$ inches per second.
8. Visual playing-time indicator.
9. With a suitable amplifier, the equipment covers a frequency range from 50-10,000 c.p.s. at $7\frac{1}{2}$ inches per second.

The deck is designed for building into complete recorders which can be handled by inexperienced personnel

22 Gns
MODEL TR2
200/250 volts
A.C. mains only

... and it's available **NOW!**

TRUVOX LIMITED

EXHIBITION GROUNDS WEMBLEY MIDDXX

Telephone : Wembley 1212

Sole distributors to the Wholesale Trade for Rola and Celestion Speakers

Instruments in stock!

WE list below some of the new and renovated instruments expected to be in stock at the start of the New Year. Please ask us to quote for your specific requirements.

ADVANCE D.1 Signal Generator, E.2 Signal Generator, H.1 Audio Oscillator, J.1 Audio Oscillator.

AVO Universal Meter Model 7, Electronic Test Meter, Valve Characteristic Meter, Power Factor and Wattage Unit.

CAMBRIDGE Spot Galvanometer, Versatile Galvanometer, Spot Vibration Galvanometer, Thermal Milliammeter, Flux Meter.

CINTEL Wide Range Capacitance Bridge, Mutual and Self-Inductance Bridge.

COSSOR 1035 Oscilloscope, 1039 Oscilloscope, 1049 Oscilloscope, 1050 Oscilloscope Trolley, 1320 Telecheck, 1428 Camera, 1429 Drive Unit, 1430 D.C. Amplifier, 1431 Drive Unit.

DAWE 400B Wide Range Oscillator, 613B Valve Voltmeter, 615 Microvolter.

DUMONT 168 Oscilloscope, 208 Oscilloscope, 241 Oscilloscope.

E.M.I. QD.051 Signal Generator, QD.041 Audio Test Set, QD.0411 Impedance Bridge, QD.0412 Distortion Bridge, QD.211 Component Bridge.

ELLIOT PP Dynamometer Wattmeter.

FURZEHILL 378B/2 Valve Voltmeter, 1684 Oscilloscopes, 281C/2 Diode Voltmeter, 1358 Attenuator, 1744 Frequency Standard, 1752 High Dissipation Resistance Box.

G.E.C. 1065 Dynamometer Wattmeter.

GENERAL RADIO 650A Impedance Bridge, 722.FS Variable Condenser, 758A Wavemeter, 760A Sound Analyser, 804B and CS.1 Signal Generators, Variacs.

HEWLETT PACKARD 205.AG Audio Frequency Oscillator.

M.I.P. Standard Milliammeter 0-1-100 m/a D.C.

MARCONI INSTRUMENTS TF.144F and G Signal Generators, TF.329G "Q" Meter, TF.338B Attenuator, TF.340 Output Power Meter, TF.373 Universal Impedance Bridge, TF.390F and G Signal Generators, TF.428A and B Valve Voltmeters, TF.517 Signal Generator, TF.867 Signal Generator, TF.868 Universal Bridge, TF.894 Audio Tester, TF.906 Varistrobe, TF.912 Transmitter Power Meter, TF.913 F.M. Signal Generator.

MEASUREMENTS CORPORATION 78 Signal Generator.

MUIRHEAD-WIGAN 4A Universal Bridge, 28D Decade Condenser, Various Capacity and Resistance Units, A.344B Tuning Fork, A.802A Phonic Motor.

MURPHY TPG.11, TPG.12, TPG.13 and TPG.32 Pattern Generators, F.S.M.22A Field Strength Measuring Set, TS.71 Interference Tracing Set.

NAGARD 103 Oscilloscope.

PHILIPS Variable Transformers, GM.6016 High Frequency Millivoltmeter, GM.6010 D.C. Millivoltmeter with UHF Probe.

PYE 11310 18kV. Electrostatic Voltmeter.

SAMWELL & HUTTON 31 "Q" Meter.

SOLARTRON OS.101 Wide Range Oscillator, OPS.100 Pulse Generator, AWS.52 Video Amplifier, AWS.53 Wide Band Power Amplifier, SRS.151 Regulated Power Unit.

SULLIVAN Logarithmic Condenser.

TELEQUIPMENT WG.4, 5 and 6 Pattern Generators, Monoscope (demonstration model).

WAYNE KERR M.148 Inductance Bridge, O222A Video Oscillator, B.101 Component Bridge.

WESTON Dynamometer, Wattmeter, Current Transformers, Megohmmeter.

Electrical Interference

Legislation has now begun! Are you prepared? You will need test instruments designed to meet the relevant British Standard Specifications. We can offer early deliveries of the following instruments for this purpose.

MURPHY INTERFERENCE TRACING SET, TS.71
(30-100 Mc/s. For locating only.)

MURPHY FIELD STRENGTH AND INTERFERENCE MEASURING SET, FSM.22A.
(30-150 Mc/s. For the complete measurements of all kinds of signal and interference.)

E.M.I. RADIO INTERFERENCE MEASURING SET, RMS.2.
(150 kc/s.-30 Mc/s. Designed by the E.R.A. for the Admiralty.)

The Murphy Panoramic Receiver for interference analysing on the aircraft and television bands will shortly be available.

LIVINGSTON LABORATORIES LTD.

RETCAR STREET, DARTMOUTH PARK HILL, LONDON, N.19.
Telephone: ARCHWAY 6251/2

Specialists in Electronic Instruments for Industry



THE Monoscope is basically a simple caption scanner apparatus capable of providing a video signal derived from a fixed pattern within the tube.

Almost any pattern comprising pure line, halftones or a combination of both can be supplied on receipt of specific requirements, and two standard types are available.

Type J.101 — Test Chart "A"
 Type J.201/XI — Test Chart "C"

TYPICAL OPERATING DATA

Deflection	- - -	electromagnetic
Focus	- - -	electrostatic
V _h	- - -	6.3 V
V _g (cut-off)	- - -	-50 V
V _{a1}	- - -	1200 V
V _{a2} (focus)	- - -	800/850 V
V _{a3} (wall)	- - -	1200 V
V target	- - -	1160/1200 V
I target	- - -	5 μA

Resolution better than 500 lines
 Video Signal 0.5 μA peak to peak (min)

CINEMA-TELEVISION LIMITED

A Company within the J. Arthur Rank Organisation

WORSLEY BRIDGE ROAD · LONDON · SE26

Telephone: Hither Green 4600

SALES AND SERVICING AGENTS

F. C. Robinson & Partners Ltd.,
 287 Deansgate, Manchester, 3

Hawnt & Co., Ltd.,
 59 Moor St., Birmingham. 4

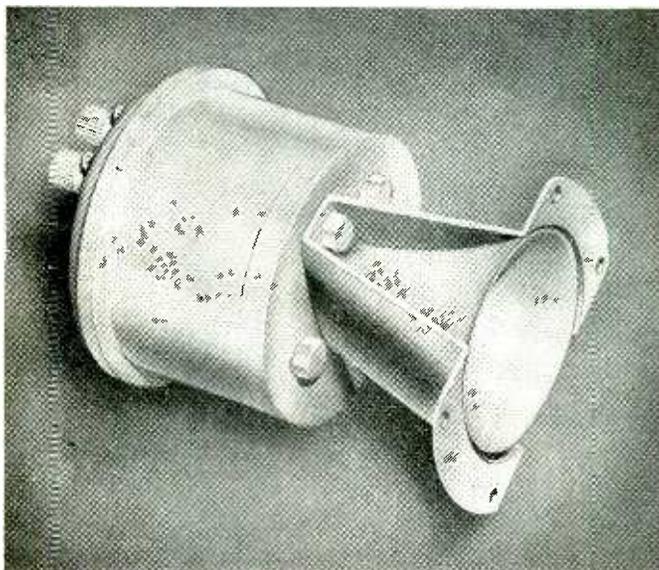
Atkins, Robertson & Whiteford Ltd.,
 100 Torrisdale Street, Glasgow, S.2



MEETING A WIDESPREAD DEMAND

Stentorian

PRESSURE TYPE TWEETER UNIT



Since its introduction two months ago, this unit has proved exceedingly popular. It can be used with any cone speaker, providing very high quality reproduction at remarkably low cost.

The Unit is of the moving coil pressure type and is similar to that embodied in the 10in. and 12in. Concentric Duplex Loudspeakers. The speech coil is of aluminium wire, wound on an aluminium former which is rigidly fixed to an aluminium diaphragm. The speech coil and diaphragm is situated at the rear of the magnet and the centre pole hollowed out to form the commencement of the horn, in the centre of which is located the phase equalizer.

Speech coil impedance : 15 or 30 ohms. Flux density: 14,000 gauss. Response: 2000/14000 c.p.s. Power handling capacity: 3 watts. Price: **75/6**

It is recommended that a suitable cross-over network of between 2000/3000 c.p.s. be used.

★ LISTEN FOR YOURSELF !

Our London showrooms at 109 Kingsway are open from 9 a.m. to noon every Saturday, when the complete range of speakers may be heard by appointment. Please write or telephone HOLborn 3074

Stentorian 10" CONCENTRIC DUPLEX

One of the most outstanding chassis speakers in the Stentorian range. Consistently specified by leading designers where the highest standards of reproduction are desired. The cost is very moderate for the outstanding performance given by this speaker, as will be seen from the brief specification below.

SPECIFICATION: Series Gap magnet of Alcomax 3

Flux in LF gap 12,000 gauss on 1" pole

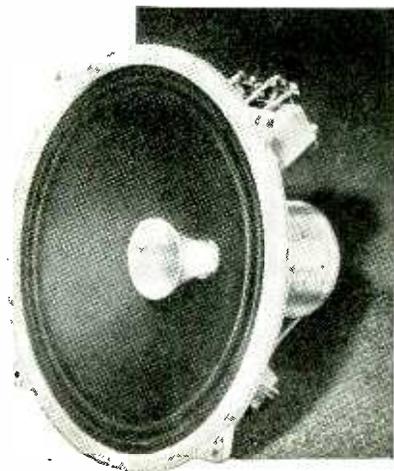
" " HF " 13,000 gauss " " "

Power handling capacity, 6 watts. Frequency range 50/14,000 c.p.s. Fundamental bass resonance; 65 c.p.s.

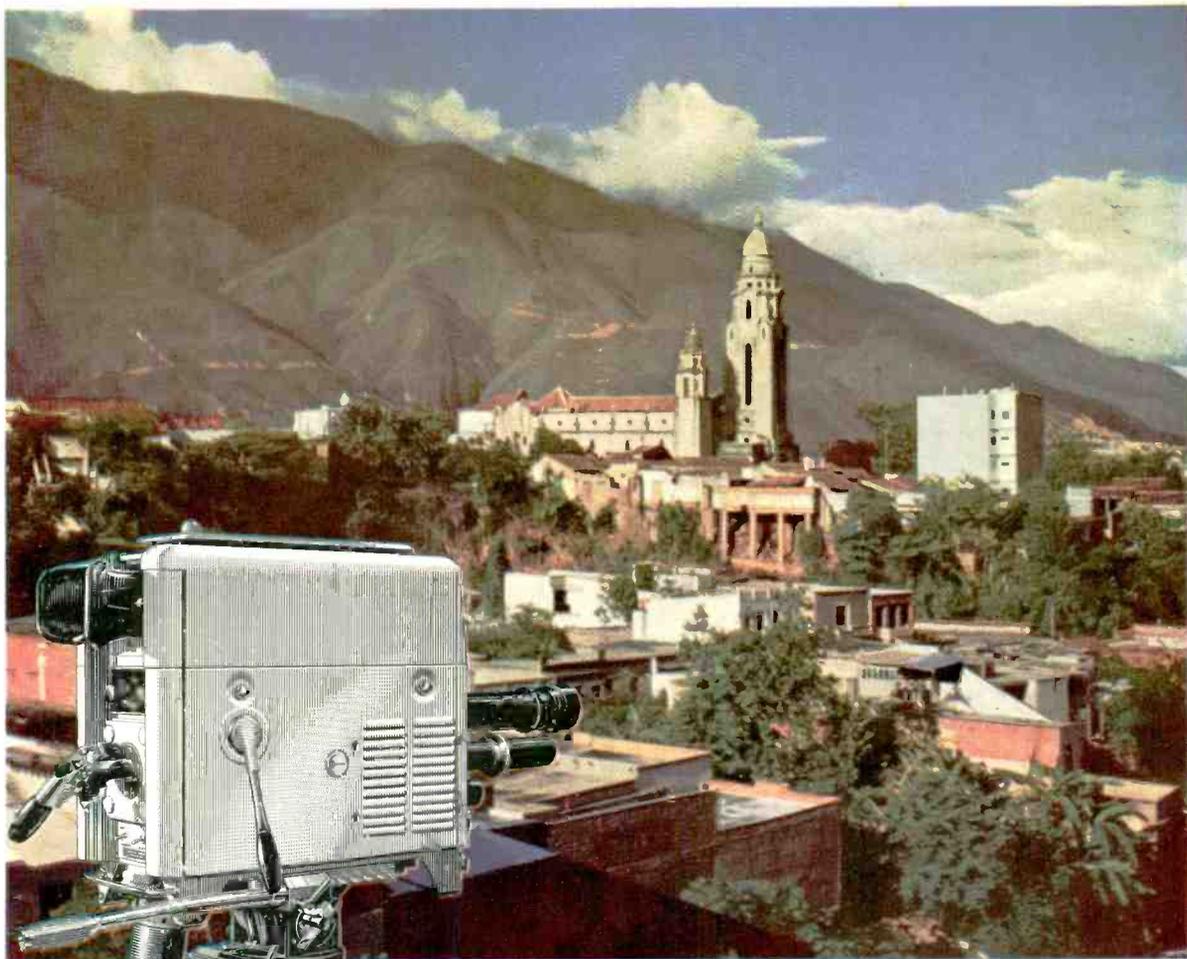
Price: with filter condenser - - - - £10. 3.3

with condenser and matching transformer £11.13.6

Other P.M. units from 2½" to 18", full details gladly sent on application.



Marconi Television for Venezuela



A Shell Photograph

Equipment purchased by 'Televisa' for their Caracas Station, includes:

- 5 kw vision transmitter
- 3 kw sound transmitter
- Complete mobile O/B television unit, with two camera channels and micro-wave links.
- Associated aerial system
- Complete studio installation

Venezuela is yet another country to install Marconi television.

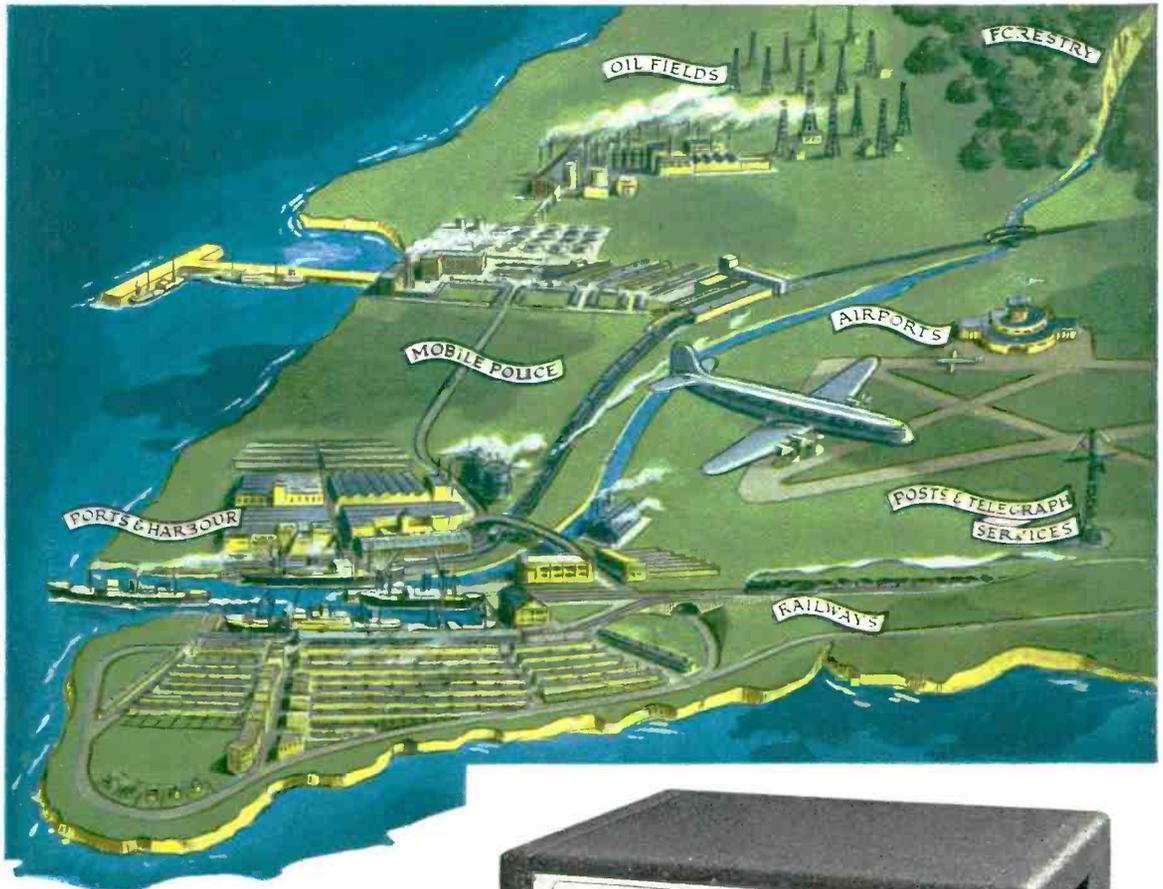
Marconi cameras are used by the United Nations to televise their Sessions, and the television systems of both Canada and Spain bear the name Marconi.

Marconi transmitters and aeriels have been installed in every one of the B.B.C.'s five television stations.

MARCONI

television transmitting equipment

G.E.C. RADIO COMMUNICATION EQUIPMENT FOR USE IN ALL PARTS OF THE WORLD



The G.E.C. with its unique research organization has always been in the forefront of radio development, and its enormous manufacturing resources have enabled these developments to be put into production. Where line telephony and telegraphy communications come up against geographical barriers, and where speed, security and mobility are important, the Company's specialists are freely available for consultation.

FOR EXAMPLE THE GENERAL PURPOSE COMMUNICATION RECEIVER BRT. 400 is built to meet the most exacting requirements of commercial service in all parts of the world, for high grade telegraphy service and quality reception for re-broadcast.



G.E.C.

RADIO COMMUNICATION EQUIPMENT

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND · MAGNET HOUSE, KINGSWAY, LONDON

PROGRESS

*in Counting ~
through the ages*

HISTORICAL
ILLUSTRATIONS
BY COURTESY
OF THE
SCIENCE MUSEUM
LONDON.



NAPIER'S BONES

Devised in 1617 by
John Napier, a
Scottish nobleman,
as a mechanical means
of multiplication by addition.



ROMAN ABACUS

Known to have been in
use at the time of Julius
Caesar. A surviving speci-
men is preserved in La
Bibliothèque Nationale, Paris.

LEIBNITZ'S STEPPED RECKONER

Invented in 1694 by the
German philosopher and
incorporated in the earliest
practicable calculating machines



OHNER'S WHEEL

A principle first evolved by
a Swedish engineer about
1890 and still being applied
in present day mechanical
calculating machines

HIVAC COLD CATHODE TUBES

The most modern devices
for use in electronic
systems.

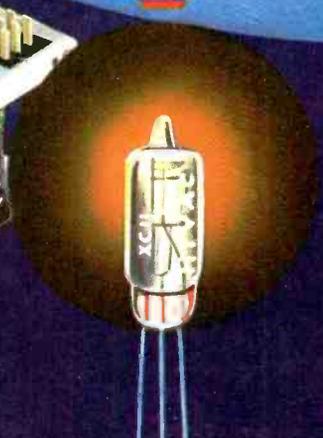
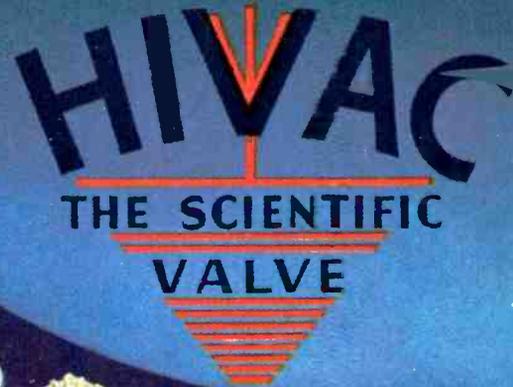


Cold Cathode Tubes

FOR

Modern

COUNTING · CALCULATING
SELECTING · SWITCHING



Hivac Limited

GREENHILL CRESCENT, HARROW-ON-THE-HILL
MIDDLESEX, ENGLAND

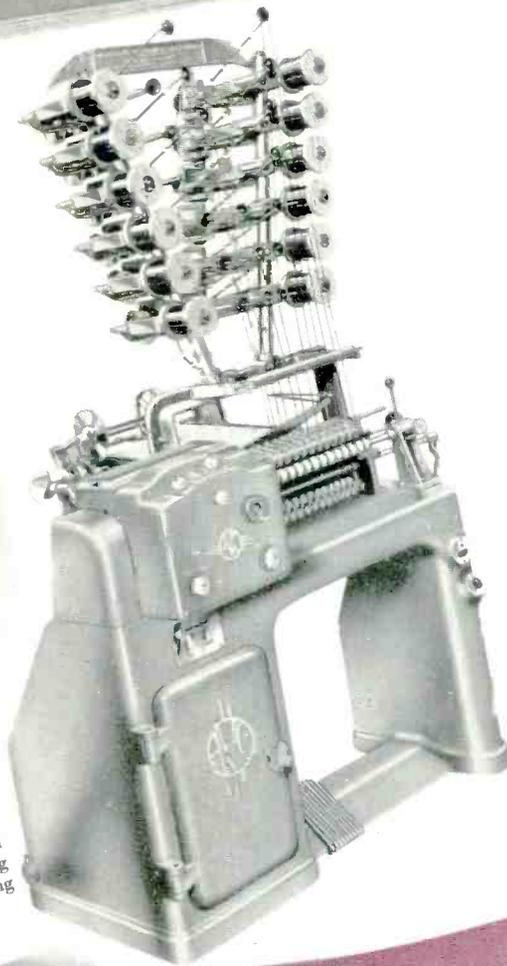
Phone: HARrow 2655

Cables: Hivac, Harrow

HIVAC Cold Cathode Tubes—Miniature and Subminiature Valves—
Electrometer Valves—Neon Indicator Lamps—Telephone Switchboard
Lamps—are used by the world's leading manufacturers.

DOUGLAS AND MACADIE

Automatic
COIL WINDERS



This typical page from our complete Catalogue shows the "Douglas" Fully Automatic Multi-Winder, designed for the high speed production of large quantities of coils with or without paper interleaving.

Our standard range includes 27 different Machines, and we make a number of other types designed for special purposes. Long experience in the design and manufacture of Coil Winders invests our machines with an unexcelled standard of efficiency and ensures maximum economy in the production of windings for every industrial requirement.

Our complete Catalogue will be sent to interested executives on application, and our specialist designers will be pleased to assist in rendering advice on any particular coil winding problems.

OVERSEAS AGENTS

We have Agents in all parts of the world. Names and addresses will be furnished on application.

PACKING SPECIFICATIONS

Gross Weight of Machine
(3 Packing Cases)
240 lbs (105 kgs.) and
249 lbs (110 kgs.)

Size of Packing Cases	W	D	H
1	25	14	14
2	25	17 1/2	14
3	25	17 1/2	14
4	25	17 1/2	14

"DOUGLAS" L.M.W. FULLY AUTOMATIC MULTI-WINDER

DIMENSIONS AND WEIGHTS

W - 17 in (430 mm.)
D - 12 1/2 in (318 mm.)
H - 12 1/2 in (318 mm.)
Gross Weight of Machine

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.

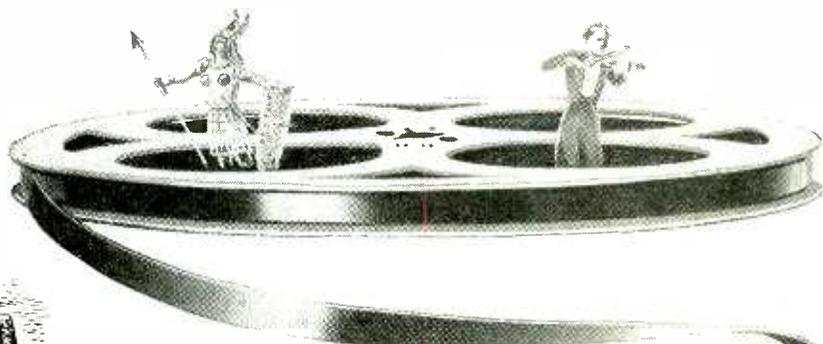
WINDER HOUSE · DOUGLAS STREET · LONDON S.W.1

Telephone: VICTORIA 3404-9

EMITAPE

MAGNETIC RECORDING TAPE

USED BY THE **B.B.C.** AND BROADCASTING ORGANISATIONS
THROUGHOUT THE WORLD



- *EMITAPE* is the outcome of 50 years of unequalled experience in the Science of Sound Recording.

- *EMITAPE* is manufactured by E.M.I. (the Group which produces H.M.V., Columbia and Parlophone records).

- Two types of *EMITAPE* are available, High Coercivity and Low Coercivity in 600 ft. and 1,200 ft. lengths wound with the oxide inside or outside on 5" and 7" spools. For professional users 11½" European Spools (cap. 3,250 ft.) and NAB Spools (cap. 2,400 ft.) are available.

- Full details of *Emitape* are available through dealers or direct from Sales Dept.



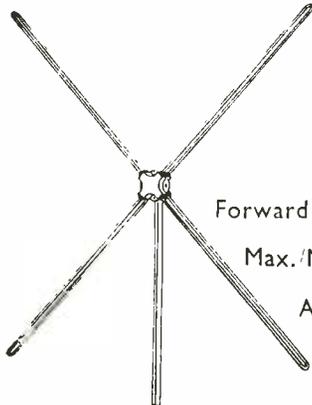
E.M.I. FACTORIES LTD.
HAYES · MIDDLESEX



**RECEPTION
PERFECTION**

The New **DUBLEX** TELEVISION AERIAL

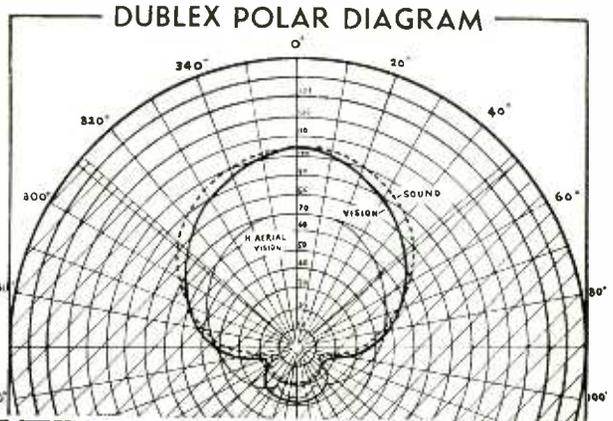
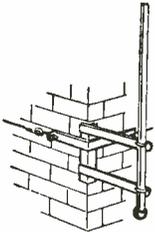
The DUBLEX is a new television aerial utilising cross connected folded elements—a unique construction which results in an excellent electrical and mechanical performance. **The forward gain of 6 dB is greater than that obtained with the orthodox type of television aerial construction, and the maximum/minimum ratio of 25 dB is invaluable for interference and "ghost" elimination in difficult reception areas.** Features of the DUBLEX are:—● High forward gain of 6 dB. ● High maximum to minimum ratio of 25 dB. ● Broad bandwidth on both vision and sound. ● Easy to instal in the minimum of time. ● Light in weight yet robust in construction. ● Fully weatherproofed in every detail. The mechanical construction of the DUBLEX is unique with a cast housing retaining four shock absorbing insulators through which the folded elements are assembled.



Forward Gain 6 dB.
Max./Min. Ratio 25 dB.
Acceptance Angle 96°.

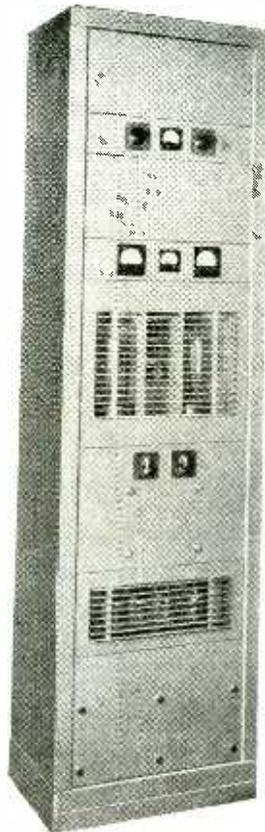
PRICES:

- DUBLEX with 7ft. mast, chimney brackets, lashings, etc Price £4/8/6
- DUBLEX (array only). Price £2/14/6
- DUBLEX with 10ft. x 2in. alloy mast, double lashings, etc. Price £7/15-
- DUBLEX with 14ft. x 2in. alloy mast, double lashings, etc. Price £8/12/-



AERIALITE LTD. Stalybridge, Cheshire

★ Have you investigated this **NEW** SOURCE OF POWER . . . ?



THE NEW SAVAGE
V.L.F.*
AMPLIFIER

* **VERY
LOW
FREQUENCY**

1 KILOWATT AT FREQUENCIES DOWN TO 10 c/s

Here is a compact, easily controllable source of power at frequencies between 4 c/s and 2,000 c/s.

Already used by the Research Departments of leading aircraft and engineering concerns for *Vibration Testing* on materials and structures, this instrument is proving an invaluable aid in many important new fields of development.

Let us send you full details and prices without delay.

BRIEF SPECIFICATION

- Frequency Range at 1,000 watts 10 c/s-1,000 c/s
- Response characteristic... $\pm \frac{1}{2}$ dB 4 c/s-2,000 c/s
- Gain 84 dB
- Noise Level -70 dB

For frequencies between 40 c/s and 14,000 c/s, we recommend the Savage Mark II Kilowatt Amplifier.

W. BRYAN SAVAGE LTD
DEPARTMENT W.W. WESTMORELAND ROAD,
LONDON NW9 Telephone: COLINDALE 7131

ADVANCE COMPONENTS LTD., BACK ROAD, SHERNHALL STREET, LONDON, E.17

LARKSwood 4366/7/8

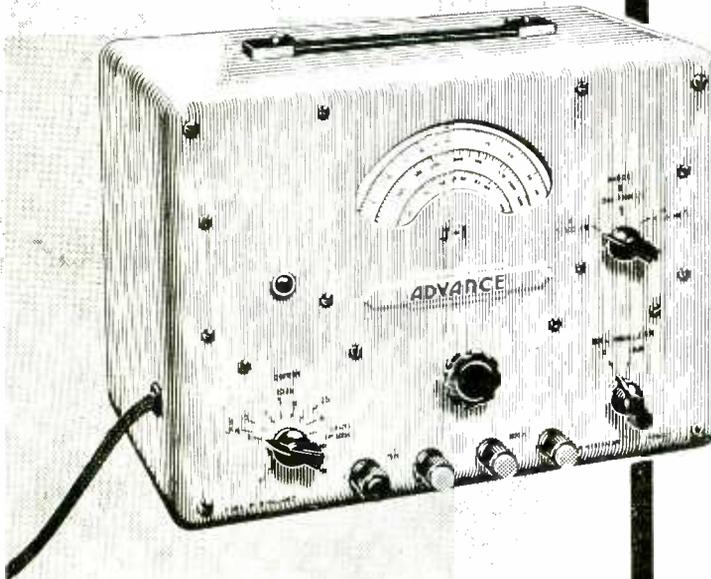
Here is the latest in the pedigree line of Advance Signal Generators — the Type J.1. This new model completely covers the wide range of 15 c/s to 50,000 c/s in three ranges, with an accuracy of $\pm (2\% + 1 \text{ c/s})$. Output (continuously variable) into 600 ohms, 0.1mW. - 1w (0.25 - 25v) $\pm 2 \text{ db}$, the output impedance approximating to 600 ohms over the whole range. Max. output into 5 ohms is greater than $\frac{1}{2}$ watt. A 20 db attenuator may be switched into use when a very accurate output impedance is required. The total harmonic and hum content as compared with fundamental above 100 c/s is better than 34 db down (2%) at full output, and better than 40 db down (1%) at 0.1 watt.

Weight 20 lb. Size 13 $\frac{1}{2}$ " x 10 $\frac{1}{4}$ " x 8 $\frac{1}{4}$ "

Advance

audio signal generator

Introducing THE TYPE "J.1." AUDIO SIGNAL GENERATOR



WIDE RANGE

LOW DISTORTION

1 WATT OUTPUT
INTO 600 Ω OVER
ENTIRE RANGE

Full technical details
available in Folder S-17W

ADVANCE COMPONENTS LTD., BACK ROAD, SHERNHALL STREET, LONDON, E.17

LARKSwood 4366/7/8

**AS ENDURING
AS THE**



Yes! **TELECRAFT T.V. AERIALS** are built to stand up to the stress and strain of all weather conditions even in the most exposed areas.

Finest quality materials, an unbreakable aluminium diecast feeder box and sound constructional design are the foundation of **TELECRAFT T.V. Aerial** strength and reliability.

The same care and attention to technical detail is employed in the manufacture of **TELECRAFT T.V. Aerials** as with our **V.H.F. Transmitting and Receiving Aerials**.

The **FA22** as an example has stood the test of time in the exposed Inland and Coastal fringe areas and is to be recommended where signal strength is low.

Wherever your district, there is a **TELECRAFT AERIAL** built to serve it—and serve it well!

Send for Descriptive Literature



THORNTON HEATH, SURREY

THORnton Heath 1191-2-3

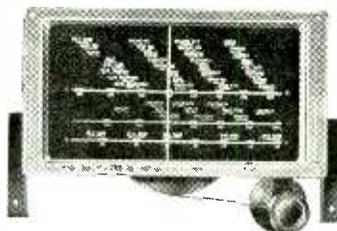
SCOTTISH SALES AND SERVICE DEPOT:

423, Clarkston Road, Glasgow, S.4

Merrylee 4326

**Depots: B'HAM, BRISTOL, MANCHESTER, WORTHING, PLYMOUTH
BOURNEMOUTH and CARDIFF**

EXACT EFFORTLESS TUNING



The **S.L.8 Spin wheel drive** gives easy control through a ratio 24-1. Fitted with constant velocity coupling, it eliminates strain on the Condenser, providing mechanical and electrical isolation from vibration and noise.

Complete with 3-band glass scale 9in. \times 4 $\frac{1}{4}$ in. Printed short, medium and long wavebands with station names. Scale length 7in. Supplied with florentine bronze escutcheon.

PRICE 27/6.

S.L.5, similar but fitted with reverse vernier drive, gives ratios of 18-1 search and 50-1 reverse vernier.

PRICE 26/6.

Replacement Scales calibrated to Copenhagen Plan now available for:

Airplane drive	2/3 retail	Full Vision Drive	2/9 retail
Squareplane Drive	2/6 retail	S.L.8 or S.L.5 Drive	4/6 retail

PRECISION COMPONENTS BY



JACKSON

BROS. (LONDON) LIMITED
KINGSWAY · WADDON · SURREY

*Telephone: Croydon 2754
Telegrams: Walfilco Souphone, London*



Pointers for Designers

AND CONSTRUCTORS

VALVES, GERMANIUM CRYSTALS AND CATHODE RAY TUBES FOR TELEVISION

This table consists of the latest additions to our television range, namely B309, N309, LN309, U329 and 6901A, together with the well established television valves, germanium crystal diodes, and cathode ray tubes.

Vision Mixer	Vision Amplifier	Video Detector	Video Amplifier	Sync. Separator	Line Osc.	Line Output	Booster Diode	EHT Rectifier
B309 X79 GEX66 Z77	Z77	GEX35	N309 Z77	Z77	B309 L77 Z77	N339	U329 U319	U37
Frame Osc.	Frame Amplifier	Sound Channel A.F. Amplifier	Sound Channel A.F. Output	Sound Channel Detector	Noise Limiter	Spot Limiter	Power Rectifier	Cathode Ray Tube
$\frac{1}{2}$ LN309 B309	$\frac{1}{2}$ LN309 N37	$\frac{1}{2}$ LN309	$\frac{1}{2}$ LN309	GEX44/1	GEX44/1	GEX44/1	U309	16" 6901A 12" 6705A 9" 6706A 6504A 6505A

The B309 is a B9A based double triode, suitable for vision mixer or time-base oscillator application. The valve has separate cathodes and a 12.6 volt, 0.15 amp. heater which is centre tapped for 6.3 volt or series operation at 0.3A.

The recent introduction of large screen television receivers using higher EHT voltages and wide scanning angles has necessitated increased power and efficiency in scanning and video amplifier circuitry. The N309, a B9A based pentode, has been developed for use as a video power amplifier to produce the increased drive required. A booster diode U329, having a heater to cathode insulation of 7.5 kV and a PIV of 7 kV necessary to withstand the high peak voltages encountered in the primary of the line output transformer, results in higher energy recovery; its 0.3 amp. heater permits series operation.

The LN309 is a small output tetrode combined with a medium impedance triode mounted on a B9A base. The systems are completely separate, except for the common heater, and these lend themselves to both sound AF amplifier and output, or frame oscillator and output channels.

The 6901A 16" cathode ray tube has a 70° scanning angle resulting in an overall length actually less than that of the G.E.C. 12" tubes. The screen is aluminised, as is common practice with G.E.C. Television tubes, and a sensibly flat screen is provided giving a wide viewing angle.

Germanium diodes have numerous advantages such as small size, low capacitance and high forward conductance, and their use is now firmly established in current T.V. practice. The most common applications are vision detector (GEX35), sound detector (GEX44/1) and sound limiter (GEX44/1). For the home constructor and experimenter they are particularly attractive since heater wiring and valve holders are not required, and they can be tried with great ease in various circuit arrangements.

Data on specified valves, C.R.T. and Germanium Crystals is available on request from the Osram Valve and Electronics Dept.

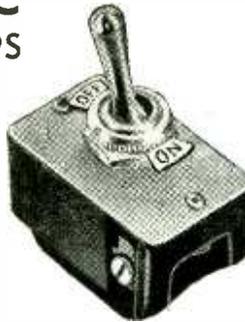
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, W.C.2

ARCOLECTRIC SWITCHES & SIGNAL LAMPS

- For Industrial Equipment
- Domestic Appliances
- Electronic Instruments
- Automobile Switching



THREE POSITION TOGGLE SWITCH
Two-way and Off



10-AMP. TOGGLE SWITCH
10-amp. 250 volt.



PUSH PULL SWITCH
For Motor Cars



MINIATURE TOGGLE SWITCH
3-amp. 250 volt.



D.P. TOGGLE SWITCH
3-amp. 250 volt.



SMALL POINTER KNOB



SIGNAL LAMP HOLDER
MES Fitting

Write for Catalogue No. 127-W

ARCOLECTRIC
SWITCHES · LTD

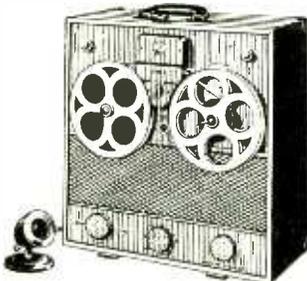
CENTRAL AVENUE, WEST MOLESEY, SURREY TELEPHONE: MOLESEY 4336 (3 LINES)



High Fidelity

RECORDING IN THE HOME

The new Baird Portable Tape Recorder incorporates the most up-to-date advances in high fidelity tape recording technique . . . twin track (speed $7\frac{1}{2}$ " per second) giving one hour's recording per reel . . . excellent response between 50 and 10,000 c.p.s. . . . single control operation of motors for recording, playback and rewind. In addition to the 45 secs. rewind, a manual "forward" device is provided. The whole unit, made with the same meticulous care that is given to all Baird instruments, is self-contained in a robust case with carrying handle. Write for leaflet giving further information.



Complete with
microphone and tape
65 GNS.

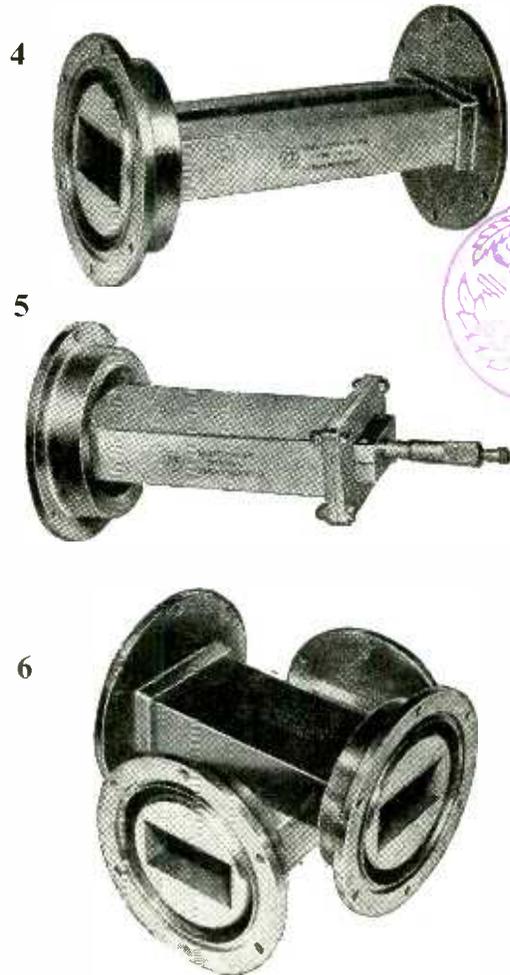
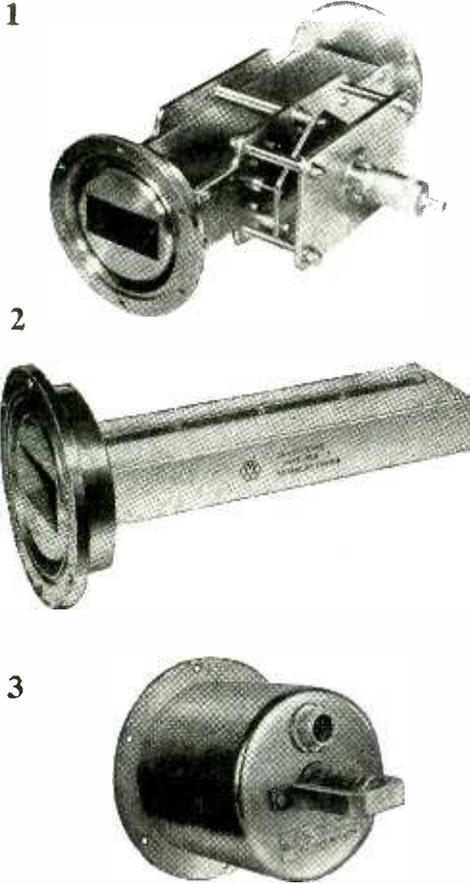
BAIRD

PORTABLE TAPE RECORDER

BAIRD TELEVISION LTD. LANCELOT ROAD WEMBLEY MIDDLESEX

Microwave Test Gear

Metropolitan-Vickers Electrical Company announce a complete range of precision microwave test gear for use in 3 in. x 1½ in. waveguide over a band of wavelengths from 10 cm. to 11 cm.



- 1 PRECISION ATTENUATOR Type 501
- 2 MATCHED LOAD Type 506
- 3 OSCILLATOR Type 508
- 4 FIXED ATTENUATOR Type 519
- 5 SHORT CIRCUIT Type 510
- 6 DIRECTIONAL COUPLER Type 504

Other Metrovick microwave equipment includes variable attenuator type 502, standing wave detector type 512, wave meter type 517, high power load type 515, S & X band spectrometer type 518.

Full technical details will be sent on request.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., TRAFFORD PARK, MANCHESTER 17
 Member of the A.E.I. group of companies

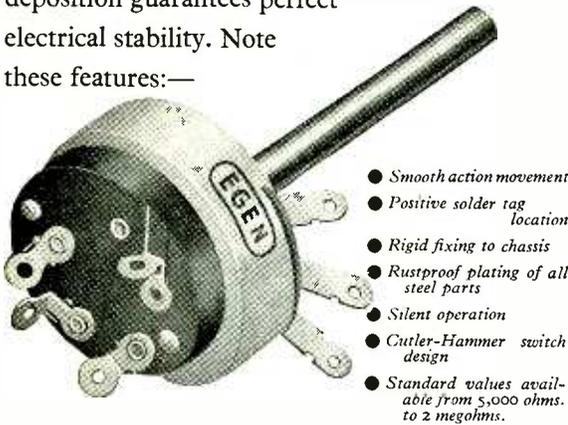
METROVICK Test gear for the microwave laboratory

R/E 203

EGEN

first and foremost!

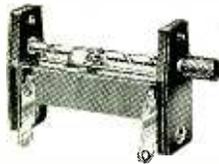
Egen Potentiometers are recognised everywhere for their dependability and are constantly being specified by radio and electronic engineers. A specialised carbon deposition guarantees perfect electrical stability. Note these features:—



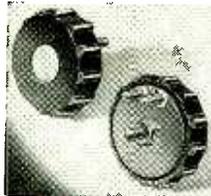
- Smooth action movement
- Positive solder tag location
- Rigid fixing to chassis
- Rustproof plating of all steel parts
- Silent operation
- Cutler-Hammer switch design
- Standard values available from 5,000 ohms. to 2 megohms.

Egen Potentiometers are also available with single pole or double pole switch and without switch. Switches only supplied separately if required.

PRE-SET RESISTORS.
A wire-wound pre-set resistor for panel or chassis mounting. Multi-unit banks available to special order.



SUB MINIATURE VOLUME CONTROL
For use in Deaf Aids and other miniature electronic apparatus.



Overall diameter less than 1/4"

Export enquiries welcomed



EGEN ELECTRIC LTD.

Charfleet Industrial Estate, Canvey Island, Essex. Phone: Canvey 691 & 2

A THREEFOLD INSTRUMENTATION SERVICE

F. C. Robinson & Partners Ltd. offer a unique threefold service to users of electronic instruments in the North of England. Enquiries are invited and will receive prompt attention.

1

We are agents for the leading types of radio and television test equipment, electronic instruments and industrial control apparatus and stocks are constantly maintained at our showroom in Manchester.

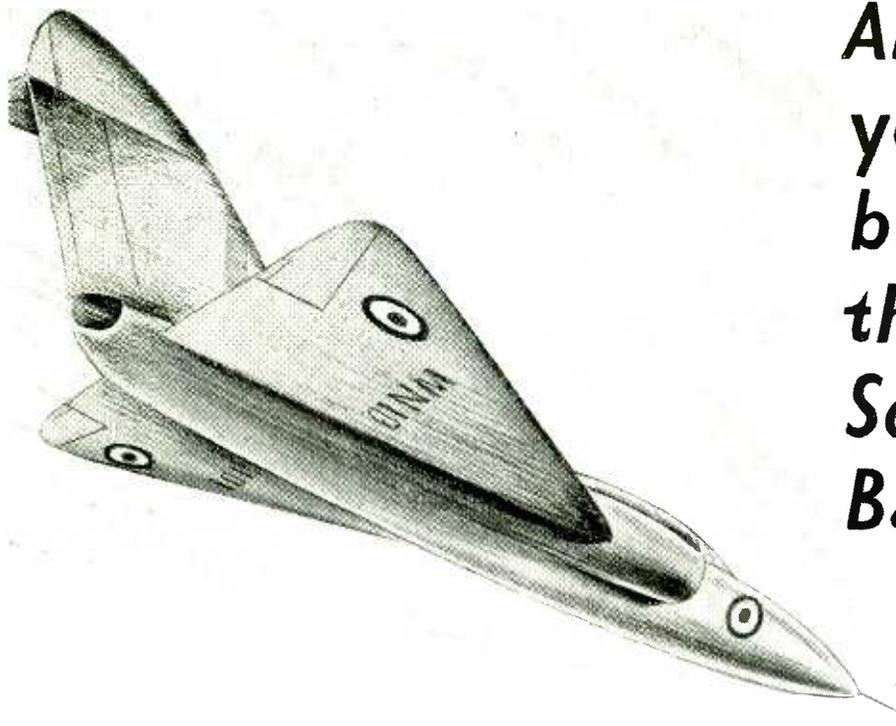
Our factory at Cheadle, Cheshire, has been specially equipped and staffed for the development, design and manufacture of specialised non-standard electronic instruments.

2

3

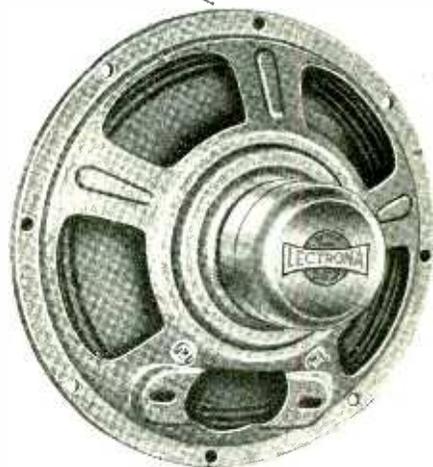
Quick and skilled maintenance facilities are always available. Our specially trained engineers are always ready to carry out repairs to electronic instruments, either in our own workshops or on your own premises.

F. C. ROBINSON & PARTNERS LTD.
SALES & SHOWROOM ● FACTORY & SERVICE
287 DEANSGATE COUNCILLOR LANE
MANCHESTER, 3 CHEADLE, CHESHIRE
DEANsgate 6601 GATley 2469



Are you breaking the Sound Barrier?

The amplifying stages of your equipment may be generously designed with plenty of inverse feedback and the electrical characteristics may be 99.9% perfect, but the transition from electrical to acoustic energy may present a serious barrier. **LECTRONA** speakers, incorporating many special design features, will enable you to penetrate this sound barrier with high efficiency and minimum distortion. A wide range of models is available for radio requirements and other special technical applications.



STANDARD TYPE C.6104
 Diameter 6½ in.
 Flux density 10,000 lines per sq. cm.
 Peak power handling capacity (speech and music) 4 watts.
 Speech coil impedance, 3 ohms at 400 cycles.
 Frequency response chosen to suit requirements.

Other models are available in this diameter, with alternative values of flux density and power handling capacity

LECTRONA LOUDSPEAKERS

Designed and Manufactured by

ACOUSTIC PRODUCTS LIMITED

STONEFIELD WAY, VICTORIA ROAD, S. RUISLIP, MIDDX.

Phone : Ruislip 6093 4

SALES : EDSTONE LIMITED

15 BUCKINGHAM PALACE GARDENS, LONDON, S.W.1.

Phone : Sloane 0621

FOR HIGH-FREQUENCY INSULATION

specify

'FREQUELEX'

The Tuning Coil shown is supported by our "FREQUELEX" Ceramic Rods, and forms part of a 200 K.W. Radio Transmitter. This is only one of many applications where Rods made to close limits are required.

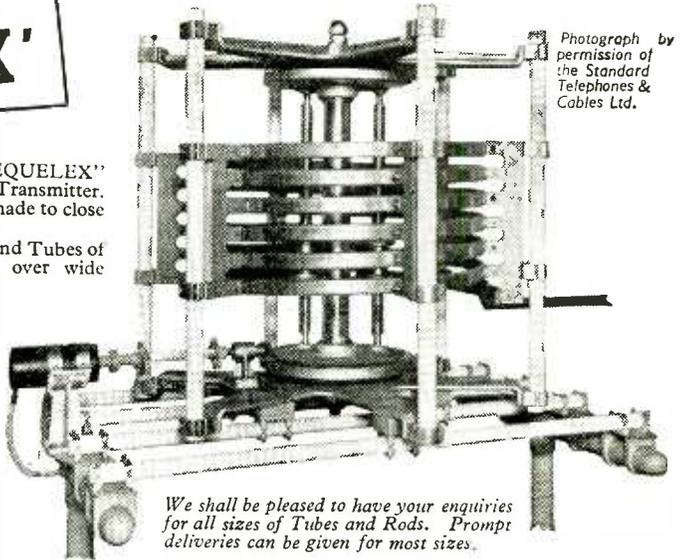
We specialise in the manufacture of Ceramic Rods and Tubes of various sections in several classes of materials over wide dimensional ranges.

The Principal Materials are :-

1. Porcelain for general insulation.
2. Frequelex for High Frequency insulation.
3. Permalax and Templex for Capacitors.

The degree of accuracy depends on the size of the Rod or Tube, but the standard degree of accuracy is outlined in the Inter Service Component Manufacturer's Council—Panel R Specification embodied in our Catalogue of Radio Frequency Ceramics, copy of which will be sent on request.

Large Rods up to 44" long and 1 1/4" square are used as supports for Tuning Coils, etc.



Photograph by permission of the Standard Telephones & Cables Ltd.

We shall be pleased to have your enquiries for all sizes of Tubes and Rods. Prompt deliveries can be given for most sizes.



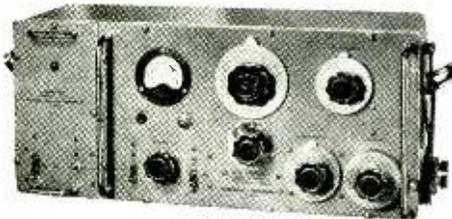
Buller's LOW LOSS CERAMICS

BULLERS LIMITED, 6 Laurence Pountney Hill, E.C.4.

Phone: MANsion House 9971 (3 lines) Grams: Bullers, Cannon, London

BL4B

HIGH GRADE LABORATORY EQUIPMENT REBUILT AND GUARANTEED AS NEW



SIGNAL GENERATOR TYPE 390G

WE HAVE A COMPREHENSIVE RANGE OF ELECTRONIC EQUIPMENT BY WELL-KNOWN MAKERS, INCLUDING SIGNAL GENERATORS COVERING THE "S" BAND (10 cm.) A SMALL SELECTION OF OTHER EQUIPMENT IS SHOWN BELOW:—

Double Beam Oscilloscopes Type 339A	Signal Generator Type TF.144G
Oscilloscopes by Dumont Type 208	" " Type 762B
" " Type 224A	" " Type D.1
Furzehill Oscilloscope Type 1684D	Sullivan Precision Beat Frequency Oscillators
Murphy Pattern Generator Type TPG.11	

For further particulars of these and other high-grade electronic instruments, write to:—

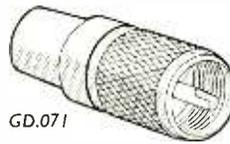
HATFIELD INSTRUMENTS

175 UXBRIDGE ROAD, HANWELL, LONDON, W.7

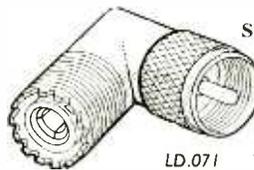
Telephone: EALING 0779

SCREENED CONNECTORS

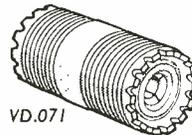
for cables of 0.2" to 1.03" O.D.
Single and multi-way types.
Special types fitted with coupling rings.
Cable joining connectors.
U.S. Type Connectors as illustrated.



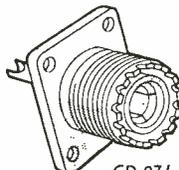
GD.071



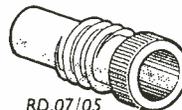
LD.071



VD.071



CD.071



RD.07/05

CABLE O.D.	TYPE	CODE NO.
0.41"	Straight plug	GD.071
0.25"	Reducing adaptor	RD.07/05
0.2"	Reducing adaptor	RD.07/03
fits on GD.071	Elbow plug adaptor	LD.071
CD.071		
VD.071		
fits on GD.071	Bulkhead (Junction) adaptor	VD.071
LD.071		
fits on GD.071	Chassis receptacle	CD.071
LD.071		

Other Transradio specialised products:
CO-AX air-spaced articulated
Very Low Loss Cables.
Microdual Two-speed Precision Drives.

TRANSRADIO

LTD

138A CROMWELL ROAD, LONDON, SW7,

ENGLAND Telephone: FREmantic 4421 (P.B.X.)

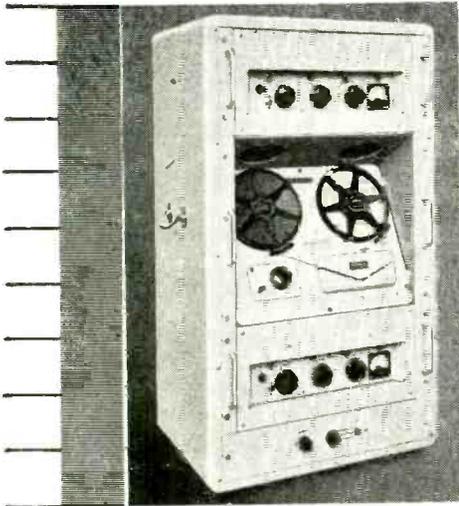


FERROGRAPH MODEL "2A"

Four years ago the first Ferrograph made its appearance, and it has remained virtually unchanged since that date. Now a new model—2A—is offered. Mechanically the same, sound time-proved recorder but incorporating those extra features called for by the many discriminating Ferrograph users.

- Synchronous Capstan Motor • Ability to use 1800 feet reels • Redesigned monitor-meter circuit • Lighter weight • More convenient carrying shape • Greater ease of manipulation • Even lower hum levels and still better performance.

Ferrograph
MAGNETIC TAPE RECORDERS

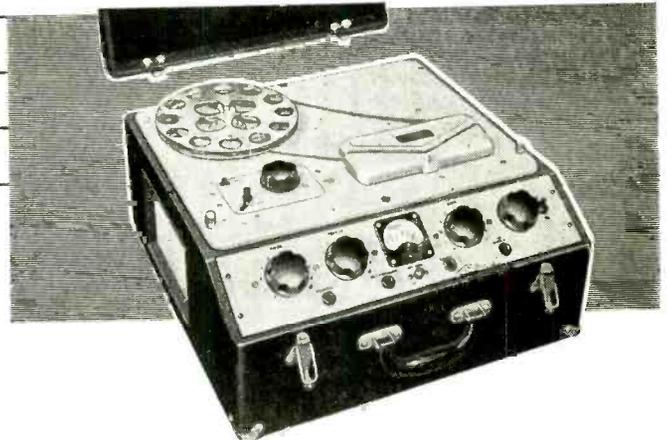


FERROGRAPH DUAL-TRACK TYPE "YDC" EQUIPMENT

A dual-track recorder and reproducer housed in a metal instrument cabinet measuring 24" x 15" x 36" high. Based on the Wearite Type "C" Tape-Deck, it has provision for three operational speeds, viz.— $7\frac{1}{2}$ ", $3\frac{3}{8}$ " and $1\frac{7}{8}$ " per second—and has as an optional fitment a voice/signal operation unit whereby the available recording time of a reel may be considerably extended.

FERROGRAPH ENDLESS LOOP RECORDER

A memory-loop recorder providing recording and continuous repetition of intelligence at periods variable from a few seconds up to twenty minutes. Can be supplied also for simultaneous dual-track working and with monitoring facilities.



Designed and manufactured by Wright and Weaire, Ltd. for

British Ferrograph Recorder Co. Ltd.

138 SLOANE STREET, LONDON, S.W.1



The NEW "EXSTAT" for the suppression of radio interference



Here is the new series of "Exstat" Aerials which incorporate a fully screened anti-static system for the elimination of radio interference. The transformers employed are of entirely new design and achieve a new high level of performance which has been achieved by using the most up-to-date technique and specialised materials which have now been developed. Special high permeability ferrite cores and the latest winding technique are used for these wide band transformers giving maximum signal transfer and impedance matching over the entire wave band between 10—3000 metres.

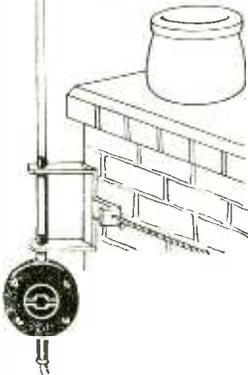
Model ASA412. Vertical Rod Chimney lashing. "Exstat" equipment, 50ft. screened cable, 16ft. Rod and complete lashing equipment as shown. List Price £8/16/-.

Model ASA412W. As Model 412 but for wall mounting List Price £8/6/-.

Model ASA413. As Model 412 but for mast head mounting. List Price £8/6/-.

Model ASA301. Complete Kit for Horizontal Span. "Exstat" equipment, 50ft. screened cable, aerial wire, rope insulators, etc List Price £5/15/-.

NOTE: All Antiference Aerials carry a 12 months' free insurance cover of £250 against lightning damage.



Full details in Leaflet G50/W from Sales Division

ANTIFERENCE Aerials
 ANTIFERENCE LIMITED, BICESTER ROAD, AYLESBURY, BUCKS.
 67 BRYANSTON STREET, LONDON, W.1.

Instruments for Research and Industry

Model 44 SUBSTANDARD MULTI-RANGE METER

A self-contained precision instrument for general laboratory use and for calibrating first grade single or multi-range meters. The accuracy on the 44 range is Substandard on D.C. and within $\pm 0.5\%$ on A.C.



★ These meters are made with the greatest care and have been supplied for a number of years to the leading laboratories at home and abroad.

ELECTRONIC INSTRUMENTS LTD
 17, PARADISE ROAD · RICHMOND · SURREY · ENGLAND



HIGH FIDELITY PRODUCTS

- Williamson Amplifier—Model D £31 0 0
- Williamson Pre-amplifier/Tone Compensation Unit £10 7 6
- Junior de Luxe Main Amplifier £20 0 0
- Junior Pre-Amplifier (incorporating low-pass filter) £8 10 0
- Minor Baffle, a new design of pleasing appearance £8 15 0
- Special High-Flux 8in Loudspeaker, for use with the above £2 5 0
 Plus Purchase Tax £1 0 0
- Junior Corner Horn. An entirely new and original design of exceptional performance. To house the Goodmans Axiom 101 or 102 loudspeakers. Full details available shortly. Price to be announced.

Available from leading dealers in London and the Provinces, or if in any difficulty, please apply direct.

Trade and Export Enquiries invited.

ROGERS DEVELOPMENTS Co
 "Rodeveo House," 116 Blackheath Road, Greenwich, London, S.E.10. Telephone: TIDeway 1723

AN IMPORTANT ANNOUNCEMENT

by  METAL PRODUCTS LTD.

A.B. Metal Products Ltd. proudly announce that they have been granted by the Clarostat Manufacturing Company Inc., Dover, New Hampshire, U.S.A., the sole manufacturing rights of the world-famous range of Clarostat Controls and Resistors.

Clarostat Controls and Resistors are known throughout the world for dependability and exceptional performance. Every control is designed and built to the very highest standard, and the wide range includes components which have not previously been available in this country.

The full research and development resources of this famous organisation, coupled with A.B. Metal's incomparable production facilities, will now make available components which will set a new standard.

Only a brief outline of the Clarostat range can be given in this present announcement, but further details will be issued as soon as possible, and a catalogue will be made available shortly.

- | | |
|---|--|
| <ul style="list-style-type: none"> • Wire-wound Potentiometers and Rheostats. • Composition - element Potentiometers and Rheostats. • "Glasohm" flexible Resistors, glass and • "Flexohm" fabric insulated. | <ul style="list-style-type: none"> • Wire-wound moulded Resistors; Wire-wound plug-in Resistors. • "Standee" above - chassis - mounted, wire - wound Resistors. • "Greenohm" wire-wound Power Resistors. • Power Rheostats, etc., etc. |
|---|--|



Controls and Resistors

METAL PRODUCTS LIMITED.
16, Berkeley Street, London, W.1.
Phone: GROsvenor 5206/7

A.D.S. SUPER QUALITY 8 1/2 WATT AMPLIFIER

FOR A.C. MAINS ONLY

Push Pull 6V6s 15 db neg. feed back
25-18,000 cps ± 1 db Hum Level—80 db
at 6 1/2 watts. Bass boost—Treble boost and
cut : LP correction : Provision radio feeder
unit.

BUILT & TESTED 16 gns.

The above Amplifier can now be
supplied in kit form. Complete with
fully illustrated instruction book.
£13.13.0

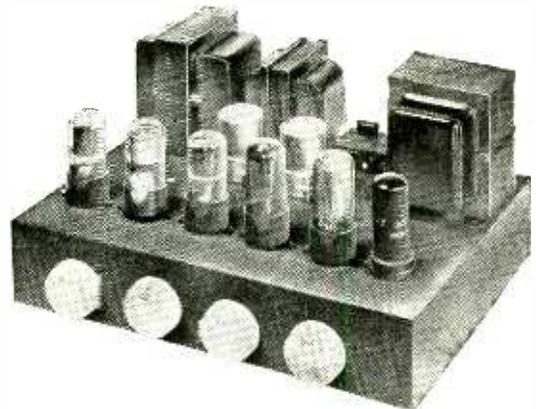
A.D.S. REFLEX CABINETS
Veneered and French Polished.
Available in Walnut, Oak and
Mahogany.

12" MODEL **£9.19.6**
10" MODEL **£9.9.0**



MUSEUM 4539 MUSEUM 2453
(Dept. W.W.) 18, TOTTENHAM COURT ROAD, LONDON, W.1
Shop Hours: Monday to Friday 9-5.30 p.m., Saturdays 1 p.m.

DEMONSTRATIONS DAILY



SUPERHET FEEDER

Three wavebands — B8A
Valves. 7 ks band width.
Wired complete and Tested.

10 gns.
FULLY GUARANTEED



**A
workshop
in your
pocket!**



**THE TELEVISION AND
RADIO SERVICE ENGINEER
FASTER TRIMMER KIT**

Contains :

- 1 End Trimmer.
- 1 Side Trimmer.
- 1 Yaxley Switch Contact Adjuster.
- 1 Low Capacity Trimmer.
- 1 Screwdr. ver.
- 1 Set of Feeler Gauges.
- 1 Set of Six Box Spanners from 1 to 8 B.A.
- 1 Set of Four Spanners from 0 to 8 B.A.

In durable black crackle finish metal case.

Export enquiries invited

SEND YOUR ORDERS TO:

J. & S. NEWMAN LTD.

100 HAMPSTEAD RD., N.W.1
Tel : EUSTon 5176/7

The **"TELEMAX"** LONG RANGE
50-μ/volts



**BIG
PICTURE
4' x 3'**

23 valve s/h. circuit. Sensitivity better than 50 microvolts.
Full bandwidth. 4' x 3' picture. 5 channel facility. A.C. only.
Insulated chassis. Neutral coloured rexine covered case, size
approx. 23" x 22" x 21", fitted with castors and geared lifting
jack for tilt.
Complete with valves, c.r.t. and optical unit.

Detailed Specification from the Manufacturers:—
TELEMECHANICS LTD.
3 NEWMAN YARD NEWMAN ST.
LONDON, W.1 L.A.Ngham 7965

Examples from the New range of TAYLOR INSTRUMENTS



Model 66A
Signal Generator

RANGES

100-320 Kc/s., 3.2-10 Mc/s. 320-1,000 Kc/s., 10-30 Mc/s. 1,000-3,200 Kc/s., 30-80 Mc/s. 60-160 Mc/s. (2nd harmonic).
ACCURACY. Frequency calibration accuracy is within $\pm 1\%$.

R.F. OUTPUT. Up to 100 millivolts at all frequencies.

MODULATION. 400 cycles per second modulated to a depth of approximately 30%.

List Price £22.10.0



Model 45B
Valve Tester

A comprehensive mutual conductance valve tester capable of measuring over 3,500 types of American and European radio valves. Supplied with a valve chart giving testing data. For use on A.C. Mains. Simple in operation. For operation from 105-125 volts and 200-250 volts A.C. supply at 40-100 c.p.s.

List Price £25.10.0



Model 240A
Pattern Generator

A high frequency oscillator covering a range from 40 Mc/s. to 70 Mc/s. with unmodulated or modulated output. Television receivers may be adjusted and set up in the absence of transmission. The modulated output produces white horizontal or vertical bars on the television screen.

List Price £14.0.0



Model 260A
Television Wobbulator

Model 260A provides entirely self-contained visual alignment facilities for Television receivers.

CARRIER FREQUENCY: range 5 to 70 Mc/s.
FREQUENCY DEVIATION: Adjustable from 0 to 5 Mc/s. total.

SWEEP FREQUENCY: 50 c.p.s. sinusoidal.
OUTPUT VOLTAGE: Adjustable from 0 to 10 mV. approx.

List Price £36.15.0

These instruments are available through your usual supplier. For full details of the complete range of Taylor instruments please write for our new 16 page catalogue.

★ Illustrated instruments are available on Hire Purchase

TAYLOR ELECTRICAL INSTRUMENTS LTD.

Montrose Avenue

Slough

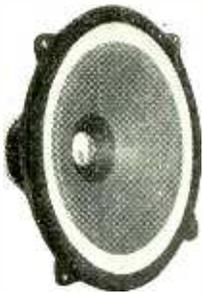
Bucks.

Telephone: Slough 21381

Be there every time!

With a **BAKERS**
Permanent Magnet
LOUD SPEAKER

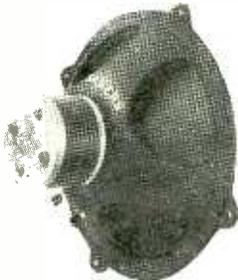
There is no surer way of obtaining true reproduction than by incorporating one of these speakers in your own cabinet, or by obtaining one of our Corner Cabinets, as illustrated below.



12" "TRIPLE CONE"
Frequency Range 18/16,000 c.p.s.
Fundamental Resonance = 35 c.p.s.
Max Peak Input 12 watt
PRICE £6.10 plu: £2.17.9. P.T.



£12.12.0. (No Tax) **18" "DUPLEX"**
Frequency Range 20/16,000 c.p.s.
Fundamental Resonance = 40 c.p.s.
Max Peak Input = 30 watts.



12" SINGLE CONE
Frequency Range 30/16,000 c.p.s.
Fundamental Resonance = 65 c.p.s.
Max Peak Input = 20 watts
PRICE £5.19.6 plus £2.11.0 P.T.

The "Selhurst" corner cabinet finished in walnut, oak and mahogany provides the perfect housing for all BAKER speakers.

PRICE £10.10.0 (No Tax)



Please write for full details to:—
24 DINGWALL ROAD, CROYDON, SURREY.

BAKERS
'Selhurst'
RADIO

Sole Distributor for Eire: BRIAN CURRAN, 283 Harold Cross Road, TERENURE, DUBLIN.

THE FAMOUS BENNETT COLLEGE

can help your career through personal postal tuition

in any of these subjects:

- Accountancy Exams. ★ Aircraft Eng. & Radio ★ Architecture ★ Auditing
- ★ Book-keeping ★ Building ★ Carpentry ★ Chemistry ★ Civil Service
- ★ Commercial Art ★ Commercial Arithmetic ★ Company Law ★ Costing
- ★ Diesel Engines ★ Draughtsmanship ★ Electric Wiring ★ Engineering (Civil; Electrical; Mechanical; Motor; Steam; Structural) ★ Jigs, Tools & Fixtures ★ Journalism ★ Languages ★ Mathematics ★ Mining
- ★ Modern Business Methods ★ Plumbing ★ Police ★ Press Tool Work ★ Quantity Surveying ★ Radio ★ Salesmanship ★ Secretarial Exams. ★ Shorthand ★ Surveying ★ Telecommunications ★ Television ★ Textiles
- ★ Works Management ★ Workshop Practice

and **GENERAL CERTIFICATE OF EDUCATION**
SUCCESS WILL BE YOURS

As a Bennett College Student your own Personal Tutor will coach you until you qualify, at your pace with no time wasted. You will learn quickly, easily.

SEND TODAY FOR A FREE PROSPECTUS

TO THE BENNETT COLLEGE DEPT. A.41, SHEFFIELD

Please send me your prospectus on (Subject)

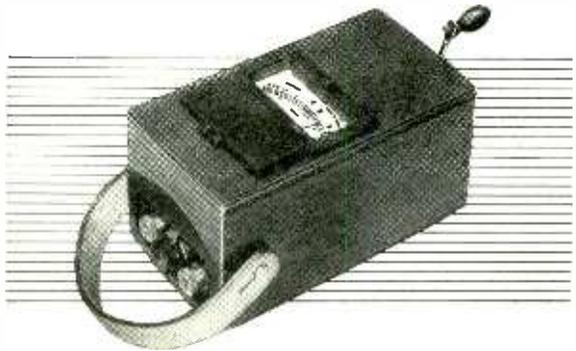
NAME.....

ADDRESS.....

..... AGE (IF UNDER 21).....

PLEASE WRITE IN BLOCK LETTERS

made to measure . . .



The man who knows exactly the state of his insulation at any time—is wise.

But one who uses a "Record" Insulation Test Set is wisest. It is made to measure—**ACCURATELY**, by those who were pioneers in this field and who have kept ahead.

RECORD

MAKERS OF MANY OTHER FINE INSTRUMENTS

THE RECORD ELECTRICAL CO LTD
BROADHEATH - ALTRINCHAM - CHESHIRE
Phone: Altrincham 3221/2/3 Cables and Grams: "Circscale" Altrincham
London Office: 28 Victoria Street, S.W.1. Phone: Abbey 5148 & 785
Grams: "Circscale" Sowest, London. Cables: "Circscale" London

● **THREE SPEED**
 ● **MIXED RECORD**
 ● **AUTO CHANGER**



Never before has there been a record changer equal to the B.S.R. Monarch, which without doubt gives tremendous sales appeal to any instrument in which it is mounted. It includes all features demanded by the discriminating listener and has a styling and colour that will blend with any cabinet design.

Simplicity of design guarantees long life and trouble-free operation. The controls consist of one knob only, no levers to adjust, no loose fittings, no confusing adjustments for playing the increasingly popular 7" L.P. records.

A brilliant new three diameter selector enables different diameter records to be played automatically. The machine thinks for you by automatically adjusting itself for all three diameters.

Quality of reproduction is unequalled due to the outstanding performance of the latest B.S.R. reversible pick-up cartridge with two sapphire styli for standard and long playing records.

OUTSTANDING FEATURES

- ★ Automatically selects and plays 12", 10", and 7" records, *mixed in any order* at 33 $\frac{1}{3}$, 45, or 78 R.P.M.
- ★ Changer automatically stops after last record, motor is switched off and pick-up is returned to rest position.
- ★ Carefully designed to reduce moving parts to the very minimum, giving long trouble-free life.
- ★ New turn over pick-up has extended range up to 10,000 c.p.s. Self compensated accurately for the L.P. lower frequencies with the Turnover frequency at the correct point. Compliant enough to take the lowest frequencies.

★ Operates on 100/125—200/250 volts, 50 cycles, A.C. mains. Models available for 60 cycles A.C. mains.

Careful design allows us to deliver this unrivalled unit anywhere in the world at competitive prices.



MONARCH



MU14



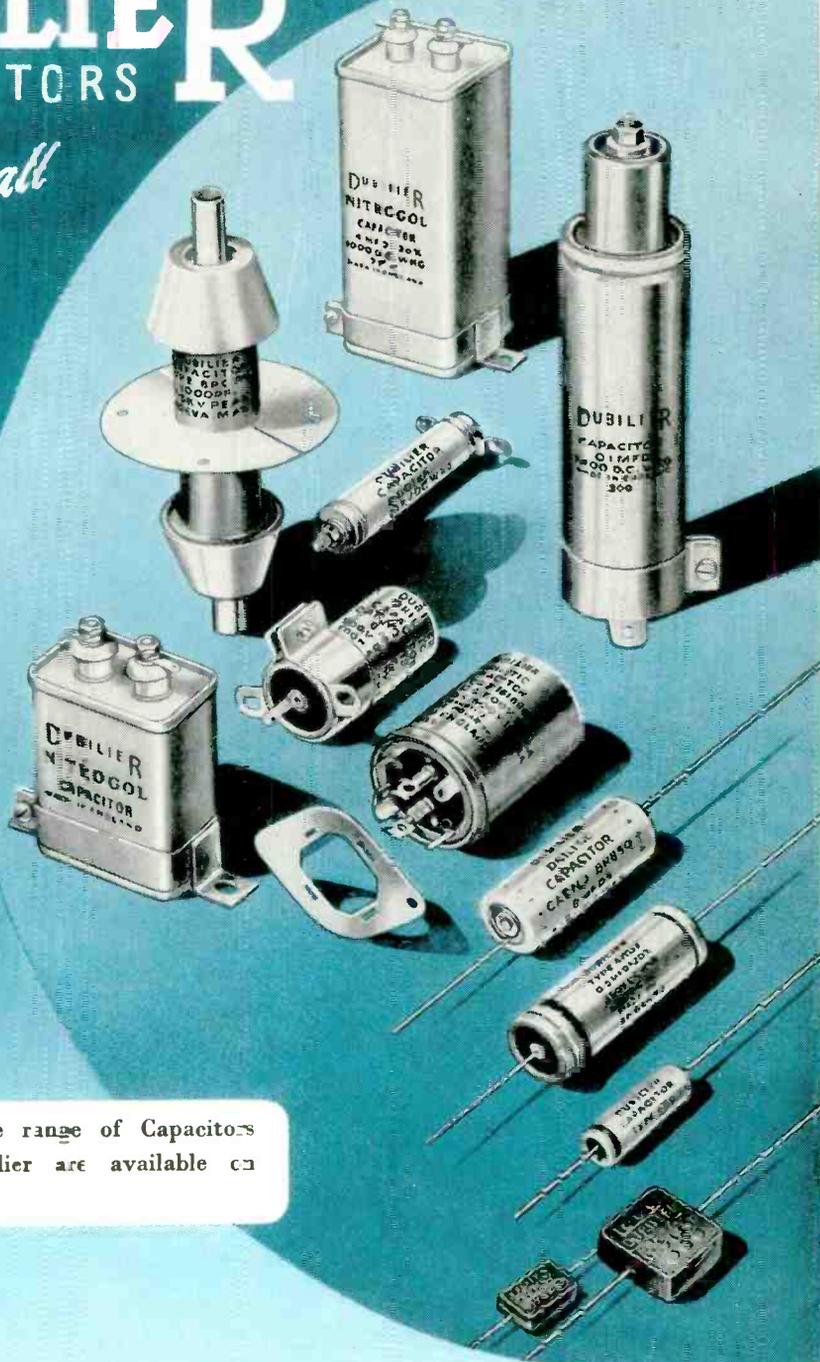
REGENT

Birmingham Sound Reproducers Ltd., Old Hill, Staffs. Grams: 'Electronic Old Hill, Cradley Heath.'

Examples of MODERN CAPACITOR ENGINEERING

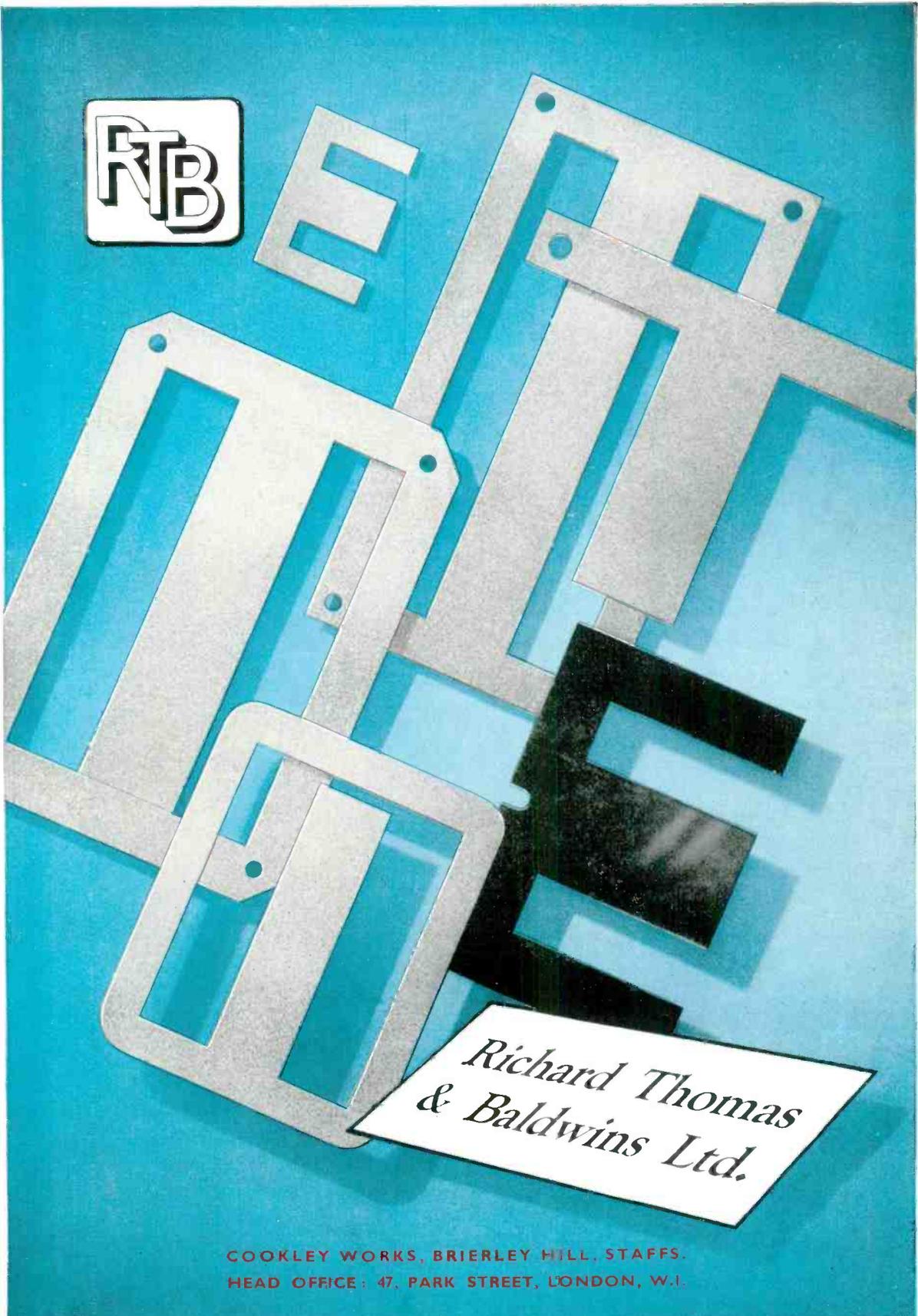
DUBILIER CAPACITORS

*incorporate all
the essential
features
required
in modern
radio and
electronic
practice*



Details of the complete range of Capacitors manufactured by Dubilier are available on request.

DUBILIER CONDENSER CO. (1925) LTD. · DUCON WORKS, VICTORIA RD., NORTH ACTON, W.3
Telephone : Acorn 2241 (5 lines) Cables : Hivoltcon, London. Telegrams : Hivoltcon, Wesphone, London
Marconi International Code.



*Richard Thomas
& Baldwins Ltd.*

COOKLEY WORKS, BRIERLEY HILL, STAFFS.
HEAD OFFICE: 47, PARK STREET, LONDON, W.1.



ADEN • ANGOLA • ARABIA • ARGENTINA
 AUSTRALIA • BAHREIN • BELGIUM • BERMUDA
 BORNEO • BRITISH ISLES • BRITISH WEST AFRICA
 BURMA • CAMEROONS • CANADA
 CEYLON • CHANNEL ISLANDS
 CHINA • COLOMBIA
 CYPRUS • CZECHO-SLOVAKIA

REDIFON R50M
 Supreme, world-wide, communications receiver for civil, military, naval, aeronautical, meteorological, and other services.



Redifon

LINKS

*Nation to Nation • Town to Town
 Village to Village • Ship to Shore
 Ground to Aircraft*

Radio Telegraph, Telephone and frequency shift Teleprinter; high, medium and low power Transmitters; Communications and Diversity Receivers.



REDIFON LIMITED

Aviation Communications Division

BROOMHILL ROAD
 LONDON, S.W.18
 ENGLAND

YUGOSLAVIA
 VENEZUELA
 U.S.S.R. • UGANDA
 TURKEY • TUNISIA
 TRINIDAD
 TANGANYIKA
 SYRIA
 SWITZERLAND
 SWEDEN • SUDAN
 SPAIN • SOUTH AFRICA
 SOMALILAND
 SIERRA LEONE
 SHIPS AT SEA
 SARAWAK
 RUMANIA • PORTUGAL

DENMARK • DUTCH EAST INDIES
 ECUADOR • EGYPT
 FALKLAND ISLANDS
 FIJI ISLANDS
 FINLAND
 FRANCE
 FRENCH W. AFRICA
 GAMBIA
 GOLD COAST
 GREECE
 GUIANA BRITISH
 GUINEA PORTUGUESE
 HOLLAND
 HONG KONG
 HUNGARY
 ICELAND • INDIA



REDIFON G67
 2½ kW Channelised H.F. Transmitter, designed for general purpose long distance communications.

IRAN • IRAQ • IRELAND • ITALY
 JAMAICA • JERSEY • JORDAN
 KENYA • LEBANON • LYBIA
 MALTA • MAURITIUS • NEW ZEALAND • NIGERIA • NORWAY

N. RHODESIA • PAKISTAN
 PARAGUAY • POLAND



REDIFON G.R.49D Equally suitable for fixed, transportable and mobile installations. The G.R.49D. is a complete transmitting and receiving station providing both Telephony and C.W. Services.



PLACE IT ON RECORD...
with a
TAPEMASTER!

TAPEMASTER RECORDING COMPONENTS
Suitable for use with either Hartley or Culpitts circuits. Retail

JUNIOR MODEL	
Play/record, imp. 3,000 ohm at 1/K/C	} at
Erase	each £1 19 6
SENIOR MODEL	
Play/record, imp. 5,500 ohm at 1/K/C	} at
Erase	each £2 5 0
Oscillator Coil in can, each.....	10 6
Oscillator Unit, incl. coil and 6V6GT valve, each.....	£2 5 0

TAPEMASTER MAGNET FEATURES:—

Electrically balanced to ensure low "hum" level.
Play/Record Model with .0005in. gap ensuring max. top response Beryllium Copper, non-magnetic gapping.
Mu-metal cores for Play/Record models.
Track width, Play/Record, .082in., Erase .110in.
Bias frequency 45 KC, exactly matching Tapemaster oscillator units and coils.
Output 10 mV.
Recording level 10 mV.
With optimum bias, recording level and equalisation of Amplifier, response in frequency equals tape speed in inches/sec.
Oscillator units and coils are designed to give an undistorted wave form, and oscillate at 45 KC to suit Tapemaster magnets.
Full instructions are included for building oscillator units and coils into amplifier circuits.

RETAILERS and STOCKISTS

LONDON AREA. Arthur's, 150-2 Charing Cross Road, W.C.2.
Bull, J., & Sons, 246 High Street, Harlesden N.W.10.
Classic Electrical Co. Ltd., Lower Addiscombe Road, Croydon.
Davis, Alec, Supplies Ltd., 18, Tottenham Court Road, W.1.
Electronic Precision Equipment, 192 Fleet Street, E.C.4.
Electronic Precision Equipment, 46 Windmill Hill, Ruislip.
Garland Bros., Chesham House, Deptford Broadway, S.E.8.
Garland Bros., 5, Obelisk Parade, Lewisham, S.E.13.
Geo Bros. (Radio) Ltd., 15 Little Newport Street, W.O.2.
Henry's, 5 Harrow Road, W.2.
Home Radio, 187, London Road, Mitcham.
Howard, David, 347 London Road, Mitcham.
Lasky's Radio, 370, Harrow Road, W.9.
Odeon Radio, 56, College Road, Harrow.
Smith, H. L. & Co. Ltd., 287/9, Edgware Road, W.2.
Stern Radio Ltd., 109/15 Fleet Street, E.C.4.
Teleradio (1945) Ltd., 177, Edgware Road, W.2.

PROVINCES. Affleck's Radio Service, 272 Shirley Road, Southampton.
Beaver Radio, 60-2 Whitechapel, Liverpool 1.
Bold & Barrows, 12 Verulam Road, St. Albans.
Brown, A., Ltd., 35 Arundel Street, Portsmouth.
Evans, D. R., Central Market Balcony, Cardiff.
Fairbotham & Co., Ltd., 47 Lower Hillgate, Stockport.
Fenwick's Radio, 61, Brickkiln Street, Wolverhampton.
Gee, H., Mill Road, Cambridge.
Kershaw, S., Pershore St., Birmingham 5.
Rapid Radio Service, 13 Fore Street, Ipswich.
Rapkin Radio, 73 Wellingboro Road, Northampton.
Wakelin's Wireless Co. Ltd., 66 Norwich Road, Ipswich.
Watts Radio (Weybridge), Ltd., 8 Baker Street, Weybridge.

TRADE AND EXPORT ENQUIRIES—PLEASE APPLY TO:—Wholesale Distributors and Sale Concessionaires.



Winter Trading Co. Ltd

6, HARROW ROAD, PADDINGTON, W.2.
Telephone: Paddington 3646 (6 lines)
SOUTHAMPTON: 20, Bevois Valley Road. Tel: 54273.
CARDIFF: 31, Bridge Street. Tel: 21829.
BIRMINGHAM: 58, Pershore Street. Tel: MIDland 1920



GOODMANS

AUDIOM LOUDSPEAKERS



AUDIOM 60
15 watt

This 12-inch single cone, medium heavy duty reproducer has an outstanding smoothness in response and performance and meets the most modern demands in the field of P.A. installations, small cinemas, high power radiogram phones, etc.

SPECIFICATION Overall Diameter 12 1/8 in. Overall Depth 7 in. Voice Coil Diameter 1 1/4 in. Fundamental Resonance 75 c.p.s. Voice Coil Impedance 15 ohms. Power Rating 15 watts peak A.C. Flux Density 14,000 gauss. Total Flux 158,000 Maxwells. Nett Weight 12lb. 13oz. Finish Grey Rivelling Enamel.



AUDIOM 70
20 watt

This high power version of our well known Audiom 60 is available as a bass unit for multi-speaker systems or general Public Address use.

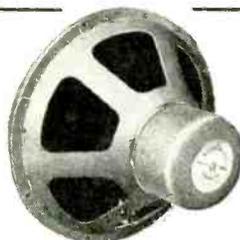
SPECIFICATION Overall Diameter 12 3/8 in. Overall Depth 7 in. Voice Coil Diameter 1 1/4 in. Fundamental Resonance. Cone Type "1205" 75 c.p.s. (Designed for Public Address use); Cone Type "1206" 55 c.p.s. (Designed for Bass Reproduction). Voice Coil Impedance 15 ohms. Power Rating 20 watts peak A.C. Flux Density 17,500 gauss. Total Flux 195,000 Maxwells. Net Weight 18lb. 4oz.



AUDIOM 80
25 watt

Ideally suited for Dance Halls, Rinks, Cinemas, Electric Organs and very heavy duty Public Address Installations, this powerful Loudspeaker has a remarkably smooth response up to 6,000 c/s.

SPECIFICATION Overall Diameter 15 in. (38 cms.). Overall Depth 8 1/2 in. (21.3 cms.). Voice Coil Diameter 2 in. (5 cms.). Fundamental Resonance: Cone type 1501, 60 c.p.s. Cone type 1502, 40 c.p.s. Voice Coil Impedance 15 ohms at 400 c.p.s. Power Rating 25 watts peak A.C. Flux Density 14,500 Gauss (nominal). Total Flux 215,000 Maxwells. Nett Weight 25 1/2 lb. 11.7kg.



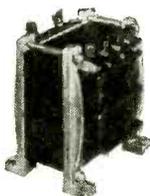
AUDIOM 90
50 watt

Massive construction throughout enables the Audiom 90 to withstand continuous handling of heavy duty inputs, suitable for use in Cinematograph installations, Electric Organs and very high power Public Address systems.

SPECIFICATION Overall Diameter 18 in. (45.7 cms.). Overall Depth 10 1/2 in. (25.4 cms.). Voice Coil Diameter 2 1/2 in. (6.35 cms.). Fundamental Resonance 35 or 50 c.p.s. Voice Coil Impedance 6 ohms. Power Rating 50 Watts Peak A.C. Flux Density 14,500 Gauss. Total Flux 267,000 Maxwells. Nett Weight 29 1/2 lb. 13.4Kg.

HIGH FIDELITY

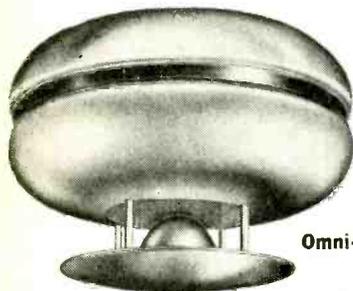
Mounted in heavy die-cast clamps and fitted with insulated terminals, the transformer is of robust construction and conforms to the highest standards of electrical engineering.



OUTPUT TRANSFORMER

MODEL H.6

SPECIFICATION Peak A.C. 30 Watts. Frequency Range 10-20,000 c/s. ± 1db. Size 3 in. x 3 1/2 in. x 4 1/2 in. Nett Weight 5lb.



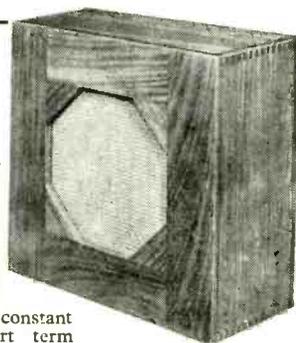
THE CONCENTRIC DIFFUSER
MODEL CD/77

Omni-directional
P.A. Reproducer

Introduced to meet the demands for an omni-directional Public Address Reproducer, this 10 watt diffuser utilises a high flux P.M. Loudspeaker. The design features besides being of an attractive nature also ensure sound distribution over a radius of 360°.

SPECIFICATION Overall Diameter 20 1/2 in. Overall Height (including eye suspension attachment) 17 1/2 in. Speaker Unit 10 in. P.M. High Flux. Voice Coil Impedance 3 or 15 ohms.

INDUSTRIAL CABINET No. 5



Strongly constructed of natural polished seasoned mahogany the aperture is covered with a woven cord material ensuring maximum protection to the diaphragm with minimum obstruction to sound. Built with locked corners to withstand the constant handling involved in short term linework the cabinet dimensions have been carefully planned for use with a 12 in. P.M. loudspeaker and is ideal also for permanent institutions.

SPECIFICATION Size: 17 in. x 17 in. x 8 1/2 in. Finish: Natural, Polished. Nett Weight: 9lb. 14oz.

Write for Illustrated Data Sheets and Full Descriptive Literature to :

GOODMANS INDUSTRIES LIMITED

AXIOM WORKS • WEMBLEY • MIDDLESEX • Telephone No. WEMBLEY 1200

THESE AXIOMS

are not just loudspeakers –
but loudspeakers with a *difference!*

There are four in the family, all differing in specification but possessing a common link—the ability to reproduce faithfully. Several years ago we designed the AXIOM 150 (12in.) which is remembered by tens of thousands of enthusiasts throughout the world. This instrument was acclaimed as “the speaker with a performance far in excess of its price.”



Axiom 150 Mk. II

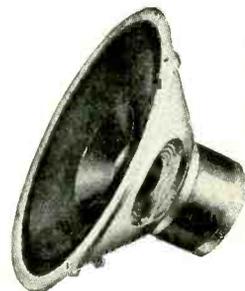
With the advent of wide range recording technique and continuous progress in the design of audio equipment (our congratulations to all concerned) we recognised these advances with the introduction early in 1952 of the AXIOM 150 Mk. II. This 15-watt Reproducer with a frequency range of 30-15,000 c/s. combined with an outstanding transient handling capability gives superlative quality for £14/13/4, including purchase tax.

What has been said of the AXIOM 150 Mk. II applies even more to the AXIOM 22 Mk. II (12in.). This is a 20-watt AXIOM with a higher flux density than the AXIOM 150 Mk. II, and an improved transient response due to increased magnetic damping. Price £20/19/9, including purchase tax.

When these units are adequately housed, Mr. Enthusiast may have to convince Mrs. Enthusiast that the space occupied is merited! Domestic difficulties of this nature can be entirely avoided by installing one of the latest additions to our AXIOM family—namely the 8in. AXIOM 101 or AXIOM 102.

Both these units will handle 5 watts of audio power, which we have found quite adequate for normal domestic levels. For their size they cover an extremely wide frequency range—40 to 15,000 c/s. Though hard to believe, this is testified by the thousands who have already heard them. The difference between the two models is again one of flux density (AXIOM 101 13,500 gauss and AXIOM 102, 17,000 gauss). When housed in reflex chambers both these units occupy the minimum space.

AXIOM 101, Price £7. 2. 9 including purchase tax.
AXIOM 102, Price £10. 14. 2 including purchase tax.



Axiom 22 Mk. II



Axiom 101



Axiom 102

In the AXIOM range there is a speaker to satisfy the most critical. We believe that due to our exceptional production and research facilities, and the fact that we are largely a self-contained manufacturing unit, these speakers represent greater value than any others obtainable.

All these models are stocked by the leading dealers, but in case of difficulty, please order direct from us. We invite you to write for further details of any unit. Remember we can give you outlined dimensioned drawings of reflex chambers for all Speakers mentioned.



GOODMANS

GOODMANS INDUSTRIES LTD., Axiom Works, Wembley, Middlesex.

Telephone: WEMbley 1200. Telegrams: Goodaxiom, Wembley, England.

THE "TELEKING"

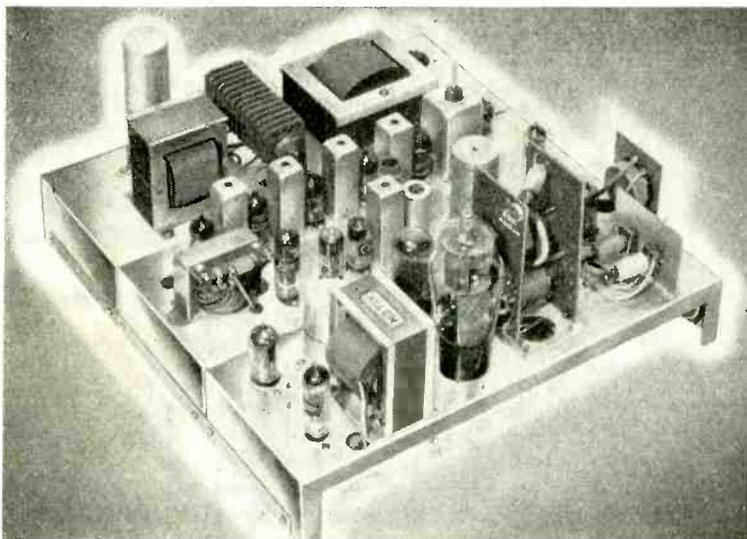
A PRACTICAL SUPERHETERODYNE 16" TELEVISION RECEIVER FOR THE HOME CONSTRUCTOR

ALL COMPONENTS ARE READILY AVAILABLE

Wide-Angle
Scanning
Components;
Ready-Made
Chassis;
Transformers &
Coils

by
**ALLEN
COMPONENTS
LIMITED**
"Crown Works"
197 Lower
Richmond Rd.
RICHMOND

Surrey



16" METAL C.R.T.
SIMPLE TO ALIGN

Suitable for
Fringe Areas.
Automatic Noise
and Spot
Limiters. De-
signed with
the Co-operation
and Approval
of the Leading
Manufacturers.
3Mc/s Bandwidth
Sensitivity 15 μ V.

ONE MODEL FOR ALL CHANNELS

ALEXANDRA PALACE SUTTON COLDFIELD HOLME MOSS
KIRK O'SHOTTS WENVOE

OVER 2,000 MODELS OF THIS RECEIVER HAVE ALREADY BEEN CONSTRUCTED
SINCE THE 1952 RADIO EXHIBITION AT EARLS COURT.

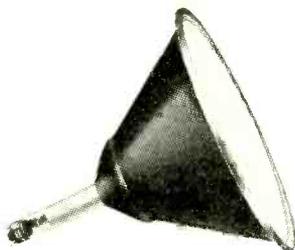
FULL CONSTRUCTIONAL DATA INCLUDING ACTUAL SIZE WORKING PRICE
DIAGRAMS IS AVAILABLE IN ENVELOPE FORM FROM ALL IMPORTANT **6/-**
RADIO STORES AND BOOK SHOPS

or from

TECHNICAL SUPPLIERS LTD.

HUDSON HOUSE,

63 Goldhawk Road, London, W.12.



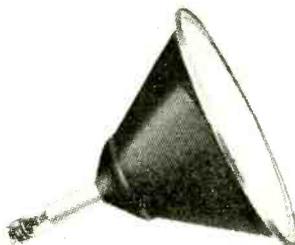
**Giving "home constructors"
everything they look for!**

'ENGLISH ELECTRIC'

BRITISH MADE

16 INCH LONG LIFE METAL C.R. TUBES

TYPE T.901



First metal tube in Great Britain and still first in performance ever since its introduction by 'ENGLISH ELECTRIC' . . . 'Tele-King' and 'Magnaview' circuits and 'View-Master' conversion circuit are built around it! The de-

signer's choice for "professional" results. Magnetic focus and deflection (70° angle). Almost flat face-plate. Wide angle scanning. Picture focussing over whole of screen area. Fitted ion trap. Length 17 $\frac{1}{8}$ ".

Your local dealer will gladly supply full particulars, or write . . .

THE ENGLISH ELECTRIC COMPANY LIMITED, TELEVISION DEPT., QUEENS HOUSE, KINGSWAY, LONDON, W.C.2.

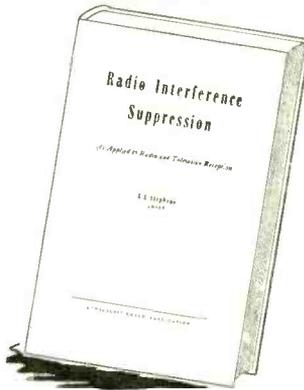
An important new book recently published for WIRELESS WORLD

Radio Interference Suppression

As Applied to Radio and Television Reception. This practical handbook by C. L. Stephens, A.M.I.E.E., provides an up-to-date guide to the various methods of suppressing electrical interference with radio and television reception, particular attention being paid to the problem at television frequencies. The author describes in detail the origins of interference and the whole theory of suppression technique. Many practical applications are given.

Typical interfering appliances discussed include: engine ignition systems, switches, thermostats and contactors, electric motors and generators, rotary converters, neon signs, fluorescent lighting, etc. Other chapters deal with the design and choice of suppressor components, methods of locating the source of interference, and suppression at the receiver itself.

10s 6d net. By post 10s 11d.



Other selected titles

Advanced Theory of Waveguides

By L. Lewin. Sets out the various methods that have been found successful in treating the problems arising in waveguide work. The author has selected a number of topics as representative of the field in which the centimetre-wave engineer is at present engaged. 30s net. By post 30s 7d.

Sound Recording and Reproduction

By J. W. Godfrey and S. W. Amos, B.Sc., A.M.I.E.E., in collaboration with the BBC Engineering Division. Covers in detail the theory and practice of disc, magnetic and film recording with special reference to equipment used by the BBC. The text is fully illustrated with nearly 200 diagrams and photographs.

30s net. By post 30s 7d

Obtainable from all booksellers or direct by post from the address below.

ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

ACE
THE LAST WORD IN
TAPE RECORDERS

MODELS 10 & 12 HAVE EVERYTHING

- 10 WATTS PUSH-PULL HIGH FIDELITY AMPLIFIER
- 3 INPUTS: CRYSTAL & M/C. MICS. & GRAM.
- 3 TAPE SPEEDS: 3¾, 7½ & 15 INCHES PER SECOND
- 2 TRACKS PER TAPE - 2 Hrs RECORDING
- 2 SEPARATE INPUT CONTROLS FOR MIXING
- COMPLETELY AUTOMATIC ERASE (ELECTRONIC)
- DETACHABLE SPEAKER UNIT MODEL 12
- FAST REWIND & FORWARD WIND MONITORED & DIRECT INPUTS
- VERY COMPACT MODEL 10 15½" x 10" x 7¾"

SEND STAMP FOR FULLY ILLUSTRATED BROCHURE

MODEL 10 £65
MODEL 12 £66-10-0

Demonstrations from:
ASSOCIATED CINE EQUIPMENTS LTD.
353, BEXLEY ROAD, ERITH, KENT. Phone: Erith 2543.

ALL the A.C. power you require from your D.C. supply

with a

Valradio

D-C/A-C CONVERTER

Models for Electric Gramophones from £8 16 0
Models for

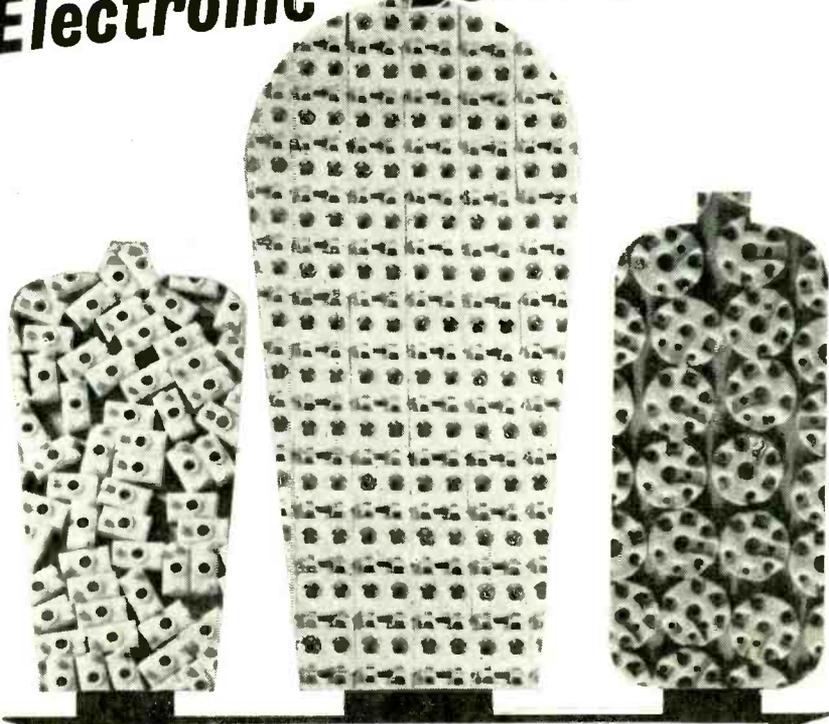
- Radiograms and Autochange Radiograms (inc. 3-speed motors)
- Radios, Televisions, etc. from £11 16 6
- Tape Recorders, Dictating Machines, etc. Input, 6, 12, 24, 32, 50, 110 or 200/250V. D.C. Output 230V. 50 or 60 c/s.

Descriptive literature W.W. 24 from the manufacturers: NEW CHAPEL ROAD, HIGH ST., FELTHAM, MIDD. Tel.: FELtham 4242

Service Dept.: 57 Fortress Road, London, N.W.5. Tel.: GULLiver 5165 & 7202
Scottish Debot: 257 Gorbals St., Glasgow, C.5. Tel.: South 1326

Overseas enquiries to nearest E.M.I. Organisation Depot.

Electronic Development...



NEEDS

**T.T.
LOW LOSS
CERAMICS**

GOOD DELIVERY

COMPETITIVE PRICES

For full particulars
OF ALL LOW LOSS CERAMICS SUITABLE
FOR ELECTRONIC DEVELOPMENT

write to

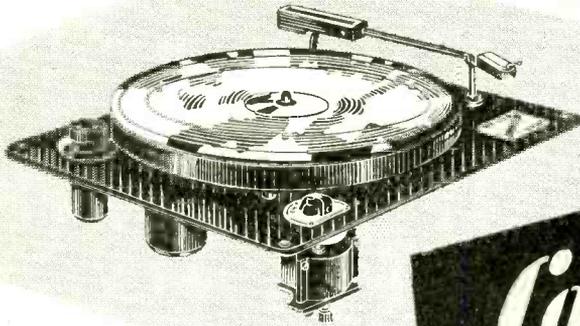
TAYLOR TUNNICLIFF (REFRACTORIES) LTD

ALBION WORKS, LONGTON, STOKE-ON-TRENT

Telephone : Longton 33122

London Office : 125 HIGH HOLBORN, LONDON. W.C.1 Tel : HOLBORN 1951/52

the *Connoisseur* 3-speed gramophone motor



This new motor unit is another noteworthy achievement in the "Connoisseur" tradition. Full 12" turntable 33 $\frac{1}{3}$, 45 and 78 r.p.m. The synchronous motor is virtually vibrationless and suitable for standard, transcription and microgroove recordings.



Main turntable spindle, precision ground and lapped, runs in phosphor-bronze bearings. Low noise level and hum induction. Input voltages: 200-250 A.C. 50 cycles or 60 cycles to order at no extra charge.

Price without pick-up £16.10.0 plus £7.3.0 P. Tax

MODIFICATION FOR TWO-SPEED

Conversion parts for "Connoisseur" Dual Speed Motor to give the third speed of 45 r.p.m. now available, together with centre disc, at a cost of 5/8 inc. of Purchase Tax.

A. R. SUGDEN & CO. (Engineers) LTD.,

WELL GREEN LANE,
BRIGHOUSE, YORKSHIRE.

Telephone: HALIFAX 69169

AN ANNOUNCEMENT



HIGH FIDELITY CRYSTAL MICROPHONES

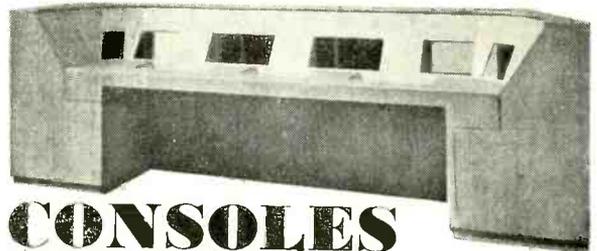
We have pleasure in announcing that we are now the approved SOLE DISTRIBUTORS of the famous range of Ronette Microphones, and can offer immediate delivery of a fully comprehensive range hitherto unobtainable in Gt. Britain, as shown below.

- | | | | | | |
|---------------|--|---------|---------------|---|----------|
| B110 | Reporter Microphone | £2 12 0 | GS.210 | Built-in on/off switches for G210 Models 20-extra on each type. | |
| HM | Hand Microphone with Filtercel Insert | £4 7 6 | RFC | Studio Microphone with Fully Floating Insert | £8 15 0 |
| 088 | Ball Microphone with Filtercel Insert. | £4 10 0 | RFC/L | do. do. with low Impedance built-in Transformer | £10 10 0 |
| 088/U | do. do. with Universal Joint | £5 2 6 | S742 | Twin Microcell Microphone | £9 5 0 |
| 088/F | do. do. Mounted on Flexible Chrome Tube with Universal Joint | £6 19 6 | R572 | Twin Microcell Studio Microphone | £9 19 6 |
| G210 | Streamlined Tilting Head Microphone with Filtercel Insert | £4 19 6 | R752/L | do. do. with low Impedance built-in Transformer | £11 19 6 |
| G210/L | do. do. with low Impedance Built-in Transformer | £6 19 6 | R474 | MULTICELL Studio Microphone | £15 15 0 |

- A choice of inserts is available for most models.
- All Ronette microphones have standard threads for mounting.
- Fully illustrated leaflet available on application.

RONETTE—the House of Aristocratic Microphones

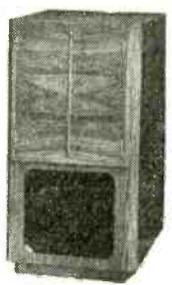
E. & G. DISTRIBUTING CORPORATION LTD.
33 Tottenham Court Road, London, W.1



CONSOLES



For Major Film Mixer Suites to Individual requirements
"VIEWMASTER" CONSOLES
AS SHOWN



Beautifully designed and finished in Walnut, Oak, Mahogany and Teak, to customers' requirements

- Standard "VIEWMASTER" model as shown £13.0.0
- With Full Length Doors ... £14.0.0
- Universal Model for all 16" tubes now in preparation. Carriage and Packing 15/- extra.

Fitted with shelf for easy mounting. These are NOT mass produced and dimensions can be altered to suit personal requirements.

Individual and Trade Enquiries to

H. ASHDOWN
CABINET MAKER

98 HERTFORD ROAD, EDMONTON, N.9
Phone: TOT. 2621

BRITISH and proud of it!

As the world has in the past depended on British inventive genius and craftsmanship in the fields of engineering, shipbuilding, and aeronautics, so it does to-day in electronics—reflected in this new British tape recorder, the Simphonic Model 1A.

Supreme in its class, the Simphonic leads on every count.

PERFORMANCE : Response 50-10,000 c/s. 8 watts high quality push-pull output. Wide dynamic range.

DESIGN : Three motor drive. Monomaster finger tip control. Positive servo brakes on both spools.

FACILITIES : Two running speeds. Twin track operation. Playback via internal or external I.S. Provision for remote control.

STYLING : Handsome, robust portable case. Attractive colour scheme. Provision for carrying microphone, spare tapes and accessories.

SERVICE : British made throughout. Complete established service facilities.

Hear the Simphonic 1A at your local dealer to-day! Trade enquiries invited.



SIMON SOUND SERVICE

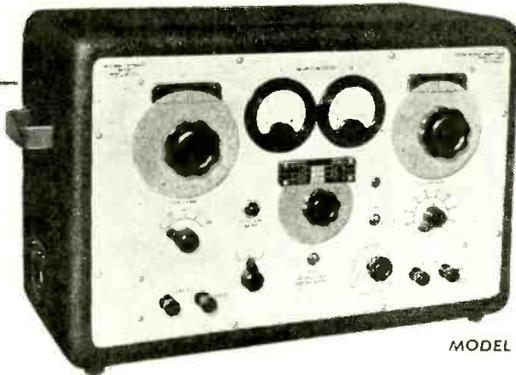
48-50, GEORGE STREET, LONDON, W.1

TELEPHONE : WELBECK 2371 (5 lines)

GRAMS : SIMSALE, WESDO, LONDON

CABLES : SIMSALE, LONDON

UNIVERSAL IMPEDANCE BRIDGE



MODEL UB 202

A general-purpose instrument covering a very wide range of measurements for values of resistance, inductance and capacity. When used for resistance measurement it is connected as a Wheatstone bridge, the required D.C. source of supply and the balance-indicating micro-ammeter both being incorporated in the instrument. When used as a capacity bridge, the con-

denser under test is connected in a modified De Saute's Bridge. The same dial is used for resistance measurement is used to balance the capacity of the unknown condenser, whilst a second dial in combination with a decade resistance balances the power loss. For the measurement of inductance the instrument is converted into a Hav's bridge.

RESISTANCE RANGE: 0.1 ohm to 1,000,000 ohms. Basic range: 0.1 to 11 ohms continuously variable plus nine steps of 10 ohms.

CAPACITY RANGE: 10 pf to 1,000 mFds. Basic range: 10 to 1,100 pf continuously variable, plus nine steps of 1,000 pf.

INDUCTANCE RANGE: 10 microhenries to 1,000 henries. Basic range: 10 to 1,100 microhenries continuously variable, plus nine steps of 1,000 microhenries. 6-way multiplier.

BRIDGE FREQUENCY: 1,000 cycles supplied from internal valve oscillator. Visual null detector is incorporated in the instrument.

SENSITIVE PANEL MOUNTING METERS

SIZE	2 1/2"	3 1/2"	5"
RANGE	25μA	15μA	15μA
	to	to	to
	50A	50A	50A

Prices on application

Available for immediate delivery from our Stockists, M.R. Supplies, Ltd., 68 New Oxford Street, W.C.1, or write to:

BRITISH PHYSICAL LABORATORIES

HOUSEBOAT WORKS · RADLETT · HERTS · Telephone: Radlett 5674-5-6

A Happy New Year to All

Let your resolution be:—

-towards perfection-

and choice from our complete and comprehensive range of "Blue Riband" electronic and electro-acoustic equipment.

You do not have to buy again when you have bought **Lowther Products.**

Leaflets gladly sent upon request.

THE LOWTHER MANUFACTURING CO.
(The Laboratory Production Unit)

Lowther House, St. Mark's Road, Bromley,
Kent. RAV. 5225.

★ now ready! ★

The

Skyway

TAPE RECORDING MANUAL

COMPLETE BUILDING
INSTRUCTIONS

for making a

De Luxe Tape Recorder

36 pages packed with information,
drawings, plans and amplifier wiring
diagrams.

PRINTED ON HIGH QUALITY ART PAPER

DIRECT FROM

Frith Radiocraft Ltd. **3'6** Plus
69-71 CHURCH GATE, 3d. Postage
LEICESTER

Or through any W. H. SMITH & SON bookstalls

miniature in size ... mighty in performance



Little wonder that OSMOR "Q" RANGE COILS are the "big noise". No imitation, regardless of price, can compare with them for super selectivity and sensitivity. And you don't just have to take our word for it—the watertight guarantee makes your satisfaction certain! Consider these points of superiority:—

- ★ Only 1 in. high.
- ★ Variable iron dust cores.
- ★ Low loss Polystyrene formers.
- ★ Packed in damp-proof containers.
- ★ Fitted tags for easy connection.

COILPACKS. A full range is available for Superhet and T.R.F. Mains or Battery. Size only 1½ in. high x 3½ in. wide x 2½ in. Ideal for the reliable construction of new sets, also for conversion of the 21 RECEIVER, TR 1196, TYPE 18, WARTIME UTILITY and others.



WARNING!!

Any coils from fire, salvage or similar sources are not subject to our guarantee and service. Buy from reputable sources only.

Aligned and tested, with full circuits, etc. Fully descriptive leaflets available.



Outstanding

OSMOR

Quality Lines of Interest



You'll get a shock—

the first time you hear your own voice! Have fun and find endless pleasure in using an **INEXPENSIVE TAPE RECORDER** you can build yourself. We can supply all the parts to make a really efficient unit, utilising your gramophone turntable (which can still be used for its normal purpose). Send 2/6 only for easy-to-follow blueprints and instructions, or ask for details.

CRYSTAL MICROPHONES

As used in the Tape Recorder mentioned above and for almost any equipment where quality at a low price is desired.

ACOS 22-2. Table or hand model, as illustrated, including removable base. Uniform response. 40-6,000 c/s. **£6/6/-.**

ROTHERMEL 2AD56. Black anodised finish, as illustrated, for hand or table use. Tapped to fit any standard base. (Table-bases available shortly at approximately 10/- each.) Uniform response. 30-10,000 c/s. With cable, **£2/19/6.**

FOUR for the Price of TWO! The NEW OSMOR CHASSIS CUTTER!

of entirely new design. Cuts two sizes of holes with any one reversible punch and die; and can be operated with a spanner or tommy-bar. Blanks easily removed.

Punch and Die sizes:
No. 2— $\frac{1}{8}$ x 1½ in.
No. 3— $\frac{1}{8}$ x 1½ in.
Enquiries for other sizes are welcomed.
Supplied complete with both No. 2 and No. 3 punches and dies for 30/- (postage and packing 1/3) or 18/- one punch and die only. (Please state which.)



The OSMOR "JIFFY PUNCH" cuts a $\frac{3}{8}$ " hole with one blow of a light hammer. Complete with punch and die... 5/9 post free.

FREE!

Send 5d. (stamps) for **FREE CIRCUIT** and full lists of coils, coilpacks and radio components.

A spotlight on just one of the range of Osmor "Q" coils.

H.F. CHOKE Type Q.C.1.

Frequency coverage 150 kc/s. to 20 mc.
Iron-dust core and single-screw fixing
Prototype tested and approved by M. G. Scroggie, B.Sc., M.I.E.E.
Ideal as a node load in TRF receivers, for decoupling and general purposes. Price 4/-.



We keep stocks of many radio components for use in published circuits, including the following:

- "WIRELESS WORLD"
- "NO COMPROMISE" TRF TUNER, by W. Winder, A.M.I.E.E. (Osmor coils QA11 and QHF11 for M.W. and QA12 and QHF12 for L.V. are suitable, price 4/- each.)
- "MIDGET MAINS RECEIVER," by W. Amos (Osmor coils QA11 for M.W. and QA12 for L.V. are suitable. Price 4/- each.)
- "PRACTICAL WIRELESS"
- "3-SPEED AUTOGRAM."
- "MODERN I-VALVER."
- "A.C. BAND-PASS 3."
- "R1155 CONVERTER."

I.F.s. 465 kc/s. Permeability-tuned, with flying leads. Standard size 1½ in. x 1½ in. x 3½ in. For use with OSMOR coilpacks and others, 14/6 pair. REALIGNED, 1/6 extra.

Dear Reader,

We can't mention all our products here, but shall be glad to receive your enquiries. If it's top-quality components and a speedy, courteous service you are looking for—try Osmor. We really shall do our best for you.



Keep those small components—resistors, condensers, etc., neatly stored yet visible, by using an

OSMOR "JAR-RACK"

(If you're a generous husband you'll buy one or two for your wife's larder, too—she will appreciate somewhere to store her preserves.) Holds any 1 lb. jam jars which are easily removed but cannot fall out. Just the thing for the tidy "HAM" or Radio Dealer.

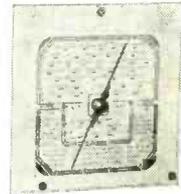
Type 1 for wall-fixing, as illustrated, 6/9 each, holds 8 jars. (Jars are not supplied but are easily obtained.)

Length 24 in., enamelled olive green.

Type 2 for screwing under a shelf, 5/9 each, holds 6 jars.

Length 18 in., enamelled green. P. & P. 1/-.

(Trade discount allowed to Dealers.)



DIALS

Metal dials, overall size 5½ in. square, as illustrated. Cream background, 3-colour. Type M1, L.M.S. waves. M2, L. & M. waves. M3, M. & 2 S. waves. Price 3/6 each.

Pointer, 1/6; Drum, Drive, Spring and Cord, 3/2.

Type A glass dial assembly, measuring 7 in. x 7 in. (9½ in. x 9½ in. overall). Mounts in any position. Choice of two 3-colour scales, 24/6. P. & P. 1/6.

(Dept. W.37) BRIDGE VIEW WORKS, BOROUGH HILL, CROYDON, SURREY.

Osmor Radio Products Ltd.

Telephone: Croydon 5148/9

Now you can have the finest Tape Recorder in the World!

THE

GRUNDIG "Reporter"

Simple and instantly effective push button controls give you complete mastery over the "Reporter's" magnificent recording and reproducing qualities. Twin track tapes give a full hour's recording and play-back time—and play-back can be effected immediately. For amateur broadcasts, professional operators and home entertainment, the "Reporter" revolutionises the fascinating business of recording and reproducing sound.

ABRIDGED SPECIFICATION

Silent fast forward and reverse rewind—2 mins. Tape length—1200 feet at 7½ in. per second. Consumption 60 watts approx. Frequency range—50 c.p.s.—10,000 c.p.s. d.b. Loudspeaker—elliptical permanent magnet coil. Mains voltage—A.C. only 110, 125, 220, 240. Price with high fidelity microphone 75 gns. H.P. Terms available.

MASTERLY DESIGN
OUTSTANDING PERFORMANCE
INGENIOUS ACCESSORIES



NOTE THESE EXCITING FEATURES

- Hand and foot operated remote controls.
- Telephone call recorder—no alteration to hand set involved.
- Mixer unit for continuous mixing up to 4 different recordings at once.
- Completely portable.
- Exclusive device for quick stop and start.

Technical leadership — Established Supremacy

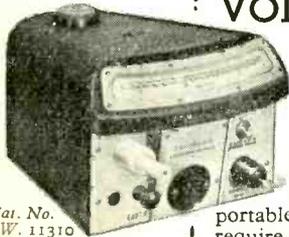
*** Stereod recordings keep indefinitely. Tape can be used over and over again—each new recording wiping out the previous one.

GRUNDIG (GT. BRITAIN) LTD., Kidbrooke Park Rd., London, S.E.3. Tel.: Lee Green 0768



Announcing the

SCALAMP ELECTROSTATIC VOLTMETER



Cat. No. W.W. 11310

- DIRECT READING.
- ZERO CURRENT DRAIN.
- THREE SECONDS PERIOD.
- LAMP OPERATES FROM MAINS OR 4 VOLT BATTERY.
- BRIGHT SPOT-AND-HAIRLINE INDICATOR.

This instrument introduces a completely new conception of electrostatic voltmeter. It is compact, portable and robust, and does not require critical levelling or special mounting. The movement has a taut suspension, is critically damped, and readings can be taken with rapidity and ease. Three models are available:

- Cat. No. W.W. 11308
1 - 5 kV A.C. D.C.
- Cat. No. W.W. 11309
3 - 10 kV A.C. D.C.
- Cat. No. W.W. 11310
5 - 18 kV D.C. and
5 - 12 kV A.C. R.M.S.

Please write for illustrated leaflet.

SCIENTIFIC  INSTRUMENTS

W. G. PYE & CO. LTD., GRANTA WORKS, CAMBRIDGE

Let I.C.S. perfect YOUR knowledge of radio and T/V

THOSE who wish to supplement their existing knowledge with a sound technological background and, if necessary, pass qualifying examinations can do so by means of I.C.S. Home Study Courses. These include **RADIO ENGINEERING RADIO SERVICE ENGINEERING . RADAR, ELEMENTARY ELECTRONICS, ADVANCED SHORT WAVE RADIO RADIO . T/V TECHNOLOGY** and training for the following examinations—**B.I.R.E. . P.M.G. CERTIFICATES FOR WIRELESS OPERATORS . C. & G. TELECOMMUNICATIONS C. & G. RADIO SERVICING CERT. (R.T.E.B.) . C. & G. RADIO AMATEURS** etc., etc.

Students are coached until successful. Fees are moderate and include all books required.

GENEROUS DISCOUNT TO H.M. FORCES

WRITE TODAY for FREE BOOKLET describing complete facilities for the successful study of Radio and T/V technology.

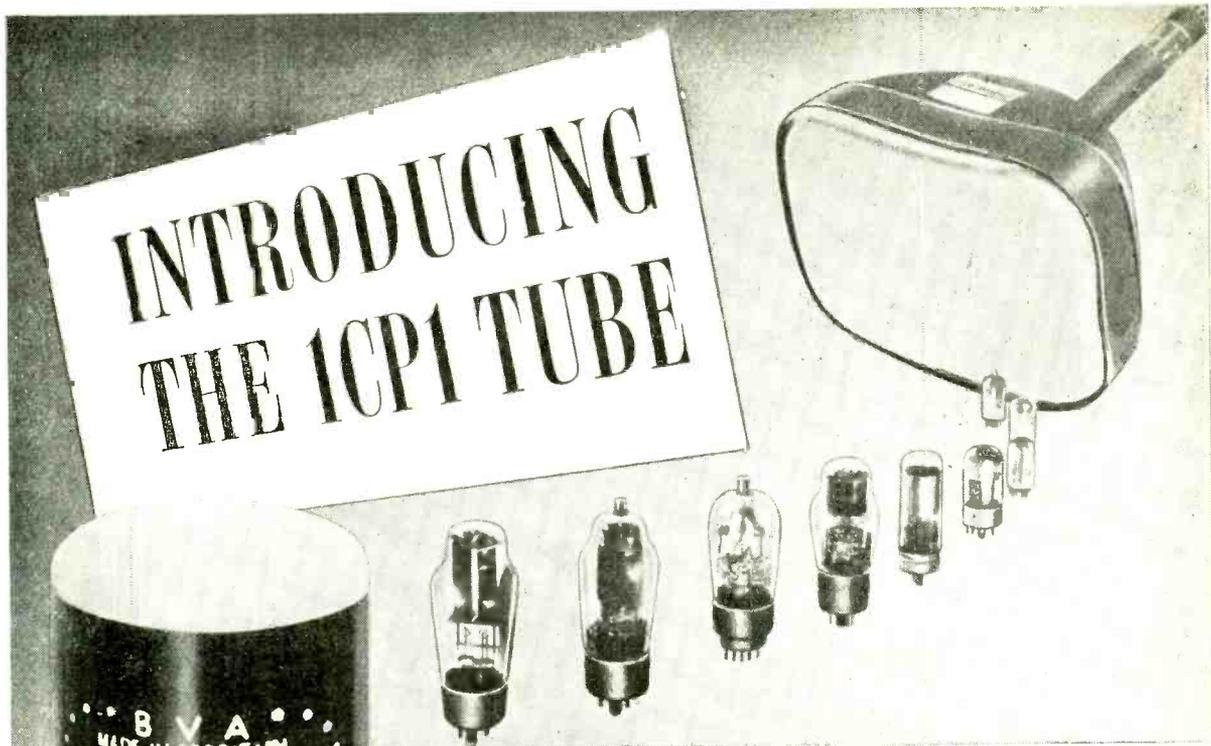
INTERNATIONAL CORRESPONDENCE SCHOOLS LTD.
Dept. 223B, International Bldgs., Kingsway, London, W.C.2

Please send booklet on subject

Name Age

(BLOCK LETTERS PLEASE)

Address



The first of a new series of industrial cathode ray tubes designed, developed and manufactured exclusively by Electronic Tubes Ltd., the makers of high quality valves and cathode ray tubes.

The 1CP1 is a miniature SELF-FOCUSING tube with a 1 inch diameter screen designed for the purpose of MONITORING WAVE SHAPES in electronic equipment.

The illustration shows the Lock-in base which allows easy self-supporting mounting.

Heater Voltage	6.3 volts
Heater Current	0.6 amperes
Anode Voltage	500/800 volts

Full technical details available on application.

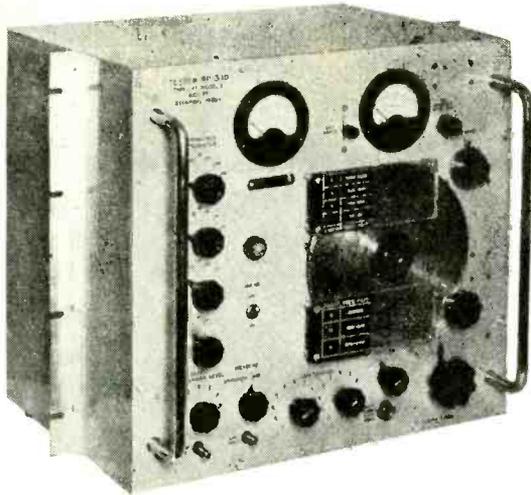
EMITRON

REG. TRADE MARK

**VALVES AND CATHODE RAY TUBES
ELECTRONIC TUBES LTD.**

KINGSMEAD WORKS · HIGH WYCOMBE (2020) · BUCKS · ENGLAND

ET7



SELECTIVE TRANSMISSION MEASURING SET MODEL RP 3110

Designed and manufactured for G.P.O.

This is a precision instrument for measurements on multi-circuit coaxial cable carrier systems by means of a comparison with locally generated signals of known frequency and level.

Frequency coverage: 60 Kc/s—3 Mc/s in 7 ranges.

Calibration accuracy: below 0.2% or 2 Kc/s whichever is the greater.

Power supplies:
200 — 250 Volt. 50 c/s

Range of measurements:
through levels + 10 db to - 61.5 db
or terminated levels + 10 db to - 81.5 db
referred to 1mW in 75 ohms

BRITISH COMMUNICATIONS CORPORATION LTD.

SECOND WAY, EXHIBITION GROUNDS, WEMBLEY, MIDDX.

Telephone: WEMBLEY 1212

Cables: BEECECEE, WEMBLEY

Drayton

FRACTIONAL H.P. MOTOR UNITS

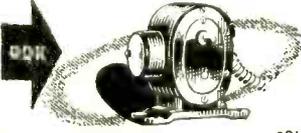
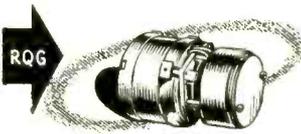
FOR actuating valves, dampers, rheostats, geneva movements, rocking baths, flashing signs, illuminated models, soldering and welding fixtures, rotating tables, automatic light strip feed, lubricating and other small pumps, small machines, animated displays, vibrators, developing baths, agitators, fans, aspirators, etc.

THE DRAYTON R.Q. is a miniature capacitor induction type motor with a current consumption at 230 volts, 50 cycles of 0.09 amps pf. 0.9. It is available:

R.Q.G. GEARLESS running at 2,700 r.p.m. continuously or intermittently in either direction or continuously reversed.

R.Q.H. GEARED for high final shaft speeds for continuous or intermittent running, forward or reverse.

R.Q.R. GEARED for continuous or intermittent running or reversing at speeds from 27 min per rev. to 600 revs. per min., with or without self-switching up to 2½ r.p.m.



Send for List No. N. 302-

RQ11

Drayton Regulator & Instrument Co. Ltd., West Drayton, Middlesex.

"WEYRAD"

TELEVISION COMPONENTS

R.F. INSERTS AND I.F. STRIPS—

Specially designed for fringe area reception. Forming a complete superhet receiver unit. Employing eleven standard B.7.G. type valves.

R.F. inserts are available for each of the five television channels.

Price £10 8s. 0d. including P.T.
Circuits and Data 1/6d. per set.

LINE FLYBACK TRANSFORMERS—

Our standard type will provide up to 12 kv. and is suitable for use with wide-angle tubes. Even when operated in AC/DC circuits up to 10 kv. is obtainable.

Price £1 13s. 0d.
Circuit and Data 6d.

Full details are given in our Illustrated Catalogue Price 6d.

**WEYMOUTH RADIO MFG., CO., LTD.,
CRESCENT STREET, WEYMOUTH.**

ANNOUNCEMENT

A new range of R. & A. Reproducers ★
will shortly be in production.

We are confident that there will be no other
mass-produced loud-speakers as good as these
available to set-makers in 1953.

We shall be pleased to send technical data
giving the reasons for this confidence
to engineers and technicians
in the radio, television and allied industries.

*★The world-renowned Series 800 and 900 with
important new features.*

The logo consists of the letters 'R' and 'A' in a bold, stylized font, with an ampersand (&) positioned between them. The letters are interconnected, with the 'R' and 'A' having a similar, blocky design.

*Loud-speaker
Manufacturers
to the radio industry
since 1930*

REPRODUCERS AND AMPLIFIERS LIMITED
WOLVERHAMPTON ENGLAND

Telephone: Wolverhampton 22241 (5 lines)

Telegrams: Audio. Wolverhampton



SOLARTRON LABORATORY AMPLIFIER

GAIN STABILITY 0.1%



MODEL AWS 51A

SPECIFICATION

FREQUENCY RESPONSE: Level 15 c/s-350 Kc/s.
GAIN: 94 db. Sensitivity 25 Microvolts.
DISTORTION: Negligible at full output.
INPUT IMPEDANCE: 600 ohms or 100 Kiloohms.
ATTENUATOR: 60 db variable in 1 db steps, with an additional 20 db input pad.
OUTPUT: 240 volts peak to peak for C.R.T. deflection, or, 5 volts on meter for voltmeter readings.

QUICK DELIVERY.

WIDE RANGE OSCILLATORS ● PULSE GENERATORS ● VIDEO AMPLIFIERS ● REGULATED POWER SUPPLIES

SOLARTRON LABORATORY INSTRUMENTS LTD., 22 High St., Kingston, Surrey.

KINGSTON 8891 P.B.X.

A versatile new amplifier which can be used as a highly sensitive valve voltmeter, a deflection amplifier for C.R.T.s or, with an external filter as a frequency selective amplifier, or bridge detector.

Features include ● Excellent gain stability ● Low noise level ● Good phase shift characteristics resulting from inverse feedback ● Level response ● Steel bench case in grey hammer finish ● 19 in. polished anodized dural panel.

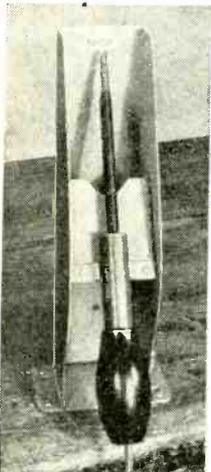
Write for details of this and other high quality instruments to:

SOLARTRON

ADCOLA

PRODUCTS LIMITED
(Regd. Trade Mark)

SOLDERING INSTRUMENTS



SHIELDS AS ILLUSTRATED CAN BE SUPPLIED WHEN AVAILABLE

SOUND Joints

For
SOUND Equipment

Any volt range supplied
6/7 to 230 250

1/8" dia. bit Standard Model
 1/4" dia. bit Standard Model
 De-achable Bit Type (Factory Bench Line)

- Equally suited to daily or intermittent use
- Heating time: 90 seconds
- Consumption: 25 watts
- Weight: 4 ozs
- Total length of instruments: 9 inches
- Handle remains cool during operation.

Made in England

Registered Design
(British U.S.A., Foreign Patents)

Export Enquiries invited

Apply Sole Manufacturers and Suppliers

ADCOLA PRODUCTS LTD.

Sales, Offices & Works: CRANMER COURT, CLAPHAM
HIGH ST, LONDON, S.W.4. MACaulay 4272

1953

"CLIFTON" TAPE RECORDER

- Playing time 2 hrs. 8 mins. per 1,200 ft. Tape
- Auto Control
- Fast forward and fast rewind
- Auto brakes on spools at all speeds
- Three speeds: 3 3/4"-7 1/2"-15" per sec.
- Visual volume indicator
- Input for microphone. Radio/Pick-up

63 Gns.

(Microphone extra)

- All parts and charts are now available for making your own Tape Desk

Write for List

Sole Distributors:

WILL DAY LTD.

19, LISLE STREET, LONDON, W.C.2

GER. 7105

Manufacturers:

BRISTOL MAGNETIC RECORDERS,
11, Alma Va e Road, Bristol, 8

Well received the world over...



A superb and powerful 6-valve 5-waveband superhet. In its design particular attention has been paid to short-wave reception, while bandspread tuning, a large, clearly calibrated scale and flywheel tuning contribute to the ease with which the many stations can be selected. Sound reproduction is of the highest quality. The cabinet, finished in figured walnut, has a beautifully contrasted front panel and a golden loud-speaker grille. Four versions of this set are available, differing only in waveband coverages and power supply requirements.

EUROPEAN

T28AE 3 short (13.5-100 metres continuous) medium (standard) and long wavebands. Voltage ranges 100-130, 140-160, 200-250 volts AC. 40-100 cycles.

TROPICAL

*4 short (11-100 metres continuous) and medium (standard) wavebands.
T28AT — AC Mains 100-130, 140-160, 200-250 volts AC 40-100 cycles. T28DAT — AC/DC Mains 100-130, 200-250 volts DC or AC 25-100 cycles. T28BT for 6 volt battery operation.*



For literature containing full details of Marconiphone Radio and Radiograms write to THE MARCONIPHONE CO. LTD., HAYES, MIDDLESEX, ENGLAND

MARCONIPHONE
the REAL thing



V.H.F.

Radio-Telephone



THE "REPORTER" A NEW LOW COST MOBILE RADIO-TELEPHONE

Maximum economy to the user, both in initial outlay and operation, is the outstanding feature of the Pye "Reporter" mobile radio-telephone. Compact, light in weight, and with an extremely low power consumption, the "Reporter" is ideal for all 2-way mobile communication schemes where low capital cost is essential.

SPECIFICATION :

Frequency Range PTC 116 60-100 mc/s.
 PTC 117 100-184 mc/s.
 The set is intended for simplex working on a "press-to-talk" basis in either double or single frequency schemes.
 Size 9 in. wide x 14 in. deep x 5½ in. high (23 x 33 x 14 cm.) overall.
 Weight 17 lb. (7.7 Kg.) including cradle and telephone handset.
 Power Supply 6 or 12 V D.C., positive or negative earth

Power Consumption
 Receiver only 3.0 amps. } At 6 volts these figures are approximately doubled.
 Standby 3.5 amps. }
 Transmitter 4.0 amps. }
 Controls
 On front panel On/Off switch and A.F. volume control.
 On handset Receive/transmit pressel switch.
 ★ The "Reporter" is suitable for use in tropical climates.


Telecommunications
 CAMBRIDGE ENGLAND


Overseas Enquiries to:

EXPORT DEPT. • PYE LTD. • CAMBRIDGE • ENGLAND

Buy your American Type Valve **\$** for **Sterling**...



The wide range of **BRIMAR VALVES** is now readily available throughout the world. Combining cost-saving techniques with craftsmanship precision, **BRIMAR** American type valves are amongst the finest obtainable in either hemisphere.

More and more the world's governments set makers laboratories are standardizing on American types, valves which are obtainable anywhere in the world, valves which you can get from **BRIMAR** without expending dollars.

Efficient reliable robust **BRIMAR VALVES** are chosen for radio and electronic equipments in the fighting services and throughout industry. Their rugged dependability can contribute so much to your own products.



THE **BRIMAR** RANGE IS

- the RANGE that is **RELIABLE** ■
- the RANGE that is **ROBUST** ■
- the RANGE **YOU REQUIRE** ■

BRIMAR everywhere the Valve of Value
Dependable

BRIMAR

BRITISH
MADE

RADIO VALVES

Standard Telephones and Cables Limited **FOOTSCRAY, SIDCUP, KENT, ENGLAND**

Authoritative Books

indispensable to engineers and students

BASIC MATHEMATICS FOR RADIO STUDENTS

By F. M. Colebrook, B.Sc., D.I.C., A.C.G.I. 2nd Edition. A step-by-step introduction. In the first six chapters treatment is quite general, and it is only in the final chapter that mathematics are actually applied to radio problems. Therefore, although written primarily for radio engineers, the work is almost equally valuable to students (or teachers) of any branch of engineering or physics. The book covers Elementary Algebra, Indices and Logarithms, Equations, Continuity, Geometry and Trigonometry, to Differential and Integral Calculus.

10s. 6d. net. By post 10s. 10d.

RADIO LABORATORY HANDBOOK

By M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition. Describes the methods available for carrying out test and measurements, using either commercial instruments or improvised equipment. Subjects covered include the principal sources of power and signals, the various types of measuring and acoustic instruments, methods of comparison and their application to receivers and amplifiers, and the plotting and interpretation of results. There are also constructional details of capacitance and resistance and inductance bridges, a special chapter on laboratory technique for V.H.F. work, and much useful general information on such varied subjects as musical scales, decibels, wire gauges, filters, building one's own gear, etc.

15s. net. By post 15s. 5d.

RADIO VALVE DATA: Characteristics of 2,000 Receiving Valves and C. R. Tubes

Compiled by the Staff of WIRELESS WORLD. 3rd Edition. Gives the main characteristics and base connections of over 2,000 types of British and American radio valves and over 150 cathode ray tubes. These are further classified into obsolete, replacement or current types as recommended by the makers. The book is fully indexed for quick reference to any required valve or tube.

3s. 6d. net. By post 3s. 9d.

FOUNDATIONS OF WIRELESS

By M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition. This volume covers the whole basic theory of radio, starting from the most elementary principles. No previous technical knowledge on the reader's part is assumed and mathematics are avoided except where essential. Apart from the fundamental laws of electricity and radio, the theory of valves, transmitters and all types of modern receivers is described, and there is an introduction to the techniques of television and radar, while aerials, power supplies and transmission lines are also considered. A special feature is the introductory section which explains the use of algebraic symbols, graphs and circuit diagrams. Equally valuable is the comprehensive index enabling the reader to find any information (particularly the meaning of both British and American technical terms) without difficulty.

12s. 6d. net. By post 13s.

SHORT-WAVE RADIO AND THE IONOSPHERE

By T. W. Benington. 2nd Edition. A new edition of "Radio Waves and the Ionosphere" (first published six years ago), this book shows how existing ionospheric data can be applied to everyday problems of short-wave transmission and reception. The author, a member of the Engineering Division of the BBC, has been able to draw freely on the Corporation's experiences in the development of short-wave overseas services.

10s. 6d. net. By post 10s. 10d.

MICROPHONES

By the Staff of the Engineering Training Department, BBC. This book, originally written as a textbook for BBC engineers, has now been made available for general publication. Subjects treated in detail include: requirements for microphones in a broadcasting studio; laws relating to sound waves and their behaviour, and the design and characteristics of various types of microphone.

15s. net. By post 15s. 5d.



Obtainable from leading booksellers everywhere or by post from the address below. Remittances from overseas should be made by Money Order or Bank Draft in sterling on London out of a registered account as British currency notes cannot be accepted. Send for the complete list of Iliffe Technical Books on Radio and Television.

ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD ST., LONDON, S.E.1



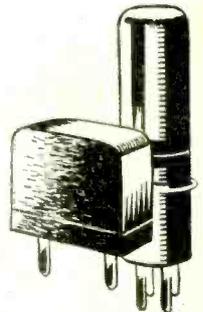
keeping in touch ... with **S.E.C. QUARTZ CRYSTAL UNITS**

Reliable radio communications must be maintained under all conditions. Only first-class components are good enough for the radio equipment, on which many lives may depend

Quartz Crystal Units are a most vital component, be sure you use the best.

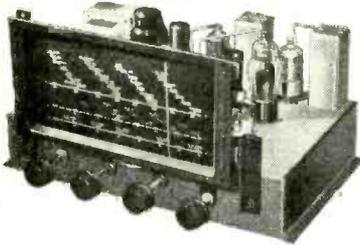
Write for list Q.C. 5012(R)

SALFORD ELECTRICAL INSTRUMENTS LTD
A Subsidiary of THE GENERAL ELECTRIC CO. LTD. OF ENGLAND
PEEL WORKS · SILK STREET · SALFORD 3 · LANCs.



LEWIS RADIO COMPANY

CHASSIS



A.C. 5 valve 3 W B Superhet Radiogram chassis. Absolutely complete kit of parts including detailed wiring diagram £10 15 0
Or fully wired and tested £12 10 0

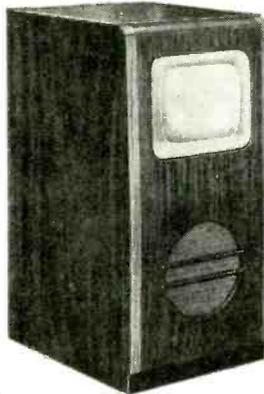
SPECIAL OFFER



Midget Walnut cabinet 12in. x 7in. x 5in. complete with punched chassis, dial, back plate, drum, drive, cord, spring, 28/6 plus 2/6 P. & P.

All correspondence to:

T V CABINETS



Handsome walnut T/V Cabinet, 16in. wide x 20in. x 34in. For 9in., 12in. or 15in. tubes. £8/8/- plus £3 deposit on crate, returnable, less carriage charge.

CABINETS

Send for our latest catalogue of T/V, Radiogram, Table and Corner speaker cabinets. Individual cabinets made to specification.

COMPONENTS

We stock all radio and T/V components. Send for our lists.

LOUDSPEAKERS

We stock all Goodman's speakers. Axiom 150 Mk. II available at £14/13/4.

GRAMOPHONE MOTORS AND PICK-UPS

All the latest Auto-changers and pick-ups in stock.

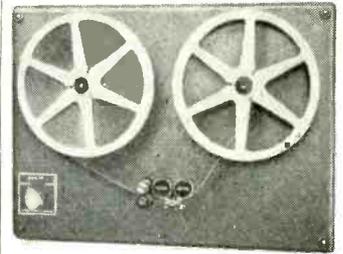
AMPLIFIERS

Models from 4 to 15 watts. From £3/19/6. Details on request.

THE VIEWMASTER

Send for OUR Shopping List. All specified components for London and all other areas available from stock.

THE "MOTEK" TAPE DECK



£15 15s. 0d.

Twin track recording giving 1 hour's playing at 7 1/2 in. per sec. 3 Collaro motors. High impedance heads. "Rewind" and "Fast Forward" in 1 min., without unlooping tape. Size 16in. x 11 1/2 in. x 4 1/2 in. depth. For A.C. 200/250 v. Each deck is fully tested in actual operation before despatch. Suitable quality amplifier circuit free with deck. Carriage and Insurance 7/6 extra.

"Motek" recording heads —
Record/Playback 39/6d
Erase 39/6d

Callers welcome to:

322, High Road, Wood Green, London, N.22

120, Green Lanes, Palmers Green, London, N.13

Telephone: BOWes Park 6064

(Near Bowes Road)

Compound filled or oil immersed.



Generously rated. Silent in operation.

An example from a range of transformers manufactured to the most stringent Government specification.

Used extensively by Ministry Departments and Laboratories.

We offer you our experience and knowledge to meet your own high standards, utilising conventional design or 'C' core types.

WILLEDEN TRANSFORMER CO. LTD.

Rear of 21, CHURCH LANE, N.W.10.

Tel. No.: WILleden 2733-7093

AMERICAN TRANSMITTER SPARES

We hold very large stocks of manufacturers' spares including:

- SWITCHES
- METERS
- TRANSFORMERS
- COILS
- CONDENSERS
- VALVES, etc.

Particularly for RCA Transmitters ET 4336 and Hallicrafter BC.610.

We shall be pleased to receive your enquiries.

THIS MONTH'S SELECTED ITEMS

METERS—FERRANTI Moving Coil Meters 0-500 micro-amps, Dia. 2 3/4", Flush mounting. 45/- each.

HALLICRAFTER SX28 & RCA AR88 S Meters, 45/- each.

We wish to purchase large or small quantities of American transmitter spares or complete equipment.

McELROY-ADAMS MFG. GROUP LTD.

Sole concessionaries U.K. for Hallicrafter Communication Equipment

46, GREYHOUND ROAD, LONDON, W.6

Cable: Hallicrafter, London.

Phone: Fulham 1138/6

A Cordial Invitation to HIGH FIDELITY

enthusiasts . . .

Even though you may NOT be contemplating buying any equipment at the moment—you are cordially invited to come along to the



DEMONSTRATION ROOMS

229 REGENT STREET, W.1

(One minute from Oxford Circus—
entrance in Hanover Street)

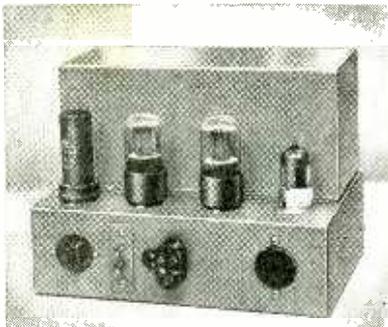
to hear for yourself in a friendly atmosphere what CAN be done in the field of modern high quality reproduction at a REASONABLE outlay. We have a competent technical staff and their sole duties are :

- To demonstrate the wide range of equipment available including Leak, Goodsell and Acoustical.
- To give you any information you require.
- To offer advice if you ask for it.

They are at your disposal from 10 a.m. till 6 p.m. every day except Saturdays when we close at 12.30 p.m.

Drop in next time you're around!

AMONGST THE RANGE OF EQUIPMENT WE ARE DEMONSTRATING ARE . . .



The MAS QUALITY AMPLIFIER

A remarkable new unit with flat frequency response from 25-20,000 c/s and a noise level better than -80 d.b. It gives an output of 4.5 watts at .2% distortion (less than .1% at 3 watts). Price £13/10/0. This will astound you when you hear it.

THE GOODSSELL U1TA TAPE PRE-AMPLIFIER

A High Fidelity unit designed to enable you to use a Tape Deck with your sound reproduction equipment. PRICE £15/0/0.

This High Fidelity equipment is demonstrated with the Wearite Tape Deck at our Showrooms.

B. K. PARTNERS LTD.

229 REGENT ST., LONDON, W.1

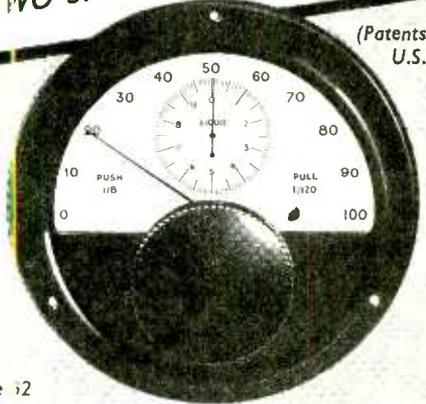
TELEPHONE: REGENT 1051

All
Equipment
available
on
Hire
Purchase
Terms

MICRODUAL

TWO-SPEED PRECISION DRIVE

(Patents U.K.,
U.S., etc.)



Type 12

TWO SPEEDS · SINGLE CONTROL FREE OF BACKLASH

Accuracy of scale reading 100%

Coarse searching speed plus fine setting control.

Single control knob displaced axially to select the speed ratio.

Spring-loaded gears with automatic take-up of any wear or play between primary and secondary drives.

Pointers geared directly to centre spindle.

Security in operation: friction clutch obviates overdriving.

TYPE No.	NUMBER OF DIAL MARKINGS	EFFECTIVE SCALE LENGTH	SPEED RATIOS	
			COARSE	FINE
52	1,000	3.3 feet	1 : 8	1 : 120
63	1,000	3.3 feet	1 : 8	1 : 120
57	2,000	6.6 feet	1 : 15	1 : 200
56	2,000	6.6 feet	1 : 15	1 : 200
53	2,000	6.6 feet	1 : 15	1 : 200



Other TRANSRADIO specialities:—

COAX Low Capacitance Cables.

COAX Precision Connectors.

TRANSRADIO LTD

138A CROMWELL RD., LONDON, S.W.7, ENGLAND

UNIQUE OFFER OF TECHNICAL GUIDANCE

uch have been the advance made recently in the design of high-fidelity equipment—amplifiers, multi-speed motors, pickups, loud-speakers, speaker cabinets, tape-recorders etc.—coupled with the recent revolution in disc-record manufacture (Long Playing), that music-lovers who are anxious to go in for Quality Reproduction or to modernise existing equipment may feel uncertain which of the various makes and models will best suit their needs and existing equipment—and pocket.

WE OFFER TO ALL those thus placed the benefit, free of charge, of EXPERT TECHNICAL ADVICE on the equipment most suited to their needs. Our Chief Engineer is available to callers from 11.30 a.m. to 5.30 p.m. daily, including Saturdays. IT WILL PAY YOU, from every point of view, to consult us before spending good money on the above items. If you cannot call, please send 2½d. for CATALOGUE (and advice if required). We quote a few of our standard lines as follows:

N.R.S. "SYMPHONY" AMPLIFIERS, fitted with the patent "three-channel system" giving independent control of Bass, Middle and Top, thus affording the maximum possible control of tone and compensation for recording deficiencies. Especially essential when mixing the playing of old and new 78s with the new LP records. Scratch control and negative-feedback also incorporated. Wooden transformers. 5-watt model only 10 gns. 10-watt model (push-pull triodes) 15 gns. Carr. 5/-.

AC/DC QUALITY AMPLIFIER for domestic or P.A. use. For those of our customers unfortunately on DC mains we are pleased to be able to offer an extremely fine quality 8 watt push-pull Amplifier by Rees Mace. Inputs for Radio/Gram/Mike, built-in mu-metal screened mike transformer, employs 6 valves, volume and tone controls. Housed in attractive dove-grey steel case for earthing and perfect safety, circuit fully fused. Brand

new and fully guaranteed. Our special offer 15 gns. (List 24 gns.). Ins. carriage 5/-.

BASS REFLEX CABINET KITS, 30in. high, consist of fully cut patent acoustic manufactured non-resonant board, deflector-plate, felt, all screws, etc., and full instructions. 8in. speaker model, 15in. wide x 12in. deep, 85/-; 10in. speaker model, 16in. wide x 13½in. deep, 97/6; 12in. speaker model, 17½in. wide x 16in. deep, 107/6. Carr. 7/6. Ready built, 7/6 extra.

SPEAKERS AT PRE-TAX PRICE. We are pleased to be able to still offer from our large pre-tax stock the fine 12in. 10-watt p.m. speakers by Grampan. Price £7 each, plus carriage 5/-. Smaller speakers which we now recommend are the Wharfedale Bronze 8in. at 69/3 and the Bronze 10in. at 103/4.

GARRARD 3-SPEED AUTO-CHANGER, model RC72A WITH NEW TYPE LONG ARM for better tracking and two separate Decca XMS heads (not to be confused with autochangers with turnover pickups). Price £18/10/-. Or fitted with the Acos GP19 and GP19LP hi-fi crystal heads, £17/10/-. Limited number only at these special prices.

MAGNETIC TAPE RECORDERS. We are now pleased to announce that after extensive research our new, high-fidelity, "Symphony" Portable Tape Recorder is in production and delivery is ex stock. Price 42 gns., details 2½d.

E.M.I. NEW MODEL 2125 3-SPEED MIXER CHANGER for AC now in stock! The H.M.V./Marconi answer to the Long-Playing Question! Plays eight 78 r.p.m. or ten 33½ r.p.m. 10in. or 12in. mixed records or the new 7in. 45 r.p.m. records singly. Fitted two separate high-fidelity featherweight Pick-up Heads with permanent Sapphire Styli. Our price £18/10/- complete. Carr. 5/-. Optional Centre-Post to enable playing eight 7in. records automatically, 17/6. Early ordering essential.

DECCA 3-SPEED GRAM UNIT, 1000-GU4A incorporating selected motor and turntable combination-mounted on brown crackle unit plate with XMS pick-up arm to take latest type 3-pin plug-in pick-up heads. Units supplied with springs for floating metal plate on wooden motorboard. Our special offer: £8/10/-, or complete with two Decca XMS Heads, £13, or with Acos GP19 and GP19LP, £11/10/-.

ACOS GP20 PICKUPS, with long white-ivory arm and either Std. or LP head, £3/11/5, or with both heads, £5/14/9.

PICKUP HEADS. All Collaro, Acos and Decca heads in stock. As specialists we will gladly advise on most suitable type for matching your equipment. A huge special purchase enables us to offer the Acos GP19 and GP19LP heads (as fitted to GP20 Pickup) at 39/6 each and the latest Decca XMS 3-pin plug-in magnetic heads at 57/6 each, both types fitted with permanent sapphire stylus.

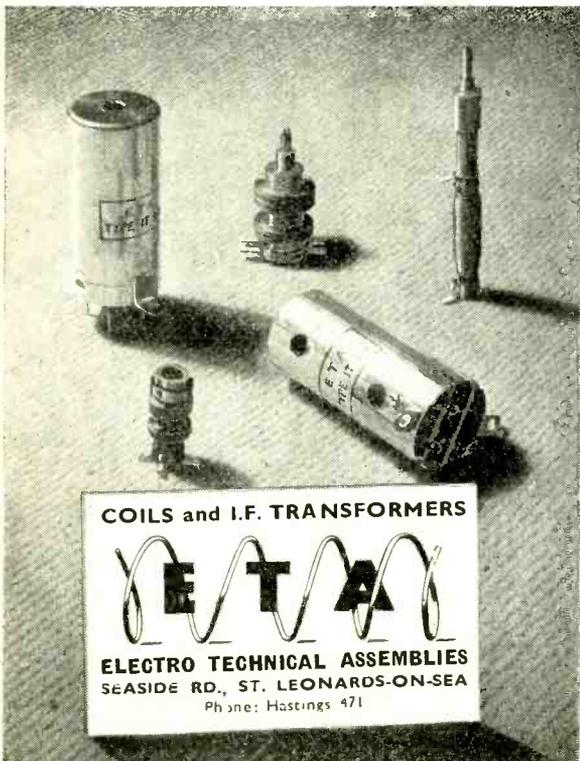
COMPLETE RECORD PLAYERS, single-record and autochange. Send for catalogue giving details of our nine different models including all popular combinations of pickups, motor and cabinet.

MICROGRAM CABINETS, ex-manufacturer, brown rexine, carrying handle, room for 3- to 4-watt amplifier, single record gram unit and fitted baffle for 6½in. speaker, attractive cream speaker grille at front. While they last, 60/-, plus carriage 3/6.

SPECIAL CABINETS. We are pleased to announce the opening of our new Cabinet Dept., under the direction of an expert craftsman and can now quote for the making of individual cabinets to suit customers' special requirements and to match any existing furnishing schemes.

NORTHERN RADIO SERVICES

16 Kings College Road, London, N.W.3
Phone: PRIMrose 8314
Tubes: Swiss Cottage and Chalk Farm.



COILS and I.F. TRANSFORMERS

E.T.A.

ELECTRO TECHNICAL ASSEMBLIES
SEASIDE RD., ST. LEONAROS-ON-SEA
Phone: Hastings 471

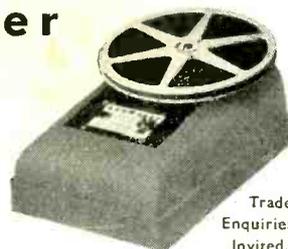
SOUND ENGINEERS TO **LEEVERS-RICH** THE FILM INDUSTRY

LeeRaser

WIPES WHOLE
SPOOLS OF
MAGNETIC
TAPE
INSTANTLY!

PRICE £7.10.0

LEEVERS-RICH EQUIPMENT LTD.,
37, WARDOUR STREET, LONDON, W.1. GER. 4502



Trade
Enquiries
Invited.

RADIO DEALERS & TRADE SERVICE ENGINEERS

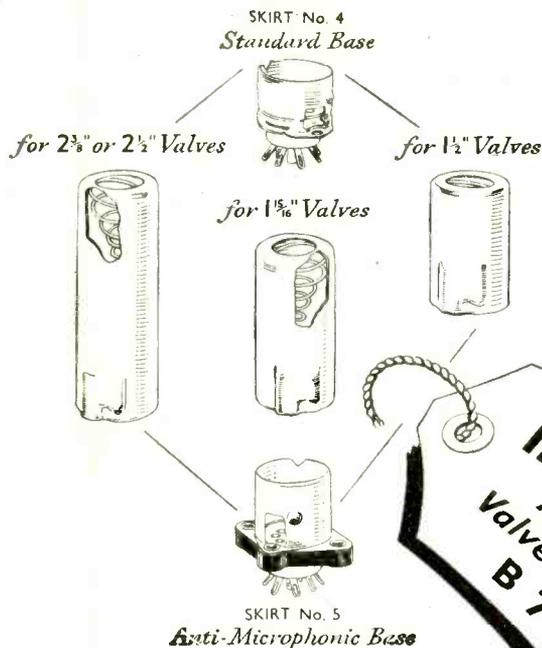
Contact A.W.F. for the best and quickest service on A.W.F. cone assemblies, for cheap repairs in your own workshops. Transformers, chokes, Tungram valves, T.C.C. and Dubilier Capacitors, Vol. controls, resistors, and hundreds of standard and surplus service items. View Master, Tele-King, "E.E." Wide angle Scan components, The Truvox Tape Deck.

Send 3d. for our complete list. **TRADE ONLY.**

A.W.F. RADIO PRODUCTS
TATLER CHAMBERS, THORNTON ROAD,
BRADFORD, YORKS.

Tel.: Bradford 24008.

Recognised as the Most Reliable Valveholders



B7G Valveholders

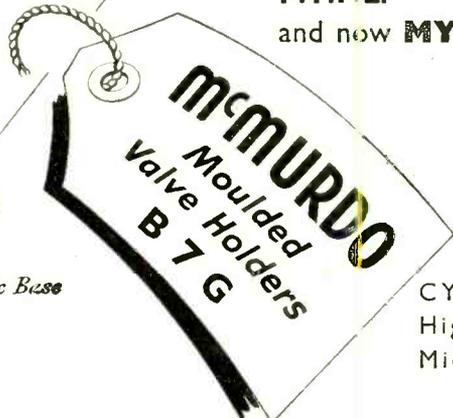
are now available moulded in:—

Phenol Formaldehyde (Black).

Nylon loaded Phenol Formaldehyde
(Natural Brown).

P.T.F.E.

and now **MYCALEX.**



Wholesale Enquiries:—

CYRIL FRENCH LTD.,
High St., Hampton Wick,
Middlesex. KIN. 2240.

Manufacturers' Enquiries: THE McMURDO INSTRUMENT CO. LTD., VICTORIA WORKS, ASHTEAD, SURREY ASHTEAD 3401

22 Years' unrivalled experience and careful design has resulted in the . . .

Armstrong

CONSOLE MODEL T.V. 15

The set, incorporating a 12in. C.R.T. and 10in. Loudspeaker, operates on A.C. Mains 200/250 v., is now available in a beautifully veneered two-tone walnut cabinet 35in. high 20in. wide 20½in. deep. There are two main controls, sound volume and picture brightness, situated on the front of the cabinet and the usual pre-set controls are on the side.

PRICE 63 Gns. Tax Paid

The usual ARMSTRONG GUARANTEE "Purchase money refunded in full if dissatisfied" is in force and a Comprehensive Maintenance Scheme is available to cover replacement C.R.T. and Valves. Installation in the home is free and erection of aerial can be arranged at moderate cost.

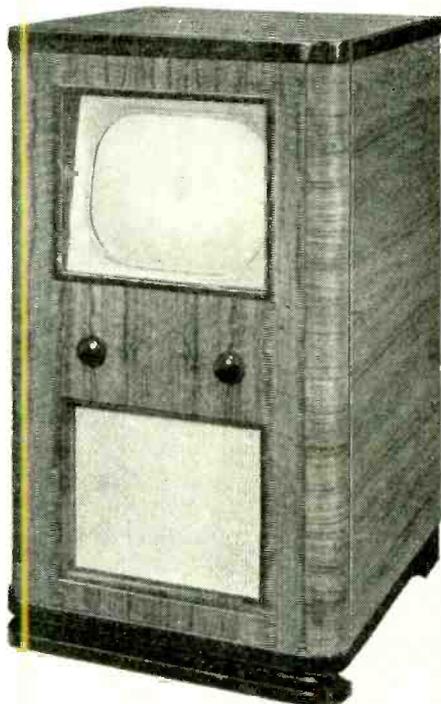
H.P. TERMS AVAILABLE

- OTHER MODELS IN THE ARMSTRONG RANGE include:
- MODEL EXP. 125/3 14-valve all-wave Radiogram chassis. A.C. Mains £36/15/-, plus P.T.
 - MODEL RF.104 10-valve all-wave Radio chassis. A.C. Mains £24/-, plus P.T.
 - MODEL EXP. 73 8-stage all-wave Radio chassis. A.C. Mains £17/15/- Plus P.T.

Demonstrations at our Holloway Demonstration Room, daily until 6 p.m., Sats., 5 p.m.

For further details write to:

ARMSTRONG WIRELESS & TELEVISION CO. LTD
Walters Road, Holloway, London, N.7.



The Armstrong Console Model T.V. 15

Telephone: **NORTH 3213-4**

Sole Distributors for
BURGOYNE
MAGNETIC
RECORDING
HEADS
37/6 Record
Playback
or Erase
each

*RADIO & TELEVISION
ELECTRICAL APPLIANCES
ELECTRIC TOOLS
KITS*



*TEST EQUIPMENT
HI-FI REPRODUCTION
TAPE RECORDERS
AMPLIFIERS*

Sole Distributors for
BURGOYNE
MAGNETIC
RECORDING
EQUIPMENT
TAPE TABLES
OSCILLATOR
COILS, Etc.



THE BURGOYNE A6 DUAL TRACK MAGNETIC TAPE RECORDER

has met with overwhelming success—and we therefore ask the indulgence of our customers for any slight delay in delivery.

Come to the Radio Centre to see and hear this amazing Recorder at the most competitive price!

PRICE **32 GNS.** CASH. 21/- Carr. and Pkg.

Or H.P. Terms £11.4.0 Deposit and 12
Monthly Payments of 42/9.

SEE LAST MONTH'S ISSUE FOR FULL DESCRIPTION

BURGOYNE HIGH FIDELITY MAGNETIC RECORDING TAPE

- Ⓢ VERY WIDE FREQUENCY RANGE
- Ⓢ ALMOST COMPLETE ABSENCE OF GROUND NOISE
- Ⓢ HIGH SENSITIVITY

Specially imported by us to meet the demand for a really high quality tape and recommended for the Burgoyne Tape Recorder described above.

SPECIFICATION

- Ⓢ Coercivity 250 Oersted.
- Ⓢ Remanence 500-700 Gauss.
- Ⓢ Signal to noise ratio depends upon recorder used, may exceed 65 DB on a given signal, 2% harmonic distortion.
- Ⓢ Erasing: minimum 70 DB.
- Ⓢ Frequency response 3½ in./sec. 50-6,000 c/s.
7½ in./sec. 50-8,500 c/s.
15 in./sec. 30-12,000 c/s.
- Ⓢ Uniformity on one reel tape ± 5DB. Uniformity on two different reels of tape MAX. 2DB.

PRICE **1200' SPOOLS 35/0**

PRICE **600' SPOOLS 21/0**

SPARE SPOOLS 1200' 4/6 600' 3/9



Record **PLAYBACK/AMPLIFIER** Type A.6

As used in the Burgoyne Recorder described above.

Special features include:—

- Ⓢ Bass and treble controls for cut and boost operative on both record and playback.
- Ⓢ Separate radio and microphone inputs.
- Ⓢ Visual indication of record or playback position.
- Ⓢ Extra switching for complete demagnetisation of heads when changing from record to playback.

Ready to use

£11-15-0 Carriage Paid.

H.P. Terms 78/- Deposit, 12 Monthly Payments of 16/5



Because of the overwhelming demand and consequent increased production of

BURGOYNE MAGNETIC RECORDING HEADS

we are able to effect a price reduction effective immediately

- Ⓢ High impedance—1,000 ohms.
- Ⓢ Single hole fixing.
- Ⓢ Half track width.
- Ⓢ Totally enclosed with tape guide.
- Ⓢ Wide frequency range.
- Ⓢ Record/Playback or Erase type available.
- Ⓢ Half-thousandth Gap.
- Ⓢ Mumetal laminations on Record/Playback.

NOW ONLY **37/6** EACH



MAIL ORDER SUPPLY CO., THE RADIO CENTRE

Dept. WW, 33, TOTTENHAM COURT ROAD, LONDON, W.1.



AND NOW!! - the



MINIWEIGHT CRYSTAL PICK-UP, with response up to 14,000 c/s.

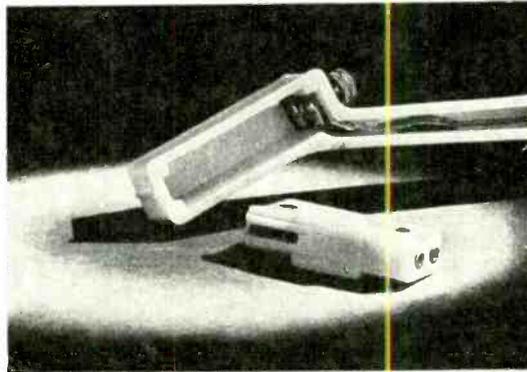
This extremely light-weight high fidelity pick-up is added to the Ronette range for the benefit of the connoisseur, providing the highest possible quality. The Miniweight uses interchangeable cartridges for 78 R.P.M. and Long Playing with response up to 14,000 c/s.

RONETTE

Ronette 14,000 c/s. response Miniweight pick-up with one head (Std. or L.P.).

£3.18.0

H.P. Terms £1/6/- deposit and 12 monthly payments of 7/3. Std. or L.P. HEADS ONLY 46/- EACH.



RONETTE

Ronette 14,000 c/s. response Miniweight pick-up with two interchangeable heads for Std. and L.P.

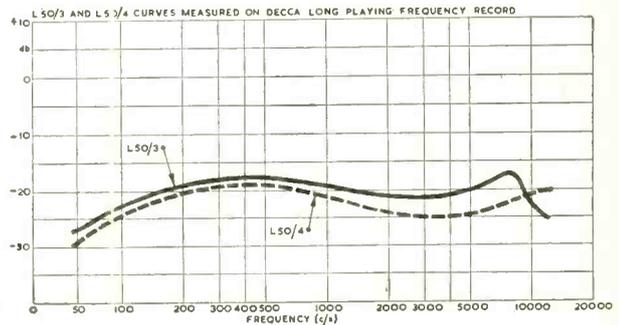
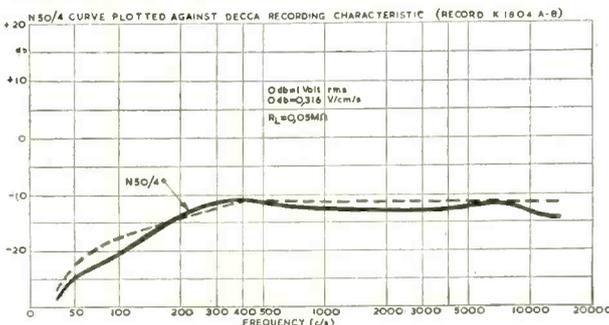
£5.19.6

H.P. Terms, £1/19/6 deposit and 12 monthly payments of 9/6.

The Miniweight has an extremely light-weight, ivory plastic pick-up arm of scientific design and pleasing appearance. The cartridge holder is offset for minimum tracking error, and cartridge changing is simple. Net weight 2½ oz. Curves for 14,000 c/s. response Ronette pick-ups are below.

STANDARD HEAD NS0/4.

L.P. HEAD LS0/4



WE CAN SUPPLY THE FULL RANGE OF RONETTE X^TAL MICROPHONES AS ADVERTISED IN THIS ISSUE. LEAFLET AVAILABLE ON APPLICATION.

THE GARRARD VARIABLE SPEED TRANSCRIPTION QUALITY MOTOR MODEL 201B/5



This three-speed Motor is a heavy-duty motor, unequalled for performance and quality and specially designed to give long life with continuous running. Used by the B.B.C. and

many other broadcasting stations.

The rotor runs at turntable speed, the heavy rotor and 12" loaded turntable contributing to very even running. Other features:—

- Specially designed, easily replaceable single ball-bearing on main spindle thrust.
- Robust governor, gear and worm.
- Special governor-control cam gives smooth speed control.
- Variable speed control between 33½, 45 and 78 r.p.m.

The space required for the 201B/5 is 12½ in. long by 12½ in. wide, with 1½ in. clearance above and 3½ in. below top of motor board.

PRICE **£24.0.9** H.P. Terms £8.2.11 deposit and 12 monthly payments of 30/9. All 201B/5 Models A.C. 100-250v. 40/60 c/s.

GARRARD AUTOMATIC RECORD CHANGER MODEL R.C.75.

This Record Changer, is a three-speed unit which will play batches of 10 records (not mixed), either 10in. or 12in. at 78 r.p.m., 7in., 10in. or 12in. at 33½ r.p.m., and 45 r.p.m. large hole records, using Garrard special record spindle.

Minimum cabinet space required: 15½ in. long x 13½ in. wide with 5½ in. clearance above and 3½ in. clearance below top of motor board.

The light-weight pick-up is fitted with an optical indicator, and uses the Garrard turnover magnetic or crystal head as desired.

For A.C. mains 100-250v. 50 c/s

£16.16.0

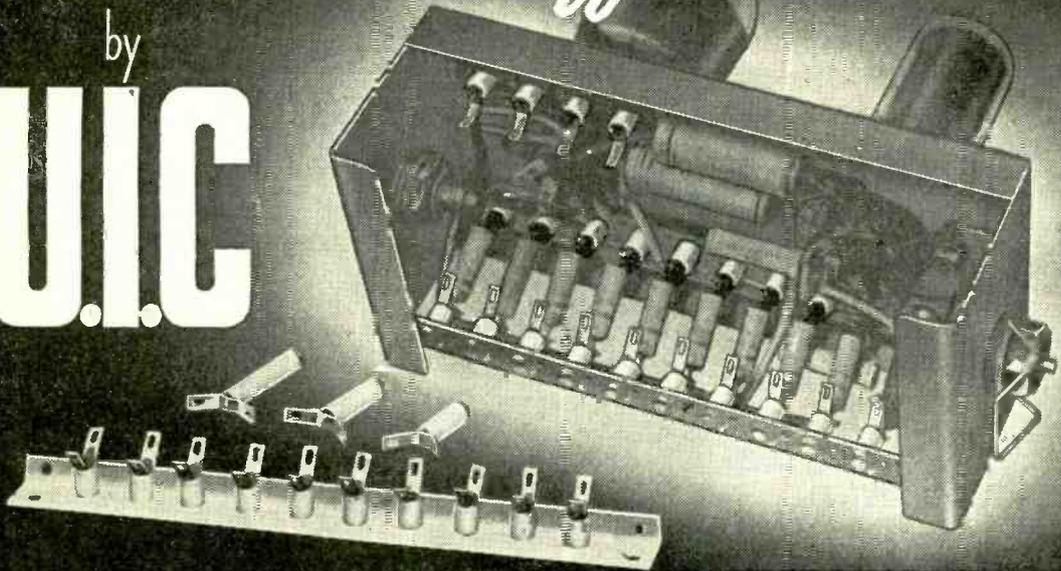
H.P. terms £5.12.0 deposit and 12 monthly payments of 22/-



MAIL ORDER SUPPLY CO., The RADIO CENTRE
Dept. WW, 33, TOTTENHAM COURT ROAD, LONDON, W.1.

Ceramic stand-off Insulators

by
U.I.C.



UNITED INSULATOR CO. LTD. CAKCROFT RD. TOLWORTH · SURBITON · SURREY
TELEPHONE: ELMBRIDGE 5241 CABLES: CALANEL, SURBITON

Yes! Another "Steep Cut" Filter

but this time an

EXPERT

5 positions giving a 20 DB/octave trough at 12, 10, 9, 7 and 6 Kc/s at an impedance of 15 ohms.

Fitted as standard to all

EXPERT

world famous, high-quality Record reproducers

— PRICE 50/- —

EXPERT

Gramophones Ltd.

"Ingerthorpe," Great North Road, London, N.2

TELEVISION

or "Fringe" and "Long distance" viewers is vastly improved with the SPENCER-WEST type AC/3 Pre-Amplifier. The specification includes a first stage neutralised triode cathode coupled to a grounded grid triode. The optimum arrangement for best "noise factor". Self-contained power supply unit complete with correctly adjusted interference filter. Price complete, 10 gns. from your dealer or direct. Leaflets, etc. on request.

WENVOE CONVERSION

Type AC/4 WL (Wenvoe/London) and Type AC/4 WB (Wenvoe Birmingham) Converter units for perfect simple conversion of your receiver. Price complete with 5 valves and self-contained power supply unit, 15 gns. Descriptive leaflet on request.

SPENCER - WEST
QUAY WORKS, GT. YARMOUTH

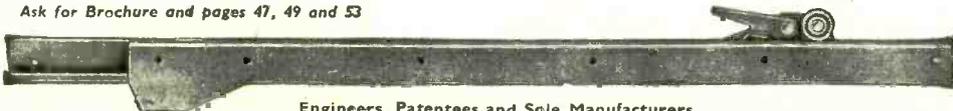
Phone: Gt. Yarmouth 3009

ALWAYS "FIT"



SUSPENSION DRAWER SLIDES, SUN and PLANET FRICTION ELIMINATORS and SHEAVES

Ask for Brochure and pages 47, 49 and 53



Engineers, Patentees and Sole Manufacturers,

AUTOSET (PRODUCTION) LTD., DEPT. "H", STOUR STREET, BIRMINGHAM 18

Tel.: EDG. 1143/44

Please mention *Wireless World*

ESTD. over 30 years

Great Britain's Mail-Order House of Valves



Table of vacuum tube types and prices, organized in columns. Includes various tube types like AC/HL, AC/HLDD, AC044, etc., and their corresponding prices.



giving 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 many valves left

2/3

at OLD-BUDGET rates which are actually sold at the old price. All B.V.A. types carry makers' full guarantee.

ABOVE IS AN ABBREVIATED LIST OF OUR RANGES - WE MAY SEND EQUIVALENTS.

Types and Prices Subject to Stock - C.O.D. or C.W.O. Please add 1/- Postage (U.K.)

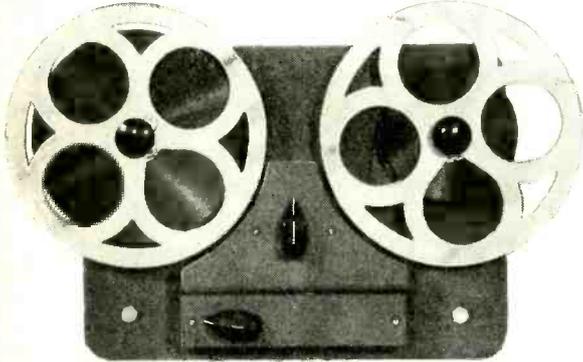
Export to the Commonwealth and beyond, safely packed and fully insured at cost.



(Please mark envelope WW1)

NEW "PRINCIPLE" RECORDER TABLE

BY QUALTAPE



Examine these new features :-

- ★ Twin track.
 - ★ Supersonic erase.
 - ★ 2-speed, giving 7½ and 15 in. per second.
 - ★ Self oiling, self aligning bearings.
 - ★ Fixed motors.
 - ★ New "gyro" drive principle.
 - ★ Rewind by turn of switch.
 - ★ All spindles centreless ground.
 - ★ Brake fitted.
 - ★ Reels fit solid.
 - ★ Operates flat, sloping or upright.
- Demonstrations with pleasure.

*We are proud to present this superb example of British design and workmanship.
Particulars and illustrated brochure from:-*

ELECTRONIC SERVICE (HALLAMSHIRE) LTD.,

93-95, BUTTON LANE, SHEFFIELD.

TELEPHONE NUMBER:- SHEFFIELD 21690. TELEGRAPHIC ADDRESS "QUALTAPE", SHEFFIELD.

HANNEY of BATH offers

ALL COMPONENTS FOR THE MAGNAVUEV, the very latest T.V. described in the book "LARGE SCREEN T.V. for the HOME CONSTRUCTOR" issued by the makers of BRIMAR valves. Detailed price list available from us, giving resistor kit, T.C.C. condenser kit, chassis, coils, Allen wide angle components, BRIMAR VALVES AND TUBES, etc. etc.

TELEKING. Complete constructional envelope, 6/-; Complete chassis kit, 70/-; Coils, TK1, 3/-; TK2-3-4-5-8-9, all 5/- each; TK6, 7/6; TK7, 1/3; SC312, 22/6; AT310, 30/-; OP117, 9/-; BT314, 15/-; Wide angle components, below.

WIDE ANGLE VIEWMASTER. All special T.C.C. condensers ex-stock.

ALLEN WIDE ANGLE COMPONENTS. LO.305, 50/-; FO.305, 21/-; DC.300, 42/-; PC.302, 35/-; GL.16 and GL.18, 10/- each.

STANDARD VIEWMASTER. All GENUINE components ex-stock. Complete kit, less valves and tube. £31 (or in 7 easy stages as per our list).

WILLIAMSON AMPLIFIER. We have limited stocks of WODEN potted components, and wish to correct an erroneous impression given in our list that they are not available. Output trans. WOT.20 (3.6 ohm secs.), 138/6; WOT.25 (1.7 ohm secs.), 130/-; PTM.1.4A mains trans. 87/6; PCF.12 150 ma. choke, 44/-; PCP.22 30 H. 20 ma. choke, 30/-; PTM.23, mains trans. for pre-amp., 47/6; Resistor (RK) and condenser kits (CK) available. RK, main ampl., 33/9; RK, fig. 13, 9/6; RK, fig. 15, 24/-; RK, fig. 19, 37/-; RK, fig. 20, 6/8; RK, fig. 27, 9/6; RK, fig. 29, 24/6; CK, fig. 13, 15/-; CK, fig. 15, 47/-; CK, fig. 19, 54/6; CK, fig. 20 (less C68 and 72), 12/9; CK, fig. 27, 19/-; CK, fig. 29, 54/-; RK includes all pots.

PARTRIDGE unpotted output trans. with terminal board, £6/19/6, inc. part packing charge.

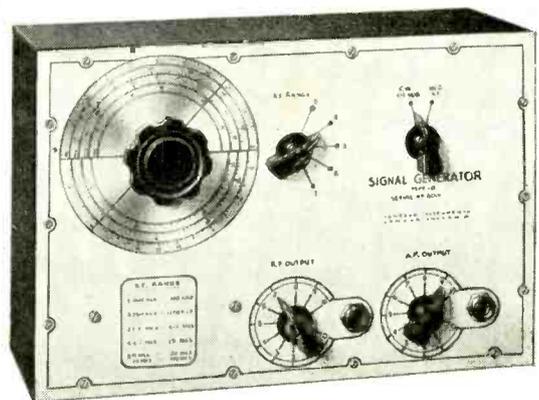
EDDYSTONE 740 RECEIVERS, available again at £38/15/-, send for illustrated brochure.

PICK-UPS. New Acos GP.30, 71/5; Acos GP.20, 71/5, std. or L.P. (spare plug-in heads, 43/4); Collaro magnetic, 40/- (std. only); Collaro GP.28, with turn-over crystal head for std. and L.P., 80/3; Collaro Orthodynamic with trans., 77/8; Goldring 165s, plays all speeds, all records, with turnover magnetic head, 71/5; Goldring Bantam (std. records), 35/10; Rothermill U48 crystal for std. records, 28/2.

SUNDRIES. Osmor Q coilpacks, type HO, 52/-, type LM, 43/4, type TRF, 43/4; Q coils, 4/- each; QC1 HF chokes, 4/-; Weymouth H coils, 3/9 each; Varite P coils, 3/- each; Denco Maxi-Q coils, 3/11; Denco type C TRF, 3/- pair; TRF coils with reaction, 4/3 each. Polystyrene varnish, genuine Distrene, 1/10 bottle. 50 watt potted output trans. for 6L6, KT66, 6V6 and PX4 in P.P., 47/3; Taylor Montrose meters, 50/-; Valve manuals Brimar, Osram and Mullard, 5/6; "Wireless World", 3/9, all post free. Lane Mk. 2 Tape Decks, 416/10/- (plus 10/- carriage and packing). Send id. stamp for our lists containing details for Viewmaster (Std. and Wide Angle), MAGNAVUEV, Teleking, W.W. S'het, Williamson Amplifier, General Components, etc., etc.

L. F. HANNEY

77 Lower Bristol Road, Bath. Tel. 3811.



SIGNAL GENERATOR TYPE 10. 100 Kc/s-100 Mc/s

Price £7 . 10 . 0

The accuracy, reliability and comprehensive specification, are some of the reasons why the TYPE 10 has achieved such outstanding success.

● 100 Kc/s to 100 Mc/s ● Modulated or unmodulated carrier ● Direct calibration ● Adjustable 400 c.p.s., AF signal ● Stable RF oscillator Large, easily-read scale ● AC mains operation.

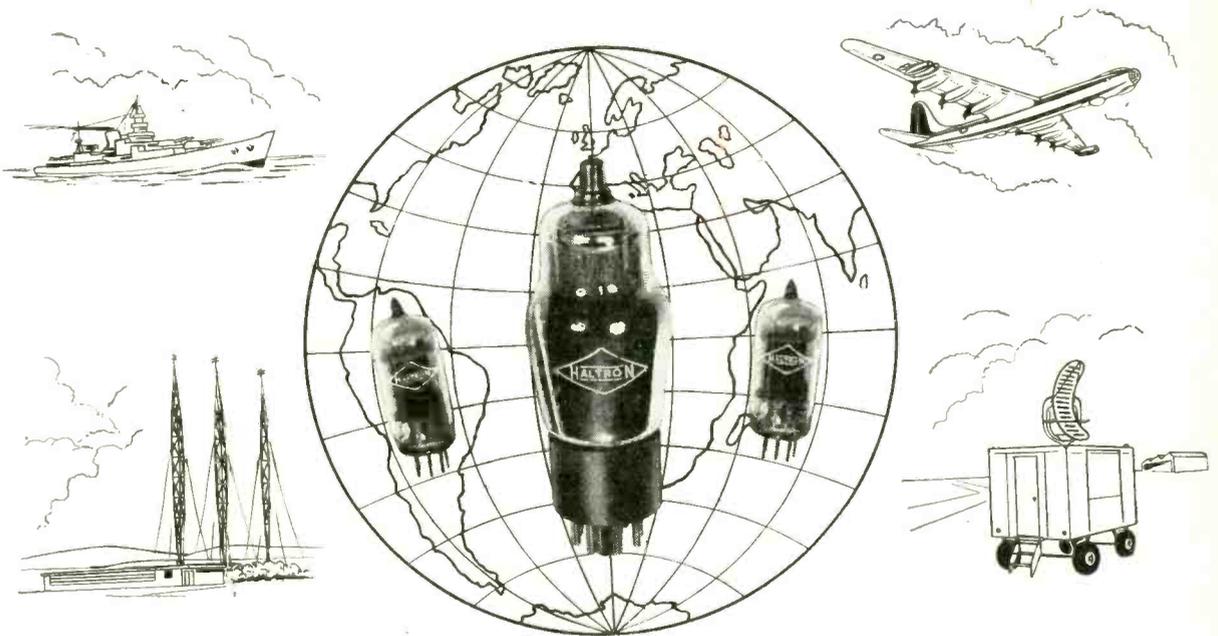
New instruments now available include the HOMELAB CHECKTEST price 37/6d., and a range of accurately calibrated variable condensers, 100pf., 500pf., and 1000pf., price 42/- each.

Obtainable only direct from the manufacturers. Send for full technical details or call at address below.

Overseas enquiries invited.

HOMELAB INSTRUMENTS LTD.,
615-617, HIGH ROAD, LEYTON, LONDON, E.10
Telephone LEY 5651

We wish all our customers throughout the world a prosperous New Year and thank them for the support they have given us in our EXPORT DRIVE



ON LAND SEA AND IN
 THE AIR RADIO TUBES
 SERVE YOU



HALL ELECTRIC LTD

**HALTRON HOUSE, 49-55 LISSON GROVE,
 LONDON N.W.1.**



Tel.: Ambassador 1041 (5 lines) Cables: Halleltric, London

CITY SALE & EXCHANGE

LIMITED

90-94, Fleet Street, London, E.C.4

Phone: Central 9391/2

Items from our large stocks include the following:

LEAK

TL/12 Point one amplifier, complete with Vari-slope pre-amp, £40/19/-. Variable selectivity tuner unit, magic eye, £38/5/-. Dynamic Pick-up, diamond stylus, £19 2 6. With Ruby stylus, £12 12/-. Available either L/P. or Standard—steep slope filter, £4/10/-.

ROGERS

"R.D." Junior amplifier, push-pull KT66 valves, separate pre-amplifier with 7 K/cs. low pass filter, £28/10/-. Baby amplifier push-pull 6V6 valves, including Junior pre-amp, £22/10/-. Minor amplifier, £11/10/-. "R.D." Corner reproducer using twin cone speaker, made under Voigt patent, £56/5/-.

DECCA

PAVI hi-fidelity push-pull amplifier, self-contained in metal case, £26/5/-. P.A.3 amplifier with 6V6 output, £17/10/-. Corner speaker, 3, 6 or 15 ohms, walnut or mahogany finish, £30/16/4. X.M.S. Pick-up with two heads, £7. 347/M 3-speed portable record player with magnetic heads, suitable for amplifier, 19 guineas, or in walnut case, 21 guineas. Both models available at the same price with Acos G.P.20 Pick heads. Model 94 3-speed radiogram, record storage, 95 guineas.

ACOUSTICAL

QUAD amplifier and separate control unit, £35. Tuner for same, 3 stations pre-set, £26.

GARRARD

RC80 3-speed changer, less Pick-ups, £16/8/6. RC75 ditto, £14/12/6. Turnover heads for these units, crystal or magnetic, £2/19/7. 201B/5 continuously variable transcription motor, £24/12/6.

WHARFEDALE

Bronze 10in. speaker, £5/0/4. Golden 10in., £8/6/-. Golden 10 CSB unit, £9/0/5. W10/CS speaker, £13/7/-. Super 8 CS/AL, £7/4/4. Super 12 CS/AL unit, £23/1/10. W 15 C/S, £16. Corner sand-filled baffle, less speaker, £12/5/-.

TRUCHORD

Hi-fidelity push-pull amplifier in the de Luxe walnut cabinet, complete with speaker, 44 guineas, tax free.

PART EXCHANGE is OUR SPECIALITY

Easy Payments can be arranged on all new equipment. Mail Orders promptly executed.

WE PAY TOP PRICES

For American Surplus Electronic Equipment

Any quantity or condition

LOOK AT THESE EXAMPLES

for equipment in good condition

Receiver R54/APR4 with tuning units TN16, 17, 18, 19, 54 (or bought separately) ...	£135
Receiver AR88D ...	£55
Frequency Meter TS/175 ...	£80
Frequency Meter BC221 ...	£26
TX/RX RT18 ARCI ...	£50
Test Set I-100 ...	£50
Klystrons Type 723AB ...	£4

We pay similar Remarkable Prices for

Receivers APR1, APR4, APR5, R5/ARN7, BC348, BC342, BC312, R78 APS15, APN9.	
Frequency Meters BC221, TS174/U.	
Test Sets TS3, TS13, TS14, TS17, TS19, TS33, TS34, TS45, TS47, TS59, TS69, TS102, TS118, IE19.	
Transmitters ART13, SCR522, TRCI, TCS6-12-13, SCR300, BC1000	
Synchronisers BC1143	Modulators BC1142

Phone us immediately, transfer charge

ALTHAM RADIO CO.
BRAZENOSE STREET, MANCHESTER 2

Tel. DEAnsga e 5378

HIGH VOLTAGE EQUIPMENT

3,000—90,000 volts

A.C. and D.C.

IONISATION TESTERS

300-30,000 volts

- ★ The specimen at true earth.
- ★ Visual indication of ionisation by meter and oscilloscope.

Write for full details to:



34A, POTTERY LANE, LONDON, W.11

Telephone: Park 6955-5237



PREMIER

RADIO Company

(REGD.)
RADIO

ESTAB. 40 YRS.
TELEVISION

B. H. MORRIS & CO. (RADIO) LTD.
Please quote Dept. W.W.

THE PREMIER De Luxe PORTABLE MAGNETIC TAPE RECORDER

THIS UNIT COMPARES MORE THAN FAVOURABLY WITH ANY OTHER MAKE OF TAPE RECORDER AT DOUBLE THE PRICE

THE 7 VALVE AMPLIFIER HAS BEEN SPECIALLY DESIGNED FOR HIGH QUALITY REPRODUCTION

Brief Specification:—

VALVE LINE-UP:—EF37A First Stage; 6SL7 Second Stage and Tone Control; 6Y6 Output; 6X5 Rectifier; VF501 Bias and Frase Oscillator; 7193 Record Level Amplifier; 6U5 Magic Eye Record Level Indicator.

OUTPUT:—4 Watts. **FREQUENCY RANGE:—**50 c.p.s. to 9,000 c.p.s.

CONTROLS:—Volume; Record/Playback Switch; Treble Boost; Bass Boost—on/off.

A VISUAL MAGIC EYE Record Level Indicator is incorporated. The unit is housed in a superbly finished rexine covered portable cabinet which incorporates a compartment for the Microphone when not in use. Weight complete 35 lb. Dimensions:—21in. long; 12 1/2in. deep; 9 1/2in. high.

This Recording Outfit has been designed for use with M.C.-1-111 "SCOTCH BOY" Magnetic Tape. With this high quality tape a frequency range of 30 c.p.s. to 9,000 c.p.s. at tape speed of 7 1/2 in./sec. can be readily achieved. Additional reels of 1,200ft. can be supplied at 35/-.



★ SUPPLIED COMPLETE WITH MICROPHONE, REEL OF 'SCOTCH BOY' TAPE, AND REWIND SPOOL

The Recorder Incorporates THE NEW LANE TAPE TABLE

Brief Specification:—

Made to high standards and incorporating features ensuring low level of "Wow" and "Flutter" throughout the full length of tape.

FAST REWIND. Provision for fast rewind and forward run in less than 1 min. in either direction. THREE MOTORS obviating friction drive.

HIGH FIDELITY RECORD PLAYBACK (1 HOUR APPROX. PLAYING) The Table is fitted with high fidelity record play-back head of new design wound to high impedance and a separate A.C. Erase Head. The Heads are half-track size allowing approx. 1 hr. playing from standard 1,200ft. Reel of Tape.

TAPE SPEED 7 1/2 in. sec. For use on A.C. 200/250, 50 cycles mains only.

39 ★
GNS.
Pkg. Carr. & Ins. 16/-

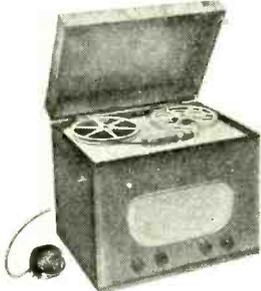
To those not wishing to purchase the complete Recorder, separate units are available as follows:

THE BUILT AMPLIFIER Complete with 8in. Speaker. £14 14 0 Plus 7/6 Pkg. Carr. & Ins.	PORTABLE CABINET £4 19 6 Plus 5/- Pkg. Carr. & Ins.	THE LANE TAPE TABLE £16 10 0 Plus 7/6 Pkg. Carr. & Ins.	ROTHERMEL MICROPHONE £2 19 6 Specification below
---	--	--	---

PREMIER TABLE MODEL MAGNETIC TAPE RECORDER

INSTRUCTIONAL BOOKLET 2/6

This is credited if a complete Kit of the Tape Recorder is ordered.



IN KIT FORM.—The Kit includes ALL parts, valves, cabinet, loud speaker, Reel of "Scotch Boy" Tape, Rewind Spool and the NEW Lane Tape Table already assembled, but excluding Microphone.

SPECIFICATION AS PREVIOUSLY ADVERTISED £29 : 8 : 0
(Packing and Carriage 15/-)

COMPLETE—to those unable to build this TAPE RECORDER, we offer it built, tested and ready to plug in, complete with Microphone, Reel of "Scotch Boy" Tape and Rewind Spool.

SPECIFICATION AS PREVIOUSLY ADVERTISED £36 : 10 : 0
(Packing, Carr. & Ins. 1 Gn.)

★ All the above Recorders are Fully Covered by the usual Premier Guarantee—3 months valves—12 months other components.

The NEW Microphone . . . for TAPE RECORDING ● AMATEUR RADIO ● PUBLIC ADDRESS

The 2D56 CRYSTAL MICROPHONE made specially for Premier by one of the world's leading manufacturers of Microphones. Although giving better all-round performance than most Microphones, we are able to offer this Unit at less than half the price of any comparable Microphone of other makes.

Brief Specification:—

SENSITIVITY —minus: 55 d.b. relative to 1 v./dyne/cm².
RESPONSE —essentially flat from 35,000 c.p.s., recommended load resistance 5 megohms (for flat response at low frequencies).

DIMENSIONS—overall length 5 1/2in. Width 2 1/2in. at widest part of Ball Top, tapering to 1in. at base of housing.

The Microphone is unaffected by mechanical vibrations and low frequency wind noises. An attractive black all-metal housing provides complete screening and protection for the crystal insert. The crystal is virtually unbreakable and specially treated to minimise the effect of humidity. The modern design of the Unit enables it to be used as a Hand Microphone, with a Base as a Desk Microphone, or fixed to a Pedestal Floor Stand. Screw fitting for any standard British type stand.

ALSO AVAILABLE FROM STOCK:	LUSTRAPHONE Moving Coil: High Impedance — Stand type: £5/12/6. — Hand Mike: £6/6/-	RONETTE Crystal Microphone: High Impedance — Ball type: £3/19/6. — Torpedo type: £2/12/-
-----------------------------------	--	--

Table Stands for all the above 17/6.

PRICE
£2 : 19 : 6



Especially recommended for use with the PREMIER MAGNETIC TAPE RECORDER

NOW BEING DEMONSTRATED AT THIS ADDRESS

207 · EDGWARE ROAD · LONDON · W · 2

TERMS OF BUSINESS:
Cash with order or C.O.D. over £1. Please add 1/- for Post Orders under 10/-, 1/6 under 40/- unless otherwise stated

Telephones: **AMBassador 4033**
PADdington 3271/2

PREMIER FOR SOUND RECORDING



WE TAKE THIS OPPORTUNITY

OF EXTENDING SEASONAL GREETINGS



PREMIER

RADIO Company

(REGD.)

RADIO

B. H. MORRIS & CO. (RADIO) LTD.
Please quote Dept. W.W.

TELEVISION

ESTAB. 40 YRS.

BRAND NEW R1355 RECEIVERS

As specified for the "Inexpensive Television," complete with 11 valves, 39/6, plus 7/6 packing and carriage. As a special offer we can supply the R1355 complete with R.F. 24 or R.F. 25 at 59 6, or with R.F. 26 at £4 17 0 plus carriage.

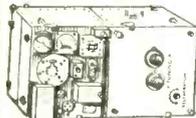
RJ3170A RECEIVER UNIT

Brand New and Unused

This is a 16-valve V.H.F. Receiver incorporating a 30 Mc/s I.F. Strip. Valve line-up: 2-CV66, 1-VU39, 2-EA50, 1-CV188, 1-VR137, 1-VU134, 8-EF50 valves. Price £24/6. plus 3/- pkg. and carr.

TRANSMITTER RECEIVER TYPE TR9H

Consists of Transmitter type T1396 and Receiver R1139 in one case. This is a 9-valve Battery operated Unit covering 4.3 Mc/s. to 7.6 Mc/s. Crystal controlled complete with valves but less crystal, 50/-, plus 7/6 packing and postage.



PREMIER'S MOST SENSATIONAL OFFER THE 'SOBELL' 4 VALVE SUPERHET TABLE RECEIVER

M. & L. WAVEBANDS Valve Line-up 1237, 35L6, 1487, 35Z4.

Entirely transportable and unusually sensitive owing to special feed-back circuit employed. Housed in attractive plastic cabinet. Choice of 5 Colours—Walnut, Pastel Peach, Ice Blue Aero Green, Magenta. Carrying handle incorporated 200/250 A.C./D.C. mains. Plus 5/- Pkg./carr./ins.



in design. For use on £8.19.6

Covered fully by Manufacturer's Guarantee

2 STAGE QUALITY AMPLIFIER Complete with 10in. Engrised LOUDSPEAKER

4 watts output. A.C. 110/230 mains. £6.19.6 plus 5/- carriage.



CRYSTAL MICROPHONE

An entirely insulated crystal microphone which can be safely used on A.C./D.C. amplifiers. High impedance. No background noise, really natural tone. The ideal Mike for tape, wire and disc recording and sound producers. Price 22/6.

MOVING COIL MICROPHONE

Low impedance. Incorporates press-to-talk switch. Housed in strong black bakelite case. Dimensions: 2in. wide, 2 1/2in. high, 1 1/2in. deep. Plus 1/6 post and pkg. A matching transformer for high impedance can be supplied at 3/6 extra.



H.T. ELIMINATOR

By famous manufacturer

Input 200/250 v. A.C. Output 120—at 30 mA., housed in strong metal box size 10in. long, 7in. wide, 6 1/2in. deep. Price 37/6 Plus 2/6 pkg. and carr.



CORRECT ASPECT WHITE RUBBER MASK

For 12in. Round or Flat-faced Tube 16 11

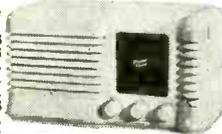
SORBO RUBBER MASKS

Grey felt finish (new aspect ratio). 9in., 5/-; 12in. 9/6

WHITE RUBBER MASK For 6in. tube ... 8/6

BUILD A PROFESSIONAL LOOKING RADIO SET AT LESS THAN HALF TO-DAY'S PRICE

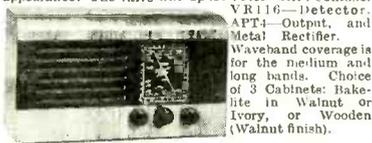
We can supply all the parts to help you. Drum (2 1/2in. dia.) 1/8 Driving head 1/8 Double pointer 4d. Spring 3d. Nylon Core (yard) 6d. Dial Front Plate 2/6 Engraved Glass Dial, 181-350 and 800-2,200 m. With station names, new wavebands 1/6 T.R.F. Coils, 180 350, 800-2,200 metres, pair... 6/6 Punched chassis, 3-valve plus rectifier T.R.F. 3/9 Cabinet, Bakelite, in Walnut or Ivory or Wooden in Walnut finish. 17/8 Packing and insurance. 2/6



SEND 1/6 FOR EASY TO FOLLOW POINT-TO-POINT DIAGRAMS AND CIRCUIT DIAGRAM which shows how YOU can build the Receiver Illustrated above.

THE COMPLETE KIT

to construct a 3-valve plus rectifier T.R.F. Receiver for use on 200/250 v. A.C. mains can be supplied at £6/9/6, plus 2/6 packing and carriage. Each Kit is complete in every detail, nothing has to be made or improvised. Easy to follow, point-to-point diagrams are supplied, making construction very simple. The Dial is illuminated, and the Receiver housed in its Cabinet size 12in. x 5in. x 6in. presents an attractive appearance. The valve-line-up is: 717A—H.F. Pentode. VR116—Detector. APT4—Output, and Metal Rectifier. Waveband coverage is for the medium and long bands. Choice of 3 Cabinets: Bakelite in Walnut or Ivory, or Wooden (Walnut finish).



BATTERY CHARGERS

200-250 v. A.C. Will charge 6 v. or 12 v. Car Battery at 1 amp. Housed in strong metal casing. Finished in Green hammered enamel. Size: 6in. long, 3 1/2in. wide, 3 1/2in. high. Guaranteed 12 mths. The above unit is manufactured by PREMIER and does not contain ex-Govt. components. Plus 2/6 Post 39/6 and pkg.



BATTERY CHARGER KITS

All incorporate metal rectifiers. Transformers are suitable for 200/250 v. A.C. cycle mains. Cat. No. 2002 Charges 6 volt accumulator at 1 amp. Resistance supplied to charge 2 v. accumulator. £1 2/6 2003 Charges 12 volt accumulator at 1 amp. £1 7/6

FOR 'HI-FI' ENTHUSIASTS QUALITY LOUDSPEAKERS

We have a small quantity available at pre-Purchase Tax price. GOODMANS 12in. 15 ohms imp. £8 8 0 CELESTION 12in. 15 ohms imp. (heavy duty type) £8 8 0 VITAVOX K12/20, 15 ohms imp. £11 11 0 Packing and carriage on each of the above 5/-. These are all BRAND NEW and in manufacturers' original carton.

Govt. Surplus—Ex W.D. STEEL AERIALS ALL BRAND NEW

12ft.-34ft. sections of copper-plated steel highly flexible tapering 1/4in. to 1in. Brand new in container. 6/9. Packing and carriage 1/6. Insulated Base, 3/-. Webbing waterproof carrying case with shoulder sling. 2/6. These aerials make ideal fishing rods.

EX-U.S.A. U.H.F. AERIAL

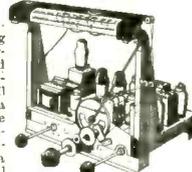
with untuned detector stage, consisting of V.R.92 valve, etc. Brand new, in carton 5/-.

METAL RECTIFIERS FULL WAVE

6 v. 1 amp., 4/-; 12 v. 1 amp., 5/-. F.H.T. Pencil Type: Output: 650 v. 1 mA., 1/7 each; 1,000 v. 1 mA., 6/- each.

A WORLD-FAMOUS Manufacturer's Surplus of RADIO RECEIVER CHASSIS 7-valve RECEIVER

Built to exacting specifications and incorporating features ensuring superlative tonal qualities and world-wide reception. Specification: 8 watts push-pull output using 2 Mazda Pen. 45 valves. Ample negative feedback is applied over all the audio-amplifier. Amplifier Mazda Type HL41D gives signal Detection A.V.C. and Phase Splitting. Two stages of I.F. amplification 465 Kc/s. using Mazda VT41. FOUR WAVEBANDS 14 M.-24 M., 24 M.-55 M., 190 M.-600 M., 900 M.-2,000 M. DIRECT AND VERNIER TUNING. Gram. position on Switch. Provision for external Loudspeaker. For use on 200/250 A.C. Mains. £13/10/-, plus 2/1/- pkg. and carr.



I124 RECEIVER UNIT

Range 30 to 40 Mc/s. Contains six new Valves. 3-9D2, 1-8D2, 1-15D2 (frequency changer), 1-1D1, 21 ceramic trimmers, 6 ceramic valve-holders, 6 valve screening cans, 30 resistors, 1-W/W Pot. Meter Mica Tubular and Block Condensers. Ceramic coil former, 2 Westector WX6 and 1 Westector WX4. 5-way 4-bank switch with long spindle I.F. transformers, etc. Brand new in maker's carton at 22.6, plus 2/6 postage and packing.



★ BRAND NEW R1155 RECEIVERS

In original cases, complete with 10 valves. Frequency range 18.5 Mc/s.-75 Kc/s. in 5 wave bands. £11/19/6. 10/6 packing and carriage.



POWER SUPPLY UNIT

for above incorporating output stage. Supplies an output of 250 volts at 80 mA., which is ample for the R1155 with the output stage. Jones plugs for connecting the Power Pack to the Receiver are included. The 6V6 output stage complete with Output Transformer and 65in. speaker is built into the unit. Price £5/5/-, plus 5/- packing and carriage.



As a special offer, power supply unit including speaker together with R1155 receiver. PRICE £16.19.6. Plus 15/- pkg. & carr.

★ We now have available a small quantity of used R1155 Receivers. We can offer these at the ridiculously low price of 29/19/6, plus 10/- pkg., Carr., Ins. These Receivers have been reconditioned and Air Tested and are fully guaranteed to be in perfect working order.

CAR BATTERIES—BRAND NEW

6 v. 11 plate—PREMIER. Height, 6 1/2in.; Length, 7 1/2in.; Depth, 6 1/2in. Price 65/-.
12 v. 9 plate—PREMIER. Height, 8 1/2in.; Length, 12in.; Depth, 6 1/2in. Price 110/-.
6 v. 90 amp. 9 plate—THOR. Height, 7 1/2in.; Length, 9in.; depth 7in. Price 75/-.
6 v. 40 amp—PREMIER. Parking Light Battery. Price 37/6.
6 v. 18 amp—PREMIER. Parking Light Battery. Price 27/6.

All prices plus 7/6 carr. and packing.

POWER SUPPLY UNIT No. 7

Ref. ZA17571. A complete Unit charging 6-volt Accumulators, by hand. Designed for the W-221 could be used for many other purposes. Consists of a stout metal case, dim. 17x10x7 1/2in., with detachable lid, containing hand driven generator, with gear mechanism which delivers 6 volts D.C. at 4 amps, also 6 volt cut out and battery clamp. Price 32.6, plus 3/- post/pkg.



207 · EDGWARE ROAD · LONDON · W · 2

TERMS OF BUSINESS:

Cash with order or C.O.D. over £1. Please add 1/4 for Post Orders under 10/-, 1/6 under 40/- unless otherwise stated

Telephones: AMBassador 4033 PADDington 3271/2

OPEN UNTIL 6 PM ON SATURDAYS

IMPORTANT ANNOUNCEMENT: WE CANNOT ACCEPT RESPONSIBILITY FOR, NOR CAN WE GUARANTEE ANY—

TO ALL CUSTOMERS, PAST AND PRESENT

AT HOME AND OVERSEAS



PREMIER

RADIO Company

(REGD.)

ESTAB. 40 YRS.

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

Please quote Dept. W.W.

RADIO

TELEVISION

METERS

Large stocks available a few of which are enumerated below :-

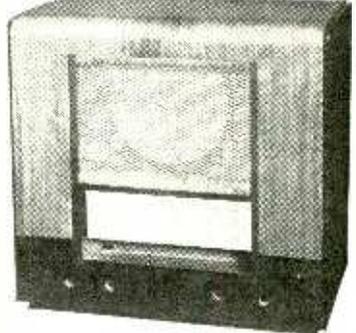
Full Scale Deflection	Scale Length	External Dimensions in.	Movement	
5 A.	1 1/2	2 1/2 x 2 1/2	R.F. Thermo	7/6
2A.	1 1/2	2 1/2 x 2 1/2	M/C	8/6
25A.	1 1/2	2 1/2 round	R.F. Thermo	7/6
3A.	1 1/2	2 1/2 round	R.F. Thermo	7/6
3.5 A.	1 1/2	2 1/2 x 2 1/2	R.F. Thermo	7/6
4 A.	1 1/2	2 1/2 x 2 1/2	R.F. Thermo	7/6
5 mA.	2	3 1/2	Centre Zero	10/4
8 A.	1 1/2	2 1/2 x 2 1/2	M/C	12/4
20 A.	1 1/2	2 1/2 round	M/C	8/4
30 A.	1 1/2	2 1/2 x 2 1/2	M/C	8/6
40 A.	1 1/2	2 1/2 round	M/C	8/6
15 mA.	1 1/2	1 round	M/C	12/6
5 mA.	1 1/2	2 1/2 x 2 1/2	M/C	8/6
5 mA.	2	3 1/2	M/C	16/8
6 mA.	2	3 1/2	M/C	8/6
50 mA.	1 1/2	2 1/2 x 2 1/2	M/C	8/6
100 mA.	1 1/2	2 1/2 x 2 1/2	M/C	10/6
5A.	1 1/2	2 1/2 x 2 1/2	M/C	15/-
20 V.	2	3 1/2	M/C	8/6
40 V.	1 1/2	2 1/2 x 2 1/2	M/C	8/6
1 mA.	2	3 1/2	M/C	25/-

MOVING COIL METER

A super quality Moving Coil Meter basic movement 2mA. Scale dimension 2 1/2 in. Overall dimensions 2 1/2 in. dia. 1 1/2 in. deep. Bakelite case projecting type. At present sealed 1 amp. R.F. By removing thermocouple, reversing scale and recalibrating the meter, a high grade test instrument with any range above the basic P.S.D. may be built up. Price 4/9.

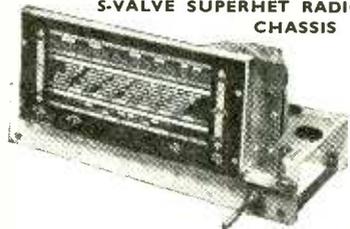
RADIO CABINET (WALNUT FINISH)

Outside dimensions: 16 1/2 in. high, 9 in. deep, 17 in. wide



A beautifully made cabinet. £3/10/-, plus 7/6 carr./pkg

S-VALVE SUPERHET RADIO CHASSIS



Drilled and cut out for all necessary control mountings and Mains Transformer, fitted with 5 Amphenol Octal Valveholders, Aerial, Earth and Gramophone Sockets, 500 pf Tuning Gang Condenser, full vision drive Tuning Assembly consisting of unbreakable Perspex 3-coloured scale for long, medium and short wavebands. Calibrated in metres, kilocycles and station names, price 39/6.

AS A SPECIAL OFFER—CABINET ILLUSTRATED ABOVE AND CHASSIS, TOGETHER £5.5.0 Plus 7/6 Carr./Pkg. & Insurance.

Famous Set Manufacturers' surplus of

ELECTRIC 'GRAM UNITS

Two-speed, 33 1/3 and 78 r.p.m. For playing Standard and L.P. recordings. Complete with Turntable. For use on 200-250 v. A.C. mains. Each unit is in its original manufacturer's carton and is fully guaranteed. Limited quantity only available at approx. half list price.



£3. 19. 6

Plus 2 8 pkg. carr. ins.

THE NEW BSR "MONARCH" AUTO-CHANGER

This is a 3-speed automatic mixer record changer designed to play 12 in., 10 in. and 7 in. records interrupted in any order. Capacity 10 records, operates on 100-125-200/250 volts 50 c./s. A.C. New reversible dual stylus crystal pick-up has extended frequency range to 10,000 c.p.s. Self compensated for the L.P. lower frequencies with the Turnover frequency at the correct point. PRICE £17/17/-, plus 5/- packing, carriage and insurance.

SPECIAL OFFER THE FAMOUS "CHANCERY" HIGH FIDELITY MICROCELL PICK-UP—TYPE GPX for Standard and Long Playing



The Chancery Light Weight G.P.X. Pick-up embodies certain unique features achieving a standard of performance not possible with normal magnetic or crystal pick-ups. The secret of the high standard of performance is in the use of the special microcell crystal cartridge assembly which has an unusually wide frequency response. The sapphire stylus is precision ground and semi-permanent. With two cartridges either L.P. or Standard. Price 52/6. Additional L.P. or Standard Cartridges can be supplied from stock at £1/11/6 each.

GRAMOPHONE UNITS

- GARRARD TYPE 70B Autochange unit, complete with Garrard magnetic pick-up head 78 r.p.m. £8 8 0
 - GARRARD Rim Drive 78 r.p.m., complete with magnetic pick-up and turntable £5 19 6
 - COLLARO 3-speed single gram. unit, complete with head for L.P. and standard recording £8 8 0
 - COLLARO RC500 Autochange unit, 78 r.p.m. £8 8 0
- All the above are for use on 200/250 v. A.C. mains. Packing and carriage on each of the above units 5/-

AVAILABLE ONCE AGAIN! A.C.R. I.C.R. TUBES

(DIRECT REPLACEMENT FOR A C.R. 2X) 5 1/2 in. screen. 4 volt Heater. This Electrostatic Tube is recommended as eminently suitable for Television, 15/- plus 2/6 Pkg. Carr. and Ins. Data sheet supplied.

V.C.R. 97 C.R. TUBES

We are once again able to offer this famous tube with the usual PREMIER guarantee of a full screen picture free from cut-off. Every tube is television picture tested before despatch. £2/5/- post paid.

SUPER QUALITY TELEVISION MAGNIFYING LENS

To suit 5 1/2, 6 in. or 7 in. Tubes. Increase picture size considerably, 25/- each.

1 mA. METER IN PLASTIC CASE

The movement is 1 mA. mounted in a case 3 1/2 in. square and 3 1/2 in. high. The scale is 2 1/2 in. long and the dial is 2 1/2 in. diameter. There is ample room in the case for a switch, and multipliers. Internal Resistance 100 ohms. Price 27/6.



PREMIER MAINS TRANSFORMERS

All primaries are tapped for 200-230-250 v. mains 40-100 cycles. All primaries are screened. All L.T.'s are centre tapped.

- SP175B, 175-0-175, 50 mA., 4 v. @ 1 a. 4 v. @ 2-3 a. 25/-
- SP250B, 250-0-250, 60 mA., 4 v. @ 1-2 a. 4 v. @ 3-5 a. 25/-
- SP300A, 300-0-300, 60 mA., 6.3 v. @ 2-3 a. 5 v. @ 2 a. 25/-
- SP300B, 300-0-300, 60 mA., 4 v. @ 2-3 a. 4 v. @ 3-5 a. 4 v. @ 1-2 a. 25/-
- SP301A, 300-0-300, 120 mA., 5 v. @ 2-3 a. 6.3 v. @ 3-4 a. 28/-
- SP301B, 300-0-300, 120 mA., 4 v. @ 2-3 a. 1 v. @ 2-3 a. 4 v. @ 3-5 a. 28/-
- SP350A, 250-0-350, 100 mA., 5 v. @ 2-3 a. 6.3 v. @ 2-3 a. 29/-
- SP350B, 350-0-350, 100 mA., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 3-5 a. 29/-
- SP351, 350-0-350, 150 mA., 4 v. @ 1-2 a. 4 v. @ 2-3 a. 4 v. @ 3-6 a. 36/-
- SP375A, 375-0-375, 250 mA., 6.3 v. @ 2-3 a. 6.3 v. @ 3-5 a. 5 v. @ 2-3 a. 39/6
- SP375B, 375-0-375, 250 mA., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 3-6 a. 39/6
- SP425B, 425-0-425, 200 mA., 4 v. @ 2-3 a. 3 v. @ 2-3 a. 4 v. @ 3-6 a. 4 v. @ 2-3 a. 42/6
- SP501, 500-0-500, 150 mA., 4 v. @ 2-3 a. 4 v. @ 2-3 a. 4 v. @ 2-2 a. 4 v. @ 3-5 a. 47/-
- SP501A, 500-0-500, 150 mA., 5 v. @ 2-3 a. 6.3 v. @ 2-3 a. 6.3 v. @ 2-3 a. 47/-
- SP425A, 425-0-425, 200 mA., 6.3 v. @ 2-3 a. 6.3 v. @ 3-5 a. 5 v. @ 2-5 a. 52/6

PREMIER VARIABLE IMPEDANCE "MATCHMAKER" MO.15 OUTPUT TRANSFORMER

Designed to meet the demand for an efficient variable ratio Output Transformer. 11 ratios from 13:1 to 8:1 all centre-tapped and can be used to match any output valves either single- or push-pull. Class "A", "AB1", "AB2" or "B" to any low impedance speech coil or combination thereof. Primary Inductance 60 henries 15 watts audio 100 mA. Price 45/-.

WILLIAMSON AMPLIFIER KIT

A complete kit of parts for the construction of the latest version of this famous amplifier, complete with valves, output and mains transformers.

15 Gns.

Plus 7/6 pkg. carr. and ins.

WILLIAMSON AMPLIFIER TRANSFORMERS (To specification)

The Output Transformer 3.6 ohms sec. £4/4/- The Mains Transformer PREMIER SP425A. £3/7/6.

SPECIAL OFFER DOUBLE WOUND AUTO-TRANSFORMER 250 watts.

Input/Output	Output/Input	
100 volts	110 volts	
110 "	113 "	
200 "	116 "	
210 "	119 "	Price 50/-
220 "	122 "	Plus 2/6 Pkg. Carr.
230 "	134 "	
240 "	146 "	
250 "		

With the two windings connected in series a vast number of voltage tapings are available.

PREMIER 3-BAND COIL PACK

Consists of a wired and aligned Coil Pack of the most Modern Type incorporating such features as Air Dielectric Trimmers, Litz wound medium wave coils. Tuned R.F. stage covers 13-14, 40-120, 200-557 metres. Dimensions of pack: 6 in. x 4 1/2 in. x 2 1/2 in. Complete circuit is supplied. Price 25/-.

MAINS NOISE ELIMINATOR KIT

Two specially designed chokes with three smoothing condensers with circuit diagrams. Cuts out all mains noise. Can be assembled inside existing receiver, 6/- complete.

HEADPHONES

- Balanced Armature Low Resistance Type 1, 5 1/2 pair; Type 2, 8 1/2 pair.
- High Resistance 12/8 pair.
- Lightweight High Resistance 14/8 pair.

ACCUMULATORS

By world-famous maker, 2 volt 10 amp. 4/11

207 EDGWARE ROAD · LONDON · W·2

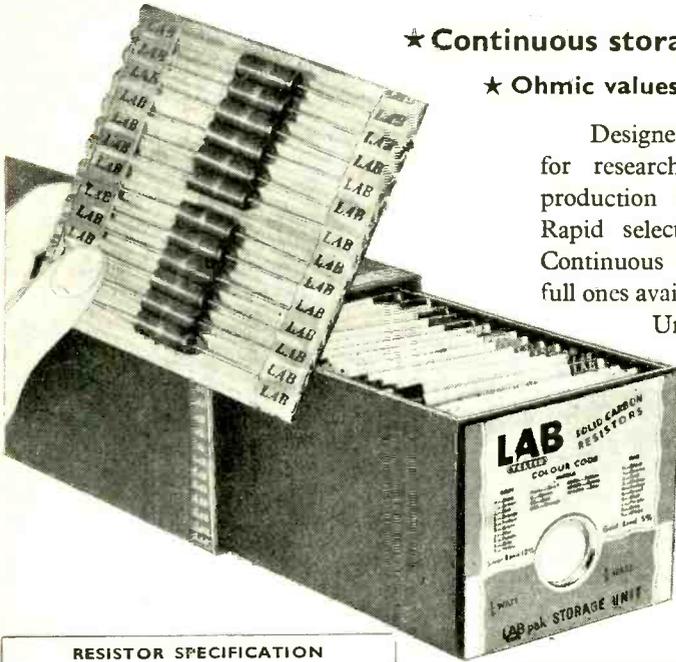
TERMS OF BUSINESS:
Cash with order or C.O.D. over £1. Please add 1/- for Post Orders under 10/-, 1/6 under 40/- unless otherwise stated

Telephones: **AMBassador 4033**
PADddington 3271/2

OPEN UNTIL
6 PM
ON
SATURDAYS

—KIT OR COMPONENT SOLD AS A PREMIER PRODUCT BY FIRMS OTHER THAN OURSELVES

ONLY the LAB unit has all these features...



- ★ Continuous storage ★ 700 resistors in a space 12" x 4" x 4"
- ★ Ohmic values separately carded ★ Finger-tip selection

Designed to provide a complete range of resistors for research and experimental laboratories and small production units. As easy to use as a card index. Rapid selection from 700 sorted and carded resistors. Continuous storage—empty cards merely replaced with full ones available from stock. The Lab Continuous Storage

Unit is supplied FREE with initial purchase of 180 Type R Resistors (Order LSUC 1/2) or 240 Type T ,, (Order LSUC 1/4)

THE LAB TESTED CONTINUOUS STORAGE UNIT

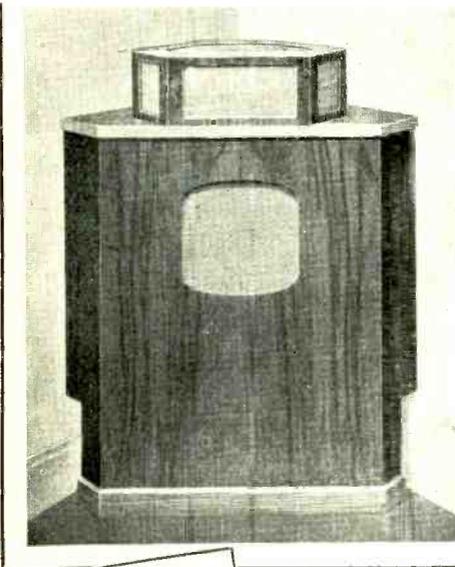
The Lab Continuous Storage Units are available from your normal source of supply but more detailed information can be obtained from

THE RADIO RESISTOR COMPANY LTD.
50 ABBEY GARDENS, LONDON, N.W.8 Telephone: Maida Vale 5522

RESISTOR SPECIFICATION

Ref.	Type	Loading	Max. Vols	Range	Dimensions
T	1/2-watt	1-watt	250	10 ohms to 10 megohms	1/2" x 1/2" x 1/2"
R	1-watt	1-watt	500	10 ohms to 10 megohms	1" x 1" x 1"

Tolerance available ±20%, ±10%, ±5%



OMNI-DIRECTIONAL 3-Speaker System

W15/CS W10/CS Super 5

Treble units facing upwards.

Crossover frequencies 800 & 5,000 c/s

Results from a 2-speaker system are usually improved by the addition of a third speaker. A crossover between 500 and 1,000 c/s is satisfactory with a 10in. or 8in. unit for the middle and upper registers plus a 5in. unit to improve the extreme "top." The 5in. speaker is connected in parallel with the middle speaker, with a capacitor of 1 or 2 mfd. in series with the voice coil or the small unit.

CROSSOVER NETWORK

Acoustically it is difficult to choose between quarter section and half section filters. The half section is probably to be preferred as, with some amplifiers, it reduces the risk of instability through the feedback circuit. In either case, a 10 ohm treble speaker is quite satisfactory with a 15 ohm bass unit. The addition of the third speaker with series capacitor does not upset the main crossover network in any way.

ADAPTABILITY

Existing two-speaker systems are easily adapted to three-speaker working without waste. Where a crossover at 2/3,000 c/s is already in use, it is important to double the values of inductance and capacitance to lower the crossover frequency when changing to a three-speaker set-up.

PRICES:

Twin Treble Assembly.....	£30 6 2
W15/CS Sand-filled Enclosure ...	£47 0 0
Three-way 1/2 section Crossover Unit	£ 8 10 0
(Tax £9 6 2 included)	£85 16 2

Veneered Walnut, Oak, Mahogany or Maple

Made and Guaranteed by

Wharfedale

WIRELESS WORKS

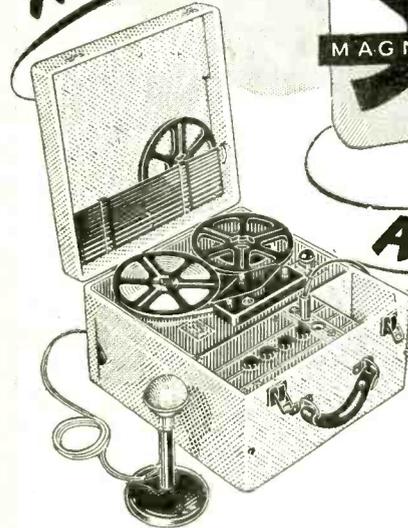
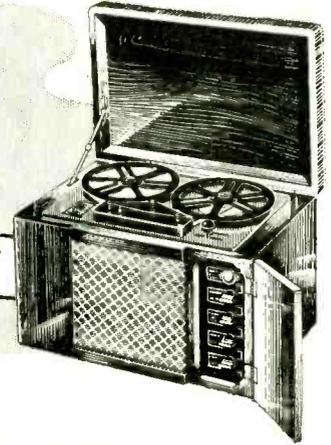
BRADFORD ROAD · IDLE · BRADFORD · YORKS.

Phone: Idle 461

THE FIRST

THE Soundmirror
MAGNETIC TAPE RECORDER

AND FOREMOST



A self-contained recorder/reproducer giving a faultless performance. The idea equipment for HOME ENTERTAINMENT, PUBLIC ADDRESS, CONFERENCE RECORDING, and SOUND COMMENTARY for SILENT FILM PROJECTORS.

- "Finger Tip" operation—one control provides for "Record" — "Play" "Rewind" or "Fast Forward" requirements.
- Constant Tape Speed—7.5 inches per second.
- Frequency Response—Essentially flat from 100-7500 c.p.s.
- High Quality Push/Pull Output.
- Recording Duration 30 minutes per reel.
- Dynamic Range approximately 40 decibels.
- Power Supply 200/250 A.C. 50 cycles—Consumption 80 watts.

Now available in England—the book "Magnetic Recording" by Dr. S. J. Begun. A comprehensive treatise. Price 25/-, postage 9d. extra.

THERMIONIC PRODUCTS LTD.

Division S/M WW, HYTHE, SOUTHAMPTON. Phone: Hythe 3265
London Showrooms: Morris House, Jermyn Street, Haymarket, S.W.1.
Phone: Whitehall 6422

MODELS AVAILABLE FROM
£69-10-0

Sales and Service Centres: Birmingham - Bristol - Manchester - Leeds - Newcastle and Glasgow.

M. R. SUPPLIES, Ltd.

offer only material which is brand new or in otherwise perfect condition. Immediate despatch—safe packing—satisfaction assured. All prices nett.

SMALL GEAR BOXES. Double worm gear 300/1 reduction, in die-cast housing approx. 2 1/2 in. x 2 1/2 in., fine precision construction. Flange shaft 1 1/2 in. dia. by 1 1/2 in. long, with two other take-offs (same ratio). Ball bearings. Transmission up to 1/16th h.p., 42/6 (des. 1/6).

FRACTIONAL H.P. MOTORS. Shaded pole types, 200/250 v. A.C. Hoover, torque 150 gm/cm, 950 r.p.m., 26/- (des. 1/6). Batain, torque 800 gm/cm, 1,200 r.p.m., 42/6 (des. 1/6). Franco, universal A.C. D.C., 230v., 1/76th h.p., 2,000 r.p.m., 37/8 (des. 1/6). B.T.H. Projector Motors (suitable for many other purposes), 110 v. A.C. (cap./load), 1/20th h.p., 18/6 (des. 1/6). Also G.E.C. ONE-THIRD H.P. MOTORS, 230/250 v. 50 c. 1 ph. Cap./load, ball-bearings, cont. rated, for mounting horizontally or vertical, 1,340 r.p.m., 26/18/6 (des. 5/-).

STUART CENTRIFUGAL PUMPS from stock. The NEW No. 18 motor/pump unit with 230/250 v. Induction motor, head 5/15 ft., 720/400 g.p.h. The perfect unit for continuous duty and minimum maintenance, no radiointerference, quiet running, 21/15/- (des. 5/-). Most other models in stock—please enquire.

VARIABLE TRANSFORMERS. First-class units by Philips, saving expense and delay. Input 220 v. 50 c. Output definitely variable 0/200 v. Bench type—fully enclosed, brand new. Loading 520 VA, 28/15/- (des. 6/-), 1040 VA, 214/15/- (des. 7/6), 2080 V.A., 219/17/6 (des. 7/6). **BOOSTER TRANSFORMERS** (G.E.C.), 180/230 v. In 10 v. taps. Loading (continuous) 4 kVA. In steel housing 16in. high overall, 8 1/2 in. x 12 in., with handwheel selector, 211/10/-, carr. paid England.

TUBULAR HEATERS, 220/240 v. 240 watts. Length 3ft. Very efficient for the low consumption and ideal for laboratories, workshops, greenhouse, lofts, garage etc. Good tax free bargain, 29/6 (des. 3/6 each).

THERMOSTATS, ex-A.M., for frost protection, on at 32 deg. F., off at 49 deg. F. (adjustable), capacity 1.5 amp 230/240 v., 4/6 (des. 2/-). Also Capillary type, tube 3ft. long, with 8in. phial, range 55/90 deg. F., capacity 8 amps, for air or immersion, 17/6 (des. 1/6). Also Room type, and for greenhouse, etc. Range 40/80 deg. F., diff. 4 deg. F., capacity 10 amps A.C.; with manual on-off switch, 54/- (des. 1/-).

SYNCHRONOUS ELECTRIC CLOCK MOVEMENTS, 200/250 v. 50 c. Fitted spindles for hours, minutes and seconds hands, ready to use. In plastic dust cover 3 1/2 in. dia. x 2 1/2 in. deep, with hex., 27/6 (des. 9/-); set of 3 hands to suit 5/7 in. dial, 2/-.

G.E.C. MINIATURE CRYSTAL CALIBRATORS. Continuation of this remarkable offer. Operation 200/250 v. A.C. For frequency calibration in 100 Kc. steps from 100 Kc. to 40 Mc/s. Modulation at 400 c/s switched in if desired. With vacuum mounted crystal, basic 100 Kc. Accuracy 0.001 per cent. Size 8 1/2 in. x 6 1/2 in. x 2 1/2 in. Brand new 12 gauge instrument for 25/5/- (des. 2/-).

SMALL BLOWER ASSEMBLIES (for attaching to own motor). With 15 vane, impeller, housing with hex., 3 1/2 in. x 4 in., 3/6 each, 40/100, carr. paid.

PORTABLE D.C. VOLTMETERS (Howard Butler), scaled 0/150 volts D.C. on clear even scale, knife-edge pointer, first grade X2 m/coil, approx. 300 ohms per volt. In carrying case 6 1/2 in. x 9 1/2 in. x 3 1/2 in. with top terminals and handle. Fine unit as base for combined instrument. Brand new 45/- (des. 2/-).

LIGHTING DIMMERS, fully enclosed sliding type, to control stated lighting load (all-bright to blackout) (220/240 v.). 100 watts 36/-, 200 watts 42/-, 300 watts 47/6, 500 watts 55/- (des. any one 2/-).

SPOT FREQUENCY OSCILLATORS, operation 200/250v. A.C. Switched spot frequencies—465 Kc., 20 Mc., 6 Mc., 1,450 Kc., 800 Kc., 300 Kc., 175 Kc. Int. mod. 1,000 c/s. 4-position output attenuator. Size 16" x 10" x 13". A few at 27/10. (des. 5/-).

Rail despatch charges relate to England and Wales only.

M. R. SUPPLIES Ltd., 68 New Oxford Street, London, W.C.1

Telephone: MUSeum 2958

POLYTHENE H. F. EQUIPMENT

- (AMBYTHENE BRAND)
COIL FORMERS
CHOKES
STAND-OFFS
FEED-THROUGHS

Send for particulars and Samples

AMPLEX APPLIANCES (KENT) LTD.

19 DARTMOUTH ROAD HAYES, BROMLEY, KENT
(RAVensbourne 5531)

All export enquiries to

ANTEX LTD., 3, TOWER HILL, LONDON, E.C.3.



M/SIGNAL LAMP LIST No D.650

BULGIN RELIABLE RADIO & ELECTRONIC COMPONENTS ARE BACKED BY 25 YEARS, EXPERIENCE IN THE FIELD OF ELECTRONICS

BULGIN
Components

A. F. BULGIN & CO. LTD., BARKING, ESSEX.

RADIO BROADCAST TRANSMITTERS

FIXED AND MOBILE COMMUNICATIONS EQUIPMENT

MARINE AND AIRCRAFT COMMUNICATIONS EQUIPMENT

ELECTRONIC NAVIGATIONAL AIDS

ELECTRONIC METEOROLOGICAL APPARATUS

TELEPHONE LINE TRANSMISSION SYSTEMS AND SIGNALLING EQUIPMENT

ELECTRONIC MEASURING INSTRUMENTS

ULTRASONIC EQUIPMENT

ELECTROCHEMICAL APPARATUS

**Modern electronic equipments of advanced
design and high performance, built to
meticulous standards
of reliability . . .**

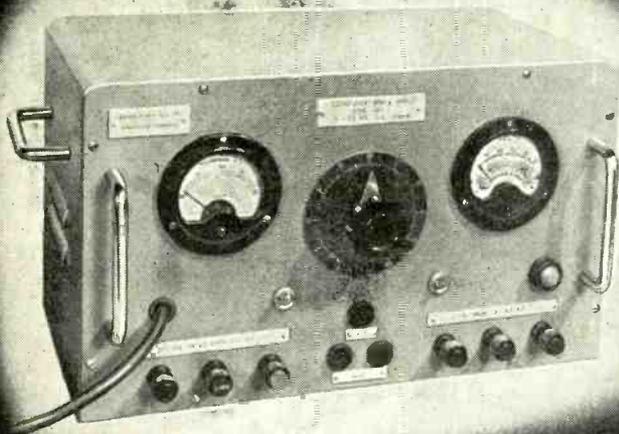


MULLARD LIMITED, EQUIPMENT DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2
(MT402)

Now ready for delivery — The New

HARVEY

Power Unit



A piece of high quality equipment, designed for general laboratory use, at a moderate price. Available for rack mounting if desired.

Write or Phone NOW for further details.

HARVEY ELECTRONICS LIMITED

Precision Mechanical and Electrical Engineers

273 FARNBOROUGH ROAD, FARNBOROUGH, HAMPSHIRE ★ Tel.: FARNBOROUGH 1120

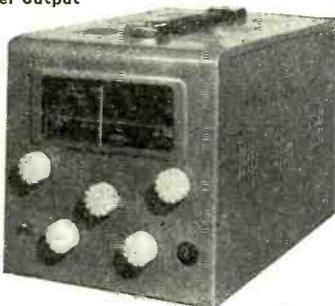
Get your share of EXTRA sales . . .

. . . with this NEW Grampian Receiver Amplifier. A lower-output version of the well-known Grampian Type 461, specially developed for applications where the higher output is not needed.

A superheterodyne Radio unit directly coupled to a L.F. amplifier with two output valves connected in parallel. Designed to meet the stringent requirements of Education Authorities, it is eminently suitable for small schools, being capable of feeding up to eight Loudspeakers at 1-watt each, or a larger number with a proportionately smaller output each.

Extend your sales to Clubs, Hotels, Works, etc.—they, too, will be interested in the Grampian Type 506.

Grampian Type 506.
8-watt A.C. Receiver Amplifier. 7 $\frac{3}{8}$ " wide x 13 $\frac{1}{2}$ " deep x 8 $\frac{1}{2}$ " high. Retail £29.10.0. P.T. £4.5.0.



GRAMPIAN REPRODUCERS LTD

9 HANWORTH TRADING ESTATE, FELTHAM MIDD.X

Phone : Feltham 2657

Grams : Reamp, Feltham

Details of this UNIT TELEVISION are worth sending for!

Four completely wired, tested and reliable units give :— (1) Vision and sound, (2) Line time base, (3) Frame time base, (4) Power supply. Mounting for 9" or 12" tube optional.

These quickly assembled and adaptable units ensure successful operation at minimum cost. (The parts are not Government surplus, but newly made by a leading electronics company.)

Write now for further information.

UNITEL ELECTRIC 18, Avenue Road, Belmont, Surrey



RELAYS AND KEY SWITCHES



**LARGEST EX-GOVT. STOCK
IN GT. BRITAIN**

Types 600-3000 Relays — Siemens High Speed
Also A.C. 400 volts 50 cycles

Uniselector Switches, Telephone Switch-boards, Telephone Components,
Plugs, Jacks, Handsets — Government Contractors.

JACK DAVIS (RELAYS) LTD. (Dept. W.)

36 PERCY STREET, LONDON, W.1

Phones : MUSEum 7960, LANGham 4821



**MODEL
1950**

**AUDIO FREQUENCY
PANORAMIC
WAVE ANALYSER**

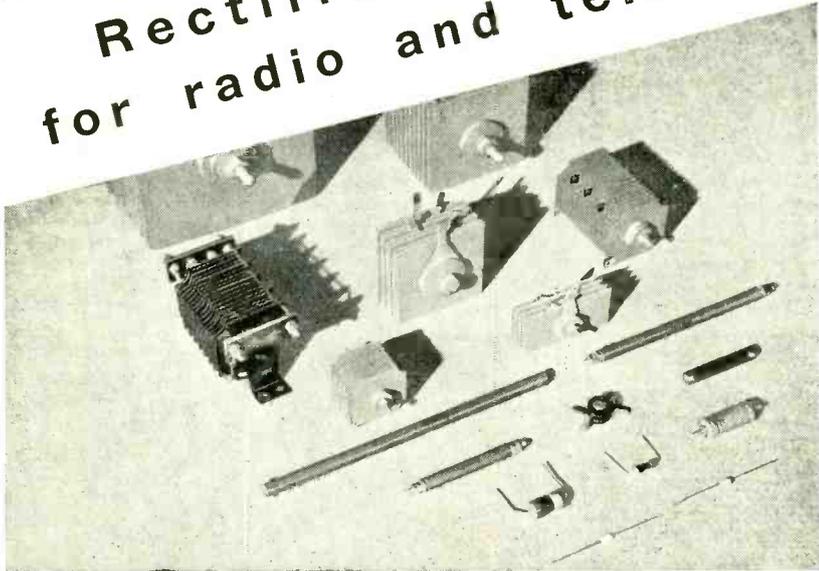
FOR NOISE, VIBRATION AND WAVE FORM INVESTIGATION

INDUSTRIAL ELECTRONICS

OFFICE: 99, GRAYS INN ROAD,
LONDON, W.C.1.
PHONE: HOLborn 9873.

MAGNET WORKS · DERBY ROAD · LONDON · S.W.14. PHONE: PRO 8211.

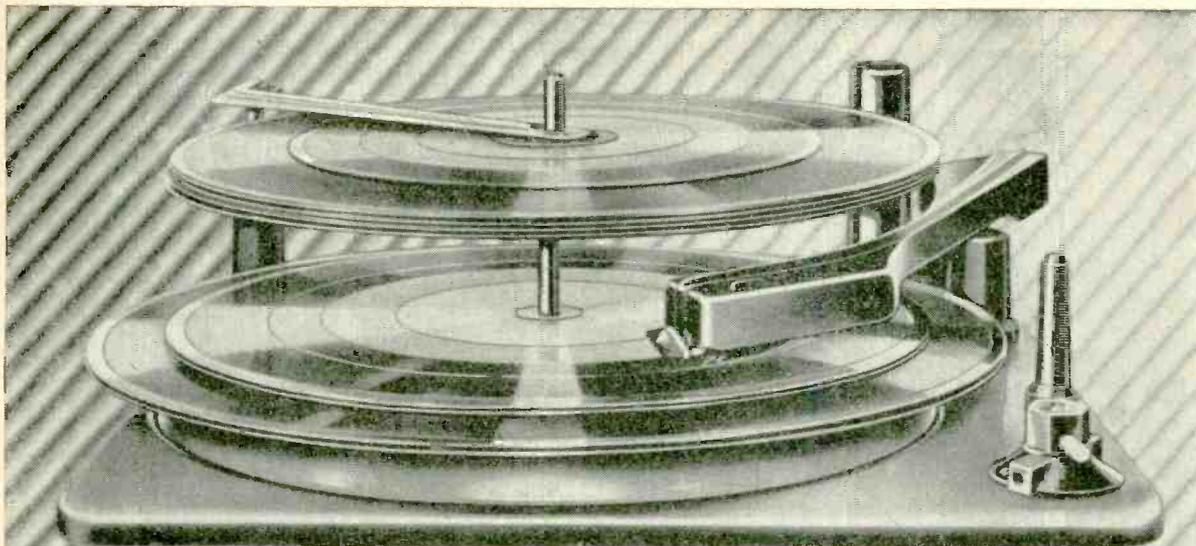
**Rectifiers
for radio and television**



In our early pioneering days of metal rectifiers, radio applications was one of the first fields to which we applied our rectifier units. It has continued to be one of the applications to receive particular attention from our laboratories, and our current ranges of miniature quadruple voltage E.H.T. units—double voltage H.T. rectifiers and miniature "Westectors" for H.F. circuits, are ample proof that the most efficient direct current supplies to radio and television receivers are still obtained from . . .

WESTINGHOUSE METAL RECTIFIERS

Send 6d. in stamps for a copy of "The All-Metal Way" to
 Dept. W.W.1.
WESTINGHOUSE BRAKE & SIGNAL CO., LTD., 82, York Way, Kings Cross, London, N.1.



A record achievement

Discriminating listeners and manufacturers alike have acclaimed the Monarch auto-changer. Its unusual new features, its ease and simplicity of operation and its high standard of reproduction and performance have proved it a masterpiece in design and technical excellence.

Note these outstanding features.

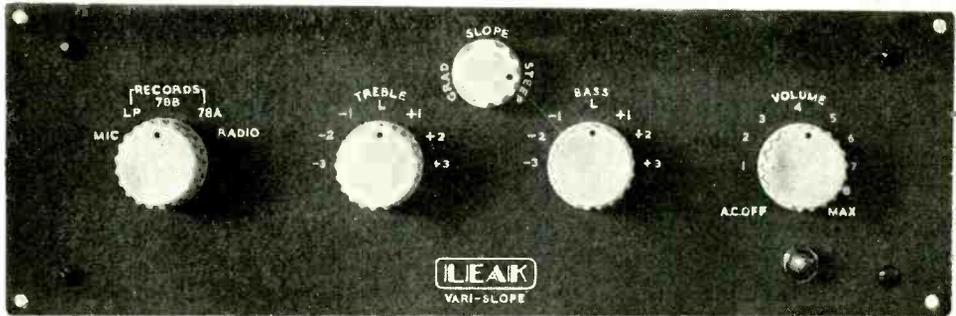
- ★ Automatically selects and plays 7", 10" and 12" records, intermixed, at 33 $\frac{1}{3}$, 45 or 78 r.p.m. Capacity, 10 records.
- ★ New record change mechanism virtually eliminates pause between records.
- ★ New reversible dual stylus crystal pick-up has extended frequency range to 10,000 c.p.s. Self compensated for the L.P. lower frequencies with the Turnover frequency at the correct point.
- ★ Pick-up automatically returned to rest position and motor switched off after last record
- ★ Remarkably compact design makes it an ideal unit for the Radiogram TV. combination console.
- ★ Simplicity of design guarantees long life and trouble-free operation.
- ★ Beautiful styling and finish that will harmonize with any cabinet design.
- ★ Operates on 100, 125-200/250 volts, 50 cycles A.C. Models also available for 60 cycles A.C.



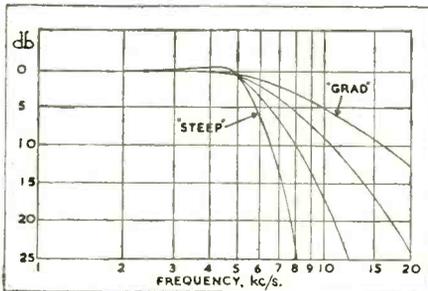
The REGENT a beautifully styled three speed gramophone. Complete with ingenious automatic stop and light-weight high-fidelity turnover-type crystal pick-up fitted with two permanent sapphire styli.

Birmingham Sound Reproducers Ltd., Old Mill, Staffs. England. Grams: 'Electronic Old Mill, Cradley Heath.'

A RADICALLY NEW PRE-AMPLIFIER FOR LEAK 'POINT-ONE' POWER AMPLIFIERS



The **"Vari-Slope"**



Frequency/amplitude curves for the "TREBLE—3" position (5 kc/s turnover). Curves of the same slopes are obtained on the other two positions turning over at 7 kc/s and 9 kc/s ("—2" and "—1" positions).

The filters consist essentially of twin-T resistor-capacitor networks inserted in the return circuit of a single-loop feedback amplifier. The more obvious advantages of this electronic feedback method over conventional choke filters include:—

- (a) Improved transient response characteristics (due to absence of chokes having self-capacitance) and the consequent reduction of "ringing".
- (b) Extremely low harmonic and inter-modulation distortion due to negative voltage feedback action.
- (c) No discontinuities in the rates of slope when the slope control is operated, and no change in signal level at frequencies below turnover. (Both these faults occur in variable-slope choke filters due to the slope control altering the terminating impedance and the insertion loss.)
- (d) There are no chokes to cause magnetic hum pick-up.
- (e) Smaller size, lighter weight, greater uniformity in production.

AUDIBLY BETTER REPRODUCTION
from unique
FEEDBACK CIRCUIT DEVELOPMENT

The new "Vari-Slope" pre-amplifier has a refinement which will doubtless set the pattern for future high-fidelity reproducing amplifiers. This advance consists of variable-slope "electronic" low-pass filters operating on negative voltage feedback principles.

No Inductors ("Chokes") are used, and all their disadvantages are completely eliminated. The turnover frequencies are 5kc/s, 7kc/s, and 9kc/s and the slopes of attenuation are continuously variable over the range 5db to 50db per octave.

PRICE £12-12-0 LIST
IN BRITAIN

TO BRITISH USERS OF THE
RC/PA/U PRE-AMPLIFIER

Your old model can be rebuilt as a standard "VARI-SLOPE" at a charge of £8.8.0.

Orders will be booked in rotation.

Please do not send your pre-amplifier to us until we advise you of a date.

OVERSEAS USERS should contact their national agent regarding the availability of this rebuilding service, which is dependent on freight and reimport duties being reasonably low.

Write for "Vari-Slope" Leaflet

H. J. LEAK & CO. LTD., BRUNEL ROAD, WESTWAY FACTORY ESTATE, ACTON, W.3

Phone: SHEpherds Bush 1173/4.

Telegrams: Sinusoidal, Ealux, London.

Cables: Sinusoidal, London.

Wireless World

RADIO, TELEVISION
AND ELECTRONICS

42nd YEAR OF PUBLICATION

Managing Editor: HUGH S. POCOCK, M.I.E.E.

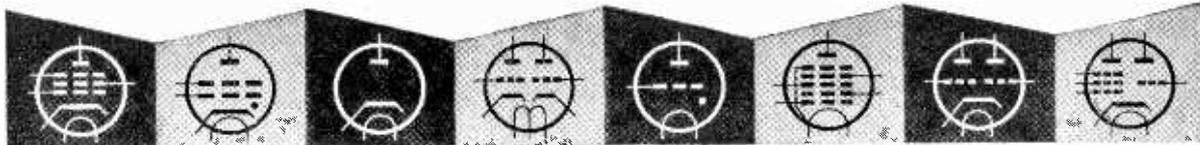
Editor: H. F. SMITH

JANUARY 1953

In This Issue

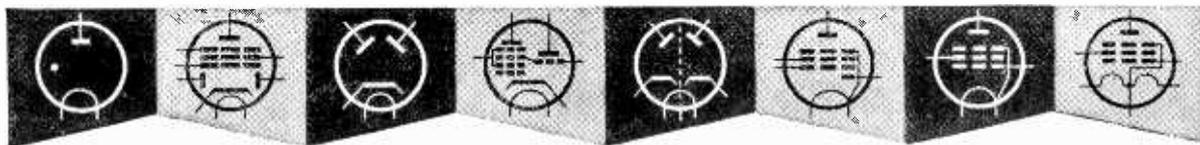
EDITORIAL COMMENT	1
THE ENVIRONMENT OF HIGH-QUALITY REPRODUCTION. By <i>F. H. Brittain</i>	2
SIXTH R.S.G.B. RADIO SHOW	6
PSYCHO-OPTICS IN TELEVISION. By <i>C. Burns</i>	9
ELECTRONIC SWITCH. By <i>K. R. Sturley</i>	11
RADIO TELEMETERING	14
LETTERS TO THE EDITOR.. .. .	15
FUTURE OF SOUND BROADCASTING	17
FUNCTIONAL CIRCUIT DIAGRAMS. By <i>C. E. Williams</i>	19
COIL WINDING DATA. By <i>Lorin Knight</i>	22
WORLD OF WIRELESS	23
FRICITION-DRIVEN LOUDSPEAKER	27
BOOKS RECEIVED	28
RESONANCE CURVES. By "Cathode Ray"	29
NETTING. By <i>H. B. Dent</i>	34
MICROPHONY IN SUPERHET OSCILLATORS—2. By <i>H. Stibbe</i>	35
"SURPLUS" RELAYS. By <i>T. Dawson</i>	39
INTERFERENCE SUPPRESSION	42
V.H.F. RADIO NOISE. By <i>E. G. Hamer</i>	43
MANUFACTURERS' PRODUCTS	44
RANDOM RADIATIONS. By "Diallist"	46
UNBIASED. By "Free Grid"	48

PUBLISHED MONTHLY (last Tuesday of preceding month) by ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1. Telephone: Waterloo 3333 (60 lines). Telegrams: "Ethaworld, Sedist, London." Annual Subscription: Home and Overseas, £1 7s. 0d. U.S.A. \$4.50. Canada \$4.00. BRANCH OFFICES: Birmingham: King Edward House, New Street, 2. Coventry: 8-10, Corporation Street. Glasgow: 26B, Renfield Street, C.2. Manchester: 260, Deansgate, 3.



VALVES, TUBES & CIRCUITS

1. PREVENTION OF INTERFERENCE BY TELEVISION RECEIVERS



A television receiver is capable of producing interference with broadcast reception over a limited area. This interference is due in the main to induced electric fields and magnetic fields set up in the neighbourhood of the television receiver; re-radiation of parasitic oscillations from the receiver proper is less serious and will not be considered here. The electric field is the more troublesome since it will affect broadcast receivers having ordinary aerials; the magnetic field will influence only that minority of receivers having frame aerials.

The most important sources of interfering electric fields are the line output transformer and associated high potential points; the deflector coils; and high impedance circuits near these components. Since, in general, magnetic fields emanate from the same sources, the measures recommended below will reduce both causes of interference.

- (1) The E.H.T. transformer, booster diode and line output valve should be totally screened by a can which makes good contact with the chassis. Two-hole fixing of the can is not entirely satisfactory and it is advisable to make multiple connections between can and chassis. The difference in radiation between a good and a bad connection here may amount to as much as 8 dB for magnetic fields.
- (2) Any width or linearity controls of the inductor type should be screened separately if they cannot be accommodated inside the line output screening can.

The design of the line output screening involves problems of ventilation to avoid overheating of the components enclosed by the screen. As a general guide to designers, the maximum safe bulb temperature for the PL81 line output pentode has been determined at 185° C. (design centre rating).

- (3) The deflector coils should be screened as far as possible by an aluminium can or by metal foil wound coaxially around the coil and earthed to chassis. Care must be taken to ensure that there is no likelihood of voltage breakdown between the foil and the coils. This form of screening will give good reduction of electric fields and will also reduce magnetic fields but not to the same degree. To reduce the magnetic field still further, the deflector coil screening can should have endplates with holes only just large enough for the tube neck to pass through. This gives a further reduction of approximately 6 dB.
- (4) Care should be taken in the layout of the receiver to keep circuits of high impedance well away from the worst sources of interference.
- (5) The graphite coating of the cathode ray tube should be efficiently connected to earth—preferably from two separate points on the coating.
- (6) Both conductors of the mains supply should be connected to the earth terminal via 0.05 μ F paper capacitors rated for 600 V_{r.m.s.} working.
- (7) The use of a perforated foil screen at the back of the set will reduce radiation in that direction.



Reprints of this advertisement together with additional data may be obtained free of charge from the address below.

MULLARD LTD., Technical Publications Department, Century House, Shaftesbury Avenue, W.C.2.

Wireless World

JANUARY 1953

VOL. LIX. No. 1

Recording of Broadcasts

MATTERS of copyright are governed in this country by the Act of 1911, which, of course, was framed long before the days of sound and vision broadcasting, and at a time when the art of sound recording was in its infancy. Among the tasks of a Committee appointed in 1951 was to advise the Government whether, in the light of these developments, any changes are desirable in the law of copyright. The Committee's Report,* recently issued, makes many recommendations touching upon technical changes brought about since 1911, but—rather surprisingly at first sight—it does not deal with the question of copyright as it affects the recording of broadcast transmissions in the home. As is well known, equipment for recording on tape is particularly well suited to this purpose and is in fact widely used.

It can, we believe, be argued that home recording of broadcasts for domestic use does not, legally speaking, constitute an infringement of copyright. One could go on to argue that the licensed listener is entitled to 24 hours of entertainment each day, and it is a matter of indifference to anybody whether he listens to "live" transmissions or to home-made records of such transmissions. Further, there is precedent for saying that the combination of radio receiver and recorder constitutes "apparatus for wireless telegraphy" within the terms of the broadcast receiving licence.

Possibly such thoughts as these influenced the Copyright Committee, although evidence had been submitted by the British Sound Recording Association, which had asked for clarification of the legal position of those making recordings "off the air." We understand the Committee considered it was unnecessary to make a pronouncement on this question. The 1911 Act does not, of course, specifically cover such recordings, and so it would be necessary for a court to decide if in fact they constitute infringement of copyright before a successful action could be brought. We understand that no such ruling has yet been made.

There, we suppose, the matter must rest, though, like the B.S.R.A., we should have preferred a clear-cut ruling in the new Copyright Act that will pre-

sumably be passed. It must be mildly disturbing to some home recordists to be in doubt as to their legal position, even though they may feel satisfied that nobody is suffering a loss from their action.

Compulsory Suppression

THE question of making interference suppression compulsory by law has been debated ever since receivers of high sensitivity were first produced; indeed, imminent legislation was confidently expected about 20 years ago! In this matter there have always been two schools of thought. First came those who insisted that clearly delimited levels of permissible interference and the methods of measuring them should be laid down with precision. Then there were those who wanted quick action, and urged that the observance under legal compulsion of "reasonable" anti-interference precautions would be enough.

The "reasonable precautions" school, with which *Wireless World* admits to having some sympathy, has fought a losing battle, and installation of interference suppression so far has been entirely on a voluntary basis. This has not proved conspicuously successful.

At last, a definite move has been made. The Postmaster-General, acting under the powers conferred on him by the Wireless Telegraphy Act of 1949, has issued regulations making it compulsory to limit the radiation of interference from internal combustion engines. As described elsewhere in this issue, the regulations apply only to new engines and deal in great detail with the characteristics of the apparatus specified for measuring the interference.

To us, these measures seem timid, half-hearted and rather ineffective. If we accept the figure in a recent Brit. I.R.E. paper of 4½ million unsuppressed vehicles at present in use it will be many years before the present regulations have any observable effect in reducing the amount of television interference. Then there is the question of frequency range: the new regulations apply only to the present 40-70 Mc/s television band. Has the P.M.G. forgotten the alternative television service on higher frequencies, promised to us in the near future?

* Cmd. 8662; H.M.S.O., 4s 6d.

THE Environment of High-Quality

Conditions Necessary for the Proper Appreciation of Loudspeaker Performance

By F. H. BRITTAIN*

In two previous articles (November and December, 1952) the design and performance of a high-quality loudspeaker were described. The advantages of a reproducer of this type can be appreciated only if the listening environment is itself free from defects which may introduce distortion of the sound. This environment may be regarded as including not only the auditorium, the associated amplifiers and auxiliary electrical circuits, but also the loudness level at which the sound is reproduced relative to the original.

SUBJECTIVE assessment of the performance of a high-quality loudspeaker can be widely influenced by the characteristics of the particular room in which it is operating. This is hardly surprising when it is realized that a hard plastered wall can reflect sound as well as a mirror reflects light. Further complications arise from the fact that sound waves are obstructed and modified by obstacles of the same size as themselves, but they flow around obstacles which are appreciably smaller than themselves.

The wavelength of audible sound varies from less than an inch to greater than 30 feet. Normal domestic objects cover much of this range in size, and will therefore affect some wavelengths and not necessarily others. The most serious considerations are the dimensions, construction, and furnishing of the room itself, since they limit the lowest frequencies which can be reproduced in it. Few living-rooms are 30 feet long, yet even they only permit one single wave of the lowest frequency to be generated in them; but it is possible to generate a half wavelength in any room quite easily; in fact, much too easily.

The reproduction of low frequencies in normal living-rooms becomes a succession of enhanced and inhibited frequencies, the one alternating with the other as the length of the sound wave becomes an exact fit or misfit in that particular room. It is not practicable to do very much about this unfortunate feature of living-rooms, but it is desirable to avoid the worst case where the length, breadth, and height are all equal, or exact multiples of each other. It is quite possible to calculate the "eigentones," as the modes of resonance of a room are called, and it will help if the resonance of the loudspeaker in its cabinet does not coincide with one of them. Moving the loudspeaker to different positions will permit it to couple to a greater or less degree to the sound pattern in the room. Greatest coupling usually occurs near a corner of the room. Wherever possible, it is worth while moving the loudspeaker about to find that position which minimizes the effects of the most serious "eigentones."

So far rooms have been considered with respect to the low frequency end of the spectrum, but they have a marked effect on the quality of reproduction both

at the middle and the higher frequencies. In the middle frequencies a complicated "eigentone" pattern still predominates and causes most of the trouble. It is frequently responsible for a high-pitched "boom." The wavelengths involved are of the order of 4 feet, and to have much effect, obstacles of this size are necessary to modify it. Large furniture, or other irregularities in the room will all help to even out the effects of these "eigentones." At the high-frequency end, individual room resonances largely disappear and a general random reflection from all the walls takes their place. Since the wavelength is short, it is easy to modify the high-frequency characteristics of a room by the addition of such things as carpets and curtains.

In addition to the irregularities which the "eigentones" of a room impose on the quality of the sound from a loudspeaker, the fact that the walls of the room are efficient reflectors means that energy is built up in a room to a higher level than it would be if the loudspeaker was used in the open air. Practically all living-rooms have less absorption at the lower frequencies than at the higher frequencies, with the two-fold result that the sound from the loudspeaker will be louder when it is heard in a living-room than when it is heard out of doors, and the lower frequencies will be particularly enhanced. Thus it would seem likely that the required frequency response for a domestic loudspeaker normally operated in a living-room should not be the smooth flat curve which will be required out of doors in free space. To check this point, a peculiar form of response measurement was employed. This consisted of adjusting the input to a loudspeaker operating at a given frequency so that its output was judged to be as loud as a standard reference tone. The amount by which the input had to be raised or lowered to accomplish this was expressed in decibels and plotted as a curve (Fig. 1). This curve showed the loudness output of the loudspeaker against frequency, without the use having been made of any microphone or measuring amplifier; instead, the actual ears of the listener had been used. The curve was determined first in a particularly dead measurement room, and, second, in a rather "live" small living-

* Research Laboratories of The General Electric Company.

Reproduction

room. It was very surprising to find that the two curves were almost identical. The explanation is that the brain and mind of the listener were also involved and that his concentration in carrying out the test was so great that at all frequencies he was able to differentiate between the direct sound from the loudspeaker and the random sound reflected back by the walls of the room.

In normal listening, less concentration is given, and less differentiation will consequently be made between direct and reflected sounds, and some increase in loudness in the low frequency end of the spectrum may be expected. Extended listening tests, carried out over the last 20 years, have shown that the subjective effect of a normal living room on the frequency response of a cone loudspeaker is to increase the bass output by about 5 db and to reduce the top output by about 5 db above 5,000 c/s. The high-frequency loss comes about partly because the listener seldom sits directly on the high-frequency beam, and partly by the greater absorption of the high frequencies by the furnishings, etc.

The Amplifier

Power Required.—When using the G.E.C. metal cone loudspeaker, it has been found that for a small living-room an undistorted power output of 12 watts is just sufficient, but if music is to be reproduced sufficiently loudly to simulate the original loudness, which would have been heard by a listener at a concert, the power output should be increased to not less than 20 watts. For large rooms, halls, etc., where music should be reproduced at its normal volume level, something between 60 and 150 watts will be required. The use of these powers will permit complete realism in the reproduction of even quite a large orchestra at its full volume level. It must be borne in mind that the amplifier must remain completely undistorted, even on very high instantaneous peaks, and it is to provide for these high peaks of short duration that these unusually high powers are necessary. The characteristics of the G.E.C. loudspeaker permit it to utilize a higher "peak-to-mean" ratio than other loudspeakers. The peak power rating is 10 watts and the continuous rating 5 watts per unit.

Quality.—It has been found, by very careful listening, that an amplifier having a distortion content of less than 0.1 per cent total harmonic is noticeably better than one which has a total harmonic content of 0.4 per cent. It appears that if full advantage is to be taken of the metal cone loudspeaker, amplifier distortion must be kept to an exceptionally low level. In fact, so small a degree of amplifier distortion is made noticeable that this loudspeaker becomes a valu-

able tool in the hands of the expert for detecting and eradicating it.

Impedance.—The output impedance of the amplifier should be as low as possible, less than $\frac{1}{2}$ of the loudspeaker impedance, but if it is not very low an improvement can be made by tightly coupling the back of the loudspeaker to a resistive acoustic load. It is most important that this acoustic load should be maintained resistive at all frequencies by the control of cabinet resonances and reflections.

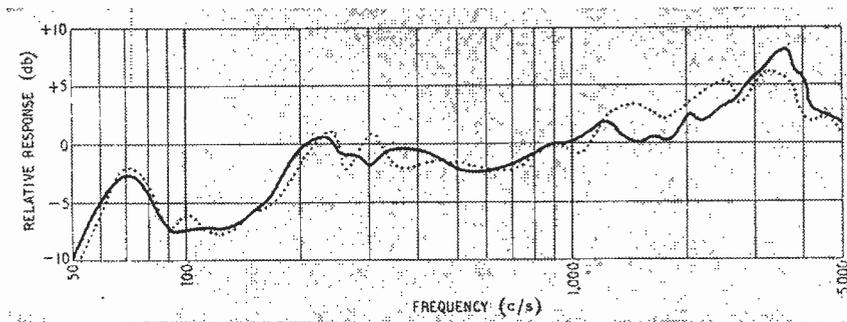
Programme Sources

In theory, any high-quality programme is suitable for reproduction by the metal cone loudspeaker, but in practice the term "high quality" is often purely relative, since the aim of both the broadcasting authority and the recording company must be to give enjoyment to the average listener, who will not always put fidelity of reproduction before every other requirement. There is, for instance, the question of what loudness should be used for announcements at concerts. If the voice is quiet, by comparison with the orchestra, distant listeners, particularly if they have inferior sets, may not be able to hear it. If the voice is loud, it will sound unnatural to nearby listeners, with high-quality sets. Disc recording also has its compromises, and fidelity of reproduction is only one of many desirable features. In general, if the necessary programme and surroundings are available for its operation, a live pick-up by a microphone of the very highest quality will give the best results. This is, however, seldom available to the ordinary listener who is interested in high-quality reproduction.

Radio.—It has been found that the B.B.C. transmissions on the 3-metre band from Wrotham are capable of giving a quality which is indistinguishable from that given by a line direct to the studio, but reception of programmes on the medium-wave band calls for a number of special precautions. First of all, the frequency response of the whole system must be wide, but this is apt to lead to interference from other stations, particularly the 9kc/s adjacent channel whistle, and some compromise must be found. This can only be made at the listener's own home and, even then, the compromise reached by day will seldom hold by night. It is not possible to compensate for a loss of high frequencies in the radio unit by augmenting them elsewhere in the circuit, because in so doing any distortion having a high-frequency component will be accentuated, and the overall quality spoiled.

The linear operation of a diode is not bettered by

Fig. 1. Subjective "equal loudness" response curves of a loudspeaker taken (solid line) in a lagged "dead" room, and (dotted line) in a "live" small living room.



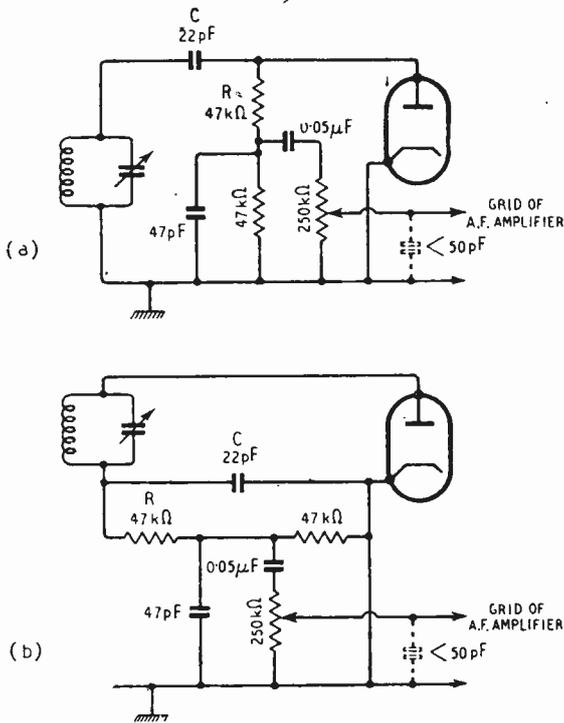


Fig. 2. Typical detector circuits, (a) for t.r.f. receivers (b) super-heterodynes, capable of handling 90-per cent modulation at all audio frequencies. To handle 95-per cent modulation the impedance of R and C must be trebled.

any other detector valve, but great care must be taken to avoid operating it at too high a modulation level. It is necessary to make the a.c. load exceed 90 per cent of the d.c. load, not only at low audio frequencies, but also at the higher audio frequencies where both soprano and brass approach the 100 per cent modulation level more often than is realized. This necessitates taking great care of the size and position in the circuit of the r.f. bypass condensers which are always necessary, as well as with the resistance network. Typical circuit values are given in Fig. 2.

When all these matters have been attended to in the detector circuit, it is still very necessary to see that there is no possibility of overmodulation occurring due to the receiver having a greater sensitivity to the sideband than to the carrier. This can easily occur if the receiver is operated off tune, or if the radio- or intermediate-frequency response is "double-humped." In both cases the effect is to reduce the carrier relative to the sidebands.

Records.—Because of the unusually smooth frequency and transient response of the metal cone loudspeaker, it does not over-emphasize distortion or noise on an imperfect programme. It is very suitable for the reproduction of records, since background hiss is devoid of any frequency coloration, and less noticeable than usual since there are no high frequency resonances to be shock-excited by it. The lack of intermodulation in this loudspeaker enables it to show the advances made by the latest recording techniques, but this feature also shows up any high frequency distortion due to worn stampers, tracing distortion of the playback stylus, and bad fitting of the stylus in the record groove.

The best performance from records is obtained with

a pickup having its bass and treble resonances outside the working range of the loudspeaker, a response which is corrected to be flat for the make of record being played, and an optional high-frequency cut to remove distortion caused by record wear, etc. This high-frequency cut should be as sharp as practicable without causing appreciable "ringing."

Magnetic Tape.—Records made on magnetic tape are capable of giving an exceptionally high standard of quality, almost indistinguishable from a live input. In order to achieve this standard, however, it is necessary to take the greatest care with every part of the tape machine and its associated amplifiers; there are, in fact, very few commercial machines available which will meet this required standard. The principal cause of the distortion comes from the use of a ferromagnetic substance as a recording medium, and it is essential to keep the signal recorded on the iron as small as possible. This calls for a very low level of noise from the erased tape, together with a low noise level from the reproducing head and amplifier.

During recording it is necessary to restrict the electrical input to the recording head in such a way that the iron oxide powder on the tape is subjected to a uniform magnetization which is constant at all frequencies. The result of this requirement is that it is necessary to amplify the lower frequencies to a greater extent than the higher frequencies in the reproducing amplifier; this calls for a very low level of both hum and motor field pick-up by the reproducing head. It is desirable to apply the lightest possible pressure between the tape and the recording or reproducing heads, otherwise there is a danger of the signal being "pressure modulated." If insufficient pressure is used with a tape having "curl" or a ragged edge, it will not bed down into contact with the head and reproduction will suffer. If the curl or ragged edge occurs in short sections it will alter the volume of sound reproduced from the tape; this alteration in volume will, if it is of short duration, be taken for "wow" or a change of pitch, due to the peculiar action of the ear.

It is surprising to what an extent the correct level of reproduction is ignored. It is at least as important as a correct frequency response, and much more difficult to measure and maintain. If reality is sought, and the metal cone loudspeaker is sufficiently good to deceive some of the best critics in the land the reproduction level must be related to the original sound to within one or two decibels. That is, if the original sound has a certain loudness when heard from a distance of, say, 10 feet, then the reproduced sound must have just the same loudness when heard from the same distance of 10 feet. If, when this has been done, the sound from the loudspeaker is too loud or too soft, it is necessary to reduce or increase the loudness of the original sound. The level must not be altered by means of the volume control which will simply increase or decrease all frequencies at once. Consider what happens when an organist wishes to increase the volume of sound in his church; he may open the swell box to its fullest extent, and after that he has to increase volume by the addition of extra stops and octave couplers. An operation which no ordinary volume control is competent to perform.

Voice Effort.—As a second example, consider a man speaking. Many people will insist that they know just exactly what male speech sounds like, but this can be true only if they have some clue as to how loudly the man is speaking. This "voice effort" has a profound

effect on the frequency response of the human voice, as can be seen from Fig. 3, which compares normal conversation level with soft and declamatory speech. These curves, which will hold only for one particular voice, were obtained by making recordings on magnetic tape of the three levels of speech. The sentence used was: "Friends, Romans, countrymen, lend me your ears; I come to bury Cæsar, not to praise him." This record was passed through an analyser which sorted out the component frequencies in the three cases. In order to present the information, a conversational level was regarded as normal and the other two volume levels drawn as differences from it. The curves show the essential quality of "crooning," and why the Mayor booms if he uses a microphone and a normal voice in place of declamatory speech. A change in voice effort may well alter the frequency distribution of a voice by as much as 20 db. Similar changes occur when instruments are played louder or softer.

Hearing.—It is now necessary to consider the psychological effect of the sound level on the mind of the listener. It does not produce an actual change in the frequency response, as did the voice effort, but the effects are just as real to the mind of the listener. This comes about because of a peculiar action of the ear and brain, which attributes less loudness to weak sounds of low frequency than to weak sounds of high frequency. Conversely, an increase in the sound level of a quiet programme will produce a greater increase in the loudness of the lower frequencies than of the middle and upper ones.

When speech is reproduced, there is a general tendency to increase the volume to a level somewhat louder than that of the original; this increase can be as much as 15 db under domestic listening conditions. Fig. 4 shows the subjective change in "frequency response" due to this cause.

When orchestral music is reproduced in the home its loudness is seldom as great as that of the original, and some subjective reduction in the loudness of the lowest frequencies is likely. This may be offset by the high acoustic output at the lower eigentone frequencies of the room. If the reproducer is used out of doors, the loss of bass will be noticed immediately.

Tone Controls.—There has been much argument as to whether the use of tone controls is correct in connection with a very high-quality system. The answer is that for the greatest possible reality, where all the features are under the control of the listener, no tone control will make any improvement to an already perfect system. When some of the features are not under the control of the listener, as in broadcasting, where it is not possible to ask the announcer to talk louder or softer, tone controls will give very material improvement over what is known to be faulty reproduction. Under these conditions, it is possible to improve realism by correcting the frequency response on the lines given in the previous sections. The actual frequency of events is as follows. It will be assumed that the listener is hearing a man who is speaking in a normal conversational voice into a perfect microphone, but the reproduction in the home is some 15 db louder than his speech. Since the speech is being reproduced 15 db louder than normal, the listener will subconsciously expect that

his voice effort would be in keeping with the high volume level, whereas only the reproduction level has changed, not the voice; consequently some improvement in realism can be made by correcting the frequency response for the voice effort which should be there but is not, and the increased loudness which should not be there but is. Fig. 5 shows the frequency correction which should be applied to the perfect reproducer in order to produce the greatest realism.

It will not be as good as if the correct volume level had been used, but it will sound less unnatural than the case where no frequency compensation was used. The reason for the incomplete success of the frequency correction only, lies in the fact that there is a change in the ratio of the consonants, fricatives, and vowels, which cannot be remedied by the tone control.

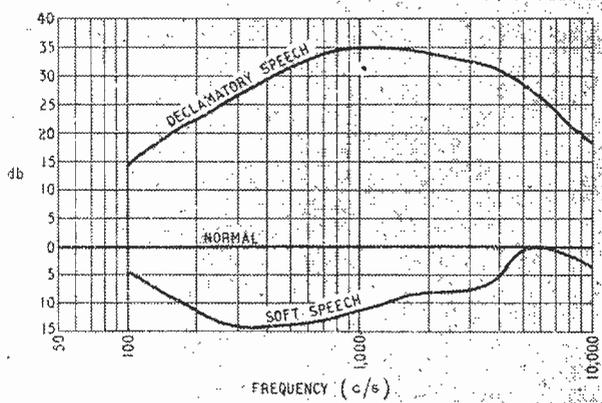


Fig. 3. Relative sound spectra of a male voice speaking at three different loudness levels.

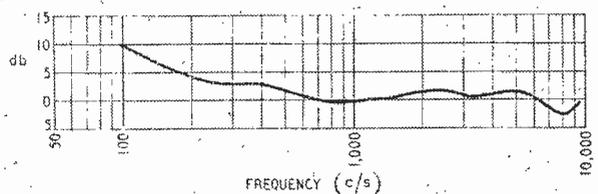


Fig. 4. Subjective change in "frequency response" due to an increase of level from 50 to 70 db above the threshold of hearing.

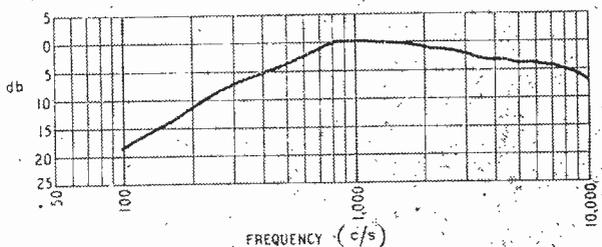


Fig. 5. Overall frequency correction for a 15 db increase in loudness and voice effort.



Sixth R.S.G.B. Radio Show

*Display of Commercially
Made and Home Constructed
Amateur Equipment*

AS exhibitions go, the radio amateurs show, which has now been held for six consecutive years by the Radio Society of Great Britain, is a comparatively small one, but what it may lack in size is amply compensated for by the enthusiasm shown by all and sundry.

So far as transmitting apparatus is concerned the "table-top" form of assembly is rapidly gaining in popularity, both for the commercially made sets and for the home constructed models. The once much-favoured and imposing, but cumbersome, rack assemblies are now almost a thing of the past, at least so far as all new products are concerned. In the present style all the equipment, such as radio transmitter, modulator and power supplies is housed in an orthodox type of metal cabinet with a front panel carrying all the controls and having a hinged lid for access to the valves, coils and suchlike. It is intended to be used on a table like an ordinary communications receiver, hence the name.

The extensive use of small, though not always miniature, components and valves has made the table-top idea a reality and its ready acceptance by amateurs has doubtlessly been fostered by the lack of space available in the average home for the "shack" or amateur radio den.

An example of this modern trend is the Panda Type PR120V 150-watt transmitter. It has an accurately calibrated and voltage stabilized VFO with buffer

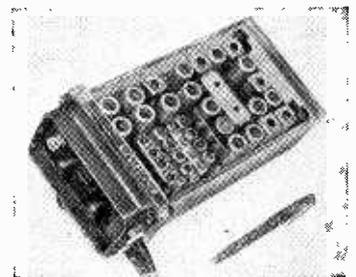
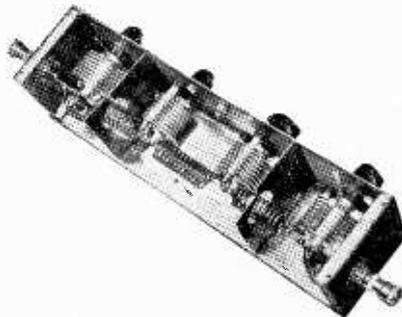
amplifiers and frequency multipliers for switch selection of any amateur band from 3.5 to 28 Mc/s. Provision is made for "break-in" operation on telegraphy and for netting and it is TVI-proof. This expression, now extensively used in amateur circles, means that all harmonics in the television band have been suppressed. The table-top cabinet measures 20 in x 17½ in x 13 in, weighs 150 lb and costs £150.

Harmonic Filters

The need to TVI-proof amateur transmitting equipment is now almost as pressing as the suppression of motor car engines and one other item made by Panda Radio consequently looms large in importance. This is a 4-stage TVI-filter. It is designed for inserting in 50-ohm coaxial aerial transmission lines and gives a sharp cut off below 30 Mc/s. At 30 Mc/s the attenuation is ½ db but at 40 Mc/s it is 85 db. It costs £3 17s 6d.

Examples of the modern trend in transmitter design and construction were quite plentiful among the amateur exhibits and the workmanship and attractive panel layouts in some cases left nothing to be desired. Such a one was the 150-watt transmitter with switching for all-band operation and complete TVI proofing, shown by John Salvage, amateur station G3HRO. Adopting the table-top technique, it was entirely self-contained.

Left: Taylor Model 66A signal generator covering 100 kc/s to 160 Mc/s. Centre: Panda 4-stage transmitter TVI-filter for 50-ohm coaxial feeders. Right: Army Type 88 pack set, a miniaturized transmitter-receiver for use by infantry. It provides 4 crystal controlled speech channels in the 40-Mc/s band.



Another example was shown by the G.E.C. with the purpose of emphasizing how well Osram valves cater for all amateur requirements. In addition the G.E.C. showed the BRT400 communications receiver, probably one of the finest made in the country, a range of high-grade microphones and some power amplifiers.

No difficulty should be experienced by the home constructor in carrying out modernization of existing equipment, or building new sets in up-to-date style, as a very wide range of crackle-finished and coloured metal cabinets and chassis are obtainable from Philpotts Metalworks.

Some very interesting and specialized type of equipment was shown this year by amateurs, one for example being a helical aerial for use on 70 cm. Consisting of six spirals of stout copper tube, it is 48 in long overall and has a 20-in diameter wire mesh reflector. According to the technical data supplied the forward gain is 14 db over a half-wave dipole and the bandwidth exceeds 100 Mc/s.

The efficiency, characteristics and general behaviour of different scale-model aerials was demonstrated by the Royal Corps of Signals, using a 10-cm radio transmitter and cathode-ray display of the polar diagrams.

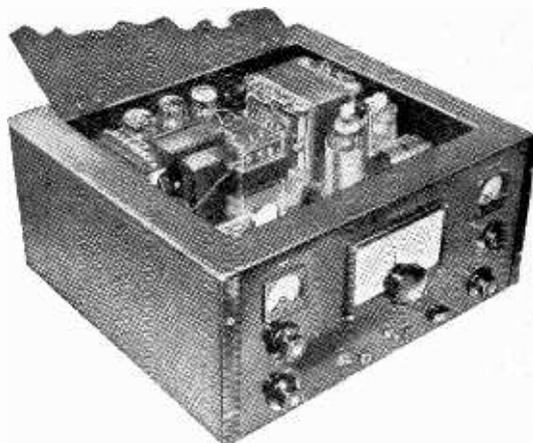
Many interesting items were shown also on the Army's stand, one being the latest Type 88 transmitter-receiver for infantryman's use. Measuring 10 in \times 5 in \times 3 $\frac{1}{4}$ in, it weighs 11 lb, including the battery case. It operates on four crystal-controlled channels in the region of 40 Mc/s and has a useful range of about two miles under normal conditions. It is an outstanding example of miniaturization. One of the earliest army wireless sets fitted with "R" valves was included for its historical interest.

The Royal Air Force had some interestingly new equipments in the miniature class also, one was the latest instrument landing equipment for aircraft, another a miniaturized radio altimeter working on a wavelength of a few centimetres. There was a unique historical collection of valves dating back to before 1914.

Amateur Television

Elaborate plans had been made to stage demonstrations of amateur television in the hall over a 70-cm radio channel, but an unfortunate accident on the road robbed the organizers of much essential equipment which could not be replaced in the short time available. Enough, however, was seen to prove that the "show" would have been a most impressive one. The pictures were this year received on a domestic

Miniature grid-dip oscillator fitted with plug-in coils shown by K. Young (G3IKY). Fitted with acorn valve it has external power supply and indicating meter.

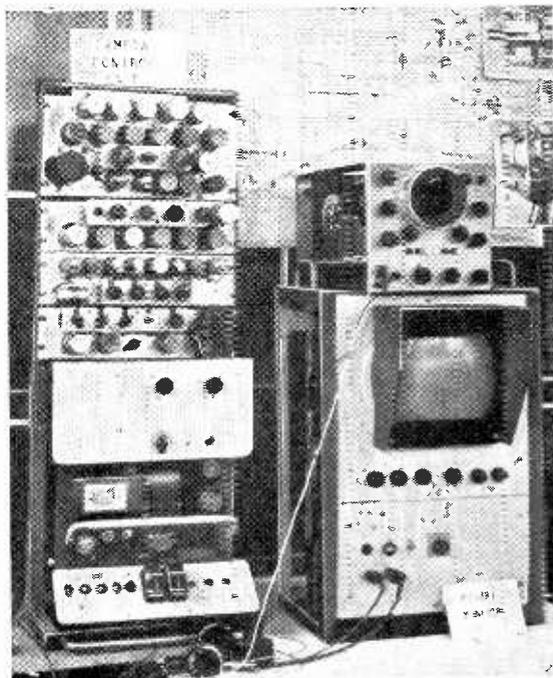


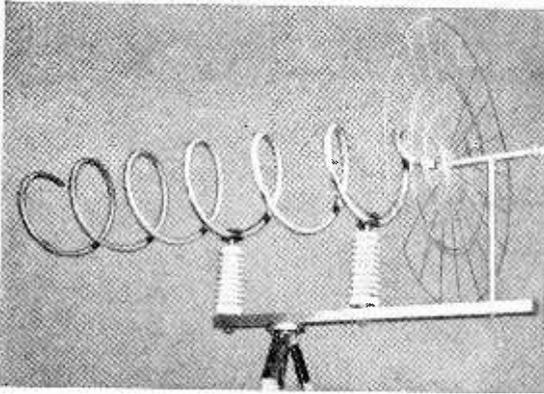
Amateur built "table-top" type transmitter covering all bands and TVI-proofed, shown by John Salvage (G3HRO).



Quartz crystal activity test set shown by Salford Electrical Instruments.

Camera control equipment and picture monitor used for demonstrating amateur television in the exhibition.





Helical aerial for use on 70-cm shown by K. W. Cranfield of the Radio Society of Ha. row.



The new Emicorder magnetic tape recorder made by E.M.I.

television receiver using a small 70-cm converter and employing 25 frames, 200 lines and sequential scanning. The receiver was loaned by English Electric, which firm also had a stand in the exhibition.

These demonstrations were organized by the British Amateur Television Club, and an interesting side-light on their latest activities was thrown by a display of apparatus used for experiments in amateur colour television transmission and reception. It seems as though the amateurs may have a colour system working long before the B.B.C.!

Many facets of amateur activities, apart from radio transmission and reception, were revealed at the show. Interest in high quality reproduction is reflected in the display of fine loudspeakers made by Goodmans. Demonstrations were given of their latest Type 102 8-in speaker mounted in a corner reflex cabinet. Incidentally, constructional details of the cabinet were available at this stand.

The comprehensive display by Cosmocord of the latest range of Acos gramophone pick-ups gave further proof of the interest in good reproduction and ways to achieve it. One of their newest products is the GP29 turnover pick-up, so called because the cartridge-type

head is swivelled and can be turned over to one position for standard records and to the other for long-playing records. Two linked sapphire needles are used. A newer model will have entirely separate sapphires.

There was a new pick-up on the E.M.I. stand which has a single pivot suspension for the arm and an oil dashpot for damping out any violent movement. Interest in this item was shared by a magnetic tape recorder known as the Emicorder. It has a frequency range of 50 to 10,000 c/s, uses plastic tape running at $7\frac{1}{2}$ in/sec, and gives 30 min playing time. Recording, playback and rewind facilities are provided, also a built-in loudspeaker. It costs about £95.

E.M.I. Institutes shared the stand, and here it was possible to obtain details of the preparatory courses available for those wishing to take the radio amateurs' examination for a transmitting licence.

Test Gear

The importance of being able to measure radio frequencies, capacitance, inductance and the resonant frequency of a tuned circuit is fully appreciated by most radio amateurs as the comprehensive display of home-made test and measuring gear amply demonstrated.

Commercially made equipment for this purpose was also quite plentiful. E.M.I. showed a wide-range signal generator, a grid-dip oscillator, bridges and such-like, all designed especially for the amateur, while both AVO and Taylor had many examples of test equipment applicable to amateur needs. The Taylor Model 66A Signal Generator is just one example; it has a range of 100 kc/s to 160 Mc/s. From 80 to 160 Mc/s second harmonics are used.

Nothing compares with an accurately cut, ground and etched quartz crystal as a standard of radio frequency and some fine examples of different types of G.E.C. crystals in plug-in holders and in valve-type glass envelopes were shown by Salford. An interesting exhibit on this stand was a test set devised and used for measuring the activity of a quartz crystal. It gives a direct measurement of the equivalent parallel resistance of any crystal over the range 1 to 20 Mc/s.

List of Exhibitors

- Automatic Coil Winder & Elect. Equip. Co. Ltd., Winder House, Douglas Street, London, S.W.1.
- Cosmocord Ltd., Enfield, Middlesex.
- Easibind Ltd., 84, Newman Street, London, W.1.
- E.M.I. Sales & Service Ltd., Hayes, Middlesex.
- English Electric Co. Ltd., Marconi House, Strand, London, W.C.2.
- General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.
- Goodmans Industries Ltd., Axiom Works, Wembley, Middlesex.
- Panda Radio Co., 58, School Lane, Rochdale, Lancs.
- E. J. Philpotts Metalworks Ltd., Chapman Street, Loughborough.
- Practical Wireless, Tower House, Southampton Street, London, W.C.2.
- Salford Electrical Instruments Ltd., Silk Street, Salford 3.
- Short Wave Magazine, 53, Victoria Street, London, S.W.1.
- Siemens Electric Lamps & Supplies Ltd., Upper Thames Street, London, E.C.4.
- Taylor Electrical Instruments Ltd., Montrose Avenue, Slough, Bucks.
- Westinghouse Brake & Signal Co., Ltd., York Way, London, N.1.
- Wireless World and Wireless Engineer, Dorset House, Stamford Street, London, S.E.1.

Non-commercial

- British Amateur Television Club.
- G.P.O. Engineering Department.
- Radio Society of Great Britain.
- Royal Air Force.
- Royal Corps of Signals.

Psycho-Optics in Television

Why Larger Screens Seem to Give Better Pictures

By C. BURNS, B.Sc.

MANY people, like myself, must have compared different television screen sizes and felt that the very large sizes seemed "better." They have probably not quite known why, for the strength of this impression would have seemed at variance with the known fact that the actual definition achieved was identical. There is, in fact, a known basis for this impression, but it is very little understood and appreciated for it involves those aspects of vision known as "subjective," where the mind influences and modifies the picture which, from considerations of geometrical optics alone, the eye might be expected to present.

The outstanding fact governing these impressions is that, to a person with normal vision, the apparent size of objects is not governed solely by their distance away. The conscious mind does not receive merely a camera picture, where the apparent diameter of an object is proportional to its true diameter and inversely proportional to its distance, following the laws of perspective. Such a picture is received on the retina of each eye; but the use of binocular vision, by measuring the angle by which the line of sight of the two eyes converge on each object, also supplies information on the distance of each object. This effect, which gives "stereoscopic" or depth-perceiving vision, is well known. But this information is not merely kept separate to be used independently by the brain. It is "fed in," as one might say, along with the independent impressions from the two eyes, and influences them in such a way that the picture "seen" by the conscious mind is a mean between the perspective rendering of the scene and its interpretation in terms of absolute size of each object obtained by stereoscopic vision.

The chain of processes involved in vision is rather as follows (see Fig. 1). Here is an object (a). It subtends an angle θ at my eye, i.e., it forms an image of a certain diameter on my retina. My eyes converge heavily when viewing it. Therefore it is near. Therefore it is really fairly small. Now here is another object (b). It forms an image the same size (subtending the same angle) on my retina. But my eyes converge much less when looking at it. It is much farther away than the first object. Therefore it is much bigger—and, behold, it actually "looks" bigger, for all the steps going before have taken place unconsciously in the automatic processes of vision. Shutting one eye removes this "correction" for absolute size of an object, as can be vividly shown by certain simple tricks. One of the best known is the effect known as the "keystoning" of a lantern screen.

If a lantern is made to project a square slide on to a screen which is sloped away from it instead of

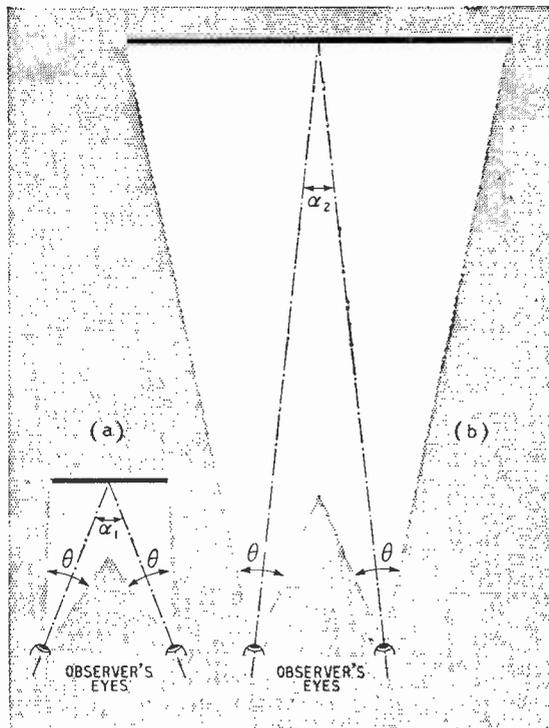


Fig. 1. The large and distant object in (b) subtends the same angle θ at the eye as the small and near object in (a), but the eyes converge less when looking at the (b) object (α_1 is larger than α_2).

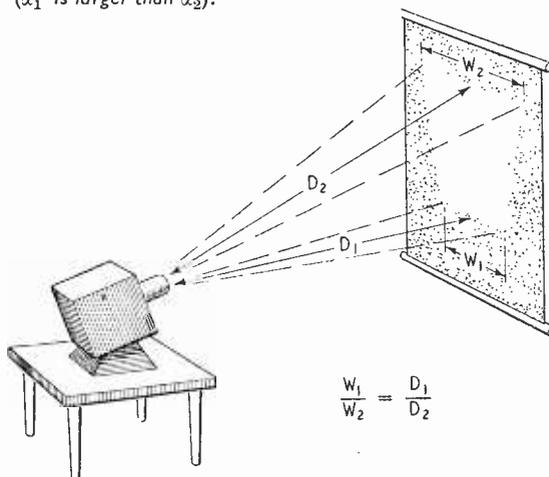


Fig. 2. "Keystoning" effect when a square is projected on to a screen which is not perpendicular to the axis of the lantern's optical system.

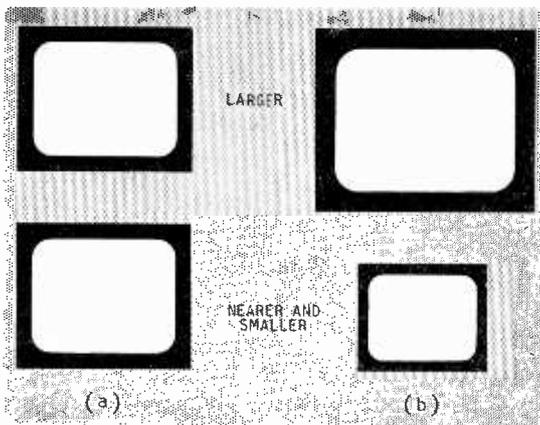


Fig. 3. At (a) is the geometrical image of two screens at distances proportional to their diameters. At (b) is the subjective impression of a human observer from the same viewing position.

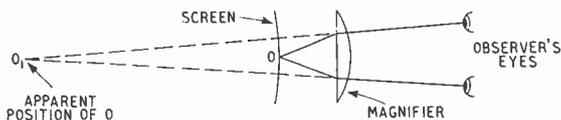


Fig. 4. Action of a magnifier in making a screen appear more distant.

perpendicular to the axis of the optical system (Fig. 2), the image of the square slide on the screen will be a trapezium, being wider at the top where it is farthest away from the projector. If a camera is placed just beside the lantern lens and pointing at the screen, it will form a square image on its plate of the trapezium on the screen, since the extra width at the top is only proportional to its increased distance. But should a human observer place his head in proximity to the lantern lens, the image on the screen will still look wider at the top. When he shuts one eye, however, the right- and left-hand sides of the trapezium seem literally to jump in, so that they are roughly parallel, for the "correction" towards absolute size introduced by binocular vision has disappeared.

On this power of vision to correct for size and distance must be laid the blame for all the unfortunate snapshot photographs of people with enormous feet or knees dwarfing the rest of them.

How does all this affect television screen size? The answer is that the consequences of the above effects make a television picture "look" bigger, and better defined, the larger its true size.

The first and more obvious consequence of a small screen size is simply that this appreciation of true size makes the picture seem much less like the original. It is impossible to make it appear as big as the original scene by looking more closely at it, for although this increases the angle it subtends at the eye, the analysis of binocular vision reveals the deception and actually neutralizes it to a large extent in the picture "seen" by the conscious mind. Fig. 3 illustrates this effect, though it is, of course, impossible to simulate completely in a drawing.

But there is one quantity which amongst all this shifting remains constant, and that is the resolving

power, or power to perceive detail, of the eye. This is about 2 minutes of arc for a good eye, which is the smallest angular separation at which the eye can still see two points distinct from each other. The human observer, of course, is not conscious of the limitations of the eye and cannot conceive of any performance beyond its capabilities.

Yet present the viewer with a large screen, and a small one, set at the nearest distance at which they can be viewed without the raster becoming visible. Both pictures will seem perfectly sharp, and they will actually subtend the same angle at the eye. But the larger one "looks" larger owing to these subjective effects, i.e., it appears to subtend a greater angle than the nearer screen; and since both pictures seem perfectly sharp the deduction is unconsciously made that the larger picture contains more detail than the smaller, although in fact they are identical.

Although perhaps confusing and rather difficult to apprehend, this seems to me an inescapable consequence of the known and accepted subjective phenomena described above. I have not the least doubt that it is one of the main factors responsible for making a large screen so much more satisfying to view than a small one, though both screens are giving a perfect rendering of the transmitted picture.

It is interesting to note that the use of a magnifying lens, as sold for television screens, is also assisted by the effects of binocular vision. The screen is, in fact, magnified by the lens; but in addition it makes the screen appear farther away and so adds a "subjective" magnification to the simple optical one. The way in which it is made to seem distant to the two eyes is shown in Fig. 4.

This is, as it were, a quasi-stereoscopic effect. It cannot introduce differences in the convergence of the eyes with different distances of object: but by making the convergence for all the objects, and thus their apparent true size, nearer the correct value, it makes the view of the screen that much truer to the view of the original.

CLUB NEWS

Chester.—At the first meeting of the Chester & District Amateur Radio Society in the new year (January 6th) J. W. Swinnerton (G2YS) will speak on tape recording troubles. Meetings are held on Tuesdays at 7.30 at the Tarran Hut, Y.M.C.A. Grounds, Chester. The club also meets on Mondays at 7.30 for Morse instruction and technical classes. Sec.: N. Richardson, 1, Victory Villa, Newton Lane, Upton, Chester.

Coventry.—At the meeting of the Coventry Amateur Radio Society (G2ASF) on January 5th at the Y.W.C.A., Queen's Road, Coventry, at 7.30, L. Gardiner (G5GR) will speak on "DX on a Landline." The Society's 21st anniversary dinner will be held on February 27th. Sec.: K. Lines (G3FOH), 142, Shorncliff Road, Coventry.

Hastings.—V.H.F. aerials and tape recorders are the subjects for the first two lectures of the 1953 session of the Hastings & District Amateur Radio Club. The meetings will be held on January 13th and 27th at the Saxon Cafe, Hastings, at 7.30. Sec.: W. E. Thompson, 8, Coventry Road, St. Leonards-on-Sea, Sussex.

Peterborough.—The January meetings of the Peterborough Radio & Scientific Society (G3DQW), which are held at 7.30 at the club's headquarters, St. Paul's Road, include "Radio Fault Finding" by R. H. Houtby (1st), "Radio Direction Finding" by S. Woodward (8th), "Short Wave Receivers—the Superhet" by C. J. Guscott (15th) and "Quality Equipment—the Amplifier" by S. Woodward (22nd). Sec.: S. Woodward, 72, Priory Road, Peterborough.

Sunderland.—"Wired Broadcasting" is the subject on which N. Farmer will speak to the members of the Sunderland Radio & Television Society at the meeting at 8.0 on January 7th at the club room, 16, North Bridge Street. Sec.: C. A. Chester, 38, Westfield Grove, High Barnes, Sunderland.

ELECTRONIC SWITCH

Two Waveform Display with Single-Beam Oscilloscope

By K. R. STURLEY,* Ph.D., B.Sc., M.I.E.E.

AN oscilloscope is a most useful aid in the teaching of radio engineering, but for satisfactory demonstration to classes of 20 or more students a large c.r. tube screen (16-in diameter) is essential. A number of these demonstration equipments can be purchased, but most are capable of displaying only a single waveform at a time. There are occasions when phase relationship needs to be shown and two waveforms have to be displayed; for this purpose a double-beam tube or its equivalent is required. It is well known that this can be achieved by a switching operation, which causes the two waveforms to be applied alternately to the Y plates of a single-beam tube. The author was recently faced with this problem, and his experience in constructing such a switch circuit may be of interest to others who have single-beam tubes.

Before going on to describe the apparatus let us examine first the principles of this switched equivalent of the double-beam tube. Fig. 1 shows a simple block schematic; the two waveforms to be displayed are fed to two separate amplifiers, whose outputs are connected together and taken to the Y amplifier input of the c.r. oscilloscope. Grid bias for the amplifier valves is derived from a switch circuit synchronized with the time base of the oscilloscope. The time-base synchronizing voltage must be obtained from one of the inputs and not from the Y amplifier, otherwise instability, or faulty synchronizing, will result because the switching waveform will be fed into the timebase. The switching frequency—let us call this low-frequency (l.f.) switching—or it may be much faster (high-frequency switching). Assuming ideal conditions, viz., an instantaneous change from one amplifier to the other we should have for l.f. switching the two waveforms displayed on the screen as shown in Fig. 2. Sinusoidal shapes are shown, but they might be of any form. If h.f. switching is employed the two waves will be displayed as dashed curves. The length of the dashes will be determined by the switching frequency, thus, if it is 20 times greater than the time-base frequency, there will be 10 dashes in each waveform, as illustrated in Fig. 3.

In practice the speed of switching is never instantaneous, and if the brightness control is operated the transfer from one amplifier to the other will be seen as a faint blur. With h.f. switching synchronization to the time-base is not essential, but it is preferable because when the switch frequency approaches a multiple of the time-base frequency the drift of the dashes becomes irritating. Another possible display is obtained when the switch frequency is twice that of

the time base; the two waveforms are then seen side by side (Fig. 4). The vertical line between the waveforms illustrates the non-instantaneous transfer from one amplifier valve to the other.

Low- and high-frequency switching each have their advantages and disadvantages. L.f. switching tends to give a clearer picture, but fine control of switch frequency is necessary to cover changes in the frequency of the input waveform. A good l.f. response is required for the amplifiers, but this is not difficult to obtain. Coarse control of switch frequency is quite satisfactory with h.f. switching, but the h.f. response of the amplifiers must be good if a satisfactory switch

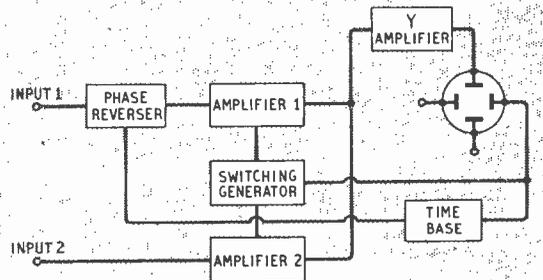
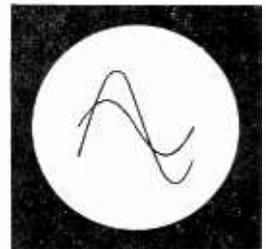
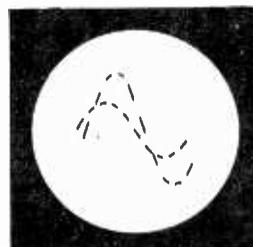


Fig. 1. Block schematic of apparatus for producing a double trace on a single-beam c.r. tube.

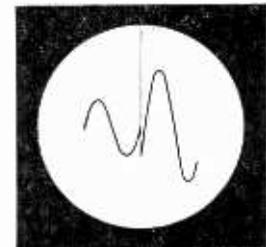
Fig. 2. Example of low-frequency switching.



Below left: Fig. 3. Example of high-frequency switching.



Below right: Fig. 4. Example of switch frequency twice time-base frequency.



* Engineering Training Dept., B.B.C.

shape is to be preserved. For example, switching at 10,000 c/s needs a response in switched and Y amplifiers having little loss at 100,000 c/s if the square wave-shape is to be preserved. A slow transfer between amplifiers causes the dashes to be less visible and increases the blurring (mentioned above) between the two waveforms.

When completed the switching circuit fulfilled the following specification:—

1. Performance to be satisfactory for input waveform frequencies from 20 to 20,000 c/s.

2. The apparatus to be capable of showing two separate waveforms, and of correctly indicating the phase relationship between the two, at the same frequency.

3. The two waveforms to be separable when required. This is the equivalent of the d.c. Y shift in the double-beam tube.

4. The two output waveforms obtained when the same input is applied to both amplifiers to be indistinguishable from a single trace. This means that the gains and phase shifts of the two amplifiers are to be equal over the frequency range given in (1), and are also to be independent of input amplitude.

5. Phase reversal of one waveform to be available.

6. Switching to be possible at a low- or high-frequency rate.

A circuit diagram of the complete switching circuit is given in Fig. 5. There are three main sections: the power supply, the two amplifier circuits, one of which contains a phase-reversing valve, and the switching-voltage generator. The power supply is conventional except that resistance smoothing is employed, R_{24} and R_{25} performing this function. This is made possible by the low total current consumption (15 mA).

In the circuit of amplifier 1 V_1 is a phase-reversing

valve providing an output from cathode or anode. R_8 is adjusted to give no change in output amplitude when switching from the direct to phase-reverse condition. The output of V_1 is connected to the g_1 grid of the hexode amplifier V_2 . The gain of V_1 is less than unity because of the negative feedback from the cathode and V_2 must give greater amplification than V_1 in order to provide equal overall gains from both amplifier circuits. This is achieved by inserting the additional resistance R_8 in the anode of V_2 . The second waveform to be examined is connected to the g_1 grid of the hexode V_3 . The output from the valves V_2 and V_3 is obtained from the common resistor R_{10} through the compensating resistor R_8 . Control of the screen voltage of V_2 by variation of R_{11} changes the d.c. operating condition of V_2 and allows the two waveforms to be superimposed or separated as desired. V_2 should be selected to give a higher anode current than V_3 when R_{11} is zero, otherwise it may not be possible to superimpose the two waveforms.

The resistances R_1 and R_{15} give control of the two input voltages. At frequencies above about 10,000 c/s phase as well as amplitude change occurs when R_1 and R_{15} are controlled, and the sliders should always be set at maximum when phase measurements are being made.

The switching voltages (approximately square-wave shapes of opposite phase) are applied to the g_3 grids of the two hexodes, which are made to conduct alternately. The grid leaks R_7 and R_{14} are returned to the cathodes; they must have a high value (2 M Ω), otherwise the shape of the square-wave switching voltage is distorted, the base line of each displayed wave having an exponential rise instead of being a horizontal line.

The switching-voltage generator is a conventional

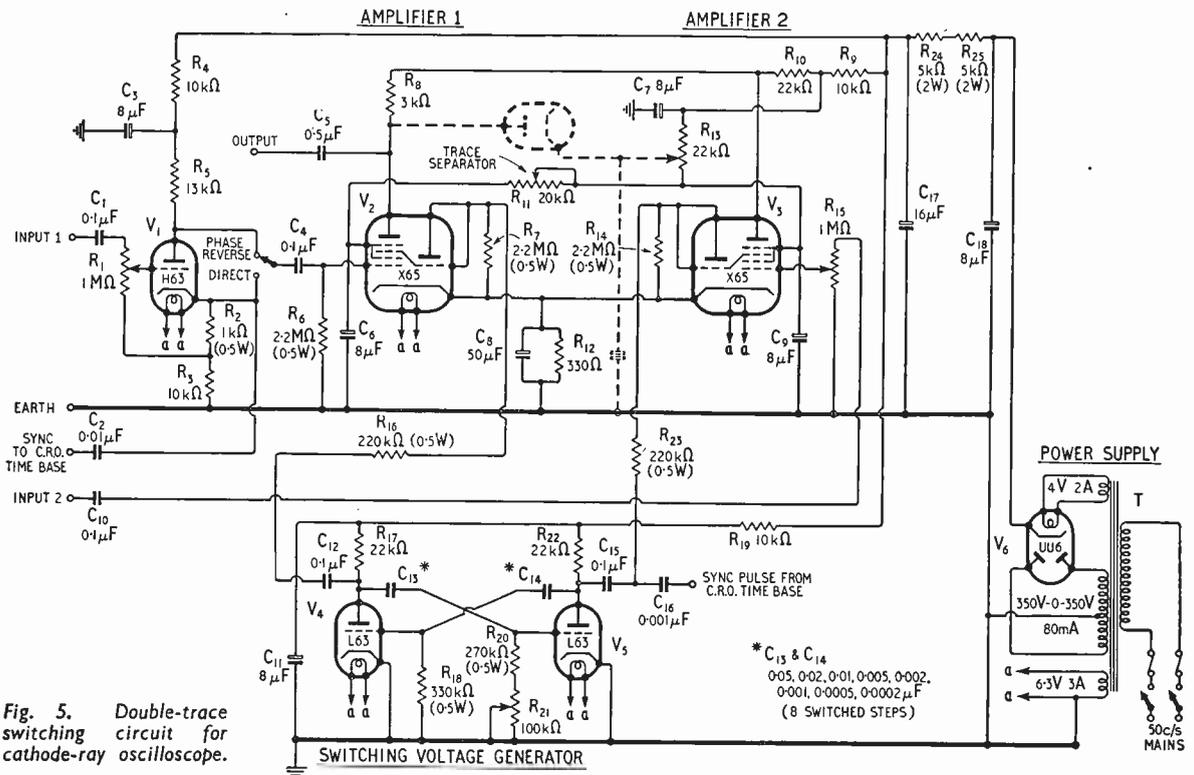


Fig. 5. Double-trace switching circuit for cathode-ray oscilloscope.

multivibrator whose frequency is step-controlled by varying C_{13} and C_{14} . The mark-space ratio of the square wave is adjusted by variation of resistance R_{21} ; it also provides a fine frequency control. The square-wave switching voltage is derived from the anodes of V_4 and V_5 ; the resistances R_{16} and R_{23} in association with the triode sections (connected as diodes) of V_2 and V_3 assist in squaring the waveform of the switching voltage to V_2 and V_3 . It is not possible to switch instantaneously from one valve to the other and there is a period during which both valves are shut down as shown in Fig. 6 for high-frequency operation (a) and for low-frequency (b). The duration of the "off" period is determined by the voltage available from the multivibrator and the magnitude of R_7 and R_{14} , both voltage and resistances should be large for a short "off" period. The switching-voltage shape is also improved by making the values of R_{18} and R_{20} as large as possible.

In the particular cathode-ray oscilloscope used by the author the flyback pulse of the time base was connected to the grid of the tube to cut off the beam during flyback. This pulse was used via C_{16} to synchronize the multivibrator. If the time-base sawtooth voltage itself is employed for synchronizing C_{16} may be reduced to about 20 pF.

During preliminary tests on the apparatus several peculiar effects were encountered and are worth recording.

When wiring the circuit the anode of the triode section of V_2 was inadvertently left free and this produced considerable hum on amplifier I waveform. It disappeared when the anode was connected to g_3 of the hexode section.

With high-frequency switching and no input voltages to the amplifiers, the "on" periods of each valve were seen to consist of exponential instead of horizontal straight lines. This was traced to injection of the switching voltage into the V_2 and V_3 signal-grid circuits for it disappeared when both were short-circuited. It was cured by keeping leads carrying the switching waveform well clear of the grid (g_1) circuits of V_1 , V_2 and V_3 .

A slight judder was noticed on the V_2 waveform in the phase-reverse position; this was not observed in the direct position with the signal obtained from the cathode of V_1 . The cause proved to be variations of h.t. voltage which were in turn caused by fluctuations of the a.c. mains supply. It could be removed by a stabilizer connected from R_4 to earth. Because of this h.t. fluctuation the synchronizing voltage for the time base was taken always from the cathode of V_1 .

There was some change in gain as the screen voltage of V_2 was varied to separate the waveforms. The amplitude of input 1 decreased by about 10% when R_{11} was changed from 0 to 20 Ω . Accurate amplitude comparison can only be made with valves V_2 and V_3 operating under similar d.c. conditions.

As stated above, any attempt to derive the synchronizing voltage for the time base from the outputs of V_2 and V_3 or the Y amplifier leads to instability or (if locking is achieved) to an artificial phase shift because triggering occurs from the "off" pulse from V_2 and V_3 and not from the input waveform itself.

If the input waveform is connected to both inputs and the frequency is varied correct synchronization occurs at multiples of the time-base frequency but there are intermediate points where the two waves are synchronized nearly 180° out of phase. This is due to synchronizing taking place alternately on positive

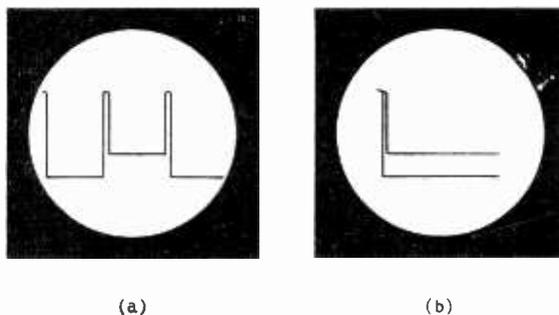


Fig. 6. Illustrations of h.f. switching (a), and l.f. switching (b), showing "off" period pulse.

and negative peaks of the waveform and occurs when the waveform frequency is $(n + 0.5)$ times the time-base frequency. There need be no confusion with correct synchronizing since with this incorrect condition the flyback of one wave starts in the "positive" half of the wave and the other flyback in the "negative" half.

There is a possibility that the Y amplifier may be overloaded by the "off" pulse from V_2 and V_3 . This is only likely to occur when the input signals are small and the gain of the Y amplifier is large. No trouble was actually experienced by the author but if it is met it can be cured by fitting a biased diode from R_8 to earth so that it conducts and clips the pulse when the output voltage exceeds a value slightly greater than that needed to display the waveform. The diode, which may be a germanium rectifier, is shown dotted in Fig. 5.

Initial Adjustments

The setting-up procedure is best carried out for low-frequency switching. Both input terminals are short-circuited to earth, the multivibrator frequency is set to be greater than that of the time base, and R_{11} is adjusted to separate the traces so giving the stepped display of Fig. 6(a). R_{21} is varied to make the steps approximately equal in length and then C_{18} and C_{11} are increased to slow down the switch frequency until the double trace is obtained with the off pulses at the left-hand side like that of Fig. 6(b). The trace separator R_{11} is now adjusted to superimpose both lines. With the sliders of R_1 and R_{15} at their maxima, a waveform of frequency equal to some multiple of the time base is applied to both inputs. The result should be a single waveform on the end of the tube but any amplitude difference between the two inputs will cause two separate waves to be seen. With the phase-reverse switch at "Direct," R_8 is adjusted to make the two waveforms superimpose exactly. The switch is now thrown to the "Phase Reverse" position and R_5 is adjusted to give the same amplitude as in the "Direct" position.

If synchronizing proves difficult with low-frequency inputs due to the stepped control of C_{13} and C_{14} , R_{21} may be used to secure locking but this will lead to unequal "double-beam" lengths. Alternatively it will be possible to pull the complete equipment into synchronism by increasing the synchronizing voltage to the c.r. tube time base. For example, when examining waveforms derived from the 50-c/s mains supply, a large synchronizing voltage can usually be obtained quite independently of the waveform being displayed.

To change over to high-frequency switching it is

only necessary to switch to lower values of C_{13} and C_{14} and to adjust R_{21} to give synchronizing as near to equal length steps as possible. The two waves can be distinguished if necessary by making the steps unequal, the shorter length step will appear less bright than the longer one.

Test results on the apparatus showed that each amplifier had a gain of 15, and satisfactory operation was achieved with input voltages from 0.02 to 1 volt. The minimum input voltage is determined by that

required to synchronize the time base and the maximum by distortion in V_2 and V_3 . If the two waveforms are not to overlap when separated to the greatest extent ($R_{11} = 20,000\Omega$) the maximum signal is limited to 0.5 volt.

The "free-running" switching frequency can be varied in 2-to-1 steps (approximately) by change of C_{13} and C_{14} from 33 c/s to 16,000 c/s for R_{21} maximum. Control of R_{21} gives a smooth variation of about 2.5 to 1.

RADIO TELEMETERING

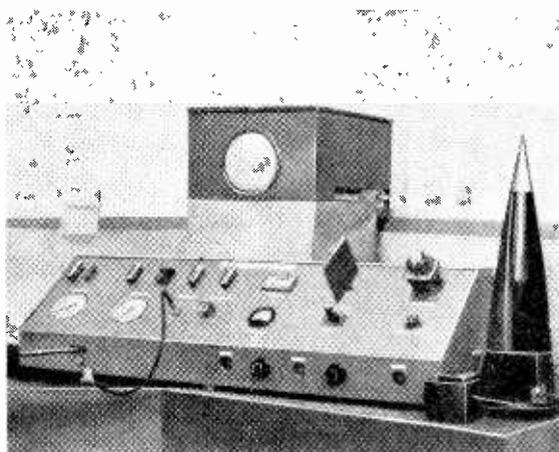
Techniques Used in Aerodynamics Research

ONE familiar application of radio telemetering is the radio sonde system of meteorological sounding, in which information is transmitted from meteorological instruments in a balloon to a ground receiving station. The same sort of technique is now being used in aerodynamics research for transmitting to the ground information about the behaviour of missiles and other pilotless aircraft, and a recent I.E.E. paper by E. D. Whitehead and J. Walsh outlines the principles of some of the telemetering systems devised for this purpose.

Usually a number of measurements have to be transmitted to the ground simultaneously, so it is necessary to use some kind of multiplexing. This is achieved either by frequency division (using sub-carriers) or by time division (using sampling techniques). Sometimes, however, one finds a combination of the two—time division is done on one or more of the sub-carriers of a frequency division system.

The physical effects to be measured are converted

Demonstration model of telemetering equipment at the Signals Research and Development Establishment of the Ministry of Supply. The transmitter is in the nose of the missile on the right. Up to 23 quantities are sampled and displayed on the cathode ray tube as a sequence of steps of different heights.



into electrical changes by pick-up devices and then modulate in some way the various channels of the multiplex radio system. With frequency division, the sub-carriers are modulated either in amplitude, frequency or phase. With time division there are two basic methods. In one, the pick-up devices are sampled by an electronic or mechanical commutator and modulate in turn a single sub-carrier frequency. In the other, each pick-up device modulates a separate train of pulses, and the pulse trains are interlaced in time and transmitted together—p.p.m. is generally used for this. The carrier frequency of the transmitter is modulated either in amplitude or frequency.

There are various kinds of pick-up devices, but the most common ones work on the principle of using the mechanical displacement to vary either a reactive or a resistive element. A capacitance pick-up made something like a condenser microphone is very convenient for direct measurement of air pressure, while a resistance element can be used in the same direct fashion as a strain gauge or, in the form of a thermistor, for measuring temperature. For rapid mechanical variations, piezo-electric crystals are sometimes used, while a.c. generators will measure speed of rotation by their output frequency.

The equipment carried in the aircraft or missile is usually miniaturized to save space and weight, and the aerial is suppressed so that it will not interfere with the aerodynamic performance.

At the receiving end of the telemetering system the various channels are separated out and the measurements they convey are displayed and recorded. The display is most frequently done on cathode-ray tubes, and permanent records of their traces are made on film.

Not all radio telemetering systems, however, are of the complex multichannel type. Some, indeed, show great ingenuity in their economy of means. For example, in one system for measuring the rate of roll of a missile the airborne apparatus is nothing more than a small transmitter radiating polarized continuous waves. This is received on the ground by a rotating dipole. Thus, when the receiving dipole is at right angles to the plane of polarization no signal is received, so that an indication of the rotation of the missile is obtained twice per revolution of the receiving aerial.

LETTERS TO THE EDITOR

The Editor does not necessarily endorse the opinions expressed by his correspondents

"I.F. Inquiry"

G. H. RUSSELL, in his letter published in your December number, mentioned that the European Broadcasting Union had published the results of its investigation on i.f. for long- and medium-wave receivers. As Secretary of the Technical Committee of the E.B.U., I should just like to explain that our reports are prepared only for the members of the E.B.U. although, in this case, copies were supplied for information to the several national manufacturers' associations that were good enough to provide us with information.

The inquiry concerning the choice of i.f. for television receivers is still in only an embryonic stage, although we have invited certain engineers—including Mr. Russell—in a number of countries for their views on the layout of the questionnaire which will, in due course, be submitted to the national associations. The problem is an extremely complex one and until the replies are received and studied we shall not be able to decide how the information can most profitably be utilized. It might, for instance, prove to be suitable as the basis of a document for submission to Study Group 11 at the C.C.I.R. Plenary Assembly to be held in the United Kingdom during 1953.

I take advantage of this opportunity to refer to Peter Dean's letter in the same number, but here, of course, I am expressing only my own personal viewpoint. A study of the history of v.h.f. broadcasting in the United States and in Germany—and indeed common sense—suggests that a v.h.f. broadcasting service cannot develop successfully in the United Kingdom or anywhere else in Europe purely on the strength of the superior quality of reproduction it is capable, in suitable circumstances, of providing. If the public is to purchase v.h.f. receivers or adaptors, they must be induced to do so because they will thereby be able to receive either the existing programmes satisfactorily in districts where reception is unsatisfactory on long and medium waves or additional programmes that are not radiated on long and medium waves (or, of course, both). Only a quite insignificant number of listeners will pay extra to hear rather better the programmes which they can hear reasonably well already, and any additional licence fee would only further reduce their number. It would seem, then, that any broadcasting authority which wishes to introduce v.h.f. economically—which means, virtually, in such a manner that potential receiver sales will be such that the sets or adaptors can be marketed at reasonable prices—should ensure that the first v.h.f. stations serve effectively those parts of the country where existing reception is least satisfactory and also should ruthlessly radiate on v.h.f. exclusively some of its most popular programmes, supported by, say, stock-exchange reports, detailed weather reports for farmers (to replace the ill-fated AIRMET), stories for children and other specialties aimed at widening the audience and so the market for receivers.

Brussels, Belgium.

H. ANGLES D'AURIAC.

"R.F. Characteristics of Capacitors"

T. E. CLARKE has raised some interesting points in his letter in your November issue, to which I would like to reply.

The inductors referred to in my article are designed to have their self-resonant frequency in the television band. Because they are wound on a core of suitable ferromagnetic material, their effective bandwidth is wide enough to provide a high impedance over the whole band 40 Mc/s-70 Mc/s. The actual self-resonant frequency is not critical. I have no evidence to suggest that suppression filters utilizing the self-resonant properties of their components

are not equally effective at frequencies above self-resonance as at frequencies a corresponding interval below self-resonance (within the resonance band).

The subject of bushing capacitors is too complex to receive full treatment in a general article on capacitors. A few details as to the best way to employ them may, however, assist Mr. Clarke and other readers. Correctly mounted, bushing capacitors can have, in practice, transfer impedances similar to that given in Fig. 4 of my article. Two points must be observed in the mounting:—

(a) The mounting plate of the capacitor must be fitted so as effectively to form an integral part of the earthed case surrounding the source of interference or the space to be kept interference free. For example, bushing capacitors mounted in the terminal box or in the framework of a d.c. generator as output terminals will provide interference-free output leads; mounted in the framework of a screened cage they will filter the mains input leads to the cage.

(b) The mounting flange of the capacitor must make good electrical contact with the earthed mounting plate over the whole surface area of the flange.

Thus, one cannot obtain the unique properties of a bushing capacitor if it is mounted on a side bracket attached to the frame of an appliance: it then merely behaves as a conventional two-terminal capacitor of comparatively low inductance. The considerable reduction of suppression at 10 Mc/s observed by Mr. Clarke may well have been due to an unsuitable or incorrect type of mounting. It may be mentioned that where particularly low transfer impedances are required bushing capacitors are now available for low-voltage applications with transfer impedances less than 0.05 ohm at frequencies above 10 Mc/s, and effective up to at least 400 Mc/s.

Hounslow, Middx.

R. DAVIDSON.

Signal Tracing

I MUST contradict the statement by your correspondent E. J. Faulkner (December issue) in which he says, "Signal tracing as a method of fault finding in radio receivers appears to have been completely ignored in this country."

As far back as 1944 Labgear, Ltd., of Cambridge manufactured and placed on the market an excellent and versatile piece of equipment of this kind.

Although basically a signal tracer, it had in addition other useful features, such as the generation of radio frequencies over a wide range and a fixed audio frequency which could be used either to modulate the r.f., or as a separate source of a.f.

Another very useful addition was the inclusion of a small neon lamp, which was used for the testing of mica and paper capacitors and also functioned as a fairly accurate peak voltmeter.

I believe I am correct in saying the Labgear "Electronic Signal Tracer" was the first instrument of its kind to be marketed in this country.

Cambridge.

C. H. BROAD.

Transformers in the Tropics

I WAS interested in the article on "Drying Out Transformers," by J. Macintosh, in your December issue, as I have had experience of these components under home and overseas conditions for very many years.

Whilst it is agreed that linseed-oil-based materials can become acidic under tropical conditions, I have never heard that bitumen does so. However, there are many varieties of bitumen compound and it is conceivable that

one type might become acidic, but I feel that this is not general.

From the article it would appear that the first batch of transformers, which gave normal recovery, were not sealed or potted so that external heating easily drove out the moisture. On the other hand, the types which did not recover quickly were stated to be bitumen dipped or potted; now if these transformers had been left exposed to tropical conditions, without working, for several months, there is likely to be a small amount of moisture in the coil. One could interpret the failure of recovery to the effectiveness of the bitumen as a moisture barrier when the heat was applied *outside* the transformers. In order to dry out this type of transformer fairly quickly, it would be necessary to develop iron and copper losses inside the component at reduced primary volts, as well as raising the external temperature. In this way the centre of the coil is perhaps 105°C if materials will allow, the centre is also hotter than the outside, which in turn is above its local ambient.

Has it been proved that recovery fails to take place when this approach is adopted?

Radford, Coventry.

D. R. SABEN.

Future of Broadcasting

IN the December *Wireless World* it is suggested that progress on the medium waves is at an end, and it is implied that conditions of interference are becoming intolerable.

It may be true to say that manufacturers find it intolerable that simple straight sets and superhets with no r.f. and one i.f. amplifier do not give sufficient selectivity. Such cheap sets are "out" for practical reasons.

V.h.f. sets are dear; so are better sets (from the selectivity point of view) for the medium waves, but there is a real difference to the ordinary listener, who, as Peter Dean points out quite truthfully, does not look for high fidelity; this difference is the station range. Now I can roam at will (with a good set) over Europe; with v.h.f. I can hear only the B.B.C. This is a dangerous curtailment of our freedom which we are asked to swallow.

Interference of all types can be fought. The P.M.G. has just decided on the suppression of new cars. Other man-produced noise could be abated by enforcement of noise suppression. Interference from other transmitters is a question of set design. One r.f. and two i.f.s. give a very good performance, yet I suppose less than one in ten thousand commercial sets have this circuit or its equivalent.

V.h.f. will require relatively expensive receiving aerials, so why not spend this money on a good medium-wave aerial instead of a piece of wire trailing round the room or a capacitor to pick up *all* the mains noise?

Taunton, Somerset.

L. STREATFIELD.

HAVING recently returned home to England, I have been very much interested in the correspondence in your last two or three issues. I can also corroborate what John Doe says and am sure that the radio business in this country may find stormy times not far ahead. The question of v.h.f. broadcasting is a good example of this. It is useless to quote America as being an example of the way in which frequency-modulated v.h.f. has failed. We could easily say the same thing about quality audio amplifiers, but I am sure that the designer of the Williamson amplifier would not agree. When considering the merits of a.m. versus f.m. we should look forward to the day when under certain circumstances interference from Continental stations may be experienced. The question of cost is, in my opinion, not the deciding factor. If the Home Service were to be put on v.h.f., I am sure it would be listened to. I would like to ask your correspondent from Manchester, Peter Dean, whether he, or anyone that he knows of, ever uses the short-wave band on his broad-

cast receiver? Its place could be taken by a v.h.f. band. If it were for a.m. then the extra cost would be about 5 per cent, if for f.m., about 8 per cent: the a.m. oscillator circuit would obviously have to be a good quality one.

I am looking forward to the time when a regular programme will be radiated from the slot aerials at Sutton Coldfield and Holme Moss.

Tibshelf, Derby.

G. C. OXLEY.

Maritime Distress Frequency

FOR some years past, the frequency of 1,650 kc/s has been in use in European waters for distress and calling purposes by small craft participating in the short-range maritime radio-telephony service.

As a result of agreement reached at the Extraordinary Administrative Radio Conference, Geneva, 1951, it has been decided that, from 0200 GMT on 1st May, 1953, the functions hitherto performed on this frequency will be transferred to 2,182 kc/s.

The latter will become a world-wide radio-telephony distress frequency and it has also been designated as a general calling frequency, for which purpose it will be used by British ships and coast stations.

This change is of vital importance to all small craft operating radio-telephony in the 2-Mc/s band and is also a matter of some interest in the history of radio-communication. It is thought that this advance information may be of interest to your readers.

G.P.O., London, E.C.1.

W. BLOW,

For the Inspector of Wireless Telegraphy.

AMATEUR BANDS

THE recent changes in the amateur bands (the latest being the opening of the 21-Mc/s band for telephony) justifies, we feel, the publication of the following table of frequencies, power and types of transmission permitted by the P.M.G. In addition to those tabulated, the bands 26.95-27.28 and 464-465 Mc/s are reserved for radio control of models.

In the column "types of emission" the prefixes A, F and P indicate the type of modulation—amplitude, frequency and pulse, respectively. The figures denote: 1, c.w.; 2, m.c.w. or i.c.w.; 3, telephony; and 5, television. The suffixes indicate supplementary characteristics of the transmission: a, single sideband, reduced carrier; d, pulse, amplitude modulated; e, pulse, width modulated.

The figure given in the second column for pulse modulation is the mean power; the peak power permitted is 2.5 kW.

Mc/s	Max. d.c. input (watts)	Types of Emission
1.715-2.0	10	A1, A2, A3, A3a
3.5-3.635	150	A1, A2, A3, A3a
3.685-3.8	150	A1, A2, A3, A3a
7.0-7.3	150	A1, A2, A3, A3a
14.0-14.35	150	A1, A2, A3, A3a
21.0-21.45	150	A1, A2, A3, A3a
28.0-30.0	150	A1, A2, A3, A3a, F1 *, F2, F3
144-146	150	A1, A2, A3, A3a
144.5-145.5	150	F1, F2, F3
420-460	150	A1, A2, A3, A3a, F1, F2, F3
425-455	150	A5, F5
1215-1300	150	A1, A2, A3, A3a, F1, F2, F3
1225-1290	150	A5, F5
2300-2453	150	A1, A2, A3, A3a, A5, F1, F2, F3, F5
2350-2400	25	P1, P2d, P2e, P3d, P3e
5650-5850	150	A1, A2, A3, A3a, A5, F1, F2, F3, F5
5700-5800	25	P1, P2d, P2e, P3d, P3e
10000-10500	150	A1, A2, A3, A3a, A5, F1, F2, F3, F5
10050-10450	25	P1, P2d, P2e, P3d, P3e

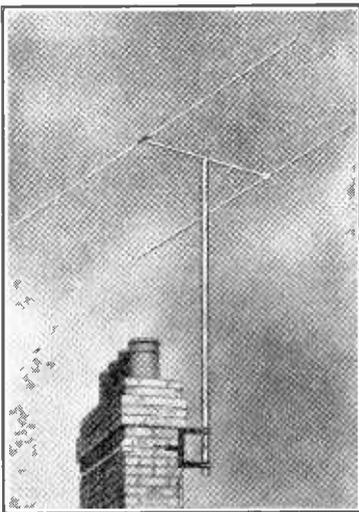
* F1 denotes frequency-shift keying (FSK).

THE "BELLING-LEE" PAGE

Providing technical information, service and advice in relation to our products and the suppression of electrical interference

Pontop Pike and Belfast

It is indeed good news to hear that these two new television transmitters will soon be on the air, even if with temporary 1.KW equipment. The fact that they will require horizontal aerials won't worry us, as we have designed these both for Wrotham and for certain continental T.V. reception. We also sent a sample aerial into the Newcastle area a week or two back. Our designs generally lend themselves to horizontal mounting. It is going to be tricky adjusting ourselves to the idea that distances of twenty miles have to be considered as fringe areas and may well necessitate the use of multi-element arrays.



It is no longer good practice to state that such and such an aerial should be satisfactory at thirty miles. We must remember to qualify such a statement. In practice the distances for the 1.KW transmitters are approximately half those of the main transmitters based on the anticipated decay of field strength. These distances are for normal countryside. Variable results must be expected in hill and dale country.

How Horizontal Polarisation Affects our Aerials.

Space does not permit a detailed treatise on this subject, but we would like to let readers know, as soon as possible, just what happens in practice.

All dipoles must be capable of rotation as a dipole is now very directional with its free ends looking at minimum.

The forward gain of an "H" of multi-array is unaltered, but again there are minima at the free ends.

A "Lofrod" cannot be used as an inverted "T" but the centre element should be discarded, the centre strap removed, and the aerial used as a straightforward dipole broadside on.

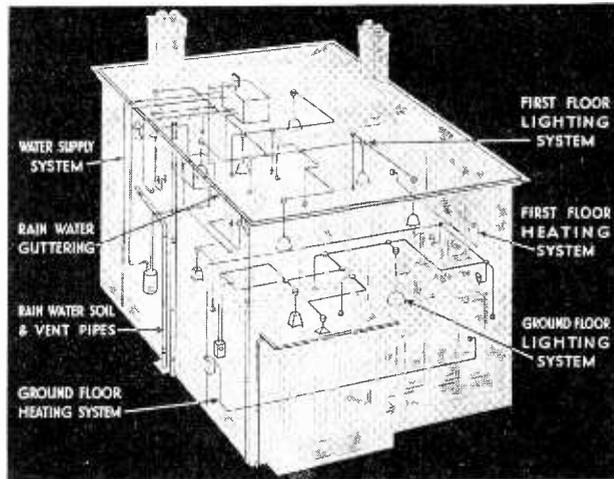
The "Doorod" is essentially a vertical aerial and is out of place when fitted in a horizontal position. The "Viewflex" comes into its own as it is an ideal horizontal indoor aerial, but remember Pontop Pike is nine miles from the centre of Newcastle and we wouldn't expect to get much change out of an indoor aerial at this distance from the temporary 1.KW transmitter.

The "Veerod" inverted "V" loft aerial will be as good if not better, but remember it will now be directional broadside on to the transmitter.

All horizontal aerials will likely be more prone to interference from above and below e.g., from aircraft reflections and electric sewing machines etc.

You will note that throughout we have quoted the power of the temporary transmitter at Pontop Pike as being 1.KW. The permanent transmitter will radiate 5.KW and this represents an increase of approximately 7 decibels, and remember 1 db can make all the difference between holding sync and not holding sync.

What we have written regarding Pontop Pike applies equally to Belfast.



How much metal in a brick built house?

The above illustration was prepared several years ago. Its purpose was to emphasise the importance of getting a broadcast aerial well away from, or high above, the house, as all the electrical wiring, conduits, waste pipes etc., are so very likely to be re-radiating interference or reducing effectiveness. Re-radiated interference is generally more troublesome at broadcast than at television frequencies.

Nevertheless, the same illustration serves to show just why it is so very difficult to predict the results that may be obtained from an indoor television aerial.

The "Belling-Lee" "Doorod" has many staunch supporters and has proved itself well worthy of them. Tens of thousands have been sold in the past and probably as many will be bought in the future, but they won't give satisfaction everywhere.

We say five to eight miles, we know this is conservative for we know where they work at many times these distances.

The illustration above also shows how the "Belling-Lee" "Lofrod"—our loft mounting television aerial—stands a better chance of collecting more transmitted energy. It is higher, and has less metal above it.

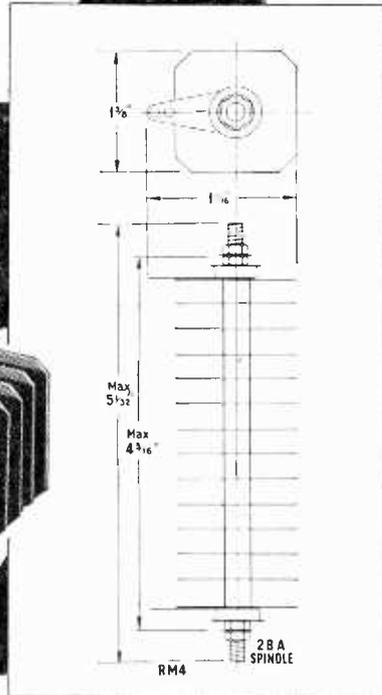
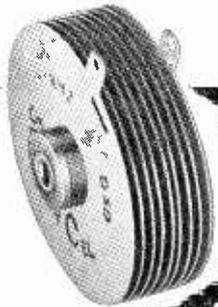
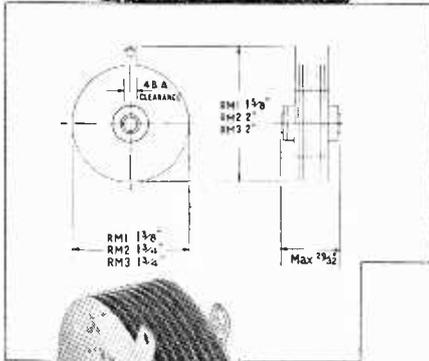
Written Nov. 20th, 1952



10 advantages of



miniature selenium rectifiers



Compare these outstanding features with those of the rectifiers which at present you are using :-

- Less wiring
- Unlimited instantaneous overload such as the charging current of de-formed electrolytic capacitors.
- Far lower heat dissipation.
- No "warming-up" period.
- No valve-holder.
- Practically indestructible in normal service.
- No limit to size of electrolytic capacitor.
- Saves weight.
- Saves space.
- Low in cost.

Study these RATINGS

TYPE	RM1	RM2	RM3	RM4
Maximum ambient temperature	35°C 55°C	35°C 55°C	35°C 55°C	35°C 40°C 55°C
Maximum output current (mean)	60mA 30mA	100mA 60mA	120mA 90mA	275mA 250mA 125mA
Maximum input voltage (r.m.s.)	125V	125V	125V	250V
Maximum peak inverse voltage	350V	350V	350V	700V
Max. instantaneous peak current	Unlimited	Unlimited	Unlimited	Unlimited
Weight	1 oz.	1.4 oz.	2 oz.	4.5 oz.



Standard Telephones and Cables Limited

(Registered Office : Connaught House, Aldwych, W.C.2)

RECTIFIER DIVISION: Warwick Road, Boreham Wood, Hertfordshire.

Telephone : Elstree 2401 Telegrams: Sentercel, Borehamwood

Future of Sound Broadcasting

Discussion on the Impact of Television

IS it just a matter of time before television supersedes sound broadcasting? The question was debated in a lively informal meeting of the Institution of Electrical Engineers, opened by Geoffrey Parr. He referred to the accompanying B.B.C. charts showing how the arrival in the home of a television receiver caused nearly all the time formerly devoted to listening to be transferred (during television hours) to viewing, and added that in his case, as a listener of twenty years' standing, the transfer was total.

In the two most important types of programme—outside events and plays—television was obviously superior to sound alone. Meanwhile, with both services running together, television was bound to influence sound broadcasting in various ways; for example, there might be a drift of artists from one medium to the other, leading perhaps to revaluation of their merits.

The situation would be further complicated by sponsored television, though neither Mr. Parr nor anyone else seemed disposed to venture very far in predicting when or how such influence would begin to be felt. It appeared that a sponsor who obtained the rights of televising an event would have a complete monopoly of broadcasting that event, with the startling possibility that the B.B.C. might be unable to broadcast in any form whatever such an occasion as the Derby or even a coronation.

Mr. Parr deprecated the tendency for certain journalists to dramatize the "battle between sight and sound . . . with sound trying to keep as many customers as possible in the face of TV-wooing," and thought that any rivalry that did exist might subside on the appearance of real competition.

Although in the discussion that followed many diverse opinions were voiced, one outstanding conclusion could be discerned: that it was neither desirable nor—in the foreseeable future—likely that sound broadcasting would be superseded. This was argued on a number of grounds: technical, economic, social and artistic. It was difficult, for example, to foresee television taking over the field now occupied by portable sets; and the objections were even greater with car radio. "Music while you work" was said to stimulate production, but that such would be the result

of "viewing while you work" seemed unlikely. Many hobbies and household duties carried on while listening could not be continued satisfactorily while gazing in semi-darkness at a screen. Television was enormously more costly than sound both to produce and to receive, and expense did not end when the receiver was paid for.

It was held that in certain types of programme seeing added nothing worth while to hearing. One speaker testified that his enjoyment of Itma ceased from the moment he saw it televised, and others disputed the claim that vision was necessarily helpful to every kind of play. There were occasions when sight disillusioned the imagination. Even outside broadcasts, which it was admitted had most to gain from

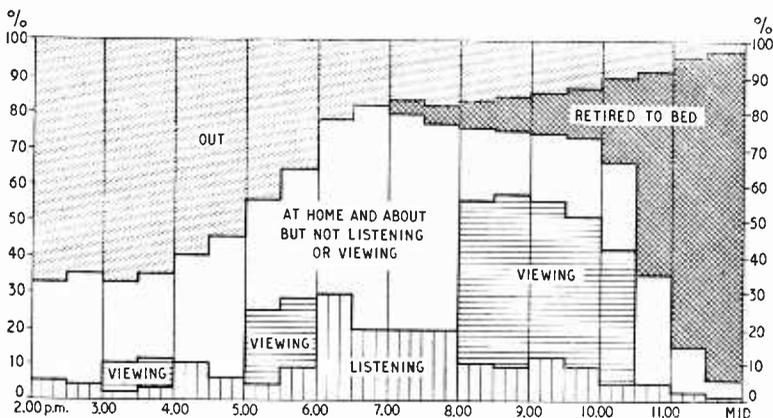
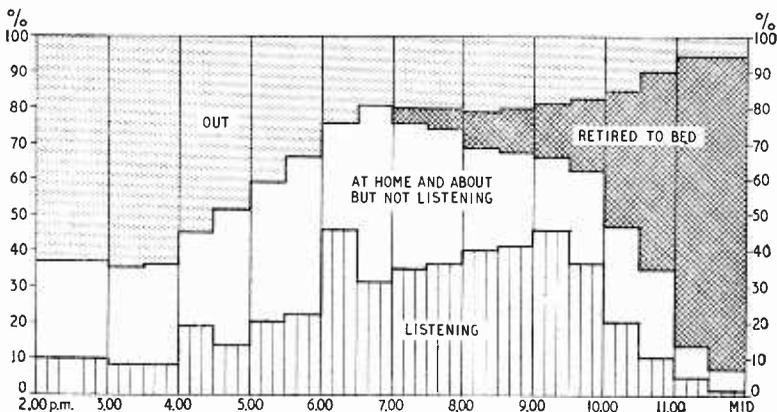


Fig. 1. This chart shows the average proportions of people aged 5 years and upwards occupied during evening hours (weekends excepted) as shown, in homes provided with both television and sound broadcasting reception.

This chart shows the comparable situation where there is no television receiver. It appears that time devoted to viewing is almost entirely at the expense of time formerly devoted to listening, the other categories being hardly affected at all. (Courtesy "The B.B.C. Quarterly".)



vision, might be restricted if there were the necessity to televise every time.

As for the B.B.C. audience research charts, Fig. 1 was explained as an initial "overshoot," which was known to be followed by a steady-state condition in which television and sound programmes were selected on their merits rather than on novelty value. It was agreed that many people inclined one way or the other according to whether they had visual or aural mentalities, but there was some difference of opinion on which indicated the higher intelligence. An eloquent plea was made for each medium of broadcasting to be allowed to develop freely, rather than be planned according to some doctrinaire principle.

Speakers were understandably cautious in arguing from experience in the U.S.A., but an article in the current *B.B.C. Quarterly* was quoted to urge that even greater caution should be exercised by broadcasting planners, for the initial success of many American television stations was not being maintained. Regarding the viewers' side of the economic problem, however, it was said that Americans did not know how they had ever afforded not to have television, it had so reduced their outlay on outside entertainment and car parking.

Interesting evidence was given that both in this country and in Canada the volume of correspondence received by broadcasters about programmes was many times more from viewers than from the vastly greater number of listeners; which seemed to support the belief that the majority of so-called listeners pay little or no attention to what is on, and in this respect at least television is having a notable impact on sound broadcasting.

Nevertheless, concluded Mr. Parr, the discussion as a whole did not appear to provide the B.B.C. with any valid basis for drastically reducing the sound services in favour of television.

COLD-CATHODE TUBES

Their Reliability and Life

NOW that the cold-cathode trigger tube is becoming available in a greater variety of types and characteristics it is beginning to replace the thermionic valve in a good many electronic switching applications. A recent article in *Wireless World** gave some idea of its versatility for this type of work. Now, a discussion meeting at the I.E.E. has thrown some light on the reliability and life of the cold-cathode tube compared with that of the thermionic valve.

The opener, K. Kandiah, was quite frank in saying that if reliability of equipment is a consideration it is preferable to use cold-cathode tubes. Failure of electron tubes, he went on, may be due either to a slow change of characteristics with life or to a mechanical fault. The change of characteristics of cold-cathode tubes is often smaller than that experienced with thermionic valves. Faults due to the glass bulb are comparable in both devices, but there are less strains on the bulb of the cold-cathode tube owing to the absence of the heater. There are many forms of mechanical failure inside the thermionic valve which are not experienced with the cold-cathode

tube. Moreover, the failure of other components in an equipment is accelerated by the higher temperatures produced by thermionic valves.

Several speakers had investigated the life of cold-cathode tubes, and figures better than 28,000 hours and 237 million operations were quoted. Two speakers working independently had determined the failure rate as 0.1 per cent per annum. For the special multi-cathode tubes a figure of 50,000 hours' life was mentioned—with the warning that this could fall to 10,000 hours if the tube were quiescent with the glow resting at one electrode.

Mention was made of the improvement in reliability achieved by the molybdenum sputtering technique in manufacture. Speakers noted that the application of excessive voltage produced excessive glow and so reduced the life of the tube. It was known that when the overload condition was reached the life and characteristics deteriorated sharply, but there was a general desire for more precise information from the manufacturers on this point and also on the photo-electric susceptibilities of the tubes.

Manufacturers' Literature

Dry Electrolytic Capacitors; a leaflet giving the new smaller sizes of the type BR "Drilitic" capacitor and current information on other capacitors made by the Dублиер Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, London, W.3.

Valve Equivalents of other makes to Emitron types given in a leaflet from Electronic Tubes, Ltd., Kingsmead Works, High Wycombe, Bucks. This also gives a complete list of Emitron valves and c.r. tubes, their characteristics, base connections and prices.

Versatile Component Mounting System; standard set of parts comprising group boards and Meccano-type mountings which can be assembled in many different ways. Descriptive leaflet from Joyce, Loebel & Co., Ltd., Vine Lane, Newcastle.

Valve Manual giving characteristics, base connections, prices and equivalents of all Marconi valves and Emiscope c.r. tubes from The Marconiphone Co., Ltd., Hayes, Middlesex.

Coaxial Connectors; new types fitted with coupling rings, cable-joining types and multi-way screened types listed in leaflets from Transradio, Ltd., 138a, Cromwell Road, London, S.W.7.

Casting Alloys in aluminium, magnesium and zinc; a guide to their selection giving trade names, chemical composition, mechanical test requirements, heat treatment and physical and mechanical properties of 27 different types. From the Birmingham Aluminium Casting (1903), Co., Ltd., Dartmouth Road, Smethwick, Birmingham, 40.

List of Components from the distributors, City and Rural Radio, 101, High Street, Swansea, Glam.

Television Replacements; comprehensive list of exact replacements for well-known receivers. Obtainable from Direct T/V Replacements, 134-136, Lewisham Way, New Cross, London, S.E.14, price 6d including postage.

Narrow-aperture Cabinet Loudspeakers giving even distribution of sound over a wide angle in the horizontal plane. Specification on a leaflet from Standard Telephone & Cables, Ltd., Connaught House, London, W.C.2.

Components and Accessories; an "international" catalogue of parts made by makers in many different countries, from Radio-Parts, G1. Kongevej 89, Copenhagen V, Denmark.

Battery Charging; a booklet "Putting it Back" giving general information on low-rate or "trickle" charging of lead-acid and alkaline accumulators. Obtainable from Easco Electrical, Ltd., Brighton Terrace, London, S.W.9, price 1s including postage.

Valve Wall Chart giving characteristics, base connections, equivalents and prices of Brimar valves, c.r. tubes, germanium diodes, Brimistors and metal rectifiers. From Standard Telephones & Cables, Ltd., Footscray, Sidcup, Kent.

Government Surplus Equipment, components and accessories. A very comprehensive stock list obtainable from A. T. Sallis, 93, North Road, Brighton, Sussex, price 6d.

* "Electronic Switching," by E. A. R. Peddle. October and November, 1952, issues.

Functional Circuit Diagrams

Making the Circuit Tell Its Own Story

By C. E. WILLIAMS,* A.M.I.R.E. Aust.

THE writer had some recent teaching experience on relatively complex electronic equipment, and during the course of this work great difficulty was experienced in working from commercially produced circuit diagrams. In fact, in many cases it was found necessary to completely redraw whole circuits before they could be made to give their story to the students.

It must be realized at the outset that circuit drawing is a means of expression: what is good and what is bad is therefore often a matter of opinion and personal prejudice. On the other hand, since it is a means of expression, there is often some subtle way of creating the desired impression in the mind of the reader.

At first thought there would appear to be little scope for subtlety in the resistance-capacitance coupling between the anode of one valve and the grid of the next, but let us examine this a little more closely. Fig 1 (a) shows one way of drawing this circuit. Note that it gives the impression that the signal passes from the anode through the capacitor to the grid of the second valve, and the resistor is merely there to provide a d.c. return path for the valve grid. This is as it should be, and hence the circuit is doing its job and telling its story. But suppose that the signal from the anode of the first valve is a square wave, and the time-constant of the resistance-capacitance combination is so short compared with the duration of the square wave that the signal is differentiated or "pipped." Does the circuit still tell a true story, or is it misleading us?

Fig. 1 (b) shows a slight rearrangement of the circuit, and it is worth noting that here we get no impression of the signal passing from the anode through the capacitor to the grid. Rather, we feel that the signal is applied to the resistor and the capacitor in series, and the resulting voltage developed across the resistor is applied to the grid of the succeeding valve.

We therefore see that these two circuits are not synonymous, and the one used should be decided by the operation performed. That is, if the capacitor serves only as a d.c. blocker, and any changes of the waveform that it may introduce are undesirable, then we should draw it as in (a). On the other hand, if in addition to serving as a d.c. blocker it introduces a desired change in the wave shape or phase, then we should draw it as in (b).

Another very simple circuit is shown in Fig. 2, and here again the way we arrange the components is dependent upon the job that they do. For instance, if the two components constitute a low-pass filter, then

they should be arranged to resemble one, as in (a). On the other hand, if they constitute an integrating circuit, or if they are used to introduce a phase shift, then they should be arranged as in (b).

From the foregoing it will be seen that there are plenty of opportunities for subtlety in even the simplest circuit, while with more complex circuits the opportunity (indeed the necessity) for subtlety and thought increases out of all proportion to the number of components.

Of course, the man who is doing the layout cannot indulge in all this thought unless he understands how the circuit works. Hence the emphasis in this man's training must be placed on electronic engineering rather than upon mechanical drawing. This need not cause much hardship, however, since the finished circuits can then be drawn by a tracer, and the requisite skill for the production of the purely mechanical side of circuit drawing is quite readily attained.

It will be apparent that if the layout man is going to think about the placement of each component this will involve time, and one can almost hear those in charge of drawing offices crying in horror at such a proposal. But we must regain our sense of proportion regarding the schematic and where it fits into the scheme of things. The circuit diagram is not an end in itself; rather it is a means to an end, this end being, of course, the telling of a story to the technician. With this in view, one doesn't need to be much of a mathematician to realize that ten minutes of the layout man's time is not wasted if it results in a saving of one minute of the technician's time on each occasion that he has to use the diagram. It would be an exceptional

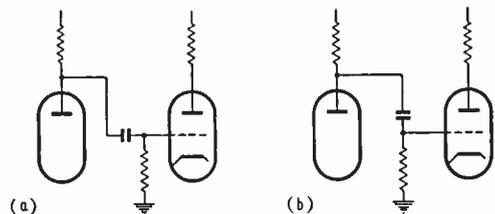
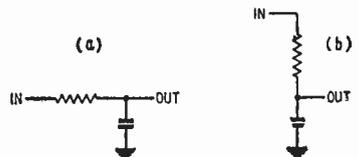


Fig. 1. In (a) is one way of drawing a resistance-capacitance coupling between valves; (b) shows a rearrangement of the circuit.

Fig. 2. In (a) is a low-pass filter circuit. This is rearranged in (b) to indicate an integrating or phase shift action.



* Division of Airways, Australian Department of Civil Aviation. This article is a slightly shortened version of a paper "The Utility Factor in Circuit Diagrams" published in the September, 1952, issue of the *Proc. I.R.E. Aust.*

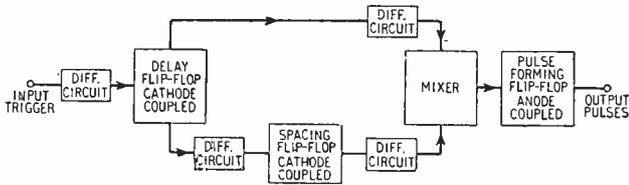


Fig. 3. Block diagram of pulse generator producing double pulses.

equipment indeed if it were discarded before the layout man's time were recovered. With a reasonably large equipment this recovery will probably be made within the maker's factory, and the resulting extra customer goodwill can be added to the firm's intangible assets.

More Standardization Needed

It is rather enlightening to consider a child learning to read. At first the child spells out C-A-T, but after a time he starts to recognize this combination of three letters as being the word CAT, and this word, of course, is applied thereafter as referring to *Felis Domestica*. But just imagine how much harder the child's task would be if the word were sometimes written TAC, at other times CTA, and at other times ACT. This may appear a little ridiculous, and no one would dream of complicating the child's life to this extent, but the circuit diagrams we produce continually ask our technicians to do just this.

In the language of circuit diagrams, individual components are analogous to letters, sub-circuits are analogous to words, while the whole sheet is equivalent to a short story, or a chapter of a longer story, as the case may be. The various standards publications have done their job in educating us up to the point where we now form our component symbols in a reasonably uniform way. That is, in our language we no longer form our letters with a view to expressing our individuality, but rather our aim is to communicate thoughts from one mind to another.

However, our language is getting more complex each day, and it is about time for us to make up our minds how we propose to form our sub-circuits (words) so that our reader can learn to recognize them with the minimum of effort. At the present stage the situation is, to say the least, chaotic, and firm action will be necessary to create order out of this chaos.

The situation would be bad enough if this variation were only between manufacturers, but unfortunately the circuits from the one manufacturer are often non-uniform. Even worse, the author noted that on the one sheet of a recent instruction manual, a sub-circuit which is complete in itself (a cathode-coupled "flip-flop") was drawn in two different ways. The situation was aggravated by the fact that there were five sub-circuits of this type on this

one page, three drawn one way and two the other. From this we may conclude that the average technician must be very intelligent if he can take such handicaps in his stride, or that the person responsible did not know that sub-circuits exist. In some fields this lack of standardization does not cause us much trouble, e.g., receiver power supplies. The reason is that by long experience we have become accustomed to every possible way of drawing this simple circuit. However, the newcomer to the field does not have this long experience, and even in this simple case there is considerable advantage to be gained by the adoption of a standardized layout.

It is in some of the less familiar fields that the advantages of standardization are most apparent. This is not only because of lack of familiarity but also because of the techniques involved. For instance, in the field of pulse techniques (with which the author has had most experience) the most complex equipments can be broken down into not more than about half a dozen basic types of sub-circuits. Once the operation of these basic sub-circuits is known and understood, tracing the operation of the complex circuit resolves itself into their recognition, since the only thing which will vary much will be their order and the manner in which they are interconnected.

Let us take as an example a simple pulse generator which is to produce two identical pulses of variable width, with variable spacing, and the first pulse is to be delayed by a variable time with respect to an external initiating trigger pulse. Fig. 3 shows a block diagram to meet this specification.

Even the lowly block diagram cannot escape without some comment, and it is worthy of more thought than it is usually given. In Fig. 3 it will be noted that the signal flows from left to right, and where the signal splits into two paths these paths are shown as being of equal importance; i.e., one is not shown as a bypass or loop for the other. Conversely, where two signals are mixed, the two paths are shown physically as coming together, and then continuing on along a common path.

Fig. 4 shows the circuit diagram as it would probably emerge from a typical drawing office. Note that it conforms to the draughtsman's ideal in that valve envelopes are in line across the page and the other components are lined up in the same way.

Fig. 4. Circuit of the pulse generator in Fig. 3 as drawn by a typical drawing office.

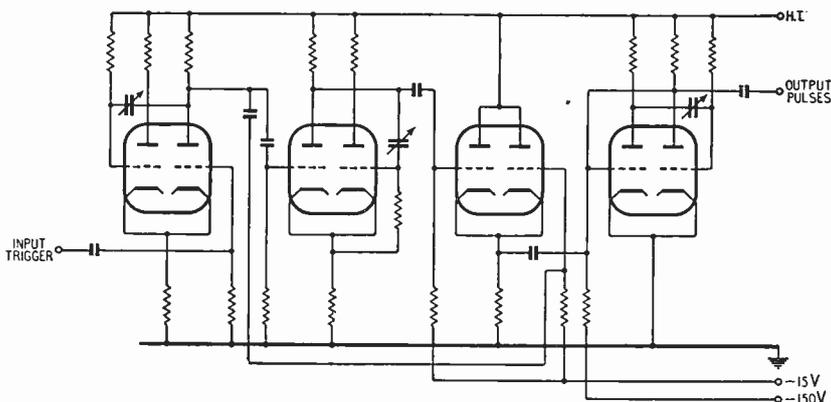


Fig. 5 shows the same circuit redrawn around the block diagram. Note that no effort has been made to put valve envelopes or components in line, but every effort has been made to standardize the sub-circuit layout as much as possible.

Most people, when confronted by the two diagrams and asked to express a preference, immediately vote for Fig. 4. This is to be expected, since, as a piece of drawing, Fig. 4 is by far the neater of the two. However, when these same people are asked to find out how the circuit works, almost invariably they change their preference to Fig. 5. If the reader cares to try this exercise, he will probably agree that the second circuit can be made to give up its information with less effort.

The points to note are as follows. The circuits of the first two valves are practically identical, hence they are drawn to resemble each other as much as possible. An effort has been made to show that the third valve is a mixer by the symmetry of this sub-circuit. The fourth valve is an anode-coupled flip-flop, and the sloping cross-couplings immediately draw our attention to this fact. Note further that all three flip-flops are drawn with the normally cut-off valve on the left, and with this convention we soon realize that we get a negative pulse at the anode of the left-hand valve and a positive pulse at the anode of the right-hand valve. This convention is recommended for general use, for experience has shown that it leads to the most convenient layout in the majority of cases, even though it may be less convenient in any one case.

At times, there will be a strong temptation to deviate from the standard, since this will often lead to a diagram which (from an artistic point of view) is far neater. We should be able to resist this temptation if we always remember that the man who draws the circuit is only one link in a chain.

Superfluous Wires

Most engineers, if asked to comment on the desirability of including valve heater wiring in the body of a circuit diagram, would maintain that this is usually not necessary and it only tends to clutter up the main diagram. On the other hand, the same engineers will usually demand that the high tension and bias lines should be included in full. This does not cause much trouble if there is only one high tension line and one grid bias line. But the situation tends to become rather chaotic if we have two or three values of high tension supply, and perhaps two or three values of bias supply. It is part of the cussedness of inanimate objects that the circuit we are interested in is usually about the centre of the sheet, and therefore, before we can discover the supply voltage for our sub-circuit, we are forced to trace half way across the page. Furthermore, the signal lines have a habit of becoming inextricably mixed up with the supply lines. We have all experienced the frustration which ensues when we set out to trace a

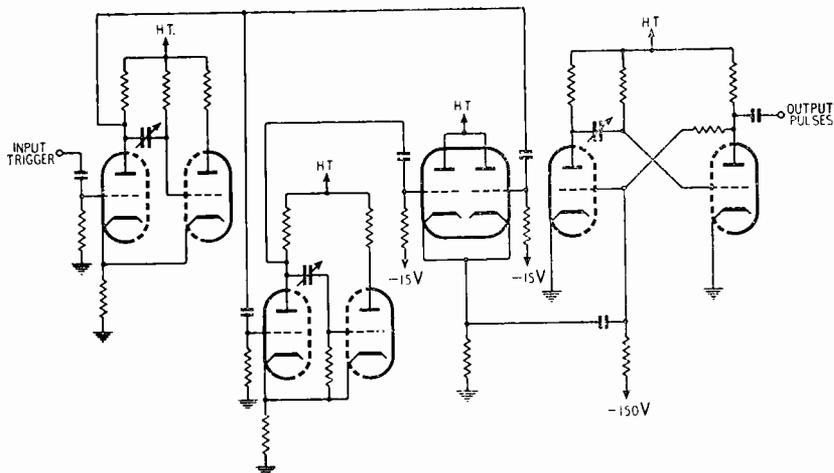


Fig. 5. The circuit of Fig. 4 redrawn to make the operation as clear as possible.

signal line through a maze of parallel lines and cross-overs and ultimately find ourselves at the edge of the page, only to discover that the line being traced is labelled 250 volts. We can prevent this situation from arising by terminating our supply lines at the last component and labelling them accordingly. When one becomes accustomed to this convention the drawing in of supply lines soon appears as superfluous as does the drawing in of heater lines at the present time.

Figs. 4 and 5 also serve as examples of the two contrasting methods. It will be generally agreed that the method adopted in Fig. 5 helps to get the story across to the reader with the least possible effort on his part, since every line of any length is actually carrying signals.

Diagrams of telephone switchboards have used a similar convention for years. All leads going to the battery are drawn as terminating on a single cell of a battery and it is understood that, even though this symbol may recur ten or twenty times in a circuit, all these points are in reality connected to the common battery.

The author wishes to acknowledge his indebtedness to R. K. Crow, of the Melbourne Technical College, who first convinced him that a circuit is more than a lot of lines on a piece of paper. G. L. Moore of Austronic Engineering Laboratories has helped to develop that interest by many an hour of argument. Thanks are also due to V. W. Gibbs of the Department of Civil Aviation for helpful and kindly criticism in the preparation of this article.

“Reading” Circuit Diagrams

THE fact that signals are generally made to flow from left to right in circuit diagrams probably comes from our natural habit of reading in this way. Hence the convention of the input on the left and the output on the right. As the Austrian painter Faistauer wrote, apropos pictures in general: “The spectator is accustomed to reading a picture from left to right just as he reads writing. Instinctively or consciously the old masters put the entrance gate to their pictures into the left-hand bottom corner. . . . The painter should take these feelings of his spectators into account if he wishes to be more easily understood.”

It would be interesting to know how the Chinese and Japanese feel about circuit diagrams!

COIL WINDING DATA

Charts for Coils on Standard Formers with Dust Iron Cores

By LORIN KNIGHT, GRAD.I.E.E.

THE moulded bakelite, or polystyrene, coil former fitted with an adjustable dust iron core and fixing feet, and which is typified by the Aladdin Type PP5892, at one time known as the type F804, has become very popular in the last few years because of its small physical size and its cheapness. This former is $\frac{3}{8}$ in in diameter and the winding space is $\frac{1}{8}$ in long. The accompanying charts enable a coil to be wound on this former and to tune to a specific frequency without having first to calculate the required inductance. Curves are given for various values of tuning capacitance. When estimating the latter an allowance should be made for the wiring and valve capacitances. The self capacitance of the coil has been allowed for in the charts.

If coils from Chart No. 2 are wound as fairly neat multi-layer coils instead of wave-wound coils there will normally be enough adjustment in the dust iron core to compensate for any differences.

At very high frequencies the inductance of the rest of the circuit may be comparable with that of the coil. Moreover the total tuning capacitance may consist mainly of stray capacitance, in which case errors in its estimation will be more serious. Consequently the curves can then be taken only as a guide.

There are several alternative makes of small formers in bakelite and other materials that can be used. Some are of $\frac{1}{2}$ in diameter and fitted with brass-stemmed dust iron cores $\frac{3}{8}$ in long. The charts can be used also for these but

about 20 per cent fewer turns will be required than indicated by the charts.

The charts may also be used for obtaining winding data for the Denco plug-in type former which has pin spacing to fit a "Noval" valveholder. This measures $\frac{3}{8}$ in diameter and gives 1 in of winding length. The dust core is $\frac{1}{2}$ in long and $\frac{1}{4}$ in diameter. In this case about 10 per cent more turns will be required.

CLOSE WOUND

SPACED BY WIRE DIAMETER

S.W.G.

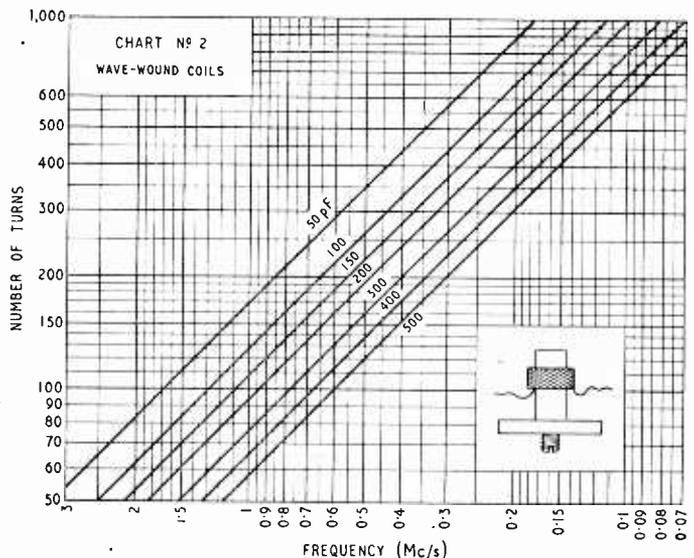
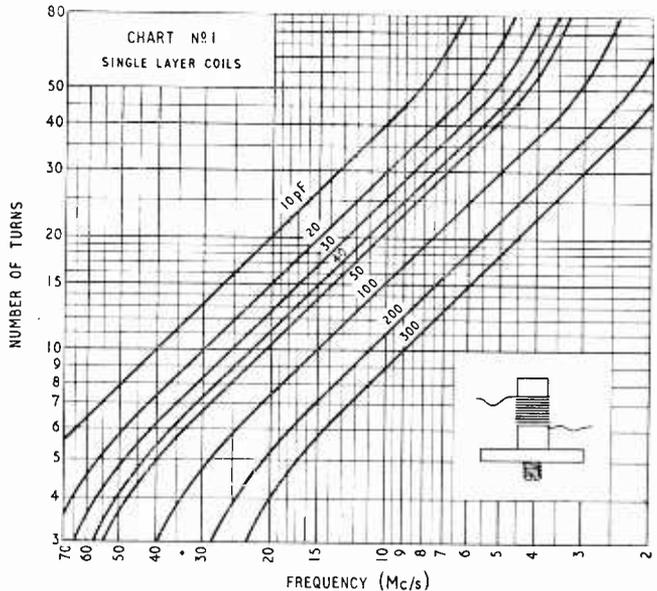


Chart No. 1: This chart gives the number of turns and gauge of wire required to tune to any frequency from 2 and 70 Mc/s using a single-layer wound on an Aladdin Type PP5892 former with dust iron core. Single-silk and enamel covered copper wire should be used.

Chart No. 2: This chart gives the number of turns and gauge of wire required to tune to any frequency from 70 kc/s to 3 Mc/s using a wave-wound or multi-layer winding on an Aladdin Type PP5892 former with dust iron core. No. 36 s.w.g. single-silk and enamel covered copper wire should be used. Up to 150 turns the coil is $\frac{1}{4}$ in long and over 150 turns $\frac{3}{8}$ in long.

WORLD OF WIRELESS

T.A.C. Constitution Upheld ♦ Revolutionary Valve Production ♦ International Electro-Acoustic Meetings ♦ Servicing Certificates and Wages

"A Queer Committee"

THE constitution of the Television Advisory Committee, which was criticized in the leading article of our last issue, was the subject of questions asked in the House of Commons on December 10th.

In an omnibus reply to a number of questions on the direct or indirect financial interest in commercial television of some members of the Committee, the Assistant Postmaster General said: "No member of the Committee was appointed as representing commercial television interests though I understand that one representative of the radio industry has a direct interest in commercial television. Indirect interest might possibly arise in the case of the other representative of the industry and even perhaps in the case of the B.B.C. representative."

Television Show

AS announced last month, the annual exhibition of equipment relating to television engineering and production organized by the Television Society will be held at 155, Charing Cross Road, London, W.C.2, on January 23rd and 24th.

On the first day, when the show is open from 6.0 to 9.30, admission is restricted to members, but tickets for the second day (10.30-6.0) are obtainable from members of the society and G. T. Clack, 43, Mandeville House, Notre Dame Estate, Clapham, S.W.4.

Exhibitors include: Aerialite, Aren, Balcombe, Belling and Lee, Bush, Cinema Television, Decca, E.M.I., Ediswan, Ferguson, Ferranti, Hunt, Leland, Marconi's, Mullard, Murphy, Philips, Pye, Regentone, S.T.C., T.C.C., Tequipment, 20th Century Electronics, Widney Dorlec, B.B.C., B.R.E.M.A. and the Post Office.

Component Reliability

HAVING referred to the valve as "relatively speaking an unreliable device," N. C. Robertson, Director-General of Electronics Production (Ministry of Supply), speaking at the Radio Industry Club luncheon in November, said that a revolutionary conception of valve production forms one of the Ministry's present research projects. If the project succeeds valve reliability will take a great step forward.

Mr. Robertson also stated in the course of an interesting address on the relationship between Government research and industry, that so far there have been disappointingly few

practical applications of printed circuits. Recent work, however, on a combination of the printed circuit and dip-soldering gives rise to the hope that there will emerge in the course of the next few years a technique which will both lower the cost and increase reliability.

Extending Television

THE announcement, referred to in "Random Radiations" last month, that temporary television stations are to be erected at Pontop Pike and Belfast in time for the Coronation, has naturally provoked a desire for similar facilities in other areas, especially Plymouth, Isle of Wight and Aberdeen, which are to be served by the remaining three low-power stations planned by the B.B.C.

The Assistant Postmaster General stated on December 8th that the Government cannot, for the time being, sanction any further temporary stations. He added that it was not a question of the B.B.C. being unable, for technical reasons, to erect these stations in time for the Coronation. It is the drain on national resources which is the determining factor, and the suggestions that have been made that commercial enterprise might be allowed to provide stations would not dispose of this objection. For the same reasons the Government cannot allow television relay companies to operate in areas not covered by the B.B.C. stations.

When asked did he not appreciate that private enterprise would put up the repeater stations and that there are plenty of television sets in the shops, the Minister replied: "The limiting factor is not so much the transmitting equipment as the receiving sets." *Wireless World* learns, however, from the British Radio Equipment Manufacturers' Association that the industry is confident it could provide the necessary receivers for areas to be served by all five low-power stations without interference with its export or rearmament effort.

Magnetic Recording

SOME 60 delegates, representing the governments and broadcasting organizations of Austria, Denmark, Finland, France, Germany (Federal Republic), Ireland, Italy, Luxembourg, Monaco, Netherlands, Norway, Portugal, Saar, Sweden, Switzerland, Turkey, United Kingdom, United States and Yugoslavia attended the Magnetic Recording Convention held in Hamburg at the end of November under the auspices

of the European Broadcasting Union. Dr. Nestel, technical director of the Nordwestdeutscher Rundfunk, was chairman and the two U.K. delegates were H. Davies, who is in charge of the B.B.C. Recording Section, and A. P. Monson, superintendent engineer (recording) B.B.C.

It was not intended that the Convention should reach any formal decision; it was mainly for an exchange of views and to this end 28 papers were submitted. The matters discussed included the physical principles underlying magnetic recording, studio equipment, tape standardization and magnetic recording in television (including the recording of the picture).

It has been decided to make the International Technical Convention an annual event, each one being devoted to a particular aspect of broadcast engineering.

Electro-Acoustics Congress

AN interesting programme is planned for the International Congress on Electro-Acoustics, to be held in the Netherlands from June 16th to 24th, under the auspices of the International Commission on Acoustics. The principal subjects and contributors will be: Sound Recording (R. Vermeulen, Netherlands), Public Address Systems (E. Meyer, Germany), Acoustic Measurements (L. L. Beranek, U.S.A.), Hearing Aids and Audiometers (P. Chavasse, France), Ultrasonics (G. Bradfield, Gt. Britain), Musical Instruments (E. G. Richardson, Gt. Britain) and Sound Insulation of Lightweight Structures (C. W. Kosten, Netherlands).

The inaugural lecture on June 16th will be given by R. H. Bolt (U.S.A.).

Full details are obtainable from the organizing secretary, P. A. de Lange, Mijnbouwplein 11, Delft, Netherlands.

Servicing Certificate Exams.

FOR the first Radio Servicing Certificate examination organized by the Radio Trades Examination Board in 1944 there were 44 entries; for that held in May, 1952, there were 301 candidates, and in addition 131 entered for the Television Servicing Certificate examination (introduced in 1950). Both exams are conducted jointly by the R.T.E.B., which is responsible for the practical test, and the City and Guilds, responsible for the written papers.

The results of the last two

examinations record that 133 of the 301 entrants for the radio exam passed in both the written and practical sections. Sixty-nine passed the written exam, but were referred in the practical test, and 19 candidates previously referred in the practical test completed the exam.

In the television servicing exam 66 of the 131 candidates qualified for the certificate and 43 passed the written paper, but were referred in the practical test.

It is announced that the next exam in radio servicing will be held on April 28th and 30th, and May 16th, for which entries must be received by February 1st. The television servicing exam will be held later, on May 4th and 6th, and June 20th, but the closing date for entries is January 15th.

Syllabuses for the exams and rules regarding eligibility of candidates are obtainable from the R.T.E.B., 9, Bedford Square, London, W.C.1.

Servicemen's Wages

AN increase of 15s per week in their minimum rates of pay has been awarded to radio and television servicemen by the Industrial Disputes Tribunal as a result of a dispute brought before the tribunal by members of the Radio and Television Retailers' Association (the employers) and members of the Guild of Radio Service Engineers (the employees).

The new rates, which are below those claimed by the employees but above those proposed by the employers, are:—

Holders of certificate "A," issued to those on the register of the Joint Standing Committee of the Radio Service Trade who have passed the R.T.E.B. exam, £7 13s 6d p.w.:

Holders of certificate "B," issued to technicians registered by virtue of their having served an approved apprenticeship or having had five years' experience in approved employment, £7 8s 6d p.w.:

Holders of the television certificate, issued to holders of "A" or "B" who have also taken a television course, £7 18s 6d p.w.:

Non-certificated servicemen, £6 5s p.w.

The full terms of the award are

given in the pamphlet "Industrial Disputes Tribunal, Award No. 274" published by H.M.S.O. price 4d.

Coronation Plans

THE B.B.C. announces that technical discussions have already taken place between representatives of the Corporation and Radiodiffusion et Télévision Françaises on the question of relaying the B.B.C.'s television transmissions of the Coronation to France. Tests are to be conducted early in the year, R.T.F. being responsible for the relay from Dover. Representatives from other European countries were also present at the discussions and it is probable that some of them will link into the London-Paris chain if the tests are satisfactory.

PERSONALITIES

Dr. Balth van der Pol is the latest recipient of the Valdemar Poulsen gold medal awarded by the Danish Academy of Technical Sciences. He has been director of the International Radio Consultative Committee (C.C.I.R.) for the past four years, prior to which he was a member of the board of the Physics Laboratory of the Philips organization in Eindhoven, Holland. The award has been made for his work on the propagation of radio waves both in theory and in practice as director of the C.C.I.R.

Professor H. G. Booker, M.A., Ph.D., A.M.I.E.E., who, during the war, was head of the Mathematics Section of T.R.E. and, since 1948, has been a professor of electrical engineering at Cornell University, New York, is one of three British recipients of the Fellowship of the American Institute of Radio Engineers.

H. Faulkner, C.M.G., B.Sc., M.I.E.E., deputy engineer-in-chief, G.P.O., also becomes a Fellow of the I.R.E. He has been with the Post Office since 1913 and was a member of the team responsible for the design of the Rugby station and was its first officer-in-charge.

Professor J. A. Ratcliffe, O.B.O., M.A., F.R.S., M.I.E.E., who is also awarded the Fellowship of the I.R.E., is reader in physics at Cambridge University and was a member of the Radio Research Board from 1946 to 1949. He was a member of the Television Advisory Committee from 1949 until its recent reconstitution.

H.R.H. the Duke of Edinburgh being greeted on arrival at the Savoy Hotel, for the Radio Industry Council dinner by Lord Burghley (president). In the course of his speech when proposing the toast "The Radio Industry" H.R.H. drew attention to the shortage of qualified radio engineers and physicists to meet the industry's needs.

C. F. Bareford, M.Sc., Ph.D., who, since 1946, has been head of the Mullard Research Laboratory at Salfords, Surrey, has accepted the appointment of chief superintendent of the Long Range Weapons Establishment at Woomera, South Australia. He is succeeding H. C. Pritchard, who, after three years at the establishment, is returning to the Ministry of Supply. Dr. Bareford was for two years with the B.T.H. Company as a vacuum physicist and ten years at the Admiralty Signal Establishment, where he was engaged on radar and telecommunication research, prior to joining Mullard's.

Alexander Landman, M.Sc., M.I.E.E., was recently appointed head of the Electrical Design Department of Murphy Radio in succession to Dr. F. C.



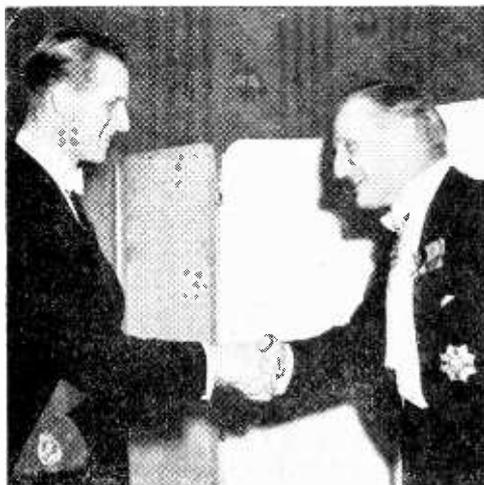
A. Landman, M.Sc., M.I.E.E.

Connelly, who is now managing director of Murphy's subsidiary, Acoustic Products, Ltd. In his new position Mr. Landman is responsible for television design and research, radio receiver design, and the engineering division, which among other things undertakes the life-testing of materials. He was with the E.M.I. organization from 1936-1943 and with the Plessey Co. from 1943-1952.

T. David Conway, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E., has been appointed chief engineer of Grundig (Great Britain), Ltd., the recently formed British offshoot of the West German radio company Grundig Radio-Werke. For the past two years he has been an instrument engineer at a large chemical plant of the Ministry of Supply. He was with Ultra Electric as a radar engineer from 1939 to 1944 when he went to the United Insulator Co. From 1947 to 1950 he was with Standard Telephones and Cables as factory valve engineer.

R. J. Gilbert, engineer-in-charge of the B.B.C.'s Ottringham transmitting station since 1945, has retired. He joined the staff of the original British Broadcasting Company at Savoy Hill as an assistant maintenance engineer in 1924 and has served at Plymouth, Washford, Droitwich, Lisnagarvey, Start Point, Stagshaw (where he was engineer-in-charge) and Ottringham.

R. H. Wilson, Assoc.I.E.E., who, until recently, was sales manager of the Ceramic Resistor Department of the Morgan Crucible Co., Battersea, has joined A.B. Metal Products as general manager.



Brigadier E. J. H. Moppett, M.I.E.E., director of Pye Telecommunications, has been appointed radio adviser to the British Mount Everest Expedition which is to attempt an ascent next spring.

OUR AUTHORS

Charles Burns, who contributes the article on psycho-optics in relation to television in this issue, graduated B.Sc. (1st Class Honours Physics) from Aberdeen University in 1940. During the war he was at the Admiralty Signal Establishment and was concerned mainly with air navigational aids. In 1947 he joined the British Iron and Steel Research Association, where he has been engaged in work on instruments for the industry's research problems.

Dr. K. R. Sturley, who contributes the article "Electronic Switch" in this issue, has been head of the Engineering Training Department of the B.B.C. since 1945. He graduated from Birmingham University with B.Sc. (1st Class Honours) and was awarded the Bowen Research Scholarship to pursue investigation on electro-thermal storage problems, which lead to the degree of Ph.D. He joined the staff of Marconi College as lecturer in 1936 and was assistant principal when he left to join the B.B.C. Dr. Sturley spoke on the principles underlying vocational technical training and the methods by which it may be achieved, in his recent inaugural address as chairman of the South Midland Centre of the I.E.E.



K. R. Sturley, Ph.D., B.Sc., M.I.E.E.

C. E. Williams, whose article on circuit diagrams recently published in the *Proc. I.R.E.* (Australia) is reproduced in this issue, has been an airways engineer in the Division of Airways, Australian Department of Civil Aviation, since 1949. After service as a radar mechanic in the R.A.A.F. he studied at the Melbourne Technical College and in 1949 received the College's Associateship Diploma of Radio Engineering.

OBITUARY

It is with regret that the death is announced of **Wilfred F. Kent**, contracts manager of the Marconi International Marine Communication Co., the Radio Communication Co. and the Marconi Sounding Device Co. He was 57. Mr. Kent originally joined Marconi's W/T Co. in 1913, but left for a short while and rejoined the organization in 1933. He had been contracts manager since 1947.

IN BRIEF

Receiving Licences in force in the British Isles at the end of October totalled 12,870,101, including 1,732,882 for television and 168,106 for car receivers. The month's increase in television licences was 77,436.

Television Production.—A record number of television receivers was produced in October—nearly 85,000. The previous highest figure was 72,000 in February. The manufacturers sold over 100,000 sets to the trade during the month compared with 75,000 in September, the previous record.

R.S.G.B. Membership.—For the fourth successive year the annual report of the Radio Society of Great Britain records a decline in membership. In 1948 the membership totalled 14,439, but with decreases of 401, 1,015, 889 and 509 in the four succeeding years, the total at the end of September, 1952, was 11,625. Whilst deploring the losses the Council points out that the membership in 1939 was only 3,500.

Television in the Cinema.—The second of the series of lectures arranged by the British Kinematograph Society to instruct projectionists and cinema technicians in the principles of television and large-screen reproduction will be held in the Lecture Hall, City Museum, Leeds, and will commence on January 13th. The fee for non-members is 25s. Particulars of this and the third in the series (to be held later in Liverpool) are obtainable from the B.K.S., 164, Shaftesbury Ave., London, W.C.2.

Air Radio Show.—As was the case last year, the 1953 S.B.A.C. Show at Farnborough, which includes a considerable amount of aeronautical radio gear, overlaps the National Radio Exhibition to be held at Earls Court, September 1st—12th. The Society of British Aircraft Constructors' show will be held from September 7th to 13th.

Sponsored Television.—It was announced by the Postmaster-General in reply to a question in the House of Commons that 24 enquiries had been received by the Post Office about licences for commercial television stations.

Technical Writing.—A course of seven lectures on the Technique of Technical Writing will be given by G. Parr, M.I.E.E., technical director of Chapman and Hall, at the Borough Polytechnic, on Thursdays at 6.30 commencing on January 15th. Enrolment forms can be obtained from the Borough Polytechnic, Borough Road, London, S.E.1. The fee is 30s.

Speeding Parting Guests.—Pye radio-telephone gear was used to call cars from the City's car parks when guests were leaving the banquet at Lloyd's after the recent foundation-stone laying by Her Majesty the Queen. Car numbers, received by radio vans parked at strategic points, were broadcast by loudspeakers to waiting cars. Guests were enabled to leave at the rate of 700 an hour.

Decca's mobile radar demonstration unit, which has been touring N.W. Germany and Scandinavia, was set up on the island of Fanø, near Esbjerg, to demonstrate the possibility of giving radar assistance to vessels entering the port. For the tests, the Danish United Shipping Company's passenger vessel *Kronprinsesse Ingrid* and the Decca mobile unit were equipped with Pye v.h.f. gear to provide a two-way radio-telephone link.

Juvenile Lectures.—The seventh in the series of Christmas lectures arranged by the I.E.E. for school children will be entitled "Sound Broadcasting" and will be delivered by Dr. K. R. Sturley on January 1st and 2nd. Tickets, which have been circulated to schools in London and the home counties, are obtainable from the I.E.E., Savoy Place, London, W.C.2, where the lectures will be given at 3.0 each day. The series of Christmas-holiday lectures arranged for secondary school pupils by the London County Council includes two of radio interest on December 31st. Geoffrey Parr, honorary secretary of the Television Society, will deal with television at the Norwood Technical College, Knights Hill, S.E.27, and E. G. Doherty will speak on "The Romance of Radar" at the Sir John Cass College, Jewry Street, E.C.3. Both lectures start at 2.30.

BEAMA Catalogue.—The second edition (1952-53) of the BEAMA Catalogue, which is again issued for the British Electrical and Allied Manufacturers' Association by our Publisher, includes in its 1,020 pages a five-language glossary of the technical terms used in the various sections. The catalogue, which provides a comprehensive buyers' guide to products of the British electrical and allied industries (listed under 1,200 headings), is for private distribution.

"**Electrical Review**", our associate journal, reached its eightieth birthday in November, having first appeared in 1872 as the *Telegraphic Journal and Electrical Review*. We were naturally interested to see that in 1888 it devoted five pages to an abstract of Hertz' paper "On the Speed of Diffusion of Electro-Dynamic Actions."

Practical Electrician's Pocket Book.—The 1953 edition of this useful annual has now been issued. New chapters include those on fibreglass, power-factor correction and time switches, while the section on interference suppression has been revised. Odhams Press, 5s.

FROM ABROAD

Audio Fair, N.Y.—British audio equipment exhibited at the Audio Fair held in New York from October 29th to November 1st included Leak amplifiers, Garrard record changers and pickups, Wharfedale speakers and Hartley speakers, amplifiers and pickups. G. A. Briggs (Wharfedale), H. A. Hartley and H. J. Leak were present at the show.

U.S. Electronics Conference.—Literature from a representative cross-section of American manufacturers who exhibited at the recent National Electronics Conference in Chicago has been secured by the Board of Trade and is available on loan for a maximum of 10 days to firms in this country. It can be seen at Room 7172, Board of Trade, Horse Guards Avenue, London, S.W.1, where a copy of the exhibition catalogue is also available.

French Television.—It would appear from the review in *La Télévision Française* of the second French Television Exhibition, recently held in Paris, that the demand for large screens is much greater in France than in this country. The author states that 36cm (14-in) tubes are obsolescent; the majority of receivers using 17- to 24-inch tubes. With the greater number

of lines (819 compared with our 405) it is, of course, possible to have much larger pictures without over-emphasis of the line structure.

German Radio Show, which was to have been held in Dusseldorf last August and was postponed until February, has now been further postponed until the late summer—August 29th-September 6th.

Aden-U.S.A. Radio-telephone.—The recently opened Cable & Wireless radio-telephone link between Aden and the U.S.A. is transmitted via Nairobi and the United Kingdom.

Cable & Wireless has extended its radio-telephone network in the Far East through its international network station at Hong Kong. The most recent additions are Macao, Formosa and the Philippines, which are now interconnected through Hong Kong.

EXPORTS

Siam's first two television transmitters, and incidentally the receivers for the initial demonstrations, are to be provided by British manufacturers. A Marconi transmitter and its associated studio equipment was installed at Chulalongkorn University, Bangkok, for the recent Constitution Fair. The second transmitter is to be brought into use by the middle of the year. They will operate on 625 lines. English Electric 16-in metal-tube receivers are being used.

British Television Equipment is also to be used in the Munich and Hamburg studios of the Nordwestdeutscher Rundfunk and the Munich studios of the Bayerische Rundfunk. Cameras and associated equipment have been ordered from Pye.

Underwater Television equipment has been ordered from Marconi's by a Belgrade shipping company for dock and harbour inspection work in Yugoslavia's Adriatic ports.

American Show.—Participation in the radio engineering show, which is being held in New York under the auspices of the Institute of Radio Engineers from March 23rd-26th, is recommended by the Board of Trade to U.K. radio and electronic manufacturers, particularly those with distribution arrangements in the United States. Further information is obtainable from the organizers Clapp & Polliak, 341 Madison Avenue, New York, U.S.A.

NEW ADDRESSES

Elliott Brothers (London), Ltd., have transferred their Birmingham branch office to 181, Corporation Street, Birmingham, 4 (Tel.: Central 8313). The new office is the sales and service centre for the Midlands.

Telcon in Manchester.—The Telegraph Construction and Maintenance Co. has opened a branch office at 43, Fountain Street, Manchester, 2 (Tel.: Central 0758).

Another Factory at Wandsworth has been acquired by Mullard Equipment, Ltd. The older factory in Brathway Road now houses the engineering development departments, and in the new building in Garratt Lane, London, S.W.18, are the main assembly and production lines and the administration and service departments.

An extension now being made to the factory of Arcoelectric, Ltd., at West Molesey, Surrey, will increase the total floor space to nearly 18,000 sq. ft.

Valve Division of the Marconiphone Co. has been transferred from Hayes to London. The new address is:—E.M.I. Sales & Service, Ltd., Valve Division, 3, Stanhope Street, London, N.W.1 (Tel. Euston 8051).

Hall Electric, Ltd., exporters of valves, had amongst the 80 guests at a "house-warming" party at their new premises, representatives of the Australian, Belgian, Pakistan and Netherlands governments. Their new address is Haltron House, 49-55, Lisson Grove, London, N.W.1 (Tel.: Ambassador 1041).

MEETINGS

Institution of Electrical Engineers

Radio Section.—"An Improved Scanning Electron Microscope for Opaque Specimens," by D. McMullan, M.A., on January 6th. (Joint meeting with the Measurements Section.)

"Printed and Potted Electronic Circuits," by G. W. A. Dummer, M.B.E., and D. L. Johnston, B.Sc. (Eng.), on January 14th.

Discussion on "The Relative Merits of Harmonic and Intermodulation Measurements for Assessing Distortion in Audio Equipment," opener E. W. Berth-Jones, on January 26th.

The above meetings will be held at 5.30 at Savoy Place, London, W.C.2.

North-Eastern Radio Group.—"High-Gain D.C. Amplifiers," by K. Kandiah and D. E. Brown at 6.15 on January 5th at King's College, Newcastle-on-Tyne.

North Midland Centre.—"Electronic Telephone Exchanges," by T. H. Flowers, M.B.E., B.Sc., at 6.30 on January 6th at the B.E.A., 1, Whitehall Road, Leeds.

North-Western Radio Group.—"The Nervous System as a Communication Network," by J. A. V. Bates, M.A., M.B., B.Chir., at 6.30 on January 7th at the Engineers' Club, Albert Square, Manchester.

South Midland Centre.—"Post-Graduate Activities in Electrical Engineering," by W. J. Gibbs, M.Sc. (Eng.), D. Edmundson, B.Sc., R. G. A. Dimmick, B.Sc. and G. S. C. Lucas, O.B.E., at 6.0 on January 5th.

Discussion on "The Co-ordination of Technical and Practical Training," at 6.0 on January 29th.

Both the South Midland meetings will be held at the James Watt Memorial Institute, Great Charles Street, Birmingham.

South Midland Radio Group.—"Electronic Telephone Exchanges," by T. H. Flowers, M.B.E., B.Sc., at 6.0 on January 26th at the James Watt Memorial Institute, Great Charles Street, Birmingham.

Rugby Sub-Centre.—"Television Programme Origination: the Engineering Technique," by D. C. Birkinshaw, M.B.E., M.A., at 6.30, on January 13th at the Rugby College of Technology and Arts.

Southern Centre.—"Post-Graduate Activities in Electrical Engineering," by W. J. Gibbs, M.Sc. (Eng.), D. Edmundson, B.Sc.; R. G. A. Dimmick, B.Sc. and G. S. C. Lucas, O.B.E., at 6.30 on January 21st at the University, Southampton.

Oxford District.—"The Trend of Technical Education," by J. H. Brookes, M.A., at 7.0 on January 14th, at 37, George Street, Oxford.

British Institution of Radio Engineers

London Section.—"The Modern Single-Layer Selenium Photocell," by G. Veszi, Ph.D., at 6.30 on January 5th at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

Scottish Section.—Programme of technical films at 7.0 on January 8th at the Institution of Engineers and Shipbuilders, Glasgow.

West Midlands Section.—"The Search for Bandwidth Economy in Television," by D. A. Bell, M.A., B.Sc., at 7.15 on January 27th at the Wolverhampton and Staffordshire Technical College, Wulfruna Street, Wolverhampton.

Merseyside Section.—"Design and Application of Quartz Crystals," by R. A. Spears, A.M.Brit.I.R.E., at 7.0 on January 15th at the Electricity Service Centre, Whitechapel, Liverpool.

North-Eastern Section.—"Hearing Aids," by R. A. Bull, B.Sc. (Eng.), at 6.0 on January 14th at the Neville Hall, Westgate Road, Newcastle-on-Tyne.

Television Society

London.—"An Introduction to the Sine-squared Pulse," by C. J. Hunt and E. W. Elliot (G.E.C. Research Laboratories) at 7.0 on January 8th at 164, Shaftesbury Avenue, London, W.C.2.

North-Western Centre.—"Design and Production of Commercial Television Receivers" by J. H. Johnson (Cossor) at 7.30 on January 28th at the College of Technology, Sackville Street, Manchester, 1.

British Kinematograph Society

Television Division.—"The Use of Film in Television Production," by Ian Atkins, at 7.15 on January 28th at the Gaumont-British Theatre, Film House, Wardour Street, London, W.1.

British Sound Recording Association

London.—"Some Physiological Factors in Quality Appreciation" by E. A. Vetter at 7.0 on January 23rd at the Royal Society of Arts, John Adam Street, London, W.C.2.

Portsmouth Centre.—Members' evening at 7.15 on January 15th at the Central Library, Guildhall, Portsmouth.

Manchester Centre.—"Some Aspects of Tape Recording in the Home and Office," by E. R. Friedlander, M.Brit.I.R.E., D. R. Tasker and H. Turner at 7.30 on January 26th at the Engineers' Club, Albert Square, Manchester.

Institute of Physics

North-Eastern Branch.—"Progress in Pure and Applied Ultrasonics," by Dr. E. G. Richardson, F.Inst.P. (University of Durham), at 6.15 on January 14th at King's College, Newcastle-on-Tyne.

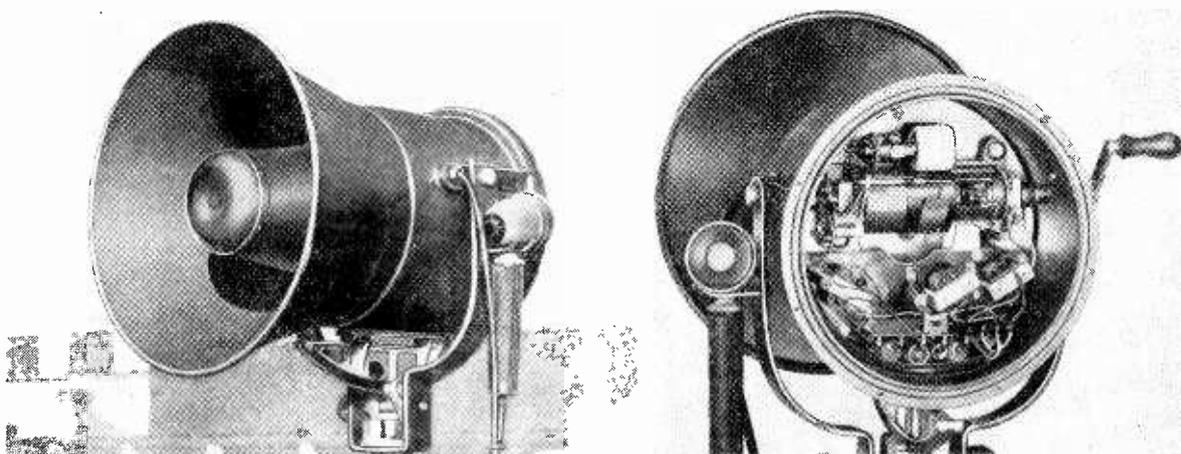
Electronics Group.—"The Electronic Theory of Valency," by Professor C. A. Coulson, F.R.S. (University of Oxford), at 5.30 on January 13th at 47, Belgrave Square, London, S.W.1.

Radio Society of Great Britain

"Single Sideband Transmissions," by R. H. Hammons (G2IG), at 6.30 on January 30th at The Institution of Electrical Engineers, Savoy Place, London, W.C.2.

Friction-driven Loudspeaker

Electro-mechanical Amplification Without Valves



A conventional re-entrant horn is used in the G.N.T. loudspeaker, and components are all housed inside the sealed back.

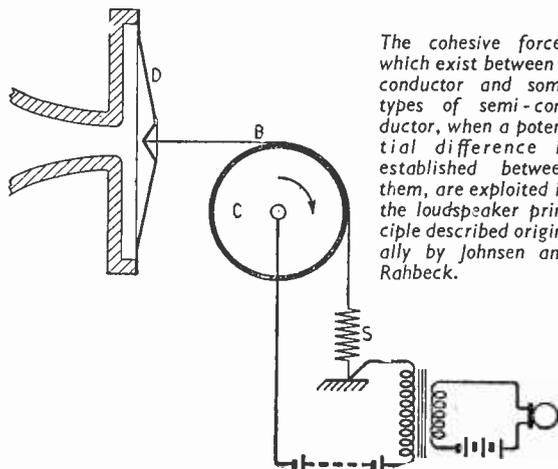
OVER thirty years ago Johnson and Rahbek designed a loudspeaker which made use of the very considerable attractive forces which exist between a metal surface and some feebly conducting substances—for example, agate—when a potential difference is established between them. The device created considerable interest at the time,¹ and by the standards then current it performed well, but was inclined to be temperamental and dependent not only on the quality of the natural agate but also on humidity.

A much wider range of artificially produced partially conducting substances is available nowadays and Rahbek has recently developed a process of depositing coatings which give a performance sufficiently reliable for use in a loudspeaker designed for public address purposes.

The principle of operation of this instrument is essentially the same as that of the original, and is illustrated in the accompanying diagram. A flexible metal band B is attached at one end to the centre of an aluminium diaphragm D and is held in contact with a rotating cylinder C, coated with the partially conducting medium, by means of the spring S. When a p.d. is applied between the cylinder and the band a considerable pull is applied to the diaphragm—of the order of 0.5kg, in current designs, for an initial voltage of 50. A polarizing voltage is necessary not only to allow positive and negative excursions from a mean position under the influence of a fluctuating force which is essentially unidirectional, but also to work on a part of the characteristic which is reasonably straight, since the force varies approximately as the

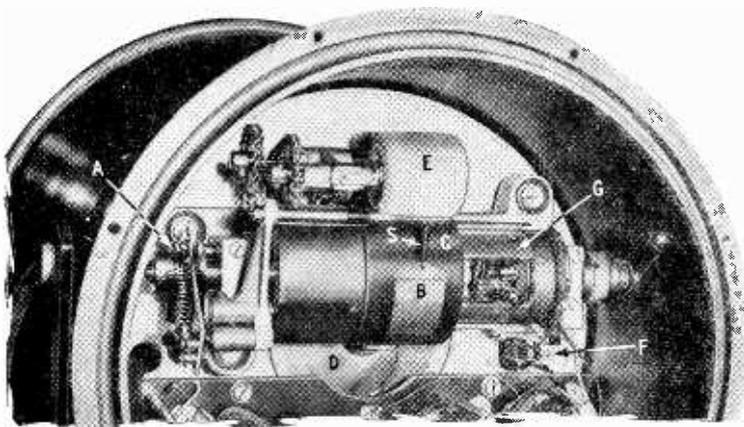
cube of the applied voltage. Modulation is applied from a carbon microphone through the medium of a step-up transformer.

No valve amplification is necessary and the primary source of energy need not be electrical. In the new G.N.T. loudspeaker, shown in the accompanying photographs, provision is made to turn the cylinder by hand in an emergency—or as a normal method of operation where mains supplies or battery charging facilities are not available. The control current can be generated by a small internal dynamo driven by the handle, or may be supplied from quite small dry batteries. In the latter case loudspeakers will give full acoustic power output for a consumption of less than



The cohesive forces which exist between a conductor and some types of semi-conductor, when a potential difference is established between them, are exploited in the loudspeaker principle described originally by Johnson and Rahbeck.

¹See for example *Wireless World* Vol. IX (1921), pp. 225, 256, 289 and 311



Details of the driving mechanism. A is a mechanical servo mechanism for controlling contact area between band B and semi-conducting coating of cylinder C. The surface is cleaned by rotating mops E. F are the mechanically operated vibrator contacts, G is the d.c. driving motor and S the band tension spring.

$\frac{1}{2}$ watt; only 0.1mA from a 49 $\frac{1}{2}$ -volt polarizing battery and 100mA from a 4 $\frac{1}{2}$ -volt microphone battery. In this model a centrifugal switch is provided to connect the batteries only when the handle is being turned.

Two other types are available in both of which the cylinder is driven through gearing by a permanent-magnet d.c. motor. When operated from an accumulator, the power consumption is 15-20 watts and the polarizing and microphone voltages are derived from a mechanically operated vibrator unit. On a.c. mains

a transformer and rectifier supplies the current for the motor.

Finally there is a hand-driven model in which a generator similar in design to the driving motors supplies 60 volts for the microphone and polarizing circuits.

To prevent damage to the diaphragm the mean frictional force is controlled by a mechanical servo system associated with the epicyclic gearing between the primary drive and the cylinder. A spring-loaded arm on which the "planet" wheels are pivoted is used as the anchorage for the band tension spring and by altering its angle automatically adjusts the area in contact with the cylinder to give a constant torque, and hence a constant mean pull on the diaphragm.

All the equipment is contained in a sealed chamber behind the re-entrant horn, and the whole unit is mounted on a tripod with a universal head, which may be clamped by a single lever.

The power output is comparable with amplifier-driven loudspeakers of similar size, and speech has an incisive quality which is the essence of high intelligibility.

The makers are the Great Northern Telegraph Company, 4 Sydhavns Plads, Copenhagen SV, Denmark, whose London address is 5 St. Helens Place, E.C.3.

BOOKS RECEIVED

Filter Design Data for Communication Engineers by J. H. Mole, Ph.D., A.M.I.E.E. Deals primarily with Zobel-type filters and supplements basic theory with formulæ and charts designed to reduce the labour of computation. Pp. 252; Figs. 127. E. & F. N. Spon Ltd., 22 Henrietta Street, London, W.C.2. Price 63s.

Les Filtres Electriques by Pierre David. Third revised edition of a general survey of the principles of filter design. Published under the auspices of the Centre National d'Etudes des Telecommunications. Pp. 192; Figs. 142. Gauthier-Villars, 55 Quai des Grandes-Augustus, Paris 6. Price 2,500fr.

Electrical Instruments and Measurements by W. Alexander, M.Sc., M.I.E.E. Theory, construction and use of instruments used primarily for power supply and installation testing. Pp. 352; Figs. 112. Cleaver-Hume Press Ltd., 42A South Audley Street, London, W.1. Price 12s 6d.

Dictionnaire Anglais-Français (des terms relatifs a l'electrotechnique, l'electronique et aux applications connexes), by H. Piraux. "One-way" dictionary giving French equivalents of English and American terms used in radio, acoustics, optics, nuclear physics and many cognate subjects, with an appendix of conversion tables. Pp. 296. Editions Eyrolle, 61, Boulevard St. Germain, Paris V. Price 1,850 fr.

Television*Engineers' Servicing Manual. Edited by E. Molloy and W. F. Poole, Assoc. Brit.I.R.E. General notes on servicing and installation, and detailed servicing data

on typical British television receivers by twenty-nine makers. Pp. 654+x; Figs. 425. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 42s.

Radio Engineers' Servicing Manual. Edited by E. Molloy and W. F. Poole, Assoc. Brit.I.R.E. Introduction to radio receiver servicing with a detailed survey of representative post-war models by thirty-two British manufacturers. Pp. 760; Figs. 585. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 42s.

Thermionic Vacuum Tubes, by W. H. Aldous, B.Sc., D.I.C., A.M.I.E.E., and Sir Edward Appleton, F.R.S. Completely revised sixth edition of a monograph on the internal action of valves and their use as circuit elements, written primarily for students of general physics or electrical engineering with an extensive bibliography. Pp. 160+vii; Figs. 98. Methuen & Co., Ltd., 36, Essex Street, London, W.C.2. Price 9s 6d.

The Television Annual for 1953. Edited by Kenneth Bailey. Background information on television programmes and personalities. Pp. 160; Half-tones 116. Odhams Press Ltd., 96 Long Acre, London, W.C.2. Price 9s 6d.

Fundamentals of Radio Communications, by Abraham Sheingold. Wide survey of principles and methods used in sound broadcasting, television, facsimile, multiplex systems, radar and loran. Pp. 442+v; Figs. 332. Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2. Price 40s.

MARCONI communication systems



serve mankind

Communications . . . across the wastes of desert and ocean, and through impassable swamps and jungles . . . were largely unsolved until Marconi invented the miracle of radio. At one stroke he substituted ease for difficulty, and opened up a new era in the history of

man. For over 50 years the Company which Marconi founded has made communications its business. Its experience in this field is unique. If you have a communications problem of any sort, anywhere, Marconi engineers are entirely at your service.



SURVEYED



PLANNED

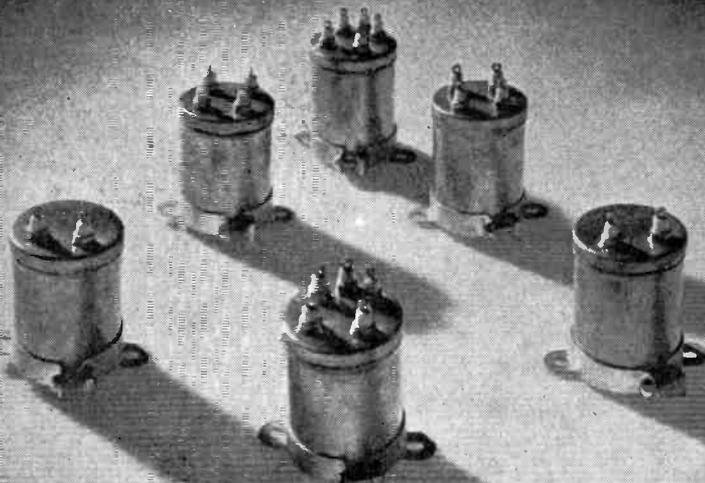


INSTALLED

MARCONI'S WIRELESS TELEGRAPH COMPANY LTD • CHELMSFORD • ESSEX

GAS-TIGHT HYPERLOY A.F. TRANSFORMERS AND CHOKES

The widely-used HYPERLOY range of over 100 Specifications is now available in hermetically-sealed containers, capable of withstanding the most rigorous climatic conditions.



Also available in similar gas-tight containers, a series of bi-limboid Transformers having balanced hum-cancelling windings for use in situations demanding the lowest hum-levels without recourse to expensive mumetal screens.

WRIGHT & WEARE LTD

138 SLOANE STREET

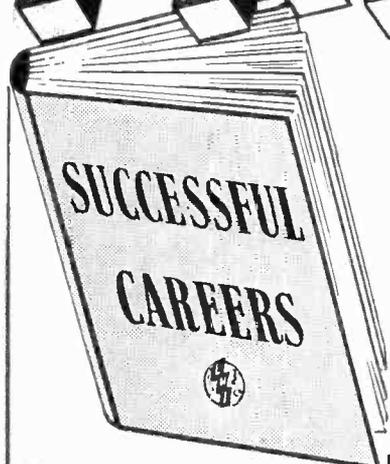
LONDON, S.W.1.

SLOne 22 4-5

FREE

THIS VALUABLE BOOK

which details the wide range of Engineering and Commercial courses of modern training offered by E.M.I. Institutes — the only Postal College which is part of a world-wide Industrial Organisation.



Courses include training for :

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

POST NOW

Please send, without obligation, the above FREE book
E.M.I. Institutes, Dept. 16,
43 Grove Park Road, Chiswick, London, W.4.

Name

Address

EMI INSTITUTES
associated with

**MARCONIPHONE
COLUMBIA &
H.M.V.**
(His Master's Voice, etc.)

COURSES
FROM

£1

PER MONTH

YC 10E

Resonance Curves

Some Things the Textbooks
Don't Always Explain

By "CATHODE RAY"

THE popular idea of learning a subject, I suppose, is that one begins at the beginning and goes on to the end; then one knows that subject. Like most popular ideas, it is wide of the mark. There is so much in almost any subject that on that plan one wouldn't be able to see the wood for the trees. It is better to tackle it first in very broad outline. In a first book, the subject should be simplified, with all the small detail left out. That is all right so long as one realizes that it is simplified, and does not imagine that one "knows it all." Having absorbed

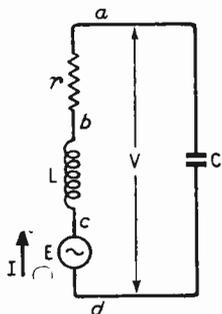


Fig. 1. Simple series tuning circuit. Resonance (meaning maximum current I for a given e.m.f. E and resistance r) occurs when the reactances of L and C are equal.

an elementary book, one can go over the subject again in a more advanced book, to fill in the detail.

The subject in mind, of course, is radio. And however simple and elementary the book, one thing it is bound to include is resonance. But the elementary book simplifies the matter, and if its exposition is taken as the whole truth there may be some confusion when one comes up against the bigger textbooks. Series and parallel resonance, for instance; the trouble is that either one may be led to suppose that they are quite different things, or alternatively one may be puzzled to understand why, if they are basically the same, the frequencies of series and parallel

resonance seem to be different.

First of all, shall we recapitulate the kind of information about resonance that one can expect in an elementary book? If it is any good at all it will have already explained how capacitance and inductance impede alternating currents, and that the amount of their impedance is called reactance, and that the amount of inductive reactance is $2\pi fL$ and capacitive reactance $1/2\pi fC$. It will also have explained that reactance is reckoned in ohms, like resistance, but that whereas the e.m.f. needed to drive a current through resistance is in phase with that current, the e.m.f. to drive current through an inductive reactance is a quarter of a cycle (or 90°) ahead of the current, and the e.m.f. to drive current through a capacitive reactance is quarter of a cycle behind the current. So if there are both inductive and capacitive reactances in series, carrying the same current, the voltages across them are two quarters of a cycle (or 180°) out of phase. The total voltage is therefore not the sum of the two (as it would be if they were resistances) but

the difference. So if inductive reactance is reckoned as positive, capacitive reactance is negative, and the total reactance is equal to the difference between the two. If they both happen to be present in equal quantities, the difference is of course nil, and the circuit as a whole behaves as if it had no reactance at all. When an e.m.f. is applied the current is limited only by the resistance, so if the resistance is small the current is large. The large current passing through the two reactances causes large and equal (but opposite) voltages across them, and it is possible for these voltages to be many times greater than the e.m.f. applied—a very useful thing in radio receivers, particularly as voltages of other frequencies are not magnified to this extent, because at other frequencies the reactances are not equal. One has only to look at the formulæ given above to see that rising frequency increases the inductive reactance and decreases the capacitive reactance. And of course vice versa. The condition for greatest current—resonance—is found by making the two reactances equal:

$$2\pi f_r L = \frac{1}{2\pi f_r C}$$

from which, by applying the processes of simple arithmetic, one arrives at the well-known formula

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

The little r at the foot of f is to show that this is not just any frequency but the particular one that causes resonance.

The explanation in any given elementary book may be quite a lot different from this; for one thing, I hope for your sake it would be presented in a form more easily taken in than my very condensed recap. But it would have to amount to the same thing. Just to clinch the matter, here in Fig. 1 is the conventional way of showing a series tuned circuit, in which E stands for the applied alternating e.m.f., and r is the series resistance of the whole circuit at the frequency of E . In most practical tuned circuits r is mainly the resistance of the coil that provides the inductance L ; the part that represents the capacitor loss is usually so small that in a simple study it is neglected. I , as usual, stands for the current; and V is the voltage across C . At resonance there is an equal voltage across L , but one can't actually get at it because L is mixed up with r ; the voltage across

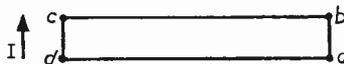


Fig. 2. Vector diagram showing the relative potentials of a , b , c , and d in Fig. 1 at resonance and the relative phases of the voltages between them.

the coil is the one between *a* and *c*. V/E at resonance is the voltage magnification.

Seeing that *I* is alternating, it may look a little silly to have an arrow alongside pointing in one direction, but this (like the letters *a—d*) is to link up with the vector diagram, Fig. 2. This may not be the sort of vector diagram you have been taught, but I think it has sufficient advantages to be worth knowing; the advantages and method of use are explained in the February, 1951, issue, pages 61 to 65. Fig. 2 shows that at the instant when the current is flowing in the direction of the arrow in Fig. 1 the voltage from *d* to *c* (V_{dc}) is in phase with it, and so is the voltage V_{ab} , which is the voltage applied to *r*, reckoned from *a* to *b* via *d* and *c*. The voltage applied to *L* is V_{bc} (in the direction of the current, via *a* and *d*) and Fig. 2 shows that it leads the current by 90° . The equal V_{bc} against the current (i.e., through *L* itself) is the voltage generated in *L* by the current. Fig. 2 also shows that $V_{bc} = V_{ad}$, so it represents the condition of resonance.

Conventional Curve

The elementary book may not venture on any kind of vector diagram, but it will certainly contain something like Fig. 3. This, I hardly need say, is what is commonly called a resonance curve, showing that in Fig. 1 the current reaches a peak at the frequency f_r which makes V_{bc} and V_{ad} equal and opposite, because this leaves the whole of *E* free to drive current through *r*. At zero frequency there can be no current, for then *C* has an infinite impedance. And at frequencies much greater than f_r the impedance of *L* is very high and is only slightly offset by the small high-frequency impedance of *C*. So the general shape at least of Fig. 3 is easy to explain and understand without any recondite vectors or mathematics.

In practice one is more interested in voltages than currents. The voltage across any impedance is of course equal to the impedance multiplied by the current passing through it—assuming no e.m.f. is being generated within it. Now although the same current passes through *L* and *C* in Fig. 1, it is only at resonance that their impedances are the same, so at all frequencies other than f_r the voltages across *L* and *C* are different, and therefore the shapes of their resonance curves must be different. Fig. 4 shows curves calculated for a particular tuning circuit, in which $L = 199\mu\text{H}$, $C = 199\text{pF}$, and $r = 200\Omega$. It is only fair to say that these curves are rather artificial; first, because *r* (which incorporates all the r.f. losses as well as the actual resistance of the wire) certainly would not remain the same at all frequencies from 0 to 1,600 kc/s. Assuming, as we do, that it is 200Ω at f_r , however, it wouldn't actually make much difference to the curves even if it did differ as much at other frequencies as it would in

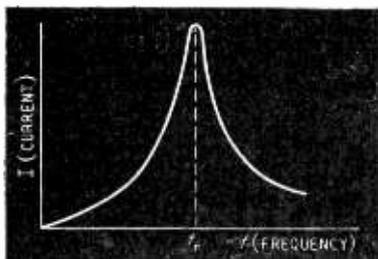


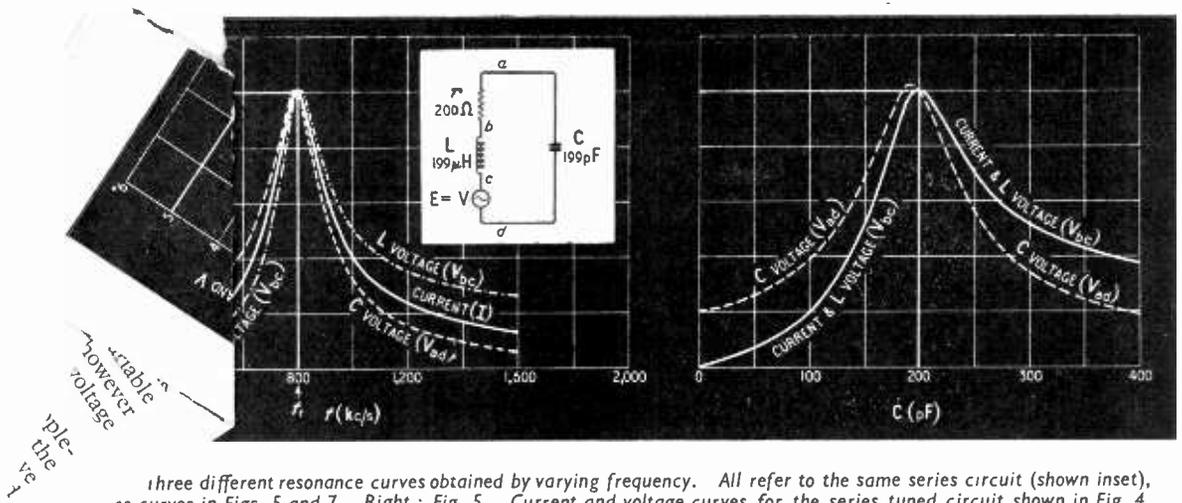
Fig. 3. Typical resonance curve. The fact that this is only one of many resonance curves that can be drawn for a given tuning circuit is not always realized.

practice. Secondly, as I have just said, one can't get at V_{bc} —the voltage across *L*. V_{ac} —the voltage across the coil, assuming *E* is generated outside the coil—is so little different from V_{bc} that it couldn't be shown clearly; V_{ab} is "at right angles" to V_{bc} so doesn't add much to it—see Fig. 2, where the distance from *a* to *c* is almost the same as from *b* to *c*. If *E* is generated within the coil, as it would be if the coil were inductively coupled to the signal source, the terminals of the coil would be *a* and *d*, the same as for the capacitor, so in this case the voltage across the coil would obviously have to be the same as across the capacitor. From now on, references to voltage curves will mean voltage across *C*, unless stated otherwise.

The thing about Fig. 4 that is most likely to startle people who are still at the elementary book stage—that is, if it shows up on the reduced scale of the printed copy—is that the peak of the voltage curve is not at f_r ! Although the difference in the positions of the peaks is small there is no doubt that there is a difference. And in practice resonance is nearly always located by the voltage peak, not the current peak. It may seem rank heresy to say that the frequency of resonance, as normally observed in a pure and simple series tuning circuit, is not $1/2\pi\sqrt{LC}$, but there it is. Moreover, since the voltage peak at this apparent resonant frequency is higher than at the theoretical f_r , the voltage magnification is higher than *Q*! It is well known that magnification and *Q* are not quite the same when *L* is complicated by self-capacitance, but that they differ even in this ideal case may come as something of a shock.

To reassure any readers who feel that their foundations are giving way, I will remind them that the discrepancy needs a fairly large-scale diagram to show it clearly, even though the tuning circuit under consideration has an exceptionally low *Q*—5 to be exact. In any typical tuning circuit *Q* would be 50 or more, and the discrepancy—which varies inversely as the square of *Q*—would be utterly negligible. Still, even though the speck of dust may be invisible to the naked eye, the thought of it existing where immaculate cleanliness was expected may be disturbing to the scrupulous mind. So the first thing to remember is that ideal simplicity and perfection of resonance— $f_r = 1/2\pi\sqrt{LC}$, $X_L = X_C$, phase difference between voltage and current = 0, total circuit impedance = *r*, $V/E = Q$, and all that—applies only to the simple series circuit (Fig. 1) and current maximum. Voltage maximum occurs at a different frequency, though the difference is negligible unless *Q* is abnormally low, so this particular discrepancy does not affect the practical use of a *Q*-meter. It is otherwise if the series circuit is complicated by parallel paths, as it always is in practice. Some of these, such as leakage across *C*, are usually negligible; but self-capacitance, which can fairly well be represented as a small lump of capacitance between *a* and *c* in Fig. 1, is often not. I dealt with this particular problem in the July, 1949, issue, so will not repeat the details now, but only point it out as something extra that has to be taken into account in practical resonance calculations.

We had better take a last wistful glance at Figs. 1—3 before passing on, for nothing else is so sweetly simple. What makes series current resonance so ideal is that the frequency at which it happens is not affected at all by the value of *r*. When the whole circuit resistance is reckoned as a simple series element



Three different resonance curves obtained by varying frequency. All refer to the same series circuit (shown inset), the curves in Figs. 5 and 7. Right: Fig. 5. Current and voltage curves for the series tuned circuit shown in Fig. 4, obtained by keeping the frequency at 800 kc/s and varying the capacitance.

like this it makes no difference how much of it is considered to belong to L and how much to C. If you are thinking that Fig. 3 falls short of perfection because it is unsymmetrical, you must remember that it is really the frequency scale that is unsymmetrical. The proper figure to set against 1,600 (which is twice f_r) is not 0 but 400 (which is half f_r). This can be done by using a logarithmic frequency scale, and then the current curve is perfectly symmetrical.

The case illustrated in Fig. 4—voltage against varying frequency—is far from being the only other kind, but it is a particularly unpleasant one mathematically. I will spare you the gruesome details and only quote one of the results—the frequency of apparent resonance, which we can call f'_r , is given by

$$\omega_r'^2 = (2\pi f'_r)^2 = \frac{1}{LC} - \frac{r^2}{2L^2}$$

This is the same as for f_{r_2} except for the addition—or rather subtraction—of $r^2/2L^2$. There is no need to try to remember this, but it may be interesting to compare with the corresponding formula in the next case, which is the type of resonance curve obtained when f is kept constant and C varied.

This is illustrated in Fig. 5, which for ease of comparison refers to the same particular circuit as Fig. 4. The current has a very similar shape, except that it is rather broader; in fact, within about 10% of resonance it is almost exactly twice as broad. But it is not symmetrical, even with a logarithmic scale of C. Being a series current curve, it has its peak dead on $f_r = 1/2\pi\sqrt{LC}$, and there is no question of difference between magnification and Q. Because the frequency is kept constant, the reactance of L is constant, and so is r (even in practice), and therefore the voltage across the coil is exactly proportional to the current. So the I curve will do as a V_{bc} curve. But of course we shall need a separate V_{ad} curve because C and consequently its reactance is varying. This voltage curve shows a more pronounced off-current-resonance peak than in Fig. 4, and it rises noticeably higher. But it is not something to be shunned on that account. It is a most interesting curve. For one thing, on a linear scale of C it is perfectly symmetrical. That being so, if C_1 and C_2 are the capacitances at any pair of points on the two

slopes where the voltage is equal, their average, $\frac{1}{2}(C_1 + C_2)$, is the capacitance at apparent resonance C'_r . It can be found more exactly in this way than by trying to decide which is really the top of a rather flat peak. What is more important, the true Q (not the magnification) can be found from these capacitance readings. The simplest calculation is when they are taken at the two points where the voltage is $1/\sqrt{2}$ or 70.7% of the peak voltage, for in that case

$$Q = \frac{C_1 - C_2}{C_1 + C_2}$$

This is actually one of the commonest and most reliable methods of measuring Q. As a matter of fact the same formula applies to the current curve, but current is usually less convenient to observe, and if there is any parallel resistance it causes complications, which it does not in the voltage case. Another difference—obvious in Fig. 5—is that the capacitance at the peak of the current curve is *not* the average of the two equal-current capacitances.

The fact that the current curve conforms to the equal-reactance or $f_r = 1/2\pi\sqrt{LC}$ or $\omega^2 = 1/LC$ condition for resonance means that the voltage curve does not, for although the frequency is the same for both, the capacitance at apparent resonance is not. The relationship is, in fact,

$$\omega^2 = \frac{1}{LC} - \frac{r^2}{L^2}$$

so the “discrepancy” to subtract from the normal $1/LC$ is twice as much as in the frequency-variation case. There is an interesting thing about this formula, but the meaning of it will be clearer later on.

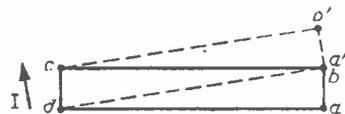
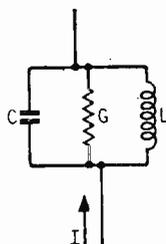


Fig. 6. The dotted lines show how the vector diagram of Fig. 2, which relates to the condition at the current peak in Fig. 5, is affected by altering the capacitance to reach the voltage peak in Fig. 5. The current, which is necessarily in phase with a^1b^1 , is no longer in phase with the e.m.f., represented by the vector dc .

Fig. 9. The calculation of Fig. 8 at any given frequency is greatly eased by representing the whole resistance as a parallel conductance G , L and C in this case being the equivalent parallel values. The circuit is then the "dual" of Fig. 1.



resistance is equivalent to almost the same reactance in parallel with a relatively very large resistance.

Now you remember I said it was interesting that the capacitance giving voltage resonance across itself in a series circuit with constant frequency $\omega/2\pi$ could be calculated by the equation

$$\omega^2 = \frac{1}{LC} - \frac{r^2}{L^2}$$

Well, if you use the series-to-parallel conversion given above to convert L and r in this equation (which are series values) to their parallel equivalents, you find that it reduces to

$$\omega^2 = \frac{1}{L_p C}$$

which is the same thing as our normal $f = 1/2\pi\sqrt{LC}$. In other words, the normal resonant frequency formula, in which resistance plays no visible part, holds good for parallel circuits as well as series circuits, provided that the L and C in it are parallel values. I say resistance plays no *visible* part, but of course if the circuit is actually made up as in Fig. 8 the resistance does play a hidden hand by causing a difference between the values of L in Fig. 8 and L in Fig. 9. The usual formula for parallel resonance (which is the same as that for series voltage resonance with capacitance variation) does bring in resistance, but that is because it is based on Fig. 8, not Fig. 9.

Why should it be based on Fig. 8, seeing that all the facts and formulæ relating to the completely parallel arrangement of Fig. 9 are identical in form with those that have been found for the completely series arrangement of Fig. 1? The reason is that unfortunately for calculations the physical nature of a tuned circuit is much more like Fig. 8 than Fig. 9. That, of course, is still only an approximation. A better imitation can be made up by putting in both series and parallel resistance—but the effect on the mathematics is highly discouraging. And even then the paper circuit wouldn't act quite like the real one, particularly if frequency varied, because resistance varies quite a lot with frequency.

So at this late stage I am not going to go through all the combinations of the parallel circuit, but leave it for anyone who is sufficiently interested to work them out from the given series set by duality. After all, the elementary book is quite right in saying that ordinarily the effects of resistance on the frequency of resonance and the shape of the resonance curve are small enough to be neglected. The trouble is that one gets so used to neglecting resistance effects that when the odd occasion turns up in which Q is very small one is likely to forget that the well-known rules are only approximations and be led far astray. Or even if one is aware of the danger there is some difficulty in finding a book that gives information on low- Q resonant circuits reasonably clearly and concisely. So I shall just finish with a summary:—

(1) The relationship between f , L , and C at resonance, and the shape of the resonance curve, depend on which of these is varied in order to obtain the curve, and on which voltage or current is observed, and whether L , C , and resistance are in series or parallel or a combination of both. Resonance is regarded as maximum (or minimum) voltage or current; with parallel resonance, this does not go along with zero phase angle.

(2) The normal relationship at resonance is inductive reactance ($2\pi fL$) equal to capacitive reactance ($1/2\pi fC$), a relationship that can be expressed alternatively as $\omega^2 = 1/LC$ or $f = 1/2\pi\sqrt{LC}$. This applies exactly to series current resonance, Fig. 1 (and therefore also to C-voltage when L is varied); and to parallel voltage resonance *if all the circuit resistance can be reckoned as in parallel*, Fig. 9—but this is not a practical condition except when C —(assumed free from resistance) is the variable.

(3) Series C-voltage resonance with variable C also conforms to the normal relationship *if L is the equivalent parallel value*. For any given series value of L , this depends on the series resistance r ; so if the series value is used (either for series or parallel C voltage resonance) the normal equation is altered to $\omega^2 = 1/LC - r^2/L^2$.

(4) Series C-voltage resonance occurs at a different frequency still when frequency is the variable, the relationship being $\omega^2 = 1/LC - r^2/2L^2$.

(5) The simple formula $Q = (C_1 + C_2)/(C_1 - C_2)$ is useful in measuring Q , C_1 and C_2 being the values of C at the two points where the voltage at resonance is divided by $\sqrt{2}$. This applies to series or parallel C voltage resonance, which occurs at $C = \frac{1}{2}(C_1 + C_2)$. Q can also be measured by varying f , the formula (which is theoretically not exact but is quite good enough for nearly all purposes) being $Q = f/(f_1 - f_2)$.

(6) Even when boiled down to these main facts it all sounds appallingly complicated, so the final comforting reminder is that with typical values of Q —50 or more—the error due to using the normal formula ($f_r = 1/2\pi\sqrt{LC}$) for everything would seldom be more than 1 in tens of thousands. Where Q is low, you are safe in sticking to current resonance in the simple series circuit, to which the normal formula applies.

Since writing the above I have seen the Army Handbook of Line Communications, Volume I, in which the various resonance conditions are set out most clearly and comprehensively on pages 227-230. Incidentally, in this book resonance is defined exclusively as the condition of zero phase difference between e.m.f. and current.

BRITISH TELEVISION

THE 80 or more papers presented at the Convention on the British Contribution to Television, organized by the Radio Section of the I.E.E. last April, are being published in four special issues of the *Proceedings of the Institution*—Part IIIA, numbers 17-20. The first issue, No. 17, covers the opening session, the papers on the history of television and programme origination and summaries of all the papers presented at the Convention. It costs £1. No. 18 includes the papers and discussions on stations, propagation and point-to-point transmission, No. 19 on receiving equipment and No. 20 on industrial television and general system aspects. These cost 15s each. The complete set (800 pp) costs £3 3s.

NETTING

By H. B. DENT*

Shared Frequency System of Radio Communication

THE expression "net" or "netting" as applied to radio communications is thought to have its origin in Army signal circles, the principle being that all fixed and mobile stations in a particular group send and receive on the same frequency. Group in this connection does not refer, of course, to any recognized formation, but merely to a random collection of stations.

Needless to say, the saving in radio frequencies can be very considerable, especially when a large number of groups are operating over the same terrain, but most important of all, the working frequency of any group can readily be changed if it is causing interference to, or is being interfered with by, other services.

Another advantage of the scheme is that any station in a group can call any other in the same group in the knowledge that the station will not be listening on some other frequency.

Control of Nets

The weakness of the scheme is that, as no more than normal precautions are usually taken to stabilize the frequency of transmitters and receivers, there is a risk that stations may drift away from the working frequency if too long a time elapses between transmissions. In practice this is a remote possibility, as most nets of this kind have a master or controlling station whose duty it is, among other things, to keep a check on conditions and make co-ordinating transmissions periodically during quiet periods.

This type of radio net is a very flexible one, as it can change frequency at will, bring in other stations as required, deflect some to other duties, or disperse

the net and allow each station to operate independently.

Certain mobile systems, such as police, fire, taxi and business radio, while operating on fixed frequencies, do not as a rule adopt the single frequency system of operation; moreover, they are tied to a particular frequency by quartz crystal control of transmitters and receivers and by licence restrictions in some cases. These services are all in the v.h.f. bands, whereas the nets we refer to here are to be found in the h.f. bands up to and including 160 metres.

Amateur Nets

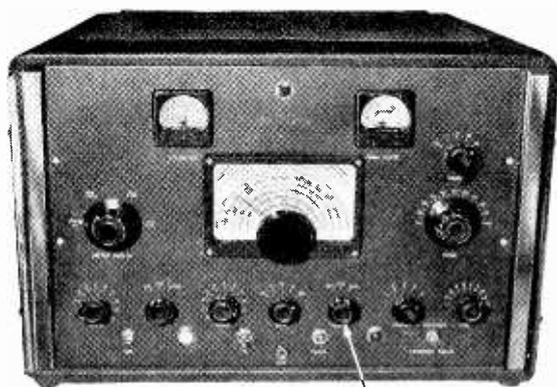
One reason for bringing up the subject here is that the netting system of operation is widely used by amateurs not only in this country but in many parts of the world. Anyone possessing a receiver with a so-called trawler band covering about 100-200 metres will frequently encounter amateur nets on 160 metres, especially on Sunday mornings, while with a good communications set overseas nets can be found in most amateur bands receivable in this country, but in particular in the 80-metre one. Local nets use telephony as a rule but long-distant stations participating often employ telegraphy.

Some idea of the world-wide extent of amateur radio nets can be gauged by the fact that the well-known American amateur journal *Q.S.T.*, publish a radio net directory giving details of nets on all frequencies from 1.8 Mc/s to 145 Mc/s.

In order to participate satisfactorily in a radio net special provision has to, or should, be made, and this generally takes the form of an arrangement of the transmitter switching to enable the master oscillator, or VFO, to be switched on while receiving and its frequency adjusted exactly to that of the received station.

The master oscillator is used as a BFO to heterodyne the distant station's carrier, but in this case its frequency is set for zero beat. This requires that very little signal be injected into the receiver from the VFO as the received signal must not be swamped and any of the message wiped out by excessively strong local oscillations.

Very effective screening of both transmitter and receiver is necessary, and it is also essential to avoid radiation from the aerial of the VFO signal. The screening problem should not be a particularly difficult one, as it is becoming more and more necessary for amateur transmitters to be well screened and filtered to prevent radiation of harmonics likely to interfere with television. Such TVI-proof transmitters will easily be modified for netting operations, one switch marked "Net" being the only additional item required in most cases.



NETTING SWITCH

A switch position is provided on the control panel of the Panda PR120V amateur transmitter for "netting".

*Amateur radio station G2MC.

Microphony in Superhet Oscillators

By H. STIBBÉ,*

A.M.Brit.I.R.E.

Part 2—How it Can be Cured

FROM the discussion in Part 1 last month it will be clear that the tuning capacitor is a very susceptible component in the oscillator circuit, and that attention must be given to its mechanical design and mounting. The two main requirements are rigidity of the frame, stator and rotor assembly, and a minimum of asymmetry in the rotor and stator spacing.

Practical experience has shown that airborne mechanical excitation of the tuning capacitor almost never occurs. The main paths for the transmission of mechanical vibrations are (a) via the leads to the capacitor, (b) via the chassis, and (c) via the drive to the capacitor.

Rigid leads should never be used for connection to the stator and rotor assemblies. The leads should be as flaccid as possible and just slightly longer than the shortest distance between their points of connection. Leads of the type used for connection to the speech coils of loudspeakers are eminently suitable. Alternatively, leads with only a few strands, covered with a thin wall of p.v.c. Narrow strips of copper foil have also been used successfully by the author.

In order to isolate the tuning capacitor from chassis vibrations a flexible suspension is required. This can be achieved with soft rubber or p.v.c. grommets, or metal springs. Rubber grommets are perhaps the most popular because of their cheapness and simplicity. However, they must be used with care, for if the screws securing the tuning capacitor to the chassis compress the grommets considerably, they then afford little or no flexible support for the capacitor, as in Fig. 5, and may be virtually useless. The chassis vibrations, with this attempted support, may be carried to the capacitor via the now hard grommet and the securing screw. (Only one securing screw and grommet are shown for clarity.)

Fig. 6 (a) shows a screw which is suitable for securing the capacitor without severely compressing the grommet. Dimension "A" should be about 0.001in less than the inside diameter of the grommet, and dimension "B" should be about 0.001in greater than the height of the uncompressed grommet. The hole in the chassis into which the grommet is placed is made about 0.001in greater in diameter than the outside diameter of the grommet at its waist.

Fig. 6 shows this screw, in conjunction with a grommet, securing a capacitor to the chassis (at one point). The clearances between the shoulders of the screw (at either end of its waist) and the inside of the grommet, and between the face of the screw under its head and the lower face of the grommet, have

been exaggerated for clarity. The only compression of the grommet is by the weight of the tuning capacitor. The screw does not touch the grommet, so that most of the chassis vibrations are absorbed by the upper portion of the grommet. For the same volume of rubber, a grommet with a waist placed asymmetrically between its faces, and positioned in the chassis hole with the thicker portion of rubber between the chassis and the tuning capacitor, affords better protection than a grommet with the waist placed symmetrically between the faces.

The practical difficulties with this type of mounting in production are the large tolerances on the nominal dimensions of the grommet. If dimension "A" is made 0.001in less than the lower tolerance of the inside diameter of the grommet, and if dimension "B" is made 0.001in greater than the upper tolerance of the height of the grommet, then with grommets having adverse tolerances the tuning capacitor can wobble on the mounting, which is dangerous in transport and gives tuning backlash. The dimensions of the screw have to be a compromise between the grommet tolerances. Then, with a grommet which fouls the outside of the screw, this occurs at only a small portion at each end; the compression between the screw head, the chassis and the

* Bush Radio, formerly Philips Electrical (Mitcham Works).

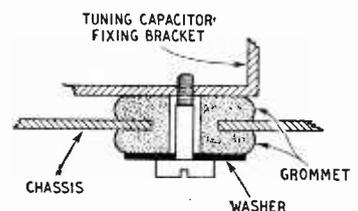
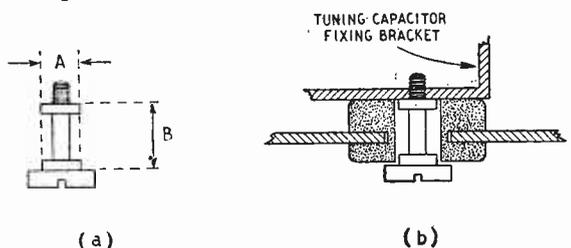


Fig. 5. How grommets can be used as flexible supports to isolate the tuning capacitor from chassis vibrations.

Fig. 6. At (a) is a type of screw which will not compress the grommet; (b) shows how it is used in conjunction with the grommet.



tuning capacitor with the worst-fitting grommet will be far less than that of the mounting of Fig. 5.

A disadvantage of rubber grommets is the hardening which occurs after a period of time in tropical climates.

When the tuning capacitor is mounted on rubber or p.v.c. grommets, it is important to provide a good r.f. earth connection, as the grommets are, of course, insulators. It was for this purpose that the author used copper foil leads: owing to their rectangular cross-section their r.f. resistance at frequencies of the order of 15-20Mc/s was much lower than that of stranded wire leads. Their use increased the oscillator grid current by approximately 30 per cent on that obtained with stranded wire leads.

Spring Wire Mounting

An interesting method of mounting the tuning capacitor, developed by Philips of Eindhoven, is with two specially shaped springs made of piano wire. Each spring, as shown in Fig. 7, acts as a pair of flexible feet, the lower ends of which are secured by screws to the chassis; the upper ends are screwed into the sides of the tuning capacitor mounting plate. In assembly, the springs are screwed to the mounting plate, and when the assembly is placed on the chassis the screws securing the loops at the lower ends of the four feet should all be capable of being aligned simultaneously with the four holes in the chassis. Thus the springs can be screwed to the chassis without distortion, and provide the tuning capacitor with a resilient mounting. The resonant frequency of the mounting is below 30c/s, so that no appreciable

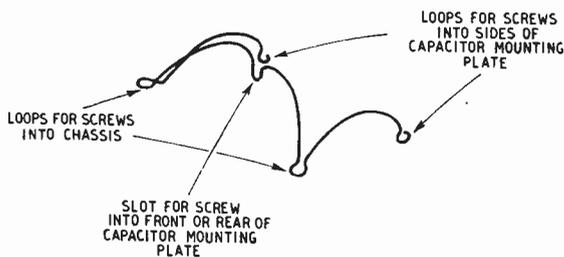


Fig. 7. Flexible spring support made of piano wire. Two are needed for mounting a tuning capacitor.

energy at frequencies which are reproduced efficiently by the speaker can be transmitted by the mounting. A plan view of a typical mounting of this type is shown in Fig. 8.

If a taut wire or cord drive compresses the flexible mounting of the tuning capacitor, whether it be by means of grommets or any other method, much of the intended protection of the mounting may be destroyed. When the drive wire (or cord) enters and leaves the drum on the capacitor spindle on different tangents, as in Fig. 9 (a), the tension in the wire from both sides of the drum will exert a force on the capacitor in the direction of the arrow, and this force will compress the grommets or other mounting. If, however, the wire enters and leaves the drum on any common tangent, as in (b), the resultant of the two tensions can serve only to turn the drum until the tensions become equal in magnitude, and no distortion of the mounting will be caused.

With any form of flexible mounting the torque of the tuning capacitor should be as small as possible, or the capacitor may move on its mounting before the spindle turns, thus causing tuning backlash.

Assuming appropriate precautions have been taken with the tuning capacitor, attention must be paid to other components in or physically near the oscillator circuit. Fixed capacitors should be soldered into the circuit with the shortest of leads. It may be necessary to use flaccid leads of the type mentioned above for wiring to the more susceptible components, e.g., grid and/or anode coupling capacitors. A moderately heavy lead may be "dressed" against a very troublesome component in order to prevent it from vibrating, but this method must be used with care and reserve, or more harm than good may result.

In bandspread receivers two popular methods of achieving the bandspreading are (a) connecting a fixed capacitor in series with each section of the tuning capacitor, and (b) using a tuning capacitor with only a few rotor and stator plates, so that it has a small maximum capacitance and the minimum capacitance remains almost unchanged.

With the first method, the capacitor in series with the oscillator section of the tuning capacitor may be very susceptible to vibration (thus altering its capacitance to earth), particularly if its value is small compared with the capacitance of the tuning capacitor. Whether either of these two methods of bandspreading are used, the wiring and components near the oscillator circuit become more critical (vibration of the latter may alter the capacitance to earth of some nearby component in the oscillator circuit) because the total circuit capacitance may be smaller at a given frequency than without bandspreading, and the change in this capacitance required to produce any given change in frequency will be smaller. Components in the oscillator circuit, other than the tuning capacitor, when taking part in the production of microphony often cause a microphonic howl of the order of 100-200 c/s.

The oscillator valve, almost always combined with the frequency changer in domestic receivers, is, of course, very susceptible to microphony, as vibration of the electrodes, particularly the grid and the cathode, will cause changes in the input (or output) capacitance. This danger is well realized by valve manufacturers and designers, who try to make them as sturdy as possible. Nevertheless, trouble is sometimes experienced, and the usual cure (or palliative) is to mount the valveholder on uncompressed grommets, in a

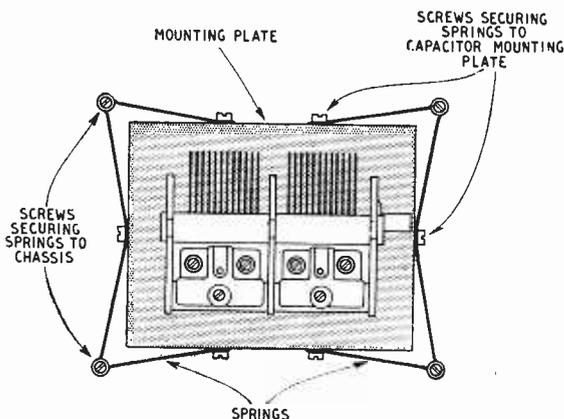


Fig. 8. Top view showing how a tuning capacitor is mounted on two of the springs in Fig. 7.

somewhat similar manner to the tuning capacitor. If the valveholder has a centre earthing contact, this should be earthed with a flaccid lead, again as with the tuning capacitor.

The chassis of the receiver should be mounted in the cabinet on uncompressed grommets in order to minimize transfer of mechanical vibrations from the cabinet to the chassis.

The cabinet should, if the cost allows, be made of wood. If, however, a moulded cabinet is used, it should not be thinner than $\frac{3}{16}$ in at the thinnest part, or large-amplitude vibrations may be set up in it. It should be thickened up where possible, and the provision of webs may prove to be an advantage.

The holes in the cabinet for the controls should be a good clearance on the spindles, or the latter may bypass, to some extent, the rubber mounting of the chassis to the cabinet.

The author was engaged for over a year on the pre-production development of a bandspread double superheterodyne (in the Philips laboratories at Mitcham) which proved to have such a remarkable freedom from microphony that it is thought to be worth mentioning here.

This receiver had eight bandspread ranges, each with a frequency coverage of 500 kc/s; these were the normal short-wave broadcast bands of 11, 13, 16, 19, 25, 31, 41 and 49 metres. The essence of achieving freedom from microphony was in having a first local oscillator with a fixed frequency (one frequency for each band). Tuning was accomplished by ganging the first i.f. and the second oscillator circuits and tuning them simultaneously. (The aerial and r.f. circuits were fixed-tuned on each band, and were wide-band circuits.) As the first i.f. tuned from 2.75Mc/s to 3.25Mc/s and the second oscillator frequency was 452kc/s below this, it was quite easy to prevent microphony in the second oscillator circuit. Also, as the first oscillator had a fixed frequency and the ganged tuning capacitor was not included in this circuit, a compact layout and short leads on the fixed tuning capacitors were all that were necessary to prevent microphony occurring here.

Production receivers were capable of producing an output, on the bandspread ranges, of 6 watts in a high-efficiency speaker (5 per cent efficiency) without microphony occurring.

This was a very elegant but also very expensive solution to the problem of microphony on the short-wave bands.

Microphony-Free Output

In order to know the degree of freedom from microphony which a receiver possesses, a measurement may be made of the "microphony-free output." At any given frequency, this is the output which a receiver will produce, at a given level of input signal and modulation depth, without microphony occurring. At any slightly higher output than this microphony will be produced.

In order to make the measurement, the signal generator must be placed somewhere acoustically remote from the receiver, so that the output from the loudspeaker cannot affect the frequency of the signal generator in just the same manner as it does its own oscillator when microphony occurs. The measurement is made at a high level of output from the signal generator because the larger the steady voltage at the output of the detector the larger is the variation of

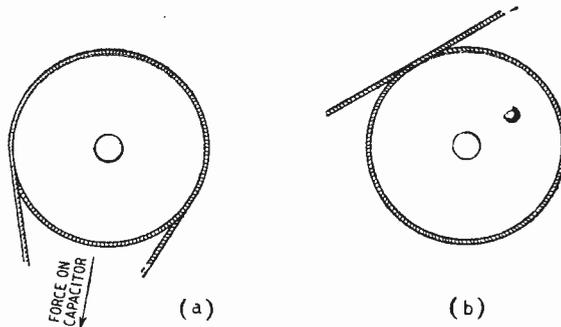


Fig. 9. Drum on the tuning capacitor spindle with drive wire entering and leaving on (a) different tangents and (b) a common tangent.

this voltage when frequency modulation of the oscillator is produced. An output level of 1-5mV is suitable.

First, the modulation is switched on in the signal generator in order to identify the signal when the receiver is tuned to it. Then the receiver is tuned to the signal from the generator and the modulation is switched off. The volume control of the receiver is then advanced, and the tuning control is rocked slowly on either side of the correct tuning point. Eventually microphony will start, and at this point the volume control is not advanced any farther.

The tuning control is then adjusted to the most susceptible position on one side of the correct tuning point which gives the worst microphony. On one side of the correct tuning position microphony is generally worse than on the other side, and the worst side has to be determined by experiment. The volume control is then turned back slowly until the microphony just ceases. The tuning control is readjusted on either side of the correct tuning position until microphony just commences again, and the volume control is once more turned back until this just ceases.

This process is continued until on readjustment of the tuning control no microphony will occur. At this last position, the cabinet should be tapped lightly and the volume control adjusted carefully with the receiver tuned to the most susceptible position, until a position of the volume control is found where a light tap on the cabinet will start a soft microphonic howl which will just die away, and where, if the control is advanced the slightest bit farther, a tap on the cabinet will start a microphonic howl which will gradually build up and eventually be sustained.

With the controls in the positions so determined, the modulation is switched on (30 per cent modulation depth), and the tuning control is then readjusted until an output power meter indicates maximum output. This output is called the "microphony-free output" of the receiver. As the measurement is a rather delicate one and requires some degree of personal skill, it is better, even when some experience has been gained, to repeat it two or three times and calculate the mean of the measurements. With care the "spread" of the measurements on any one receiver will not exceed 1-2 db.

If the microphony-free output is found to be of the order of the output of the receiver for 10 per cent distortion, the modulation depth on the signal generator should be reset to 10 per cent, the output re-measured, and this new output multiplied by nine

(since power is proportional to the square of the voltage across a resistance). A well-designed receiver should be capable of producing a microphony-free output upwards of twice the output which the set can provide at 10 per cent distortion. On the face of things, this may make the measurement appear to be an artificial one. However, it only means that if a receiver can produce more than its output for 10 per cent distortion free of microphony when receiving a signal modulated to a depth of 30 per cent, then it can produce undistorted (so-called) output free of microphony when the signal is modulated to a depth lower than 30 per cent, because in this condition the volume control must be advanced farther to produce any given output than when the modulation depth is 30 per cent.

If the measured microphony-free output of a receiver is not large enough, it will be necessary to trace the troublesome component(s). Suppose a howl of the order of 2 or 3 kc/s is produced; suspicion will probably fall on the tuning capacitor. In order to determine whether this is the culprit, its oscillator section should be disconnected and in its place a fixed capacitor with short leads in parallel with a trimmer substituted. If the leads are short these components cannot vibrate, and will be above suspicion. The receiver is then tuned to the signal by means of the trimmer, with the rotor of the tuning capacitor left in its original position, so that the aerial and/or r.f. circuits are not detuned. If microphony at the previously measured output level does not now occur, then the tuning capacitor was definitely playing a part in producing the microphony originally encountered. If, however, the microphony still persists at the same level, then the trouble is probably in the oscillator valve.

Let us assume that the microphony has disappeared. The mounting of the tuning capacitor and its drive must be carefully examined in order to determine a suitable remedy. On no account should the plates of the tuning capacitor be stroked or tapped to find out whether it is microphonic as this practice may seriously upset the ganging. If the capacitor is found to be taking part in producing the microphony it may be re-connected to the oscillator, and the drive wire removed. If microphony again disappears, the mounting has been cleared, and either the drive wire is transferring the mechanical vibrations or it is compressing the mounting. Again suitable remedies will have to be found, working on the principles already described.

Low frequency (100-200 c/s) howl, as mentioned previously, is often due to components other than the tuning capacitor vibrating in the oscillator circuit. These may be checked by adjusting the volume control to the position where microphony does not quite occur and then tapping the various components in turn lightly, until one is found which produces an output from the speaker of the same frequency as the howl at the threshold level.

This may be confirmed by advancing the volume control until microphony just occurs, then holding the suspected component still with an insulated stick and noting whether this stops the microphony or not. This must be done with great care, for if the extra capacitance added into the oscillator circuit by the stick should detune the oscillator, the microphony may cease. The slope of the i.f. response curve at the new i.f. produce by the detuning may be smaller and the microphony may cease purely on this account, thus

giving the false impression to the unwary that the faulty component has been located.

In order to achieve a sufficiently high microphony-free output, it may often be necessary to cure several sources. As each one in turn is cleared, another one causes trouble at a slightly higher level.

Consistency of microphony-free output in production can be achieved only by eliminating as many sources as possible, for the level at which each source produces microphony varies widely over a number of receivers of the same type because of the randomness of the individual causes.

At least six, and preferably more, receivers of any one type made under production conditions should be capable of giving 2-3 db more than the output required in production before it is considered that the design is a safe one from the point of view of microphony.

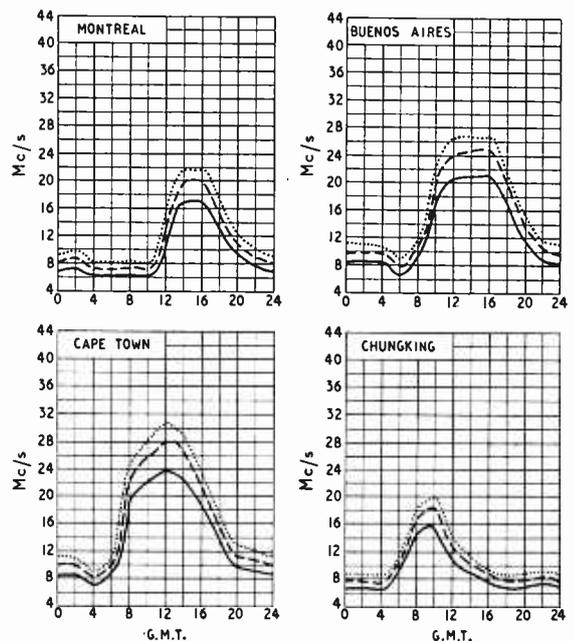
Thanks are due to T. E. Goldup, M.I.E.E., a director of Mullard, for his kind permission to describe certain designs originated in the Philips group of companies.

Short-wave Conditions

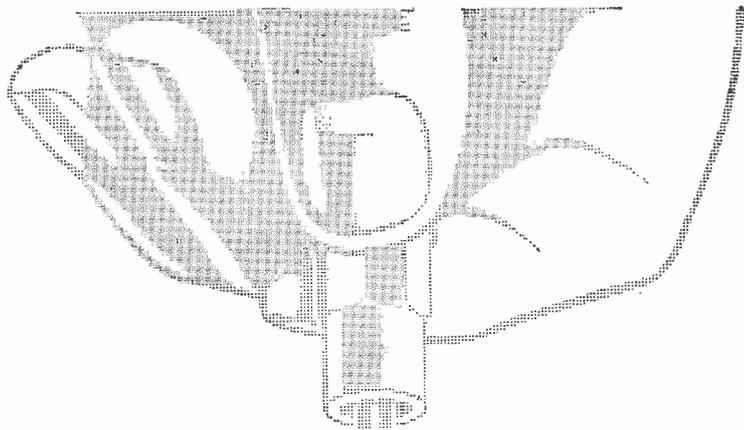
Predictions for January

THE full-line curves given here indicate the highest frequencies likely to be usable at any time of the day or night for reliable communications over four long-distance paths from this country during January.

Broken-line curves give the highest frequencies that will sustain a partial service throughout the same period.



— FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE ON ALL UNDISTURBED DAYS
 - - - PREDICTED AVERAGE MAXIMUM USABLE FREQUENCY
 FREQUENCY BELOW WHICH COMMUNICATION SHOULD BE POSSIBLE FOR 25% OF THE TOTAL TIME



EDISWAN



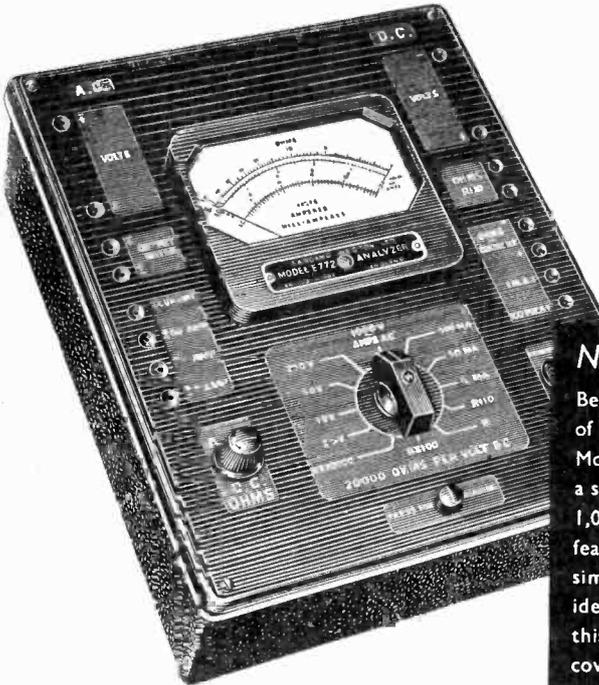
By adding the Clix range of radio, television and electronic components to its existing list of products The Edison Swan Electric Co., Ltd. is able to offer an improved components service to the radio industry. Future enquiries and orders for these products, and others in the Ediswan range, will be welcomed.

**United
for better
Radio, Television
& Electronic
component
service**

THE EDISON SWAN ELECTRIC COMPANY LIMITED
155 Charing Cross Road, London, W.C.2, and branches

Member of the A.E.I. Group of Companies

SR9



THE WESTON E772 Super Sensitive Analyser

No 10. Multi-Range Testing Instruments

Best known of all instruments for the testing and servicing of radio and television equipment is undoubtedly the Weston Model E.772 Analyser, a first-class portable instrument with a sensitivity of 20,000 ohms per volt on all D.C. ranges and 1,000 ohms per volt on all A.C. ranges. The additional features of wide range coverage, robust construction and simplicity in operation contribute toward making the E.772 ideal also for laboratory and research work. Full details of this instrument and also of the Model S.75—a Test Set covering 53 ranges—will gladly be supplied on request.

SANGAMO WESTON LIMITED - ENFIELD, MIDDLESEX

TELEPHONE: ENFIELD 3434 (6 lines) and 1242 (4 lines).

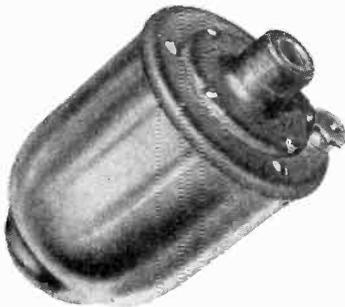
GRAMS: SANWEST, ENFIELD

Branches:	London Office:	St. Georges Court, New Oxford Street, W.C.1.	Telephone:	CHAncery 4971.					
GLASGOW	MANCHESTER	NEWCASTLE	LEEDS	LIVERPOOL	WOLVERHAMPTON	NOTTINGHAM	BRISTOL	SOUTHAMPTON	BRIGHTON
Central 6208.	Central 7904	Newcastle 26867	Leeds 30867	Liverpool Central 0230	Wolverhampton 21912	Nottingham 42403	Bristol 21781	Southampton 3328	Brighton 28497

TRUVOX

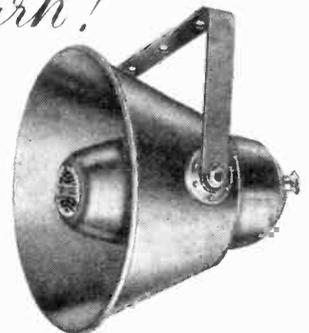
It Pays **A**s **Y**ou **E**arn!
EQUIPMENT

Profitable P.A. business is built upon a reputation for reliability which can only be based on the dependability of your equipment. That is why it pays to use only TRUVOX, the reproducers that have had reliability built into them for a quarter of a century.



TRUVOX PRESSURE TYPE DRIVING UNITS

Senior and Junior models have a power handling capacity of 15 and 10 watts respectively and provide a substantially linear response from 175 to 10,000 c.p.s. The Senior model is available with built-in tropicalised multi-ratio transformer, a noteworthy feature much appreciated by sound engineers.



TRUVOX REFLEX SPEAKERS

Senior models give a substantially linear response from 250 to 8,000 c.p.s. with a peak handling capacity of 8 to 10 watts whilst Junior models range from 350 to 8,000 c.p.s. with 6 to 8 watts peak handling capacity. Either can be supplied with built-in transformer. Completely weather-proofed and designed to withstand prolonged exposure and vibration.

For Full Details Write to :

ROLA CELESTION LTD., FERRY WORKS, SUMMER ROAD, THAMES DITTON, SURREY

*Phone: Emberbrook 3402-6.

Wholesale enquiries to—Truvox Ltd., Exhibition Grounds, Wembley, Middx. (WEM 1212)

"Surplus" Relays

Methods of Construction and Operating

Principles of Post Office Types

By T. DAWSON *

BECAUSE it is the most easily obtained, attention will be given mainly to the Post Office type 3000 relay which, owing to its general robustness and reliability, has been adopted as a standard on Post Office telephone equipment. This relay (Fig. 1) is assembled from six main component parts, the core, the coil, the yoke, the buffer block, the spring sets and contacts, and the armature.

The core consists of a rod of Swedish soft iron (or sometimes nickel iron), on to which is wound the coil. It is enlarged at one end to reduce the magnetic reluctance of the circuit between the pole face and armature, and turned down and threaded 2 B.A. at the other to provide a means of fixing the completed coil to the yoke.

The coil (Fig. 2) is wound on a fibre bobbin or a sleeve of paper fitted around the core, and may comprise up to four windings. They are terminated on tags affixed to the lower coil cheek and the number fitted depends upon the number of windings. In Post Office practice these tags, of which there are a maximum of five, are designated "a," "b," "c," "d" and "e," reading from left to right, with the relay contacts uppermost.

For single-wound coils, tags "a" and "e" are provided; "a" being the start of the winding. For double-wound coils, tags "a" and "b" are one winding and tags "d" and "e" the other. Tags "a" and "d" are the start of the windings. For triple-wound

coils, all five tags are provided: "a" and "c" are the start of two coils and "b" their common finish. Tags "d" and "e" are a separate winding. For quadruple-wound coils, all five tags are provided: "a," "b," "c" and "d" are the start of the coils and "e" their common finish.

The maximum dissipation of the coil is six watts, while the coil resistances vary over the range 0.1^{Ω} to $80,000^{\Omega}$. For normal work, where marginal operation in series is not required, coil resistances between about 200^{Ω} and $2,000^{\Omega}$ will be suitable and voltages between 12V and 50V will give satisfactory operation. The standard voltage on the main Post Office automatic exchanges is 50V, with variations of between 46V and 52V.

It is, of course, possible to rewind the relay coil

* Sound Diffusion Ltd.

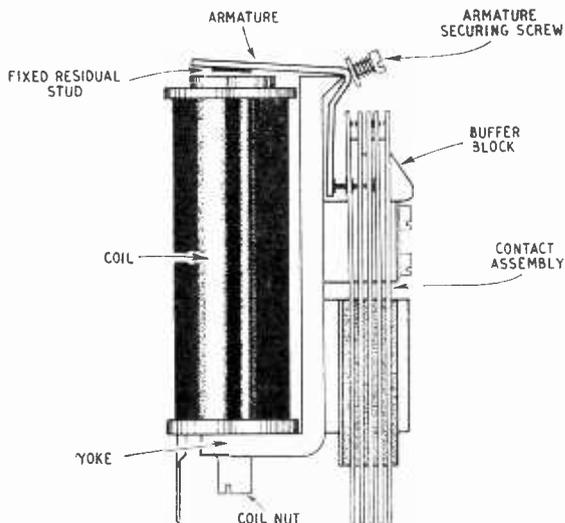


Fig. 1. General view of complete Post Office type 3000 relay.

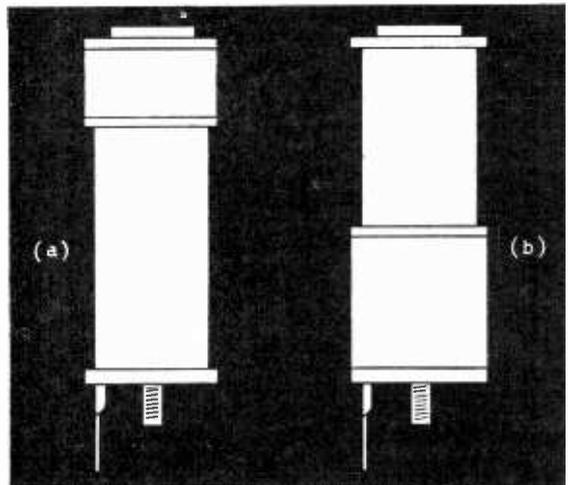


Fig. 2. The coil of the type 3000 relay, with (a) $\frac{1}{2}$ -in toe slug, (b) 1-in heel slug.

Fig. 3. Side view of the yoke of the relay (see Fig. 1).



to a different resistance, but for details of this the reader must be referred to the brief treatment given in standard telephony textbooks or to the Post Office graphs and data sheets, if these are available.¹

The yoke (Fig. 3) consists of an L-shaped piece of soft iron machined to a knife edge on the longer arm around which pivots the armature. In the shorter arm are provided a 2 B.A. clearance hole for fixing the coil and two tapped 4 B.A. holes for fixing the relay. In the longer arm are the fixing holes for the spring sets and buffer block, which are all either tapped or clearance 6 B.A. holes. A 7 B.A. tapped hole is provided in the knife edge for securing the armature by means of a special spring loaded screw.

The buffer block (Fig. 4) is a white synthetic block, provided with steps at intervals, against which rest the projections from the non-moving springs. This block is manufactured in various sizes, with various spacings between steps to accommodate the contact assemblies.

There are four types of contact assemblies found on relays, and they are:—

(1) "Make" spring set, Fig. 5 (a), which consists of two springs, one fixed and one moving.

(2) "Break" spring set, Fig. 5 (b), which also consists of two springs, but the one at the top of the pile is the moving one, as opposed to the one nearest the armature on the "make" set.

(3) "Changeover" spring set, Fig. 5 (c), which consists of two springs resting against the block and a centre moving spring that makes contact with the spring nearest the armature when the relay is inoperative.

(4) "Make-before-break" spring set, Fig. 5 (d), which consists of two fixed and one centre moving spring. The fixed springs are of standard length, but the lower one has a set in it to enable it to make contact with the upper fixed spring when the relay is inoperative. The centre spring, which is considerably shorter, does not normally make contact.

The contacts themselves are made in three different metals. Silver is the usual material, while tungsten is used for controlling circuits carrying currents of up to five or more amperes. Platinum contacts are always found in circuits that possess considerable inductance, such as unselector magnet circuits, where there is a danger of arcing and damage to the contacts when the circuit is interrupted. Their high cost makes them unsuitable for general

use and they are consequently only rarely found. They are identifiable by a "v" notch cut in the top of each spring.

Both the silver and tungsten contacts (tungsten is now being replaced by an alloy which is easier to fix to the contact springs) are manufactured in various current ratings, but it is usual to employ tungsten contacts for heavy current control as they are generally cheaper than silver ones of comparable rating.

The springs themselves, which are nickel silver, are either 12 or 14 mils thick. A label on the top front coil cheek indicates the thickness, a white label indicating 14-mil springs and a green label 12-mil springs. A red label is sometimes found and it indi-

cates a special purpose assembly. The author has several relays of this type and the component springs of the "make" sets are of different thicknesses. These relays were probably used for impulsing, where the back spring could be made heavier to reduce contact bounce and subsequent sparking.

On Post Office type 3000 relays the maximum number of standard springs that can be accommodated on each side of the buffer block is nine, with a spacing between adjacent springs of between 55 and 60 mils.

When the relay is inoperative the tension on the moving springs should lift the fixed "break" springs a sufficient distance to allow daylight to be just visible between the block and spring. As the relay operates the "break" springs should return to the block and the "make" springs should be lifted just clear. This gap is usually of the order of about 8 mils, but a relay is considered to be correctly adjusted if this narrow strip of light can be seen.

The adjustment procedure is therefore to tension all the fixed springs against the block, and then to tension all the moving springs so that they just lift the "break" springs from the block. Finally the travel of the armature should be checked so that the "make" springs are lifted clear when the relay operates. The block pressure that a 14-mil spring should be adjusted to is between 16 and 20 grams, while for a 12-mil spring it is between 11 and 15 grams.

Operation in Two Steps

Certain applications call for a relay with some contacts that will operate earlier than the remainder. This is achieved by arranging that the contacts nearest the yoke can exert only slight pressure on the armature and that the remainder of the contacts cannot exert pressure until after the first contacts have operated. These contacts are referred to as "x" contacts.

By suitably shortening the lifting pins of the contacts at the top of the pile (the end remote from the yoke) they may be made to operate after the remainder of the assembly. Contacts so arranged are referred to as "y" contacts.

By careful spring tensioning it is possible to arrange for the relay to operate in two steps; half closing on the first step and operating the "x" contacts and fully closing on the second step and operating the remainder of the assembly. An arrangement whereby the relay operates in two steps is not permitted in telephone equipment, for it is a marginal condition of operation which could not be sustained over long periods.

It will be opportune to add a word here regarding the remaking of relay contact assemblies. A relay looks a very simple thing to assemble, but unless one has a large and varied selection of parts from which to choose it is by far the wisest plan to refrain from attempting, for it is a job that calls for experience and skill if the relay is to operate satisfactorily.

The armature (Fig. 6) is L-shaped with a "v" bend designed to enable it to pivot around the knife edge of the yoke without binding. The portions of the armature that make contact with the spring pins, are provided with Caramot bushes which should be squarely aligned with these pins.

For applications where the relay is required to function consistently under widely varying operating currents the cross-sectional area of the armature is reduced, and as a result the magnetic reluctance of



Fig. 4. The buffer block (see Fig. 1).

¹ "Telephony," Vol. 2, Herbert and Proctor, p. 132 *et seq.*

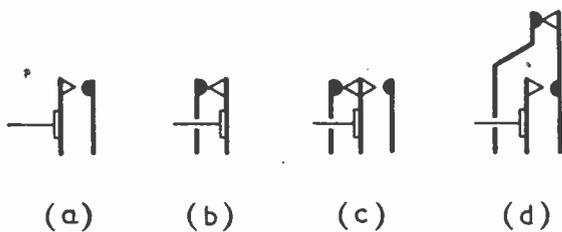


Fig. 5. Diagrammatic sketch of four types of contact assemblies: (a) "make" spring set, (b) "break" set, (c) "changeover" set, (d) "make-before-break" set.

this part becomes very high and saturation of the magnetic circuit is achieved at low values of ampere-turns. These isthmus armatures, as they are termed (Fig. 6 (b)), are used on the impulsing relays of certain types of automatic telephone exchange systems where absence of impulse distortion is essential under varying conditions of subscribers' line circuit.

The gap between the relay coil and armature with the relay operated is termed the residual gap, and is normally fixed by means of a stud of phosphor bronze either 4, 12 or 20 mils thick riveted to the armature. For certain applications where stringent limits are imposed on the speeds of operation and release, this stud is replaced by an adjustable screw and lock nut.

The adjustment of this gap, and of the residual air gap has considerable effect upon the timing of the relay, due regard being given to the adjustment of the armature travel when increasing the air gap. The armature travel is standardized at 31 mils for a normal relay, as measured between the pole face and the underside of the residual stud. For relays fitted with "x" contacts it is increased to 43 mils.

The problem of spark quench does not often become acute when controlling standard relays, but it is possible that the controlling contacts of inductive circuits carrying heavy currents may be badly damaged or even welded together by arcing when the circuit is interrupted.

The voltages induced in telephone circuits by dialling could reach a value of about a thousand volts if steps were not taken to reduce them. The voltage is prevented from rising above 200 volts by the shunt spring assembly of the dial which shunts the impulsing springs with a 2- μ F capacitor in series with the 26- Ω winding of the induction coil on the subscriber's instrument.

To prevent arcing occurring and damaging the controlling relay contacts of a selector magnet circuit, a 2- μ F capacitor in series with a 100- Ω resistor are fitted across uniselector magnet coils. In addition, the controlling relay contacts are always platinum, which has a high melting point and renders them less liable to damage by arcing than silver contacts. For relays, a resistor equal to, or slightly in excess of, the coil resistance shunted across the coil is usually sufficient to damp any sparking that may occur. It should be remembered that in addition to increasing the current consumption of the circuit, this resistor will also tend to delay the release of the relay.

An extra non-inductive winding is sometimes found in relay coils, and may be either connected internally across the coil to provide spark quench or terminated as a separate winding. It is made non-inductive by the wire being first doubled in half then wound on to the core with the folded end innermost as an ordinary

single winding. The single ends are terminated on separate tags or paralleled across the main winding. As there is no true start to such a winding it is virtually non-inductive. The existence of such a winding is indicated by the letters N.I. after the appropriate coil resistance figure.

Although the current through the coil ceases to flow the instant the circuit is interrupted, the magnetic flux will take different times to die away depending on the size of the residual air gap. If this is large, the flux will rapidly die away to a value that will allow the release of the relay. If it is small the flux will take an appreciable time to decay and the release of the relay will be delayed. The releasing times for normal relays range between 10 and 30 milliseconds.

These delay times may be appreciably increased by the use of solid copper slugs positioned at the heel or toe of the coil; three standard sizes of slug are in use, $\frac{1}{2}$ in, 1 in and 1 $\frac{1}{2}$ in. The effect of these slugs depends on the fact that a current will be induced in the slug when the circuit is completed or interrupted. In accordance with Lenz's Law the sense of this induced current will be to oppose the main current flow when switching on and to aid it when switching off. The effect of this induced flux on the delay is therefore dependent upon two factors, (a) the direction of the flux (opposing or aiding), and (b) the position of the slug on the coil. If the slug is at the heel end of the coil, Fig. 2 (b), provided there is an ample margin of ampere-turns on the coil the flux through the coil and slug, although in opposition, can have little or no effect on the operating time of the relay. A slug positioned at the toe end of the coil, Fig. 2 (a), will prevent the operation of the relay until after the induced flux has died away.

On interrupting the circuit, the induced currents in the slug will tend to maintain the flux in the same direction as the coil and so retain the armature attracted until after the induced currents have died away. As there is no opposing flux, the effect will be the same whether the slug is at the heel or toe end of the coil, and with a small residual and light spring tensions it is possible to obtain releasing delays of up to 500 milliseconds. This compares with the operating delay of 150 milliseconds which is the maximum obtainable with the slug at the toe end, a large residual air gap and heavy spring tension.

These delays may be produced by other means without resorting to slugged coils: for fast operation and slow release, by arranging that the relay will short circuit its second winding on operation; for slow operation and fast release, by arranging that the relay will remove a short circuit across its second winding on operation.

Other Relays

Turning now to other types of relays, the Post Office type 600 is virtually a smaller and cheaper version of the type 3000 relay described above. The maximum number of coil tags is four, while the number of

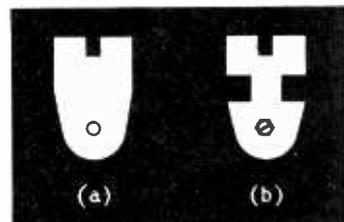


Fig. 6. Two types of armature, (a) standard type, (b) isthmus type with adjustable residual gap.

springs that can be accommodated on each side of the buffer block is limited to six. The residual air gap, which is fixed, is in three sizes, 4, 8 and 12 mils, the 8-mil one being the most common. This relay is not supplied with an adjustable residual. The springs, which are nickel silver, are usually 14 mils thick, but for especially sensitive relays 12-mil springs are used.

The simplest method of making a relay respond to a.c. is to shunt the coil with a half-wave metal rectifier. As the rectifier acts as a short circuit across the relay for alternate half cycles, it is necessary to include a resistor in series with the supply. For the half cycles when the rectifier is not acting as a short circuit it acts as a high-resistance shunt, and will, therefore, because of the current induced in the coil when the rectifier is acting as a short circuit, build up a relatively steady flux through the coil. Because of this induced flux the release of the relay will be delayed.

High-impedance relays are often found in telephone equipment connected across the speech circuits, and the transmission loss is minimized by increasing the impedance of the coil. It can be shown that a sleeve of nickel iron or similar alloy placed around the core will, because of its high permeability and resistivity, make considerable differences to the ohmic and angular values of the relay coil's impedance. The sleeves are 12 mils thick, and published figures for a 200-200 ohm line relay with its windings series assisting show

an impedance difference of $5,405/55.5^\circ$ with no sleeve, to $15,607/76.1^\circ$ with three sleeves.

Polarized and shunt-field relays are used when it is required that a relay shall be sensitive to the direction and magnitude of the current flow. A shunt-field relay comprises two separate coils and cores with a common yoke. When one coil is energized the resultant flux takes the line of least reluctance through the core of the second coil, and so prevents the operation of the relay. If the current flows through both coils so as to produce opposing polarities at adjacent ends of the coils, the relay is again unable to operate. It will only operate when the polarities at adjacent ends of the coils are of the same sense and equal in magnitude. The flux must then take the line of high reluctance across the residual air gap and so operate the relay.

Siemens high-speed relays were developed expressly for the control of motorized selectors, and they are characterized by the exceptionally short operating time of 0.5 milliseconds. The phosphor bronze contact spring carries a single domed platinum contact, which rests between two adjustable screws. Tension is applied to the contact blade by means of an adjustable buffer spring.

The author wishes to acknowledge his indebtedness to his Managing Director, C. P. Stonor, for the valuable and constructive suggestions given in the preparation of this article.

Interference Suppression

P.M.G.'s Regulations for Ignition Systems

IT will be recalled that the Wireless Telegraphy Act, 1949, made provision for the first time for the Postmaster-General to control interference. The Act empowers him to prohibit the sale of apparatus which fails to comply with such regulations as he may make regarding its non-interfering properties. To assist him in making these regulations he was to set up an advisory committee to consider the various aspects of interference. Out of a panel of 45 people nominated by the I.E.E. the P.M.G. has actually appointed three advisory committees to deal with different classes of equipment: (a) a seventeen-member* committee to consider ignition interference (July 1950); (b) an eighteen-member committee concerned with refrigeration interference (July 1950); and (c) a twenty-one-member committee to consider the question of interference from small electric motors (March 1952).

The first of these to make its report is that concerned with internal combustion engines. As a result of its recommendations the P.M.G. has laid before Parliament the long-awaited regulation governing the suppression of interference caused by internal com-

bustion engines—the "Wireless Telegraphy (Control of Interference from Ignition Apparatus) Regulations 1952".† It prescribes that new ignition apparatus forming part of an internal combustion engine—other than aircraft engines—which is sold in the United Kingdom on or after July 1st must be fitted with suppressors. Moreover, it is an offence to remove the suppressors thus fitted. The permitted field strength of the radiation at any frequency between 40 and 70 Mc/s in any direction from the apparatus must not exceed $50 \mu\text{V/m}$ when measured at a distance of 33ft.

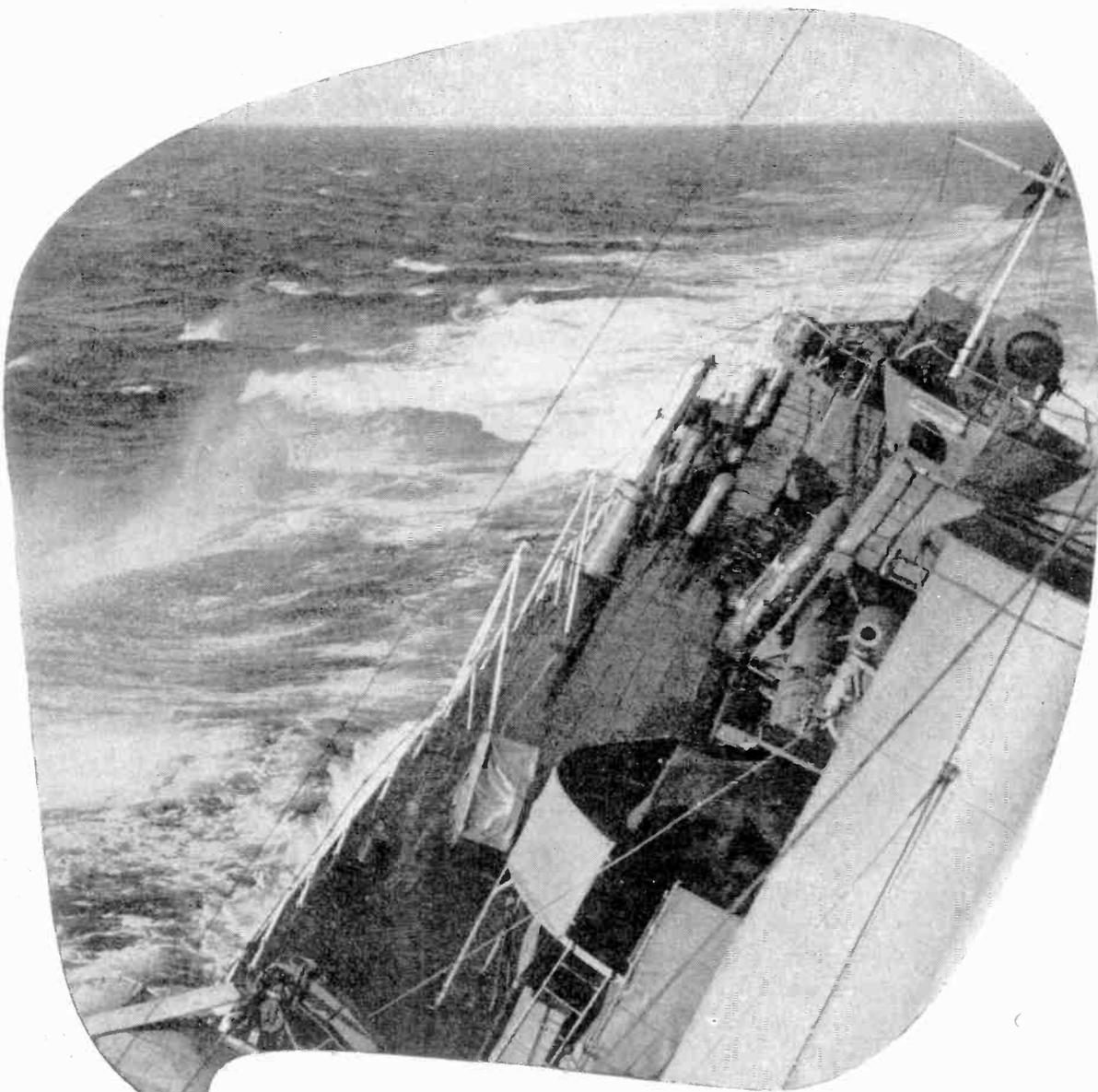
The schedule appended to the regulation sets out the method by which the field strength is to be measured, the conditions under which tests are to be made and specifies the measuring equipment to be used in the tests.

It is understood that the advisory committee's recommendations were not completely adopted by the P.M.G. In its report it did not differentiate between existing and newly manufactured i.c. engines, but the P.M.G., in making this regulation, has seen fit to confine it to any new i.c. engine used within the United Kingdom on land or in territorial waters within 100 yards of any moored vessel or within 100 yards of the low water mark.

Commenting on the regulation, Dr. Radley (engineer-in-chief, G.P.O.) stated that it has been drawn up on the assumption that all practicable and reasonable precautions have been taken in receivers.

* Sir Stanley Angwin (chairman); A. H. Ball (Society of Motor Manufacturers & Traders); H. Bishop (B.B.C.); S. R. Burbidge (R.T.R.A.); Sir John Dalton (Federation of British Industries); W. J. Edwards (Association of British Chambers of Commerce); Sir Peirson Frank (Standing Joint Committee, A.A., R.A.C., and R.S.A.C.); P. Gratwick (National Chamber of Trade); Professor Willis Jackson (Imperial College); E. M. Lee (R.I.C.); Dr. Merritt (British Transport Commission); E. L. E. Pawley (B.B.C.); N. E. Rowe (B.O.A.C. and B.E.A.C.); G. F. Sinclair (Institute of Transport); T. M. H. Stubbs (B.E.A.M.A.); Mrs. C. Renton Taylor (National Federation of Women's Institutes); and Dr. S. Whitehead (E.R.A.).

† Statutory Instruments, 1952, No. 2023, H.M.S.O., price 6d.

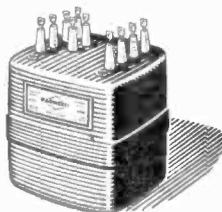


Men against the sea

By a majestic change known only to the sea, this friendly ally can become a frightening enemy. There are times when a man feels very small and his ship seems a pitiable thing.

In times of danger a captain reflects on those who gave him command. The men who designed and built his ship, the crew that help him sail her : confidence in these gives the captain confidence in himself.

The instruments that help him are themselves helped by Parmeko transformers, particularly in radar, making safer 'blind' approach to shore. Parmeko are proud of their part in the chain of confidence that enables man to challenge and conquer the cruel sea.



PARMEKO of **LEICESTER**

Makers of Transformers for the Electronic and Electrical Industries



NEW!

E·M·I INSTITUTES EXPERIMENTAL KIT

LEARN THE PRACTICAL WAY

A specially prepared set of radio parts from which 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 a radio set. Whether you are a student for an examination, starting a new hobby, intent upon a career in industry, or running your own business — this Course is intended for YOU — and may be yours at a very moderate cost. Available on Easy Terms.

WE TEACH YOU: *Basic Electronic Circuits (Amplifiers, Oscillators, Power Units, etc.) Complete Radio Receiver Testing & Servicing.*



POST IMMEDIATELY FOR FREE DETAILS

TO: E.M.I. INSTITUTES, DEPT. 16K
Grove Park Road, Chiswick, London, W.4

Name

Address

I.C.12

★ Experimental Kits also form part of the following courses: Draughtsmanship, Carpentry, Chemistry, Photography, Commercial Art, etc.

EMI INSTITUTES
Associated with
MARCONIPHONE COLUMBIA & HMV
(His Master's Voice)

Audix B.B. Ltd.

Suppliers of Specialized Equipment
for

**SCHOOLS (B.B.C. Approved)
HOSPITALS
HOTELS, ETC.**

Write for details

**Amplifiers, Radio-amplifier Units
Loudspeakers, Pillowphones
Control Units, etc.**

Contractors to :-

**Local Government and Educational Authorities,
Hospital Boards, Government Depts., etc.**

Main Scottish Agent

CAITHNESS BROS., KIRKCALDY.
Tel. DYSART 5457.

Head Office and Works

**HOCKERILL WORKS, BISHOP'S STORTFORD,
HERTS.**

Tel. Bishop's Stortford 1394.

Unsurpassed for
QUALITY
REPRODUCTION

S. G. Brown

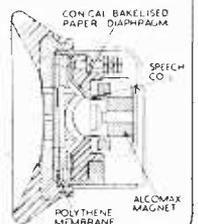


"K"
TYPE
MOVING COIL
HEADPHONES

The increasing appreciation and importance of High Quality Reproduction accounts for S. G. Brown Type "K" headphones being used in Laboratories, Sound Studios for acoustic research monitoring, DX work, etc.

D.C. Resistance: 47 ohms
Impedance: 52 ohms. at 1,000 c/s.

Full details of the wide range of S. G. Brown Headphones for a.p.c. purposes are available in Brochure "K" sent on request.



S. G. Brown Ltd.
SHAKESPEARE ST., WATFORD, HERTS.
Telephone: Watford 7241.

V.H.F. Radio Noise

Assessment of Total Noise at Selected Receiving Positions

By E. G. HAMER,* B.Sc.(Eng.) (Hons.), A.M.I.E.E.

THE increasing use of v.h.f. radio for fixed services has focused the attention of the systems' planner on the importance of radio noise. This noise originates from a combination of thermal, cosmic, atmospheric and man-made sources and is the main limiting factor in determining the maximum spacing of stations, or the number of links it is possible to operate in tandem. It is usually assumed that the mean thermal noise level in the aerial circuit is 204 db below 1 watt per cycle of bandwidth, and some allowance is made for peaks above this mean level. At very high frequencies, however, other sources of noise may predominate.

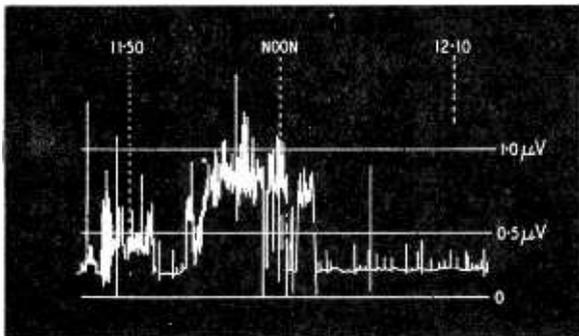
Total Noise

With a view to obtaining a guide to the total amount of noise likely to be encountered in actual practice, noise measurements were made at a number of typical sites during the latter part of 1950, at frequencies of 77 and 172 Mc/s. These results were obtained by connecting the rectified audio output from suitable receivers to recording meters, and using diode noise generators to calibrate the equipment. Fig. 1 shows part of a typical record of measurements made near a large factory, showing the effect of the factory closing down for lunch.

To present the large amount of information collected, some form of statistical analysis must be used. The following quantities were therefore noted during the analysis of the graphs obtained:—(a) the number of noise pulses per hour exceeding a certain level, and (b) the number of seconds per hour during which a certain noise level was exceeded.

The noise level was found to be much less in the country and in residential areas than in industrial areas. It was also found that there was no noticeable

Fig. 1. Noise measurement at 77 Mc/s near large factory, showing reduction in noise level during lunch period.



difference between horizontal and vertical polarization. On the basis of a noise level exceeded for 60 seconds in the worst period of one hour, the following are average results:—

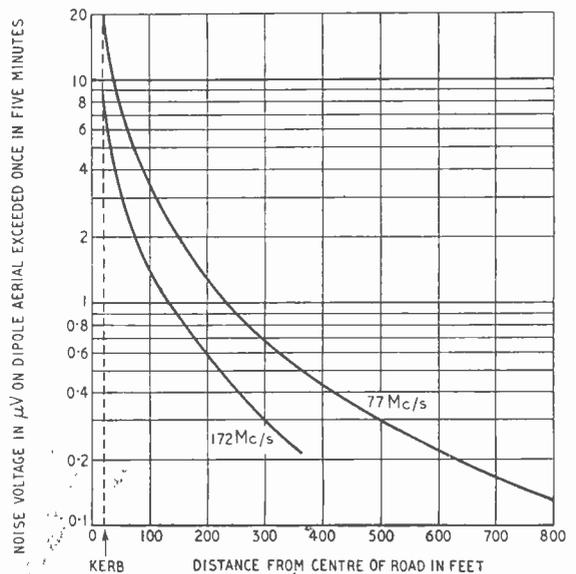
Town Sites	{	77 Mc/s—165 dbw per cycle of bandwidth
	{	172 „ —175 dbw „ „ „ „
Country Sites	{	77 Mc/s—180 dbw „ „ „ „
	{	172 „ —180 dbw „ „ „ „

A further series of experiments was conducted to determine the variation of total noise level with distance from a main road. Observations over periods of ten minutes were taken at various distances from a main arterial road, and Fig. 2 shows the variation of noise level with distance from the main road at frequencies of 77 and 172 Mc/s.

The general atmospheric noise level in all cases was found to be considerably greater than that due to thermal noise alone, but decreasing with increasing radio frequency. It is possible that if the receiving aerial is located in an industrial area, the decrease in radio noise at the higher frequencies would more than counterbalance other deleterious effects due to the use of a higher frequency, and as a result the performance at 172 Mc/s might be appreciably better than at 77 Mc/s.

* G.E.C. Research Laboratories, Wembley.

Fig. 2. Variations of noise level with distance from a main road at two frequencies, 77 and 172 Mc/s respectively.



Manufacturers' Products

NEW EQUIPMENT AND ACCESSORIES FOR RADIO AND ELECTRONICS

Audio Signal Generator

AN output of up to 1 watt into 600Ω with less than 2 per cent distortion (above 100 c/s) is claimed for the new Type J1 audio signal generator introduced by Advance Components, Ltd., Back Road, Shernhall Street, Walthamstow, London, E.17. The frequency generator is of the resistance-capacitance bridge type,



"Advance" Type J1 audio signal generator.

and three ranges are used to cover 15 c/s—50 kc/s. The $5\frac{1}{2}$ in diameter dial gives a total scale length of 18 in, and a slow-motion drive is provided for fine adjustment. Accuracy of setting is ± 2 per cent or ± 1 c/s, depending on the frequency.

Although designed primarily for telephone engineers there are many applications in radio servicing where it should prove useful.

Television Voltmeter

A VOLTMETER for measuring the very high voltages encountered in the development, production and testing of television equipment has been introduced by W. G. Pye & Co., Ltd., Granta Works, Cambridge. It functions on the electrostatic prin-

Pye "Scalamp" voltmeter with self-contained optical system and lamp.



ciple and embodies a suspension-type mirror galvanometer movement, which is critically damped magnetically.

Known as the "Scalamp" this electrostatic voltmeter is extremely compact considering it includes a mains supply for the lamp and a self-contained scale and optical system. As the illustration shows the scale is well-positioned and has a backward tilt for ease of reading.

The meter is available with various full-scale ranges, three suitable for most television requirements being: 1-5 kV, 3-10 kV a.c. and d.c., 5-18 kV d.c. and 5-12 kV a.c. The accuracy is given as one per cent on all d.c. ranges and a.c. ranges up to 12 kV r.m.s. and up to 100 Mc/s in frequency. For portable use the lamp can be run from a 4-volt battery.

High-quality 8in Loudspeakers

THAT high-quality reproduction need not be expensive if one is prepared to concede a little in maximum power handling capacity and extreme bass response is convincingly demonstrated by the latest Axiom 101 and 102 units recently introduced by Goodmans Industries Ltd., Lancelot Road, Wembley, Middlesex. These have fundamental resonances of 65 c/s, and, in conjunction with a vented corner cabinet having dimensions recommended by the makers, give a uniform bass response down to 50 c/s which is more than adequate for most musical scores and does not run into the troubles often experienced from turntable rumble.

We have recently had an opportunity of hearing one of these speakers (Type 102), the response of which seems admirably adapted for use in small heavily damped living rooms. The high-frequency response is exceptionally good and in some

Goodmans Axiom 102 8-in high-quality loudspeaker.



surroundings may need a few db of top cut if it is not to mask the middle frequencies. On the other hand it is ideal for applications in which the direct sound arrives at an angle to the axis.

The units are rated for a peak a.c. input of 5 watts and so far as the ear can judge there is no objectionable non-linearity distortion at normal average inputs of one or two watts.

Type 101 has a magnet giving a flux of 51,200 maxwells at a density of 13,500 gauss while Type 102 gives 63,000 maxwells at 16,000 gauss and may be expected to show improved damping when used with an amplifier of low output impedance. Prices (including tax) are £7 2s 9d and £10 14s 1d respectively.

Short-wave Overseas Receiver

THE Model BS54 introduced by Armstrong is a new export receiver especially for listeners abroad requiring a sensitive and easy-to-handle short-wave set at a reasonable price.

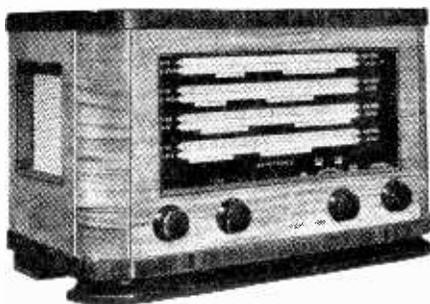
The receiver gives a continuous coverage from 10.9 to 50 metres, this range being divided into four bands. It is said that the bandspread obtained by the limited coverage on each range makes station finding almost as easy on the short waves as it is on the medium waveband of a more orthodox broadcast receiver. This is considerably helped by long scales and a flywheel-type tuning control.

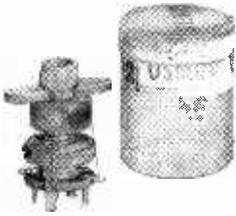
Five valves are used in a more or less straightforward superhet circuit, those employed being 6K8, 6K7, 6Q7, 6V6 and 6X5, all octal-based types easy of replacement almost anywhere in the world. The set is a.c. operated with transformer adjustment for supply mains of 110 V or 200-250 V at 40-100 c/s.

The set is housed in an attractive walnut cabinet together with a high-grade loudspeaker. Negative feedback is incorporated in the output stage.

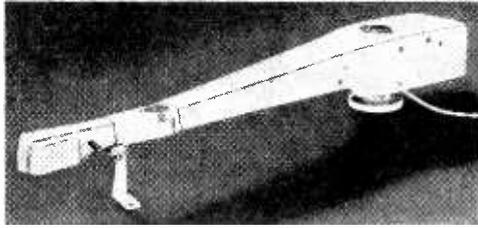
The makers are Armstrong Wireless & Television Co., Ltd., Warrlers Road, Holloway, London, N.7.

Armstrong export model short-wave broadcast receiver, BS54.





Osmor miniature coils for "No Compromise" tuner.



E.M.I. Type 17 transcription pickup with cantilever-driven moving-iron armature.

Miniature Coils

SAMPLES of miniature coils for the "No Compromise" R.F. tuner described in our October 1952 issue have been submitted by Osmor Radio Products. Type QA11 and QA12 are suggested for the input, or aerial, circuits and QHF11 and QHF12 for the corresponding intervalve circuits. Their identifying colours are blue foot for aerial and green foot for intervalve coils.

QA11 and QHF11 cover medium waves and QA12 and QHF12 long waves. All coils have large primaries and adjustable dust iron cores. They provide an inductance range of 100 to 170 μ H in the medium-wave coils and 2,000 to 3,000 μ H in the long-wave types. These ranges are adequate for all the requirements of the set.

Coils are packed in sealed transparent boxes, as shown in the illustration, and are thus protected from damage in transit from factory to user. They cost 4s each and six coils are required. The maker's address is, Bridge View Works, Borough Hill, Croydon, Surrey.

Transcription Pickup

THE E.M.I. Model 17 pickup is designed to accommodate all sizes of discs up to 17 inches in diameter and has a tone arm with an adjustable tracking angle. Particular attention has been paid to the design of the tone-arm suspension, which is by means of a single pivot. An oil-filled dashpot gives control of both vertical and horizontal movement and offers resistance to violent movement without impeding the normal low-velocity tracking motions.

The pickup itself is of the moving-iron type with a cantilever-mounted stylus to step down the mechanical impedance at the point. Basic sensitivity is 60 db per cm/sec of transverse recorded velocity, referred to 1mW. In terms of volts out, a typical figure is 30 mV from the Type 34680CQ high-ratio transformer for high-impedance input circuits, for a lateral r.m.s. recorded velocity +12 db referred to 1 cm/sec. An alternative transformer (Type 46775E) is available for 600- Ω and 200- Ω lines.

Frequency response is claimed to be level from 30 c/s to 12 kc/s with

0.0025 in stylus and 30 c/s to 10 kc/s with 6.001-in stylus (for microgroove records). Nominal resonances are above 15 kc/s and 12 kc/s respectively. The weight at the stylus point is 6 gm.

The complete pickup costs £13 13s and the head only £2 3s. Interchangeable cantilever styli are available at 13s 6d each. (These prices include purchase tax.) The high-impedance output transformer costs £1 and the 200/600- Ω transformer £1 18s.

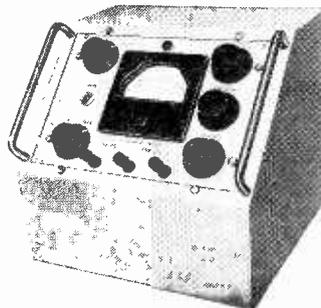
Phase Meter

PROVIDED that the signals to be compared are sine waves and that their amplitudes are of the same order, it is possible, by means of the Southern Instruments Type K159 meter, to obtain pointer readings of their relative phase. The inputs are first equalized and then applied to a differential valve voltmeter so arranged that it shows no reading when the signals are in phase and twice the normal reading when they are in opposite phase. The scale would be cramped between 90 and 180 degrees and is therefore calibrated between 0 and 90 degrees and one input is reversed for measurements between 90 and 180 degrees.

The accuracy claimed is ± 3 deg between 20 c/s and 20 kc/s and ± 8 deg between 5 c/s and 100 kc/s. Input waveforms should contain less than 3 per cent harmonic and should have amplitudes between 1.5 and 10 volts.

The instrument, which works from 200-250-V, 50-c/s supplies is made by Southern Instruments, Ltd., Hawley, Camberley, Surrey.

Southern Instruments Type K 159 phase meter.



New
TRIX

Quality

SOUND EQUIPMENT

AC/DC AMPLIFIER

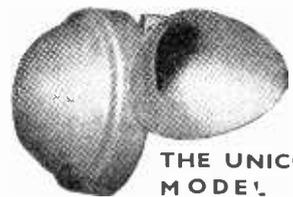


MODEL U885, 20 WATT.

A most useful and adaptable 20 watt Amplifier, designed for universal AC/DC operation. Inputs for two microphones and gramophone. Outputs both high and low impedance. Completely enclosed and ventilated. Nine valve circuit with negative feedback.

Also available as complete portable equipment—U885 P.

MINIATURE HORN SPEAKER



THE UNICORN MODEL H21

The Unicorn (regd.), a miniature exponential horn type speaker of novel design and construction. Ideal for mobile equipments, factory call systems, railway stations, airports, and other noisy locations.

SEND FOR CATALOGUE AND PRICE LIST OF THE LATEST RANGE OF TRIX SOUND EQUIPMENT

The TRIX ELECTRICAL CO. LTD.

1-5 Maple Place, London, W.1
Telephone: MUSEum 5817.

Telegrams: TRIXadio, Wesdo, London.

AMPLIFIERS · MICROPHONES · LOUSPEAKERS

RANDOM RADIATIONS

By "DIALLIST"

Another Crackles Mystery

HERE IS ONE of the queerest cases of intermittent noisiness in a wireless receiver that I have ever come across. I was spending an evening with a friend who had recently acquired a house not far from mine. At nine o'clock we agreed that we'd like to hear at any rate the headlines of the news; he got up, went over to the set, switched on and, having waited for it to warm up, tuned in the Home station. As he moved back to his chair there was a sudden outburst of crackles and bangs, which ceased as soon as he sat down and recurred when he walked across to switch off. "That," he said, "is my own pet mystery. The set started these games soon after I got settled in, though the previous owner tells me that nothing of the sort ever happened to him and the wiring is just as it was in his time. Some days the trouble is there, some days it isn't." That sort of thing always intrigues me; any case of intermittent noisiness should be investigated, for it may mean that there is some dangerous defect in the power or lighting circuits. My friend gladly accepted my offer to give him a hand the following Saturday.

Getting Warmer

Soon after breakfast that morning he telephoned that all was well for my visit, for the set was putting up one of its best performances. Arming myself with a multi-range measuring instrument, a dry cell, and sundry tools, I set forth. Now, I don't believe in taking such stern measures as moving furniture, rolling back carpets and levering up floorboards until other investigations have failed to give results. In this case it looked very much as if such measures would be necessary, for we quickly established that movements of one particular board were responsible. Still, it was worth while to take a good look round first. One important point was quickly established; using the 0-300 V range of the instrument, which has a resistance on a.c. of $2,000\Omega/V$, to test the mains supply we found that there was no flicker on the needle, even if one of us jumped on that floor-board. Both power and lighting circuits were wired for 3-pin plugs and the

resistance of all earth sockets to earth was a respectably small fraction of an ohm. The floor-board in question ran to a point opposite the middle of the fireplace, a modern affair using a gas burner for lighting the fire. Was there under that board a lead-covered cable making intermittent contact with the gas-pipe? Aha, we thought; getting warmer now!

Got It!

My hand was reaching to offer my friend the electrician's chisel (after all, they were *his* floorboards) when I paused to take a look at the ornate old brass fender which stood before the fireplace. It had originally had three "paws" at the front of it, but now only the middle one was left. This paw rested on a sheet of metal which was fixed to the boards. At the left-hand end a slot had been cut in the fender to allow the gas feed-pipe to pass to the grate. We connected the dry cell with a voltmeter in series between fender and pipe: no reading until the plank below the paw was trodden on; then violent kicks of the needle. Clearly, as the plank moved it slightly tilted the fender, bringing it into contact with the pipe. So far so good; but the fender's potential must differ from that of the pipe, and how came that to be? The metal sheet must

originally have been wider than the present fender. It had been cut short at the left-hand end; but at the other it stuck out several inches. And on this protruding piece stood an electric heater. Since its plug was in the power socket, the frame of the heater was earthed; so, therefore, was the fender *via* the metal plate. The gas pipe wasn't, except when the fender touched it—and there you are! The crackle-less days were those on which the electric fire had been moved off the plate.

A Weak Spot

"MY ACCUMULATOR has broken down," an old friend told me a while ago, "and I really can't afford to buy another just now. I'll just have to wait; but I do hate being without wireless." I learnt that the case had cracked and that the radio dealer had told her that nothing could be done about it. On taking a look at the casualty I found that it was a $3\frac{1}{2} \times 3\frac{1}{2} \times 5\frac{1}{2}$ in dry accumulator, housed in a Bakelite case which was well and truly cracked. Now, these dry secondary cells are otherwise remarkably robust: you may recall my telling you a month or two ago how I found one that had lain unused and neglected for years and how, after a long, slow charge and many drinks of water, it proved (and still proves) to be perfectly serviceable. The weak point of many of these cells is that they have thin cases.

Mend and Make-do

Despite a rather general belief that nothing can be done about a



"WIRELESS WORLD" PUBLICATIONS

	Net Price	By Post
RADIO INTERFERENCE SUPPRESSION as Applied to Radio and Television Reception. G. L. Stephens, A.M.I.E.E. ...	10/6	10/11
RADIO VALVE DATA: Characteristics of 2,000 Receiving Valves and C.R. Tubes. Compiled by the Staff of "Wireless World." 3rd Edition ...	3/6	3/9
SOUND RECORDING AND REPRODUCTION. J. W. Godfrey and S. W. Amos, B.Sc., A.M.I.E.E., in collaboration with the B.B.C. Engineering Division ...	30/-	30/8
MICROPHONES. By the Staff of the Engineering Training Dept. B.B.C. ...	15/-	15/5
ADVANCED THEORY OF WAVEGUIDES. L. Lewin. ...	30/-	30/7
FOUNDATIONS OF WIRELESS. M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition ...	12/6	13/-
TELEVISION RECEIVING EQUIPMENT. W. T. Cocking, M.I.E.E. 3rd Edition ...	18/-	18/8
SHORT-WAVE RADIO AND THE IONOSPHERE. T. W. Bennington. 2nd Edition ...	10/6	10/10
WIRELESS SERVICING MANUAL. W. T. Cocking, M.I.E.E. 8th Edition ...	12/6	12/11
RADIO LABORATORY HANDBOOK. M. G. Scroggie, B.Sc., M.I.E.E. 5th Edition ...	15/-	15/5

A complete list of books is available on application.

Obtainable from all leading booksellers or from

ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1.

cracked Bakelite case, I have repaired dry secondary cells and components similarly housed quite satisfactorily. Readers may find my method useful. I told my friend that I would endeavour to give her cell a new lease of life, though I could not guarantee that the new life would be a long one—with a very thin case and a semi-solid electrolyte, any deformation of the plates can give rise to local pressures that may be disastrous. Still, with prices what they are, any restoration of a "dud" cell to usefulness is worth while, provided that it can be done easily and cheaply. My poorest result to date is three months' extra life. Here's the method. Lay the cell on its side with the crack uppermost. Scrape off all oozings and dry the crack as far as possible with pieces of rag and blotting paper. Then leave the cell in that position until the crack has thoroughly dried out. When you are satisfied that it is dry, take a good big blob of plastic wood and work it well into the crack, just as if it were putty—you can get it off your fingers when the job is done by using acetone. Also spread the plastic in a thin layer extending to a good inch either side of the crack. Next day apply another layer. Then, when that is thoroughly dry, apply a coating of Durofix.

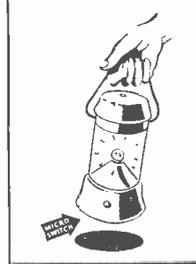
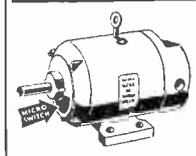
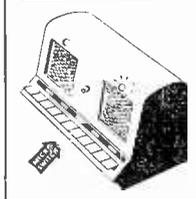
THE WORLD'S JOURNALS

WITH the growing number of technical journals, it is quite impracticable for the technologist to peruse them all (even if he is a linguist) and yet, if he is to keep abreast of electronic developments generally, it is essential for him to know what is published in the world's technical press. This need is met by the monthly publication in our sister journal *Wireless Engineer* of abstracts from, and references to, articles on radio and allied subjects appearing in journals published throughout the world.

In the past twelve months some 3,500 articles have been abstracted in this section which is compiled by the Radio Research Organization of the Department of Scientific and Industrial Research.

The annual index to this section of *Wireless Engineer* is in course of preparation and will include both subject and author indexes and a list of the 160 or more journals regularly scanned for abstracting. The index will, it is hoped, be published in February, price 3s 9d including postage.

BULGIN MICRO-SENSITIVE SWITCHES



THESE versatile switches with almost feather-weight action are manufactured from the finest materials to the highest standards and specifications.

These switches can be, and indeed are, applied to many hundreds of different uses. The illustrations on the left, and the list below will give prospective users some idea of the wide variety of uses.

- Tape Recorders.**
- Meter Switching.
- Portable Tools.
- Auto Record Changers.**
- Medical and Dental Equipments.
- Kitchen Equipments.
- Automatic Switching on Air Compressors, etc.
- Intercommunications Systems.**
- Electric Washers.
- Ticket Vending.
- Cocktail Cabinet and Cupboard Lighting.
- Centrifugal Starters.**
- Thermostat Switching.
- Coin operated Machine.
- Ciné Projectors.
- Foot and Mat Switching
- Burglar Alarms.**
- Conveyor Counting.
- Safety Switches.
- Courtesy light switching in cars.
- Time Switches.
- Reliable Relay Contacting.
- Desk Signalling Pushes**
- Dictating and Transcribing Equipment.
- Pin Table Switching.
- Electric Shavers, Clippers and Hair Dryers.
- Go-No-Go Gauges.
- Coil Winding.
- Portable Lighting Automatic Switching.**

The keen amateur will be quick to grasp the enormous possibilities of a switch such as this. Designed to be operated by light pressures down to about 1½ oz., and small movements. Every type is basically single-pole-double-throw (two-way) for use as on-off, off-on, or change-over, as required.

SEND FOR FULL TECHNICAL DETAILS NOW

QUOTE REF. W.W./MICRO

MANUFACTURERS OF RADIO AND ELECTRONIC PRODUCTS

BULGIN
Components

A. F. BULGIN & CO. LTD
BYE-PASS ROAD BARKING
TELEPHONE: Rippleway 3474 (5 lines)

UNBIASED

By FREE GRID

More Jungle Jargon

THE stethoscope is a very ancient tool of the medical profession but it was not until George IV lay-a-dying in 1820 that it was given its present panhellenic name which, of course, simply means an instrument for examining the chest. In 1876 a further instrument was developed for making a visual record of heart beats and chest noises by tracing a curve on paper. This new instrument, too,



Visible heart affection.

was aptly and correctly named, being called the stethograph. It was, however, very crude and soon fell into disuse, being revived and greatly improved in our own century when it was renamed the cardiograph as its main function was to register heartbeats.

It is not surprising that modern electronic technique has been harnessed to the problem and the result is the production of an instrument which as *W.W.* tells us (Dec., 1952) "gives both visual and aural observation of the functioning of the heart and lungs" which are, of course, the main organs housed in the chest. This new instrument is, in fact, an electronic stethoscope but is it so-called? Not on your life. It is given the dreadful Latin-Greek hybrid name "auscultoscope." In justice to the inventor I think he is trying to get across to us the idea that the instrument gives both visual and aural indications of what the chest organs are doing. But could not he have used the Greek phrase an "electronic acoustoscope" or if he prefers Latin an electronic "auscultocrute," which means precisely the same thing.

Information Received

QUEEN ELIZABETH I, although a very protestant, seems to have had a very catholic taste in beds; in fact

if the local historians are to be believed she spent most nights of her life sleeping in other people's beds. I once made a rough check-up not only in the stately homes of England but also in all our ancient hosteleries where they proudly exhibit a bed in which our one and only spinster Queen spent a night and I find they far exceeded the number of her days even though she reached the Psalmist's allotted span.

Since that time I have always mistrusted the so-called "facts" of historians. It is, therefore, refreshing to find one who really does know what he is talking about and has enlightened me on a certain point on which I enquired recently.

You will recall that I asked in the October issue whether wireless was used to convey news of the Coronation of Edward VII in 1902 to ships—more especially ships of the Royal Navy—as, of course, it was in the two subsequent coronations of this century in 1911 and 1937.

I certainly thought it would have been used, as over six years had elapsed since the date of Marconi's first patent. I am, however, assured to the contrary by no less an authority than one who was the P.M.G.'s Inspector of Wireless Telegraphy—Colonel Chetwode Crawley—until he retired in 1945. He tells me that in 1902, as an officer of the Royal Marines, he was in the Mediterranean Fleet taking a wireless course under Commander—later Admiral—Jackson and he makes it clear that news of the 1902 coronation was *not* transmitted by wireless to ships of the Royal Navy.

Having had the unique opportunity of access to records, which the position of Inspector of Wireless Telegraphy would naturally give, Colonel Chetwode Crawley could, no doubt, clear up many doubtful points, to say nothing of giving the lie to some of the errors and superstitions which have been popularized by amateur historians.

Plagiarism Run Riot

IT is astonishing how old ideas of which details have been published in this journal turn up many years afterwards in a slightly amended—and, not infrequently, debased—form.

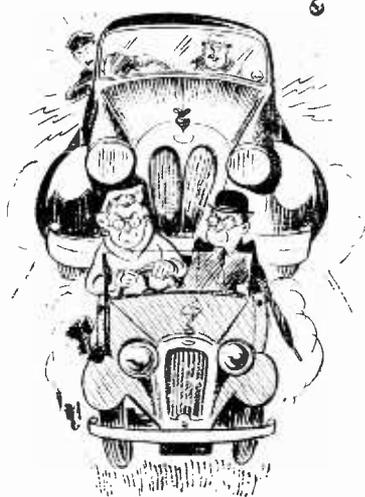
The latest of these borrowed and adapted ideas, as reported in the daily press, is "a device projecting high-frequency rays which can be picked up by a vehicle ahead and so warn the driver that he is about to be overtaken." The old-fashioned toot on the horn has apparently been found inadequate on busy roads where there

is a lot of heavy traffic. This profound thought has been communicated to the motoring organizations of this country who have, so my newspaper informs me, referred it to their experts.

The same thought struck the French Motor Manufacturers' Associations a long time ago and it has taken twenty years for it to cross the channel. The French had the crude idea of putting a microphone at the back of heavy and noisy lorries and a loudspeaker by the driver's ear so that he could hear the plaintive tooting of the frustrated car behind, and I suggested certain improvements to it in the issue of this journal for January 27th, 1933.

Now that the general idea has at last crossed the channel, I am glad to see that our own people will have none of this noisy tooting, but are going to use what are termed "high-frequency rays." This at first suggested radio to my mind. I cannot help feeling, however, that it is nothing of the kind, but merely a photocell deeply hooded to protect it from daylight and operated by the flashing of headlamps of the car wanting to overtake.

If I am right, then it is nothing more than an adaptation of another 1933 idea which I also reported in *W.W.* (November 3rd, 1933). The photocell arrangement then described was to be used as a safety device to prevent a car running into the vehicle



Noisy tootings.

ahead of it if the latter happened to stop suddenly. My suspicions are confirmed by a statement that this new idea is also to be used as a safety device at cross roads in foggy weather.

ASSOCIATED
ILIFFE
TECHNICAL BOOKS

USEFUL REFERENCES

TELEVISION RECEIVING EQUIPMENT (3rd Edition)

By W. T. Cocking, M.I.E.E.

Explains the fundamentals of the subject and deals with practical details of receiver design. There is a lucid description of each stage of the normal television receiver, while details of special circuits are also considered. Additional chapters are devoted to faults and their remedies, servicing of modern sets and the problems of obtaining selectivity.

The text is largely non-mathematical in treatment, but mathematical matter of particular value to the designer has been collated and appears in a series of appendices.

This third edition, thoroughly revised, has been brought into line with the latest developments.

375 pp. 18s. net.
By Post 18s. 8d.

These books are obtainable from leading booksellers, or direct from The Publishing Department, Dorset House, Stamford Street, London, S.E.1. Write for the complete Radio Book list.



WIRELESS SERVICING MANUAL (8th Edition)

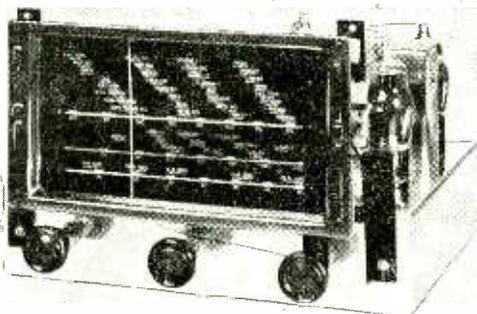
By W. T. Cocking, M.I.E.E.

Deals with the location and cure of the innumerable faults which can develop in broadcast receivers and their associated equipment. Apart from domestic sets, short-wave receivers and converters are covered, and there is a special chapter devoted to servicing with the cathode-ray oscilloscope. Methods of ganging receivers of both the 'straight' and superhet types are given in detail; problems of hum and distortion are also discussed.

The eighth edition has been revised and brought fully up to date, the chapter on television receiver defects being completely re-written.

298 pp. 12s. 6d. net.
By Post 12s. 11d.

DO YOU LIKE HARD WORK ?



then don't build our receivers!

As a reader of this magazine you obviously are keen to build your own equipment, also you want to make a super job of it, don't you? Then by following our easy-as-A.B.C. Construction Sheets you not only ensure a first-class job but know beforehand that FAILURE IS IMPOSSIBLE! No radio enthusiast can afford to be without our famous "HOME CONSTRUCTOR'S HANDBOOK," the new edition of which not only contains all of our popular circuits, but also full technical descriptions, parts lists, hints and tips, formulae, resistance colour code, symbols, etc., etc., etc. SEND 2/6 NOW for the new 1953 46-page issue, which comes complete with Catalogue.

RODING LABORATORIES

(D:pt. W1), 301 HURN AIRPORT CHRISTCHURCH, HANTS.

CITY & RURAL IMMEDIATE DELIVERY FROM STOCK "VIEWMASTER"

SPECIFIED COMPONENTS

Sand for Stage 1 now — price £3/2/3, post free. Complete Kits, Stage-by-Stage and Single Components Supplied. "Viewmaster" Construction Envelopes 7/6 ea.

LARGE STOCKS GENERAL TELEVISION COMPONENTS

MANUALS: "Television Explained," 5/-; "T.V. Fault Finding," 5/-; "Wireless World" Valve Guide, 3/6. All manuals post and packing 6d.

TRANSFORMERS: 30 v. 2 a. for models, etc., Tapped 3-4-5-6-8 9-10-12-15-18-20-24 v., 21/-; 350-0-350 v. 80 mA. 6.3 v. 4 a., 5 v. 2 a., 21/-. Ditto but 250-0-250 v., 21/-. Heater 6.3 v. 1.5 a., 7/6. 350-0-350 v. 150 mA. 6.3 v. 5 a., 5 v. 3 a., Fully Shrouded, 45/-; EHT 2.5 Kv. 5 mA. 0-2-4 v. 4 a., 0-4 v. 2 a., 45/-. All Primaries 200-220-240 v.

METAL RECTIFIERS: 6 v. 1 a., 5/6; 12 v. 1 a., 9/9. ALUMINIUM CHASSIS: 6 x 4 x 2 1/2 in., 4/9; 8 x 6 x 2 1/2 in., 6/4; 10 x 7 x 2 1/2 in., 7/7; 12 x 8 x 2 1/2 in., 9/6.

S.T.C. METAL RECTIFIERS: E.H.T. K3/40, 7/6; K3/45, 8/2; K3/50, 8/8; K3/100, 14/8; H.T. RMC, 5/-; RM1, 5/3; RM2, 5/9; RM3, 7/-; RM4, 21/-; DRM1B, 11/6; DRM2B, 12/6; DRM3B, 15/-.

CO-AXIAL CABLE: All makes in stock. Belling 72 ohm, Twin Feeder, 7 1/2 d. yard.

LOUDSPEAKERS: 8in. PM, 19/6; 6 1/2in. PM, 18/6; 3in. PM, 13/6.

CLEAREX 6in. ENLARGERS (for VCR97, etc.), 22/6.

M/C METERS: 0-50 mA. 2in. square, 9/-.

Terms: C.V.O. or C.O.D. over £2. Over £2 post free, otherwise please add 1/- post and packing.

MATCHED VALVES, RESISTORS, &c.

Extensive Stocks New and Surplus Components, Special Purpose Valves, &c.

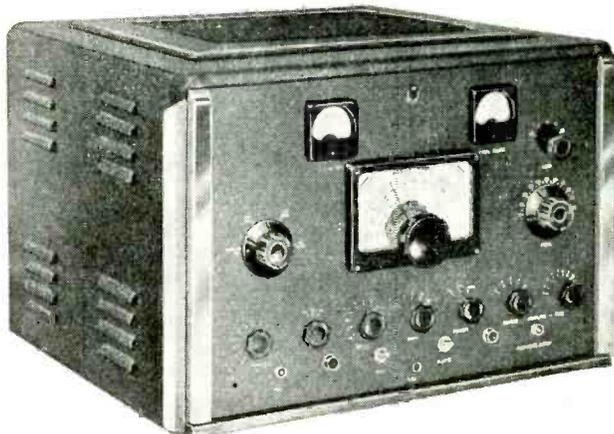
FOR ATTENTION—ADVICE—SERVICE, WRITE:

CITY & RURAL RADIO,
101, HIGH STREET, SWANSEA, GLAM.

Telephone: Swansea 4677

Announcing the 1953 Improved Version of the already famous **PANDA PR-120-V** the perfect "Table Topper"

- ★ Bandswitched 10, 15, 20, 40 and 80 metres.
- ★ Change bands in a flash.
- ★ Operate through TV hours, 'phone or C.W. with this highly efficient carefully designed self-contained transmitter.



PRICE £150 NETT
Delivered U.K. only
Export C.I.F. rates quoted per return air mail to all parts of the world.

We specialise in manufacturing radio transmission equipment for low and medium power for all general purposes or to individual requirements... quotations given per return air mail inclusive of freight charges to all parts of the world.

PANDA RADIO CO., 58 School Lane, Rochdale, Lancs.

Cables: PANDA ROCHDALE — Tel. 47861

Works: 16-18 Heywood Road, Castleton, Nr. Rochdale

MODERN ELECTRICS LTD.,

164, Charing Cross Road, London, W.C.2.

'phone TEMple Bar 7537.

Export enquiries welcomed

Immediate delivery from stock.

Prompt attention to post orders.

TAPE RECORDERS

SOUNDMIRROR	
Table Model.....	£69 10 0
Portable.....	£74 10 0
SCOPHONY-BAIRD	
New Model Mk. 2, complete.....	£63 5 0
SIMPSONIC	
New Model IA.....	£83 0 0
"GRUNDIG" 2-Track 50 10,000 c.p.s., press-button control.....	£78 15 0

RECORDING TAPE

GRUNDIG	
L.G.H., 1,200ft.....	£2 0 0
SOUNDMIRROR	
Paper Tape.....	£1 5 0
Spare Spool.....	6 6
E.M.I. H.60, 1,200ft.....	£1 15 0
E.M.I. H.60, 600ft.....	£1 1 0
E.M.I. H.65, 1,200ft.....	£1 15 0
E.M.I. H.50, 1,200ft.....	£2 8 0
SCOTCH BOY	
1,200ft.....	£1 15 0
SCOTCH BOY, 600ft.....	£1 1 0
Spare Spools, 1,200ft.....	4 3
Spare Spools, 600ft.....	3 3
E.M.I. H.57, 3,250ft.....	£6 0 0
SIMPSONIC	
As advertised.....	£1 15 0

VALVES

We are one of London's Largest Stockists — Please write for requirements.

RECORD REPRODUCING EQUIPMENT

DECCA	
2-speed Motors, complete with Turntable and Rubber Mat.....	£3 18 6
3-speed, complete.....	£6 8 6
B.S.R.	
3-spd. (Crystal T/O Hds.).....	£9 19 11
3-spd. (with 2 GP20 Hds.).....	£11 16 6
3-spd. (with 2 Decca Hds.).....	£13 18 6
3-spd. Auto-Mixer.....	£17 17 0

GARRARD	
R.C. 75 (3-spd. Auto.)	£16 16 6
R.C. 75A, as above, but less heads.....	£14 10 3
S.201.B. Variable 3-spd. Transcription Motor.....	£24 12 6

CONNOISSEUR

3-spd. Deck.....	£23 13 0
------------------	----------

SPEAKERS IN STOCK

GOODMANS	
Axiom 150, Mk. 2.....	£14 16 10
Aurifon 60.....	£12 6 3
WHARFEDALE	
W.12/CS.....	£14 6 0
Golden 10C.S.B.....	£9 0 5
Super 8CS/AL.....	£7 4 4
Super 5CS/AL.....	£7 4 4
Bronze 10.....	£3 9 6

TEST GEAR

AVO	
Model 8.....	£23 10 0
Model 7 (latest).....	£19 10 0
Unimotor Mk. 1/2.....	£10 10 0
Electronic Meter.....	£40 0 0
Wide Band Sig./Gen.....	£30 0 0
Valve Characteristic Meter.....	£60 0 0
D.C. Minor.....	£5 5 0
10 kV. Multiplier for Model 8.....	£2 5 0
Carrying Cases for Models 7, 8 and 40.....	£3 0 0
ADVANCE	
H.1 (Sig./Gen.).....	£25 0 0
E.2 (Sig./Gen.).....	£28 0 0
P.F.C.O. Radiometer.....	£1 9 6
PICO	
COSSOR	
Double Beam Oscilloscopes	
1035.....	£93 10 0
1047.....	£132 0 0
TAYLOR	
ALL NEW TAYLOR TEST GEAR IN STOCK AND AVAILABLE ON H.P. Send S.A.E. for Catalogue and Terms.	

PICK-UPS

ACOS	
GP.20 (Std. or L.P.)	£3 11 5
Spare Heads for above	£2 3 4
DECCA	
XL.T/O.....	£3 19 2
XMS, Magnetic.....	£7 0 0
CONNOISSEUR	
Super Lightweight, LP/Std.....	£10 0 8
Spare Heads.....	£3 11 8

LEAK PICK-UPS

Dynamic (Ruby Stylus).....	£12 0 8
Dynamic (Diamond Stylus).....	£18 8 4
MICROPHONES	
Mic 22 (Crystal).....	£6 6 0
Mic 22 (head only).....	£4 10 0
Mic inserts for above	£1 9 6
Mic 16 (Crystal).....	£12 12 0
Mic 30 (Crystal).....	£4 4 0

SOUNDMIRROR

M/C with T/F.....	£7 7 0
LUSTRAPHONE	
M/C with T/F.C.51.....	£5 15 6
M/C less T/F.C.51.....	£5 5 0
Heavy Table Base for above	£1 1 0
Hand M/C with T/F CH.51.....	£5 15 6
Hand M/C less T/F CH.51.....	£5 6 0

RESLO M/C (Low Imp.)

RIBBON.....	£6 0 0
FLOOR STAND (Mic), 3 extensions.....	£12 6 0

LEAK AMPLIFIERS

Point 1, TL12.....	£28 7 0
Point 1, TL25.....	£34 7 0
Control Unit.....	£12 12 0

CONNOISSEUR AMPLIFIERS

Q.25, in Cabinet.....	£48 10 0
Q.25, less Cabinet.....	£41 5 0

"R.D. BABY DE LUXE"

3, 7, 15 ohms Output Incl. Pre-Amp.....	£21 7 0
---	---------

TAPE DECKS
SOUNDMIRROR—With Complete Instructions for Associated Amplifier ... £33 0 0, carriage extra.
WEARITE (limited stock), with Complete Instructions for Associated Amplifier, £35 0 0, carriage extra.

MAINS TRANSFORMERS

**FULLY INTERLEAVED
SCREENED AND IMPREGNATED. ALL GUARANTEED.
ALL PRIMARIES ARE 200/250 v. Half Shrouded.**

HSM63. (Midget). Output 250-0-250 v. 60m/a., 6.3 v. at 3 amps., 5 v. at 2 amps.	18-
HS63. Output 250-0-250 v. 60m/a., 6.3 v. at 3 amps., 5 v. at 2 amps.	18/6
HS40. Windings as above. 4 v. at 4 amps., 4 v. at 2 amps.	18/6
Output	
HS2. 250-0-250 v. 80m a.	21/-
HS3. 350-0-350 v. 80 m/a. HS30. 300-0-300 v. 80 m/a.	21/-
HS12X. 250-0-250 v. 100 m/a. HS75. 275-0-275 v. 100 m/a.	23/-
HS30X. 300-0-300 v. 100 m/a. HS3X. 350-0-350 v. 100 m/a.	23/-
Fully Shrouded	
FSM63. (Midget). Output 250-0-250 v. 60 m/a., 6.3 v. at 3 amps., 5 v. at 2 amps.	18/6
Output	
FS2. 250-0-250 v. 80 m/a.	23/-
FS30. 300-0-300 v. 80 m/a. FS3. 350-0-350 v. 80 m/a.	23/-
FS2X. 250-0-250 v. 100 m/a. FS75. 275-0-275 v. 100 m/a.	25/9
FS30X. 300-0-300 v. 100 m/a. FS3X. 350-0-350 v. 100 m/a.	25/9
All the above have 6.3 4-0 v. at 4 amps., 5-4-0 v. at 2 amps.	
FS43. Output 425-0-425 v. 200 m/a., 6.3 v. 4 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded.	51-
FS50. Output 450-0-450 v. 250 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 4 amps., C.T. 5 v. 3 amps. Fully shrouded.	75-
F30X. Output 300-0-300 v. 80 m/a., 6.3 v. 7 amps., 5 v. 2 amps. Framed. Flying leads.	31/9
F35X. Output 350-0-350 v. 250 m/a., 6.3 v. 6 amps., 4 v. 8 amps., 4 v. 3 amps., 0-2-6.3 v. 2 amps. Fully shrouded.	71/6
FS160X. Output, 350-0-350 v. 160 m/a., 6.3 v. 6 amps., 6.3 v. 3 amps., 5 v. 3 amps. Fully shrouded.	47/6
FS43X. Output, 425-0-425 v. 250 m/a., 6.3 v. 6 amps., 6.3 v. 6 amps., 6 v. 3 amps. Fully shrouded.	69-
HS6. Output, 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. For receiver RI355. Half shrouded.	29/3
HS150. Output, 350-0-350 v. 150 m/a., 6.3 v. 3 amps., C.T. 5 v. 3 amps. Half shrouded.	30/9
F36. Output, 250-0-250 v. 100 m/a., 6.3 v. 6 amps., C.T. 5 v. 3 amps. Fully shrouded.	32/6
FS120. Output, 350-0-350 v. 120 m/a., 6.3 v. 2 amps., C.T. 6.3 v. 2 amps., C.T. 5 v. 3 amps. Fully shrouded.	33/-
FS256. Output, 250-0-250 v. 80 m/a., 6.3 v. at 6 amps., 5 v. at 3 amps. Fully shrouded.	30/9
PRI/1. Output 230 v. at 30 m/a., 6.3 v. at 1.5/2 amps.	23/1
FS150. 350-0-350 v. 150 m/a., 6.3 v. 4 amps., 5 v. 3 amps.	34/9
FS150X. Output, 350-0-350 v. at 150 m/a., 6.3 v. at 2 amps., C.T. 6.3 v. at 2 amps., C.T. 5 v. at 3 amps. Fully shrouded.	34/9
The above have inputs of 200/250 v.	

FILAMENT TRANSFORMERS

F4. Output, 4 v. 2 amps. F6. Output, 6.3 v. 2 amps.	9/-
F12X. Output, 12 v. at 1 amp., 9/-, F6X. Output, 6.3 v. 0.3 amps.	6/-
F12. Output, 12.6 v. tapped 6.3 v. at 3 amps.	18/6
F24. Output, 24 v. tapped 12 v. at 3 amps.	26/-
F12 and F24 framed with Flying Leads.	
FU6. Output, 0-2-4-5-6.3 v. at 2 amps.	11-
F29. Output, 0-2-4-5-6.3 v. at 4 amps.	20/9
FU6 and F29 clamped with Flying Leads.	
F5. Output, 6.3 v. at 10 amps., or 5 v. at 10 amps., or 12.6 v. at 5 amps., or 10 v. at 5 amps.	37/9
F6/4. Output, four at 6.3 v. tapped at 5 v. at 5 amps. per winding giving by suitable series and parallel connections 24 v. at 5 amps., 20 v. at 5 amps., 18 v. at 5 amps., 15 v. at 5 amps., 12.6 v. at 10 amps., 10 v. at 10 amps., 6.3 v. at 20 amps., 5 v. at 20 amps. F5 and F6/4 framed with Flying Leads.	57/-
FU12. Output 0-4-6.3 v. 3 amps. FU24. Output 0-12-24 v. 1 amp. The above have inputs of 200/250 v.	19/6

OUTPUT TRANSFORMERS

MOPI. Ratios, 26, 46, 56, 66, 90, 120-1 50 m/a. max. current. C.T. for Q.P.P. Class B, etc. Secondary 2/4 ohms. Top panel and clamped, each	6-
OP10. 10/15 watts output. 20 ratios on Full and Half primary	19/9
OP30. 30 watts output, 20 ratios on Full and Half primary	28/6
Williamson's O.P. Transformer to Author's specification...£4	13/6
Chokes for Williamson's Amplifier. 30H. at 20 m/a.	18/6
10H at 150 m/a.	35/6
Choke C4. 60 m/a., approx. 8H., 350 ohms	5-
Choke C5. 40 m/a., approx. 5H., 350 ohms	4-
Choke C6. 50 m/a., 50H., 1,500 ohms	22/-
C8. 360 Micro henries clamped, 5/3. C7. 90 m/a 180 ohms, clamped	6/3
Belling-Lee Co-Axial Plugs. Type 642/F. each	1/3
Belling-Lee Co-Axial Sockets. Type 604/S, each	1/3

Quotations, etc.—stamped addressed envelope please.
C.W.O. (add 1/3 in £ for carriage).
Trade and also Export enquiries invited.

**H. ASHWORTH (Dept. WW),
676, Gt. Horton Road, Bradford, Yorks.**



Estd. 1925

EASY TERMS

LEAK QUALITY EQUIPMENT

for the Connoisseur

THE NEW "VARISLOPE" PRE-AMPLIFIER



for the famous Leak "Point One" Power Amplifier. For full details see maker's advertisement on page 85.

CASH PRICE £12-12-0

THE INCOMPARABLE TL/12 12-WATT
TRIPLE LOOP FEEDBACK
"POINT-ONE" AMPLIFIER



which has won world-wide recognition by its pre-eminence in performance, reliability and craftsmanship.

**CASH PRICE
£28-7-0**

TERMS for these TWO UNITS
£9 deposit with order and 18 monthly instalments of 40/-.
LEAK TUNER & DYNAMIC P.U. also available on similar terms. All above available separately.

*More and more men are
changing to Electric Shaving*

because the amazing **NEW**
REMINGTON Contour 6
ELECTRIC SHAVER

really **DOES** give a Cleaner—Smoother and Faster Shave than any other method. We have carefully tested every make of Electric Shaver available to-day and in our opinion the Remington is the finest of them all. **TO CONVINCe YOU** our

14 DAYS' FREE TRIAL IS AVAILABLE FOR 20/- DEPOSIT

(Returnable if shaver not entirely satisfactory). Balance payable by 8 monthly instalments of 21/-. Cash price £8.19.5. AC/DC/200/250. Other voltages available. Every shaver brand new and despatched by return in superb silk-lined presentation case. Brochures free



THE L.R. SUPPLY COMPANY LTD.
(LONDON RADIO SUPPLY COMPANY)
BALCOMBE SUSSEX

Telephone:
Balcombe 254

PRIVATE

OPINIONS

"... it is everything you say, in fact even more; on every range it is accurate... after about half an hour from receiving it I had it working."—A. P., Longton.

"... I am very pleased with kit, especially the instructions—so clear!"—K. T., Cleethorpes.

"... I felt I had to write and congratulate you for putting on the market a R/C bridge of such high accuracy at a phenomenally low price. Construction is remarkably easy..."—D. G. R. L., Chead.

"... I am very pleased with same and think it remarkably good value for such low cost..."—W. E. C., Hoove.

"... when one of your bridges was tried out against Laboratory Standards and everyone present was amazed at the very high degree of accuracy..."—J. R., Fulham.

THE RADIO MAIL 30/- RES./CAP. BRIDGE KIT IS THE BEST RADIO VALUE OBTAINABLE TO-DAY

5 megohms—50,000 ohms	50 mfd.—.2 mfd.
100,000 ohms—1,000 ohms	1 mfd.—.01 mfd.
1,000 ohms—10 ohms	.01 mfd.—.0005 mfd. (500 pF.)

NO CALIBRATING

The panel bears six separate scales, one for each range, calibrated in Ohms and Micro-farads for direct reading. Easy range is fully variable, covering all intermediate values.

Part post & packing 1/6

Cash with order or C.O.D.

Prompt Delivery.

RADIO MAIL, 4, RALEIGH ST., NOTTINGHAM
Stamp for list and with all enquiries, please

DIRECT T/V REPLACEMENTS

(REGD.)

Prop. A. ROSE, A.I.R.E.

134/136, LEWISHAM WAY, NEW CROSS, S.E.14.

TIDEWAY 3696

ADDITIONAL ITEMS TO THOSE IN OUR "T/V SPARES MANUAL"

(if you have not yet received your copy, please send 6d. stamps).

H.1.1 C.R.T. HEATER ISOLATING TRANSFORMER. Low capacity winding, 2 volt input, 2.1 volt at 1.5 amp. output. Used for cathode/heater shorts. Definition 2.5 mc/s. Price 26/6.

H.1.2 C.R.T. HEATER TRANSFORMER. Low capacity secondary, 230 volt input 2.1 volt output at 1.5 amp. For cathode heater short on Baird, Everyman, Portable and Townsman. Price 26/6.

HEATER BOOSTER TRANSFORMER. Rejuvenator, 22/9 each. H.B.1, 2 volts in 2.6 volts output. H.B.2, 4 volts in 5.2 volts output. H.B.3, 6.3 volts in 7.5 volts output, for low emission C.R.T.'s. Tapped at half boost voltage. Set of 3 transformers. Price 61/6.

ULTRA V470 and W470. E.H.T. transformer mains type. 4.2 KV. 2 volt 1.5 amp., £4/19/6.

W570 and D570. E.H.T. mains transformer, 5.2 KV. and 2 volt 1.5 amp., £4/19/6.

W700. Mains and E.H.T. filament transformer, £5/4/-.

FERRANTI TYPE E.H.T. voltage doubler transformer 230 v. mains, primary 2.5 KV. and 4 volt 1 amp. filament at 6 KV. insulation, £4.

COSSOR 1210 and 902 TYPE. E.H.T. and filament transformer, £7.

PHILCO 1707 and 1708. E.H.T. transformer, £4/7/-.

PLESSEY. E.H.T. transformer, mains input, 4 KV. output and U22 heater, part No. CP70049, limited supplies at £2/12/-.

SILICON COMPOUND DC4. For the first time in this country, available in 2 oz. tubes, prevents E.H.T. flash over and arcing. Price 10/6.

"TELEVISION FAULTS." With a supplement comprising circuits of Baird, English Electric, Murphy, Philips projection and Ultra sets. Price 5/6.

Have You Seen the CONSTRUCTORS ENVELOPE

Containing Comprehensive Instructions For Building the

LANE RECORD-PLAYBACK AMPLIFIER

5/-

THE LANE RECORD/PLAYBACK AMPLIFIER KIT

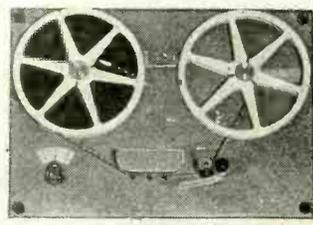
This high-grade kit incorporating modern miniature valves, punched and drilled chassis, ready assembled and screened switch and detailed theoretical and practical blueprints is supplied complete in every detail. No surplus items included. All components are of well-known makes and fully guaranteed.

Price £13.0.0

Amplifier ready built and tested, £15.10.0

THE LANE TAPE TABLE

Three motors. Fast forward and reverse rewind. High fidelity twin track heads. Positive braking £16.10.0. A combination of these two items provides tape recording in its most perfect form.



From your local dealer—in case of difficulty write to:

VERDIK SALES LTD.
17 SHAFTESBURY AVENUE, LONDON, W.1

Phone: Gerrard 8266

Dept. W.W.

18 TOTTENHAM COURT ROAD, LONDON, W.1

Tel.: MUSeum 2453/4539

Business Hours: Monday-Friday 9—5.30

Saturday 9—1

RELAYS

D.C. COIL RESISTANCE

3,000 TYPES: 1.9Ω to 80,000Ω
600 TYPES: 0.4Ω to 9,200Ω.

ALSO LARGE STOCKS OF DOUBLE & TRIPLEWOUND AND SLUGGED COILS.

SIEMENS TYPE HIGH SPEED

CONTACTS

3,000 TYPES: up to 8 sets.
600 TYPES: up to 4 sets.

3,000 TYPES: Make (M), Break (B), in Twin-silver Twin-platinum, Dome-silver (2 amp.), Tungsten (5 amp.), and Flat-silver (8-amp.). Change-Over (C), in all but Tungsten: Make-Before-Break (K), in Twin-silver and Twin-platinum.

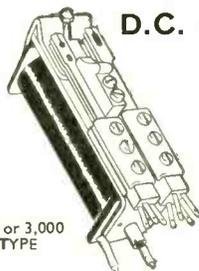
600 TYPES: (M), (B) and (C), in Twin-silver and Twin-platinum.

KEY SWITCHES.

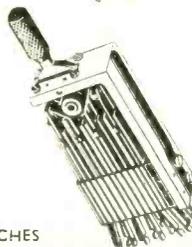
2 C/O. to 8 C/O. Special types made up to order.

SPECIAL.

Kit of parts less chassis for photographic timer unit. ½ sec. to 100 secs.



600 or 3,000 TYPE



KEY SWITCHES



Send for our fully illustrated Catalogue

THE HEART OF EVERY CIRCUIT

is to be found in its Transformer, which, like the human heart must keep the lifeblood flowing evenly and constantly under both normal and abnormal conditions.

POTTED COMPOUND FILLED TRANSFORMERS AND CHOKES

manufactured by WODEN have been designed to fulfil such a purpose, and for this reason they have been standardized by many leading Radio, Television and Electronic manufacturers and also Government Research Departments. Their choice is only made after exhaustive tests for accuracy and reliability. To merit this confidence, there is a constant need to provide components of the highest quality and our ample research and testing facilities ensure continued progress in this direction.

WODEN TRANSFORMER CO. LTD.

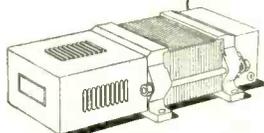
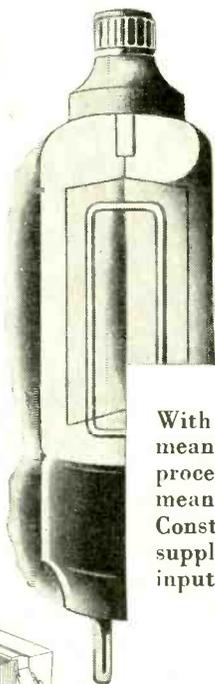
MOXLEY ROAD · BILSTON · STAFFS.

TELEPHONE: BILSTON · 41959

I.T.L.

With all
PHOTOMETRIC DEVICES
and also for

- INSTRUMENT CALIBRATION
- ELECTRONIC TIMING EQUIPMENT
- REPEATER EQUIPMENT
- REMOTE CONTROL GEAR
- MATERIAL ANALYSIS
- ETC.



You need
Constant Voltage TRANSFORMERS

With any photometric device a variable light source means variable and inaccurate operation, which in process control and other industrial applications may mean lost efficiency and increased costs. Advance Constant Voltage Transformers ensure that the mains supply voltage is stabilised to within $\pm 1\%$ with input voltage variations as high as $\pm 15\%$.

Full technical details showing how you can keep voltage under control are given in Folder S.15/W

Advance

ADVANCE COMPONENTS LTD., BACK ROAD, SHERNHALL STREET, WALTHAMSTOW, LONDON, E.17
 Telephone : LARKSWOOD 4366/7/8

Telegrams : Attenuate, Walt., London



NEW YEAR'S SCOOP

**BRAND NEW — UNUSED — COMPLETE
A PORTABLE TAPE RECORDER
NOT A KIT** BUT A FACTORY BUILT JOB. By a well-known manufacturer. Simple to operate. Finest quality components throughout.



- ★ Attractive carrying case.
- ★ Twin track recording.
- ★ Instant playback.
- ★ Size of case: 17 × 12 × 7 ins.
- ★ Total playing time of 66 mins.
- ★ 6 Valves.
- ★ Weight 31 lbs.
- ★ A.C. mains 200-250v.
- ★ Fast rewind.
- ★ Record level indicator.
- ★ Complete. Ready to switch on.

**MAKE NO MISTAKE—
YOU MUST SEE AND
HEAR THIS**

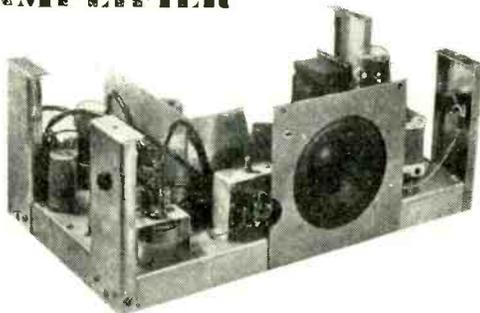
**LASKY'S PRICE
£34.19.6**

Carriage and insurance 15.-

Supplied fully assembled and wired, with all valves, 1200ft. spool of tape, take-up spool, crystal hand microphone, instruction book, and circuit diagram.

THE RECORDING AMPLIFIER

As used in the recorder above. 6 valves, 2 6V6; 2 6J7; 1 6J5; 1 5Z4. Supplied fully assembled and wired, with all valves and 5" speaker. Ready for use, 200-250 volt A.C. mains. Size: —15½" wide, 8½" deep, 6" high. Circuit available.



LASKY'S PRICE £8.19.6

Carriage and insurance 10/- extra.

TAPE RECOMMENDED
Scotch Boy
1,200 ft. Reels 35/-
600 ft Reels 21/-

MICROPHONES. CRYSTAL
Rothermel 59/6
Acos No. 1 £6 6s.
Acos No. 2
Complete with stand £6 6s.

Lustraphone. Moving Coil. Stand type. £5.12.6.
Lustraphone. Moving Coil, hand type. £5 5s.

MICROPHONE STANDS

Table model. 2 section. Chrome plated. Crackle finish base. 19/6.
Floor model. 2 section Brass, heavily chrome plated. 89/6.
Carriage 2/6 extra.

PORTABLE CABINETS

As illustrated. Can be supplied separately.
LASKY'S PRICE £3.15. Carriage 10/- extra.

LASKY'S

Lasky's (Harr

370 HARROW ROAD, PA

(Opposite Paddington Hospital) Tele

MAIL ORDER & DESPATCH DEPARTMENT, 485/487

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m., Thurs. half day 1 p.m.

MAINS TRANSFORMERS

All 200-250 volts c.p.s. primary. Finest quality, fully guaranteed.
MBA/3. 350-0-350 v. 80 mA, 6.3 v. 4 a., 5 v. 2 a. Both filaments tapped at 4 volts. An ideal replacement trans. Price 18/-
MBA/5. 350-0-350 v. 125 mA, 6.3 v. 4 a., 5 v. 3 a. With mains tapping board. Price 27/6
MBA 6. 350-0-350 v. 100 mA, 6.3 v. 3 a., 5 v. 2 a. With mains tapping board. Price 22/6
MBA/7. 250-0-250 v. 80 mA., 6.3 v. 3 a., 5 v. 2 a. Both filaments tapped at 4 volts. Price 18/-
MBA/8. 325-0-325 v. 120 mA., 6.3 v. 2.5 a., 5 v. 2 a. Impregnated. Tapped input, 110-250v. Price 27/6.
AT/3. Auto transformer. 0-10-120, 200-230-240 volts, 100 watt. Price 17/6

METAL RECTIFIERS

6 v. 1 a. 6/9
 6 v. 4 a. 17/6
 12 v. 1/2 a. 3/11
 12 v. 4 a. 17/6

"HAYNES" radio and television components. A large range available from stock. Send us your requirements.

TEST PRODS. Fused, with fully retractable points. Price 4/11 per pair.

SUPERHET COIL PACKS. 3 Wavebands: 12-35 metres; 35-100 metres; 200-550 metres. Size: 4x4x3in. Price 16/-.

RF.25 UNITS. BRAND NEW AND UNUSED. For use with 1355 Receiver. Supplied with 3 new SP61 valves. 19/11. Carriage 2/6 extra.

TWO-GANG TUNING CONDENSERS .0005MFD.

No. 1. Miniature. With Perspex dust cover and trimmers. Size: 1 1/2 x 2 x 1 1/4in. **LASKY'S PRICE 8/6**
 No. 2. Midget. With trimmers. Size: 2 1/4 x 1 1/4 x 1 1/4in. **LASKY'S PRICE 8/6**
 No. 3. Midget. Less trimmers. Size: 2 x 1 1/4 x 1 1/4 ins. **LASKY'S PRICE 6/6**
 No. 4. Standard type. Size: 2 1/2 x 2 1/2 x 1 1/2in. **LASKY'S PRICE 6/6**
THREE - GANG TUNING CONDENSER. .0005 mfd. Size 3 1/2 x 2 1/2 x 1 1/2in. **LASKY'S PRICE 7/6**

P.A. SPEAKERS. Re-entrant horn, 10 watts, beam projector, weatherproof speakers. 7.5 ohm impedance. Horn diameter—1 1/4in. **LASKY'S PRICE 99/6**
 Spigot mounting 10/- extra
 Carriage and packing 15/- each.

TANNOY PRESSURE UNITS. 10 watts. 7.5 ohms impedance. **LASKY'S PRICE 79/6**
 Carriage 4/6 extra.

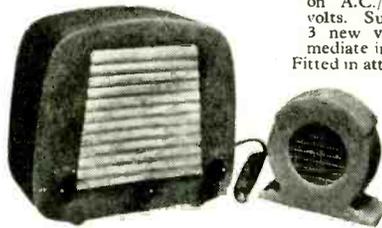
A Large range of Garrard and Collaro Auto Changers in stock. For immediate delivery.
 Single-speed Garrard. From £8/19/6
 3-speed Garrard. From £12/19/6

INTER - COM. SETS

4-station operation. For use on A.C./D.C. mains 200-250 volts. Supplied complete, with 3 new valves, ready for immediate installation.
 Fitted in attractive plastic cabinet

MASTER UNIT £7.15.0.
 Carr. 5/- extra.

Extension Units. As Illustrated. £1/1/-.
 Carriage 2/- each extra.



BRAND NEW AND UNUSED R1132A RECEIVER.

Supplied in makers' original wood transit case. Frequency coverage 100-124 mc/s. 11 Valves: 1 VR65; 1 VR66; 4 VR53; 2 VR54; 1 6J5; 1 VS70; 1 VR57. Large tuning scale with slow motion drive. 0-5 m/a. tuning meter, RF, and LF. gain controls, jack sockets for line and 'phone.
 Totally enclosed in metal case, grey enamelled with plated handles. Size: 18 x 10 x 1 1/2in. Supplied with all valves, also circuit and calibration chart. **LASKY'S PRICE £3.19.6**
 Carriage 10/- extra.

R1481 RECEIVER. Soiled condition. Supplied in original wood transit case.

Frequency coverage 66-86 Mc/s. 11 Valves: 1 VR65; 1 VR66; 4 VR53; 2 VR54; 1 6J5; 1 VS70; 1 VR57. Large tuning scale with slow motion drive. 0-5 m/a tuning meter, RF, and LF. gain controls, jack sockets for line and 'phone.
 Totally enclosed in metal case, grey enamelled with plated handles. Size: 18 x 10 x 1 1/2in. Supplied with all valves, also circuit and calibration chart. **LASKY'S PRICE 59/6**
 Carriage 10/- extra.

P.M. LOUDSPEAKERS

All less o'trans. new and unused. First: quality.
 3in. 12/11
 5in. 12/6
 6 1/2in. 13/6
 8in. 15/-
 10in. 25/-
 12in. 75/-

CARBON POT/METERS

All with long spindle, 1/2, 1 and 2 mez. **LASKY'S PRICE 3/3** less switch each.
 With switch 4/3 each. All post extra.

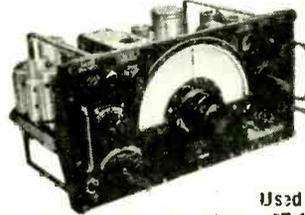


SPECIAL OFFER

BRAND NEW AND UNUSED R1155 RECEIVERS AERIAL TESTED BEFORE DESPATCH

THESE SETS ARE THE TOPS

Supplied complete with 10 valves. Circuit: B.F.O., A.V.C., R.F. Amp., two I.F. Stages, magic eye, etc., etc. 5 Frequency ranges: 18.5-7.5 Mc/s.; 7.5-3.0 Mc/s.; 1.500-600 Kc/s.; 500-200 Kc/s.; 200-75 Kc/s.



LASKY'S PRICE £11.19.6
 Carriage 12/6 extra

Used Models. Aerial Tested.

Complete with all valves, £7.19.6. Carriage extra.

POWER PACK AND OUTPUT STAGE.

Fully assembled. For use with above receiver. Complete with valves, wired and working. For operation on 200-250 volts 50 c.p.s.

LASKY'S PRICE 79/6 carriage 5/- extra.

WEARITE TYPE 550 I.F. TRANSFORMERS. Permeability tuned. 445-520 Kcs. Size: 3 1/2in. high, 1 1/4in. square. Price 12/6 per pair.

MIDGET YAXLEY SWITCHES. 4 pole 3 way and 2 pole 5 way. Long spindle. Price 2/11 each.

CAR RADIOS. BY FAMOUS MANUFACTURER. 12 Volt. 6 Valves. Valve line up: 6K7 RF. amp.; 6K8 Frequency changer; 6K7 I.F. Amp.; 6Q7 Detector and A.V.C.; 6V6 Output, 6X5 Rectifier. Non synchronous vibrator. Fitted in two units, with only electrical connections, not Bowden cable.
 Fitted 6 1/2in. speaker gives excellent quality output, adequate for the largest car.

Model No. 1. Frequency coverage: Medium wave band 197-560 metres, Long wave band 857-2065 metres. Model No. 2. Frequency coverage: Short wave band 18-50 metres, Medium wave band 197-560 metres. **LASKY'S PRICE £15.19.6**
 Carriage 10/- extra.
 State model required when ordering.

EXTENSION SPEAKERS. 3in. P.M. Complete with cabinet. Medium walnut veneer. Modern and pleasing design. Ideal for radio extension and intercom. slave units. Fitted with back. **PRICE 21/-.** Postage 2/- extra.

AMPLIFIERS. All fully wired and assembled, ready for operation.

25 Watt Model. By Romac, with radio tuner, long and medium wave. 7 valves, including 2 6L6 in push-pull. Provision for high and low impedance microphone. Absolutely perfect, new and unused. For 200-250 volts 50 c.p.s. mains. £25.

Model J/RA/2. 10-12 watt, 4 valves, including 2 KT61 in push-pull. Brand new and unused. For 200-250 volts 50 c.p.s. mains. Details available on request. £7/19/6.

12 Watt Model. 10 valves, including 2 25L6 in push-pull. Brand new and unused. For 200-250 volts 50 c.p.s. mains. £10/19/6.

ROTHERMEL (DEAF AID) CRYSTAL MICROPHONES.

Diaphragm driven. Extremely sensitive, can be used for tape recording, etc. Miniature, 1 1/4in. diameter. 1/2in. thick.

LASKY'S PRICE 7/6

POST FREE.

RADIO

ow Road) Ltd.,

DDINGTON, LONDON, W.9.

phones: CUNningham 1979 and 7214

Harrow Rd., Paddington, London, W.10. Tel. LADbroke 4075

TERMS: PRO Forma, Cash with order, or C.O.D. on post items only. Postage and packing on orders value £1-1/- extra, £5-2/- extra, £10-3/6 extra. Over £10 carriage free unless specifically stated otherwise.



CONDENSERS ELECTROLYTICS

- 32+32 mfd. 350 v.w. and 25 mfd. 25 v.w. in single aluminium can.
 Latest fixing, 4/11 each.
 8 mfd. 450 v.w. . . . 2/3
 8 mfd. 500 v.w. . . . 2/11
 16 mfd. 350 v.w. . . . 2/6
 16 mfd. 500 v.w. . . . 3/6
 32 mfd. 275 v.w. . . . 2/6
 50 mfd. 350 v.w. . . . 3/11
 60 mfd. 350 v.w. . . . 3/11
 250 mfd. 12 v.w. . . . 2/-
 250 mfd. 350 v.w. . . . 4/11
 8+8 mfd. 450 v.w. 4/6
 8+16 mfd. 500 v.w. 5/3
 12+12 mfd. 350 v.w. 3/6
 16+16 mfd. 500 v.w. 4/6
 16+24 mfd. 450 v.w. 5/11
 32+32 mfd. 150 v.w. 2/6
 32+100 mfd. 450v.w. 7/6
 60+100 mfd. 350v.w. 9/6
- BIAS** Ⓞ
 25 mfd. 25 v.w. . . . 1/6
 50 mfd. 12 v.w. . . . 1/6
 50 mfd. 50 v.w. . . . 1/6
 75 mfd. 12 v.w. . . . 1/-

MINIATURE BIAS

10 mfd. 25 v.w., 10½d. each, 9/- doz.

TUBULAR WAXED CARDBOARD

500 v.w. .1, .01, .02, .05, .001, .002, .005, etc., etc., 6d. each, 5/- doz.

MINIATURE MICA

100, 200, 300, 500 PF, etc., 6d. each, 5/- doz.

CERAMIC AND SILVER MICA

All values from 4½d. each, 4/- doz.

MINIATURE

.1, .01, .001, .02, .002 mfd. etc., 7½d. each, 6/- doz.

T.C.C. VISONOL HIGH VOLTAGE CONDENSERS (Cathodray).

.001 mfd. 12.5 kV. 7/6.
 .001 mfd. 15 kV. 10/-.
 .001 mfd. 25 kV. 18/-.
 .0005 mfd. 25kV. 18/-.
 .0005 mfd. 12.5 kV. 10/-.
 .1 mfd. 7 kV. 20/-.
 0.04 mfd. 12.5 kV., 7/6.
 Plastic case, single bolt fixing.

SPEAKER FRET

- Expanded metal. Finished silver.
 12in. x 12in. 3/11
 12in. x 18in. 5/11
 Plastic. Finished bronze or cream.
 12in. x 5in. 2/-
 12in. x 6in. 2/9

SMOOTHING CHOKES

- 20 mA 40 H 3/11
 40 mA 8 H 3/11
 40 mA 10 H 4/3
 100 mA 10-20 H 7/3
 150 mA 3 H 3/6
 250 mA 10 H 18/6

INDICATOR UNITS TYPE

233. Contains 1 c.r. tube type VCR97, and 11 valves.— 3 EF50; 3 EB34; 3 SP61; 2 EA50. Also hundreds of various types of components, resistances, switches, etc., etc. Assembled on strong metal chassis, in grey enamel steel case. Size:—18 x 8 x 8in. **LASKY'S PRICE 89/6.** Carriage and packing 10/6 extra.

CO-AXIAL CABLE 70-80 ohms impedance. Single core, 9/- doz. yards. Twin core, 12/- doz. yards. Balanced twin feeder, 6/- doz. yards

CRYSTAL DIODES

G.E.C. type, Glass wire ends 3/3 each. B.T.H. Type, Plastic, 3/- each.

TELEVISION SOUND AND VISION STRIPS

T.R.F. Birmingham frequency
 Chassis size: 11in. wide, 3½in. deep, 4½in. high (inc. valves). 4 R.F. stages. (2 common to both sound and vision.) 6 new Mullard valves. (4 EF80, 2 EB91.) Suitable for AC/DC or AC operation. Valves wired or AC operation. Limited quantity. Produced by famous manufacturer.

LASKY'S PRICE £6/19/6 With all valves. Carriage 3/6 extra. Other types in stock (S'het).

OUTPUT TRANSFORMERS

- 40 mA. Multi ratio 6/11
 80 mA. Multi ratio 14/11
 80 mA. Pentode 12/6
 60 mA. Plessey, 6,000 ohms 5/11
 Standard pentode 4/11
 Pentode 3/6
 Midget pentode 4/3
 Miniature pentode. 3S4, 1S4 4/6
 PX4 Intervalve 8/6
 5:1 Intervalve 5/11

FILAMENT TRANSFORMERS

- All 200-250 v. 50 c.p.s. primary.
 6.3 v. 1.5 a. 7/11
 6.3 v. 3 a. 12/6
 6.3 v. 4 a. 14/6
 2 v. 2 a. 4/11
 Special Transformer. 30 volts at 2 amps., with the following tappings —3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volts, 17/6.

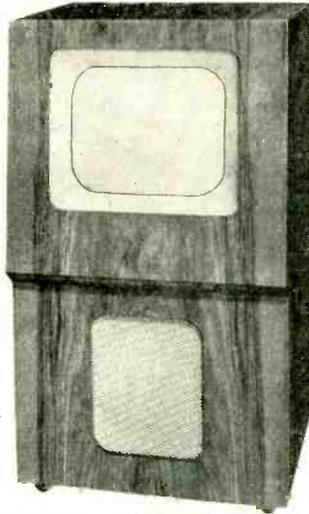
DE LUXE TELEVISION CABINETS

For 12in. cathode ray tubes. Beautiful figured medium walnut finish, with high polish. Fitted with shelf for receiver, glass speaker baffle and fret, and castors for easy movement. Undrilled. Suitable for use with the Viewmaster, "Practical Television," "Practical Wireless," and "Wireless World" televisions.

LASKY'S PRICE £8.10.0
 Carriage 12/6 extra.

Outside dimensions of cabinet: 17½in. x 16½in. x 32in. Why not convert your table receiver to a console? Adaptor frames for fitting 9in. or 10in. C.R. tubes available if required.

This cabinet can also be supplied cut out for a 16" c.r. tube.



METAL RECTIFIERS

- WX3 and 6. Each 3/9
 14D36 11/8
 14A86 20/4
 36EHT45 23/8
 36EHT50 26/1
 36EHT100 29/6

SUNDRIES

- Morganite resistances
 London 36/3
 All other models 35/3
 Bulgin com-ponents 13/2
 Colvern pot/meters, Type CLR901, 3/2 each
 Type CLR4089/22, 6/4 each

Morganite type "Q" pot/meters, 5/- each
 Belling-Lee L707 and fuses 9/9

W/B & PLESSEY

- Line EHT trans. 32/6
 Frame trans. 25/6
 3 Mc/s boost choke 5/9
 Width control Scanning coil 10/-
 Main choke 33/3
 Focus ring 15/6
 Heater trans.:
 WB 103 42/-
 WB 103A 52/6
 Front and rear C.R.T. supports 21/6

THE VIEWMASTER

COILS

All models available including filter chokes. Wenvoe, Kirk o' Shotts, Holme Moss Sutton Coldfield, 28/- per set. Alexandra Palace, 20/- per set. L9 RF choke, 2/-.

CHASSIS

Sound-Vision, 18/6.
 Power-Pack/Time base, 18/6.
 Support for S.V. chassis, 6/-.

CONDENSERS

All by T.C.C.
 100 mfd. CE10LE, 14/-
 250 mfd. CE10DA, 10/-
 2,500 mfd. 3 v.w. CE25AA 6/9
 All other types in stock.

VALVES

- EF50, 8/6 and 12/6 each; EBC33, 12/6; KT61, 12/10; 6P25 15/10; 6K25, 15/1; 6P28, 25/1; EB92, 10/6; EY51, 6/6.

The television set you can build at home from standard parts.

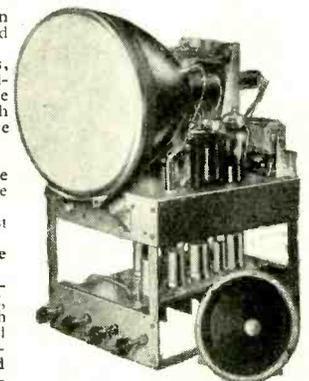
Wenvoe, Kirk o' Shotts, Holme Moss, Sutton Coldfield and Alexandra Palace operation. Brilliant high definition black and white picture.

Superb reproduction. Uses 9in. or 12in. Cathode Ray Tube. Table or Console Model.
 Incorporates all the latest developments.

Television for the home constructor at its finest. Send to-day for the CONSTRUCTION ENVELOPE, 32-page booklet crammed with top-rate information and all the necessary data, also 8 full-size working drawings and stage by stage wiring instructions. Model "A" for use in London and Home Counties Model "B" for use in Sutton Coldfield Area. Model "C" for Holme Moss. Model "D" for Kirk o' Shotts. Model "E" for Wenvoe.

PRICE 7/6 per copy. Post free

ALL COMPONENTS IN STOCK AND SOLD SEPARATELY.



CATHODE RAY TUBES

New and unused, fully guaranteed. All makes available from stock for immediate delivery. 9" from £13.13.8, 10" from £15.4.0, 12" from £18.4.10
 Carriage and insurance extra.
 Let us have your requirements.

LASKY'S
 Lasky's (Harrow Road), PA
 (Opposite Paddington Hospital) Telc
MAIL ORDER & DESPATCH DEPARTMENT, 485/487

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m., Thurs. half day 1 p.m.

Larger Screen T.V. new Wide Angle Components and Picture Tubes



CIRCUIT DETAILS AND DIAGRAMS SUPPLIED.

C.R.T. MASKS. Brand new LATEST ASPECT RATIO	Multi-Ratio Frame Output Transformer, 10/6.
10in. 7/6	
12in. 15/-	Frame Blocking Oscillator Transformer, 4/6.
12in. flat face 15/-	
14in. rectangular 21/-	Line EHT Transformer, with EY51 heater winding, 12/6.
15in. round 25/-	
16in. Double-D 30/-	Focus Magnet. With Vernier Control. For any type c.r. tube with 35 mm. diam. neck, 21/6.
17in. rectangular 27/6	
SOILED OLD ASPECT RATIO	Scanning Coils. High impedance frame, low line, 12/6. Low impedance line and frame, 14/6. Plessey. Low impedance line and frame, 25/-.
9in. 5/-	
12in. 7/6	Variable Inductance Width Control, 3/6.
15in. 10/-	
12in. with fitted armour plate glass (new ratio) 11/6	
ARMOUR PLATE GLASS	
15in. Actual size 18 1/2in. x 19 1/2in. x 3/4in. 7/11	
12in. Actual size 13in. x 10 1/2in. x 3/4in. 4/-	
9in. Actual size 9in. x 8in. x 3/4in. 3/-	

14in. rectangular C.R. tube	£21 5 8
17in. rectangular C.R. tube	£26 19 8
16in. round, metal cone ion trap tube ..	£24 6 5
Carriage and insurance extra.	
ALLEN WIDE ANGLE COMPONENTS	
Line and frame scan coils. Type DC300	£2 2 0
Width coil. Type GL18	10 0
Line linearity coil. Type GL16	10 0
Focus coil. Type FC302	£1 15 0
Line output and EHT transformer, 10-16 kV. Type L308	£2 10 0
Frame output transformer. Type FO305	£1 1 0
Frame Blocking Osc. Transformer	15 0
ELAC P.M. FOCUS MAGNETS —	
For 14in. and 16in. Tetrode tubes	£2 12 6
For 14in. and 17in. Triode tubes	£2 17 6

TELEVISION SELENIUM RECTIFIERS

The very latest "Sentercell" S.T.C. range.

K3/40, 3.2 kV.	7/6
K3/45, 3.6 kV.	8/2
K3/50, 4.0 kV.	8/8
K3/100, 8.0 kV.	14/8
K3/160, 12.8 kV.	21/6

S.T.C. METAL RECTIFIERS

RM1	3/11
RM2	4/6
RM4	21/-

CONVERT YOUR VIEWMASTER TELEVISION RECEIVER TO USE THE LATEST WIDE ANGLE 14, 16 or 17-inch. CATHODE RAY TUBE.

CATHODE RAY TUBE, MASK, VALVES AND ALL OTHER NECESSARY COMPONENTS CAN BE SUPPLIED FROM STOCK FOR IMMEDIATE DELIVERY.

WRITE FOR LIST.

C.R.T. REAR END PROTECTORS

Suitable for fitting to T.V. cabinets, 2/6-each.

CLOSED FIELD LOUDSPEAKERS

Ideal for television receivers. Less o/trans. 3 ohms. Will not affect your C.R. tube.

6 1/2in.	15/-
8in.	17/6

DARK SCREEN FILTERS (LATEST TINT)

12 1/2in. x 14 1/2in. For 16 and 17in. c.r. tubes, 25/-.

11in. x 13 1/2in. For 9, 10 and 12in. c.r. tubes, 19/11.

BRAND NEW 12in. MASKS. LATEST ASPECT RATIO.

Round face, with fitted dark screen filter. Dust-proof. **SPECIAL OFFER 29/11.** COMPLETE. Postage 2/- extra.

LARGE STOCKS OF RESISTANCES ALWAYS AVAILABLE

All values. Prices: 1/10th and 1/8th watt, 7d. each. 1/2 and 1 watt, 4d. each. 1 watt, 8d. each. Postage extra.

VCR97 C.R. TUBES BRAND NEW AND UNUSED

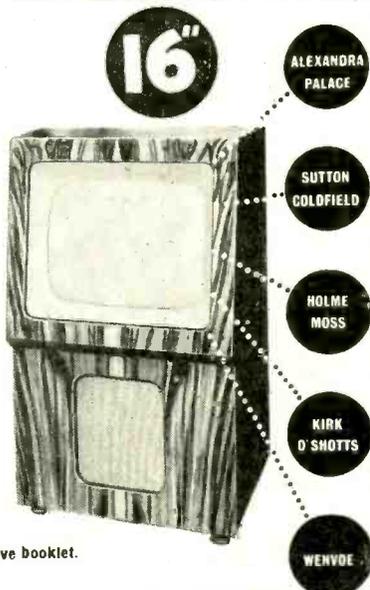
In maker's original sprung wood ransit case.

LASKY'S PRICE 45/-

6in. ENLARGER LENSES

Oil-filled plastic 19/6. Carriage 2/6 extra.

Introducing the **TELE-KING** laboratory developed



CHASSIS

Power pack; Sound-vision and Scan chassis. **PRICE 16/-** each. All other metal-work available from stock

COILS

13 All exactly as specified. **PRICE £2/14/3.**

RESISTANCES

72 Resistances, all exactly as specified. 18/-.

CABINET

As illustrated **£8/10/0** plus carriage.

A fully itemised price list of Tele-King components will be supplied free on request. All Tele-King components now in stock, available for immediate delivery.

- ALEXANDRA PALACE
- SUTTON GOLDFIELD
- HOLME MOSS
- KIRK O SHOTTS
- WENVOE

A practical 5-channel SUPERHET TELEVISION RECEIVER

Using the new 16-inch cathode ray tubes and wide angle components for the home constructor.

Complete instructions, wiring diagrams and 32-page descriptive booklet. **6/- POST FREE**

RADIO
Low Road) Ltd.,
DDINGTON, LONDON, W.9.
phones: CUNningham 1979 and 7214
Harrow Rd., Paddington, London, W.10. Tel. LADbroke 4075

SOLON-HENLEY ELECTRIC SOLDERING IRONS

Brand new and unused. Oval Bit.
For 230/250 volts only. **LASKY'S PRICE 19/-** Postage 1/- extra.

TELEVISION PRE-AMPLIFIERS

For London frequency, 2 Stage, uses 2 6F13 valves. Completely wired, ready for use. **LASKY'S PRICE 10/-** (less valves).

E.H.T. TRANSFORMER FOR VCR97

Primary: 200-250 v. 50 c.p.s.
Secondary: 2.5 kV., 4 mA.; 4 v., 1.1 a.; 4 v. (CT) 1.5 a. **LASKY'S PRICE 45/-** Postage 1/6 extra.

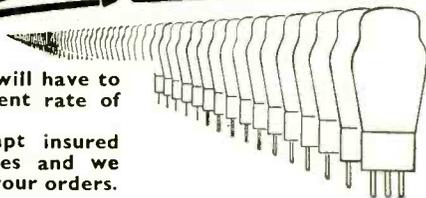
BASES FOR VCR97 C.R. TUBES. Fully shrouded and insulated. 4/11.

VALVES

At Pre-Budget Prices

Below is a list of B.V.A. and other Proprietary valves which we can supply at the pre-1951 Budget Price, i.e., only one third tax. We can of course supply most of the other types to complete the range but

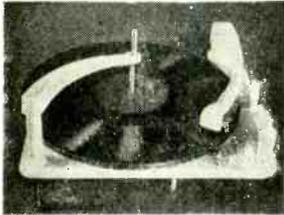
usually those not listed will have to be charged at the current rate of tax, i.e., 66 per cent. We give a very prompt insured C.O.D. service on valves and we shall be glad to execute your orders.



AC/HFP	DL33	HD14	K80A	PPL4	TB622	VP13K	1P11	6K8	15A2	117N7
AC/HL	DL35	HD21	K183	PP3 250	TB5013	VP13X	1R120	6LD20	15D1	117Z6
AC/HP5	DL33	HD24	K494	PP3 425	TB9620	VP14	1R4	6LFG	15D2	120
AC/PC	DL74	HF13	K535	PP5 400	TCE24	VP20	1R5	6L5	15E	124
AC/PEN	DL33	HL A2	LB210	PP6B	TD22A	VP23	1S4	6L8	17	150
AC/PT PEN	DL94	HL DD1320	LD2	PP6C	TD130	VP42	1S5	6L7	18	150A
ACP1	DL145	HL3 K	LD210	PP6E	TD25	VP41	1T4	6L18	18	150B
ACP4	DL747	HL4	L210	PP13A	TE564	VP41E	1T5	6L18	18BG6	154V
AC/SG	DN41	BL4G	LL2	PP24	TF44	VP60	1V	6N6G	20C	164V
AC/SGYM	DN143	HL13.HL	LL1	PP35	TH4B	VP133	2	6P5	20D1	185BT
AC/VH	DF495	HL 3C	LN152	PP225	TH4	VP210DD	2A3	6P7G	20D2	202DDT
AC/VP1	DTU1	HL21	LP2	PP411C	TH13C	VP1320	2A3	6R7GT	20F2	201PT
AC042	DT215	HL21DD	LP220	PP2018	TH21C	VR1C	2A5	6R7GT	20P1	202MPG
AC064	DVSG	HL23	L1	PP4118	TH28	VW48	2A6	6SA7G	20P1	202MPG
AC06/HL	DW2	HL33DD	L2	PT.DD35DA	TH30	V9	2A6	6SA7GT	21A	202STH
AC8/PEN	DW4 500	HL41	L2DD	PT2	TH30C	V30	2A7	6SF7	24	202VPE
AC5.PENDD	DB40	HL1DD	LE1DD	PT10	TH32	V312	2A8	6SH7	24A	203THA
APP4A	DO20	HL2DD	L3	PT24A	TH233	V914	2DA4	6SH7	24A	210DDT
APP6E	DO24	HL35DD	L38	PT24 DAL	TH2321	V960	2D13	6S17	24C	210DD
AP141	DO28	HL73C	L77	PT41	TM1	V1907	2D13A	6SK7	25AC5	210DG
ARP4	D1	HL13	LA10	PT230	TM14	V5116	2D13C	6SL7	25B5	210HF
AR101	D3	HL133DD	ME2	PV25	TR21	WD40	2D17	6SN7	25L8	210HL
ASL125	D41	HL210	ME17	PV29	TR22	WD142	2D17	6SQ7	25Y5	210LF
AS4120	D42	HL1320	ME20	PV495	TP25	W21	2YR215	6S25	26	210PG
AS4125	D43	HPB13	MHD4	PX230	TP26	W42	3D6	6S7G	26	210VP
AZ1	D63	HP13	MML13	PX230SW.P	TP220	W78	3Q5	6M7G	27	210VPT
AG6	D77	HP210	MH4	PY30	TP230	W77	3V4	6TH8G	28D7	210VPT
A11D	DE2	HP211C	MH141	PY31	TP1340	W81M	3Y4	6U5G	30	215P
A20B	D400	HR2	ME26E	P2	TP2820	W142	4D7	6U7G	31	215SG
A25A	D3597A	HP215	MH1118	P41	TP284	W143	4D1	6V6G	32	2201PT
A50A	EAF41	HP1118	MH4103	P61	TT4	W145	4TRA	6V7	32E	220P
A80A	EAF42	HP2018	MH4105	P140N	TT4A	W150	4TPB	6W5G	33	220PA
BLL32	EAS0	HP4101	MH4108	P215	TK21	X7	4TSA	6W7	34	220PT
BR202	EB30	HP4101C	MK74	QP21	UB21	X22	4TSP	6X5	35	220VPE
BR8G	EBC33	HP4108	NL4	QP22B	UB241	X24	4X3	6Y4	35A5	220VSG
BVA42	EBC41	HP4106C	MP/PEN	QP25	UB90	X63	4100UB	6ZY5G	35C5	220VSG
BVA.1	EBF11	HP4106G	MR1	QP42	UB121	X64	5	6Z5	35L9GT	224
BVA44	EBF80	HP4108	MS/PEN	QP40	UB41	X65	5U4	7A2	35Z3	225DU
BVA45	EBL21	HP4115	MS/PENB	QP21	UB42	X71	5V4	7A3	35Z4	230PEN
BY47	EB41	HP4101	MS/PENY	QP22B	UB241	X73	5Y3	7A7E	35Z5	230XP
BVA45	EB34	HR28	MSP41	QP25	UB90	X73M	5Y3	7B5	37	240QP
BVA56	EB41	HR210	MSA4B	QP42	UB121	X76	5Y4	7B5	37	240QP
B2	ECC31	HVU1	MU4105	QP230	UB121N	X78M	5Y33	7B6	38	244V
CB1	ECC34	HW20L	MVSPEN	RB41	UB41	X78	5Z3	7B7	39	290L4
CB131	ECC35	H2MB	MVSPENB	R1320	UB21	X79	6A1B7	7C5	39 44	301
CL4	ECH11	H2	MVSPENY	R1920	UC142	X81M	6A1C5	7C6	39 44	302
CL33	ECH21	H20	NHL13	R3250 1000	UC41	X138	6AC7	7C7E	41MDG	302THA
CP220	ECH42	H21	NHL13L	RX210	UF41	X143	6AE5	7D3	41MH	304
CR84	ECL80	H30	NH4105	R3	UFW29L	X148	6AE8G	7D5	41MHL	307A
C10	EC2	H42	N14	R2	UL41	X150	6AF5G	7D7	41MLF	329
C1	EC91	H141D	N18	R42	UL44	X160	6AG5	7D8	41MLP	340
C2	EE50	IRV120/350S	N37	SD2	UL44	X173	6AG8	7D9	41MPG	360BX
C5B	EF5	J240	N43	SD6	UL48	Y63	6AL5	7K7	41MPT	402PENA
C9	EF6	KBC32	N77	SD20	UM34	Y73	6AM6	7Q7	41MRC	408BU
C18	EF8	KF35	N145	SE211	UR3	Z20	6A3	7R7	41MSG	410HF
C20C	EF9	KG32	N307	SE211C	UR13	Z22	6A4	787	41MTA	410PT
C23B	EF11	EL4	OC13L	SG220	UR13	Z25	6A6	7Y4	41MTL	413PD
C30B	EF12	KL32	OM4	SG220SW	U3	ZD17	6A7	8A4	41MXP	413XP
C36A	EF13	KL35	OM6	SG410	U07	Z14	6A8	8A1	41MXP	423PT
C36C	EF22	KTW81M	OM9	SPT4A	U09	Z21	6BA8	8D2	41MRC	408BU
C50B	EF36	KW91	OM10	SP2	U030/250	Z22	6BE6	8D3	41MSG	410HF
C50N	EF39	KW82	OM12	SP2D	U030	Z25	6BG6	8A1	41MTA	410PT
DAC1	EF41	KTW63	PA1	SP4	U060/250	Z25	6B8	8A2	41MTL	413PD
DAC32	EF42	KTW73	PA20	SP13	U07	Z77	6B4G	10	41MPT	423PT
DAF91	EF50	KTW74	PD220	SP13C	UY21	Z152	6B7	10C1	42PTB	607
DCP	EF54	KTZ2	PD230A	SP135	UY31	OX5G	6B8	10D1	43	646
DC35GM	EF56	KW41	PD230A	SP135	UY31	OZ4	6C4	10D2	431U	696
DDA13	EF91	KTZ83	PEN4A	SP2	U4	O1A	6C4	10F1	44E	802
DDL4	EF92	KT2	PENB4	SP41	U16	1A4	6C5G	10F3	45	803
DD/PEN	EH2	KT4	PENDD1360	SP42	U17	1A4E	6C6	10F9	451U	805
DDTR13	EK2	K78	PENDD253	SP45P	U18 20	1A5GT	6C6G	10P13	48	813
DDTR133	EL91	KT24	PENDD4020	SP61	U21	1A5G	6C9	10P14	49A	860
DDT13	EL32	KT32	PEN25	SP10	U22	1A6	6C10	10P15	50C5	866A
DDT135	EL3	KT38C	PEN24	SP215	U25	1BC1	6D1	11D5	50L4	954
DDT16	EL32	KT35	PEN25	SP220	U33	1B4E	6D2	12AH7	53	955
DD13	EL33	KT36	PEN30C	SP1320	U35	1B5/255	6D3	12AL5	55	958
DD14	EL35	KT41	PEN40DD	SP220	U37	1B7G	6D4	12AT7	56	1215GT
DD20	EL42	KT42	PEN45	SP42	U42	1B7G	6D6	12AX7	58	1299A
DD41	EL41	KT44	PEN45DD	SS210	U74	1B12	6D7	12A5	61BT	1508
DD101	EL42	KT45	PEN46	SU25	U78	1C1	6F1	12A8	62BT	1619
DD207	EL50	KT61	PEN220A	SU61	U78	1C5GT	6F6	12C8	62DDT	1628
DD620	EL82	KT83	PEN383	SU2150A	U82	1C6	6F7	12H6	62TH	1628
DD818	EM1	KT85	PEN428	SW42	U82	1C7G	6F8	12J5	62VP	1632
DD830	EM1	KT71	PEN453DD	S3DD	U145	1D5	6F12	12J7	68U	1642
DEH610	EM4	KT72	PJ10	S4A	U281	1D5G	6F13	12K8	67PT	1701
DETR10	EY91	KT74	PL33	S4V	U404	1D6	6F14	12Q7	71A	1801
DE3	EZ2	KT76	PL38	S4VA	U914	1D7G	6F15	12Q7A	72	1804
DF51	EZ35	KT81	PL38M	88	U920	1D8	6F16	12SF6	73	1812
DF91	EZ40	KT82	PM12	S23	VMP4G	1E7A	6G6	12SG7	75	1815
DF92	EZ41	KT263	PM2A	S130	VMP4G	1F2	6G8G	12SH7	76	1820
DF495	FC2	KW32	PM2B	S215VM	VO25	1F3	6H6	12S17	77	1927
DE2	FC2A	K23B	PM2HL	S217	S217	1F5G	6H7	12SK7	78	1928
DE24	FC4	K30G	PM3	S410	S410	1F6	6H62	12SL7	80	2040
DE73	FC13	K30K	PM12	S410N	S410N	1F7GH	6J5	12SQ7	82	2101
DE149	FW104	K31A	PM12M	S132N	VP13A	1G42	6J6	12S27	83	2102
DE149	FW4/500	K33B	PM14	S1328	VP4	1G6G	6J7	12Y4	84	2103
DE150	F5R	K40N	PM20	TB14	VP4A	1H4G	6J8	12Z3	101	2151
DK91	GR2	K50M	PM22	TBL14	VP4C	1H5GT	6K5	13D1	104V	0153T
DL310	GU1	K50N	PM24M	TBL44	VP13	1H6	6K6	13SPA	105	7193
DL510	GA2	K52	PM25	TB052	VP13A	1L42	6K7	13VPA	110	8355A
UL2	GA20	K70B	PM29D	TB102	VP13B	1L45	6K7M	13V9	112A	8355A
DL24M	HD13	K70D	PM292	TB192	VP13C	1P5	6K7G	15	117L7	13201A

Advertisement by Electronic Precision Equipment Ltd., see overleaf.

DECCA RADIO-GRAM UNITS



A special purchase enables us to offer the famous Decca Record Changer new and unused, at a little over half price. A superb instrument, plays standard 78 r.p.m. and 33 r.p.m. records up to 10 of which of mixed sizes can be loaded at one time. Ideal for modernising an old radiogram or for a new installation, has attractive modern finish and very conveniently located controls. Size, 12in. x 10in. deep, clearance above board 5in., below board 3in. Each unit is complete with 2 Decca lightweight pick-up heads. Special price £11/17/6, plus 7/6 carr. and ins. £4/1/6 deposit and 12 payments of 17/-.



EX-ROYAL NAVY SOUND POWERED TELEPHONE

These require no batteries, and will go for long periods without attention. Complete with generator and sounder which gives a high pitched note, easily heard above any other noise. Also fitted with an indicator lamp which in quiet situations can be used instead of the sounder, or where several phones are used together will indicate which one is being called. Size 7 1/2in. x 9in. x 7 1/2in., wall mounting, designed for ships' use, but equally suitable for home, office, warehouse, factory, garage, etc. Price 57/6 each, plus 4/6 carriage.

ADJUSTABLE THERMOSTAT

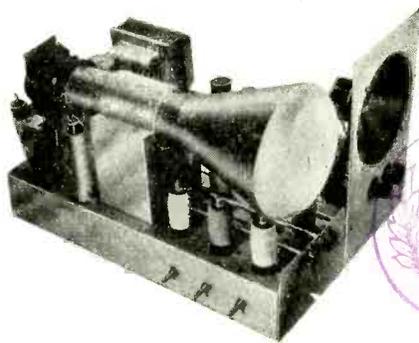
250 v. heavy silver contacts can be adjusted to operate between 70° - 300° F. These are suitable for aquarium heaters, electric blankets, etc. 1 Amp. Model 3/6. 2 Amp. Model 5/6. Post, etc., 6d. extra. Don't be cold this winter, make an Electric Blanket, blueprint 1/6, post free.

SOMWEAVE

This really lovely loud-speaker fabric we offer at approximately a third of today's cost. It is 42in. wide and our price is 12/- per yard or panels 12in. x 12in., 1/9 each. This is also very suitable for covering plain wooden cases, for portable radio amplifiers, etc.

THE "P.T." 'ARGUS' TELEVISION RECEIVER

A 21 Valve 6in. C.R. Tube Unit-built Televisor for the Amateur



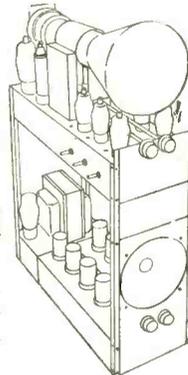
Although this televisor costs only about £20, it does not involve the conversion of ex-Government units, and has been designed for construction by the novice. The circuits have been kept straightforward and devoid of "frills," though nothing has been sacrificed which would assist in its efficient and stable operation.

The cathode-ray tube used is a VCR97. This 6in. tube was chosen as it is readily available at a low cost, and is capable of providing pictures of very good quality. The trace is green, but one soon becomes accustomed to the colour, and it is very restful to the eyes.

The chassis is divided into five separate units which makes for ease of construction; the units are vision receiver; sound receiver; time base; E.H.T. Supply and C.R.T. network and power unit. Each unit is complete on its own chassis, and when finished all units are bolted together to form the complete televisor.

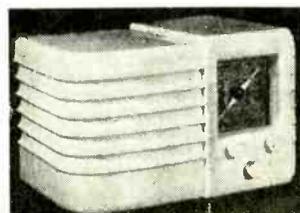
We can supply all the parts for £20/10/-, H.P. terms are available, deposit being £6/17/6 and 12 monthly payments of £17/8. Carriage and packing 10/- extra. A reprint of the data which originally appeared in "Practical Television," together with some additional diagrams and notes produced by our Television engineers are available as a constructor's Envelope. Price 5/-, post free.

THE ARGUS ARRANGED AS A CONSOLE



PROFESSIONAL RADIOS YOU CAN MAKE

You will find that the building of our all-mains radio receivers is simplicity itself, and the more you make the less time each takes, everything down to the last nut and bolt is supplied, and everything fits together in a professional manner. When finished the receiver looks and plays as well as those being offered in radio shops at anything between £10 and £14. The one illustrated above we call the "Occasional," in a choice of colours, Ivory or Walnut and the T.R.F. costs just less than £6 to make (H.P. terms being £2/1/6 deposit and 10 monthly payments of 10/6), while the superhet costs approximately £9 (H.P. terms £3/2/- deposit and 12 monthly payments of 13/6).



The other radio illustrated we call the "White Lady." This is an extra fine cabinet of pure white. The complete T.R.F. receiver costs about £6/5/- to build, H.P. terms being £2/3/- deposit and 10 monthly payments of 10/9 and the superhet receiver costs about £9/5/- to build, H.P. terms £3/2/- deposit and 12 monthly payments of 13/6. Constructional data for either set is available at 1/6, post free.

METAL RECTIFIERS



The one illustrated is a special bargain being available at considerably below cost. It is a selenium type rectifier rated at 12 v. 2 1/2 amps, it is of course a full wave type highly suitable for battery chargers. Limited quantity. Price 17/6 each.

Also available 6 v. 1 amp. Type. Price 5/- each. 12 v. 1 amp. Type. Price 9/- each.

UNBREAKABLE GLASS

Is a parcel of toughened glass which we can offer at approximately a quarter of its cost. This glass, as many readers will know, can be dropped and will not break. In fact it is most difficult to break and is so useful for dozens of applications in addition to its original purpose of protecting viewers against flying glass in the event of an exploding Cathode Ray tube.



We offer a parcel of five panels each 10 1/2 x 9 1/2 in. for 7/6, post free.



CONNECTING WIRE SNIP

P.V.C. insulated 23 s.w.g. copper wire in 100ft. coils, 2/9 each. Colours available - Black, Brown, Red, Orange, Pink, Yellow, White, Transparent. 4 coils for 10/-.

AUTO TRANSFORMERS

For working American equipment off our mains. etc., etc. Input tapped 200-240 v. Output 115 v. In addition to those listed below, we have special

this month: 150/200 watt totally enclosed in metal box with input and output leads. Price 47/6 plus 2/- post and packing.

Totally enclosed and screened

	Price	Carr.
50 watt	£12/6	1/6
100 watt	£11/16	1/6
150 watt	£3/-	2/-
250 watt	£4/10/-	2/6
500 watt	£5/10/-	2/6

Unscreened

1 KVA (1,000 w.)	£6/10/-	5/-
1.5 KVA (1,500 w.)	£7/17/6	5/-
2 KVA (2,000 w.)	£10/17/6	7/6
3 KVA (3,000 w.)	£12/7/6	10/-
5 KVA (5,000 w.)	£19/5/-	12/6

SLIDER RESISTORS

Heavy Duty Type. Size 7in. x 1 1/2in. 11 ohms 4.5 amp. 22/-; Size 9in. x 1 1/2in. 1.2 ohms 15 amp. 15/-; Size 13 1/2in. x 1 1/2in. 3 ohms 10 amp., 15/-.



TRANSFORMER BARGAINS

250 mA, 350-0-350 v., 6.3 v. at 6 amps, 5 v. at 3 amps, 4 v. at 5 amps. Price 37/6.

200 mA, 425-0-425 v., 6.3 v. at 4 amps, 6.3 v. at 4 amps, 5 v. at 3 amps. Price 50/-.

120 mA, 350-0-350 v., 4 v. at 4 amps C.T., 4 v. at 2 amps C.T. Price 42/6.

100 mA, 350-0-350 v., 6.3 v. at 4 amps, 5 v. at 3 amps, fully shrouded upright mounting. Price 22/6.

100 mA, 250-0-250 v., 6.3 v. at 6 amps, 5 v. at 3 amps, fully shrouded upright mounting. Price 27/6.

85 mA, 350-0-350 v., 4 v. at 2.5 amps C.T., 4 v. at 5 amps C.T. Price 37/-.

80 mA, 350-0-350 v., 0-4-6.3 v. at 5 amps, 0-4-5 v. at 2 amps. Price 19/6.

80 mA, 300-0-300 v., 6.3 v. at 4 amps C.T., 5 v. at 2 amps upright mounting. Price 19/6.

80 mA, 280-0-280 v., 4 v. at 1.5 amps, 4 v. at 6 amps, half shrouded. Price 18/6.

70 mA, 235-0-235 v., 6.3 v. at 2.5 amps, 5 v. at 2 amps, upright mounting, price 22/6.
70 mA, 235-0-235 v., 4 v. at 4 amps, 4 v. at 1 amp, upright mounting. Price 22/6.



60 mA, 260-0-260 v., 4 v. at 3 amps, 4 v. at 2 amps, upright mounting fully shrouded. Price 18/6.

40 mA, 325-0-325 v., 6.3 v. at 3 amps, upright mounting. Price 15/6.

FILAMENT TRANSFORMERS

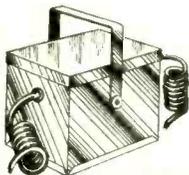
Standard types for receivers, 6.3 v. at 1.5 amps. Price 6/6. 6.3 v. at 2 amps. Price 8/6. E.H.T. insulated. 2 v. at 2.5 amps. Price 7/6.

T.V. TRANSFORMERS

Fixed Primary—H.T. Secondary, 300-0-300 v. at 150 mA, L.T. 7.5-0-7.5 v. at 3 amps and 4 v. at 3 amps. Dimensions are 4 1/2 in. high × 4 in. × 3 1/2 in. Price 17/6, plus 2/- postage and packing.

E.H.T. TRANSFORMERS

2,500 v. 5 mA, 2-0-2 v., at 1.1 amps. 2-0-2 v. at 2 amps. Price 37/6.



WELDING TRANSFORMERS

12 v. 50 amp output from 200-240 v. A.C. mains. Primary and secondary separated by a special screen to prevent interference, this screen is brought out to the terminal block. Complete in metal case with carrying handle, price £4/5/-, plus 5/- carriage and packing.

MAGNETIC TAPE RECORDER KIT— YOURS FOR £11/14/6



Total cost, £35.
Cabinet only, £4/17/6.
Tape Deck only, £16/10/-.

Tape Deck. Fitted with 3 motors giving fast rewind/forward run and no friction. High fidelity record playback giving approximately 1 hour playing from standard 1,200ft. tape. Tape, 35/- per reel.

Amplifier. High gain enables recording to be made from microphone, pick-up, or loudspeaker. Separate bass and treble lift controls.
Cabinet. Portable, is rexine covered, table model is polished walnut.
Instruction Booklet. Shows in close detail exactly how to assemble and operate the recorder, is free with kit or available separately at 5/- (credited if you buy kit or complete recorder).

Price £35. Complete kit of parts, including 6 B.V.A. valves, loudspeaker and cabinet (state whether portable or table model required), or £11/14/6 deposit and 12 monthly payments of £2/6/3. Carriage, ins. 10/- extra.

T.V. SIGNAL AND PATTERN GENERATOR

Cost of all components, valves, etc., only 29/6.

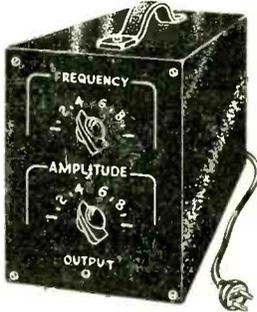
Although this generator can be built and used by any beginner it is at the same time a most useful instrument for the more advanced worker.

It can be tuned to the vision channel and will produce a pattern on the face of the C.R. tube. Alternatively if tuned to the sound channel it will produce an audible signal in the loudspeaker.

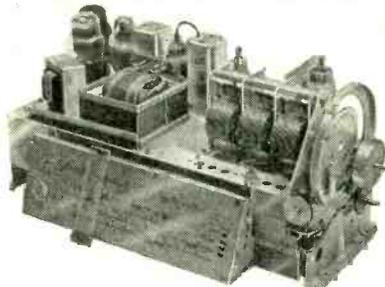
Thus its owner will become independent of B.B.C. transmissions and can fault-find or test at any time. It operates entirely from A.C. mains and is quite suitable for use with superhet or straight receivers.

A complete kit of parts (in fact everything except the cabinet) with full constructional and operational data will be supplied for 29/6, plus 2/6 post and insurance, alternatively data is available separately, price 2/6 (credited if you buy the kit later).

NOTE. Cabinets as per the illustrated prototype will be available shortly.



7 VALVE 5 WAVEBAND RADIO CHASSIS



A famous set by a famous manufacturer. Undoubtedly a serious listener's receiver. Among many special features are an H.F. stage and tuning indicator. Tunes up to 11 metre band. Price complete with valves but less speaker, £14/19/6. H.P. terms £5/10/- deposit and 12 monthly payments of £1/10/-.

We have a few left, less valves and power pack, otherwise in good condition; they definitely have never been used. Price £6/19/6, or £2/7/- deposit and 11 monthly payments of 10/9, plus 15/- carriage.

ELECTRICAL BARGAINS

In addition to our large range of radio accessories we also carry a good stock of electrical wiring accessories, details of a few of these and of cable can be found below:—

5 AMP SURFACE SWITCHES—HICRAFT
Oblong Brown Plastic 1-way, 1/3 each.
Oblong White Plastic 1-way, 1/3 each.

Oblong Brown Plastic 2-way 1/6 each
Oblong White Plastic 2-way 1/6 "
Round Brown Plastic 1-way 1/3 "
Round White Plastic 1-way 1/3 "
Round Brown Plastic 2-way 1/6 "
Round White Plastic 2-way 1/6 "

SOCKETS—HICRAFT

Flush type for skirting 5 amp. 6-pin shuttered, 1/3 each; ditto with switch, 2/3 each.



CEILING SWITCHES—HICRAFT

With cord and acorn. Brown or White, 1-way, 3/9 each; 2-way, 4/3 each.

LAMP HOLDERS

Bakelite 1/- each or 10/6 doz.
Bakelite skirted Batten holder 1/6 or 15/- doz.
Bakelite type threaded for #in. with HO skirt, 1/6.
10 per cent. discount if bought in dozens.

T.R.S. CABLES, 250 v. CLASS

1.044 Twin flat	.....	7/9
3.029 Twin flat	.....	1/-
3.029 Twin with earth	.....	1/3
3.029 3 Core flat	.....	1/6
3.036 Twin flat	.....	1/4
3.036 Twin with earth	.....	1/7
3.036 3 core flat	.....	2/-
7.029 Twin flat	.....	1/6
7.029 Twin with earth	.....	1/11
7.036 Twin flat	.....	2/9
7.036 Twin with earth	.....	3/3
7.064 Twin flat	.....	4/9

LEAD COVERED CABLES, 250 v. CLASS

3.029 3 core	.....	yard 2/3
3.036 3 core	.....	3/8
7.044 Twin	.....	3/3
3.036 Twin	.....	2/-
7.029 Twin	.....	2/9
7.064 Twin	.....	5/-

WAR EMERGENCY TYPE CABLES, 250 v. CLASS

These are P.V.C. or rubber insulated, laid flat then braided with cotton and compounded:

7.029 3 core flat	.....	yard 2/-
7.044 Twin flat	.....	2/-
7.064 Twin flat	.....	3/3

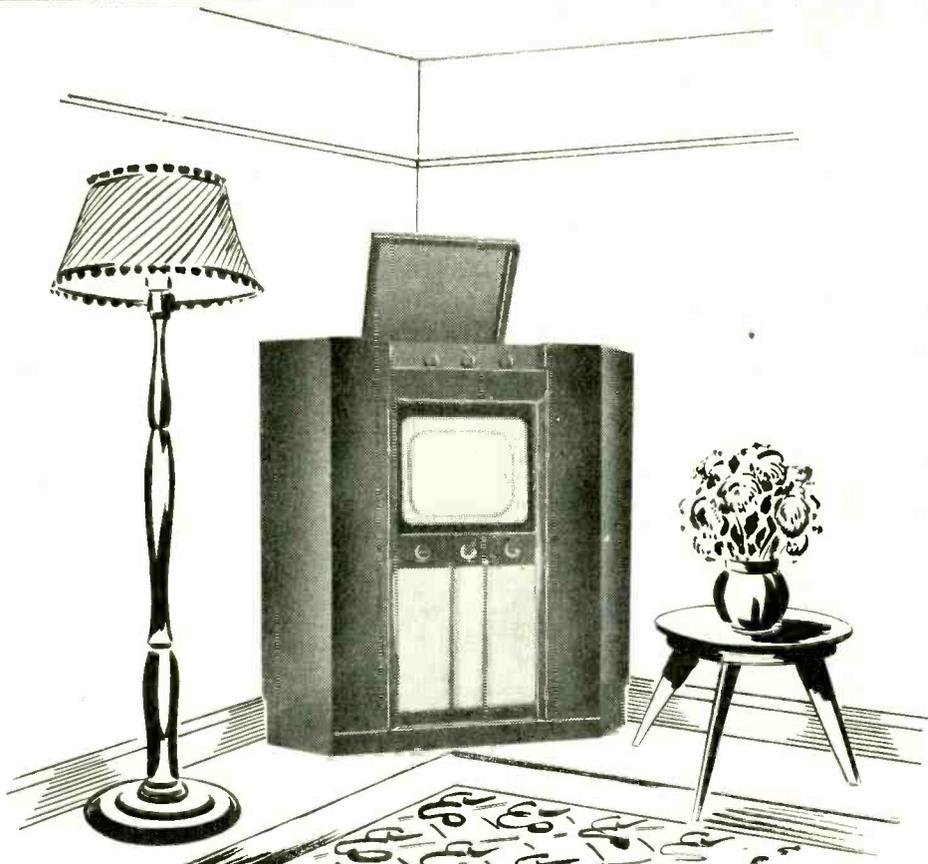
MULTICORED FLEXIBLES

All are suitable for mains work as the separate conductors are very well insulated, then they are covered overall either with hard rubber, plastic or waterproof braiding:—

10 core	.....	yard 2/6
7 core	.....	2/-
5 core	.....	1/-

GIVE AWAY PRICE

only £6 . 19 . 6



THE ELPREQ CORONATION CONSOLE

A combined Radio, Radiogram and 15in. Televisor valued at a shop price of £300-£400 can be yours for about £75 if you adopt our plan.

THE T.V. CHASSIS. Of the several which will be submitted to us in our "Win £100" Competition the best will be chosen (and we feel sure it will be good), wiring diagrams, plans and constructional details will be printed and be ready early in the New Year. Total cost of this chassis with tube will be less than £35.

THE RADIO UNIT. A 3 station pre-set superhet with special attention to quality is we think the best for the "Console," such a set is being designed and will not cost more than £7 10s. 0d.

THE RADIOGRAM UNIT. The latest

3 speed Collaro or Garrard autochanger will fit in the top. Cost about £15.

THE CABINET. This handsome corner fitting piece (47in. wide, 31in. deep to the corner, and 50in. high) has actually been made. We are having it redesigned so that it can be supplied flat for you to screw together. You can then get a local man in to french polish it. We have not an actual costing but are told that it should not be more than £18.

OUR PLAN. As soon as we are ready to send out the parts we will ask you to forward £12 10s. 0d. upon receipt of which

we will send you parts for the Televisor section. From then on you send us 30s. every week and we will send you other sections in the following order: Radio and Audio Chassis, Cabinet and finally Record Changer unit.

WHAT TO DO FIRST. Constructors envelopes will be ready early in January so first send 7s. 6d. for one of these. Upon receipt you can study it, and we feel sure that you will want to make the "Console" but the data will be on 7 days approval and if you wish you can return it within this period and providing it is received in clean condition 7s. will be refunded to you.

ELECTRONIC PRECISION EQUIPMENT LTD.

We have moved in at last so you can now address your orders to:—

**ELPREQ HOUSE (Ref. 2), HIGH STREET,
WEALDSTONE, MIDDX.**

Personal shoppers however should continue to call at:—

42-46, WINDMILL HILL, RUISLIP, MIDDX.

Phone: RUISLIP 5780
(Half-day, Wednesday).

152-153, FLEET STREET, E.C.4.

Phone: CENTRAL 2833
(Half-day, Saturday).



BUILD A PROFESSIONAL RADIO OR AMPLIFIER AT LESS THAN HALF TODAY'S PRICE

A MAINS OR BATTERY PORTABLE KIT



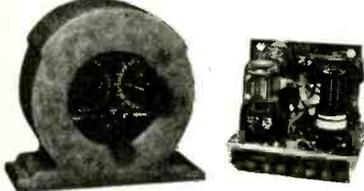
A Midget 4-valve Superhet Portable Set covering medium and long wavebands.

Designed to operate on A.C. mains 200/240 volts, or by an "Alldry" battery. The set is so designed that the mains section is supplied as a separate unit which may be added at any time. The Kit therefore can be supplied (a) as an "Alldry" Battery Superhet Personal Set which can then be accommodated in the Attache Case as illustrated above (size 9 1/2 in. x 4 1/2 in. x 7 in.). This is attractively finished in lizard, maroon, dark green or blue rexine (b) or as a Combined Mains/Battery Superhet Portable Receiver, for which a polished Wood Cabinet is available to accommodate both Mains Unit and Batteries together.

Circuit incorporates delayed A.V.C. and Pre-selective Audio Feedback. Kit is complete in every detail and includes ready-wound Frame Aerials, fully aligned I.F. Trans., and drilled Chassis, etc. Overall size of assembled chassis 8 in. x 4 in. x 2 1/2 in. This Receiver, as illustrated, can be completely built for approx. £10 (plus Mains Unit if required). Send 1/9 for the fully descriptive Assembly Book which includes Practical Layouts and complete price list of Components.

THE "MINI-TWIN" 1-VALVE BATTERY SET

A design of a simple 1-valve 2-stage Battery Receiver, giving excellent results on Medium and Long Wavebands and having exceptionally low Battery consumption.



Drilled Chassis and Practical Diagrams make it the ideal set for the beginner to build.

The complete chassis including valve can be built for 37/6, the attractive Plastic Case is 8/6, and suitable headphones 14/8.

The complete Assembly Instructions, Layouts and a Component Price List are available for 1/6.

This Receiver also performs excellently, without modification, as a Tuning Unit, and in addition, with simple modifications for which a complete diagram is provided makes a first-class Preamplifier for Pick-Up or Microphone.

BATTERY CHARGER KITS

All Kits incorporate Metal Rectifiers, and are for use on A.C. mains 220-250 volts. All Kits include an easily followed Wiring Diagram.

For charging 6- or 12-volt battery at max. 1 1/2 amp. with Variable Resistor and Meter, £2/4/0.

For charging 6- or 12-volt battery at max. 2 1/2 amp., less Variable Resistor and Meter, £2/2/0.

For charging 6- or 12-volt battery at 2 1/2 amp., with Variable Resistor and Meter, £3/8/3.

PICK-UPS

Cosmoord "G.P.20," for standard records, £3/11/5; interchangeable (G.P.19) Head for L.P. records, £2/3/4.

Decca lightweight "turnover Head" type, for L.P. and standard records, £3/18/2.

Marconi Standard, lightweight Magnetic, £1/15/10.

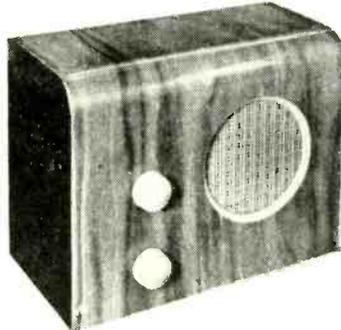
Marconi Matching Transformer, 7/6.

Golding, Standard, lightweight Magnetic, 35/10.

You're SURE to get it at
STERN'S
ESTABLISHED 25 YEARS

A MIDGET 4-STATION "PRE-SET" RECEIVER

A complete Kit to build a 4-station "Pre-set" Superhet Receiver for A.C. mains operation. The Set is designed to receive any three Stations on medium waveband and one on long wave, each Station being received by the turn of a Rotary switch—No Tuning being necessary. It is of midget size, being 8 1/2 in. x 4 1/2 in. x 7 in. high, and has the performance of a far more expensive ready-made set, but can be built for half the price.



This Receiver, as illustrated, can be completely built for approx. £9/9/-. The complete assembly instructions including Component Layout and Component Price List is available for 1/9.

THE "MINI TWO-THREE" BATTERY PORTABLE

An "Alldry" Battery Portable of midget size, 6 1/2 in. x 4 1/2 in. x 3 1/2 in., designed to cover medium waveband 196-559 Metres, with use of short trailer Aerial.



The simple design of this Receiver is so arranged that either a 3-valve Set or a 2-valve (afterwards easily converted to the 3-valve) can be made.

Consists of a T.R.F. circuit using a Regenerative Detector with H.F. Stage, and a High Gain Output Pentode. Valve line up 1T4-1T4-DL94.

The 2 valve Set can be completely built for £4/3/8 (less Case), and the 3 valve for £5/3/- (less Case). Each price includes Valves, Speaker and drilled Chassis.

Send 1/9 for the Assembly Instructions, they include simple and complete Practical Component Layouts and Diagrams, which enable the most inexperienced constructor to successfully build either Set. All Components are available for separate sale, a price list being supplied with the Assembly Instructions.

ALL KITS INCLUDE "EASY TO FOLLOW" POINT-TO-POINT WIRING DIAGRAMS

THE "WIRELESS WORLD" 3-VALVE SET



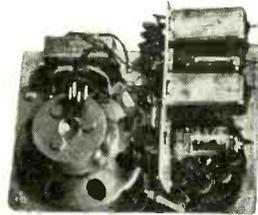
A Midget 3-valve T.R.F. Receiver for operation on A.C. mains, covering long and medium wavebands.

We are able to supply all of the components to build this set, as designed and specified in the Feb. 1950, issue, including the drilled Chassis, Valves and moving coil speaker etc., at the following prices:— To construct complete Chassis, less Dial and Drive Assembly £5/5/-. Ditto, including Dial and Drive Assembly, £6. To construct the complete Set, including Dial and Drive Assembly and Cabinet, £7/3/6.

Overall size of Cabinet is 7 1/2 in. x 3 1/2 in. x 11 1/2 in. A reprint of the designer's article, giving Circuit and Assembly Instructions (this is available separately for 9d.) together with a Practical Component Layout is included with each of above assemblies.

THE "PRACTICAL WIRELESS" "MINI FOUR" BATTERY PORTABLE

A 4-valve Battery Superhet Receiver designed to receive 4 Pre-set Stations, three on medium waveband and one on long wave to suit local conditions. Each Station is obtained on the set by the turn of a Rotary Switch. No tuning is necessary.



It is of midget size, being only 4 1/2 in. x 6 1/2 in. x 4 1/2 in. when completely built, and is very easily assembled from diagrams supplied.

Cost of all components to build this Set, in accordance with the design, including a drilled and cut chassis and panel, and new valves, is £9/10/- (or less valves for £8/7/6).

Attractive carrying case finished in blue leatherette, 16/8.

Complete constructional data with a blueprint, which shows the Practical Component Layout and Wiring Diagram, together with an Individual Component Price List is available separately, 1/6.

Our Battery Eliminators (illustrated opposite) available in kit form are suitable for use with this set.

THE "WIRELESS WORLD" MIDGET A.C. MAINS 2-VALVE RECEIVER

We can supply all the components to build this set, including Valves and Moving Coil Speaker for £3/10/-, including designers' Complete Building Instructions (these are available separately for 9d.)

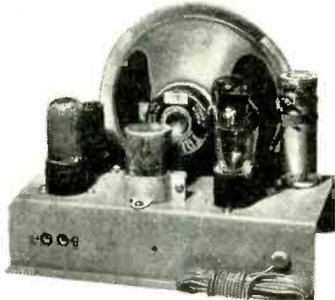
★ Send 9d. P.O. for our New JANUARY STOCK LIST, it shows PARTS for both Sets and Battery Chargers. When

STERN RADIO LTD., 109

Tel: CENTRAL

A Complete Kit of Parts to build a 3-4 WATT HIGH GAIN AMPLIFIER

for operation on A.C. or D.C. Mains, 200-250 volts.



This amplifier will give 3 Watts output for the small input voltage of only 75 millivolts, and is therefore suitable for use with any type of pick-up from the crystal type to the miniature H/F Magnetic type. A tone control is incorporated and the quality produced is excellent. The overall size of chassis is 9in. x 5in. x 7in. and valve line up 25 V5-14H1-251.6. Price of complete kit including drilled chassis and Valves £4/2/9, plus 6in. P.M. (which fits on chassis), 16/-, or 8in. P.M., 18/-. Price of fully assembled chassis ready for use, £5/5/- (plus cost of speaker). Copy of Assembly Instructions and Components Price List available for 1/3.

!! AMPLIFIERS !!

TWO COMPLETE KITS OF PARTS

(a) A 6-8 watt **QUALITY "PUSH-PULL" DESIGN**, which is the type illustrated below.
 (b) A 12 watt **HIGH FIDELITY "PUSH-PULL" AMPLIFIER**. Both for operation on A.C. mains 200 to 250 volts. **THE 6-8 watt AMPLIFIER** incorporates a simple arrangement to enable either a Magnetic-Crystal, or Lightweight pick-up to be used and is suitable for use with Standard or Long Playing Records. A Tone Control is incorporated, and the 10 watt Output Transformer is designed to match 2 to 15 ohm speakers. The overall size of the assembled chassis is 10in. x 8in. x 7in. high, and full practical diagrams are supplied. Price, including drilled chassis and valves, of complete kit, £3/17/6. Price of assembled chassis, supplied ready for use, £8/12/6. Full descriptive leaflets are available separately for 1/-.

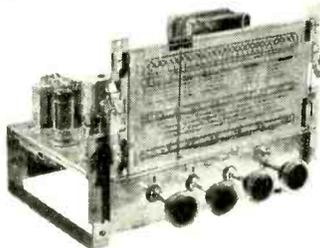


THE 12 watt HIGH FIDELITY "PUSH-PULL" AMPLIFIER employs 6 valves plus Rectifier, with Negative Feedback, and comprises a main Amplifier Chassis and a Remote Control Unit incorporating four controls—Bass, Treble, Main Volume or Mixing Control, and a Radio, Gram, Microphone, Selector Switch. This Control Unit measures only 7 1/4 x 2 1/2 in. The measured frequency range of the Amplifier with this Unit shows an excellent response from 14,000 cycles down to 30 cycles. The Bass and Treble Controls allowing independent control of gain at both ends of the frequency range from zero to a gain of 50. It can be seen therefore that ample correction is provided to suit any type of Pick-up with any type of recording. Input voltage for maximum output is 70 mV, 6.3 volts at 2 amps and 30 mA H.T. is provided for Tuning unit, etc. Price of complete kit, including drilled chassis and valves £14/10/-. Complete specification and layout, 1/6. THIS AMPLIFIER COMPARES WELL WITH THE WILLIAMSON AND SIMILAR DESIGNS AT A FRACTION OF THE COST.



TWO COMPLETELY ASSEMBLED "ALL-WAVE" SUPERHET CHASSIS

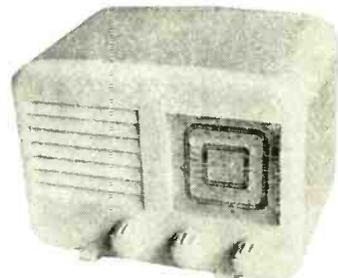
(a) **MODEL B.3.** A 5 Valve 3 Waveband Superhet Receiver.
 (b) **MODEL B.** A 5 Valve 6 Waveband (4 bandspread) Superhet Receiver.
 Both Receivers are for operation on A.C. Mains 100/120 Volts and 200/250 Volts, and employ the very latest miniature valves. They are designed to the most modern specification, great attention having been given to the quality of reproduction which gives excellent clarity of speech and music on both Gram and Radio, making them the ideal replacement Chassis for that "Old Radiogram" etc.



Brief Specifications for: **Model B.3.**—Valve line up, 6BK6, 6BA6, 6AT6, 6BW6, 6X4—Waveband coverage, Short 16-50, Medium 187-550, Long 900-2,000 metres. Controls: (1) Volume with on/off; (2) Tuning (Flywheel type); (3) Wavechange and Gram; (4) Tone (3 position switch operative on Gram and Radio). **Negative Feedback** is employed over the entire audio-stage. Chassis size 11 1/2 x 7 1/2 x 8 1/2 in. high. Dial size 9 in. x 4 in. Price, complete and **READY FOR USE**, excluding speaker, £12 12/-. (Carr. Pkg. & Ins. 7/6). **Model B** employs a similar valve line up as the B.3, but covers 6 Wavebands. Short wave 11-16, 16-25, 22-32, 31-46, and 48-120 metres, and Medium Wave, 187-550 metres. The first four short bands are Bandspread. The Controls employed are as used on the B.3 model but the Tone Control operates a six position switch, having three additional positions for varying Bass and Treble on Gram reproduction. **Negative Feedback** is employed over the entire Audio Stage. Size of Chassis and Dial is as given for B.3 Price complete and **READY FOR USE**, excluding speaker, £15/15/- (Carr. Pkg. & Ins. 7/6 extra).

A 5-VALVE "ALL-WAVE" SUPERHET RECEIVER

For use on A.C. Mains 200 to 250 volts.



This small attractive Receiver, embodying modern circuit technique is designed to cover Short, Medium and Long wavebands, and incorporates the following outstanding features:

- A superhet circuit designed for high efficiency on all three wavebands.
- A 3in. P.M. Speaker accurately matched for good quality reproduction.
- The latest range of new 6-volt B.V.A. miniature valves.
- Built-in Frame Aerial with provision for external aerial for distant stations.
- A White Plastic Cabinet of very attractive appearance overall size 7 1/2 in. x 5 1/2 in. x 3 1/2 in.
- **THE RECEIVER AS ILLUSTRATED CAN BE BUILT FOR APPROX., £10/10/-.**

Send 2/6 for the fully descriptive stage by stage assembly and wiring diagrams, with which complete price details are given.

A DUAL CHANNEL PRE-AMPLIFIER and TONE CONTROL UNIT

This comprehensive **PRE-AMPLIFIER** and **TONE CONTROL UNIT** provides full control of Bass and Treble, in conjunction with a main Volume/Mixer Control.



It can be used with any Amplifier and with any Pick-Up, the range of frequency control provided by the unit affording ample compensation for all types of Pick-Up and all natures of recordings, i.e., English, American and Long Playing, without recourse to Pick-up correction. The extreme flexibility of the Bass and Treble Controls is such that the level of Bass and Treble can be set to suit any conditions irrespective of the volume output of the Amplifier. Resonance characteristics are given in 12 watt Amplifier advt. The Unit measures only 7in. x 4in. x 2in. including self-contained Power Supply, and can be accommodated either on or away from the main Amplifier, i.e., on the front panel of a Cabinet or any other position. Price including drilled chassis, valves (68N7 and 6J5), £3/16/9. Complete assembly data is available separately for 1/-. Completely assembled unit ready for use £5/5/-.

A Genuine SPECIAL OFFER !! PLESSEY 3-SPEED AUTO CHANGE UNITS

Brand New in maker's Carbons, complete with mounting instructions.

£11. 19. 6

(Normal price is £23/10/0)

- ★ These Units will auto change on all three speeds, 7in., 10in. and 12in.
- ★ They play MIXED 10in. and 12in. records.
- ★ They have separate sapphires for L.P. and 78 r.p.m., which are moved into position by a simple switch.
- ★ The size of the unit deck is 14in. x 11in. with 8in. show deck and 2 1/2in. below.

A bulk purchase enables us to offer these **BRAND NEW UNITS** at this exceptional price. Please include 5/- carriage and packing.

The Viewmaster Telescor.—We have had very considerable experience in assisting customers to build this T.V. and can supply all **SPECIALIZED COMPONENTS EX-STOCK**. The Assembly Instructions showing Practical Layouts and Price List are available for 7/6 for London, Sutton Colfield, Holme Moss, Kirk-o-Shotts and Wenvoe. Complete Television Price List is contained in our general **STOCK LIST** at 9d., including Haynes, etc., Components.

"PERSONAL SET" BATTERY ELIMINATOR

A complete Kit of parts to build Midget "Alldry" Battery Eliminator, giving approx. 60 volts and 1.4 volts. This eliminator is for use on A.C. mains and is suitable for any 4-valve Superhet Receiver requiring H.T. and L.T. voltage as above, or approx. to 60 volts.



The Kit is quite easily and quickly assembled and is housed in a light aluminium case size 4 1/2 in. x 1 1/2 in. x 3 1/2 in. Price of complete Kit with easy-to-follow Assembly Instruction 42/6. In addition we can offer a similar **COMPLETE KIT** to provide approx. 90 volts and 1.4 volts. Size of assembled Unit 7in. x 2 1/2 in. x 1 1/2 in. Price 47/6.

"hundreds" of Wireless and Television Components and many KITS OF ordering please include approx. cost of Post and Packing.

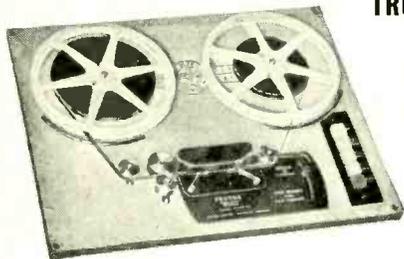
& 115 FLEET STREET, E.C.4

5812-3-4

GARLAND

HIGH-FIDELITY TAPE RECORDING

TRUVOX TAPE DECK MARK III



Incorporating high impedance mu-metal twin-track heads. Two-speed capstan, for tape speeds of 7½ and 3½ inches per second. Three heavy-duty motors allowing for fast forward and rewind facilities without tape handling. All controls operated by electrically and mechanically interlocked push buttons.

Price plus 10/- carriage, etc. **£23.2.0**

Send S.A.E. for full particulars.

GARLAND RECORD-PLAYBACK AMPLIFIER RP8

This amplifier is specially designed for the Truvox Tape Deck. It is built in two cable connected units (pre-amp-control unit and main amplifier), and provision is made to enable the equipment to be used as a gramophone amplifier. Built-in power supplies, bias and erase oscillator, magic-eye record level indicator, 6-watt push-pull output, Bin. P.M. loudspeaker with provision for feeding into external 3 or 15 ohm speaker. Formica control panel to match Tape Deck. Standard valves used throughout.

Price plus 10/- carriage, etc. **£19.19.0**

Send S.A.E. for full details.

GARLAND TAPE RECORDER LU.7. (C)

Incorporating the Lane Tape Table and the Garland UE.7 amplifier. For direct record and playback from radio, mike or pick-up. Available as Table Model in matched walnut veneer cabinet or in portable form. Price, including a 1,200 ft. reel of "Scotch Boy" Tape and a spare spool, Portable Model **£38/10/-**, plus 15/- carriage, etc. Table Model **£37/10/-**, plus 15/- carriage, etc.

GARLAND UE.7 RECORD PLAYBACK AMPLIFIER (C)

This amplifier is specially designed for the Lane Tape Table but is suitable for use with any high impedance head. Five standard valves are used providing super-sonic bias and erase and equalise record and playback facilities. Complete with Bin. loudspeaker. Amplifier wired and tested **12 gns.**, plus 7/6 carriage, etc. Trade supplied. **GARLAND KIT** for this Amplifier **£9/15/-**, plus 7/6 carriage, etc.

LANE TAPE TABLE (C)

Three motors; very fast wind-on and re-wind; automatic braking; high impedance, half gap heads; tape speed 7½ in. per sec. Price **£16/10/-**, plus 10/- carriage.

SCOTCH BOY MEDIUM COERCIVITY TAPE

We recommend this tape for use with ALL GARLAND Tape Recorders. Now available in the following lengths. 1,200ft. 35/-; 600ft. 21/-; 300ft. 12/3. Spare 7in. spools (1,200ft.) 4/3.

Garland Oscillator Unit

For magnetic recording. Incorporating 6V6G valve and Garland Oscillator coil, and supplying H.F. bias and erase for high impedance leads. Price **£2/2/-**, plus 2/6 post. Trade supplied.

VIEWMASTER AND ELECTRONIC ENGINEERING TELEVISORS, all components in stock as previously advertised.

MICROPHONES

Ronette B110 Crystal microphone, **£2/12/6**. Ronette HM7 Filtercell Microphone, **£3/7/6**. The following stands are suitable for the above microphones. Floor stand, **£4/10/-**. Table Stand, **£2/12/6**. Desk Stand, **15/6**.

GARLAND ACIV AMPLIFIER (C)

Providing exceptionally wide frequency response and low harmonic distortion at a maximum output of 11.5 watts. High and low gain inputs with bass, treble and volume controls. Standard valves throughout. **15 gns.**, plus 15/- carriage, etc. **GARLAND KIT** for ACIV, **£13**, plus 15/- carriage, etc.

AMPLIFIER ACII (C)

Incorporates volume and tone controls, providing 4 watts output. H.T. and L.T. supplies are from mains transformer. Standard valves throughout. Amplifier wired and tested, **£6/2/6**, plus 5/- carriage. **GARLAND KIT** for ACII, **£5/2/6**, plus 5/- carriage.

HIGH-QUALITY AMPLIFIERS (C)

LEAK "Point One" TL12/12 watt, **27 guineas**. LEAK RC/PA/U remote control pre-amplifier, **9 gns**. LEAK "Vari-slope" pre-amplifier, **12 gns**. ACOUSTICAL QUAD 12-watt Amplifier (including pre-amplifier), **£35**. ROGERS "WILLIAMSON" AMPLIFIER, **£31**. "WILLIAMSON" PA/TC/UNIT, **£10/7/6**. ROGERS "RD BABY DE LUXE" including pre-amplifier, **£18**. ROGERS "JUNIOR DE LUXE" 10 watt, **£26/10/-**. ROGERS "MINOR" 4 watt, **£11**.

TAPE RECORDER OS- CILLATOR COILS.

Inductance 6.3 mH, giving frequency of 45 Kc/s with a .002 mfd. condenser. For use with high impedance heads. Made for us by a leading manufacturer. Price **6/9** each. Trade supplied.

CLEAREX TELEVISION MAGNIFYING LENS. 9in. clear, **55/-**; 9in. filter, **60/-**; 12in. clear, **75/-**; 12in. filter, **80/-**. Carriage and packing **5/-** each on all types. (C)

PORTABLE CABINETS

For Truvox or Lane, with RP8 or UE.7. Write for details.

RECORD PLAYERS (C)

COLLARO RC511 single-speed Autochanger. Magnetic, price **£11/14/11**, incl. P.T. Crystal price **£12/3/2**, incl. P.T.

COLLARO 3/RC511 3-speed Autochanger with two heads, **£18/14/1**.

BSR MONARCH 3-speed Autochanger with reversible pick-up, price **£17/17/-**.

GARRARD RC.75 3-speed Autochanger, **£16/6/6**.

COLLARO AC47 single-speed turntable and motor. Centre driven by heavy induction motor. Price **£6/13/4**, incl. P.T.

COLLARO ACS14 Record Player. Single speed rim-drive with pick-up. Price **£6/19/-** inc. P.T.

BSR single-speed motor and turntable MU.15. Price **£3**. Fitted in portable bakelite cabinet, **£4/10/-**.

DECCA 3-speed Gram. motors. Price, incl. P.T., **£6/8/6**. **DECCA** Turnover Pick-up for use with above motors. Price, incl. P.T., **£3/19/4**

ACOS G.P.20 Standard or long playing, price **£3/11/5**. Spare heads, **£2/3/4**

B.S.R. GRAMOPHONE UNITS. 3-speed motor with pick-up, mounted on plastic playing table. Price, **£9/10/11**, including purchase tax.

BROS., Ltd.

I.F. TRANSFORMERS. Small size, 2½in. x 1½in. x 1in., 13/6 per pair. Made for us by a leading manufacturer.

UNDRIILLED CHASSIS. In 20 s.w.g., bright mild steel: Four-sided size 13in. x 7in. x 2½in., 7/6 each: two-sided with two straps, size 12in. x 4in. x 2½in., price 3/9 each. Two sided with two straps, size 6 x 5 x 2in., price 2/6 each.

T.R.F. KITS. Three valve and rectifier receiver, in two-tone Walnut veneered cabinet, size, 12in. x 5in. x 7in. Valve line-up 6SH7, 6SH7, 6K6, 2xRM2 metal rectifiers. As is usual all main components are supplied mounted on the chassis. Kit includes circuit diagram, but does not include wiring diagram or instructions. Price, £6/17/6 (C).

TWO-GANG TUNING CONDENSERS. Standard size 2-gang of 500pF capacity, with fixing feet. Price 8/6.

OSMOR COIL PACKS. Type H.O. mains superhet 15-50, 190-520, 800-2,000 metres, 52/-; Type TRF medium and long waves incorporating a reaction winding, 43/4. Type B for mains or battery portable receivers using a frame aerial and covering 15-50, 190-560, 800-2,000 metres 54/2. All the above prices include purchase tax. Note: Included with each coil pack are complete circuits and layout diagrams.

WEARITE 705 COIL PACK. For mains superhets covering long, medium and short waves. An additional position is provided on the switch for gramophone. Price including purchase tax £2/13/4.

REACTION CONDENSERS. Solid dielectric also suitable as tuning controls in one-valve receivers. Available in 300 pf and 500 pf sizes with standard ½in. spindle. Price 3/10.

TYANA SOLDERING IRONS. Light weight, 40 watt irons with easily interchangeable elements and 3/16in. diameter bits. Voltage ranges, 100/110 v., 200/220 v. and 230/250 v. Price 16/9. "The iron that makes soldering a pleasure."

ELECTROLYTIC CONDENSER OFFER. 8 mfd. 450 v., 1/9; 8-32 mfd. 475 v., 5/-; 32-32 mfd. 350 v., 4/9; 500 mfd., 15 v., 2/9; 1500 mfd., 6 v., 2/-.

CERAMIC SWITCHES. Single pole, eight-way, 3/6 each.

J.B. SQUAREPLANE DIALS. Printed in two wavebands with station names. 8/1 drive and bronze escutcheon and glass. Price 12/9.

J.B. FULL VISION DIALS. Similar to above but with 7½ x 3½in. dial printed in three wavebands. Price 13/-.

DECALS. 500, ¼in. high white transfer letters and words for marking electronic equipment. Price 4/9 per book.

WIRE WOUND RESISTORS. Open, cement coated or vitreous enamelled. 4 watt, 21, 50, 90, 100, 200, 1 k. Price 1/- each. 6 watt, 30, 145, 250, 270, 10 k., 15 k. Price 1/6 each. 10-15 watt, 5, 90, 100, 120, 170, 175, 200, 250, 400, 500, 600, 700, 750, 950, 1 k., 1,690, 3.5 k., 3.6 k., 4.5 k., 4.7 k., 11 k., 15 k., 20 k., 25 k., 47 k., 50 k., 1/9 each. 15 watt, 650 ohm. Price 2/-.

ALL GOODS NEW AND UNUSED. ITEMS (C) REQUIRE CRATING FOR SAFE DESPATCH. CRATES ARE NOT CHARGED PROVIDED YOU UNDERTAKE TO RETURN CARRIAGE PAID TO US. PLEASE ADD POST OR CARRIAGE ON ALL ITEMS. KINDLY PRINT NAME AND ADDRESS. POST ORDERS TO OUR DEPTFORD ADDRESS. EARLY CLOSING THURSDAY. OPEN ALL DAY SATURDAY.

CARBON RESISTORS

ONE-THIRD TO ONE-HALF WATT: 10, 13, 15, 22, 33, 39, 56, 68, 71, 73, 100, 150, 170, 180, 220, 250, 270, 330, 390, 400, 450, 470, 500, 530, 600, 680, 820, 1k, 1.2k, 1.5k, 2.2k, 3.3k, 3.9k, 4k, 4.7k, 5.6k, 6.2k, 6.8k, 7.5k, 8.2k, 10k, 12k, 15k, 18k, 20k, 22k, 24k, 25k, 27k, 30k, 33k, 39k, 40k, 47k, 50k, 56k, 100k, 150k, 220k, 270k, 330k, 470k, 680k, 1m, 1.2m, 1.5m, 2m, 2.2m, 2.7m, 3.3m, 4.7m, 10m. All at 4d. each.

ONE WATT: 50, 56, 82, 120, 150, 240, 330, 290, 680, 1k, 1.5k, 2.2k, 3k, 3.9k, 4.7k, 5.1k, 5.6k, 6.8k, 10k, 12k, 18k, 22k, 24k, 27k, 33k, 68k, 70k, 80k, 170k, 330k, 390k, 470k, 680k, 750k, 1m, 2.2m. All at 6d. each.

TWO WATT: 220, 1k, 2k, 2.2k, 3k, 3.3k, 4.3k, 4.7k, 6k, 10k, 12k, 20k, 22k, 27k, 30k, 47k, 50k, 68k, 2.2m. All at 9d.

FOUR WATT: 500k, 1/- each.

L.F. CHOKES. 10 Henry, 70 mA., 5/6 each.

PUSH-PULL OUTPUT TRANSFORMERS. Ratio, 45:1 to match 6V6 etc., 10,000 ohm to 2 ohm, 4/6 each.

PULLIN MOTORS. Type A3R, 24 volt D.C., size, 3½in. x 2½in. x 2in., 8/6 each.

HEAVY DUTY CROCODILE CLIPS. Suitable for use on car battery chargers, price 6d. each.

JACK PLUGS. 3-way, G.P.O. type, 1/- each.

LOUDSPEAKERS AT PRE-TAX PRICES

By leading manufacturers. Brand new and fully guaranteed. 5in. p.m. moving coil 12/6. 8in. p.m. moving coil, 17/6.

SENSITIVE NEONS: 85 v. striking. SBC with centre contact. Ideal for record level indicator on tape recorders, mains indicator, etc., 2/6 each.

HIGH VOLTAGE MICA CONDENSERS 0.1µF 1,500 v. wkg. Bakelite-cased upright mtg. 3in. x 2½in. x 1½in. overall, 1/- each. Ceramic pot type, 10C/2178, 0.0002µF 5 kv wkg., high H.F. current, 2/6 each. Flat bakelite-cased type, ZA2837, 0.001µF, 5 kv. A.C. test, 0.5 A. at 2.8 mc.; size 3½in. x 1½in. x ¾in.; suitable for tv, 1/9 each. 0.002µF, 2.5 kv. wkg., 1/3.

T.R.F. COILS. Medium and long wave, aerial and H.F., 6/- per pair; with reaction winding, 6/9 per pair.

METAL RECTIFIERS

Type RM2, 125 v. at 100 mA. Two in series required for mains voltage. Price 4/6 each. Type 14D/972, providing 250 v. 25 mA. when used with a reservoir condenser. Small size ideal for test equipment also in place of 14D/36 in T/V circuits. Price 6/6 each. 6 v. 1 a. half-wave (or full wave with C.T. tmr.), price 5/- each; 12 v. 1 a. bridge, price 8/6 each; 12 v. 4 a. bridge, price 22/6.

TOROIDAL CERAMIC POTENTIAL METERS. 17k, 100 watt, 8/6.

TOGGLE SWITCHES. SPCO, 250 v. 2 amp. 1/9; DP on-off 250 volt, 1 amp., 2/3.

ENGRAVING TOOL. Operates from 200-240 volt A.C. for engraving on metal and plastic. Price 12/6.

WAFER SWITCHES

For ½in. dia. spindle. Length of spindle quoted from end of bush

3p. 2w. ½in. 1/9. 4p. 3w. miniature 2½in. 6w. paralleling ½in. 1/9. 3/6.

4p. 2w. miniature ½in., 1/9. 4p. 2w. 4 bank ½in., 3/6. 1/9. 3p. 3w. 4 bank ½in., 3/-.

FIXED CONDENSERS: (pF's): Ceramic: 2, 4, 15, 20, 27, 30, 50, 220, 350. All at 9d. 1,000pF. 1/-; Silver Mica: 10, 30, 50, 160, 170, 180. All at 6d. 200, 300, 1,500, 8,100, 9d. Moulded Mica: 50, 75, 100, all at 6d. 300, 470, 1,000, 2,000, 3,000, 4,000, 4,500, 4,700, 5,000, 10,000, all at 9d.

CLOSE TOLERANCE SILVER MICA CONDENSERS. All plus or minus 1 per cent. 100pF. 400pF. 9d. each. 1,000pF. 1,400pF. 1/3 each. 10,000pF. 1/6 each.

MULTI-PURPOSE TOOL. Bends, shears, punches and threads sheet-strip and rod. For all the little workshop jobs that waste your time. Tool price, 10/-. Jig, gauge and protractor for use with this tool, enabling repetition work to be carried out with precision, 7/6.

VARLEY MAINS TRANSFORMERS. Primary 10-0-200-220-340 volts. Secondary 300-0-300 volt at 150 mA., 5 volt at 3 amps., 6.3 volt at 4 amps., 6.3 volt at 1 amp. Open type construction. Price 45/-.

SPECIAL TYPE VALVE OFFER. CV1141 (NGT1), 4 v. THYRATRON. Electronic relay for timers, etc. 85 base, 6/6 each. CV265 4 v. ½-wave high current rectifier, 10 base, 5/- each. ½-wave high current rectifier, 10 base, 5/- each. 1/9-6.3 v. UHF triode. Plug-in replacement for 6J5G if anode and grid top caps connected to pins 3 and 5. 10 base, 2/6 each. 6SH7 6.3 v. HF pentode. For T.V. amplifiers, receivers, etc. 10 base, 6/6 each. RL18 6.3 v. miniature triode B3G base, 5/- each. 6U5G 6.3 v. magic eye. Ideal for bridges, recorders, etc. 10 base 7/6 each. U22 2 v. EHT rectifier for T.V. MO base, 8/6 each.

RADIO PACK. Consisting of a walnut Cabinet, size 19in. x 15in. x 8in., complete with Perspex dial; undrilled chassis size 13in. x 7in. x 3in.; 8in. Elac speaker; 500pF twin-gang tuning condenser; 250-0-250 v., 6.3 v. and 5 v., mains transformer; L.F. choke; output transformer; 16-24 mfd. 350 v. electrolytic condenser. These items are not surplus, but current production goods. Price £4/15/- including packing and carriage (G.B. only). (C).

METAL-CASED TUBULAR CONDENSERS. 0.01 mfd. 1 kv., 1/-; 0.02 mfd. 750 v., 9d.; 0.1 mfd. 350 v., 9d.; 0.25 mfd. 500 v., 2/-.

HEATER TRANSFORMERS. Primary 230 v., secondary 6.3 v., 1.5 amp. Wax impregnated. Price 6/- each.

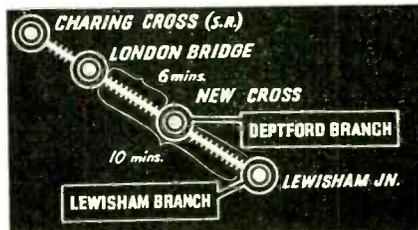
GARLAND BROS., Ltd.

CHESHAM HOUSE, DEPTFORD BROADWAY, S.E. 8

Telephone: TIDEWAY 4412/3

5 OBELISK PARADE, LEWISHAM, S.E.13

Telephone: LEE GREEN 4038



Immediate delivery - of course



VALVES !! TUBES !!

RECEIVING, TRANSMITTING, MAGNETRONS, KLYSTRONS,
CATHODE-RAY TUBES, PHOTOCELLS, ETC.

First Grade Quality - British and American Make - No Dollar Expenditure Involved

LARGE QUANTITIES & GREAT VARIETIES

S. Szymanski
(pronounced SHE-MAN-SKEE)

ELECTRONIC ENGINEER AND STOCKIST

Office and Stores :

12a LEIGHTON GROVE - LONDON - N.W.5

Telephones : { GULLiver 6077/8 (2 lines)
HENDon 1617

Telegrams : { Overseas : "Shemanskee" London
Inland : "Shemanskee" Norwest London

PROBABLY THE LARGEST ACTUAL STOCKIST IN ENGLAND

WHOLESALE AND EXPORT ONLY

1 KW TELEGRAPH TRANSMITTERS. Two HF 300's output. Operation 3.5 mc. to 16 mc.

RCA TRANSMITTERS. Type ET-4336. Complete with speech amplifier, crystal multiplier and VFO units. Unused and re-conditioned. Can be supplied with very large quantity of spares.

RCA TRANSMITTERS. Type ET-4332 modified by R.A.F. for use on crystal or master oscillator. Complete with speech amplifier.

EX-R.A.F. 1143 TRANSMITTERS.

NAVY MODEL COLLINS TRANSCEIVERS. TCS9, Complete sets.

No. 12 TRANSMITTERS. With coupling units, remote control, etc.

A.R.88D's, A.R.88LF's, A.R.77's, S27's, HRO and others.

AUTOMATIC HIGH-SPEED TELEGRAPH EQUIPMENT. "BOEHME" (U.S.A.). Up to 400 signs per minute on line and wireless.

NAVY MODEL TBY-8 TRANSMITTING-RECEIVING EQUIPMENT. Output 0.75 watts on M.C.W. telegraphy and 0.5 watts on telephony. Frequency range 28-80 mc.

All above items in excellent working condition.

Working demonstration upon request.

TX VALVES 803, 805, 807, 813, 814, 861, 866A, DET-16 and many others.

Large stock of Tx condensers, crystals and other components. Alignment and repair of communication receivers and all other short-wave equipment undertaken.

P.C.A. RADIO

Transmitter Division :—

Receiver Division :—

The Arches, Cambridge Grove,
London, W.6.

170 Goldhawk Road,
London, W.12.

Tel.: RIV 3279.

Tel.: SHE 4946.

G2AK This Month's Bargains G2AK

PARMEKO H.D. SHROUDED CHOKES. 8H at 250 mA. Weight 11 lb., 16/6 each. Post and packing 1/6.

1,000 µF. 15 V. CONDENSERS, 2/6 each.

TWIN RIBBON FEEDER. Heavy duty 300 ohm, 5d. per yd. Standard K25 300 ohm ribbon, 9d. per yd. Co-axial cable, 1/2 in. dia. 50 ohm, 8d. per yd., 1/2 in. dia., 1/- per yd., 10/6 per doz. yds. 7ft. length 1/2 in. dia. Co-axial with Pye plug one end, 1/6, post free. All other Co-axial and feeder, plus 1/6 post any length.

POTENTIOMETERS. Carbon Type Potentiometers, 25k., 50k., 100k. 1/2 meg., 2 meg., 1/6.

TRANSMITTING TUBES. Type 813 New and Boxed £3/10/- each. Type 866A., 17/6 each. 3E29 (829B), 44 each. Few only.

METERS. 2 1/2 in. Flush mounting M.C. 100 m/a., 12/6 each; 2 in. Flush M.C. 5 m/a., 7/6; 0.5 amp. thermo., 5/-; 4 amp. thermo., 5/-.

SPECIAL VALVE OFFER. Photocell Multipliers. Type 931A. New and Boxed, limited quantity, 30/- each.

DEAF AID CRYSTAL MICROPHONE UNITS, 12/6 each.

SPECIAL OFFER. 300 ohm Flat Twin 150 w. rating, 6d. per yd. (minimum 20 yds.), post free.

STANDARD 1/2 in. T.V. COAXIAL CABLE, 1/- yd. or 10/- per doz. yds. or 9d. yd. in 100 yd. coils. P. and p. 1/6, any quantity.

SHROUDED M.C. MIKE TRANSFORMERS. M.C. mike or line to grid, 5/- each. P. and p. 1/-.

M.C. Mike Trans. 2/-, plus p. and p. 6d.

CARBON MIKE TRANS., 2/- each. P. and p. 6d.

COMPLETE SET OF AR88 TUBES (14) for LF or D Model receivers, £5/10/-.

TAPE RECORDING EQUIPMENT. Decks by Bradmatic, Tamsa, Lane and Qualtape. Ex. stock. Heads, Oscillator Coils, Tape and Reels always available.

SEND 1/6 STAMP FOR COMPREHENSIVE NEW VALVE LIST.

Carriage paid on all orders over £1 except where stated. Please include small amount for orders under £1.

Please print your name and address.

CHAS. H. YOUNG, G2AK

All callers to 110 DALE END, BIRMINGHAM

Phone: CENTRAL 1635.

Mail orders to 102 HOLLOWAY HEAD, BIRMINGHAM

Phone: MIDLAND 3254.

Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/- extra under £1, 1/6 extra under £3.

RADIO SUPPLY CO.

15 Wellington Street, Leeds 1

Tel. 22153

Open to callers: 9 a.m. to 5.30 p.m. Saturdays until 1 p.m.
FULL PRICE LIST
 5d.
TRADE LIST 5d.
 Please enclose S.A.E. with all Enquiries

COLLARO AUTOMATIC RECORD CHANGERS

Latest 3-speed Type 3RC511, complete with Dual Purpose Crystal Pick-up for standard or Long-playing Records. Machine takes 9 records, 10in. or 12in., not intermixed. Overall size 15 x 12in. Height above Motor Plate 4 1/2in., below 2 1/2in.

PRICE ONLY £11/11/-, inc. tax. Carr. 5/- extra. (This is approx. 25% below current list price.)
SPECIAL OFFERS. Midget Mains Transformers (size approx. 2 1/2 x 3 x 2 1/2in.). Drop-through chassis type. Screened Primary 220/240 v. 50 c/s. Output: 250-0-250 v. 60 mA., 6.3 v. 2.5 A. Only 10/9. Small Filament Transformers, 220/240 v. input, 6.3 v. 1.5 a output, 5/9. Auto Transformers (with separate l.t. 6.3 v. 1.5 a), 0-110-200-210, 230-250 v. 50 watts, 4/9 each. New Boxed Ex-Govt. Valves, VR126 (4 v. 7-pin H.F. Pentode), 1/9 each.

BATTERY SET CONVERTER KIT. All parts for converting any type of Battery receiver to All Mains. A.C. 200-250 v. 50 c/s. Kit will supply fully smoothed h.t. of 120 v. 90 v. or 60 v. at up to 40 mA., and fully smoothed l.t. of 2 v. or 1.4 v. at up to 1a. Price complete with circuit, only 47/9

H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Consists of h.t. and l.t. transformer, h.t. and l.t. rectifiers, smoothing electrolytic, and choke, adjustable charger resistor. For Mains input of 200-250 v. Output 120 v. 40 mA and 2 v. 1/2 a. Price with circuit, 29/6.

H.T. ELIMINATOR KIT. Consisting of Mains Transformer (200-250 v. input), smoothing choke, metal rectifier, 32-32mfd. smoothing Elect., Tapped Dropper Resistor, Chassis (undrilled aluminium) and circuit. Price 21/9.

BATTERY CHARGER KITS

To charge 6 or 12 v. acc. at 2 a. 29/6.
 To charge 6 or 12 v. acc. at 1 1/2 a. 45/-
 Above consists of transformer, bridge rectifier, fuse and fuseholder

SELENIUM RECTIFIERS. 230 v. 50 ma., H.W. (small), 6/9. 120 v. 40 ma., H.W. (small), 4/6. 12-15 v. 2 a. F.W. Bridge, 10/9. 12-15 v. 4 1/2 a., F.W. bridge, 18/9.

ELECTROLYTICS (Current production. Not ex Govt.)

Tubular Types	Can Types
8µF 450 v. 1/11	16µF 450 v. 2/9
8µF 500 v. 2/9	24µF 350 v. 2/11
16µF 350 v. 2/3	32µF 350 v. 2/11
16µF 450 v. 2/9	40µF 450 v. 4/9
16µF 500 v. 3/9	50µF 350 v. 4/9
24µF 350 v. 3/3	8-8µF 350 v. 3/9
32µF 350 v. 3/9	8-8µF 450 v. 3/11
8-16µF 500 v. 4/11	8-16µF 450 v. 4/6
25µF 25 v. 1/6	16-16mfd. 500 v. 5/9
25-25µF 25 v. 1/9	16-32µF 350 v. 4/9
50µF 12 v. 1/3	32-32µF 350 v. 4/9
25µF 60 v. 1/9	32-32µF 450 v. 5/11
50µF 25 v. 1/9	50-50µ 350µF 5/11
50µF 50 v. 2/3	500 mfd 6 v. 1/11
250µF 12 v. 10d.	2,000mfd. 25 v. 4/11

CAN TYPES	
32-32-8µF 350 v. (Small)	5/11
16-16-8µF 475 v.	5/9
16-16µF 450 v. plus 20µF 25 v.	5/3
32-32µF 350 v. plus 25µF 25 v.	5/11
50µF 350 v. plus 250µF 12 v.	4/11

Chassis. 6 x 4 1/2 x 1 1/2in., 1/11; 7 1/2 x 4 1/2 x 2in., 2/9; 16 s.w.g. Undrilled Aluminium. Receiver Type 10 x 5 1/2 x 2in., 3/9; 11 x 6 x 2 1/2in., 4/3; 12 x 8 x 2 1/2in., 5/3; 16 x 8 x 2 1/2in., 7/6; 20 x 8 x 2 1/2in., 8/11; Amplifier Type, 12 x 8 x 2 1/2in., 7/11; 16 x 8 x 2 1/2in., 10/11; 14 x 10 x 3in., 12/6; 20 x 8 x 2 1/2in., 13/6.

SILVER MICA CONDENSERS. 5µmF, 10µmF, 15µmF, 20µmF, 25µmF, 30µmF, 35µmF, 50µmF, 120µmF, 150µmF, 180µmF, 200µmF, 230µmF, 300µmF, 350µmF, 400µmF, 470µmF, 500µmF, 1,000µmF (1.00µF), 2,200µmF (.0022µF). All at 5d. each. 3/9 dozen one type.

TUBULAR WIRE-ENDED CAPACITORS (New Stock). .001µF 750 v., .01µF 750 v., .02µF 1,500 v. (large), .05µF 350 v., .1µF 350 v., .25µF 350 v., .5µF 400 v. All at 4d. each, 3/3 dozen one type, 27/6 gross.

BAKELITE (Brown or White) and **WOOD** (Walnut veneered) **CABINETS.** Size approx. 12 x 6 1/2 x 5in. Very attractive appearance. For illustration see our List. Supplied complete with fully punched T.R.F. 3-valve Chassis, back, 2 or 3 wave. Glass scale with coloured station names, Dial Backplate, 25/-, plus Carr. 2/6.
 All parts available for construction of T.R.F. or Superhet Receiver in above cabinets.

CLEARANCE LINES. .0005µF 2-gangs with short spindle, 4/6. Vol. Controls, 1 Meg. Midget, with S.P. switch and long spindle, 2/9. 25K with D.P. switch and in. spindle, 2/9.

VOLUME CONTROLS with long spindles, all values less switch 2/9, with S.P. switch 3/11. **WIRE WOUND POTS:** 2.5K, 5K, 10K, 20K, 25K 50K (medium length spindles), 2/9.

FOR CALLERS ONLY. Mains Trans., drop-through type with top shroud. Primary 230-250 v. Secs. 425-0-425 v., 200 mA., 300-0-300 v. 100 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a., 29/9.

COAXIAL CABLE, 75 ohms, 1/4in. 11d. yard.

DIAL BULBS, M.E.S., 6.5 v. 0.15 a., 8 v. 0.15 a., 6/9 dozen.

VALVE SCREENING CANS. International Octal 3 piece, B7G (Button Base) 2 piece 10/6 doz., 1/3 each.

EX-GOVT. ITEMS. Pye coaxial plugs and sockets 7/6 doz. prs. Belling-Lee moulded type 5-pin and 10-pin plugs and sockets. 1/11 pr. .02 mfd. 5,000 v. Tubulars, 1/9.

EX-GOVT. SMOOTHING CHOKES.

Potted Types	
330 mA. 5 H. 50 ohms	12/9
220 mA. 5 H. 50 ohms	10/9
150 mA. 10 H. 200 ohms	10/6
50 mA. 50 H. 1,250 ohms	8/11

EX-GOVT. BLOCK PAPER MANSBRIDGE TYPE CONDENSERS
 4µF 500 v. T.C.C. 2/9
 8µF 500 v. T.C.C. 4/9
P.M. SPEAKERS. All 2-3 ohms, 5in. Plessey 13/9, 5in. Goodmans 14/9, 6 1/2in. F.W. 14/11, 6 1/2in. Goodmans 16/9, 8in. Plessey 15/9, 10in. Goodmans 31/-, 10in. Plessey 18/6.

M.E. SPEAKERS. All 2-3 ohms, 4in. E.M.T. with trans. Field 700 ohms 14/9, 6 1/2in. Rola field 700 ohms, 11/9. 8in. R.A. field 600 ohms, 12/9. 10in. R.A. field 600 ohms, 23/9.

COLLARO TAPE DECK MOTORS clockwise or anti-clockwise. 29/9 each.

R.S.C. MAINS TRANSFORMERS

Fully Guaranteed. Interleaved and Impregnated.
 Primaries 200-230-250 V. 50 c/s Screened.

TOP SHROUDED, DROP THROUGH

200-0-260 v. 70 mA., 6.3 v. 3 a., 5 v. 2 a.	14/11
200-0-260 v. 80 mA., 6.3 v. 2 a., 5 v. 2 a.	14/11
350-0-350 v. 80 mA., 6.3 v. 2 a., 5 v. 2 a.	17/9
350-0-350 v. 90 mA., 6.3 v. 3 a., 5 v. 2 a.	21/9
250-0-250 v. 100 mA., 6.3 v. 4 a., 5 v. 3 a.	23/9
300-0-300 v. 100 mA., 6.3 v. 4 v., 4 a., c.t. 0-4-5 v. 3 a.	23/9
350-0-350 v. 100 mA., 6.3 v. 4 v. 4 a., c.t. 0-4-5 v. 3 a.	23/9
350-0-350 v. 120 mA., 6.3 v. 4 a., 5 v. 3 a.	28/9
350-0-350 v. 150 mA., 6.3 v. 4 a., 5 v. 3 a.	29/11
350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a.	29/11

FULLY SHROUDED UPRIGHT

250-0-250 v. 60 mA., 6.3 v. 2 a., 5 v. 2 a., Midget type 2 1/2-3-in.	17/6
350-0-350 v. 70 mA., 6.3 v. 2 a., 5 v. 2 a.	18/9
250-0-250 v. 100 mA., 6.3 v. 4 v. 4 a. c.t., 0-4-5 v. 3 a.	25/9
250-0-250 v. 100 mA., 6.3 v. 6 a., 5 v. 3 a., for 1355 conversion	29/9
300-0-300 v. 100 mA., 6.3 v. 4 v. 4 a. c.t., 0-4-5 v. 3 a.	25/9
350-0-350 v. 100 mA., 6.3 v. 4 v. 4 a. c.t., 0-4-5 v. 3 a.	25/9
350-0-350 v. 150 mA., 6.3 v. 4 a. 5 v. 3 a.	33/9
350-0-350 v. 150 mA., 6.3 v. 2 a., 6.3 v. 2 a., 5 v. 3 a.	33/9
350-0-350 v. 160 mA., 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a.	45/9
350-0-350 v. 250 mA., 6.3 v. 6 a., 4 v. 8 a., 0-2-0 v. 2 a., 4 v. 3 a. for Electronic Eng. Televisor	67/6
425-0-425 v. 200 mA., 6.3 v. 4 v. 4 a. c.t. 6.3 v. 4 a., c.t. 0-4-5 v. 3 a., suitable Williamson Amplifier, etc.	51/-
425-0-425 v. 250 mA., 6.3 v. 6 a., 6.3 v. 6 a., 5 v. 3 a.	65/6
325-0-325 v. 20 mA., 6.3 v. 0.5 a. 6.3 v. 1.5 a. for Williamson Pre-amplifier	17/6

FILAMENT TRANSFORMERS
 All with 200-250 v. 50 c/s. primaries: 6.3 v. 2 a., 7/6; 0-4-6.3 v. 2 a., 7/9; 12 v. 1 a., 7/11; 6.3 v. 3 a., 10/11; 6.3 v. 6 a., 17/6; 0-2-4-5-6.3 v. 4 a., 16/9; 12 v. 3 a. or 24 v. 1.5 a., 17/6; 0-5-6.3 v. 5 a., four times, giving up to 24 v. 5 a. up to 12-6 v. 10 a., up to 6.3 v. 20 a. by series or parallel connections. 55/-.

CLAMPED UPRIGHT MOUNTING

300-0-300 v. 100 mA., 6-3 v. 3 a., 5 v. 3 a.	21/9
350-0-350 v. 100 mA., 6.3 v. 3 a., 5 v. 2 a.	21/6

CHARGER TRANSFORMERS
 All with 200-230-250 v. 50 c/s. Primaries: 0-9-15 v. 1.5 a., 14/9; 0-9-15 v. 3 a., 16/9; 0-9-15 v. 6 a., 22/9; 0-4-0-15-24 v. 3 a., 22/9; 0-9-15-30 v. 3 a., 23/9.

SMOOTHING CHOKES

250 mA., 8-10 H., weight 12 lb.	16/9
250 mA., 3 H. 50 ohms	8/9
100 mA., 10 H. 200 ohms	7/6
80 mA., 10 H. 350 ohms	5/6
60 mA., 10 H. 400 ohms	4/11
50 mA., 50 H. 1,000 ohms	9/11
40 mA., 5 H. 150 ohms	3/6
1 A., 25 H., .t. type	4/9

ELIMINATOR TRANSFORMERS
 Primaries 200-250 v. 50 c/s., 120 v. 40 mA.... 7/11
 120-0-120 v. 30 mA. 4 v. 1a. 12/9
E.H.T. TRANSFORMERS. 2,500 v. 5 mA., 2-0-2 v., 1.1 a., 2-0-2 v. 1.1 a. for VCR97, etc. 37/6
 4,000 v. 5 mA. 2 v. 2 a. 39/6

OUTPUT TRANSFORMERS
 Midget Battery Pentode 66: 1 for 3S4, etc. 3/6
 Small Pentode, 5,000Ω to 3Ω 3/9
 Small Pentode, 8,000Ω to 3Ω 3/9
 Standard Pentode, 5,000Ω to 3Ω 4/8
 Standard Pentode, 8,000Ω to 3Ω 4/9
 Multi-ratio 40 mA., 20:1, 45:1, 60:1
 90:1, Class B Push-Pull 5/6
 Push-Pull 10-12 Watts 6V6 to 3Ω or 15Ω 16/9
 Push-Pull 10-12 Watts to match 6V6 to 3-5-8 or 15Ω 16/9
 Push-Pull 15-18 Watts to match 6L6, etc., to 3Ω or 15Ω Speaker 22/9
 Push-Pull 20 Watts, high-quality sectionally wound, 6L6, KT66, etc., to 3, 7.5 or 15Ω (secondary in 4 sections of 3.75Ω each) 51/9
 Williamson type, exact to author's specification 85/-

WE CAN QUOTE FOR QUANTITIES OF STANDARD OR SPECIAL TYPES. S.A.E. PLEASE WITH ALL ENQUIRIES.

£7-19-6

for a first-class **COMMUNICATIONS RECEIVER**. This is the famous ex-R.A.F. type R.1155, which is justly known as being a really tip-top set. Covers 5 wave ranges, 18.5-7.5 Mc/s, 7.5-3.0 Mc/s, 1,500-600 Kc/s, 500-200 Kc/s, 100-75 Kc/s, and is easily and simply adapted for normal mains use, full details being supplied. These receivers have had some use, but are in very good condition, and are all aerial tested and guaranteed in working order before despatch. Also available:

Brand new, in maker's cases and aerial tested..... £11 19 6
Used, good condition, untested..... £6 19 6
Used, good condition, untested, less valves..... £5 0 0
Factory-Made Power Pack, Output Stage and Speaker, which operates the receiver immediately £5 10 0
 Carriage costs of 10/6 for Receivers, 5/- for Power Pack, extra please.

SPECIAL REDUCTION OF 10/- IF POWER PACK AND RECEIVER ARE PURCHASED. Where used receivers are purchased, they may be exchanged for new ones within 14 days, you only pay the extra and carriage.

CLASS D WAVEMETER. A further supply of these superb instruments which conform to G.P.O. requirements. Covers 1.9-8.0 Mc/s. (direct reading without charts), and are supplied with 100/1,000 Kc/s. dual crystal, 1 valve ECH 35, and 1 v. vibrator. Designed for use on 6 v. D.C., but is easily modified for A.C. operation, full details being supplied. A suitable transformer is available for only 7/6 extra. **BRAND NEW IN MAKER'S TRANSIT CASES, ONLY £5/19/6** (carriage, etc., 5/6).

6 VOLT VIBRATOR UNIT. Made by The NATIONAL Co. of America, for their HRO Communications Receivers, supplying 165 volts at 85 mills fully smoothed D.C. Complete with vibrator and 6 x 5 rectifier in black crackle cabinet size 7in. x 7 1/2in. x 6in. **BRAND NEW IN MAKER'S CARTONS** with full operating instructions **ONLY 5/6**.

12-VOLT VIBRATOR UNIT. Delivers 300 volts @ 100 mA. Complete ready to use. Manufactured by Masteradio for the Admiralty, these are **BRAND NEW IN ORIGINAL CARTONS. ONLY 35/-** (postage, etc., 2/6).

I.F. STRIP TYPE 194. An easily modified I.F. Strip recommended for T.V. constructors who want good results at moderate cost, or for those who have built televisions but are having trouble in the vision or sound receivers. Can also be modified for 2-Channel working as per details in "Practical Television" October issue. This 6-stage strip measures 18in. x 5in. x 5in., and contains 6 valves: VR65, 1 of VR92, and 1 of VR53 or VR56. Mod. data supplied. **BRAND NEW. ONLY 45/-** (postage, etc., 2/6).

INDICATOR UNIT TYPE 6. Contains 6in. C.R. Tube VCR 97, 4 valves EF 50, 1 of EB 34, and 1 of EA 50. The unit recommended for conversion to the "Wireless World" General-Purpose Oscilloscope, full details supplied (or available separately 1/-). **ONLY 79/6** (carriage, etc., 7/6).

100 MICROAMPS METER. 2 1/2in. Flush Mounting. Widely calibrated scale of 15 divisions marked "Yards," which can be rewritten to suit requirements. These movements are almost unobtainable to-day, and being **BRAND NEW IN MAKER'S CARTONS** are a "snip" at **ONLY 39/6**.

50 MICROAMPS METER. 2in. Flush mounting. Another movement which is in short supply and is also **BRAND NEW IN MAKER'S CARTON. ONLY 45/-**.

TRANSFORMERS. Manufactured to our specification, and fully guaranteed. Normal Primaries.

425-0-425 v. 200 mA., 6.3 v. 6 a., 6.3 v. 6 a., 5 v. 3 a., 0-2-4-6.3 v. 3 v. 3 a. **ONLY 72/6**.

425-0-425 v. 200 mA., 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a. **ONLY 50/-**.

350-0-350 v. 160 mA., 6.3 v. 6 a., 6.3 v. 3 a., 5 v. 3 a. **ONLY 42/6**.

250-0-250 v. 100 mA., 6.3 v. 6 a., 5 v. 3 a. **ONLY 32/6**.

The above are fully shrouded upright mounting.

Universal Mounting 350-0-350 v. 80 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 2 a. **ONLY 18/6**.

Universal Mounting 250-0-250 v. 80 mA., 0-4-6.3 v. 4 a., 0-4-5 v. 2 a. **ONLY 18/6**.

The following are upright mounting.

EHT for VCR 97 Tube 2,500 v. 5 mA., 2 v.-0.2 v. 1.1 a., 2 v.-0.2 v. 2 a. **ONLY 37/6**.

EHT 5,500 v. 5 mA., 2 v. 1 a., 2 v. 1 a. **ONLY 72/6**.

EHT 7,000 v. 5 mA., 4 v. 1 a. **ONLY 82/6**.

PLEASE ADD 1/6 PER TRANSFORMER POSTAGE.

TRANSFORMER, for a variety of uses giving outputs of 3 v., 4 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v., 30 v., at 2 amps. from normal mains input. **ONLY 17/6** (postage 1/-).

TRANSFORMERS. Ex-W.D. and Admiralty, built to more than 50 per cent. safety factor, with normal A.C. Mains Primaries. All Brand New and Unused.

300-0-300 v. 200 mA., 5 v., 3 a., 6.3 v., 5 a., C.T., 20 v. 750 mA., 70 v. 100 mA. Weight 12 lb. **ONLY 42/6** (postage, etc., 2/6).

330-0-330 v. 100 mA., 4 v. 3 a. Weight 7 lb. **ONLY 22/6** (postage 1/6).

Cash with order please, and print name and address clearly. Amounts given for carriage refer to inland only.

U.E.I. CORPORATION

Radio Corner, 138, Gray's Inn Road, London, W.C.1.
 Phone: TERMINUS 7937.

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

C. MARKS & CO.

SPECIAL THIS MONTH!

VALVEHOLDERS, CERAMIC B7G. With collar and Silver plated covers. 1/6 each. 15/- per doz. E.H.T. to suit VU111, VU120's, etc. 1/- each. **ENGLISH 4-PIN** moulded type. 3/- doz.

CHOKES. 3h, 200mA, 6h 200mA, 9h 100mA. All at 7/6 each. 6h 70mA, 20h 80mA. at 6/6 each. Please add 1/- for post and packing.

INDICATOR UNIT TYPE 233 CHASSIS with VCR97 tube mounting and mask, 3-EF50, 3-int. octal, 3-Mazda octal and 2-EA50 valveholders, 14 various potentiometers, 4 bank Yaxley switch, and numerous resistors and condensers, mounted on strong metal chassis with outside case. A **BARGAIN AT 17/6**, plus 2/6 carriage.

TANNOY POWER MIKE INSERT (YA2815), for Tele. L.S. No. 1, 2, 3. Brand new in containers 2/6 each.

THROAT MIKE (ZA13935). Brand new and boxed. Complete with leads 2/6 each.

MAINS POWER PACK. With 350-0-350v, 80mA, 6.3v., 1.5a., 6.3v. 1.5a., 5v. 2a. transformer, 10h 40mA choke, 8 x 8mfd. condenser, and 5Z4 rectifier. In neat, grey-finished metal case, size 9in. x 8 1/2in. x 7 1/2in. with chrome handles. Price 37/6, plus 5/- carriage.

CONDENSERS. 250mfd. 175v. at 2/6 each, 24/- doz. .01mfd. 5kv. 1/- each, post paid.

MICA CONDENSERS. 10, 50, 100, 500, 1,000 pts., at 6/- doz. These condensers are brand new not Govt. Surplus.

AIR SPACED TRIMMER CONDENSERS 25pf., 50pf. and 100pf., at 9/- doz.

VARIABLE CERAMIC CONDENSERS 2 to 8pfs., at 6/- doz.

MAINS TRANSFORMER, input 200-240v., output 475-0-475v., 250mA, at 35/-, plus 2/6 carriage.

METERS, 0-500 MICROAMPS (Calibrated 0-10 volts). 10/6, plus 1/- post.

ENGINE TEMP. GAUGE. Moving coil 0-1mA movement (calibrated 0-300°), at 7/6, plus 1/- post.

GERMANIUM CRYSTAL DIODES. B.T.H. wire-ended 2/6 each.

VITREOUS RESISTORS, 20K, 150 watt. Brand new and boxed 3/6, post paid.

SELENIUM RECTIFIERS 250v. 70mA. at 6/-, post paid.

SMALL MAINS TRANSFORMER COMPLETE WITH METAL RECTIFIER. Suitable for T.V. pre-amps, tuner units, and test equipment, power supply input 230v. 50cps. Output 200v. 50mA. 6.3v., 1.4 amps. 13/6, plus 1/6 postage.

HALF-WAVE MAINS TRANSFORMERS (Slightly sub-standard). Input 230v. 50cps. Output 200v. 50mA, 6.3v. 1.5 amps. A anip at 5/- each, plus 1/- post.

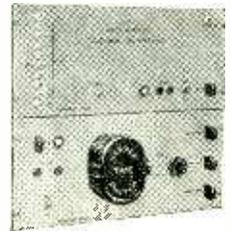
88 COMMERCIAL ST., NEWPORT, MON. Tele. 4711

also at 15 Wyndham Arcade, Cardiff

All mail orders and enquiries to Newport branch please



CUSTOM BUILT MULTI-OUTLET T.V. PRE-AMPLIFIER



units now available to Aerial Manufacturers, Local Authorities and Contractors. Performance to specification, and with automatic switching if required. Please write for further Particulars.

RAINBOW RADIO MFG. Co. Ltd., Mincing Lane, Blackburn, Lancs.
 Specialists in all types of T.V. Pre-Amplifiers, etc.

TRANSFORMERS COILS CHOKES

TRADE ENQUIRIES INVITED

SPECIALISTS IN

FINE WIRE WINDINGS
 MINIATURE DEAF AID TRANSFORMERS, PICK-UP
 CLOCK AND INSTRUMENT COILS, ETC.

RADIOMENDERS LTD.

123-5-7 PARCHMORE ROAD, THORNTON HEATH, SURREY
 LIVINGSTONE 2261 EST. 1933

UNIVERSITY RADIO LTD.

Offer Guaranteed Used Equipment at Attractive Prices

- Eddystone Marine R.X., as new £35 0 0
- Ambassador 20-watt amplifier chassis, with M.W. quality tuning unit £10 10 0
- 1951 Wharfedale Corner Speaker, fitted with twin speaker units, cross-over network and separate controls for bass and treble, original price £56, as new £30 0 0
- Large selection of latest type American valve testers, all as new, all one price £10 0 0
- M.S.S. Portable Disc Recording Amplifiers, complete with valves, output meter, and in perfect working order, can be used as a high quality 5-watt microphone or gram amplifier, with high and low impedance outputs, as new £12 0 0
- Hunts Resistance Capacity Bridge, model C.R.B., perfect and as new £10 10 0
- Avo Model 40, as new £12 0 0

- Lowther 12-watt Amplifier, with Telefunken pick-up and motor mounted in oak cabinet, with built-in energising unit for Voigt speaker £14 0 0
- R.T.S. Resistance and Capacitance Bridge, brand new £10 10 0
- Taylor Circuit Analyser, model 110a, as new £10 0 0
- Radio Vision 55 V.R. Receiver. This is a professionally converted edition of the 1155 with built-in power pack and output stage and new front panel, absolutely as new £19 10 0
- Large selection of cutting heads for disc recorders, from £3 0 0
- H.M.V. Record Player, with lightweight pick-up and transformer £6 0 0
- Collaro Mixer Record Changers, 78 r.p.m., as new ... £6 0 0
- S.T.C. Oscilloscope, with separate X and Y amplifiers and new tube, as new £22 10 0

- Quotations gladly given for complete amplifier installations of any size.
- Charles K.I Amplifier, as new... £11 0 0
- G.E.C. 60-watt Amplifier, complete with valves, as new..... £18 10 0
- National I-10, with power pack and coils £10 10 0
- Pamphonic 18in. Energised Speakers, 200-volt field, 15 ohms, 3 only, as new £6 10 0
- B.2 R.X., with power Pack, as new £9 10 0
- Plessey Mixer Changer, 3-speed, as new £15 0 0
- Plessey Mixer Changer, single speed, as new £8 10 0
- Garrard Mixer Changer, single speed, R.C.60, as new £8 10 0
- Ex-W.D. 12-volt 12-watt Amplifiers, with valves in steel cases, 2 only £6 10 0

We urgently need good used test equipment and sound equipment especially B.C. 221's, 348's, 312's, 342's, A.R.88.D.'s & T.S.175's we are willing to pay the highest cash prices for all first class equipment.

- Avo Valve Testers, 1948/9, as new £12 0 0
- Taylor 65b Signal Generator, as new £9 10 0
- Eddystone 640 Receiver, complete with valves, as new..... £22 0 0
- E.D.C. Rotary Converter, 200-250 volt D.C. to 200-250 volt A.C., 1 Ph., 50 cy., 110 watts, in metal case, as new..... £9 10 0
- Valradio Converters, D.C. to A.C., 100 watt £8 10 0
- 200 watt £10 0 0
- 300 watt £12 0 0
- Avo Wide Range Signal Generator, as new £21 0 0
- Voigt Home Constructor's Horns, complete with Voigt energised unit, in perfect order £20 0 0
- A.R.77 rack mounted model in exceptional condition, as new, one only £26 10 0
- R.1132, complete with matching power pack, as new £12 10 0
- M.S.S. Portable Disc Recorder, rim drive, easily converted to 33½ with variable pitch lead screw, less amplifier, as new ... £40 0 0
- As above, with built-in amplifier and matching speaker, as new... £65 0 0
- National 183, complete with matching loudspeaker, as new... £70 0 0

- Large selection of Ham built T.X. equipment at very reasonable prices.
- Eversheds and Vignols 250-volt Bridge Megger, in perfect condition £16 0 0
- Western Electric High-frequency Pressure Unit, 40 watts, complete with six-cell horn, as new £16 0 0
- E.M.I. Ribbon Tweeter, with T.X. from 5 ohms cross-over frequency, 5 kcs. £25 0 0
- Single Beam Oscilloscope by Dumont, 115-250 volts A.C. ... £27 10 0
- American Industrial Circuit Analyser, 20,000 O.P.V. D.C., 1,000 O.P.V. A.C., in oak carrying case, with room for small tools, reads up to 30 megohms on internal batteries, as new ... £19 10 0
- Wilkins & Wright Moving Coil Pick-ups, as new, with matching transformer £3 0 0
- Large selection of high quality microphones, including ball and biscuit types and American Ribbon, from £5 0 0
- We always have in stock a large selection of new test gear by all the leading makers against which we can make the maximum allowance on your present equipment.
- Trixette Record Player, with automatic changer and built-in speaker and 4-watt amplifier, as new £20 0 0

- Lever's Rich Recording Amplifier, less valves £5 0 0
- Leak pre-Amplifier, 1949 £3 0 0
- Taylor 30a Oscilloscope, as new £16 0 0
- Pre-war Mullard Signal Generator, 100 Kcs. to 20 Mcs., complete with calibration charts ... £6 0 0
- 1949 Sound Sales 6-watt Amplifier, less tone control, as new... £8 10 0
- Pre-war E.M.I. Condenser Tester, in perfect order..... £5 0 0
- Ex-W.D. Avo 1948 A.C./D.C. Test Meter, similar to Avo 40, perfect £8 10 0
- Advance E.I. Signal Generator, as new £15 0 0
- 1948/9 Avo All-wave Signal Generators, as new £11 0 0
- Avo Model "7," as new £14 10 0
- Evershed's Circuit Testing ohmmeters, in leather case, as new £5 0 0
- Evershed's Wee Meggers, as new £9 10 0
- 5 only, Westinghouse Full Wave Rects., 200-250 v. 3 amp. rating, unused..... £7 0 0
- H.R.O. Senior, with 6 coils and original power pack, in perfect order £27 10 0
- A.C./D.C. Avo Minors, latest models, as new £7 0 0

THESE ITEMS ARE ONLY A SMALL SELECTION FROM OUR STOCK OF EQUIPMENT. YOUR ENQUIRIES FOR ANYTHING THAT YOU MAY NEED WILL BE WELCOME. WE HAVE OTHER EQUIPMENT ARRIVING DAILY!
CASH OR CHEQUE WITH ORDERS. ALL ITEMS LISTED ARE CARRIAGE EXTRA. S.A.E. PLEASE.

22 LISLE STREET, LEICESTER SQUARE, LONDON, W.C.2

OUR BRANCH AT 39a (opposite) IS OPEN ALL DAY THURSDAY.

Phone: GERrard 4447, 8582 and 5507. Hours 9 to 6. Thursday 9 to 1.

RADIO TRADERS LTD.

23 WARDOUR ST., LONDON, W.1.

(Coventry Street end)

Note Phone No. GERrard 3977/8 Grams: "Radiotrade"

WHOLESALE, MANUFACTURERS'
AND EXPORT ENQUIRIES ONLY

JONES PLUGS & SOCKETS —4, 6, 8, 10 and 12 WAY EX. GOVT. CARBON BRUSHES—LARGE STOCKS RESISTORS

HIGH STABILITY, close tolerances from $1\% \frac{1}{4}$, $\frac{1}{2}$, 1 and 2 watts. All values up to 2 meg., including 8, 13 and 30 meg.

VITREOUS WIREWOUND. Large selection from 2 to 200 watts.

CARBON. $\frac{1}{4}$ watt to 5 watt. All popular values. Standard Car Suppressors, 15,000 ohms.

CAPACITORS

Block Paper, Silvered Mica, Mica, Tubular and Ceramic.

SWITCHES

TOGGLE, YAXLEY, OAK, ETC.

EPICYCLIC DRIVES

INDICATOR LAMP HOLDERS

Red, Green and Clear.

LAMINATIONS

RADIOMETAL 31, 39 and 40. Also many other types.

VOLUME CONTROLS

MORGANITE "H" type, "LH" type, "M" type and WIRE WOUND. Most values and popular makes in stock.

PLUGS AND SOCKETS

CINCH, PYE, JONES, BELLING & LEE, BULGIN, ETC.

TRIMMERS

Variable CERAMIC TRIMMERS. Capacities from 5 to 100 pF. Spindle and pre-set types. Also Philips trimmers and trimmer tools and many other types.

WIRES

ENAMELLED, SILK COVERED, REG. CELLULOSE and PUSH-BACK. Screened, Standard and P.V.C.

VALVE HOLDERS

Paxolin, Moulded and Ceramic. Large selection including all latest types.

Large selection of

INSTRUMENT & RADIO KNOBS

NUTS, BOLTS, WASHERS, P.K. SCREWS, RIVETS, EYELETS, SOLDER TAGS, GROMMETS, GLASS CARTRIDGE FUSES, BRASS TERMINALS, VARNISHED COTTON AND PLASTIC SLEEVING—various colours $\frac{1}{2}$ mm.—30 mm., ETC. STOCKISTS of all CINCH COMPONENTS.

LARGE STOCKS OF EX-GOVERNMENT AIRCRAFT, RADIO AND ELECTRONIC COMPONENTS

All enquiries dealt with individually, but regret no lists are issued.

IMMEDIATE DELIVERY

TRADE COUNTER OPEN 9.30 to 5.30 MONDAY TO FRIDAY. CALLERS WELCOMED.

UNIVERSAL ELECTRONICS

London's Largest Selection of High Quality Communications and Test Equipment.

Test Equipment.

AVO, Model 7, as NEW, £15/10/-. AVO wide range signal generator, perfect, £22. AVO, Model 40, as NEW, £12/10/-. AVO signal generator, mains. £11. AVO A.C./D.C. minors, good condition. £6/15/-. ADVANCE E2 signal generator, £21. ADVANCE Audio Oscillator, £23. COSSOR double beam oscilloscopes, perfect, from £35. COSSOR ganging osc., type 343, £30. COSSOR 1035 oscilloscope, perfect, as NEW, £75. WESTON industrial test set, 20,000 O.P.V., £25. EVERSLED Wee Meggers from £10., 500 v. Bridge type, £35. TAYLOR 65B signal generator, £11. MARCONI output meter TF340. SIGNAL GENERATOR 390G TF517 pulse modulator. B.F. OSCILLATORS and other test equipment in stock. Various sensitive movements. Cambridge. Unipivots, etc., available.

Receivers.

R.C.A. AR77E receivers in perfect order, £37/10/- each. HALLI-CRAFTERS SX28, perfect condition, as NEW, £55. EDDYSTONE, types 640, £22/10/-. 740 £32/10/-. 750 £50. Marine £50. Panadaptors 1031, 1032, from £35. NATIONAL receivers, type NC200, 550 Lc/s., to 32 Mc/s., perfect, £45. MARCONI CR100, £30 ; BC348 and BC342 from £20. HAMMARLUND HQ120X, £45. R.M.E. 69. R.C.A. AR88, BC147, RL85. HALLICRAFTERS S40, S38, SX24, S20R and many others in stock.

VHF Wavemeters, 300-1,000 Mc/s. receivers S27, S27C, Marconi, VHF Klystrons 723/AB CV129's. Magnetrons 725A, etc., 10 C.M., TX type ADM 9C, £30 ; Bendix BC221 frequency meters. Lavoie Freq. meters 300-700 Mc/s., Waveguide and other items for VHF work. Audio Gear, SCOPHONY BAIRD Cine Soundmaster tape recorder, as NEW, £50. CDP disc recorder, complete with amplifier Amp., perfect order, £45. MICROPHONES : STC Ball Type, £9/10/-. RESLO TANNYO, LUSTRAPHONE and U.S.A. types. DECCALIAN 2-speed player, as NEW, £27. TRIXETTE player, £30. Wanted URGENTLY. Name your own price. Freq. meters BC221. TS. 47AP, and RCA AR88D-LF. Hallicrafters S27CA. Spectrum Analyser type TSX-4SE, or TS 148/JUP. TS174. TS175.

Shop hours : 9.30 a.m. to 6 p.m. Thursday to 1 p.m.

OUR ONLY ADDRESS DEPT. W. Phone : GERrard 8410 (Day) MEAdway 3145 (Night)

27 LISLE STREET,
LEICESTER SQUARE, LONDON, W.C.2

L. WILKINSON WHOLESALE AND EXPORT

19 LANSDOWNE ROAD, CROYDON

Phone : CRO 0839

Telegrams : "WILCO," CROYDON

AVAILABLE FROM STOCK

470 Contactors, American	12,000 yds. QUINCEL 7 Cable.
30,000 Glass Cartridge Fuses.	6,000 Selenium Rectifiers
4,800 Glass Insulators.	60,000 Pye Co-Axial Sockets
50,000 Potentiometers	1,000 Silydlok Fuses, 100 amp.
30,000 Valves	10,000 Key Switches
750,000 Resistors	80,000 Telephone Jack Sockets
250,000 Condensers	42,000 ft. Capillary Tubing
30,000 Breeze Plugs and Sockets	44 Signal Generators 20/88 M/cs.
150 Portable Electric Blowers, 230 V., 220W.	100 Klaxon geared Induction Motors, 220/240 volts, 175 r.p.m., torque, 15lb. ins. No. 1K58B3.W7.
80,000 yds. UNICEL 4 Cable	
77,000 yds. UNICEL 19 Cable	
30,000 yds. TRICEL 4 Cable	

RELAYS. P.O. TYPE 3,000

BUILT TO YOUR REQUIREMENTS

P.O. Standard Racks for 19in. Panels. Steel Channel Type, 6ft. high

CLEARANCE OFFER!!

Of special interest to Experimenters, Service Engineers, Dealers, and all Radio Constructors.

100 RADIO CONDENSERS, all brand new Ex-Govt. Stock and comprising Electrolytic, Paper, Mica, and Ceramic types. Capacities 2.P.F. to 8 mfd (at least 1 8 + 8 + 8 mfd at 500 volt working included in each selection).

NOTE—We cannot guarantee any one particular type of condenser to be included, but we do guarantee that the normal retail price for the parcel to be not less than £3.10.0d.

Our Special price for the 100 Condensers

15 / - (Post & Packing 1/6d.)

WALTON'S WIRELESS STORES
48, STAFFORD STREET - WOLVERHAMPTON

Send S.A.E. and 3d. in stamps for our latest list

CLYDESDALE

SPECIAL OFFERS

MINIATURE VOLUME CONTROLS

(Carbon Track)

- Dia. 1 1/2 in. single hole fixing (Standard).
- H893 2 Megohms. (log) with 1 1/2 in. spindle DP/Switch 4/- each, post 3d.
- H894 1/2 Megohm. (log) with 1 1/2 in. spindle DP/Switch 4/- each, post 3d.
- H895 1/2 Megohm. (log) with 1 1/2 in. spindle, no switch 2/6 each, post 3d.
- H896 1/2 Megohm. (lin.) with 3/4 in. spindle, no switch 2/6 each, post 3d.

VALVE HOLDERS, TOP GRADE

- E67 International Octal, Ceramic 1/- each, post 1 1/2 d.
- H889 International Octal Moulded 9d. each, post 1 1/2 d.
- E63 B9G (EF50) Loctal, Ceramic 1/- each, post 1 1/2 d.
- H890 B7G (6AM6) Noval, Moulded 9d. each, post 1 1/2 d.
- H897 B9A (12AU7) Noval, Moulded 9d. each, post 1 1/2 d.
- Dozen lots, Ceramic 10/6 doz. Moulded 7/6 doz.

ELECTROLYTIC CONDENSER

32 mfd. capacity 450 V.D.C. wkg. Aluminium cased, tubular with waxed cardboard insulating cover. Dim.: 4 1/2 in. long, 2 in. dia.



ASK FOR No. X/H852 **3/-** Each POST 6d.

SPECIAL CONDENSER OFFER



Comprising 3 (H852), 32 mfd. El. Condensers with mounting plates in original carton. ASK FOR No. X/H852 **7/6** Each POST 9d.

METAL CASED PAPER CONDENSER

4 mfd. capacity, 2,000 V.D.C. Test. Dim.: Overall, 5 1/2 x 4 x 1 1/2 in. ASK FOR No. X/H860 **4/6** Each POST 3d.

U.S.A. METAL CASED PAPER CONDENSERS

Made by Electrical Utilities.

4 mfd. capacity 500 v. D.C. wkg. Dim.: 3 1/2 x 2 1/2 x 1 1/2 in. overall. ASK FOR No. X/E257 **2/6** Each POST 3d.

4 mfd. capacity 350 v. D.C. wkg. Dim.: 3 1/2 x 2 1/2 in. overall. ASK FOR No. X/E258 **2/-** Each POST 3d.

Carton of 20 E258 Condensers. ASK FOR No. X/E258X **30/-** POST PAID

HALF MILE REELS OF WIRE

Metal Reel 8 1/2 in. Dia. x 3 in. containing 880 yards of single P.V.C. covered 23 s.w.g. Wire. Wgt. 12lb. nett. ASK FOR No. X/H855 **39/6** per REEL POST PAID

RELAY Y974 HI 500 ohms COIL 6 make 6 break, Changeover, Standard P.O. type. ASK FOR No. X/H891 **7/6** POST 1/-



THE R1155 AS A COMMUNICATIONS RECEIVER WITH 9 VALVES FOR 200-250 VOLTS A.C. MAINS.

Comprises:—RECEIVER UNIT R1155 WITH:—
5 Switched Bands, 18-7.5 Mc/s = 17-40 metres.
7.5-3 Mc/s = 40-100 metres. 1,500-600 kc/s. = 200-500 metres. 500-200 kc/s = 600-1,500 metres. 200-75 kc/s. = 1,500-4,000 metres.
7 Valves: VR99 (X65), 3/VR100 (KTW61), 2/VR101 (DH63), VI103 (Y.63) ME: DF Valves left out.

Simple controls. Slow motion 2 speed Tuning Manual Volume Control. Wave Change Switch. Also optional B.F.O., A.V.C., Magic Eye Tuning Indicator. In black metal case 16 1/2 x 9 x 9 in. Plus:—COMBINED OUTPUT/POWER PACK, with 2 valves, Pentode Output and Rectifier 8in. Speaker, Mains and output transformers. Tone Control, On/Off Switch. In black crackle metal case, 16 1/2 x 9 x 9 in.

ASK FOR No. X/E6A **£18.10.0** CARRIAGE PAID

A few only: R1155-N Model. Range: 18-1.5 mc/s., 1500-600/500-200 kc/s.

ASK FOR No. X/H481 **£18.18.0** CARRIAGE PAID
Or with combined Output/Power Pack at £26/19/6.

SPECIAL OFFER—LIMITED QUANTITY R1155 and R1155A RECEIVER UNITS COMPLETE LESS POWER PACK Fully reconditioned and tested

ASK FOR No. X/H898 **£7.19.6** Each CARRIAGE PAID

192 PAGE CATALOGUE, NEW LIST No. 8D

Giving details and illustrations of ex-services items and cancelling all previous lists and supplements. NOW IN THE PRESS and AVAILABLE SHORTLY Price 1/6

Price credited on first purchase of 10/- or over

TUBULAR STEEL MAST

Adm. Type APX 706 height 36ft. in 6 sections 1 1/2 dia. special spring clip fitting, ensures very Rigid Assembly. Colour green, wgt. 43 lb. No base or lashings supplied.

ASK FOR No. X/H857 **37/6** Each CARRIAGE PAID

VENT-AXIA 6in. FAN. REF.: 5A/2905

Moulded Plastic Fan housing assembly 7 1/2 in. dia. (Max.) 8in. long, made in two interlocking sections for mounting in a circular aperture, and completely self-contained, mounted on metal frame 17 1/2 x 8 1/2 in. With suppressor unit 5C/870, input through 2P. Chassis Plug.

ASK FOR No. X/H869 **£3.19.6** Each CARRIAGE PAID

Bargains in EX-SERVICE AND MANUFACTURERS' SURPLUS RADIO & ELECTRONIC EQUIPMENT

METAL (MINE) DETECTOR NO. 3



In Original Transit Case Ref.: ZA.22755/1, Of British design and construction. Comprises: A 3-valve AF Amplifier (ARP.12's = VP.23 Mazda) with space for dry batteries (not supplied) in metal box dim: 10 1/2 x 10 1/2 x 3 1/2 in., with leads terminating in 7-way cable socket, contained in a carrying satchel, with high resistance headphones.

Search Coil, ZA.22175 or Equivalent, surface area 134 sq. in. Dim 14 1/2 x 10 in.

Search Coil Pole, comprising: Control Box Pole and pivot-eye assembly. Pole (rear section) and Counter-weight assy.

Small Probe, Surface area 35 sq. in. Dim. 9 x 5 1/2 in. The whole contained in original fitted transit case, dim.: 52 1/2 x 14 x 10 1/2 in. Gross Wgt. 72lb. approx. ASK FOR No. X/H856 **£8.19.6** CARRIAGE PAID

Power Requirements. Dry batteries. L.T. 6 Type "S" 1 1/2 volt cells. H.T. 60-90 volts.

METAL (MINE) DETECTOR NO. 4

Ref. ZA24238

Of Cdn. design and construction, using I4T pentodes. Comprising TC. Amplifier, Search Coil, Sweep pole, Control Box, Headphones, Test Unit and Rucksack. Complete less batteries in fitted transit case.

ASK FOR No. X/H179 **£6.19.6** CARRIAGE PAID

FOR INEXPENSIVE TELEVISION

IF/AF AMPLIFIER UNIT R.1355 IN ORIGINAL CASE CARRIAGE PAID
ASK FOR No. X/E770 **47/6** CARRIAGE PAID
2nd Grade in Transit Case, 42/6 CARR. PAID
3rd Grade, loose stored. 35/- CARR. PAID
Circuit of R1355 available at 1/3.

5 CPI CATHODE RAY TUBE

ASK FOR No. X/H529 **35/-** POST PAID

INDICATOR UNIT TYPE 62 in Maker's original case

ASK FOR No. X/H526 **£5.9.6** CARRIAGE PAID

Also available, used, good condition. ASK FOR No. X/E774 **79/6** CARRIAGE PAID

INDICATOR UNIT TYPE 62A

Used, Good Condition.

ASK FOR No. X/H868 **£7.19.6** CARRIAGE PAID

INDICATOR UNIT TYPE 6H

ASK FOR No. X/E777 **£4.9.6** CARRIAGE PAID

TRANSFORMERS

E.H.T. 55/-, 57/6, 59/6 or 65/- each
Mains (Morley), 55/- and 60/- (Argus), 69/6 each.

CLYDESDALE

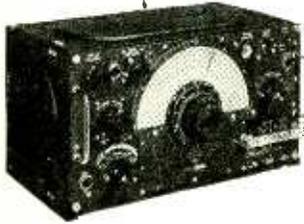
SUPPLY CO. LTD.,

2 BRIDGE ST., GLASGOW, G.5

Phone SOUTH 2706/9

BRANCHES IN SCOTLAND, ENGLAND AND NORTHERN IRELAND

VALUE FOR MONEY OFFERS



AIR MINISTRY COMMUNICATION RECEIVER RI155A. Brand New in transit cases. Frequency ranges—18.5-7.5 Mc/s, 7.5-3 Mc/s, 1,500-600 kc/s, 500-200 kc/s, 200-75 kc/s. Complete with 9 valves and Magic Eye. Guaranteed absolutely perfect. Price £9/10/-, plus 10/- for packing and carriage.

I155 POWER PACK AND OUTPUT STAGE complete with U50 and KT61 valves (not surplus) Black crackle case 12 x 8 x 5in. built-in 5in. pm Speaker and phone jack. 200-250v. A.C. All connections terminate in Jones plug which enables instant operation of receiver **without any modifications whatever.** Matches in appearance with receiver. Made to "Wireless World" specifications. Built entirely from top grade new components, £7/10/- plus 3/6 carriage.



G.E.C. VHF RECEIVERS complete with 10 valves. Ex-Govt. As used by police. Used but guaranteed in excellent condition. Valves comprise ZA2's, 954's or EF50's in HF and 1st Det. stages. Det 19 in local oscillator, KTW63's in three IF stages, D63 Det and AVC, LF H63, Output KT63, Noise suppressor D63, Power requirements 6v 3a, 270v 80ma, as used by various British Police forces. Available in TWO frequency ranges, "B" 95.5-100 Mc/s and "C" 78.5-82 Mc/s. Intermediate frequency adjustable 8.3-9.8 Mc/s. Oscillator Crystal controlled (No crystal included). Sensitivity 3 microvolts for 50mw audio output. Input impedance 72 ohms. Housed in Grey enamel steel case with lid 10 x 8 x 7in. Weight 22lbs. Note the amazingly low price, 49/6 plus 5/- carr.

GAUMONT BRITISH 16 mm. LS16 TALKIE PROJECTOR. Absolutely complete and in very fine condition. Cost £216. A snip at £75. carr. paid.

NATIONAL NC46 HF RECEIVER. This is one of the latest National receivers. 10 valves. Coverage .6 to 30 Mc/s. with separate Band Spread scale. Grey crackle cabinet, L. 17½in., D. 9½in., W. 11in. Complete with National Speaker in separate grey crackle cabinet to match. 110v. We supply suitable stepdown transformer for 230v. An opportunity to secure a rare and much sought after receiver, £35, carriage paid.

BC221 FREQUENCY METER, complete with charts. Not in original cabinet. Cabinet fitted is actual size of BC221 front panel. Perfect condition. Separate R.A.F. type HT unit included. Price 111 gns. A snip. **CATHODE RAY TUBES.** VCR138. 3½in. white screen, 3 gns. 5N1P, 60/-; 3BP1, 2 gns. All postage paid.

VIEWMASTER TELEVISION COMPONENTS

If you are building the Viewmaster you cannot do better than order your parts from us. We hold very large stocks of all Components.

TCC Condensers, Midland or Holme Moss Kit	147/-	WB200 Video Chassis ...	18/6
Or separately as required.		WB102 Time Base, Power Resistor Kit	18/6
Resistor Kit	35/3	WB101 Chassis Support	6/-
Wearite Coil Kit	30/-	WB103 Heater Trans. ...	42/-
Westinghouse Rectifier Kit	69/-	WB103A Auto Trans. ...	52/6
Bulgin No. 7 Kit	14/-	WB104 Mains Choke ...	15/6
Belling Lee L707 Kit	8/9	WB106 Frame Trans. ...	25/6
Colvern Pot. Kit	22/3	WB107 Line Trans.	32/6
WB112 Front and Rear Tube Supports, 9in., 21/-; 12in.	21/6	WB108 Scanning Coil ...	33/3
Instructional Envelopes. State Area	7/6	WB108/9 Focus Rings ...	22/6
		WB110 Width Control ...	10/-
		WB111 Boost Choke ...	5/9

EXPORT ONLY

- 3,000 OXYGEN MASKS, 6D642 Type G. Brand new. All in original cartons.
- 3,000 Gauges for de Icer Black Bakelite case, 2½in. dia., 4 screw fitting. Calibrated 14-0 vacuum. 0-10 pressure. New condition. All cartoned.
- 40 American Aircraft Cabin Heaters. Type ABV-50D-H7-B, all brand new in original packing.
- 100 5U/546 Voltage Regulators. All brand new. Individually boxed.
- 36 10Q13003 Type 7H. Black bakelite case, 3½in. diam.

Many items previously advertised still available.

SATISFACTION IS UNCONDITIONALLY GUARANTEED BY US AND MONEY WILL BE REFUNDED IN FULL ON ANY GOODS RETURNED CARRIAGE PAID WITHIN 7 DAYS OF RECEIPT. CAN WE BE ANY FAIRER?

H. P. RADIO SERVICES LTD.

Britain's Leading Radio Mail Order House,

55 County Road, Walton, Liverpool, 4

Tel.: Aintree 1445

Established 1935

RADIO EXCHANGE CO.

STROBE UNITS, with 6 EF50's, 5Z4, SP61, five EA50's, dozens of resistors, condensers, pots, relays, transformers, chokes, smoothing condensers, etc. Brand new. ONLY 59/6.

RECEIVER S450 and S450B. Complete with valves, tuning 65/85 or 85/95 mc/s, these are ideal for Wrotham or "2" metre conversion. Housed in attractive robust grey cases measuring 12 x 4½ x 5½in., these contain 4 EF54's (RF, mixer, Xtal multipliers), EC32 (Xtal oscillator), 2 EF39's (2.9 mc/s IF), EB34 (det.), 6J5 and 6V6 (audio). Complete with circuit, 49/6, post 2/- State which required.

INDICATOR I82A. With VCR517 6in. tube, 3 EF50's, 6 SP61'2, 5U4, 9 pots, resistors, condensers, etc. Ideal for television or 'scope. New in crates (less relay). 79/6. A few, less EF50's and 5U4, 50/-.

BRAND NEW ACCUMULATORS in transparent, unspillable plastic cases. 7 A.H. 2 v., 3in. x 1½in. x 4in., 6/6, post 1/-.

NEW 1355 CONVERSION, NEW EDITION of our data, for all 5 TV channels. Self contained, on ONE chassis, WITHOUT RF unit, 3/-.

1355 RECEIVERS complete with 11 valves, BRAND NEW, in original cases, 45/-.

I155 COMMUNICATION RECEIVERS, unused, in original transit case (air tested), £10/15/-.

NATIONAL H.R.O. POWER UNITS, providing 230 v. D.C. H.T., and 6.3 v. L.T., from 115/230 v. 50 cps. mains, these are ideal for the I155 receiver, and are BRAND NEW in sealed cartons. Attractive black crackle cases measure 7½ x 7½ x 6½in. ONLY 59/-.

HEMISPHERICAL CARBON MICROPHONES with switch, new, boxed, 5/-, post 5d.

MALLORY 4-PIN VIBRATORS. 12v., non-sync., 5/- (post 9d.).

14 ST. MARY'S STREET, BEDFORD

Phone: 5568.

Television • Radio • Record CABINETS MADE TO ORDER

ANY SIZE OR FINISH

CALL OR SEND DRAWINGS FOR QUOTATIONS

B. KOSKIE

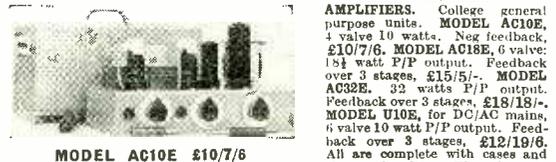
72-76 Leather Lane, Holborn, E.C.1

Phone: HOLborn 4777

PRATTS RADIO 1070 Harrow Road, London, N.W.10

(Nr. SCRUBBS LANE)

Tel.: LADbroke 1734



MODEL AC10E £10/7/6

AMPLIFIERS. College general purpose units. MODEL AC10E, 4 valve 10 watts. Neg feedback, £10/7/6. MODEL AC18E, 6 valve: 154 watt P/P output. Feedback over 3 stages. £15/5/-. MODEL AC32E, 32 watts P/P output. Feedback over 3 stages. £18/18/-. MODEL U10E, for DC/AC mains, 6 valve 10 watt P/P output. Feedback over 3 stages. £12/19/6. All are complete with case and chrome handles. They have a separate microphone stage. Separate inputs for mike and gram., allowing individual mixing, etc. Outputs match 3, 8 or 15 ohms speakers. Max. inputs volts required for full stated output average Mike .003, Gram. 3 v. MODEL AC80, 5 valve P/P 9-10 watt unit for records, radio, etc. Feedback over 3 stages. Output to 3, 8, 16 ohms, £10/10/-. MODEL AC4C, 3 valve record/radio amplifier, 4 watts to 3 ohms, £5/15/-. Ditto U4C for DC/AC mains, £5/15/-. Stamp for list. Full range of accessories available including: Rothermel Crystal Mikes, 105/-; Goodmans 12in. P.M. speaker, £8/12/6; Collaro A.C. Record Players, rim drive, magnetic model, £6/9/-. Crystal, £6/15/-. Jack plugs, 2/- each extra. All amplifiers are complete and ready for use.

MAINS TRANSFORMERS

These transformers are all famous radio manufacturers' surplus and are fully interleaved, impregnated and guaranteed.

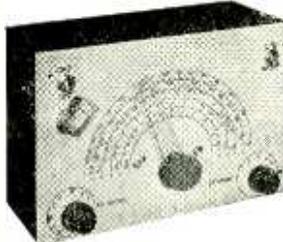
Primary 200-250 v. P. & P. on each, 1/6 extra.
300-0-300, 100 mA., 6 volt 3 amp., 5 volt 2 amp., 25/-.
280-0-280, 80 mA., 6 v. 3 amp., 4 v. 2 amp., drop-through, 14/-.
Drop-thro' 350-0-350 v. 70 mA., 6 v. 2.5 amp., 5 v. 2 amp., 14/6.
280-0-280, semi-shrouded drop-through, 80 mA., 6 v. 3 amp., 5 v. 2 amp., 16/6.
Semi-shrouded, drop-thro', 280-0-280, 80 mA., 4 v. 6 amp., 4 v. 2 amp., 12/6.
Auto-wound, H.T. 280 volts at 360 mA., 4 v. 3 amp., 2 v. 3 amp., or 6 v. 3 amp. Separates 4 v. 3 amp., rectifier winding (upright or drop-through), 10/6.
350-0-350, 120 mA., 4 v. 4 amp., 4 v. 3 amp., drop-through, 21/-.
Auto-transformer, various combinations of voltages including 110 v. 70 watts, and 3/4 volt windings at 1 amp., 2 volt 1 amp., drop-through or upright mounting, 10/6.
250-0-250, 60 mA. 6 v. 3 amp., 12/6.
250-0-250, 80 mA. 6 v. 4 amp., 14/-.
 Pri. 230 v. Sec. 200-0-200 35 mA. 6 v. 1 amp., 8/6.
 Pri. 200/250 v. secondary 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., 13/-.

MAINS TRANSFORMER, semi-shrouded drop-through 200/250 v. primary; secondary 280-0-280 250 mA., 6 v. 6 amps., 5 v. 3 amps., 29/6. P. & P. 3/-.
Heater Transformer, Pri. 230-250 v. 6 v. 1 1/2 amp., 6/-; 2 v. 2 1/2 amp., 5/-; 2, 4 or 6 v. at 2 amps. 7/6. P. and P. each 1/-.

P.M. SPEAKERS (Closd field) with less trans. trans.
 2 1/2 in. 15/6
 3 1/2 in. 13/6
 5 in. 16/6
 6 1/2 in. 16/6
 8 in. 18/6
 P. and P. on the above 1/- each. 10 in. less trans., 25/-, P. and P. 1/6.
R. & A. 8 in. M.E. Speaker field coil, 1,600 ohms O.P. trans, 5,000 ohms, impedance, 18/6. Post and packing 2/-. Rola 5 in. P.M. with O.P. trans., 16/6.
6 1/2 in. Energised Television Speaker by PLESSEY. Field resistance 68 ohms with hum-bucking coil. Will pass up to 300 mA., requires minimum 200 mA. to energise. These are cheaper than a T.V. choke. 9/6 each, 2 for 18/-.

Volume Controls, by famous manufacturer. Long spindle less switch, 50K, 500K, 1 meg., 2/6 each. P. & P. 3d. each.
B.T.H. Crystal Diode wire ends, 2/3, post paid.
Expanded aluminium speaker fret, 1 1/2 x 9 in., 2/-.
Volume Controls by famous manufacturer. Long spindle and switch, 1/2, 1 and 2 meg., 4/- each; 50 K., 3/6 each. Ganged control 3 K. and 5 K., 3/6. Post and packing 3d. each.
Trimmers, 5-40 pf., 5d.; 10-110 10-250, 10-450 pf., 10d.
Ceramic P.F.S. 3 each of the following: 330, 220, 180 and 82, 2/6.
Twin-Gang .0005 Tuning Condenser, 5/-. With trimmers, 7/6. P. & P. 1/-.

D. COHEN
 RADIO & TELEVISION COMPONENTS



WALNUT BAKELITE CABINET 3-wave-band scale, size 8 1/2 x 3 1/2 in., 5-valve superhet chassis with I.F., valve scale clips, 3 pulley wheels, two brackets, scale pan and back. **DESPATCHED TO ENGLAND ONLY, 31/-**, post paid.

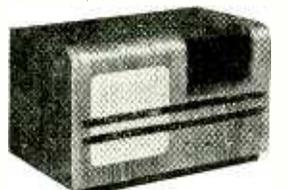
CONSTRUCTOR'S POLISHED CABINET. Size 10 x 6 1/2 x 5 in. approx., supplied in flattened form, grooved and ready to glue together. Complete with plastic front, 3-valve chassis, size 8 1/2 x 4 x 1 1/2 in., tuning scale, backplate and back, 10/-, P. & P. 1/6.

TWIN-GANG AND PAIR OF T.R.F. COILS with circuit to suit above, 8/6.



CRYSTAL PICK-UP by famous manufacturer complete with sapphire trailer needle and volume control, 23/-, Less volume control 21/-, post and packing on each 1/-.

EX-GOVT. RECEIVER TYPE B28 Complete coil unit, 6 bands, 60 kc/s -420 kc/s., 500 kc/s-30 Mc/s. Complete with circuit, 21/-. Post and packing 2/-. Circuit sold separately, 4/-, post paid. Four-gang to suit, 7/6. Coil pack, gang, 5 I.F.s., B.F.O. and crystal, 57/6, plus 3/- P. & P. 465 Kc. crystal, 12/6.



WATERHOUSE 5 in. EXTENSION SPEAKER, complete with vol. control, in gold and green, 22/6. P. & P. 1/-.

MAINS OR BATTERY SUPERHET PORTABLE COILS. Comprising medium-wave frame aerial and long-wave loading coil, used as aerial coils. Midget iron-cored screened L/M osc. coils, complete with circuit I.F. frequency 465 Kc., 9/6.

465 KC. MIDGET I.F.S. Q 120, size 1 1/2 in. long, lin. wide, 3 in. deep by very famous manufacturer. Pre-aligned adjustable iron-dust cores, per pair, 12/6. Both these items £1, post paid.

CONSTRUCTOR'S PARCEL comprising chassis 8 in. x 4 in. x 1 1/2 in., with speaker and valveholder cut-outs, 5 in. P.M. speaker with transformer, twin gang with trimmers, pair T.R.F. coils long and medium, iron-cored, four valveholders, 20 K. volume control and wave-change switch, 23/-, P. & P. 1/6.

OUTPUT TRANSFORMERS. Standard type 5,000 ohms imp., 2 ohms speech coil, 4/9; 42-1 speech coil 2-ohm with extra feed-back winding, 4/3; Miniature 42-1 2-ohm speech coil, 3/3. Multi-ratio 3,500, 7,000 and 14,000 2-ohm speech coil, 5/6. 10 watt push-pull, 6V6 matching, 2 ohm speech coil, 7/-.

Twin-gang .0005 with separate 75 pf. on each section for S.W. tuning with feet, size 3 1/2 x 3 x 1 1/2 in., 6/6.

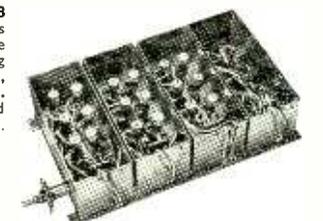
Television Chassis: Size 9 1/2 x 9 1/2 x 3 1/2 in., 18 gauge steel cadmium plated complete with 5-coil cans size 1 1/2 x 1 in. with iron-cored former. These are wound for television frequency, 6.6. P. & P. 1/6.

Push-back connecting wire. Doz. yds. 1/6 post paid.

KIT OF PARTS FOR SIGNAL GENERATOR. Coverage 110 Kc/s-320 Kc/s., 320 Kc/s.-900 Kc/s., 900 Kc/s.-2.75 Mc/s., 2.75 Mc/s.-8.5 Mc/s., 8.5 Mc/s.-20 Mc/s. Metal case 10 in. x 6 1/2 in. x 4 1/2 in. size of scale 6 1/2 in. x 3 1/2 in. 2 valves and 1 rectifier valve, A.C. mains 230/250. Internal modulation 400 c.p.s. to a depth 30 per cent. Frequency calibration accuracy plus or minus 1 per cent. Modulated or unmodulated R.F. output continuously variable 100 millivolts. £3/10/-, P. and P. 4/-. This includes the return to us for checking and calibration. Circuit and point-to-point wiring diagram 3/6.

3-wave-band scale, size 8 1/2 x 3 1/2 in., 5-valve superhet chassis with I.F., valve scale clips, 3 pulley wheels, two brackets, scale pan and back. **DESPATCHED TO ENGLAND ONLY, 31/-**, post paid.

Size 10 x 6 1/2 x 5 in. approx., supplied in flattened form, grooved and ready to glue together. Complete with plastic front, 3-valve chassis, size 8 1/2 x 4 x 1 1/2 in., tuning scale, backplate and back, 10/-, P. & P. 1/6.



RADIO CABINET. In polished walnut size 19 x 11 x 8 in. approx., complete with scale. These are slightly soiled and require retouching, 7/6 each, post paid.

Valve Holders, moulded octal, Mazda, and loctal, 7d. each. Paxolin, octal, Mazda and loctal, 4d. each. Moulded B7G, B8A and B9A, 7d. each. B7G moulded with screening can, 1/6 each.

32 mfd., 350 wkg.	2/6
16 x 24, 350 wkg.	5
4 mfd., 200 wkg.	1/3
40 mfd., 450 wkg.	3/9
16 x 8 mfd., 500 wkg.	5/-
16 x 16 mfd., 500 wkg.	5/9
8 x 8 mfd., 450 wkg.	3/6
1 mfd., 500 v. wkg.	1/6
32 x 32 mfd., 350 wkg.	6/-
32 x 32 mfd., 350 wkg. and 25 mfd., 25 wkg.	6/6
25 mfd., 25 wkg.	11d
250 mfd., 12 v. wkg.	1/-
16 mfd., 500 wkg., wire ends	3/3
8 mfd., 500 v. wkg., wire ends	2/6
8 mfd., 350 v. wkg., tag ends	1/6
50 mfd., 25 v. wkg., wire ends	1/9
10 x 6 x 2 x 2 mfd., 500 v. wkg.	5/-
50 mfd., 250 v. wkg.	1/9
Ex-Govt. 8 mfd., 500 v. wkg. size 3 1/2 x 1 1/2 for	2/6
60+100 mfd., 280 v. wkg.	7/-
16 x 32 mfd., 350 wkg.	6/6
50 mfd., 180 wkg.	1/9
65 mfd., 220 wkg.	1/6
4+4+4 mfd., 350 wkg.	2/6
8 mfd., 150 wkg.	1/6

Frame Oscillator Blocking Transformer, 4/6.

Transformer. Inductance 10 hy. ratio 10 : 1, 9/6.

Tube Mounting Bracket, size 9 1/2 x 4 1/2 in., with 4 1/2 in. dia. cut-out. In 18 gauge cadmium plated steel and 12 in. tube clamps, 2/-.

Smoothing Choke, 2 henry 150 mA., 3/6.

Smoothing Choke, 250 mA. 4 henry, 5/-; 250 mA. 5 henry, 6/-.

P.M. Focus Unit for Mazda tube, 15/-, P. & P. 1/6. Similar to above with front adjustment, 2/6 extra.

P.M. Focus Unit for any 9 in. or 12 in. tube, 35 mm. neck, except Mazda 12 in. state, tube, 12/6.

Similar to above, but with front adjustment, 2/6 each extra. **Ion Traps** for Mullard or English Electric Tubes, 5/- post paid.

Pre-Aligned Midget 465 Kc. Q. 120, 9/- per pair, post 6d.

465 Kc. I.F.S., size 2 1/2 x 1 1/2 in. Q.110 removed from American equipment, 5/- per pair.

Iron-Cored 465 Kc. Whistle Filter, 2/6.

Standard 465 Kc. I.F.S. Q. 120, iron-cored, 3 1/2 x 1 1/2 x 1 1/2 in., per pair, 9/6.

Television Masks. White Rubber, 9 in. with glass, 7/6. Cream rubber, 12 in. with armour-plate glass, 15/-; 15 in. white rubber mask, soiled, 12/6, plus 1/6 P. & P.

Two-piece Octal Screening Can, 9d. P. and P. 3d.

Three-bank, 50 pf., 1/3. Four-bank, 50 pf., 1/8.

Twin-Gang Midget .00037 with perspex dust-cover and trimmers, 8/6. Post and pkg. 6d.

Mains Droppers, 0.3 amp., 460 ohms, tapped 280 and 410, 1/6. 0.2 amp., 717 ohms, tapped at 100 ohms, vitreous, 1/6; 0.3 amp., 950 ohms, tapped 700 and 825, 2/6; 0.2 amp., 1,000 ohms, vitreous, tapped, 2/6. Vitreous 3 amp. 700 tapped 680, 640, 600, 3/6, P. and P. on each 3d.

3-gang .0005 with separate 75 pf. on each section for S.W. tuning with feet, size 4 1/2 x 3 x 1 1/2 in., 7/6.

Terms of Business: Cash with order. Despatch of goods within 3 days from receipt of order. Where post and packing charge is not stated please add 1/- up to 10/-, 1/6 up to £1, and 2/- up to £2.

SPECIAL NOTE: NO GOODS SENT WHERE CUSTOMS DECLARATION IS APPLICABLE.

23 HIGH STREET (Uxbridge Road) ACTON, W.3

Hours of Business: Saturdays 9-6 p.m. Wednesday 9-1 p.m. Other days 9-4.30 p.m. Telephone: ACOrn 5901

RI132A RECEIVERS. 100/125 Mc/s., £6 10/-.
RI147A/B U.H.F. RECEIVERS, ideal for conversion to 144 Mc/s, with circuit, £4/15/-.
EX-W.D. TRANSFORMERS, input 200/250 v., output 0-460 v. 200 m/a 6.3 v. 5 a., 22/6.
3-VALVE TRF KIT, complete with beautiful polished wood cabinet, 5in. speaker, £5.
TEST EQUIPMENT B.C. 906, £5; B.C. 1066, £3; and I-196-B, £3.
U.S. ARMY CABLE VULCANIZER KIT, £10. Carr. extra.
VALVES. 154, 10/6; 6AG5, 13/6; 117Z6, 12/6; 6SH7, 6/6; EF50, 8/6; 955, 954, 6/-; SG215, 6/6; Pen 220A, 6/6; TT11, 8/6; VR 150, 10/6; 42, 10/6.
RF24 UNITS. Converted to 28 Mc/s Band. Variable tuned with 100-1 geared S.M. Dial. Complete with plug and leads for immediate use, £35/-.
MAINS TRANSFORMERS. Input 200/240 v. Output 350-0-350 or 250-0-250 volt, 80 mA and 4 and 6.3 v. 4 a. and 4 and 5 v. 2 a. Price 21/6. Input 200/240 v. Output tapped, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30 volts, 2 amps., 21/6. All with one year's guarantee.
NEW MINIATURE VALVES. CK512AX, 9/-; 6AG5, 10/6; 9001, 9002, 9003, 7/6, 954-955, 6/6.
D.P.D.T. RELAYS. Operate at 200/300 volts D.C., 8/6. D.P. make and break, 8/6. We can supply any type of voltage and contacts at varying prices.
NEW SELENIUM RECTIFIERS. F.W. 12.6 volt 3 amps., 14/6; 4 amp., 26/-; 6 amp., 30/-; 1 amp., 10/6; 250 v. 120 mA. H.W., 9/-; 12 v. 100 mA., 3/-.
TYPE IN34—GERMANIUM CRYSTAL DIODES, 5/6.
POLAR—TWO-GANG VARIABLE CONDENSERS. .00015 mfd. Large quantity available. New offers please.
B.C. 603 RECEIVER AND B.C. 604 TRANSMITTER. 20 co 28 Mc/s. including 80 Crystals, £35, carriage extra.
U.S. MANUALS for Test Equipment IE-56-A, SCR-729-A and SCR729AZ. Contains all the gen on Freq. Meter B.C. 906, Receiver B.C. 1066 and Sig. Gen. I-196-B, 21/-. New and Boxed Type T.C.C. CP58QO, 1 mfd. 7 kV Condensers, 10/6 each. 1 mfd. 2.5 kV., 5/6.
VCR97 CRTs. New and crated. Picture tested, 45/6. Bases 3/6.
M.C MICROPHONES with Matched Trans., 12/6.
NEW P.M. SPEAKERS. 5in., 14/6; 6in., 16/6; 8in., 20/-; 10in., 29/6. Goodman 10in., 32/6; 8in., 20/-.
CARBON MICROPHONES with Matched Trans., 10/6.
 All the above Post Paid from Dept. W.W.,

The RADIO & ELECTRICAL MART
 253B PORTOBELLO ROAD, LONDON, W.11

Phone: PARK 6026

NORMAN H. FIELD 68 HURST STREET BIRMINGHAM, 5

Mail Order Department
 64-65 CHURCH LANE, WOLVERHAMPTON

CRYSTAL MONITORS. Type 2. For frequency checking of Transmitters and Receivers. Provision for phones. Battery Operated. Easily adapted for Mains use by using 3 615 valves. Housed in attractive cabinet, size 7 1/2 in. x 5 1/2 in. x 6 in., with red panel indicator light. Less valves and crystal, 7/6. Circuit for conversion to mains, 1/-.
BATTERY AMPLIFIERS. A1968. Complete with VR35 and VR21 valves. For use as intercom. or with slight modification as Gram. Amplifier, in metal base, 7 in. x 4 1/2 in. x 4 1/2 in., 15/-.
 In Carrying Case 1/6 extra. Full instructions and circuit for Modification, 1/- each.
METERS. Marked Air/Oil Moving Coil basic 200 Micro amps. Very sensitive. 2 1/2 in. square, 7/8.
ROTARY CONVERTERS. Approx. 6 volts input and 220 v. at 80 m/a. Output. (Postage 1/9). 12/6.
HAND MIKES. Tannoy Power. Carbon Type. With press-to-talk button, 3/6.
THREE-IN-ONE TRANSFORMERS, 6/- each plus postage 1/6. 230 v. 50 cycles. Input 150-0-150 at 100 m/a. output. Useful for H.T. Eliminators and Low Voltage Power supply. Can also be used 300 v. half wave at lower current.
LOOP AERIALS. 1155. D.F. 8/6.
PRE-AMPS. Ultra S.W. uses EF54 with Coaxial input and output sockets. Also plug and socket for power supply. Broad Band. Slug tuned for use on T.V. frequencies over 10 metres. Valves to suit available, 5/-.
8 MFD. CONDENSERS, 500 v. Screw hole fixing, 2/-.
 Please include something for postage. Money-Back Guarantee.

WILL BUY any U.S. surplus radio parts, equipment

* APN-9, TS-67, R-89B/ARN-5, ARC-1, ARC-3, ART-13, BC-221, BC-348, SCR-522, MN-53, MN-61, RA-1, MN-31, MI-32, ARN-7, Headsets, Mikes, Cannon Ampheloh plugs, 274-N, ARC-5, Dynamotors, Test sets, "TS-" or "I-" prefixes.

State condition and Best Price
Aircraft Radio Industries, Inc.
 85 St. John Street, New Haven, Conn., U.S.A.

HIGH GRADE TRANSFORMERS

FOR ALL PURPOSES
 SINGLY OR IN QUANTITIES
 TO YOUR SPECIFICATION
 VARNISH IMPREGNATED
 BAKED WINDINGS
 WITH OR WITHOUT TAG PANELS
 GOOD DELIVERIES

Our rewind dept. will handle your repairs promptly and efficiently.

P. HOWORTH
 51 POLLARD LANE · BRADFORD

Tel.: 37030

EASILY RAISED MASTS COMPLETE IN EVERY DETAIL

From 25ft to 120ft.

These masts are specially designed and the neatest yet produced

WE ARE MORE THAN WILLING TO GIVE ADVICE ON ALL MAST PROBLEMS—FREE OF COURSE

• **SKY-MASTS** •
 BEADON GARAGE, BEADON RD., LONDON, W.6
 RIV. 1124

FIRE! MY LIFE LOST BUT FOR NU-SWIFT!

"A match struck...an explosion... petrol-sprayed I became a living torch...but my 13-year old Nu-Swift Extinguisher saved me from agonizing death." Everyone has too many fire risks. What would you have done?
 NU-SWIFT LTD. • ELLAND • YORKS
 In Every Ship of the Royal Navy

VIEWMASTER COMPONENTS

Send for special price list of items always in stock.

Radio and Television Components—large stocks held. Please send for our monthly bulletin, which always contains many exclusive bargain lines.

- Loudspeakers 2 1/2" to 12"
- Resistors
- Autochangers
- Record Players
- Valves: Receiving & Transmitting
- Transformers: Power, Filament & I.F.
- Volume Controls
- Condensers
- Electrolytic Paper S.M.
- Radiogram
- Walnut Cabinets
- Plastic Radio Cabinets, etc.

Trade only supplied.



V.E.S. WHOLESALE SERVICES LTD.

11 GUNNERSBURY LANE, W. ACTON, W.3
 Telephone: ACOrn 5027

AVOID BOTTLENECKS!

We hold large and comprehensive stocks of components and units. Contact us; we may solve your production problem.

- CONDENSERS.** Silver Mica. Tubular. Mansbridge.
- CRYSTALS.** American FT241 & FT243 Etc.
- HEADPHONES.** DLRI, DLR5, IBA5 Etc.
- METERS.** Thermo. Moving Coil. Moving Iron.
- RESISTORS.** High Stability. Carbon. Wire wound.
- VOLUME CONTROLS.** Morganite Types H, M, LH, BJ. Colvern I-5 watts.
- PLUGS & SOCKETS.** Pye Patterns, Belling, etc.

Wholesale and Export Only

ANDERS RADIO LTD.

167 HAMPSTEAD ROAD, LONDON, N.W.1
 EUS. 1639. EST. 1928

**Best Buy
at
Britain's**

Scope for a Bargain!!!

SPECIAL OFFER OF G.E.C. MINISCOPES

A single-beam cathode ray oscilloscope, specially designed for the radio, television and audio engineer to achieve maximum versatility and compactness.

BRAND NEW in manufacturer's original cartons, with felt-lined leatherette carrying case complete with tube, valves, all leads and comprehensive INSTRUCTION MANUAL which includes 40 pages on the use of the 'scope by Miller. Send S.A.E. for illustrated pamphlet.

LIST PRICE ~~£21.0.0~~
OUR PRICE—

£9.19.6

Plus 4/6 Carriage and Packing



- Range 10 c/s to 50,000 c.s.
- Hard valve time base.
- 2-stage amplifier for Y plates.
- Attenuator.
- For operation on A.C. main: 110 to 250 volts; 50/100 c/s.
- All usual controls—shift, sync., brilliance, focus, time base frequency, etc.

**A happy
New Year**
to all our customers
PAST, PRESENT & FUTURE

COMMUNICATION RECEIVER R1155 for world-wide reception. This set is recognised as one of the finest obtainable. For those not familiar with the receiver we can supply the authoritative "Wireless World" circuit and descriptive booklet for 1/3 post paid. All our receivers are air-tested before despatch and supplied complete with 10 valves. **ABSOLUTELY BRAND NEW for £11/19/6**, plus 10/6 carriage and packing, in original transit case. Demonstration given any time. Come and hear the receiver you buy.

Few only, slightly used, air tested at **£7/19/6**, plus 10/6 carriage, in original transit cases. **R1155N**. A few of these models still available at **£17/19/6**, plus 10/6 carriage and case.

A.C. MAINS POWER PACK/OUTPUT STAGE enables the R1155 to be operated from 200/250 volts A.C. mains without any alteration whatever to the receiver. Just plug into mains and connect 2/3 ohm speaker (speaker not included). Manufactured by ourselves from first class components in a black case size 8 1/2 in. x 6 1/2 in. x 4 in. Uses extra heavy duty transformer, 5Z4, 6V6 and output trans. Note that **OUR power pack is GUARANTEED for SIX MONTHS**. Complete with all valves, Jones plugs and leads for **£4/10/-**, plus 3/6 carriage.

SAVE £ £ £

We offer brand new R1155, Power Pack/Output stage for only **£15/19/6**, plus 12/6 carriage (not model "N").

RECEIVER TYPE R132A.—A complete U.H.F. receiver covering 100-124 Mc/s. with variable tuning. In handsome case, suitable for rack mounting, size 19 in. x 10 1/2 in. x 1 1/2 in. All normal controls, L.F. Gain, R.F. Gain, B.F.O., 0, 6 and 12dB attenuator and tuning meter. Tuning by means of a super slow motion drive with clear 0-100 dial. Valve line-up—R.F.—VR65, F.C.—VR65, Oss.—VR66, Stabilizer—VS70, 2 I.F.'s—VR53, B.F.O. VR53, I.F. Amp.—VR53, Det.—VR54, A.F.—VR57, Output—VR67. Power requirements are 6.3 volts 3.3 Amps and 250 volts at 100 mA. Coils easily altered for 144 Mc/s. or for reception of Wrotham on 90 Mc/s. **Brand New** and unused complete with circuit diagram for only **79/6**. Plus 10/6 carriage and packed in original transit case.

182A INDICATOR UNIT contains three EF50's, one 5U4G, four SP61's and a 6 1/2 in. Cathode ray tube, VCR517. This tube will replace the VCR97 without any alteration, is completely free from cut-off and has a more pleasant tube colour. The unit contains in addition a very large assortment of pots, resistors, condensers, etc. All tubes demonstrated to personal shoppers. This is the very best value obtainable to-day. Supplied **brand new** (less relay) for only **79/6**, plus 7/6 carriage, in original transit case.

MINIATURE MAINS TRANSFORMER.—Primary 230 volts 50 cycles. Secondary 230-0-230 volts 50 mA, 6.3 volts 2.6 amps. Suitable for small sets, instruments, etc. Upright mounting, size 2 1/2 in. x 2 1/2 in. x 3 in. high. Price **ONLY 10/-**, plus 1/- post. Brand new and boxed.

STANDARD MAINS TRANSFORMER. 200/230/250 volts 50 cycles. Secondary 325-0-325 volts 70 mA, 6.3 volts 2.5 amps, 5 volts, 2 amps. Half shrouded, drop through, with mains panel. Size 4 in. x 3 1/2 in. Brand new at **12/6**, plus 1/6 post.

R1294 RECEIVER.—This superhet receiver covers 10 to 60 cms. with continuous variable tuning. Local osc. EI231 with silicon crystal as first detector. I.F. of 13.5 Mc/s. Complete with all 9 valves and instruction manual. Price **£14**, plus £1 carriage and packing.

HRO POWER SUPPLY operates from a 6 volt D.C. source and supplies 165 volts at 80 mA. completely smoothed D.C. Uses Mallory Type 626 vibrator and 6X5 rectifier, 17 Henry smoothing choke, hash filter, etc. This is a really well made job, typical of the manufacturers of the HRO. Contained in a black crackle cabinet size 7 in. x 7 1/2 in. x 6 in. high. Supplied **BRAND NEW** in original packing for only **52/6**.

RCA SPEAKER.—An 8 in. P.M. unit contained in beautiful black crackle cabinet, suitable for AR88, etc. **BRAND NEW**, price only 45/-, plus 2/6 carriage.

R1355.—The receiver unit which is specified in the "Inexpensive TV." book. Valve line up: 8—SP61, 1—VR92, 1—VU120 and a 5Z4. Brand new for **39/6**, plus 7/6 carriage in original transit case.

RF UNITS for the R1355 supplied modified to T.V. frequency required. Any station, sound or vision for **32/6**, plus 2/6 carriage.

SPECIAL OFFER of brand new R1355 and RF unit tuned to frequency required for only **£3/10/-**, carriage paid. The cheapest way of making that T.V. set. The book "Inexpensive Television" supplied for 2/9, post free.

E.H.T. TRANSFORMER for the VCR97, VCR517, etc. Mains input 230 volts 50 cycles. Output 2,500 volts 5 mA., 4 volts 2 amps, 2-0-2 volts, 2 amps. **FULLY GUARANTEED** only 35/-, post 1/-.

6in. MAGNIFYING LENS for the VCR97, etc. First grade, oil filled perspex. **ONLY 19/6**, plus 1/6 post. Doubles your picture area.

100 MICRO-AMP METER. 2 1/2 in. flush mounting. Brand new in manufacturer's original cartons. The scale is calibrated in yards but can easily be re-written. Very scarce and an exceptional buy at 39/6.

50 MICRO-AMP. METER. As used in the Adm. Sig. Gen. W6797. 2 in. Flush mounting. Brand new and boxed at 42/6 each. Also 2 1/2 in. type panel mounting for 65/-.

1 MILLI-AMP. METER. 2 1/2 in. Dial. Flange mounting. Brand new in original boxes for only 22/6.

EF50 (VR91) RED SYLVANIA. American types, brand new at 8/6 each. British types also available at 5/- each tested. Hundreds of other special purpose valves in stock at competitive prices.

AMERICAN CONDENSERS. .01 mF. 1,000 volts, .02 mF 750 volts at 7/6 per doz. .002 mF. 1,000 volts at 6/- per doz. All metal cased tubulars wire ended. Micamold ditto .1 mF. 350 volts at 7/6 per doz. Small Mica Condensers. .001 mF. CM20N at 6/- doz.

ELECTROLYTIC CONDENSERS. 32 mF. 450 volts D.C. working. Aluminium cased, tubular with waxed cardboard insulating cover. Size 4 1/2 in. long, 2 in. diameter. Price only 6 for 7/6 post paid. For callers only 1/- each.

CO-AXIAL CABLE. Brand new 75-80 at 1/- per yard—minimum per post 10 yards. This is standard 7 in. dia. with stranded inner conductor—not ex-Govt.

T.V. PRE-AMP. Small size. Uses two EF50's, tunes to 45 Mc/s, but easily altered to any other station. With valves 19/6, less valves 10/-, Post 1/- extra.

62 INDICATOR UNIT, complete with all valves but less tube. Limited number only offered to personal shoppers for clearance price of 55/-.

"INEXPENSIVE TELEVISION". This book describes the building of a T.V. set using ex-Govt. equipment. Price 2/9 post paid.

"EASYBUILT TELEVISION" describes a television set built from a certain amount of ex-surplus equipment and using a 9 in. or 12 in. tube. Complete circuit and point to point wiring diagram given. Price 2/9 post free.

T.V. FAULT FINDING has 80 pages with a large number of photos taken from a television screen. Should be invaluable to servicemen. Price 5/3 post free.



CHARLES BRITAIN (Radio) Ltd.
11 UPPER SAINT MARTIN'S LANE
LONDON, W.C.2. TEM 0545

One minute from Leicester Square Station (up Cranbourn Street).

Shop Hours: 9-6 p.m. (9-1 p.m. Thursday).

Open all day Saturday.



MAKE YOUR OWN CAR RADIO!

CONSTRUCTIONAL DETAILS FREE WITH OUR NEW HOME CONSTRUCTORS HANDBOOK

CONTAINING 15

TRIED AND TESTED CIRCUITS

of T.R.F. SETS

4, 5 AND 6 VALVE SUPERHETS A.C., A.C./D.C. and BATTERY SETS TEST EQUIPMENT

FEEDER UNITS AMPLIFIERS ETC.

WITH

FULL CONSTRUCTIONAL DETAILS

FOR AN EFFICIENT, STABLE, CRYSTAL RECEIVER

AND A LOW COST SUPERHET COIL PACK

LOTS OF TECHNICAL INFORMATION, TOO!

PRICE **2/6** POST FREE

With full Illustrated Catalogue.

SEND FOR YOUR COPY TO-DAY!

BARGAIN BASEMENT

CHASSIS—Large range at reasonable prices.

I.F. TRANSFORMERS, aligned, 465 Kc/s, air-cored, with trimmers 12/6 pair

Iron dust cored 16/6 pair

HEAVY DUTY CHOKES, 20H, 120 mA 19/6 each

STANDARD SUPACOILS, iron-cored. Aerial, H.F. or Osc. All wave ranges 3/- each

TRF COILS, dual range 8/- pair

JB COMPONENTS stocked, including SL8 dials 27/6 each

SL5 DRIVE 26/6 each

FULL VISION DRIVE 13/- each

CALIBAND DRIVE 21/6 each

Postage on above : 6d. under 10/-, 1/- up to £2.

Post free over £2.

SUPACOILS MAIL ORDER OFFICE
98 Greenway Avenue, London, E.17

THE BRITISH NATIONAL RADIO SCHOOL

ESTD. 1940

NOW IN OUR THIRTEENTH YEAR AND STILL

NO B.N.R.S. STUDENT HAS EVER FAILED

to pass his examination(s) after completing our appropriate study course

A NEW YEAR RESOLUTION

Easy to make—A pleasure to keep

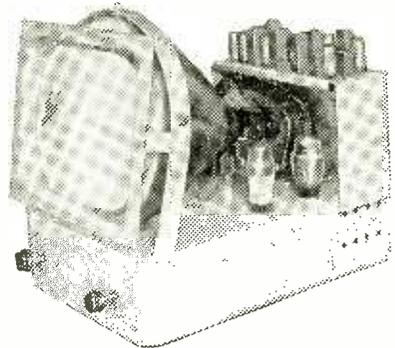
"I will work diligently on a B.N.R.S. STUDY COURSE and DO MYSELF A BIT OF GOOD."

A.M.Brit.I.R.E. and CITY and GUILDS Radio and Telecommunications Exams, etc., etc.

Please mention this advert. and send for free booklet to:—

STUDIES DIRECTOR
BRITISH NATIONAL RADIO SCHOOL
68, ADDISCOMBE ROAD, CROYDON
Phone : Addiscombe 3341

Armstrong

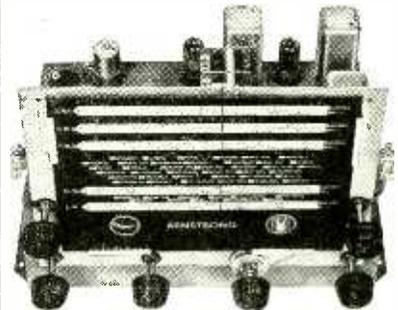


The new **ARMSTRONG TELEVISION CHASSIS, Model TV.15**, incorporating a 12" C.R.T., is now available for distribution, complete with 10" Loud-speaker.

PRICE: **£55.13.0** TAX PAID

Aerial erection and servicing by skilled Engineers, in any part of England and Wales, is provided. A fully comprehensive MAINTENANCE and INSURANCE SCHEME covering Replacements can also be arranged.

For the convenience of customers who are unable to call during normal working hours, we are now open until 5 p.m. on Saturdays.



MODEL EXP 125/3 14-VALVE ALL-WAVE RADIOGRAM CHASSIS

5 Wave Bands covering from 10.9 to 550m and 800m to 2,000. R.F. Pre-Amplifier. Two I.F. Stages with Variable Selectivity. Bass and Treble Controls. 15-Watt Push-Pull Output. For A.C. Mains. £36.15.0, plus P.T.

MODEL RF 104 10-VALVE ALL-WAVE RADIO CHASSIS

4 Wave Bands. R.F. Pre-Amplifier. Two I.F. Stages with Variable Selectivity. 10-Watt Push-Pull Output. For A.C. Mains. £24.0.0, plus P.T.

MODEL EXP 73 8-STAGE ALL-WAVE RADIO CHASSIS

3 Wave Bands. Variable Selectivity. Flywheel Tuning. 8-Watt Push-Pull Output with Negative Feed Back. For A.C. Mains. £17.15.0, plus P.T.

POTENTIOMETERS



Wire-wound and Composition types. Single, Ganged, Tandem Units. Characteristics: linear, log., semi-log., non-inductive, etc. Full details on request.

RELIANCE

RELIANCE MFG., CO. (SOUTHWARK), LTD.
SUTHERLAND ROAD, HIGHAM HILL, WALTHAMSTOW, E.17.
Telephone : Larkwood 3245

ARMSTRONG WIRELESS & TELEVISION CO. LTD.
WALTERS ROAD, HOLLOWAY, LONDON, N.7
Telephone: NORTH 3213



5 Harrow Road, Paddington, W.2

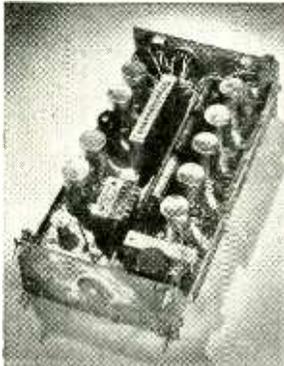
PADddington 100B,9 and 0401

OPEN MONDAY to FRIDAY 9-5.30, THURS. 1 o'clock, SAT. 6 p.m.

RADIO-GRAM CHASSIS

3 Wave-band Superhet. Med., long and short.
 5 Latest Type MULLARD Valves.
 4 Position Switching. Gram., Med., long and short.
 Also provision for A.C. Mains
 Extension Speaker. 110/250 volts.
 Chassis 11" x 7" x 2 1/2" Scale 8" Square.

PRICE £10.19.6 BRAND NEW AND GUARANTEED
 CARR., PACKING AND INS. 15/-

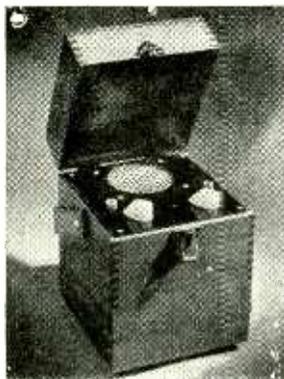


PYE 45 Mc/s STRIP. Special purchase of M.O.S. Type 3583 Units. Size 1 1/2in. x 8in. x 2in. Complete with 45 Mc/s Pye Strip, 12 valves, 10 EF50, EB34, and EA50, volume controls and hosts of Resistors and Condensers. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price £5, carriage paid.

A COMBINED SIGNAL TRACER AND AUDIO OSCILLATOR.

An easy-to-build unit that can be used for I.F. and Audio Signal Tracing, without any switching or tuning, including variable output oscillator for amplifier checking. Highly sensitive, responds to signals picked up from an ordinary receiving aerial.

The circuit is that of a high-gain 2-stage, resistance-coupled audio frequency amplifier, employing 3 miniature 1.4 valves, with a 3in. speaker in the output of the power amplifier stage. An added advantage being that as this unit is "All-Dry" it can be used with safety on A.C. or A.C./D.C.



mains and battery sets. The complete kit with portable cabinet (size 6in. x 7in. x 6in.) and battery weighs only 4 lbs. We shall be pleased to supply a complete kit for the construction of the above, right down to the last nut and bolt, including 2 1T4 and 1 1S4 valves, 3in. speaker and portable case and all-dry battery for £4/19/8.
 Concise instructions and circuits supplied. If preferred, circuit and instructions only can be supplied for 1/6. If required this unit will be assembled and tested for extra charge of 15/-. This is a highly efficient instrument, and a MUST for every radio man.

CONDENSERS.

Electrolytic 8 mfd. 450 vv., 2/6; 8 x 8 mfd., 4/-; 16 mfd. 450 vv., 3/6; 16 x 16 mfd., 450 vv., 5/-. All midget tubular cans, cardboard sleeves, 60 mfd. x 40 mfd. 350 vv. size 4 1/4in. x 1in. 5/-. Bias condensers 25 x 25 mfd., 50 x 12, 12 x 60, 1/6; 50 x 50, 2/-. All new stocks. NOT surplus.

BOWTHORPE CONTINUITY METER. Dual scale 0-500 ohms and 100-200,000 ohms moving coil operated from 4 1/2-volt internal battery. Size 6in. x 3in. x 4in. Original price £8/19/-. Our price, brand new, £4/4/-.

MOVING COIL METERS (Brand New):-

0-5 mA, square panel mounting, 2in. scale	7 6
0-50 mA, square panel mounting, 2in. scale	7 6
0-10 v. square panel mounting, 2in. scale	7 6
0-20 amp square panel mounting, 2in. scale	7 6
0-300 v. square panel mounting, 2in. scale	12 6
0-40/120 mA double reading round scale	12 6
2 1/4in. round flush mtd., drilled hinge:-	
Range 0/750 v. 200 ohms per v. Each	£1 2 6
Range 0/1500 v. 250 ohms per v. Each	£1 2 6
Range 0/3000 v. 200 ohms per v. Each	£1 5 0
0-1 mA desk type, 2 1/4in. scale	£1 7 6

L.T. RECTIFIERS

6 v. 1 amp G.E.C.	4 0
12 v. 2 1/2 amp Westinghouse	12 6
12 v. 4 amp S.T.C.	17 6
12 v. 8 amp S.T.C.	£1 12 6

S.T.C. RECTIFIERS E.H.T.

E3/25 650 v. 1 mA	4 7
K3/40 1,000 v. 1 mA	6 0
K3/100 8,500 v. 1 mA	14 8
K3/200 10,000 v. 1 mA	£1 6 0

H.T. RECTIFIERS

S.T.C. 125 v. 60 mA	4 6
S.T.C. 125 v. 100 mA	5 0
S.T.C. 125 v. 125 mA	6 0
S.T.C. 250 v. 250 mA	18 0

WESTINGHOUSE 14D/972

250 v. 25 mA	6 6
S.T.C. M1/3 Noise Limiter	2 0

G.E.C. METER RECTIFIER, 1 mA 11 6

WEARITE

705 Coil Pack 3 waveband	£1 17 10
400B Min. I.F.T. 465 K/c. Pair	15 0
301 and 502 465 kc. pair	14 0
300s pair	15 0

RECEIVER R1355. As specified for "Inexpensive Television." Complete with 8 valves VB65 and 1 each 5U4G, VU120, VR92. Only 55/-. Carriage 7/6. Brand new in original packing case.
 RF24, 25/-; RF25, 25/-; RF26, 50/6; RF27, 50/6. (Owing to limited quantities, these units supplied only with R1355s.)

CATHODE RAY TUBES:
 VCR97. Guaranteed full picture, 40/-, carr. 5/-.
 VCR517. Guaranteed full picture, 40/-, carr. 5/-.
 Mu-Metal Screens for above, 12/6, P.P. 1/3.
 3BFL. Suitable for scopes, 25/-, carr. 3/-.
RECEIVER UNIT TYPE 159. Size 8in. x 6 1/4in. x 4 1/4in., containing VR91, VR92, CV60, VR65 and 24 v. selector switch. New condition, 15/-.

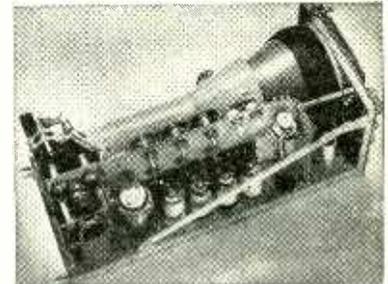
9in. ESCUTCHEON. Brown bakelite. Suitable plate glass and mask for 9in. tube. Price 7/6 each.

E.H.T. TRANSFORMER for VCR97. Input 200-250 v., output 2,500 v. 4 v. 2-0-2, 45/-.

EXPORT ONLY

4,000 prs. D.L.R. No. 5. 500 Brand New TR1196 Trans./Rec. In transit cases, 100 Trans./Rec. Type "46" with crystals and accessories. In canvas bags. 750 Walkie Talkies "38" with accessories. Large stocks of transmitting and special-purpose valves.

E.H.T. TRANSFORMER for 5CPI. Input 230v., output 3,250v. 6.3v. @ .6 amp, 2-0-2v., 2 amp. 45/-



INDICATOR UNIT TYPE 182A. This unit contains VCR517 Cathode Ray Gun tube, complete with Mu-metal screen, 3 EF50, 4 SP61 and 1 5U4G valves, 9 wire-wound volume controls and quantity of resistors and condensers. Suitable either for basis of television (full picture guaranteed) or Oscilloscope. Scope constructional circuit included. Offered BRAND NEW (less relay) in original packing case at 79/6. Plus 7/6 carr.
SPECIAL NOTE.—The VCR517 Tube has proved to be far superior to the VCR97 Tube (call for demonstration).

WALKIE-TALKIE TYPE "46," complete with 6 valves, 3VP28, HL23, DD, QP25, TP25 and ATP4, aerial rods, I.F. trans., 1.6 mc/s. mike trans., new condition, but less transmitting components and coils removed by M.O.S., 35/-, carr. paid. (Lens valves, 12/6.)

VR91 (EF50). Red Sylvanian. Brand new original boxes U.S.A., 10/-; Silver, brand new original boxes. British, 8/6; red or silver ex-units guaranteed, 6/-; 6A7, 12/6 43, 12/6; VU111, VU120, VU120A, 6/5; PA 23 at 10/-; Ten EF50 (all brand new units), 55/-.

WE STOCK ALL TYPES OF STANDARD CATHODE RAY TUBES AND VALVES.

VIBRATOR PACKS

Input 6 v. Output 200 v., 60 m/a	30/-
Input 6 v. Output 150 v., 40 m/a	25/-
Input 6 v. Output 180 v., 40 m/a (Ex. 21 Set)	17/6
Input 2 v. Output 180 v., 90 v., 35 m/a, 1.4 v., 250 m/a	50/-
Input 6 v. Output 200 v., 80 m/a (Masteradio)	25/-
Input 12 v. Output 300 v., 100 m/a	30/-
6 v. Vib Trans. 250 v., 80 m/a	7 6

STROBE UNITS. Brand New. In sealed cartons, these contain 6 EF50s, 5 EA50s, 1 SP61, a host of condensers, resistors, transformers, chokes, relays, switches, 7 pots and 5 smoothing condensers. Size 18in. x 8 1/4in. x 7 1/4in. Only 67/6, plus 5/- carriage.

No. 38 "WALKIE-TALKIE" TRANS-RECEIVER, complete with throat mike, phones Junction Box and aerial rods in canvas bag. Freq. range 7.4 to 9 Mc/s. All units are as new and tested before dispatch. As supplied to Overseas police forces, £4/19/6. Carriage 2/6.

TUNING CONDENSERS

2 gang. 0005 standard 1/4 spindle, with trimmers	7 6
3 gang. 00005 with ceramic insulation 1/4 spindle	7 6
Midget two gang. 000075, with trimmers. Size 2in. x 1 1/4in. x 1 1/4in. Vanes enclosed in perspex	6 8
Midget. 0005 mfd. 2 gang tuning condenser. Size only 2 1/4in. x 1 1/4in. x 1 1/4in.	6 6
Or with built-in trimmers	7 6
Two-gang Midget. 0003 with 4-way push-button assembly suitable for car radio, etc.	8 6

SEND STAMPS FOR NEW 1953 28-PAGE CATALOGUE

ROYAL NAVAL VOLUNTEER WIRELESS RESERVE

Two reasons why YOU should join now:—

ONE To ensure doing your NATIONAL SERVICE in the ROYAL NAVY.

OR

TWO If EX-SERVICE, to get a first class WIRELESS TRANSMITTER and RECEIVER for use in your OWN HOME.

Added ATTRACTIONS:—

- (a) Cruises to FRANCE, NORWAY, HOLLAND etc. with PAY.
- (b) All travel expenses paid. Training allowances.
- (c) Free Uniform.
- (d) Tax free bounty of up to £12.

DETACH THIS coupon and send it to:—

THE STAFF
COMMUNICATIONS
OFFICER,
Queen Anne's Mansions,
London, S.W.1.

NAME

ADDRESS

..... AGE

Please send me details of the Royal Naval Volunteer (Wireless) Reserve

OUTSTANDING OFFERS FOR EXPORT ONLY

U.S.A. Radio and Radar Equipment

- RCA TRANSMITTERS, Type ET-4336-B, H, K, L.
- AIRCRAFT TRANSMITTERS, Model GO-9 (Westinghouse).
- RADIO SETS SCR-695. RECEIVERS AR-77 and 88.
- TEST EQUIPMENT IE-46, TS-36/AP, TS-56A/AP, TS-51/APG-4, Type 205A, Type LR-1 (General Radio), BC-221 (Bendix) AN/UPM.
- Hallicrafters SCR-299, 399 and 499 (BC-610).
- RADAR Mk. 26 (Models 3 and 4).
- INTERROGATORS-RESPONSORS BM-1 (and BN-1).
- REPEATER-INDICATORS AN/APA-1.
- RADAR INDICATING EQUIPMENT, Model VF.
- AN/APS-3 Airfield Search RADAR.
- AIRCRAFT RADAR (complete units), APS-6.
- AN/APN RADIO ALTIMETER EQUIPMENT.
- TS-10A/APN TEST EQUIPMENT FOR ABOVE.

Spares (Radio and Radar-U.S.A.)

Full range of spares for most U.S.A. Aircraft, Naval and Ground Radio and Radar Units (SCR-187, 188, 193/269, 274-N, 287, 399, 508-10, 17, 536, 566, 593, 608-10 (very large quantities), 694, 695, MRN-3, TRA-1—ABK, BM, BN, SM, SO, SQ, SK, APS-2, 3, 4, 6, 15, etc.). Klystrons 2K33 (Oxford tubes).

● British T/R (X 42, W/S No. 11, W/S No. 17, W/S No. 18 Mk. III, W/S No. 38, W/S No. 58, W/S No. 68-T).

Power Units, Wavemeters, Motor Generators, Dynamotors and large quantities of various components.

● Aircraft Instruments and Accessories.

Large selection of Bendix Instruments.
Aircraft Generators and Motor Assemblies. Oxygen Installations.
Individual Test Certificates and A.I.D. Certificates can be supplied upon request.

Enquiries to

BRITISH SAROZAL LTD.

(Export Branch)

1 BRISTOL HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1

Telephone: HOLborn 6763/4/5

Cables: Sarozal, London

OVERSEAS BUYERS ARE CORDIALLY INVITED TO VISIT OUR WAREHOUSES, SHOWROOMS AND LABORATORY.

We buy for cash American surplus equipment.

PERMANENT & PROGRESSIVE POSTS AVAILABLE

Important interesting work on civil and military aircraft, hydraulic accessories, air conditioning equipment, turbine units, gun control systems, also guided weapons, industrial electronic apparatus.

3 SENIOR DESIGNERS Young men free of National
4 INTERMEDIATE DRAUGHTSMEN Service (or shortly due re-
5 JUNIOR DRAUGHTSMEN lease) particularly invited
to apply. If of good education, previous experience not
essential. Special facilities for junior employees for further
technical study.

6 STRESSMEN Candidates must hold de-
gree. Previous experience not essential but salary adjusted
for previous responsible employment in these fields.

7 MATHEMATICIANS For stress calculating.
8 MATHEMATICIANS 1st class honours or higher
degree for work on guided weapon control systems. Know-
ledge of statistics and noise essential.

Apply in confidence with full details, quoting reference number of post sought, to:—

Personnel Manager,

DE HAVILLAND PROPELLERS LTD.,

Hatfield, Herts.

Wireless World Classified Advertisements

Rate 7/- for 2 lines or less and 3/6 for every additional line or part thereof, average lines 8 words. Box Numbers 2 words plus 1/-. (Address replies: Box 0000 c/o "Wireless World" Dorset House, Stamford St., London, S.E.1.) Trade discount details available on application. Press Day: February, 1953 issue, Thursday, January 1st. No responsibility accepted for errors.

WARNING

Readers are warned that Government surplus component: which may be offered for sale through our columns carry no manufacturers' guarantee: Many of these components will have been designed for special purposes making them unsuitable for civilian use, or may have deteriorated as a result of the conditions under which they have been stored. We cannot undertake to deal with any complaints regarding any such components purchased.

NEW RECEIVERS AND AMPLIFIERS

NEW. Qual tape R/replay amp. cost £32; barg. £20. d.t.s.—Box 3814. [9385]

AMPLIFIERS and radio chassis built to order. TV kits built up.—Farrant Radio 70, Crescent Rd., Stonehouse, Glos. [9359]

12-watt high quality amplifiers, bass and treble boost; £12/15; lists.—Broadcast & Acoustic Equipment Co., Ltd., Tombland, Norwich. [0065]

AMPLIFIERS built to your specification. Williamson types a speciality.—Espee Electronic Instruments, 9, Queens Rd., Wimbledon, S.W.19. [9337]

LEEVERS RICH MAINTENANCE, Ltd.—Service engineers to the recording industry; under personal direction of Bernard J. Brown; design and construction of all types of audio equipment and sound recorders.—80, Wardour St., W.1. Gerrard 4161. [0218]

1953 radiogram chassis, 3-waveband, 5-valve superhet, large attractive glass dial, coloured and station-named, 5½-watt output; outstanding bargain at 12s. incl. 10in P.M. speaker; illustrated leaflet on request; demonstrations daily at Radio Unlimited, Elm London, E.17. Tel. Key 4813. [0063]

C.J.R. ELECTRICAL & ELECTRONIC DEVELOPMENT, Ltd., Bickford Rd., Witton, Birmingham, 6 (Eas. 0455), the Midlands specialist manufacturers of high fidelity sound reproduction equipment for the world-famous Williamson amplifier and associated accessories including tone control stages, loudspeaker crossover units, distortionless contrast expanders and radio feeders; send for details and prices. [0105]

RECEIVERS, AMPLIFIERS—SURPLUS AND SECONDHAND

VIDOR miniature portable battery radio; £10, or offer.—Tel. Hounslow 4979. [9396]

£9—New R1155 receivers.—E.W.S. Co., 69, Church Rd., Moseley, Birmingham. [9295]

E.M.I. model 116 pre-amplifier and 12-watt power amplifier in mahogany finish cabinet; £12.—Box 4017. [9435]

FOR sale, British receiver type R308, P.M./A.M. 20 to 145 mc/s, same size as R107; price £30, or offer.—Box 3841. [9389]

AMPLIFIER, 25-watt Pam record player with two 10-watt speakers; £25.—Ashford, 19356 Lodge, Ewhurst, Surrey. [9456]

HRO Rx's and coils in stock, also AR88, BC348R, CR100, etc.—Requirements please to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4986. [0053]

ECHOPHONE, E.C.2 communication receiver, band spread, P.O. noise limiter, stand by; best offer accepted.—Apply Alford, 50, Richmond Hill Court, Richmond, Surrey. [9352]

EDDYSTONE receivers, 640, 740, 750, 680, all in mint condition, £18, £30, £35, £45; wanted. Pye high-band v.h.f. radio-telephone.—G5TZ, 82, High St., Newport, Tel. 2504. [9443]

LEAK TL/12 amplifier, Barker natural reproduction, both unused, Marconi receiver, 2 I.F.s separate detector, special Williamson tone control system fitted; what offers?—Box 3958. [9415]

ACONNOISSEUR'S receiver, Dynatron Merlin Console, 11 valves, 4-wavebands, 9-watt output, 12in speaker, recently overhauled, cost over £12 in 1947; price £35; delivered free in London area.—Keen's, Sycamore Rd., Amersham. [9458]

LOUDSPEAKERS—SURPLUS AND SECONDHAND

HARTLEY 215, £10.—Cryer, 24 Langham Pl., Northampton. [9374]

HARTLEY Turner 215, as new and boxed; offers over £10.—Box 4099. [9426]

GOODMAN'S, as new 12in Axiom 150 Mk. II, cost £15, accept £9, going abroad.—Box 3911. [9405]

GOODMAN'S Axiom 12, £6/10; Wharfedale Super 5, £4; WBS812, 15 ohms, £1/10.—Dougharty, 68, Woodbourne Ave., S.W.16. [9442]

LIMITED number of unused Baker triple cone speakers 15ohms available at £5/5 12in model and £6/10 18in model; carriage paid passenger train; approximately half price! prices.—Box 3532. [9330]



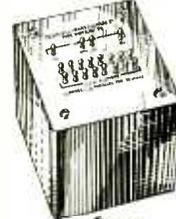
20 amp 2f 50
100V AC
From 100/-

FORMULAE TO FACT...



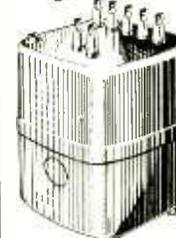
THE TYPE CFB

Acknowledged the ultimate in Audio transformer design. Incorporates latest grain orientated strip wound "C" core. Full audio range with absolute minimum distortion.



THE TYPE WWFB

Built to the authentic Williamson specification. Eight section secondary. Stock types 0.95 ohm, 1.7 ohm, 3.6 ohm and 7.5 ohm. 20 watts output. Minimum distortion.



THE TYPE HS.MU

Hermetically sealed in oil, fully screened, provides reduced field 40db at 50 c/s. Specially produced to operate under all climatic conditions.



THE TYPE P.P.O.

A push-pull unit rated 12 w. for 0.5 per cent. harmonic distortion at 50 c/s. Six standard models, matching 4,000 to 12,000 ohm anode loads secondary to match 15 or 3.7 ohm loads. For immediate delivery.

The above represent some of the Partridge products (the result of over 20 years' specialisation) built from original formulae supplied or from the Partridge research department. Partridge Transformers are used by the Royal Aircraft Establishment, The Admiralty, War Office, British Railways, B.E.A., National Coal Board, etc.

Technical data sheets available on request.

PARTRIDGE TRANSFORMERS LTD
BOEBUCK ROAD KINGSTON-UPON-THE-HEATH, MIDDLESEX
TELEPHONE: ELMWOOD 6737

NEW DYNAMOS, MOTORS, ETC.

BATTERY chargers, 4 models 2-6-12v. 1-2-4 amp D.C.; any mains voltage; also larger types special transformers, chokes, test gear, interior car heaters, etc.—The Banner Electric Co., Ltd., Hoddesdon, Herts. [0122]

ATO 20kva available. Including rotary converters, rotary transformers, motors, petrol and diesel-engined generating plants, alternators and d.c. generators. We are also in a position to quote for power transformers: as actual manufacturers we will be glad to quote for any quantity for home or export.

DIESEL Electric generating plants, 3kva, 230v with push-button remote control, starting equipment, ready for use; £255.

ROTARY transformers, input 20v d.c., outputs 6.5v d.c. and 300v d.c., permanent magnet field, 20/-; ditto, input 28v d.c. and 1,200v 70ma d.c. output; energised field, 35/-; ditto, input 12v d.c., output 500v 90ma d.c., energised field, 35/-; reasonable delivery.

CHAS. F. WARD, Lordscroft Works, Haverhill, Suffolk, Tel. 253. [0039]

THE Pearce new model diesel alternator plant, on welded steel frame, 230/1/50 3kva plus 32v 15a d.c., Petters latest AVAI, air-cooled special rotary engine, alternator, self-energised, automatic voltage control by winding on stator, at govern, speed 1,500 rpm, d.c. output trickle charges or charges lighting and starter battery up to 15amps, 24v. Lighting is used when plant is not in use; start and stop by remote control push-button; complete with main switch and fuses, battery cables, 24v 72 amp/hr. batt. instruction book, spares; engine covered by Petters' inspection service £275, free delivery; where remote start and stop not required but only push start, plant reduction price £6/10; a few from stock, others quick delivery; if you collect, or we deliver, battery is charged and a 10 cu ft concrete bed given free. SEND P.C. for full description and photographs. ALSO AUTOMATIC start & stop plants. Water-cooled "Petters" engine.

ALTERNATORS, 230/1/50, 400VA, self energised, 3,000 rpm, ball bearing, £23/15 del.; also special television model same price; voltage regulator 30/- extra.

TELEVISION, guaranteed interference free; special rotary converters, fitted radio and television filters, wt. 60lb d.c. input, 12v 200va out, 24v, 50v, 110v d.c. to 230v out, 250va, £27/10, del.; also converters for radiogram and general use, inputs, outputs and prices as above; the above also supplied without smoothing, £24/10 del.

THE above are the latest products of British manufacture, and are guaranteed for one year, fullest details of plant, alternators or 400VA alt. or rotary converters, by return post; state which required; terms c.o./p., pro forma invoice c.o.d. (post goods only).

T. W. PEARCE, 66, Great Percy St., W.C.1 (Near Angel). [0013]

DYNAMOS, MOTORS, ETC.—SURPLUS AND SECONDHAND

EX-W.D. unused rotary converters, 12 and 24v d.c. input, 230v a.c. output, with choke, condenser, leak transformer, for 85watt vacuum lamps, the whole enclosed in metal box, £5 to clear.—A. J. Philpott, Fountain Sq., Fenton, Stoke-on-Trent. [9160]

TV without mains, picture equal to mains supplied, special Chorhorse A.C./D.C. petrol electric generators, self-starting, self-contained, compact, A.C. voltage 220/250, 50/60 cycles, 25 0/350 watts; will also run radios, vacuum cleaners, small tools, etc.; D.C. output will charge batteries for permanent lighting.

PRISE £47/10 plus 10/- delivery.—Below.

STORAGE batteries, finest possible specification, dry, uncharged, 12v 75 a.h. heavy duty, 19 plates, separate cells, in hardwood cases, price £7/7/6 plus 9/6 delivery.

6V 90 a.h., 15 plate hard rubber cells, also suitable for cars, tractors, lorries; price £5/7/6 plus 7/6 delivery.

TEDDINGTON ENGINEERING Co., Ltd., Dept. "D", High St., Teddington, Middx. [0023]

TRANSMITTING EQUIPMENT

ET4352B, EC375E, BC191, TR1143A, T1151, E.T1409G offered.—E.W.S. Co., 69, Church Rd., Moseley, Birmingham. [9464]

RCA A.C. mains ET4356 1.5-20 mcs. £45; international marine transmitters 100kc to 12 mcs crystal and VFO, any voltage, mains, £40; Marconi crystal and VFO 1.5-9 mcs, brand new, 12-24v D.C. 100-260v A.C. £25; many others.—Marine Radio Co., 233, Wood Lane, London, W.12. [9436]

NEW TEST EQUIPMENT

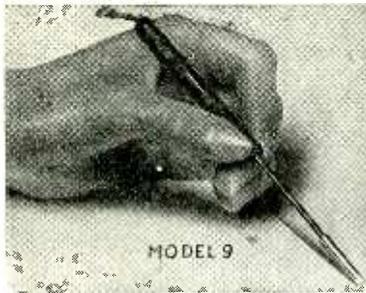
ECONOMICAL power units, 250v 60ma, un-stabilised, variable to zero, prov., price £16/10; early delivery; larger types to follow; write for details.—Radiovizier, 377, High Rd., N.2. [0220]

TELEVISION.—A 2-valve, 2-range modulated test oscillator, 40/60 and 9/15Mcs, individually calibrated, variable output, uses external power, supplied in chassis form, with valves, wired 75/-.—Bel Sound Products, Co., Marlborough Yard, London, N.19, Archway 5073. [0187]

TEST EQUIPMENT—SURPLUS AND SECONDHAND

BRIDGE Merger with Varvet test, excellent condition; £12.—Box 3598. [9344]

CROSSOR 1035 oscillograph and 1428 camera, as new; nearest offer £85, trial.—Moss, 252, Peppard Rd., Reading. [9419]



ORYX

miniature soldering instrument

- Heats up in 30 seconds
- "Pin point" heat concentration
- "Finger control" soldering
- Can be left switched-on all day
- Interchangeable push-on bits

For 6, 12 or 24 volts—8 watts
Length: 6" Weight: 1/2 oz.

ORYX

Electrical Laboratories

3, TOWER HILL, LONDON, E.C.3
Telephone: ROY 4439
EXPORT: ANTEX LTD.,
At above address

THE MODERN BOOK CO.

- Radio Engineers' Servicing Manual. By E. Molloy (ed.). 42s. Postage 1s.
- Television Engineers' Servicing Manual. By E. Molloy (ed.). 42s. Postage 1s.
- The Amateur's Guide to Valve Selection—Mullard. 1s. 6d. Postage 3d.
- Haynes Television Circuits. No. 38. 3s. 6d. Postage 3d.
- Automatic Telephony. By C. W. Wilman. 15s. Postage 6d.
- TV Fault Finding. Compiled by "Radio Constructor." 5s. Postage 3d.
- Electrical Engineer's Reference Book, 6th ed. 63s. Postage 1s.
- The Oscilloscope Book. By E. N. Bradley. 5s. Postage 3d.
- Communication Engineering. By Everitt. 64s. Postage 1s.
- The Recording and Reproduction of Sound. By O. Read. 68s. Postage 1s.
- Woods Practical Guide to Fan Engineering. 10s. 6d. Postage 9d.
- Filter Design Data. By J. H. Mole. 63s. Postage 1s.
- Electron Tubes in Industry. By Henney and Fahnestock. 51s. Postage 1s.
- Radio Valve Data. Compiled by "Wireless World." 3s. 6d. Postage 3d.

We have the finest selection of British and American radio publications in the Country. Complete list on application.

19-23 PRAED STREET,
(Dept. W.1)

LONDON, W.2

PADdington 4185

VARIACs (100L), 230V/0/230V 8 amps, brand new cond. £16/10 ea. carr. paid.—P. B. Crawshaw, 166, Pixmore Way, Letchworth, Herts. [0240

BRIDGE-MEGGERS by E. & V. Ltd., 0.10 ohm to 50 megohms, self-contained, 250V accuracy tested; each, in leather case, £21.—P. B. Crawshaw, 166, Pixmore Way, Letchworth, Herts. [0239

SIGNAL generators, oscilloscopes, output meters, valve voltmeters, frequency meters, multi-range meters in stock; your enquiries are invited.—requirements to R.T. & I. Service, 254, Grove Green Rd., London, E.11. Ley. 4966. [0086

TEST sets: IE19A, TS34, TS10A/APN, TS238; Du-Mont oscilloscopes, types 168 and 208, also oil-filled electrostatic condenser, 2250F, 25,000 volts D.C.; also H.F. alternators, 60 volts, 25 amps, 1,500 c.p.s.—E.W.S. Co., 69, Church Rd Moseley, Birmingham. [9292

NEW GRAMOPHONE AND SOUND EQUIPMENT

TAPE recorder motors, 230V, a.c., powerful, quiet, brand new 13/11; post, etc., 1/1.—K. W. Logan, Westley, Hitchin, Herts. [0232

BRAND new high quality radiogram, separate bass and treble amplifiers and speakers, automatic record changer, beautiful walnut cab.net; price 70gnns.—29, Chaffinck Rd., Beckenham. [9432

MAGNETIC tape recordings heads, complete with tape guide, Mu. metal screened, single pin fixing, 22/6, postage 1/-; why pay more: trade enquiries invited.—E.M. Developments, 50, Grove Lane, Handsworth, Birmingham. [9276

PRECISION made tape desks, 3-3/4in/7-1/2in p.s., double track fast rewind, guaranteed reliability and wow-free operation, assembled desk, £13; easily assembled kits supplied, constructional drawings, high fidelity amplifier; stamp list; GM6LS—15, Corstorphine Hill Rd, Edinburgh. [9462

TAPE recorder (Unithib), pars.: power-drive unit H.D. fan-cooled motor, heavy balanced flywheel, in special bearings mounted in cast alloy frames, 5-hole fixing to panel front speed change 3-3/4 in/sec, 1/2 in/sec, 1/4 in/sec, 1/8 in/sec, posit on packing; control head unit 1-hole fixing cam unit interlocked for motor, stop, rewind, etc., 55/-; pot core oscillator coil, with tans. 10/-.

ALSO equaliser pre-amps with EF40, amplifier parts, complete sets, or leadlets.
MIDLAND Radio Coil Products, 28, Winstanley Rd., Wellingtonborough. [0224

POLLOCK lightweight m/c pick-up, response 40cs to 20kc/s, h.f. resonance 25kc/s approx, complete set of parts for constructing head, 25/-, plus 1/- post and packing; building instructions, 5/-; sapphire stylus, 0.01in or 0.025in, 7/6; model also for thorns; 100:1 input transformer, steel case, 20/-, plus 1/- post, etc.—S.a.e. for details to A. M. Pollock, 31, Brook-lawn Drive, Manchester, 20. [9358

A FEW Wearite decks available from stock, £35; Vortexion Super 50 amp., £25; Ferro-graph tape recorder, complete with ribbon mike and carrying case, just released, £94/10; Emicorda (tape), just received, 90gnns; Cossor 10in Console, tube o.k., needs slight attention, £17/10. Viewmaster, complete in cabinet with brand new G.E.C. tube, £35; Goodmans Audium Loudspeaker, £8; Wharfedale Super 8 CSAL, £5.—Rex Radio, 329, Kilburn Lane, W.9. Ladbroke 1770. [9459

GRAMOPHONE AND SOUND EQUIPMENT —SURPLUS AND SECONDHAND

COLLARO 3-speed record changer, 3RC511 c/w two GP27 Hi-Fi heads, 78 and 1.p. perfect, cost £18 14s; accent £12.—Box 3842. [9390

VOT corner speaker £16; two recording amplifiers, £15, £20; Vortexion AD47, £22.—8, Hinde St., Manchester Sq., W.1. We. 3762, 9.30 a.m.-5.30 p.m. [9449

16MM sound projectors, G.B.L516 and B.T.H. SRB, in excellent condition, complete with valve spares, splitters, record players, etc.; best offer.—Coyle, Hareway, Hayes, Middx. [9421

M.S.S. portable disc recorder, £40; Leak amplifier matched for above, £32; Vitavox microphone and stand, £10; Wearite tape deck, £28; all guaranteed perfect.—Box 3513. 19309

OIGT gramophone pick-up and corrector £4; Barker 148a speaker, £12; Baker speaker, £4; Hartley Turner (medium and long) 2HF and detector with circuit farbook, all good condition at above prices or near offers.—Box 3889.

COMPLETE public address system, 25 watts, twin turntable auditorium and projector speakers, Cross-over network; microphones; portable generator; demonstration.—Ing. 36, Sunny Gardens Rd., N.W.4. Hendon 8583.

QUALTAPe deck, £13/13; S.T.C. ball mike, £5/10; Cossor gating oscillator, £10; Avo valve tester, £10; 90 characteristic valve tester, £35; Ekco pattern TV generator, £10.—Rex Radio, 329, Kilburn Lane, W.9. Ladbroke 1770.

MAGNETIC recorders; all types of magnetic recorders bought, sold, hired and exchanged; comprehensive repair service; mechanical and electronic repairs carried out by specialists; Marnegraph Limpet telephone pick-ups, 25/-.

THE MAGNEGRAPH RENTALS Co., 1, Hanway Place, Oxford St., W.1. [0236

BARGAIN Recorder (disc) and playback amplifier, absolutely complete in cabinet, professional job, 78 or 33 1/2 r.p.m.; inspection invited. Tel. 61635; must sell £35 cash or £12/10 dep. and 52 weekly payments of 10/9.—East Reading Radio, 1, Rupert St., Reading. [9421

PUBLIC address equipment, Philips type 2857(R), quarter kilowatt output, microphone, record player, twenty 8in loudspeakers and two unused DA 100 output valves; cost £250; bargain at £120.—Electrical Officer (Radio) R.N.A.S. Ford, Arundel, Sussex. [9412

BENSON'S BETTER BARGAINS NEW METERS

Scale FSD	Size	Type	Fitting	Price
300 mA. (100 mA.)	2in.	MC	Flush	8/6
300 mA.	2 1/2in.	MC	Flush	12/6
30 mA.	2in.	MC	Proj.	8/6
5 mA.	2in.	MC	Flush	8/6
1 mA.	2 1/2in.	MC	Flush Desk	22/6
1 A.	2 1/2in.	TC	Proj.	8/6
3 or 4 A.	2in.	TC	Flush	8/6
15 v.	2 1/2in.	MI	Flush	12/6
3,500 v. (5 mA.)	3 1/2in.	MC	Proj.	20/-
6 A.	2 1/2in.	TC	Flush	8/6
6 mA.	2 1/2in.	TC	Fl. Metal	20/-
50 A. (50 c.)	6in.	MI	Proj. Met.	50/-
20 A. (50 c.)	2 1/2in.	MI	Flush	17/6

(Various others, too few to list, enquiries invited.)
Chokes, L.F., 3 H. 200 mA., 5/-; R.F., 4-pole R.x., 9d.; Tx., 1/3. Accumulators, Midget, celluloid, new, 4 A.H., 8/6; 7 A.H., 7/6; VR9 retainers, screw, 6d. O.P. Trans. 60/1, with Choke, L.F., 5 H. 80 mA., 7/6; Box BC706, with microswitch, 3/6. Ceramics (N750K), 2.2, 3.5, 6.6, 8, 10, 12, 13, 20, 25, 27, 33, 39, 47, 100 pF's. 6d. (5/- doz.); 40 pF. (P120M), 9d. Condensers: Mica, large, .0047; small 100, 500 pF's, 6d. (5/- doz.); Metal, 2in. dia., .5 mfd. 3,500 v.w., 4/-. Variable miniatures, 75 pF. twin, 4/-; single, 2/-; single, long spindle, 2/-; 25 pF., 60 pF., 1/6; 20 pF. preset, 1/3; 25 pF. Butterfly, twin, 3/6; 500 mfd., 300 pF. twin etc., 5/6; 3 and 4 gang, 8/6. IFT's, new, canned, 10/13 Mca., 1/6; 7 Mca. (R1355), 1/6; diode type, 2/-; 10 mca. for wideband couplers, 2/9. Coils, 2in. x 1in. pax. slugged, 4 for 1/3. Dials, as RF26, 8/6. Epicyclic drives, 1/3. Dynamotors, D.C., 9 v. to 450 v., 8/6 (torque solenoid). Rectifiers, selenium, H.W., 550 v., 30 mA., 8/-; 270 v., 80 mA., 6/-. C.O. Meter (FW) type, 7/6; HW CT 12 v., 250 mA., 1/6. Motors, small, 400/2,000 cycles, Cap. start/run, 8/6. Lampholders, Ruby, moulded, 1/3. Generators, hand-drive, geared, 300 v. and 28 v. output, 8/6. Neons, SBC, D.C. or S.C., 2/-. List and enquiries, S.A.E., please!

TERMS: Cash with order. Postage extra. Immediate delivery.

W. A. BENSON

308, Rathbone Road, Liverpool, 13 (W.W.). 'Phone: STO 1604

New Year Offers

PRECISION TEMPERATURE CONTROL OVENS for Quartz Crystals, 230 volts 50 cy. will give stability with suitable crystals of better than 2 parts in one million. Fitted precision thermostat and thermometer. Temp. adjustable 40/60 degrees cent. £6/10/-, carr. 5/-.

FREQUENCY METERS, B.C.221. Accuracy guaranteed 0.005 per cent, frequency range 120 Kc. to 20 Mc/s. Battery model, complete with Charts and Crystal. Few only, cheap.

R.C.A. WAVEMETER, T.E.149, new, 200 Kc. to 30 Mc/s, accuracy 0.005 per cent, in original packing, with Crystal, spares and instruction book, £20, carr. 5/-. Few with soiled cases, Crystal and instruction book, but without spares, £17/10/-.

NIFE BATTERIES, type F.4, 1.2 volts 45 amp. hr. cells, in first-class condition, 25/- per cell; or crate of 10 cells, £10/10/-; or crate of 9 cells, £9/9/-, carr. extra 2/- per cell or 10/- per crate.

DYNAMOS, 14/32 volts 9 amps., 2,500 r.p.m., shunt wound, ball bearings, suitable for charging and lighting, 70/-, carr. 5/-. By leading Dynamo Makers.

HEATER ELEMENTS, flat copper clad, 24 volts, 1/6 each, post 6d.

PERISCOPES. Beautifully made precision instruments, ex-W.D. Model in aluminium case, 3 1/2in. x 4 1/2in. x 1 1/2in. each, fitted two angle prisms. Can easily be extended by metal or wood strips to the height required. Don't miss this bargain, make it a Christmas Gift, 6/3 per pair, plus 1/9 post.

MOTOR PUMPS, 230 volt A.C. 50 cy. Stuart Turner No. 10, 3ft. lift, 10ft. head, capacity 100 g.p.h., £7/10/-; Foot valve and strainer, 25/-, carr. 2/6. Rotary Suds Pump only, lift 8ft., head 35ft., capacity 70 g.p.h., with pulley, £5. Semi-Rotary Hand Pump, 6in. dia., with handle, 45/-, carr. 3/6.

LIGHTING PLANTS, Rotary Converters, Transformers, Meters, Morse Keys, etc. Send us your enquiries.

ELECTRADIX RADIOS

Dept. A, 214 Queenstown Road, London, S.W.8

Telephone: MACaulay 2159

BARKER SOUND UNITS AT NEW PRICES DIRECT TO YOU ARE SUPREME VALUE IN NATURAL SOUND

The basic price of the famous Barker 148a is now only 230/-. This is a lot lower than it, or any comparable sound unit, has ever been before, and even with P.T. it is amazing value. No other unit in the world, at any price however high, can offer all these features :-

**DUAL DRIVE WITH
BUILT-IN CROSSOVER**

**FEED-BACK GIVING
CRITICAL DAMPING**

**GRADED COMPLIANCE
HAND-MADE CONE**

FULL AUDIO RANGE

**NO RESONANCES OR
BREAKS IN QUALITY**

**PIN-POINTED DETAIL
CRYSTAL TRANSIENTS**

**INCOMPARABLE
NATURALNESS**

The 148a is a full 12in. unit with die cast frame, high flux magnet and everything which craft skill, personal care and individual attention can give.

The 501 cabinet is now only £19. We believe it is the best blend yet of good acoustics and good looks. Definitely a need for owners of good 12in. units.

YOU DESERVE BOTH FOR 1953

WRITE DIRECTLY TO :-

BARKER NATURAL REPRODUCERS

3 Newman Yard, London, W.1

WORK WANTED

A SSEMBLY, wiring, special equip.; audio specialist; private or trade.—Radlovizier, 377, High Rd., N.2. [0219]

A MPLIFIER manufacturers, specializing in contract work, will have some available capacity for repetitive work from 5 to 50 per week.—Enquiries to Box 4025. [9441]

NEW COMPONENTS

S ELENIUM rectifiers, 18mm and 25mm, single or qty., many types, state requirements.—Champion Products, 43, Upians Way, London, N.21. Lab. 4457. [10102]

N EW 3-waveband (long, medium, short) super-het coilsacks, 465 Kc/s Osc. Freq. Prealigned 32.6 each, 465 Kc/s I.F. transformers, 15/-; pri. trade supplied.—Post orders only please to J. Simpkins, 19, South Molton St., London, W.1. [10036]

C RYSTAL microphone inserts (Cosmocond Mic. 6) guaranteed brand new, 15/6 post free; Cosmocond Mic. 30 hand stand microphones, black or white, £4/4 each post free.—Radio-Aid, Ltd. (Retail Dept.), 29, Market St., Watford. [10036]

W INDING capacity for all laboratory and production work, including std TV coils, radar deflectors, filter parts and complete, sub-miniature assemblies, toroidal and strip potentiometer elements, transducers, current transformers.—Bel Sound Products Co., Marlborough Yard, London, N.19. Tel. Arc. 5078. [10183]

F M receiver (Oct., '52), following V.H.F.-tested components, coilssets, with 4odes and included components, 75/-; new 8TH Xial vlv.s., separately, 15/- pair; 6AM6, 6AK5 vlv.s. 28/- pair; above plus drilled chassis 100/-; trade invited.—Bel, Mfg. Radio Engrs., Marlborough Yard, London, N.19. Arc. 5078. [10184]

C OULPHONE RADIO.—As a result of the continued requests for components from all parts of the world the proprietor has decided to restart the business, new goods only, no government or manufacturer's surplus; s.a.e. will bring you a most comprehensive list of radio and television components.—Coulphone Radio, 138, Roper St., Whitehaven, Cumberland. [10366]

F OR really good results you can do no better than use Osrom coils and coilbacks, ask anyone of experience! Send 5d (stamps) today for beautifully-drawn free circuits, our new coil-data leaflet, and latest lists of matched radio components. A speedy mail order department is at your service and remember, all Osrom lines are guaranteed. (Trade enquiries invited.) Dept. C.W.1.

OSMOR RADIO PRODUCTS, Ltd., Bridge View Works, Borough Hill, Croydon Tel. Croydon 5149-9. [10046]

M ALDEN TRANSFORMER SUPPLIES offers 80W fluorescent chokes, 230v with circuit, 17/6; glow starters, 2/6; 6 and 12v metal rectifiers, 2 amp, 8/6, 1/2 wave, 250v 300 mill-amp, 13/6, supplied to any specification, ex-Government safety heaters 230v 350W, 12/6; rotary converters, 12v or 24v d.c. input and giving 250v 60 mill-amp and 6.3v at 2.5 amp, 6/8; speaker cases, 5in, bakelite, 5/8.—200, Cambridge Rd., Kingston-on-Thames, Kin. 3501. [10035]

T ELEVISION, 3, X24-in. cored tagged TV transformers, 6 for 12/6 or 2/3 ea.; coilssets on above, 5-channel s'het. (12 pc.), 60/-; TRF (PT AC/DC), 50/-; 1in and 1/2in cored tagged formers, 8/- and 12/- doz.; EF42, EF41, set of 2 ea. with V.H. 85/-; T901 metal CRT, few always stocked, callers preferred; 1/2in OD pax tube, 2/6 per 18in; OBA brass rod, 1/6 ft; Belsol polsterene cement, 10/- pint; the Synchrolock (RCA), intermediate AFC cct. locks linescan with sync, independence from noise, sync. amplitude, this 5 vlv. addition, very worthwhile, special trans. and 55 (refer V.P.T. Sept., '52); test oscillator, 2-5v chassis, calibrated, 75/- (see "test equipment"); all new, guaranteed goods and trade supplied, approval, terms, and made by—Bel Sound Products Co., Marlborough Yard, London, N.19. Archway 5078. [10186]

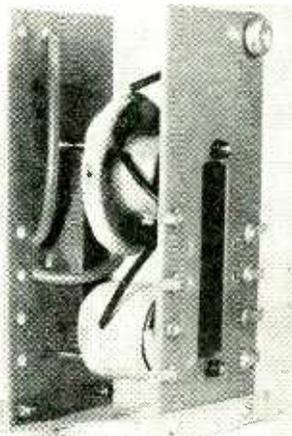
COMPONENTS-SURPLUS AND SECONDHAND

G. A. RYALL, "Utopia," Mayfield Road Herne Bay, Kent, offers brand new post-free bargains; switches: 2B.SP. 6-way, no stop switch is drilled for this, 1/4; smaller type switch, 3B. TP. 6-way, total five poles only 2/3; also 2B.SP. 3-way with coloured leads, 1/4; one type 2Bank, 4-way five poles total, soldered tags, 1/4, Loggies Bakelite, 250v a.c. close either of two poles, 1/3; and 2P, DT, change over 1/9; all single hole fixing, and Bakelite panel switch marked On/Off, break 10amps, four-hole fixing 2/6; voltmeters, best make 0-5ma square front 2in meters, 8/9 each; and 0-30ma 2 1/2in (3 1/4in overall) 6/9, or best make, 8/9; signal lamps, panel mtg. red or green, with 12-24v bulb brass case and bakelite top with protection 1/6 each; twin cable over 3yds length, 1/4, plastic; screened twin, 2yds, in two lengths, 1/4; triple plugs and jacks, 1/4 set; Mansbridge condensers, fixing feet, heavy duty terminals, 250v N.I., 5x3 4/9; ditto oil filled 11x7, 8/9; extra heavy terminals at side; first-class Bakelite fuse boxes, four-way, with two spare fuses, 5 amp cartridge, 5/9; small single 20 amp or 10amp, with spare, 2/6; set four panels with over thirty 1 1/2, 1/2, 1/2; watt resistors, 3/6; and high grade panel with fixing bolts, 0.1mf and 470v, resin, 10amp and two 1/2 w. 2 1/3; radio mains suppressor units, four-division, fixing feet terminals, etc., 7/9; headphone sets high resistance, complete with padded headbands, sponge rubbers on ear caps, and rood class microphone, all wired into four cleft plus sets as illustrated in R.A.F. adverts, as new, 8/9 set; meters scaled 0-300v F.S.D. 5ma and 0-5ma, both types slightly defective and suitable for low current continuity meters, no series res., with v/m. square front bakelite 4/9 each [10205]

LARGE SCREEN TELEVISION

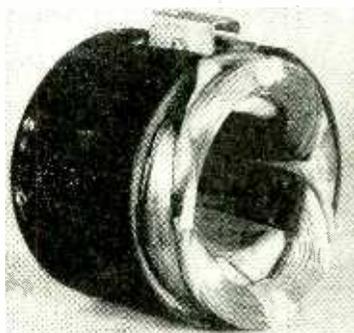
Wide Angle Scanning can only be accomplished by using HIGH EFFICIENCY COMPONENTS and "ALLEN" can supply the WHOLE range necessary for this NEW TECHNIQUE.

THE LINESCAN TRANSFORMER



Capable of fully scanning any C.R. Tube from 9" up to 17" (Double D) Scan at 16 K V.

THE DEFLECTOR COILS designed for a 70" Scan with minimum deflection defocussing.



FOCUS COILS—FRAME TRANSFORMERS—LINEARITY & WIDTH CONTROLS are all available to complete the range.

All these components are specified for the TELEKING

For Circuit diagram of Line and Time Base for use with 12" to 17" C.R.T.s, send 9d. and S.A.E.

ALLEN COMPONENTS LTD

(Specialists in the Manufacture of L.T. Transformers.)

"CROWN WORKS,"

197, LOWER RICHMOND ROAD,
RICHMOND, SURREY

*Phone: Prospect 9013

MINIATURE SWITCHES

for constructors and engineers



by

ARROW

ARROW offer you a special range of miniature switches at competitive prices. Look in your local dealer's window for the Arrow Display Box showing 10 different types or ask him to get you full particulars of the switch you want. Insist on ARROW switches and get the best results.

ARROW ELECTRIC SWITCHES LTD.
HANGER LANE · EALING · W.5

RADIO CLEARANCE. Ltd., 27, Tottenham Court Rd., London, W.1.
SPECIAL offer of electrolytic condensers, capacity, voltage, size, type of mounting, price post paid, in that order.—400. 6v. 1in×2in. lug. 2/6; 250+250. 6v. 1in×2in. lug. 2/6; 500+500. 6v. 1in×3in. lug. 2/6; 1,500. 1in×3in. clip. 3/4; 30+50. 350v. 1½in×2in. clip. 3/3; 40+40. 150v. 1½in×2in. clip. 3/3; 40. 150v. 1in×2in. clip. 2/6; 20+20. 275v. 1in×2in. lug. 4/-; 16+32. 275v. 1in×2in. lug. 4/-; 16+16. 275v. 1in×2in. clip. 4/-; 32+32. 275v+50mf. 25v. 1in×3in. lug. 4/6; 60+100. 275v. 1½in×3in. lug. 5/6; 100. 275v. 1½in×2in. clip. 3/9; 50. 350v. 1½in×2in. clip. 3/6; 32×12. 350v. 1½in×2in. clip. 4/9; 16+16+16. 350v. 1½in×2in. clip. 5/3; 40+40+20. 350v. 1½in×3in. lug. 5/3; 16. 350v. ¾in×2in. lug. 2/3; 40+40. 300v. 1in×3in. lug. 4/6; 10. 450v. ¾in×2in. lug. 2/-; 16. 450v. ¾in×2in. 3/3; 20. 450v. 1in×2in. lug. 3/3; 32. 450v. 1½in×2in. clip. 4/4; 24+12. 450v. 1½in×2in. clip. 5/3; 16+16. 450. 1½in×2in. clip. 5/6; 32+32. 450v. 1½in×3in. clip. 6/-; 30+30. 450v+20mf. 25v. 1½in×3in. lug. 6/-; 15+15. 450v+20mf. 25v. 1½in×3in. lug. 5/3; 200mf. 6v. ¾in×1½in. clip. 2/3; 100mf. 12v. ¾in×1½in. wire. 1/9; 1,000mf. 6v. ¾in×2in. clip. 2/6; 8mf. 450v. 1in×2in. clip. 2/3; 50mf. 12v. ¾in×1½in. wire. 1/9; 150mf. 25v. ¾in×1½in. clip. 2/-; 250mf. 12v. ¾in×1½in. wire. 2/6; 350mf. 25v. 1in×2¼in. clip. 2/9; 16+16mf. 450v. 1½in×2in. clip. 4/3; 40. 40mf. 275v. 1½in×2in. clip. 3/9; 16+32mf. 450/525v. 1½×2in. clip. 5/6; 24+24+16mf. 350/425v. 1½×2in. clip. 4/9; 60+200mf. 275/350v. 1½×4¼in. clip. 6/6; 24+16+8mf. 450v. 1½in×2in. clip. 6/-; 1,000mf. 12v. 1in×2¼in. clip. 3/-; 4mf. 150v. ¾in×1½in. clip. 60+100mf. 35v. 1½in×4¼in. clip. 6/6; 500mf. 12v. 1½in×2¼in. clip. 2/9; 8mf. 350v. ¾in×2in. 2/-; 6,000mf. 6v. 1½in×3¼in. clip. 4/-; all are all. cans. some with cardboard sleeves, all voltages are WKG. all new stock, some limited quantities. Trade stamped most types.

TELEVISION! Set of 3 components, comprising line output trans., with E.H.T. winding to give 7kV, using EY51 (heater winding for EY51 also included), and fitted with width control scanning coils, low impedance line and frame, focus coil (res. 0.000Ω), current approx. 20mA; the set of 3 for 42/-, plus 1/6 post, diagram of line trans. supplied.

PERSONAL receivers. 3 valve T.R.F. using IT4s, contained in handsome bakelite case with lift-up lid, size 7½×5½×5in with lid closed, plastic carrying handle, fram. AE in lid, these receivers cover the medium waveband and operate from self-contained dry batts., standard types. W1435 and U2, output to a pair of lightweight 'phones (H.R.) controls, SM tuning and reaction, opening lid switches on supply, brand new, with valves, batteries, 'phones, an ideal set for invalids, hosp. patients, etc., these receivers are not Govt. surplus and are offered ready to play; carr. paid; £4/10.

CHASSIS steel. 5¼×5¼×1½in drilled 3 button base holes. 1/9; primary 0-110-210/250v. 50c/s. secs 300-0-300 80ma. 4v 2a. 6.3v. 2.5v. 15/6; superhet coils 1½×1¼. formers M. wave H.F. AE. Osc. L. wave H.F., AE. Osc. 1/9 per coil; I.F. trans. 465kc/s 1½×1½×4in. iron cored. 3/- pair; meters 2in square, bakelite case, 0/5ma. 6/6; Rotary power units, type 104 p.m. rotary mounted on chassis with supp. input 12v d.c. output, 250v 60ma 6:5v. 2.5a. d.c. 7/6. type 87 24v input. outputs as 104. 7/- post paid; plugs and sockets, bakelite with keyway. 5. 7. 1/6 pair; focus coils, low res., 200Ω standard T.V. 8/6; can be had as alternative with kit if required; 6½in loudspeakers p.m., less trans., boxed, 13/6 post paid.

STANDARD Yaxley-type switches. 2¼in spindle, 4P 3w, 2/9; 2½in spindle, small size, 465kc/s I.F.s iron cored. 2½in×1½in×1¼in. 9/- pair; 6½in P.M. speakers, with transformer (5/000/3Ω) 16/6 post paid; small size O.P. trans., 10,000/30. 2/11.

VITREOUS res. 5k 20w. ¾in×3in. with clips. 1/6; carbon V.C. 10k small L/S. 3in spindle. 1/9.

E.H.T. trans. pr. 230v. 50c sec. 4,000v. 1ma. 2v. 2a. with U22 valve holder mounted, gives 5,500v. smoothed; 27/6 post paid.

RADIO CLEARANCE. Ltd., 27, Tottenham Court Rd., London, W.1. Tel. Museum 9182. [0015

124 only switches, Wright & Weaire type 2-pole, 5-way, pen-shorting; free length on ¼in diameter spindle—¾in. length on threaded bush ¾in. unused; offers to.—Box 3848. [9397

SAVE pounds, send for free list to-day; really amazing bargains, guaranteed goods.—Annakin, 25, Ashfield Place, Otley, Yorks. [9450

500 moving coil meters 3¼in diameter calibrated 0-200 ma; basic movement approximately 8 ma; new and unused; £250 the lot.—Box 3696.

MAGSLIP transmitters 3in. No. 5, A.P.10861, large quantity, brand new, in tins; 45/- ea., post freq.—P. B. Crawshaw, 166, Pixmore Way, Letchworth, Herts. [0241

LOOK!—Plan position indicators containing L.F. valves—2 VT60A (47), KT41, 2 DDL MH4, VR78, 7 VR65A, HV R2, 2 U4U, Iark 230/150 power pack giving 300/0/300 (twice), 6.3v. 2/0/2v. 4v (twice), 4,000V EHT (approx.), M type motor with reduction gearing (worm and spur), scanning coils with slip-rings, large quantity of other parts, including 22 tropical, WW, and other pots, 24 Mansbridge condensers (1-10mf 450v and others up to 5,000v), switches, 8 knobs (fluted), 14 jacks, fuses micro-switch, dial light, 70 vitreous and other resistances and condensers, etc.; the whole mounted in handsome heavy gauge steel cabinet, 20¼in×27in×60in high finished door hinged with milled doors and plated handles; price (unused) £8/15 each carr. paid (cabinet alone worth more).—K. M. Logan, Westally, Hitchin, Herts. [0238



TRANSFORMERS

of all types up to 25 KVA for Single or Three Phase operation, Phase Conversion, etc.

MAINS

Output and Special Purpose Transformers for Radio Equipment, Chokes, etc.

COILS

for Contactors, E.M. Brakes, Air Valves, etc., and COIL WINDINGS for all purposes.

SOLENOIDS

for A.C. and D.C. Operation

A.I.D. Approved

W.F. PARSONAGE & CO LTD

INDUCTA WORKS

PARK RD · BLOXWICH · WALSALL
TELEPHONE: 3101. 66464

OPPORTUNITIES IN RADIO

ENGINEERING OPPORTUNITIES

Get this FREE Book!

'ENGINEERING OPPORTUNITIES' reveals how you can become technically qualified at home for a highly paid key-appointment in the vast Radio and Television Industry. In 144 pages of intensely interesting matter, it includes full-details of our up-to-the minute home study courses in all branches of **TELEVISION and RADIO, A.M. Brit. I. R. E. E., City & Guilds, Special Television, Servicing, Sound Film Projection, Short Wave, High Frequency and General Wireless Courses.**

We definitely Guarantee

"NO PASS—NO FEE"

If you're earning less than £15 a week this enlightening book is for you. Write for your copy today. It will be sent **FREE** and without obligation.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
388B SHAKESPEARE HOUSE,
17/19 STRATFORD PLACE, LONDON, W1



Surplus BARGAINS

MANUFACTURER'S & BANKRUPT STOCKS
LIMITED SUPPLIES ONLY

We can offer for immediate delivery

LARGE STOCKS OF RESISTORS

ALL VALUES: ½, 1, 2, and 3 WATT.

Electrolytic Condensers—All Types

ANTI-INTERFERENCE AERIALS



SPECIAL QUOTATIONS FOR QUANTITIES

Low and High Resistance Headphones

Belling Pushotters, Plugs and Sockets; Bakelite Accumulators; Dinghy Transmitter Sets; Output and Mains Transformers; Valve Holders; Yaxley Type Switches; Speakers, all types; Meters; Chokes; Coaxial Cable; Magnifying Lens; Rubber Masks, etc., etc. Your enquiries are invited.

WHOLESALE AND EXPORT ONLY

For further bargains call at our Counter or write for NEW bulletin.

RADIO MERCHANDISE COMPANY LIMITED

65, Farringdon Road, London, E.C.1
Telephone: HOLborn 6377. Quote Dept. W.W.

www.americanradiohistory.com

H. FRANKS, 58, NEW OXFORD STREET, LONDON, W.C.1

PHONE : MUSEUM 9594.

One minute from Tottenham Court Road Stn.

COLD CATHODE RELAY UNITS fitted two S.T.C. Cold cathode tubes No. G240/2D, two Siemens High Speed Relays 1700/1700 ohms, size of unit approx. 6 x 7 x 4in. Price £3/2/6 each.

ELLIOTT MAGNETIC RELAYS TYPE H, coil res ± 100 ohms. Operating current, low contact 238 microamps, high contact 378 microamps, totally enclosed in metal case 9 x 4 1/2 x 4in. £4 each.

600 WATT STEP-DOWN TRANSFORMERS, Input 200/250 v.a.c. Outputs 100v 4 amps. 12/14v. 100amps, 32v. 5amps. £4 each. Carr. 10/-.

STEP-DOWN, input 200/250 volts, 50 cycles, Output-tapped, 8, 16, 24, 32 volts, 15amps. Price £3/7/6 each. Carr. paid.

STEP-DOWN TRANSFORMERS, input 230 volts A.C., 50 cys. Output 12 volts, 8 amps. Price 28/- each. Post paid.

"STANCOR", U.S.A. 2.5 K.V.A. 50/60 cycle auto-transformers. Input, 115/250v. Output, 110v. Completely shrouded. £11 each.

WESTINGHOUSE RECTIFIER SETS, Style 288 G.P.O. Input 200/250 volts A.C., 50 cycles, output 50 volts D.C. 1 1/2 amps. £3/10/- each. Carriage 10/-.

LONDEX RELAYS, type 220 Ref. No. 10F/494, two heavy break contacts, 24 volts, fitted in metal cases 4 x 4 x 2 1/2in. 8/6 each.

ADMIRALTY PATTERN. Heavy duty L.T. transformers, Primary 230 volts A.C., 50 cycles 9 amps. Secondary 18 volts centre tapped 108 amps. Price £15 each. Carr. 20/-.

SANGAMO MOTOR UNITS, Model 7, final speed one rev. 24 hours. 200/250v. A.C., 50 cycles. Price 27/6 each.

SANGAMO MOTOR UNITS, Model 7 final speed one revolution per seven days, 200/250v. A.C. 50 cycles. Price 30/- each.

"KLAXON" 24v. D.C. **SHUNT WOUND MOTORS**. 1/20th h.p., 2,500 r.p.m. Price 40/- each.

3in. **MAGSLIP TRANSMITTERS**, fitted in cradle, Ref No. A.P.6547. Price 40/- each.

CANADIAN FULLY SMOOTHED ROTARY TRANSFORMERS, housed in metal case 8 1/2 x 6 x 4 1/2in. Input 12v. 2.5amps. Output 220v. D.C. 60 ma. Price 40/- each.

2 **ENGLISH ELECTRIC IGNITION TESTERS**, ex Air Min. Ref No. 5G/417 Model U.E.D. Takes supply of vehicle under test of 6/12/24v. D.C. or 230v. A.C. mains supply. Price each, less Harness £23/10/-.

Carr. paid.

STAINLESS STEEL AERIAL WIRE, Gauge 7/015 in 1600 foot reel. Price 40/- per reel.

RECEIVER OUTPUT LIMITERS Type No. 1 Ref. 10A/M0520, fitted 4 pencil rectifiers, switch, phone jack and plug, in metal case size 3 1/2 x 4 1/2 x 1 1/2. Price 14/- each. Post paid.

U.S. ARMY TYPE BD/71 TELEPHONE SWITCHBOARDS, 6 line connection, fitted in case 18 x 10 x 14in. Price £6/10/- each.

MINIATURE IMPULSE MOTORS made by "Gents," size 3 x 2 x 1 1/2in. Suitable for operating models, switches, etc. Operates on 4.6 volts A.C./D.C. and is very powerful for its size. Price 8/6 each. Post paid.

SANTON SWITCH-BOXES type E. Ref. 5c/2468. Fitted three Santon switches and fuse box. All housed in one unit, size approx. 14 x 10 x 3in. Price 22/6 each.

TURNBULLLEC., CO. U.S.A. MULTI-BREAKER SWITCHES, 115/230v. A.C., 70/100 amp. Max. fitted in metal cases 13 x 9 1/2 x 3 1/2in. Packed in original cartons. Price 27/6 each. Carr. paid.

SEIZIUM SELENIUM RECTIFIERS. 250v. 120 ma. Price 9/- each.

10,000 G.P.O. type 3,000 and 600 relays, assorted contacts and coils. Siemens High Speed Relays, Uniselectors, Telephone Keys, Handsets, etc.

Apply for full Mailing Lists. Price 6d. each.

An assortment of various Ex-W.D. Radar and Radio Equipment, Relays, Power Packs, available to callers only.

SUPREME RADIO, 746b. Romford Rd., Manor 17 Park, London, E.12. Tel. If. 1260. Est. 17 years

BARGAIN line in mains trans. by "Parmeko." Universal fixing, primary tapped 0-200-220-240v. sec. 290-0-290v. 80M/A. 6.3v 3amp and 6.3v tapped at 4v 2amp, with screen: our price 14/11 ea. plus 1/- post/packing.

SMALL v.c. controls with 1/2 spindle and d/o switch, 1meg or 1/2meg. 3/- ea.

STANDARD vol/controls with 1/2 spindle and s/p switch, 2 meg, 100K ohms. 25K ohms. 10K ohms and 5K ohms. 2/3.

SPECIAL bargain line in v/controls, 1/2meg with 1/2 spindle in die. 1/- ea.

3MEG carbon vol/controls. 7/6d ea.

SEASONAL bargain!! Manufacturer's surplus a.c. mains amplifiers. 4watts output, complete with 10in m/eng. speaker, supplied with leads and fitted with p/u sockets, all tested before dispatch, ideal for records: our price, £5/15 inc. pack/post.

VERY popular line. Westinghouse type metal rec., 250v R.M.S., 65ma/ea. L.T. heater trans., 0-200-230v. 6.3v at 1.5amp or 4v type at 2amp. 6/9 ea.

TELEVISION rectifiers "Sentercell" type. K3/40, 3.2K/v. 7/6 ea.; K3/45, 3.6K/v. 8/2 ea.; K3/50, 4K/v. 8/8 ea.; K3/100, 8K/v. 14/8 ea.

S.T.C. metal rectifiers. R.M.1, 3/11 ea.; R.M.2, 4/3 ea.; R.M.4, 18/- ea.

P.M. speakers, 2-3ohm v/coil, all less trans., 5in. 10/6 ea.; 6 1/2in. 12/11 ea.; 8in. 13/11 ea.; 10in. 18/11 ea.

T.R.F. dual/wave coils for L/M wave. with circuit, 6/6 pair.

PANELS with 6 various 1/4w resistors, one P/F cond. and WX6 Westector. 1/- ea. twin balanced 80ohms feeder for television, 4d per yard.

ELECTROLYTIC cond., 8mfd 500v tag end. tub/cardboard, 2/- ea.

METAL can type electrolytic cond., 64+120mfd. 350v, 425v surge. 12/6 ea.; 16+32mfd. 350v. 4/9 ea.; 8mfd. 500v. 2/9 ea.; 16+8mfd. 450v. small type. 4/- ea.

CARDBOARD wire-end bias cond. 50mfd. 50v. 9d ea.; 50mfd. 12v. 9d ea.; 25mfd. 25v. 1/- ea.

MANY other bargain radio and television component lines in stock. Terms. c.w.o., no c.o.d. Send 9d extra for postage orders under £5.

2/6d s.a.e. all enclosed with list. [0021

SOUTHERN RADIO SUPPLY LTD., 11, Little Newport Street, London, W.C.2. See our displayed advertisement, page 126. [0016

G.E.C. 7-watt VHF mobile transmitter/receivers, complete with 12v rotary power pack 80.9, 81.1, 81.3 mc/s. new; £37/10 each.

1,450 r.p.m.; by Centaur motor, 1,000/4H.P. 100/250v A.C. repulsion motor, 1,000/1,450 r.p.m.; by Super and Reg. £5 each.

DEPNO D.C. 19v receiver, £30; G.E.C. single channel V.H.F. transmitter/receiver. Cat. No. B.R.T.600; special offer semi-shrouded mans trans. 250/0/250 60ma. 5v. 2amp. 6.3v. 4amp. 13/3 each; communication receivers in stock. Hammerlung, H.R.O. Seniors, C.R.100, A.R.80, A.R.88L/F, etc. all in perfect order; R.1155 receivers in new condition; your enquiries are invited for rotary converters and electric motors, most sizes and type available from stock; special clearance of F.H.P. electric motors, 35/-.

UNIVERSAL a.c./d.c. motors, suitable for sewing machines, 40/- each; 12v-15v a.c./d.c. motors with extended spindle, suitable for models, etc. 9/3; 20 watt P.A. rack mounting amplifier, new and complete, with heavy duty 250v power pack. 200/250v. PX25. 2/2. our price £5/10. less valves; new moving coil microphones, hand type, heavy duty and complete with 12yd screened cable. £3/15; 20ft telescopic tubular T/V mast, 13/6 each; large selection of test equipment; multi-range meters valve testers, signal generators, oscilloscopes, bridge meggers and meggers, etc., all at reasonable prices; hand bearing prismatic compasses, perfect. 45/- each; very large stocks of transmitting valves, Klystron, of all types; send us your requirements; special offer of new not ex-W.D., mains transformer, semi-shrouded 200/250v tapped primary, 250-0-250, 100ma, 5v 3amp. 6v 4amp. 21/6 each; large stocks of L.T. transformers, special sizes and ratings wound to specification; auto-record changers in stock from £13/2/6 to £18/10; switchboard mounting volt meters, ampeters, various ranges a.c. and d.c. available at cheap prices to clear; large stocks of enamelled wire, 18 and 20 s.w.g., D.S.G. Special offer. H.R.O. coils, 48-96 m/s and 180/430 k/s. 45/- each. quantity of litz and nickel chrome wire available; type 74 indicator units, complete with tube, as new, £6 each; Halli-croft Super Silytr SX28 in stock; Ever-shed bridge megger, 500v 1 1/2kw e.d.c. rotary converter, 220 d.c./230 a.c., complete with Igranite starter, £28; large selection of American Pyranich high-voltage working condensers; 5m/s meter rectifiers, 6/3 ea.

HAMERLUND B.C. 779B, perfect order, rack mounting, £42/10; Q-Max. Q-5/10 receiver, new £38; prices do not include postage.

D.S.T. 100 receivers, perfect, £26; Celestion 12in P.M. speakers, heavy magnets, £5/10.

SERVICE RADIO SPARES, 4, Lisle St., W.C.2. Gerrard 1734. [0188

MORRIS, 99, Tottenham Court Rd., W.1. (near Goodge St. Stn.)

MIDGET radios, sensational offer! "Cadet" A.C./D.C. mains portables, in ivory plastic with handle, magnificent tone and volume, guaranteed complete, ready to play; £6/19/6.

ALL-WAVE superhet midget, world-famed maker, ivory plastic; £9/19/6 guaranteed.

VALVES: VR108 (SP130) 3/1; VT171 (DK92), VT172 (DAF91), VT173 (DF91), VT174 (DL32), 11/6; V59 (M12/14) 9/6; CV509 (6V6), 10/6; 500 other types available; s.a.e. for lists; trade enquiries invited; 9-6 week-days, 9-1 Saturdays. [0237

GEE RADIO LTD.

METAL RECTIFIERS.		Price
Volts	Amps	
230	1 1/2	£4 0 0
230	1	£1 10 0
165	1	£8 0 0
110	1	£7 6 0
50	1	£19 6 0
24	10	£4 0 0
24	6	£1 15 0
24	2 1/2	£1 5 0
24	1	£13 6 0
12	10	£2 0 0
12	6	£1 5 0
12	4	£18 6 0
12	2 1/2	£16 6 0
12	2	£12 0 0
12	1	£7 6 0
6	1	£7 6 0
RM1-125v.	60mA. H.wave	4K/v. 5 0 0
RM2-125v.	80mA.	5 0 0
RM3-125v.	100mA.	6 0 0
RM4-250v.	250mA.	18 6 0
GEE4-250v.	250mA.	14 6 0
K3/200 5.2kV.	1mA.	£1 1 0
K3/160 4.1kV.	1mA.	£1 1 6
K3/100 2.6kV.	1mA.	£14 8 0
K3/50 1.3kV.	1mA.	8 8 0
K3/45 1.2kV.	1mA.	8 2 0
K3/40 1K.	1mA.	7 6 0
K3/25 655V.	1mA.	5 8 0
150-400v.	2mA.	6 9 0
1250v.	2mA.	3 6 0
36 EHT 25 W/house	2mA.	£13 6 0
36 EHT 35	2mA.	£7 6 0
36 EHT 40	2mA.	£1 0 0
36 EHT 45	2mA.	£1 2 6 0
36 EHT 50	2mA.	£1 6 0 0
36 EHT 100	2mA.	£1 8 9 0

U.S.A. ARGOS RECTIFYING BULBS. 2 v. Filament, at 7.5 to 100 v., at 6 amps 15/-.

G.E.C. CIRCUIT BREAKER (ELF). 2 amps. 250 v. 12/6.

TRANSFORMERS. 230 v. A.C. to 11, 11.5, 12, 12.6 v. at 70amps, £3/7/6. 230 v. A.C. to 13, 13.5, 14, 15v. at 60amps. £3/7/6.

VARIABLE RHEOSTATS. 152 ohms at 2 amps, £1/2/6; 7.5 ohms at 4 amps, 12/6; 5.3 ohms at 8 amps, 18/6.

MANSBRIDGE CONDENSERS. 2 mfd., 4,000 v. working, 15/-; 40 mfd. 400 v. working £1; 100 mfd., 150 v. working, £1.

PRE-SELECTOR UNIT. 32 way, Type B, Ref. No. 5D/1064, 30/-.

PRE-PURCHASE TAX SPEAKERS BY LEADING BRITISH MANUFACTURERS. 12in. P.M. 3 ohms, £2/15/-; 10in. P.M. 3 ohms, £1/3/6; 6in. P.M. 3 ohms, 14/6; 5in. P.M. 3 ohms, 12/6; 2 1/2" P.M. 3 ohms, 12/6.

CERAMIC BASES for 813 and 803's 9/6 each.

CATHODE RAY TUBES. VCR 138 Screen and Base, 40/-; VCR 139A, 35/-; 3BP1, 25/-; 3FP7, 25/-.

RII55 RECEIVER. In perfect condition in original transit case. Each instrument tested under correct working condition before despatch. £9/19/6. Suitable power unit with built-in output stage. £3/10/-.

1155, 10/-; Power unit, 7/6.

ROTARY CONVERTERS. 12 v. D.C. input to 230 v. A.C., 50 cycles output. Approx. 150 watt. Complete in wooden carrying case, containing voltage control, sliding resistor, mains switch, input and output sockets. Ex-Govt., in perfect order. £9, carriage paid. Also 24 v. D.C. to 240 v. A.C., 120 watts, in original transit case, 95/-, carriage 5/-.

Ex-Govt., in perfect order.

ALUMINIUM SHEET. Undrilled 16 s.w.g. Sizes available: 12in. x 12in., 24in. x 12in., 24in. x 24in., 24in. x 36in., 5/- per sq. ft.

LANE TAPE TABLE MK2. The latest type with 3 motors, 200/250 v. A.C., 50 cycles. Price £16/10/- carriage paid. Leaflets on application.

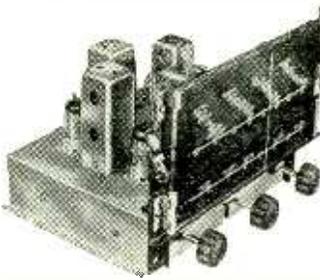
MAGNETIC RECORDING TAPES. Emi-tape, type H60 and 65A, 1,200ft. at 35/-; Scotch Boy, type MCI-111, 1,200ft. at 35/-; G.E.C., type "A", 1,200ft., at 30/-; spare spools, 4/-; E.M.I. jointing compound, 4/6 per bottle.

Terms. C.W.O., C.O.D. or pro-forma invoice. Orders under 20/- please add 1/6 p.p. unless otherwise stated. Special quotation for overseas buyers.

15 LITTLE NEWPORT ST., LONDON, W.C.2

GERrad 6794/1453

TUNERS



2 IMPORTANT NEW MODELS

S10G A 10 valve High Quality Complete Radio-Gram chassis. Using well known 55 R.F. Feeder with Variable selectivity. The Audio section has P-8 Watt output. Three stage negative feed back. Bass and Treble controls. On two chassis for ease of installation. Gram input 40 mV suitable for all P-Ups Magnetic or Crystal. £30, plus P.T.

S6BS 9 Band (6 Electrical band spread) with R.F. F.C. 2 I.F. Delayed Amplified A.V.C. Variable Selectivity. Fly Wheel Tuning. Tropicalised. Suitable for use with any High Quality Amplifier.

Standard Range of Feeder Units also available.

G. T. CHAPMAN (Reproducers) LTD.

RILEY WKS., RILEY ST., CHELSEA, S.W.10

FLAxman 4577/8

Export Enquiries Invited

OFFER NEW YEAR BARGAINS

INDICATOR UNIT TYPE 62A
Containing VCR97 with Mu-metal Screen. 12 EF50, 4 VR65, 3 VR92, 2 VR54, etc. All Brand New. In Transit Cases, £5/10/0 each

TRANS/RECEIVER TYPE 1196. Complete with 9 valves and 24 volt rotary converter. Brand new. 3 Units mounted together, £3.

RECEIVER TYPE 1132A. Coverage 100-125 M/cs. Complete with 10 valves. Every set brand new in Transit Case. Price £4.

SPECIAL OFFER VR91s, removed from new equipment. Every valve guaranteed. 4 for £1.

POWER UNIT TYPE 285. 230 volt 50 cycle, 18in. x 12in. x 8jin. With 3 Transformers, output 1. 450-0-450 volt 175 m/a. 5 v.-3 amp. 2 6.3 volt. 6 amp. 6.3-6 amp. 6.3-6 amp. 3. 1650 volt 5 m/a. 2 volt 2.5 amp. Two heavy Chokes. 2 Condensers 1 mfd. 2,500 volt working, 2-10 mfd. 450 volt 1.4 mf. 1,000 volt, resistors, etc. 3 valves, 5U4G, VU120, EF50. The Unit you have waited for, all new in Transit Case, £4.

ALL PRICES INCLUDE CARRIAGE SCOTLAND AND ENGLAND.

M. & J. PEARSON
263 GALLOWGATE, GLASGOW, C.4

RADIO UNLIMITED, Elm Rd., London, E.17.

SELECTED bargains: Miniature 3-wave coils packs with circuit, 32/6; P.M. spkrs., 3in 11/6. 5in 12/6, 6in 12/6, 10in 19/6, stdnd. 0/trans. 3/11; p/pull, 5/9; mains trans., 350-0-350, 6v. 5/9, 4v, 4v, 80ma, 22/6; l.r.f. coils, w/reac., 5/9 pr. stdnd 465 kc/s; l.f. trans., 9/6 pair; X/tal diodes, W/circ., 3/-; droppers, 4 and 3, 4/6; volume cntrls., all values, 3/-; S/P sw, 4/3; special oner, 500K, 100K, 4/K, DP/ sw, 4/6; electrolytics, fresh stock, 450 v/8mf, 2/- 16 3/- 8x8 5/- 8x16 4/3, 16x16 4/6, 32x32 5/3, 500 v/w, 8mf 2/6, 16 3/9, 32 4/9, 8x8 4/-; bias, 25/25 1/6, 50/50 1/9; new list, 1/4d stamp.

RADIO UNLIMITED, Elm Rd., London, E.17.

TeL. Key 4813. 10062
MAGSLIPs at 1/10 to 1/20 of list prices, TOS12 huge stocks, please state requirements.
K. LOGAN, Westaley, Hitchin, Herts. 10233
SEE our displayed advertisement on page 110 for surplus bargains.—Radio Exchange, Bedford. 10012

NOTICES

BRITISH SOUND RECORDING ASSOCIATION.
MEMBERSHIP is essential to all actively engaged or interested in really high quality sound recording and reproduction and is world wide. Fees are most reasonable and benefits considerable. First-class programmes of lectures and demonstrations have been arranged for the 1952-53 season and the new Northern Centre, meeting in Manchester, is making very good progress. The Portsmouth Centre is now well established. Information may be obtained from the Membership Secretary, H. King, 48, Mount View Rd., North Chingford, London, E.4, England. 10119

CABINETS

WALNUT radiogram cabinets; details.—Cabinetware, 1a, Heyes St., Blackourn. 10091

WALNUT radiogram cabinets, stamp details.—E. Wisser, 501, Hale End Rd., Highams Park, E.4. 1942/7

WALNUT radiogram and television cabinets, soundly constructed, stamp details.—R. Shaw, 69, Fairlop Rd., Leytonstone, E.11. 18897

WANTED. EXCHANGE, ETC.

BC610 Hallicrafters, also spares; RCA ET 4336 series with spares; BC548 receivers, also TC56, TOS12 and components. 1942/7

MCELROY ADMS. MFG. GROUP Ltd., 46 Greyhound Rd., W.6. Tel. Fulham 1138-9. 10194

WANTED, receivers A.P.R.4, also I.N. 16, 17, 18, 19, etc., and any radio test gear. 10176

LESLIE DIXON & Co., 214, Queenstown Rd., Battersea, S.W.8. Macaulay 2159. 10176

WANTED, 2 R.I. micron inductance coils.—Deadman, 6, Abingdon Rd., Kensington, W.8. 19410

VALVES, type 813 (R.C.A.), urgently required by manufacturing concern.—Box 1642. 18892

WANTED, general purpose coil winder, wave winder, motor and accessories; details.—Box 4098. 19425

WANTED, quantity valves, type 805 and 966A, 805 must be either R.C.A. or G.E. manufacture.—Box 8783. 18765

WANTED, RCA 4531 transmitters.—P.C.A. Radio, Cambridge Grove, Hammersmith W.6. Tel. Riverside 3279. 00993

WANTED, Cossor oscilloscopes, type 339 or 3359, state condition and price.—Ritson, Red Lion House, Exmouth. 19394

WANTED, second-hand Ferraro-graph tape recording machine.—A. O. Watkin, 116, Shortmead St., Bizzleswade, Beds. 19395

1155N, Eddystons, marine receivers, any Marconi transmitters, TV5, etc.—Marina Radio Co., 233, Wood Lane, London, W.12. 19435

WANTED, laboratory test equipment, including standard signal generator, watt meter, oscilloscope, bridges, recorders; send price and details to: HATFIELD INSTRUMENTS, 175, Uxbridge Rd., Hanwell, W.7. Tel. Exline 0779. 10037

WANTED, HRO coils, Rxs, etc.—A.R.88s, BC348s S27s, etc.—Details to R.T. & I. Service, 254, Grove Green Rd., London, E.11, Ley, 4986. 10163

WANTED, set manufacturers' or ex-Government radio equipment, large or small quantities of valves, electrolytics, speakers, meters, also components. 10163

LOWE BROS., 199, Mile End Rd., London, E.1 Ste. 2579. 16554

WANTED, VCR139 a tube holder and screen in indicator tube 87, reference 103B/176, with or without tube.—R.E.P. Ltd., 33, Much Park St., Coventry. 19367

WANTED.—EC-610 Hallicrafters, R.C.A. ET-4336 transmitters, 5X-28, AR-88, 6-27 H.R.P. receivers and spare parts for above; best prices.—P.C.A. Radio, The Arches, Cambridge Grove, W.6. 10081

SCR 536 Handle Talkie (also known as BC 611 transmitter receiver) spare parts wanted, including cases, top and bottom lids, microphones, eq. phones, crystals and coils.—Details to Box 3520. 10223

ALTHAM RADIO Co. pay highest prices in the trade for all American equipment, in cluding test sets, transmitters, receivers, tele-printing gear, etc.—Tel. transfer charge, Manchester, Deansdale 5387. 10229

WE purchase all types of domestic or ex-Government radio receivers and equipment; send full details or call and collect cash; large or small quantities.—Walton's Wireless Stores, 48, Stafford St., Wolverhampton. 10116

EX-GOVERNMENT BARGAINS!

Indicator Unit Boxes. Suitable for 139A cathode ray tube. Complete with chassis, these have been stripped of components, but are ideal for oscilloscopes, etc. Chassis 11 x 6 x 3in. Cover 11 x 6 x 6in, which also contains a glass panel in front 3in. square. Price 2/6. Ditto but with 2 potentiometers, resistances and condensers, etc. Price 4/6, postage 2/- each.

VCR 97 Tubes. Special offer. Brand new in makers' cartons, price 25/-, postage 2/6. We cannot repeat at this price.

Scanners Type 83. 10AB/8022. Containing antenna, reflector 15in. dia. covered with Perspex dome. 18in. dia., 24V drive motor, position transmitter motor, relay and suppressor gear. Brand new in crate £3/10/-, Carriage 10/-, Ditto with no Perspex dome, store soiled 35/-, Carriage 10/-.

Meters. 0-100 m.a. in black bakelite scale case, brand new and boxed 24in. dia. oblong, price 12/6. Postage 1/6.

Submersible Pumps. Brand new, 24V 120 g.p.h., 20ft. lift. Price 50/-, Postage 2/6. Ideal for wells, boats, garden fountains, etc.

Sound Power Telephone Sets. Similar to G.P.O. type hand sets complete with buzzer, pushes, etc. No batteries required for transmission. Price 30/- per set, Post 2/-, R.F.24's. Modified to 27. Complete with three 5P61 valves. Price 21/6. Postage 2/-.

Mumetal Screens for VCR138. 3/6. Post 6d.

Morse Code Tape Recorders. These are Ex-G.P.O. Telegraph Receivers for recording Morse Code in ink on a half-inch paper tape. They have a clockwork motor which runs at varying speeds, according to setting of instrument, for approximately quarter to half an hour. Used, but in brand new condition. Price 50/-, Carriage 7/6.

Our new list, No. 9, containing over 400 ex-Government items, is now available, price 6d. inland, 1/6 Overseas Air Mail.

A. T. SALLIS

93 North Road, Brighton, Sussex.

Phone : Brighton 25806

WILCO ELECTRONICS

MAGNETIC TAPE RECORDING.

"Motek" tape deck, with 3 motors, fast forward and rewind, high impedance record/playback and erase heads. A really first-class job at £15/15/-. Post and pkg., 5/-." Motek" R/play or erase heads 39/6, oscillator coils, with circuit 8/6. "Emtape", 1,200ft. 35/-, spare reels, 4/-. Post extra.

MICROPHONES. Moving coil, Dynamic. American make. Electro voice model 600C with transformer. Can be held neatly in palm of hand. £6/6/-.

MAIN TRANSFORMERS. Primary 230v., Secondary 350-0-350v., 80 m.A. 6.3v. 1A.; 6.3v. 5A. and 5v. 2A. Tapped Primary Surface mounting, 21/-, Post 1/6.

CHOKES. LF10H. 80 m.A. 7/6. Post 1/-.
POTENTIOMETERS. Wire wound, insulated. 300Ω; 500Ω; 1KΩ; 2.5KΩ; 5KΩ; 25KΩ; 50KΩ; 100KΩ; 4/6 each. 50K+50K ohms 4 watt 7/6 each.

RECEIVER R135S. As specified for "Inexpensive Television." In original packing, as new. Complete with all valves, 38/6, carriage 7/6.

EF50 VALVES. Red Sylvania, or British guaranteed unused, 7/6 post 6d.

RESISTANCE MATS.—Make ideal heating mats for Aquariums, Photographic solutions, Print dryers, etc. Mains voltage. Black Heat, size 10in. x 6in. Price 2/6, post free.

SLOW MOTION DIAL. With Vernier, 200-1 Reduction, front of panel mounting, 6in. dia., calibrated 0-100. 5/6 each, post 1/-.
BATTERY CHARGER. Type 42 A. Input 230 v. A.C. Output 6 or 12 v. 4 amps. In black crackle case with fuses, switch and meter. £5/5/-, carriage paid.

MOVING COIL METERS. 2 1/2in. Flush Rectifier type. Scaled 0/100 volts A.C. resistance 100 K ohms. A very useful meter with a 1 Milliamp movement, 30/-, post free.

These are just a few of the items in our stocks. Send 6d. in stamps for comprehensive list giving full details of Potentiometers, Condensers, Resistors, Switches, etc., etc.

204 LOWER ADDISCOMBE RD., CROYDON.

ALPHA OFFERS

MAINS TRANSFORMERS
MT1 PRIMARY, 200-220-240 v. **SECONDARIES**, 250-0-250 v. 80 mA, 0-4 v.; 5 a.-6.3 v.; 4 a.-0-4 v.-5 v. 2 a., 17/6 each. **MT2** as above, but with 350-0-350 H.T. winding, 17/6 each.

AUTO TRANSFORMER
 0-10-120-200-230-250 v. 100 watts, 17/6 each.
MT3 PRIMARY, 200-220-240 v. **SECONDARIES**, 30 v. 2 amp. with tappings at 3 v., 4 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v. 17/6 each. Post on all Transformers 1/6.

COLLARO AC37 RECORDING MOTOR
 Variable speed 0-100 r.p.m., 100/125 v., 200/250 v. Spindle $\frac{1}{16}$ in., 32/6 each. Post 1/6.

METAL RECTIFIERS
 12 v. $\frac{1}{2}$ amp., 1/6 each. 2 to 6 v. 1 amp., 3/- each. 250 v. 45 mA, 6/9 each. 250 v. 75 mA, 7/6 each. 12 v. 5 amp., 18/6 each. 14D36, 8/6 each.

CHOKES
 Large type 5 H 250 mA, 8/6 each. Midget type 1H 250/45 mA, 2/6 each. Standard type 120 mA, 5/- each.

ALLADIN COIL FORMERS
 $\frac{1}{2}$ in. and $\frac{3}{8}$ in. with Iron core slugs, 9d. each.

TRUVOX
 Heavy duty 12in. P.M. Speaker, 15/2, £6/10/- each. Carriage 3/-.

INDICATOR UNIT
 Type 233—complete with 11 valves and VCR97 in good condition. Price 72/6 each. Carriage 7/6.

SURPLUS GEAR
 Parts dismantled, etc., from Govt. surplus included in each parcel. Condensers, Resistors, Vol. Controls, Chokes, Transformers, etc. A Great Bargain. 10/- ea. Parcel.

WIRE WOUND VOL. CONTROLS
 5 Ω , 20 Ω , 10 K Ω , 20 K Ω , 25 K Ω , 50 K Ω 2/- ea.
 400 Ω , 1 K Ω , 2 K Ω , 5 K Ω , 15 K Ω , 300 Ω , 50 Ω 2/9 ea.

MOULDED MICA CONDENSERS
 .01, .001, .0001, .005, .00027, .008, .0004, .0005, .0002, .002, .003, 50 pF, 20 pF. All 4/6 doz.

RECTIFIERS RMI 4-, RM2, 4.9.
 "Viewmaster" Envelope, Holme Moss or Kirk O'Shotts, 5/- each.

METAL CASE CONDENSERS. Wire ends. 1 mfd. 350 v., 9/- doz., .01 mfd. 1,000 v., 9/- doz., .02 mfd. 750 v., 7/- doz., .001 mfd. 1000 v., 4/6 doz., .5 mfd. 350 v., 6/- doz.

SPECIAL PURPOSE VALVES
 VR123 (EF8), 7/6; 954, 2/9; 955, 5/-; 956, 3/3 ea. VR136, 7/-; VU111, 4/6; E1148, 2/-; VR150/30, 9/-; VU120A, 4/-; CV71, 1/-; VT501 (TT11), 6/6; BL63, 7/6 each. 9001, 6/6; 9002, 7/-; 9003, 6/6; 9004, 6/6; VU133, 5/6; 6AG5, 8/6; GUS, 15/-; VR116, 4/-; E1436, 3/6; VT105, 6/-; PT15, 13/-.

SPEAKERS
 3 in., 13/6; 5 in., 12/6; 6 in., 13/-; 8 in., 17/6; 10 in., 19/6; R.M. Extension Brown Bakelite case, 39/6 each. 12 in. Heavy Duty 15 ohms Truvox, £6/6/-.

TERMS: Cash with order or C.O.D. MINIMUM C.O.D. Fee and Postage 2/3. Full list available, send 3d. in stamps.

MAIL ORDER ONLY

POSTAGE—Please add 6d. to 10/-, 1/- to 20/-, 1/6 to 40/-.

ALPHA RADIO SUPPLY CO.

5/6 Vinces Chambers, Victoria Square, LEEDS, 1

WANTED—R.C.A. speech amplifiers, type MT-1220 J or K arm Arct tuning units BC339A; Hallicrafters speech amplifiers BC614; others stating quantity and price to P.C.A. Radio, The Arches, Cambridge Grove, W.6. 10080

WANTED. AN/APR-4 receiver, any units; any other good quality U.S. surplus radio and radar tubes, test sets, laboratory equipments, etc.; give condition and price in first letter.—Engineering Associates, 434. Patterson Rd., Dayton, 9, Ohio, U.S.A. 10234

WANTED, good quality communication rxs., domestic radios, test equipment, etc., top prices paid; established since 1932—Miller's Radio, 38a, Newport Court, 1 min. from Leicester Sq. Tube, Tel. Ger. 4638. Call, write or send. Hours of business 10-6 p.m. Open all day Saturday. 9147

WANTED; we will pay 10% more for the following American equipment; test sets with TS prefix, American AP4 receivers, APR4 tuning units, BC342, BC312, power units No. 15 and PE98, teleprinter equipment.—Tel. immediately, transfer charge, Manchester. Deansgate 5387. Altham Radio Co. 10227

WANTED, new surplus valves of all descriptions, large or small quantities, types 723A/B, 805, 807, 613, 832, 100th, 250th, 2C40, 2C43, test instruments receivers, transmitters, BC610, etc., best prices paid.—Write Pype-Hayes Radio, 606, Kingsbury Rd., Birmingham, 24. (Phone: Erdington 4942.) 18811

WANTED, crystals IN23, CV253, CS3A, 100c 3-pin; tubes 2AP1, EF50, 807, 829, 6AC7, 6AG7, VR150/30, 2X2, 1B2, 723A/B; any 3 cm parts, Carbon tubes, screened sleeve or multi-core Hex up to lin dia., 1155N unmodified, acoustical amplifier; sale B.B.C. recorder, £12.—35, Abbev Rd., Grimsby. 19428

URGENTLY WANTED—VHF test equipment; TS147AP, TS17U, TS34, TS148/UP, TSX-05B, BC221s and any other types; valves, klystrons, magnetrons 723/AB, receivers, APR4 and TN-16-17-18 tuning units, RCA, AR88s, S27s, SX28s, S27CA and any late types; microwave equipment or spares; highest prices given; please write, call or telephone Gerard Electronics, 27, Lisle St., Leicester Square, London, W.C.2. 10219

REPAIRS AND SERVICE

ARMATURE Re-winding Service to the Trade.
VACUUMS, drills, grinders, hood dryers, dental motors, vacuum cleaner armatures replaced from stock; 24-hour service; every job guaranteed; all vacuum cleaner parts, hoses, etc., in stock for any make.
REGAM ELECTRIC, 95, Park Lane, Leeds, 1. 10221

MAINS transformers rewound, new transformers to any specification.
MOTOR rewinds and complete overhauls; first-class workmanship, fully guaranteed.
F.M. ELECTRIC CO. Ltd., Potters Bldgs., Warser Gate, Nottingham, Est. 1917. Tel. 3855

OUR speciality, amplifier repairs.—Send, house Glass.
FARRANT RADIO, 70, Crescent Rd., Stonehouse, Glos. 19340

REPAIRS—E.H.T. mains and O.P. transformers, field coils and chokes; also armatures and motors; new transformers designed to any specification; all work fully guaranteed.
WILLEDSEN TRANSFORMER CO., Ltd., Rear of 31 Church Lane, Church Rd., N.W.10. Tel. Willesden 7093. 10076

MAINS transformers rewound or constructed to any specification; prompt delivery.
Bede Transformers Co., Ltd., Bedesway, Bede Trading Estate, Harrow, Middlesex. 3198

CAPACITY available for assembly and wiring. Also reconditioning radio transmitter receiver equipments and units all types, amplifiers, etc.; South London area.—Write Box 4023. 19438

ELECTRICAL test instruments repaired and standardised all types British or American, ammeters, voltmeters, ohmmeters, DC/AC multi-range meters, etc. Meters converted to specification.
THE ELECTRICAL INSTRUMENT REPAIR SERVICE, 329, Kilburn Lane, London, W.9. Tel. Lad. 4168. 19175

ALL types of transformers, chokes and field coils for radio and television, etc.; promptly and efficiently rewound or manufactured to any specification.—Ladbroke Re-wind Service, Ltd., 34, Rainham Rd., Kensal Rise, N.W.10. 10222

LEEVERS RICH MAINTENANCE Ltd.—Service engineers to the recording industry; under personal direction of Bernard J. Brown; modification or repair of all types of audio equipment and sound recorders.—80, Wardour St., W.1. Gerrard 4161. 10217

24-HOUR service, 6 months' guarantee, any transformer; rewind, mains outputs and i.f.s., etc.; all types of new trans., etc., supplied to specification; business heading or service card for trade prices.—Maestic Winding Co., 180, Windham Rd., Bournemouth. 16520

MISCELLANEOUS

METALWORK all types cabinets, chassis racks, etc., to your own specifications.
PHILPOTT'S METAL WORKS Ltd. (G4B1), Chadman St., Loughborough. 10208

WESTINGHOUSE metal rectifier battery charger £10 radiometer valve tester, bridge, data books, £8.—26, Eastwood Rd., Ravleigh, Essex. 19429

FOR sale.—One second-hand Marconi telegraph/telephone equipment type TGS 501A/CR100/2 complete with six sets additional frequency components.—Detailed and inspection, apply Colonial Development Corporation, 33, Dover St., W.1. 19200

TELE-RADIO (1943) LIMITED

177, EDGWARE RD., LONDON, W.2.

'Phone: PAD. 5606, PAD. 6116.

Shop Hours: Mon-Sat, 9 a.m.-6 p.m.
 Thursday, 9 a.m.-1 p.m.

LEAK "POINT ONE" AMPLIFIERS £28 7 0
VARI-SLOPE PRE AMPS. £12 12 0
GARRARD AC/DC 3 Speed changers £26 19 11

ALUMINIUM CHASSIS 18 S.W.G.
Four Sided, Riveted Corners—
 8in. x 6in. x 2in. 6 9
 8in. x 6in. x 2 1/2in. 7 6
 12in. x 6in. x 2 1/2in. 8 6
 14in. x 10in. x 2 1/2in. 11 0
 17in. x 10in. x 2 1/2in. 12 6
Steel Chassis, Welded Corners
 17in. x 10in. x 2in. 11 3
 17in. x 10in. x 3in. 12 6

HAYNES TELEVISION COMPONENTS—
Full range available including—
T33 Lin. Transformer £2 8 0
T27 Line Trans. with 12 KV E.H.T. £6 12 6
T34 as T27 less rectifiers £2 10 0
M17 Medium Freq. 17 KV. E.H.T. £10 0 0
R10 E.H.T. Unit, 6/10 KV. £6 15 0
TJ18/5000 E.H.T. Transformer 5KV. £4 17 6
G1 Kit of 10 Coil Formers, etc. £1 0 0
G2 Kit of 7 Coil Formers, etc. 15 0
W2 Coil Winding Tool 5 0
"TELEVISION CIRCUITS," 4th Edn. 3 6

OAK SWITCHES

WE SPECIALISE IN ASSEMBLING OAK PAXOLIN AND CERAMIC SWITCHES TO INDIVIDUAL REQUIREMENTS. QUOTATIONS BY RETURN OF POST. DELIVERY 2/3 DAYS.

ADCOLA SOLDERING IRONS
 200/220 v. or 230/250 v.—
Fixed 3/16in. Bit £1 5 6
Detachable 3/16in. Bit £1 13 9

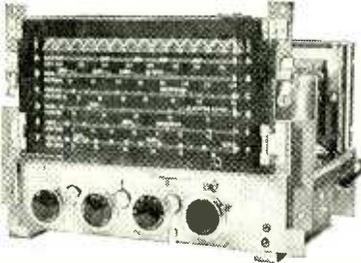
ELLISON MAINS TRANSFORMERS (All upright mounting).
Type MT162. Pri., 200 v., 220 v., 240 v. Sec., 250-0-250 v. 60 mA., 5 v. 2 a., 6.3 v. 3 a. £1 3 3
Type M121. Pri., 200 v., 220 v., 240 v. Sec., 350-0-350 v. 80 mA., 5 v. 2 a., 6.3 v. 3 a. C.T. £1 8 6
Type MT137. Pri., 220 v., 230 v., 240 v. Sec., 250-0-250 v. 120 mA., 5 v. 3 a., 6.3 v. 7 a. £1 13 9
Type MT190. Pri., 200 v., 220 v., 240 v. Sec., 350-0-350 v. 120 mA., 5 v. 5 a., 6.3 v. 5 a. C.T. £2 1 3
Type DT199. Pri., 210 v., 230 v., 250 v. Sec., 350-0-350 v. 120 mA., 0-4.5 v. 3.5 a., 4 v. 5 a. C.T., 6.3 v. 5 a. C.T. £2 1 3
Type SP171. Pri., 210 v., 230 v., 250 v. Sec., 425-0-425 v. 150 mA., 5 v. 3 a., 6.3 v. 4 a. C.T.... £2 16 3
Type TV21. Pri., 210 v., 230 v., 250 v. Sec., 2.5 kv. 5 mA., 2-0-2 v. 4 a., 4 v. 2 a. £2 8 6
Type T238. Pri., 200 v., 220 v., 240 v. Sec., 350-0-350 v. 250 mA., 0-2-4 v. 2 a., 0-4-5 v. 3 a., 6.3 v. 6 a., 4 v. 8 a. £4 10 0
Type FT51. Pri., 230 v. Sec., 6.3 v. 1.5 a. 9 0
Type T68. Pri., 210 v., 230 v., 250 v. Sec., 0-4-6.3 v. 4 a. 19 6
Type SP70. Pri., 210 v., 230 v., 250 v. Sec., 12 v. tapped 6.3 v. 3 a. £1 1 9

ELLISON LF CHOKES
TC75. 30 H., 20 mA., 500 ohms 10 6
SP76. 10 H., 150 mA., 85 ohms... £1 7 9
TC38. 5 H., 250 mA., 50 ohms... £1 9 3
LF60. 10 H., 60 mA., 400 ohms... 6 9
TC37. 10 H., 80 mA., 200 ohms... 12 9

OVERSEAS ENQUIRIES INVITED
 Please allow for postage and packing.
 C.W.O. or C.O.D.

DIRECT FROM THE MANUFACTURER

Dulci Radio/Radiogram Chassis
A/C 100-120 & 200-250 VOLTS.
OUTSTANDING VALUE OF NEW PRODUCTION!
Fully Guaranteed



Model B. Six Wavebands, 11-115 metres continuous in 5 ranges (4 BANDSPREAD) and MW 185-550 m. Six position Tone Switch (3 radio-gram.). Price ... **£15'15'0**
Tax Paid

Model B3. Three Wavebands, Long, Medium, Short. Gram. switching on W/Change switch. 3 position Tone. Price ... **£12'12'0**
Tax Paid

Both chassis 11 1/2 in. x 7 in. x 8 1/2 in. high. Latest type valves: 6BE6, 6BA6, 6AT6, 6BV6, 6X4. Flywheel tuning Negative Feedback over entire audio section. Engraved knobs.

BUILT TO HIGHEST PERFORMANCE STANDARD AND SPECIFICATION

Cabinet Escutcheon for 9 in. x 5 in. dial for 4/9 extra Chassis despatched under Money-Back Guarantee conditions on receipt of remittance.

Further particulars from:

THE DULCI CO. LTD.,
97 VILLIERS Rd., LONDON N.W.2
Tele: Willesden 7778



In the early '20s Horn Type speakers came to be regarded as bad and designers concentrated on haffle types, etc. Mr. Voigt recognised their error and designed for horn loading. Horn Loaded Voigt Units were selling by 1929. Lately the return to horn loading has become general, but Voigt Desikas Led The Way!

VOIGT PATENTS LTD., LONDON, S.E.26

G.E.C. GERMANIUM CRYSTAL DIODES

Midget Size, 5/16 in. x 3/16 in.
Wire Ends for Easy Fixing.

4/6 each, postage 2 1/2 d.

Technical Details and Selected Types available.

B.T.H. GERMANIUM CRYSTAL DIODES

Moulded in thermo-setting plastic,
4/6 each, postage 2 1/2 d.

SIL'CON DIODES, 3/6. Postage 2 1/2 d.

Fixing Brackets, 3d. pair.

COPPER INSTRUMENT WIRE
ENAMELLED, TINNED, LITZ.
COTTON and SILK COVERED

Most gauges available.

B.A. SCREWS, NUTS, WASHERS
soldering tags, eyelets and rivets.

EBONITE and BAKELITE PANELS,
TUFNOL ROD, PAXOLIN TYPE COIL
FORMERS AND TUBES, ALL DIAMETERS.
ERIE and DUBILIER RESISTORS.
Latest Radio Publications.

SEND STAMP FOR LIST. TRADE SUPPLIED

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

DICTAPHONES, 1 mains operated, £7/10: 1 spring operated, £6; both with headphones. Wax cylinder skimmer, precision job. 50/-, quick sale.—East Reading Radio, 1, Rupert St., Reading, Tel. 61833. 9422

ALLSCREWS Ltd., for B.A. screws, nuts, washers, studding, grub-screws, bolts, soldering tags, woodscrews, etc., plain or nickel or cadmium plated, one-gross packets or large quantities: stamp for lists.—270a, King St., Hammersmith, W.6. Riv. 7762. 10225

DECALS, the modern method of marking panels, controls, etc., in book form, each book containing approx. 500 words and abbreviations, etc., covering every aspect of electronics, price 4/9 and 3d postage.—Alexander Equipment, Ltd., Child's Place, Earls Court, S.W.5. 10243

ENGRAVING amateurs and trade could take the opportunity of engraving problems in the future by getting in touch with A.G. Engraving, 19a, Windmill Rd. London, S.W.18. Bat. 5793. Brass, bronze, erinoid, Perspex dials; one knob or repetition equally retained. 10034

COPPER wires enamelled, tinned, Litz, cotton, silk covered, all gauges; B.A. screws, nuts, washers, soldering tags, eyelets, ebonite and laminated bakelite panels, tubes coil formers; Tufnol rod; headphones, flexes, etc.; latest radio publications, full range available; list, s.a.e.; trade supplied.—Post Radio Supplies, 33, Bourne Gardens, London, E.4. 10139

LOUDSPEAKERS P.A. twin moulded horn, L Parmeko Admiralty type, new, 75/- each; Tannoy Military type, 17/6 each; Bendix transmitters TA-12C, £10 each; receivers RA-10, £10 each; radio compass receivers, MR-26, £12/10; Magship Hunters, 3-inch, 12/6 each; transmitters, 3 inch, 20/- each; Canadian type 58 Walkie-Talkie sets, £15; 5-line switchboards, terminal boxes, teleprinter keyboard perforators, re-perforators, Morse tape printers, smoothing units, filters, carrier relays; a in new condition.—E. Gillilan & Co., 52, South St., Worthing, Te. Worthing 8719. 19430

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc. if the applicant is a man aged 18-64 or a woman aged 18-59 in industry, business or the employer is exempted from the provisions of The Notification of Vacancies Order 1952.

RESEARCH.

A TYNESIDE engineering establishment has openings for designers or on development and maintenance of electronic instruments and control gear.

CANDIDATES should have degree or equivalent and experience. GIVE full details education, exper.ence, etc.—Write Box 3754, 19371

SILVER CITY AIRWAYS, Ltd.

INVITE applications for positions as ground radio engineers from experienced persons keen to return to the aviation industry.—Blackbushe Airport, Camberley, Surrey. 19351
CROWN Agents for the Colonies.

WIRELESS Station Superintendent (Temporary) required by the Gold Coast Government Posts and Telegraphs Department for two tours of 18 to 24 months in the first instance. Commencing salary, according to qualifications and experience in the consolidated scale £955 rising to £1,180 a year, with gratuity of £25 or £37/10 according to salary for each completed period of three months' service. Outfit allowance £60. Liberal leave on full salary. Free passages. Candidates must possess a Higher National Certificate in Electrical Engineering or equivalent, and have had practical experience in two or more of the following fields: V.H.F. link systems; H.F. communication networks; Frequency shift keying and teleprinter maintenance; V.H.F. and H.F. Direction finding systems; Aeronautical navigation aids (ground); manufacture of light engineering equipment. Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.29100.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 19338

CROWN AGENTS FOR THE COLONIES.

RADIO officer required by Nigeria Government Posts and Telegraphs Department for two tours of 18-24 months in the first instance with prospect of permanency. Commencing salary in scale £750 rising to £1,175 a year (including expatriation pay). Outfit allowance £60. Free passages for officer and dependants and assistance towards cost of children's passage or their maintenance in this country. Liberal leave on full salary. Candidates must possess a Postmaster-General's Certificate in Radio Telegraphy, or an Air-Operator's Certificate or an equivalent Service qualification. Full names in block letters, and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.29270.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 19356

NEW G.E.C., S.T.C. AND "WESTALITE" SELENIUM RECTIFIERS. Largest L.T. range in Great Britain. Latest Current Products: NOT Surplus.

JANUARY'S PRICE LIST

S.T. & C. HALF WAVE. 100 v. 2 a., 49/6; 4 a., 92/-; Post 1/-.

BRIDGE CONNECTED FULL WAVE. 17 v. 1.2 a., 16/4; 1.6 a., 26/-; 2.5 a., 29/-; 3 a., 30/-; 4 a., 34/6; 5 a., 37/6, all post free. 33 v. 0.7 a., 24/3; 1 a., 28/-; 1.5 a., 45/-; 2 a., 51/-; 3 a., 52/-; 4 a., 62/-; 5 a., 67/-; all post 1/- 54 v. 1 a., 38/6; 1.5 a., 62/-; 2 a., 69/-; 3 a., 70/-; 5 a., 93/-; 72 v. 1.5 a., 78/-; 2 a., 81/-; 3 a., 92/-; 5 a., 122/-; 100 v. 1.5 a., 112/-; 2 a., 128/-; 5 a., 174/-; all post 1/2.

BRIDGE CONNECTED HEAVY DUTY 7 1/2 in. SQUARE COOLING FINS. 17 v. 6 a., 49/6; 10 a., 56/-; post 1/6.

BRIDGE CONNECTED HEAVY DUTY Funnel Cooled, also 7 1/2 in. SQUARE COOLING FINS. Revised price, same both types. 17 v. 12 a., 102/-; 20 a., 118/-; 30 a., 164/-; 50 a., £12/15/-; 33 v. 6 a., 91/-; 10 a., 104/-; 12 a., 168/-; 20 a., 188/-; 54 v. 6 a., 120/-; 10 a., 142/-; 72 v. 6 a., 154/-; 10 a., 178/-; 100 v. 6 a., £11; 10 a., £12/15/-; all post 1/10.

"WESTALITE" (BRIDGE), 12-15 v. D.C., 1.2 a., 15/9; 2.5 a., 27/8; 5 a., 31/9; 10 a., 54/6; 20 a., 99/6; 30 a., 144/10; 24 v. 1.2 a., 15/9; 2.5 a., 27/8; 5 a., 10 a., 92/7; 20 a., 176/2; 36 v. 6 a., 154/-; 2.5 a., 51/-; 5 a., 69/10; 10 a., 130/9; post extra.

Wholesale and Retail

T. W. PEARCE (Est. 21 Yrs.)

66 GREAT PERCY STREET, LONDON, W.C.1
Off Pentonville Rd. Between King's Crr and Angel

RADIO & TELEVISION COMPONENTS

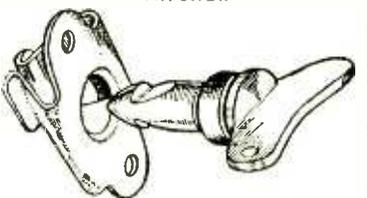
WE OPERATE A PROMPT & EFFICIENT MAIL ORDER SERVICE.

"VIEWMASTER" & "TELE-KING" specialists
Easy terms available.

JAMES H. MARTIN & CO.,
FINSTHWAITE, NEWBY BRIDGE,
ULVERSTON, LANCs.

ODDIE FASTENERS

PAT. 507249



THE FASTENER WITH ENDLESS APPLICATIONS—SIMPLE—POSITIVE SELF-LOCKING. MADE IN A VARIETY OF TYPES AND SIZES.

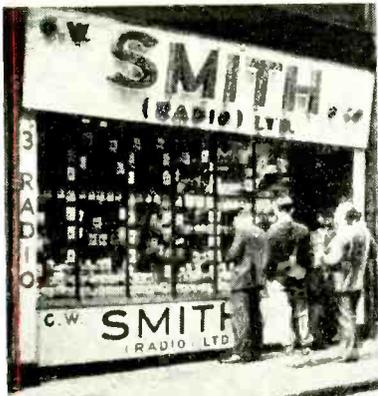
SPECIAL FASTENERS TO SUIT CUSTOMERS REQUIREMENTS.

WIDELY USED IN THE RADIO INDUSTRY.

Illustrated brochures and other information will be gladly sent on request. DEPT. "W.W."

Oddie, Bradbury & Cull Ltd., Southampton

Tel. : 55883 Cables : Fasteners, Southampton



A WINDOW WORTH LOOKING INTO

High Stab Resistors. 2 Meg. 2% 1 Watt, 1.2 Meg. 2% 1/2 and 1 Watt, 1.5 Meg. 5% 1/2 and 1 watt, 29.5 K. 2% 1/2 watt, 100 K. 5% 1/2 watt, 150 K. 5% 1 watt, 6- per doz. min. quantity.

Bleeder Resistors. 100 K. 150 watts, 200 ohms 150 watts adjustable, 800 ohm 150 watts, 350 ohm 40 watts, 40 K. 150 watts, 20 ohm 50 watts, 24 ohm 100 watts, all at 2% each.

Cossor 3339 Double Beam 'Scopes. Re-constructed complete and in working order, limited number only £35 each.

R.1294 Receiver, complete and in new condition. Tunable coverage, 300-3,000 Megacycles.

Constant Voltage Transformers. Advance, Input voltage 190-260 @ 50 cycle, Output 230 volts @ 150 watts, £7/10/-.

Venner Hour Meters, for operation on 200/250 A.C. 50 cycle, synchronous movement, capacity zero-10,000 hours. 62/6 each, brand new.

Auto Transformers. 110-250 volts 100 watts, 15/6, 1,000 watts, separately wound, £6/10/-, Ditto, 3,000 watts, £10/10/-.

Relays. All types in stock from 2/6 each, send us your enquiries.

Welding Transformers. Input voltage 230 volts 50 cycle, output 13/16 volt, 65/75 amps, 82/6 each.

Micro Switches. Large stocks available. Send us your enquiries.

Mains Transformers. Ex-W.D. Input voltage 230 volt A.C., output 500 x 500 volt 170 mA, 4 volt 3 amp., 22/6 each.

Smoothing Chokes. Ex-W.D. 15 Henries 275 mA, Resistance 125 ohms, 10/6 each.

Television Coil Formers with iron dust cores "Polystyrene" lin. x 1/4 in., single hole fixing, 6d. each, 5/6 per dozen. Television Condensers 1,000pF Midget Moulded Mica wire ends, 6d. each, 5/- per dozen.

Dural Masts, Telescopic 15in. to 7ft. 6in., 2/6 each, ideal for making your own T/V aerial.

Bendix Command Rotary Transformers. 12 volt input plug in type, output 250 volts 60 mA, 29/6 each.

Pots. 10 K. wire wound 3 watt rating, 1/3 each. Carbon Ditto 10 K. and 100 K., 9d. each. Min. quantities 12.

R1155 Receivers. Brand New in sealed boxes, aerial tested, £11/19/6 each.

Rectifiers, Metal. 850 volts 30 mA. 8/6 each. 10 volt full wave 1/2 amp., 6/9 each. 12 volt 3/4 amp., full wave, 16/9 each.

Valves. Brand New and Boxed. VU111, 4 volt E.H.T. Rectifiers, 2/6 each.

Microamp Meters 0-50, 2in. round flush mounting, 42/6 each.

B7G Holders. Ceramic with bottom screen, 10/6 per dozen.

H.R.O. 6 Volt Vibrator Power Supply units Type 686s, brand new, 52/6 each.

Rotary Converters. 24 volt D.C. input, 230 volt A.C. 50 cycle output @ 100 watts, 92/6 each. Ditto 12 volt input, 102/6 each.

A.C. Mains Transformers. 200/250 volt input, output 45 volt 4 amp., 19/6 each.

Don't forget your postage.
Open all day Saturday.

G. W. SMITH & CO.
(RADIO) LTD.
3 LISLE STREET, LONDON, W.C.2
Telephone: GERrard 8204/9155

CROWN AGENTS FOR THE COLONIES.

ASSISTANT signals officer required by the Government of Nigeria for the aviation department for one tour of 18 to 24 months in the first instance. Commencing salary (including allowances) according to qualifications and experience, either (a) in scale £750 rising to £1,315 a year with the prospect of permanency, or (b) in scale £807 rising to £1,453 a year, on a temporary basis with gratuity of £25 for each period of three months' satisfactory service. Outfit allowance £60. Free passages for officer and wife, and assistance towards cost of children's passages, or their maintenance in the United Kingdom. Liberal leave on full salary. Candidates must be Associate Members of the Institute of British Radio Engineers, or possess City and Guilds certificates in radio communication, or technical electricity, or a satisfactory pass in the Ministry of Civil Aviation Radio Mechanics course. APPLY at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.29637.G. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [9455]

ADMIRALTY.—Royal Naval Scientific Service.

ENGINEERS and Physicists (particularly with electronics) required for appointments in (a) Senior Scientific Officer and (b) Senior Scientific Officer (Ref. A246/52A) and (b) Senior Experimental Officer, Experimental Officer and Assistant Experimental Officer grades (Ref. A247/52A) in Experimental Establishments in London, Portsmouth, Weymouth areas and Scotland. Candidates, British subjects, for (a) must possess O or second-class honours degree in Physics of Engineering, or high professional attainments such as corporate membership of appropriate professional institution with suitable experience and responsibility and for (b) should possess one of the following qualifications: University degree in Science, Engineering or Mathematics. Graduate membership of appropriate professional institution, Higher National Certificate, Final certificate of five-year grouped course in relevant subject at City & Guilds of London Institute or comparable institution, Higher School Certificate with equivalent qualification. S.S.O.s at least 26 years of age with at least three years' approved experience, London salary scale (men) £750-£950 per annum; S.O.s at least 21 years £400-£650; S.E.O.s at least 35 years £780-£1,000; A.E.O.s at least 26 years £575-£725; A.E.O.s at least 17 1/4 years £250-£255. Rates for women and posts in Provinces somewhat lower. Starting salaries above minima may be granted according to age and experience. Salaries carry pay addition of approximately 10% on the first £50 plus 5% on second £500. All appointments unestablished (with F.S.S.U. for S.S.O. and S.O.) but with some opportunities to compete for established posts. Application forms, etc., from M. of L. & N.S. Technical and Scientific Register (K), Almack House, 26, King St., London, S.W.1, quoting appropriate reference. [9373]

KINGSTON UPON HULL EDUCATION AUTHORITY.

MUNICIPAL TECHNICAL COLLEGE.
PRINCIPAL: Emyln Jones, M.Sc., F.R.I.C.
REQUIRED to commence on April, 1953. Teacher (Assistant Grade B) for Radar and electronic engineering. Applicants must possess the Ministry of Transport Radar Maintenance Certificate or an equivalent qualification. Considerable practical experience in marine radar engineering is essential and applicants should preferably have had teaching experience. The person appointed will be required to conduct correspondence courses as part of the normal teaching duties.
SALARY: £490-£25—£765 per annum, plus additions for training and/or graduate qualifications.
FURTHER particulars and application forms, to be returned within 14 days of the date of this issue, will be supplied by the Chief Education Officer, Guildhall, Kingston upon Hull on receipt of stamped, addressed, foolscap envelope, [9454]

ASSISTANTS (Scientific) required by Government Department in Eastcote.

APPLICATIONS are invited from men and women between the ages of 16 and 25, possessing the equivalent of the General Certificate of Education or who are competent of reaching this standard within two years.
A PASS in Maths or Science an advantage.
OLDER candidates may be considered exceptionally on the grounds of experience in an industrial or technical branch of the Services.
THE work will be concerned with physics and electronics applying to communications.
IMMEDIATE appointments will be to un-established rank but opportunities to compete for established appointments will be given later.
SALARY (Intermediate)
MEN £198 (age 16) to £379 (age 28).
WOMEN £198 (age 16) to £340 (age 28).
WRITE: ESTABLISHMENT Officer (B.19A1), GOVERNMENT Communications Headquarters, LIME GROVE, EASTCOTE. [9413]
RUISLIP. [9413]
RADIO and television testers, good rates, 5-day week—Ace Radio, Ltd., Tower Rd., N.W.10, Wil. 3904. [9127]

EXPERIENCED capstan setter for milling and drilling; state age, experience and salary required.—Box 3815. [9386]

HOLLEY'S ANNUAL SALE of Slightly used Hi-Fidelity Equipment

- WILLIAMSON Amplifier with T/C Unit 19 gns.
- SOUND SALES 12-15 watt Amplifier 15 gns.
- LEAK RC/PA Tone Control Units from £3 10 0
- SOUND SALES DX Plus One Feeder Unit 14 gns.
- GARRARD 3 speed Autochange Unit £12 10 0
- COLLARO 3 speed Autochanger... £9 19 6
- COMPLETE HI FI RADIOGRAM Autochange 3 speed, built in Sound Sales Equipment £55 0 0
- DITTO using Hartley Turner Equipment £75 0 0
- Q.U.A.D. Amplifier with T/C Unit... £29 10 0
- SEVERAL 12in. L/S UNITS from £4/10/- each.
- SEVERAL FEEDER UNITS by known makers from..... 9 gns.
- BARKER 150 Speaker Unit £16 10 0
- SEVERAL RADIOGRAM CABINETS from..... £9 10 0
- REFLEX SPEAKER CABINETS for 10 and 12in. Units from..... £8 10 0
- SOUNDMIRROR Tape Recorder 55 gns.
- THREE SPEED GRAM MOTORS £5 19 6

STOP PRESS NEWS

AT LAST! A real HI-FIDELITY TAPE RECORDER. The GRUNDIG 75 gns. Call for demonstration, also GOODMAN'S AXIOM 101 102 8 in. Speaker units now in stock.

Demonstrations from 9.30 a.m.-1 p.m., 2-6 p.m. 1 p.m. Thursday.

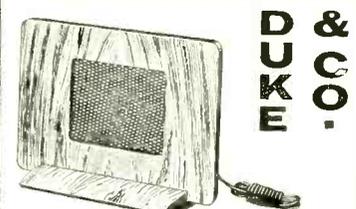
"The Firm with After Sales Service"

HOLLEY'S RADIO STORES

285, CAMBERWELL ROAD, LONDON, S.E.5

Telephone: RODney 4988

DUCKE & CO.



EXTENSION SPEAKERS. Brand new 5in. P.M. speakers on latest polished baffle stand with metal fret (gold sprayed), 19/9. Also in totally enclosed cabinets at 25/9. Post 1/9. Miniature m/c. phone speakers, new, 2/9. Post 0d.

SALVAGE RADIO-GRAM CHASSIS. 5 valve, three wave superhet. Ext. speaker and gram sockets. Latest pilot valves. End drive controls £7/17/8. Also brand new radio-gram chassis, six- and three-wave bands. Stamp for separate leaflet.

AUTO-CHANGERS. Salvage. Take eight 10in. or 12in. records. Famous maker. £5/19/6.

25/1196 SETS. Ideal for short wave reception. Convert to mains or battery (free drawing). Valves and some parts removed, but following remain: 4 tuning conds., 32 fixed conds., 28 res., trans., switches, v/controls, v/holders. 7/9. Post 2/.

TRANSFORMERS. Bargain offer of store soiled Mains Transformers. New, re-sprayed, guaranteed for three months. 260-0-260, 80 mA.; 8.5 v., 3 A., and 6.3 v. 1 A. Tapped 240, 210, 115 v. 9/9. Post 2/.

CONDENSERS. Two gang .0005 mfd. tuning condensers. All tested. Bargain offer at 2/9 each. Post 9d. Also single tuning condensers, .0005 mfd. 2/9 each. Post 4d. Electrolytics: 30-30 mfd., 450 v. D.C., 3/9; 12-12 mfd., 350 v. D.C., 3/9; 32 mfd., 275 v. D.C., 2/9; 8 mfd., 350 v. D.C., 1/9.

C.W.O. or C.O.D. Money back guarantee. Stamp for complete catalogue.

**621, ROMFORD ROAD,
LONDON, E.12. GRA. 6677**

S. S. ELECTRONICS, Ltd., invite applications for the following vacancies:

(1) JUNIOR test engineers who have completed N.S. Technical background, minimum qualification O.N.C.

(2) FOREMAN for small transformer shop, to take charge production and testing.

(3) WIREMAN capable of working from diagram to P.O. and similar standards. APPLY, giving full details salary, etc., to Byron Rd., Harrow, Middx. [9444

MINISTRY OF SUPPLY has vacancies at R.A.F. Signals Establishment to assist in one of the following:

1. RUISLIP (3 posts). General experimental work and tests in connection with design of radio communication and radar systems.

2. MEDMENHAM. (a) (6 posts). Installation design of airfield communications and landing air systems, equipment investigations and siting problems. (b) (1 post). Design of installations for large radio receiving and transmitting stations. (c) (1 post). Design of aerial and feeder systems. (d) (6 posts). Design development or test of prototype mobile and portable radio and radar installations. (e) (1 post). Reconstruction of a radar landing aid and organization of associated experimental investigations.

3. WATTON, Norfolk. Development of highly specialised radio and radar equipment. Minimum qualification (Science) but higher qualifications in Physics or Electrical Engineering may be advantage. Experience in duties outlined desirable and knowledge R.A.F. Signals equipment an advantage. Salary according to age, experience, etc., within ranges. Experimental officer (minimum age 25), £597-£754. Assistant experimental officer £264 (at age 18) to £555. Women somewhat less. Posts are unestablished. Application forms from M.O.L.N.S., Technical and Scientific Register (K), Almack House, 26, King St., London, S.W.1, quoting D.416/52A. Closing date January 12, 1953. [9354

CAPABLE senior and junior engineers required for development work on radio and television, apply by letter with full particulars to: **PILOT RADIO, Ltd.** Park Royal Rd., N.W.10. [9409

A. V. ROE & Co. Ltd. have a vacancy in their engineering research department on interesting development work for an **ELECTRONIC engineer**, preferably with knowledge of electronic equipment used in vibration testing; some knowledge of vibration and fatigue an asset. **APPLICANTS** for the above post should possess at least Higher National Certificate or equivalent. **GOOD salary and prospects. PENSION and life assurance scheme. APPLY,** stating age, qualifications and experience to **THE Labour Manager, A. V. Roe & Co., Ltd., Greengate, Middleton, Manchester.** [9251

ENGINEER manager required with experience in the layout of new works for production of batch and mass-produced articles connected with electrical industry. **APPLICANTS** should have had similar experience, where modern methods have been employed for machining and assembly and able to produce satisfactory results essential; only those capable of commanding a substantial salary need apply for the post, which is permanent and pensionable.—Full details of experience and age should be sent in confidence to Box 3885, 19398

RADIO and television service engineers required for City radio factory. 5-day week-staff fifteen.—Apply A. J. Balcombe, Ltd., 52-54, Catherine St., London, E.C.2. [9538

PROGRESS engineer required; familiar with radar equipment; electronic prototype work and service specifications; driving licence an advantage; state age, experience, salary required.—Box 3516, [9387

K. COLE, Ltd. (Malmesbury Division) invite applications from electronic engineers for permanent posts in development laboratories engaged on long-term projects involving the following techniques and Transmission.

1. PULSE Generation and Transmission.
2. SERVO Mechanism.
3. CENTRIMETRIC and V.H.F. Systems.
4. VIDEO and Feedback Amplifiers.
5. V.H.F. Transmission and Reception.
6. ELECTRONICS as applied to Atomic Physics.

THERE are vacancies in the Senior Engineer, Engineers and Junior Grades. Candidates should have had at least 3 years' industrial experience in the above types of work, together with educational qualifications equivalent to A.M.E.E. examination standard. Commencing salary and status will be commensurate with qualifications and experience. Excellent opportunities for advancement are offered with entry into a pension scheme after a period of service.—Forms of application may be obtained from Personnel Manager, Ekco Works, Malmesbury, Wills. [8719

EXPERT T.V. service engineer wanted for South Bedfordshire (Dunstable) dealer; good accommodation provided at reasonable rent after 3 months' trial if satisfaction, some workshop experience; enclose copy references. **CHATTELL, Murphy and Pye Dealer, 40, High St. North, Dunstable, Tel. 340.** [9400

WIREMAN required, experienced wiring electronic equipment including radar, etc., must be capable of working direct from theoretical circuits without supervision, some workshop experience an advantage.—Box 3688, [9365

D. NAPIER & SON, Ltd. Luton Airport, Beds. require electronics laboratory assistant, familiar with C.R.O. practice, keen on development of new techniques for experimental work on aero engine development and allied projects. **APPLICATIONS** stating age, experience and salary required should be made to the local Employment Exchange. [9304

SOUTHERN RADIO'S WIRELESS BARGAINS

RECEIVERS. Teleonic 4 valves Battery Portable. Complete with 4 Midget Valves. In metal case 5 1/2 x 7 x 2in. Easily convertible to Personal Portable, 40/- including conversion Sheet.

TRANSMITTER-RECEIVERS (Walkie-Talkie) Type 38 Mark II. With 5 Valves. Microphone, Headphones, Aerial, Less Batteries. Guaranteed, £4/15/- Post Paid.

TRANSMITTER-RECEIVERS. Type "18" 6-9 Mega. Guaranteed Perfect, £7/10/-.

RECEIVERS R109 COMPLETE WITH ENCLOSED SPEAKER, and Vibrator Pack for 6 Volts, 1.8 to 8.5 Mega. Complete with 8 Valves in Metal Case, £7/15/-, plus 7/6 carriage.

INDUCTION MOTORS. Shaded Pole A.C. Mains, 120/240 Volts 2,500 R.P.M. Ideal for Recorders Models, etc., 23/-

LUBRA HOLE CUTTERS. For use on Wood, Metal, Plastic etc. Adjustable from 1in. to 3 1/2in., 5/9.

THROAT MICROPHONES Complete with Long Lead and Plug, Magnetic, 4/6.

PLASTIC TRANSPARENT MAP CASES. 14in. by 10 1/2in. Ideal for Charts, Photos Display, etc., 5/6.

STAR IDENTIFIERS with Hydrographic office Mods. A-N Type, New, in cases, 5/6.

WESTECTORS. Wx6, W112, 1/- each.

MARCONI AERIAL FILTER UNITS. Type "916." Full Fixing Instructions. P.O. Specifications, 4/6.

CONTACTOR TIME SWITCHES. 10-hour Movement 2 Impulses per Second. Thermostatic Control. In Sound-proof cases, 11/6. REMOTE CONTROLS for use with same, 7/6.

VISUAL INDICATORS Type 3 (10q4). Contains 2 Microamp Meter Movements, Neons, etc. Easily convertible to very efficient M.C. Meters as described in W.W., 11/-.

RESISTANCES 100 Assorted Values. Wire Ended 1 to 2 Watts, 12/6 per 100.

CONDENSERS 100 Assorted Tubular and Mica Condensers all useful values up to 2Mfd., 15/- per 100.

GRAMOPHONE MOTORS. GARRARD INDUCTION. 100/250 Volts A.C. 78 R.P.M., Brand New, £4/17/6. Full list of Radio Books 2jd.

HUNDREDS OF MORE LINES FOR CALLERS.

SOUTHERN RADIO SUPPLY LTD.
11, LITTLE NEWPORT STREET, LONDON, W.C.2.
GE RRARD 6653.

RELAYS try KAYES.

We Build them at competitive prices.

UNIVERSAL ENGINEERING CO.

(Subsidiary)

11, ST. ANNS ROAD, HARROW, Middlesex.

Telephone: HARrow 1432.

Repaired Standardised

TEST METERS



THE ELECTRICAL INSTRUMENT REPAIR SERVICE
329 Kilburn Lane, LONDON, W.9. Tel. LAD 4168

DE LUXE TV CHASSIS



FACTORY BUILT SUPERHET CIRCUIT. Any Frequency. AC/DC. 9 kV. E.H.T. Aluminised Thbe. 1.95 2 Glass Valves. 12" or 15".

PRICES FROM £54. Ready for Use.

Guaranteed 12 months and immediately available. Also in beautifully made Walnut, Table or Console Cabinets. S.A.E. please for full details of six models.

NEW TELEVISION OF QUALITY

CINESMITH PRODUCTS Est. 1932.

BRITANNIC WORKS, REGENT ST

BARNESLEY. 'Phone: 4445.

THE AMOS & JOHNSTONE

F.M. FEEDER UNIT

for 87.5—100 mc/s
(SEPTEMBER ISSUE)

is Simple & Inexpensive

SMITHS

of EDGWARE ROAD

can supply the complete set of parts as used by the designers, with chassis ready drilled, for 70/- (less valves and diodes).

All components for their "Sensitive T.R.F. Receiver" (Nov. 1951) still available. Reprint 1/-.

Priced component list on receipt of S.A.E.

H. L. SMITH & CO. LTD.

287/289 Edgware Road, London, W.2

Telephone: Paddington 5891

Hours 9 till 6 (Thursday, 1 o'clock)

Near Edgware Road Stations, Metropolitan & Bakerloo

Something completely
NEW
in High-Fidelity
AMPLIFIERS

Any good amplifier can produce the most disappointing results if the input circuit is not correctly matched to the radio or gramophone unit feeding it. Most amplifiers are made without any knowledge of the other equipment to be used with them and the input circuit, therefore, is a compromise which may or may not result in a satisfactory performance. The Nusound 8½ watt is not a mass-produced product of this kind. The basic circuitry is identical in all models but the input circuit is designed to individual requirements. The customer tells us which pick up or feeder units are to be used (our own or any other good make) and the amplifier is supplied to ensure the very best results possible from the combination.



Nusound 8½ watt Quality Amplifier — PP 6V6—Independent Bass and Treble boost and cut—neg. Feedback—provision for Radio Feeder Unit—Freq. response 25 to 20,000 c.p.s. ± ½ DB—hum 80DB down at 6.5 watts—Feedback 14 DB. Price only £15/17/6, also available with Remote Control Unit, Price £17/10/-.

... and something completely
NEW
in High-Fidelity
FEEDERS

It is generally conceded that the V.H.F. broadcasts from the B.B.C.'s Wrotham transmitter provide the highest quality of sound available to the listener to-day. Here is a Nusound feeder unit designed specifically to take advantage of this fine source of entertainment. This unit, with its output of 250 mV., together with a Quality Amplifier offers a performance to delight the most discriminating ear. Price £7/19/6.

NUSOUND PRODUCTS LTD.
(Dept. W. 11) WARDOUR ST., LONDON, W.1.
Tel: GERrard 8845

- MILLIAMMETERS. 0 to 50 Mc/c., 2½in. scale, 8/6 each, post 9d.
- SLYDLOCK FUSES. 30 amp., new, sample 3/6, post 4d. 36/- doz., post 11d. SLYDLOCK FUSES. 15 amp., new, sample 2/-, 30/- doz., post 11d.
- AMPLIFIERS TYPE 1134a. Less valves, contain 3 transformers, key switch, etc. 2 v. L.T. 120 H.T. Make good pick-up. New in transit cases, 8/6, post 1/6.
- TOGGLE SWITCHES. Ref. No. 51/531. Single Pole C/o 7/6 doz., post 6d. 72/- gross, post 1/-, 10,000 available.
- SIEMENS H/S RELAYS. Twin 37 Ohm coil, new 7/6, post 6d. Many other relays. P.O. 3,006 and P.O. 600.
- GERMANIUM CRYSTALS. 4/- each, 42/- doz.
- TWO-WAVE CRYSTAL SET COILS, including diagram, 2/6 each, post 3d. 24/- doz., post 1/-.
- R.A.F. NAVIGATOR'S PRISMATIC COMPASS. Type 02A. Large size, new in transit case. Original cost £75, our price 50/- post 2/-.
- Also large stock SINGLE PHASE MOTORS, 1/6 h.p. to 1 h.p. Send S.A.E. For List.

L. C. NORTHALL
16 Holly Road, Quinton, Birmingham, 36
Retail: 418, High St., Smethwick. Phone: WOO 3122

RADIO engineers, marine radio operators and testers and inspectors required for positions as good pay; apply in first instant to—Masteradio, Ltd., Treforest Trading Estate, Glam. [9407]
WORKS manager wanted by light electrical engineers in S.E. London with coil-winding machine and assembly shops and employing 450.—Write stating age, qualifications, detailed experience and salary expected Box 3266. [9254]

ENGINEERS and Assistants required in Test Room for the manufacture and adjustment of Precision electrical apparatus; write or apply in person to—H. Tinsley & Co. Ltd., Werndee Hall, Stanger Rd., S. Norwood, London, S.E.25. [0222]

INSPECTOR. used to radio components; applicants must have high standards and ability to maintain discipline and improve quality; state full details of experience, salary required and salary now received; replies strictly confidential.—Box 4096. [9465]

WANTED by Radiomobile Agents, radio mechanic with thorough knowledge of installations and repairs of all radiomobile receivers; write giving experience and salary required.—Lindsay Bros., Ltd., 925, High Rd., North Finchley. [9448]

TECHNICAL assistants required for development of electro-mechanical and electronic instruments (marine). Work involves initial experiments, design trials, pre-production models and factory liaison. Occasional visits overseas are arranged.

QUALIFICATIONS: Practical, 5 years' workshop or drawing office experience. Academic. City & Guilds Telecommunications Final Group Certificate. APPLY Personnel Dept., Kelvin & Hughes, Ltd., Barkingside, Essex. [9551]

THE Research Laboratories of The General Electric Co., Ltd., propose to set up an organization near Adelaide, South Australia, for trials and further development of guided weapon equipment which is at present under development in this country. APPLICATIONS are invited from men with qualifications suitable to fill the following vacancies:—

(a) AN engineer to take charge of trials teams.
(b) AN engineer or physicist to take charge of a laboratory engaged on the development and use of special test equipment.

(c) A PHYSICIST or mathematician to take charge of a small group on the analysis and assessment of trials results.

CANDIDATES should have an honours degree or equivalent qualification. For post (a) and (b) they should have had experience of modern radar or similar equipment and of supervising the work of a small number of experimental workers. It is desirable, together with ability to write clear concise reports and supervise the work of a small number of assistants.

The successful applicants will commence employment in this country on the date they will ultimately be doing in Australia, and will be transferred to that country in due course.

DETAILED conditions of employment, housing, passages to Australia, etc., will be given to candidates who are selected for interview.

REPLY, quoting reference KTH/AUST, to the Staff Manager, G.E.C. Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middlesex, stating age, qualifications and experience. [9350]

VACANCIES exist at the Stanmore Laboratories of The General Electric Co., Ltd., as under. Applicants should apply to the Staff Manager, The Grove, Stanmore Common, Stanmore, Middlesex, quoting the reference against the vacancy and stating age, qualifications and experience.

i. GRADUATE mechanical engineer is required for work on light engineering mechanisms of a reciprocating type; here to five years' experience or more is required.—(Ref. SS/WW.1.)

ii. ENGINEER with Higher National Certificate in Mechanical Engineering is required with practical experience of small mechanisms.—(Ref. SS/WW.2.)

iii. SENIOR engineer or physicist with Honours degree is required for design of system test equipment required in connection with airborne radar; previous experience in the field is essential; applicants should be between 30 and 35 years of age.—(Ref. SS/R.1.)

iv. SENIOR assistant is required for flight trials and assessment of airborne radar equipment; experience of radar and similar work in the laboratory and in the air under operational conditions is essential; candidates must be prepared to travel and work away from the Laboratories.—(Ref. SS/LK.1.)

v. PHYSICISTS and engineers with Higher National Certificate or degree are required for electronic circuitry and servo mechanisms and smaller electro mechanical devices.—(Ref. SS/JM.1.)

vi. PHYSICISTS and engineers are required for the microwave field to work on aerials and components.—(Ref. SS/AH.1.)

vii. PHYSICISTS and engineers with degrees and Higher National Certificates are required for a field trials team and for assessment work in connection with the trials; candidates must be prepared to travel and work away from the Laboratories.—(Ref. SS/JP.1.)

viii. ENGINEERS and physicists with Higher National Certificates are required for the design of small quantities of transformers for experimental apparatus.—(Ref. SS/NB.2.)

ix. ENGINEERS and physicists with experience on magnetic amplifiers or small power electric motors are also required.—(Ref. SS/NB.3.)

x. THERE is a vacancy for an engineer or physicist for work on transistors and cold cathode valve circuitry.—(Ref. SS/NB.4.) [9348]

PREMIER
(REGD.) ESTAB. 40 YRS.
RADIO COMPANY

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

OPEN UNTIL 6 p.m. SATURDAYS

R1132A RECEIVER. Complete with Valves £3.19.6
Plus Pkg. & Carr. 10/6

Type APN4 RECEIVERS containing 1—6SN7, 4—6SK7, 1—6SA7, 1—VR105, 1—6H6, 1—6SL7, 1—5U4G, 3—6B4G, 2—2X2, 1—6SJ7 £5.5.0
Plus Pkg. & Carr. 7/6

Type R3136 RADAR RECEIVER UNIT containing 19 valves, 6—VR65, 2—6J7C, 2—VR116, 3—6Q79, 1—VR54, 1—VR137, 2—VR136, 1—VR92, 1—5Z4G. The Unit incorporates an R.F. strip followed by an IF strip £5.7.6
Plus Pkg. & Carr. 10/6

Type R1155 RECEIVER. Frequency range 18.5 mcs.—75 Kcs. in 5 wave-bands complete with 10 valves £11.19.6
Plus Pkg. & Carr. 10/6

Complete with Power Pack £16.19.6
Plus Pkg. & Carr. 15/6

Type R1155 POWER PACK complete with 6½in. Speaker and 6V6 Output stage £5.5.0
Plus Pkg. & Carr. 3/6

Type 1124 RECEIVER with Range 30 to 40 Mc/s. Contains six new Valves, 3-0D2, 1-8D2, 1-15D2 (frequency changer), 1-4D1, 24 ceramic trimmers, 6 ceramic valve-holders, 6 valve screening cans, 30 resistors, 1-W/W Pot. Meter Mica Tubular and Block Condensers. Ceramic coil former, 2 Westector WX6 and 1 Westector WX4, 5-way 4-bank switch with long spindle I.F. transformers, etc. Brand new in maker's carton at £12.6
Plus Pkg. & Carr. 2/6

Type R3170A RECEIVER, a 16 valve VHF Receiver incorporating a 30 mcs. IF strip, 2—CV66, 1—VU39, 2—EA30, 1—CV188, 1—VR137, 8—EF50, 1—VU134 £4.2.6
Plus Pkg. & Carr. 7/6

Type TR9H TRANSMITTER/RECEIVER consists of transmitter type T1896 and Receiver R1139 in one case. This is a 9 valve battery operated unit covering 4.3 mcs. to 6.6 mcs. Crystal controlled, complete with valves. Less crystal £210.0
Plus Pkg. & Carr. 10/-

Type R1355 RECEIVER AMPLIFIER with 5 IF Stages for T.V. conversion. Contains 7 VR65's, 1—5U4, 1—VU120, 1—EA50 £19.6
Plus Pkg. & Carr. 10/-

Type RF25 UNITS frequency covered 40-50 mcs. (6-7.5 metres) switched tuning, 5 Pre-set positions complete with 3 VR65's £15.0
Plus Pkg. & Carr. 2/6

Type RF26 UNITS. The ideal short-wave converter for T.V., variable tuning, contains 2—EF54, 1—VR137 £19.6
Plus Pkg. & Carr. 2/6

As a special offer we can supply the R1355 complete with RF.24 or RF.25 at 59/6, or with RF.26 at £4.17.0, plus carr.

Type 6L INDICATOR UNITS complete with VCR07, 4—VR91, 3—VR54 £3.15.0
Plus Pkg. & Carr. 7/6

ROTARY CONVERTER POWER SUPPLY UNITS. 12 v. D.C. Input 230 v. 30 mA Output. Completely smoothed. Complete with case. £19.6
Plus Pkg. & Carr. 5/-

CALL AND SEE OUR VAST DISPLAY OF RADIO, AND T.V. COMPONENTS

TERMS OF BUSINESS—
CASH WITH ORDER OR C.O.D.

Please quote Dept. E.M.

207, EDGWARE RD. LONDON, W.2

Phones: 4033, Paddington 3271/2, Ambassador 4033.

RADIO COMPONENTS — SURPLUS

New and Unused—Trade Offers

SWITCHES. All one-hole fixing. Yaxley types, 2 bank, single pole, 6 way double spaced, no stop switch is drilled for this. 15/- doz. Smaller type, 3 bank, 2-pole, 6-way, total of five poles only, 15/- doz.

SLEEVING. High voltage ex-Govt. 2 mm., black, 5/-, 100 yds. 3 1/2 mm., black, 5/-, 100 yds. 4 mm., blue, 6/9. 100 yds. Per/braid, black, 3 mm., per gross 8/-, Varmlashed cotton 4 mm. brown, this slightly flattened but electrically sound, 7/6 gross.

TRIMMERS. 25 mm., preset with locknut, on ceramic, boxed singly, cellophane wrapped, 30/- gross, postage 4/-; ditto loose, cellophane wrapped, 18/- gross.

VITREOUS RESISTORS. L.T. types, 23 ohms tapped, 4 ohms, no taps, 3.59 tapped, 6/9 doz.; 3 doz. 15/-; per gross 48/-.

SLIDING RESISTORS on stand, worm drive, 25 amps 4 ohms, parallel wound, can be 0.8 ohm by slight alteration, 8/9 each.

CONDENSERS. Upright with feet, 1 mf. 500 v., 6/- doz. 5 x 3 250 v. N.I., heavy terminals, 4/6. 11 x 7 250 v. N.I., oil filled, extra heavy terminals at side 8/6 each. Mica moulded 0.004 mf., 1.250 v. wkg., 20/- gross, all perfect insulation.

FILTER BOXES. Metal with fixing bracket, hasswitch, cond. and res. co-axial input and output, in open ended cartons, 8/- doz. P.F.

VARIABLE CONDENSERS. 4-gang straight type, slightly soiled, 6-8/- P.F., or perfect 3/- each, plus post.

Terms C.W.O. or C.O.D. Full list on request.

See classified columns for retail offers.

G. A. RYALL,

"UTOPIA," MAYFIELD ROAD,
HERNE BAY, KENT

F.M. ("W.W." Oct. '52) COILSETS
T.V. S'HET (3/4") COILSETS
PRECISE COILWINDING

BEL SOUND PRODUCTS CO.
Marlborough Yard, London, N.19
Tel.: ARChway 5078

"TYANA"

SOLDERING IRON 16/9



The Perfect Small Soldering Instrument—overall length 1 1/2 in., diameter of bit 1/16 in.

- Adjustable Bit.
- Easy to handle.
- Weight approx. 4 ozs
- Heating Time 3 min
- 40 Watt. economy Consumption.
- Standard Voltage Ranges. (Other Ratings Available on Request.)
- Long Life and Efficiency.
- Replacement Elements and Bits always available

Just the Convenient iron Required for Intricate and Fine Work.

Reqd. Design No. 867804 Soldering, Maintenance Service for Industrial users. British made by:—

KENROY LIMITED

152,297 UPPER ST., ISLINGTON LONDON, N.1.

Telephone: Canonbury 4905-4663

EXPERIENCED TV engineers required for retail service, permanent positions at good salary.—Full details to Shenstones (op. Town Hall), Leyton, E.10. Lev 1362. [9266]

RADIO engineer with practical knowledge of R.A.F. or Fleet Air Arm radio or radar equipment, required; post-war experience an advantage.—Applicants should apply in writing to Chief Inspector: A. J. Whittmore (Aeradio), Ltd., Croydon Airport. [9388]

ENGINEER required to undertake the development of low frequency iron-cored components; previous experience desirable; salary according to qualifications and experience.—Apply in writing to Advance Components, Ltd., Back Rd., Sernhall St., E.17. [9392]

TELEVISION and radio service engineer required; must be fully experienced; telecommunication knowledge an advantage, also driving ability desirable; excellent wages and prospects to the right man.—Apply Vallance & Davison, Ltd., 148, Briggate, Leeds, 1. [9347]

Competent radio and television engineer required for service in Bedford area, one with limited television experience may be acceptable, good rates of pay and working conditions; assistance given to find accommodation.—Write Radio Service Manager, Box 3957. [9414]

RADIO engineering engineers required immediately by well-known firm of manufacturers in the S.E. London area; men must have good knowledge of television servicing.—Apply, giving details of experience and qualifications, to Box 4022. [9437]

FERRANTI Ltd. have immediate vacancies for men with electrical engineering qualifications to undertake the advanced testing of Naval anti-aircraft fire control equipment involving electronics and servo mechanisms either in firms, workshops or on board H.M. Ships in home ports. [9437]

SALARY in accordance with age and experience between £356 and £650 per annum, normal expenses plus a generous allowance are paid when working out; previous experience of this type of work though desirable, is not essential. Forms of application from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Lancs. PLEASE quote reference HGN/X. [9322]

FERRANTI, Ltd. require for their Radio and Television Department a radio engineer to design production equipment and to be responsible for maintenance and modification of existing equipment; a man of H.N.C. or equivalent qualifications with some experience of modern radio practice is needed. [9322]

PERMANENT staff appointment with pension benefits and good prospects of advancement; salary in the region of £8-£11 per week. FORMS of application from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Lancs. [9322]

PLEASE quote reference HW/T [9314] LABORATORY assistant, preferably with some experience, required to construct and use specialised electronic equipment.—Apply in writing, giving details of experience, to Personnel Officer, Associated Electrical Industries, Ltd., Research Laboratory, Aldermaston Court, Aldermaston nr. Reading. [9322]

RADIO service mechanics are required by S. Smith & Sons (England), Ltd., of Cricklewood, N.W.2; starting at £8.5 per week, plus profit sharing bonus, there are good prospects of advancement together with career facilities and a five-day week.—Write for interview to Personnel Officer (Radiomobile), [9242]

PYE TELECOMMUNICATIONS, Ltd. Dilton Works, Cambridge, will shortly have vacancies for senior and junior engineers, experience in V.H.F. design and engineering is essential; vacancies also exist for engineers with specialist experience in multi-channel V.H.F. Telephony; salary according to qualifications and experience. PLEASE apply, stating age, qualifications and experience to the Personnel Manager. [9209]

TECHNICAL assistants required for work in electronics laboratory, National Certificate standard, experience in development of v.h.f. equipment and pulse and wide band amplifier technique, good prospects.—Write, stating age, qualifications and experience, to Personnel Manager, Burndell, Ltd., Erith, Kent. [9461]

ENGINEER required for theoretical and experimental work on aircraft fuel contents gauging; qualifications, electrical engineering or physics degree or equivalent; experience of measurements problems advantageous; south-west of London. Send tabulated details of experience, quoting Ref. E9, to Box 3771. [9379]

REQUIRED, mechanical inspectors, experienced in the inspection of high quality scientific instruments, also electrical inspectors and testers, preferably with experience in small transformers and/or electronic equipment.—Apply by letter to E.M.I. Engineering Development, Ltd., Penlegh Works, Wells, Somerset. [9346]

SENIOR radio designer required: an interesting and responsible job with excellent future prospects is waiting for an engineer with several years' experience in development of home and export radio receivers.—Applications may be addressed in confidence to the Personnel Manager, J. Murphy Radio, Ltd., Welwyn Garden City, Herts. [9401]

DECCA RADAR, Ltd. invites applications from microwave, electronic and mechanical engineers to join the Company in its extensive work in the wide field of microwave link and radar development. The Company offers excellent starting salaries and first rate opportunities for men to exploit their initiative and to rise rapidly to responsible posts; graduates without industrial experience who are prepared to undertake intensive training are so invited to apply for junior posts.—Apply in writing to Research Director, Radar Laboratory, 2 Tolworth Rise Surbiton, Surrey. [9240]

SAMSONS SURPLUS STORES

S.T.C. FIELD HAND TELEPHONE SET. Complete Unit in metal Container which can be easily held in one hand, operates from 44 v. flat battery. Buzzer calling device will work efficiently up to 15 miles, on twin cable or 10 miles earth return, suitable for Offices, Farms, Building sites, Estates, etc., 65/- each instrument. P.F. 2/-.

TELEPHONE CABLE D.3 Single 1 Mile drums 55/-, Carr. 5/-.

HEAVY DUTY TRANSFORMERS. Prim. 200/230, Sec. 10 volts 15 amps., 32/6. P.P. 2/6. Prim. 200/240 volts, Sec. 6.3 volts 15 amps., 25/-, P.P. 2/6. Prim. 230 volts, Sec. 12 volts 10 amps., 22/6. P.P. 2/6.

MINIATURE LIGHTWEIGHT 4 VOLT REVERSIBLE MOTORS. Ideal for models. Size 1 1/4" x 1 1/4" x 1 1/4", 7/6. P.P. 1/6.

HEAVY DUTY SLIDING RESISTORS. 20 ohm, tapered, 7.5 to 1 amp. Gear drive, 45/-, P.P. 2/6; 0.5 ohm, 25 amp., 17/6. P.P. 1/6; 16 ohm, 2 amp., 12/6. P.P. 1/6; 1 ohm, 12 amp., 12/6. P.P. 1/6; 8 ohm, 5 amp., 17/6. P.P. 1/6; 50 ohm, 1 amp., 10/6. P.P. 1/6.

MASTER VOLTMETERS. 0-20 v. A.C. 50 cy. Moving Iron 6in. Mirrored scale by Metro-Vick, 27/6, carr. 2/-.

169/171 Edgware Road

London, W.2. Tel. PAD. 7851

125 Tottenham Court Road, W.1

Tel. EUS. 4982

All orders and enquiries to our Edgware Road branch, please. This is open all day Saturday

WEBB'S Radio

for INDUSTRIAL ELECTRONIC SUPPLIES

'PHONE GERRARD 2089 for our "SAME DAY" SERVICE

appreciated for 25 years by GOVERNMENT DEPARTMENTS COMMERCIAL LABORATORIES RESEARCH ESTABLISHMENTS HOSPITALS, etc.

Unrivalled Stocks of components and complete apparatus

WEBB'S RADIO

14 Soho Street, London, W.1 Gerrard 2089

LYONS RADIO Ltd.

RECEIVERS, TYPE R.1132. These are a top grade, 11 valve superhet, receiver having a frequency range 100-125 Mc/s. Circuit: R.F. amplifier, freq. chgr., osc., stabiliser, 3-L.F. amplifiers, B.F.O., Det., 1st audio and output. Valves employed are 4-VH53's, 2-VR65's and 1 each of V186, V187, V870, V.H54 and V.H57. Fitted with tuning meter, precision slow-motion drive, R.F. and L.F. gain control etc. Circuit diagram and component values given on card inside dust cover. Made for bench or rack mounting, size 19 x 11 x 18in. In good unused condition. Price £4/10/-, carriage 7/6.

POWER UNITS, TYPE 3. Input 200/250 v. A.C. mains. Outputs: 220 v. approx. smoothed D.C. at 70 mA., and 6.3 v. A.C. at 1 A. Specially designed for the above receiver, also for the R.1481. Our November advert gives fuller details. For bench or rack mounting order. Price £4/4/-, carriage 7/6.

SPECIAL OFFER. R.1132 and Power Unit type 3 ordered together. Price £8/19/6, carriage free U.K. **SAPPHIRE GRAMOPHONE NEEDLES.** Provide for over 2,000 playings for each needle with less record wear and improved reproduction. TRAILER for magnetic or ordinary gramophone and STRAIGHT type for midget pick-up. A special bulk purchase enables us to offer these at the very low Price of 4/- either type.

HIGH RESISTANCE EARPIECES. American light-weight (approx. 1 1/2 ozs.). D.C. resistance 3,000 ohms. Price 5/- each, post free.

3 GOLDHAWK ROAD, (Dept. M.W.), SHEPHERDS BUSH, LONDON, W.12

Telephone: Shepherds Bush 1729

The KAYE ELECTRICAL DISTRIBUTING CO.

ST. ANNS ROAD, HARROW, MIDDLESEX

Invite Cash Offers for the following Stock surplus to requirements.

One only P.A.X. No. 4119a Automatic Telephone Exchange 10 line complete with Table Type Telephones (can accommodate 25 lines).

500 only 3,000 type Relays, 300 300 ohms lin. Toe Slug, Contacts 1 make H.D. 1 make L.D. 500 only 600 Type Relays 400 ohm. Coil, 5 make L.D. N/S Contacts.

1,000 yards in 100 yd. Coils 23/36 C.T.S. Cable 5 Way.

300 only 4151AG Polarised Relays 2 x 600 ohm Coils.

4,000 only 100ft. 7 Strand C.T.S. Aerials Tag Ends.

300 only 1 lb. Reels Fry's 40 60 Solder.

20 only Magnetic Relays Heavy Duty Type FE-U 21 amps. 1 Ph.

20 only Ditto Key Type High Speed for Grid Control Admiralty Pattern 1526a.

48 only 24 volt Small Rotary Generators SO 250 v. .06 amps.

210 only Type 3a Telephone Units complete with all Relays, Keys, Jacks, Lamps. No. 25 Bell Set, C Type Generator and Cable connector.

100 only Automatic Slipping Cam Phone Dials, engraved 0-9.

A Brooks 2 H.P. 250 v. 1 Ph. Motor.

2,500 yards in 100 yd. Coils 6 way screened Telephone Cable.

300 only American Remote Contactors.

4,000 only No. 4162A T.F.G. Telephone Jacks.

300 only 3,000 Type Relays, 270 x 270 ohms. Coils Contacts 2 H.D. Make.

50,000 approx. Mixed Carbon Brushes.

30,000 only Telephone Lamp Jacks with Green, Red and White Indicator Caps.

1,000 only 5 amp. 2 pin Flush Sockets Bakelite Flange, Porc. Base.

2,000 only Toggle Type Sweeper Switches 250 v. for Sweepers etc.

300 only 230/50 v. 1 Ph. Ironclad Mains Buzzers.

17,000 Jones Plugs and sockets 8 way and 4 way.

200 only 6 Valve Short Wave Battery Sets with Valves Type 1120, ex-Government Surplus material.

2,000 only Telephone Keys, No. 174.

300 yards 90/36 Triple Circular Cable 633 megohm Grade Heavy Duty Canadian Manufacture 3/4 in. dia.

300 only Specially built 4 Way Ball Joint Telephone Keys 2 c/o each way.

500 Momentary "Off" Toggle Switches.

APPARATUS BOXES

Standard size: 8 x 7 1/2 x 4 1/2 inches deep (with front panel and screws). Price: 18 swg. Aluminium, 23/- each; 20 swg. Steel, 17/9 each. (With 4 rubber feet, 1/6 extra.) Finish: Wrinkle or Glossy enamel. Colour: Black or Grey. Chassis to fit 15 gauge Aluminium 5/-. The above size is available ex-stock. Other sizes to order.

Terms: C.W.O. or C.O.D. Carriage extra on orders under £2. We also manufacture specialised electronic apparatus.

Trade Enquiries invited.

SUTTON COLDFIELD
Electrical Engineers

6 HIGH ST., WALSALL. Phone 4962

SENIOR Draughtsmen required for checking in a large engineering company situated in the East London area. Applicants should have had previous experience of electronic equipment. Good salaries and staff conditions; pension scheme in operation.—Please write, giving details of experience, to Box 4047, quoting reference N.98 [1946]

ELECTRICAL assistant required for an industrial metallurgical research laboratory in the S.E. London area. To help with problems connected with furnaces and control equipment; national certificate in electrical engineering a minimum requirement with some knowledge of electronic an advantage.—Write, giving full details, to Box 2675. [1910]

TRANSFORMER designer required; an excellent opportunity exists for an engineer with thorough practical experience of radio mains transformer design and preferably some experience of R.F. coils and I.F. transformers; applications may be addressed in confidence to the Personnel Manager, Murphy Radio, Ltd., Welwyn Garden City, Herts. [1942]

TEST gear design engineers required with practical experience of this class of work, based on sound knowledge of electronic principles; these vacancies are permanent and progressive; a Company pension scheme in operation; London area; please write, in confidence, giving full details of qualifications, to Box 3819, quoting reference No. N.24. [1938]

BOULTON PAUL AIRCRAFT, Ltd., Wolverhampton, require senior electronics engineer or physicist with adequate theoretical and practical design experience to take charge of department engaged in development of precision electronic instruments, servo mechanisms, analogue computers, etc.; applications should detail qualifications and experience and state salary required. [1953]

ELECTRICAL insulation varnishes; technologist, aged 25-40, with experience in radar, radio or electrical equipment, required to specialise in insulating varnishes; previous experience of varnish preferable, but not essential; training will be given for service and laboratory work; based in London.—Please reply, stating age, technical qualifications and experience, to Box 3843. [1939]

AIR MINISTRY requires Civilian Instructors, Class 1 (Radio Filter) for temporary posts, at R.A.F. Radio with prospects of permanency, at R.A.F. Radio Schools, Yatesbury (Wilt), and Locking (Somerset), qualifications: at least 5 years' practical experience and ability to instruct; trade test before entry; pay is £480 at 26, rising to £597.—Apply to: Air Ministry, S.5(6), Cornwall House, Stamford St., London, S.E.1. [1942]

M.R.C.G., Ltd., has vacancies for development engineers, for design work on radio and television, the openings cover a wide field from basic technical research to construction of experimental receivers and models; superannuation scheme, etc.—For suitable applicants—Application must be by letter in the first instance, giving all relevant details to Mains Radio Gramophones, Ltd., 359, Manchester Rd., Bradford. [1948]

MARCONI'S WIRELESS TELEGRAPH Co., Ltd., is opening a new works in about 9 months time at Basildon (New Town) Essex, and now has the undermentioned vacancies. Houses of a standard type are available to rent for suitable applicants. Initial training and employment will be at Chelmsford, and fares from Basildon will be paid. Salaries commensurate with ability and experience. Pension scheme.

REF. 992/3. Methods superintendent. Applicants should have a sound technical education and previous experience preferably in an electrical, radio or electronic concern working on batch production. Responsibilities may include methods planning (including metal finishing), tool design, toolroom, time and motion study, plant layout. Experience in rate-fixing and formulating bonus schemes, both for production and indirect workers, is essential. Age limits 30-40.

REF. 994/2. Test superintendent. Applicants should be of degree standard, preferably with a sound knowledge of most of the following techniques: M.F., H.P. and V.H.F. transmitting, vision transmitting, radar and electronic measurements. Previous experience in charge of inspection and test of service requirements is essential. Responsibilities could include inspection and test of piece parts, components, sub-assemblies and full equipments, manufacture and/or provisioning of test gear, electro-chemical, physical and/or metallurgical control of processes, liaison with development and outside bodies. Must be keen on integrating test planning with methods planning and inspection with production. Age limits 30-45.

PLEASE reply giving details and quoting appropriate reference to English Electric Co. Ltd., Central Personnel Services, Marconi House, 336-7, Strand, W.C.2. [1950]

ELECTRONIC Engineers are required for development work on aircraft instruments, they should possess a degree in electrical engineering or physics or higher national certificate or similar qualifications, previous laboratory experience in physics, electrical engineering or instrument technology would be an advantage; Guildford area.—Send details of qualifications and experience, quoting Ref. E10, to Box No. 3770. [1957]

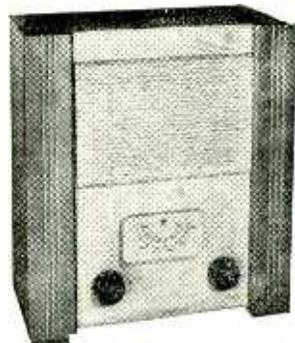
ELECTRONIC junior test engineer required with experience in motor control; National Certificate standard or equivalent, ex-H.M. Forces personnel with radar experience will be considered; permanent position, good working conditions, life insurance and pension scheme.—Apply, stating age, experience and qualifications, quoting reference 13.11.2 to the Personnel Superintendent, English Electric Co., Ltd., Stafford. [1939]

LONDON CENTRAL RADIO STORES

10-VALVE COMMUNICATIONS RECEIVER—Type R1155

Covers five wave ranges from 7.5 Mc/s. Complete with 10 valves, including magic eye. Enclosed in metal case. Every receiver is aerial tested. Receiver only. Price £7/5/-. Complete with Power Pack and Loudspeaker for A.C. mains, 200-250 v., £11/5/-. Plus Carr. and Pkg. 12/6.

4-VALVE (Used) SUPERHET UTILITY RECEIVERS—Medium wave band only.



Four valves, P.M. Speaker, complete in pine wood cabinet size 13 1/2 x 12 x 6 1/2 in. In good condition. A.C. mains 200/250 volts. Price £4/10/- Carr., etc., 5/-

WALKIE-TALKIE (Transmitter and Receiver) Type 38 Mk. II. Complete less batteries. Range 7.4-9 Mc/s. Limited number. Requires 3 v. L.T., 120/150 v. H.F. Complete with 5 valves, one pair throat mikes, pair headphones and aerial, also battery junction box. In metal case. Free wiring diagram. £3/15/- Carr. and pkg. 2/6.

SPARE TRANSMITTING VALVES FOR ABOVE AP74, 6/6. AP712, 5/6.

WANTED TEST EQUIPMENT • COMMUNICATIONS RECEIVERS • TELEVISION RECEIVERS, Etc.

Cosor **DOUBLE BEAM OSCILLOSCOPE** No. 339A. £37/10/- each. Carr., etc., 20/-.

UNISELECTOR SWITCHES. Full wipers 3-bank 19/6, 8-bank 47/6. Half wipers 4-bank 27/6, 8-bank 42/6. Have various applications, including automatic tuning circuit selection, etc. Operates on 25-50 v.

VIBRATORS. 2-volt, Type R76C, 7-nin self-rectifying. Output 200-v. at 60 mA. Made by Electronic Laboratories Inc., 7/6.

HIGH SPEED TWIN COIL ELECTRO MAGNETIC COUNTERS



Excellent quality in new condition. With 50 ohm and 1,500 ohm coils. 10 pulses per second approx. Counts to 9,999 and automatically returns to zero. 25-50-v. D.C. Size 3 1/2 x 1 1/2 in. 22/6. Post and pkg. 9d.

ELECTRO MAGNETIC COUNTERS. Ex-G.P.O. every one perfect, electro-magnetic, 500 ohm coil, counting to 9,999, operated from 25-v.-50-v. D.C., 4 1/2 in. long x 1 1/2 in., many industrial and domestic applications. 15/- EQUAL TO NEW. P. & P. 9d.

NIFE ACCUMULATORS. 1.5-v. about 10 amps., size 6 1/2 x 1 1/2 in. Post and pkg. 9d., 6/6. Also Ex-Navy type, slightly shaped, 1.5-v. about 20 amps, size 8 x 4 1/2 in. All guaranteed, post 1/-, 15/-.

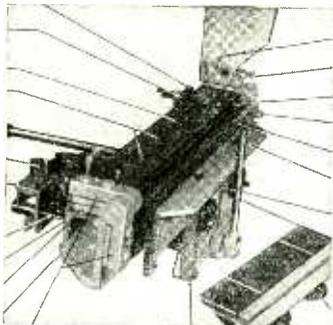
PHOTO-ELECTRIC CELLS. Type GS18. These cells are the gas-filled type with caesium Cathode. Made by (Cintel). Minimum sensitivity 1000 A/lumen working voltage 100 D.C. or peak A.C. Projected cathode area, 16 sq. cm. Suitable for 16 mm. Home Cinema, Talkie equipment, Safety Devices, Colour and Photo. Match ign. Burglar Alarms, Automatic Counting, Door Opening, etc. Brand new in original cartons. 42/6.

N.B.—We do not issue lists or catalogues. Carriage Charges relate to British Isles only.

23 LISLE ST. (GERrard 2969) LONDON, W.C.2

Closed Thursday 1 p.m. Open all day Saturday

This UNIQUE BENDER



Quickly and Accurately Forms

Angles, Channels, Sections, Boxes, Lids, Trays, Tanks, Chassis Brackets, Clamps, Clips, Strouds, Chemical, Electronic and Electro Medical apparatus. Used by leading Radio Manufacturers. Invaluable to Servicing Engineers, Hospitals, Universities and Research Workers.



For 6 page Folder write to:—

A. A. TOOLS (W)

197a Whiteacre Rd., Ashton-u-Lyne

NEW EDITION!

Wireless World

RADIO VALVE DATA

with characteristics of 2,000 valves.

Price 3/6 post 3d.

MODERN BOOK CO.

19 Praed Street, Paddington, London, W.2

NUTS, BOLTS, SCREWS AND WASHERS

ALL CADMIUM PLATED

SET 305 (Size 2BA). Assorted screws and bolts from 5/16in. to 1 1/2in. long, with plain hex. nuts, Pinnacle nuts, double anchor nuts, lock washers and plain washers. All rust proof. Average Contents, 450 Pieces 7/6, plus 6d. post.

SET 306 (Size 4BA). Assorted screws and bolts from 1in. to 1 1/2in. long, with plain hex. nuts, Simmonds nuts, and plain washers. All rust proof. Average Contents, 600 Pieces, 7/6, plus 6d. post.

SET 307 (Size 6BA). Assorted screws from 1/2in. to 1 1/2in. long, with plain hex. nuts, Simmonds nuts, shake proof washers, and plain washers. All rust proof. Average Contents, 750 Pieces, 7/6, plus 6d. post.

By post, air-freight or ship, anywhere in the world. All sets well packed in compartmented boxes.

BERNARD F. WADE LTD.

2, WELLINGTON RD., ILKLEY, YORKS.

Tel.: Ilkley 1767

HiFi
REGD TRADE MARK
RESEARCH & DEVELOPMENT
C H O K E S

ELECTRONIC CONTROLS
SOUND REPRODUCING EQUIPMENT
TRANSFORMERS
PRECISION INSTRUMENTS

HIFI LTD., 150, HIGH STREET, LYE, STOURBRIDGE, WORCS. Telephone: LYE 261

SENIOR television receiver design engineer required.—Write stating experience and salary required to the Technical Director, Pve. Ltd., Haig Rd., Cambridge, 19341

MURPHY RADIO, Ltd., have vacancies for experienced testers and inspectors for work on radio and electronic equipment, with a subsidiary company at Ruslip, Middlesex; a number of qualified project supervisors are also required.—Applicants should write in first instance, giving full particulars of their experience and qualifications, to Personnel Dept., Murphy Radio, Ltd., Welwyn Garden City, 19382

VIBRATION engineers required for work on monitoring techniques essential, together with some theoretical knowledge of mechanical vibrations and shock; H.N.C. or equivalent preferred, but O.N.C. acceptable in special cases; write, stating salary required, age and details of qualifications and experience, to Central Personnel Services, the English Electric Co., Ltd., 336-7, Strand, London, W.C.2. 19385

DEVELOPMENT engineers, International, Atradio, Ltd., specialists in equipment design for aviation service, due to expansion of development section at Bovington Airport near Watford, require junior and senior radio and telegraph engineers. Salary according to experience, single quarters provided, pension scheme, 5-day week, canteen facilities.—Please apply through Local Authority Exchange to Personnel Officer, 40, Park St., London, W.1. 10235

BUSH RADIO, Ltd., have vacancies at Chiswick for senior and assistant radio and television engineers; applicants for senior positions must have 4 years practical experience in design of radio/television receivers; assistants should have 2 years' practical experience in laboratory and be familiar with radio/television measurement technique.—Apply stating age, qualifications, experience, and salary to Personnel Manager, Bush Radio, Ltd., Power Rd., W.4. 19342

THE ENGLISH ELECTRIC CO., Ltd., Luton, requires a qualified radar engineer with good experience in centimetre radar and/or radar circuits; this work is of special importance and interest and is under laboratory conditions; permanent, progressive post for the successful applicant; salary £600-£900 p.a. according to experience.—Please reply quoting reference 815H, to Central Personnel Services, English Electric Co., Ltd., 336-7, Strand, London, W.C.2. 19370

MICHAEL RADIO, Ltd., require senior and junior engineers in their equipment division development laboratory at Slough. Training and experience in field of applied electronics (including communications) and experience of working with Government departments are the chief qualifications required.—Write stating age and full details of training, qualifications and experience, to the Chief Engineer, Equipment Division, McMichael Radio, Ltd., Slough, Bucks. 19174

ENGINEER required to run modern toolroom (about 10 men) also small drawing office; must have ability to design cheap, short run press tools as well as high quality long run tools; for man with initiative and drive, able to assist in manufacturing press and radio components, etc., and improve methods all round in factory; a four-figure salary will be paid; state full details, past experience, education, present salary and salary required; all replies in confidence.—Box 4057. 19346

NORWOOD TECHNICAL COLLEGE, Knight's Hill, West Norwood, S.E.27.—Laboratory technician in physics and telecommunications Dept.; sal. scale (inc. current percentage addition) 650 weekly at 15 to 965 at 19; £270 a year at 20; add. incs. of £18 for each full year of age above 20 years on entry (comm. sal. entry not to exceed £342); rising by annual incs. of £18 to £378 and with add. incs. for special. qualifs. to £414. Appl. forms from college sec. rmt. within 14 days. (1180) 19361

BELLING & LEE, Ltd., Cambridge Arterial Rd., Enfield, Middlesex, require research assistants in connection with work on electronic components, fuses, interference suppressors and television aerials; applicants must be graduates of the I.E.E., or possess equivalent qualifications together with similar laboratory experience; salary will be commensurate with previous experience; 5-day week contributory pension scheme.—Applications must be detailed and concise, and will be treated as confidential. 10230

PROJECT Engineer required to be responsible for a laboratory engaged on development of aircraft fuel contents gauges and associated equipment; applicants should possess qualifications in electrical engineering and/or physics, and have had design and laboratory experience in the application of electronic techniques to airborne equipment.—Apply, in writing, quoting Ref. E8 and giving details of qualifications and experience, to the Chief Development Engineer at Weymouth Gauges & Instruments, Ltd., Station Rd., Godalming, Surrey. 19377

FERRANTI, Ltd. (Moston), have a vacancy in the Circuits Section of the Physical Laboratory for a circuit development engineer to work on specialised test equipment for investigation of cathode-ray tube and valve characteristics. Applicants should be graduates in electrical engineering or possess a H.N.C. or equivalent qualification and have had at least three years experience of the design and construction of this type of equipment. A sound theoretical and practical knowledge of television and radar circuit techniques is essential. PERMANENT staff appointment with pension benefits.

FORMS of application from Mr. R. J. Hebbert, Staff Manager, Ferranti, Ltd., Hollinwood, Leics. PLEASE quote reference LA. 19411

THE HAYES COMPANY

RADIOGRAM CHASSIS

● 9 VALVE CHASSIS MODEL RG 200

High quality 8-watt push-pull output. Separate LF and HF units. Bass and treble boost controls. 3 wavebands. £27/10/-. 10235

● 7 VALVE CHASSIS MODEL RG 135

Push-pull output 6 watts. Negative feedback. Special tone control circuit. 3 wavebands. £19 10/-. (Also available for universal mains.)

● 5 VALVE CHASSIS MODEL RG 120

4-watt output. 3 wavebands. New type dial. Negative feedback. £15 10/-. 10235

Fully illustrated details of all chassis gladly sent by return post. Kindly note new address for both Sales and Service.

LUTHER STREET, BRIGHTON, 7.

'Phone—Brighton 2146'

We have a large stock of

HIGH STABILITY RESISTORS

Trade enquiries invited: Marris & Cartin Ltd., 42 Brook Street, London, W.1. GRO. 5571.

YOUR METER DAMAGED ?



Leading Electrical Instrument Repairers to the Industry

Repairs by skilled craftsmen of all makes and types of Voltmeters, Ammeters, Micrometers, Multirange Test meters, Electrical Thermometers, Recording Instruments, Synchronoscopes, etc. Quick deliveries for speedy estimate send defective instrument by registered post to:—

L. GLASER & CO.
Electrical Instrument Repairers
96-100 ALDERSGATE STREET, E.C.1
(Tel.: MONarch 6822)

MORSE CODE Training



COURSES for BEGINNERS and OPERATORS, also a SPECIAL COURSE for passing the G.P.O. Morse Test for securing an AMATEUR'S TRANSMITTING LICENCE.

Send for the Candler BOOK OF FACTS

It gives details of all Courses. Courses supplied on Cash or Monthly Payment Terms.

THE CANDLER SYSTEM CO.
(55W) 52b ABINGDON RD., KENSINGTON LONDON, W.8

Candler System Co., Denver, Colorado, U.S.A.



E.M.G. STEEP-CUTTING INFINITELY VARIABLE FILTER

No other filter combines all the advantages of this model which are, briefly, to cut response above any desired level between 4,000 and 8,000 c.p.s. at an average steepness of 30 db. per octave, easy fixing, (connects between 15 ohm speaker and amplifier output), robust construction, no distortion or appreciable loss of volume. Recommended for reducing surface noise on '78' records, cutting 'edge' on some L.P. records, and eliminating high-pitched interference on radio. Price £4/10/0. Leaflet on request.

E.M.G. HANDMADE GRAMOPHONES, LTD
6, Newman St., Oxford St., W.1
Telephone: Museum 9971-2-3

PITMAN

AC/DC Test Meters

By W. H. Cazaly and Thomas Roddam. A useful book for all wireless engineers, test-room assistants and laboratory technicians. 18/- net.

Antenna Theory and Design (2 vols.)

By H. Paul Williams, Ph.D., A.M.I.E.E., Sen. M.I.R.E. Vol. I—FOUNDATIONS OF ANTENNA THEORY. 21/- net. Vol. II—THE ELECTRICAL DESIGN OF ANTENNAE. 63/- net.

Wireless Fundamentals

By E. Armitage, M.A. (Cantab.), B.Sc. (Lond.). Develops the theory of radio from the fundamental stages to the super-heterodyne principle. Illustrated. 18/- net.

The Technique of Design

By P. J. Wallace. The author illustrates the solution of design problems by showing the progressive stages in actual practice. With 16 illustrations. 12/- net.

From booksellers. Published by **SIR ISAAC PITMAN & SONS, LTD.**, Parker Street, Kingsway, London, W.C.2

ELECTRONIC engineer required by manufacturers North-west London, practical knowledge of television and pulse circuitry essential.—Write, stating age, experience and salary required, to Box 4076. 19463

EXPERIENCED radio testers and inspectors required for production of communication and radio apparatus also instrument makers, wiremen and assemblers for factory test apparatus.—Apply Personnel Manager, E. K. Cole, Ltd., Ecco Works, Malmesbury Wilts., 102358

JUNIOR Technical Assistant is required for a secretarial staff of Manufacturers' Association in London; essential qualifications, B.Sc. Grad. or equivalent, good personality and general education; interesting work in excellent conditions; commencing salary £450.—Box 4016. 19431

ELECTRONIC engineers required at Nelson Research Laboratories, English Electric Co., Ltd., Stafford for work on high speed automatic electronic digital computers; applicants should possess: (a) Honours degree in Physics or engineering with a sound knowledge of the principles of circuit design, or (b) B.Sc. in electrical engineering and have had three or four years' experience in radar or electronic development; please reply quoting ref. 1051, to—Central Personnel Services, English Electric Co., Ltd., 336/7, Strand, London, W.C.2. 19406

AN engineer with production experience, trained in the electro-chemical and light engineering field is required by a manufacturer of electronic components to take charge of a unit engaged primarily in the pre-production of new products. Candidates must have ability to co-operate with the laboratory on questions of design for manufacture and with the factory in solving production problems and should preferably possess an engineering degree or near equivalent. Write in confidence giving age, summary of experience and other relevant information to Box 3655. 19358

B.B.C. requires a limited number of Technical Assistants, aged 21 or over, in operations and maintenance departments for service at transmitter, studio and television centres throughout the United Kingdom. Knowledge of mathematics, electricity and magnetism to School Certificate standard; experience in electrical or radio engineering an advantage. Salary £360 p.a. with increments up to £470 p.a. maximum. Promotion prospects.—Application forms from Engineering Establishment Officer, Broadcasting House, London, W.1 (enclosing addressed foolscap envelope). 19353

DECCA RADAR, Ltd., require draughtsmen and junior draughtsmen for research drawing office, preferably experienced in any of the following fields: radar, radio and electronic circuits, electro-mechanical devices, light mechanical engineering; knowledge of workshop practice essential, applicants must possess Ordinary National Certificate or equivalent; positions are permanent and progressive; salaries based on A.E.S.D. rates; tracers (female) also required.—Write giving full details to Chief Draughtsman, Decca Radar, Ltd., 2, Tolworth Rise, Surbiton, Surrey. 10241

TECHNICIANS between 20 and 30 years of age required for the initial and routine testing of relay wireless equipment including 1 kw audio amplifiers; applicants should have had some experience in the wire broadcasting, telephone or radio industries; possession of C. & G. and/or National certificates an advantage; commencing wage between £5/10 and £9 per week according to qualifications, etc.; 5 1/2 days a week, superannuation scheme and active sports and social club.—Applications in writing to Personnel Manager, British Relay Wireless, Ltd., 343-5, Walworth Rd. Southwark, S.E.17. 19356

SENIOR physicist or engineer with wide experience of telecommunications and radar is required to direct a research team in these fields at the Stanmore Laboratories of The General Electric Co., Ltd.; familiarity with centimetric techniques, circuitry and propagation is essential, together with a real knowledge of the fundamental aspects of such work; this is an appointment for a first-class research man and carries an attractive salary commensurate with experience.—Applications should be sent to the Staff Manager (Ref. SS/NB.1), The Grove, Stanmore Common, Stanmore, Middlesex, giving full details of age, qualifications and experience. 19349

DRAUGHTSMEN—Bush Radio, Ltd., have vacancies in their W. London and Plymouth drawing offices for senior and junior draughtsmen/draftswomen; applications for senior posts are invited from men with experience in electronic, radio or light electro-mechanical engineering; applicants for junior posts should have at least 2 years' D.O. experience; positions offered are permanent and pensionable and are concerned with television development, commercial radio and long-term defence projects; appointments may be arranged for Saturday mornings.—Apply, giving details of experience and age, or telephone the Personnel Manager, Bush Radio Ltd., Power Rd., W.4 (Chiswick 6491). 19380

MURPHY RADIO have vacancies in their electronics division for a first-class senior design draughtsman and a senior mechanical designer; applicants should be up to at least National Certificate standard and have had extensive experience in design of electronic equipment, small mechanisms or similar work and must be capable of working on their own initiative; employment is permanent and pensionable and offers excellent opportunity of broadening experience in this interesting field; full details of experience and qualifications should be included in applications which may be forwarded in confidence to—Personnel Manager, Murphy Radio, Limited, Welwyn Garden City, 19275



DEPT. W.W.
18 TOTTENHAM CT. RD.
LONDON, W.1.
MUSEUM 4539/2453

5-valve Superhet Chassis. Latest all glass Valves, etc. Speaker Sockets, P/up Sockets. L.M.S. wavebands with switching for Gram. ready for fitting to cabinet, £12/12/6, plus 5/- postage. Fully Guaranteed.

A.D.S. Hi Fidelity Amplifier. This is our latest gramophone amplifier which you MUST hear.

P.P. 6V6 output. Freq. 25—18,000 cps.—1 db Hum—60 db at 6 1/2 watts. Treble boost and cut—Bass boost—L.P. correction. Provision for Feeder Unit. Mas. UNDISTORTED OUTPUT 8 1/2 watts. Price £16/16/6 plus 7/6. Now available! Kit of parts, complete with illustrated instruction book—13 gns. plus 5/-.

All-Wave S/Het. Feeder Unit to match, 10 gns.

Gramophone Equipment. B.S.R., 33 1/2—78 RPM Motor Unit, 78/7, plus 1/6. B.S.R. 3-speed Motor Unit, £6/8/6, plus 1/6. SPECIAL OFFER!

Chancery XTAL Pickup, complete with LP and Std. Inserts, 59/6.

Decca XMS P/UP, £7, plus 1/-. Connoisseur STD P/UP, £4/11/8, plus 1/- S/Lightweight, one head, £6/9/-. LP Head, 71/8. Trans. 15/- Fibre P/UP, £4/3/2. Trans., 25/-. Chancery XTAL P/UP, 54/-, plus 1/- LP Insert 31/6. Collaro AC514 Player Unit MAG Head, £6/10/5 plus 2/-.

Garrard Heads.—Hi Fi, 59/11. Miniature, 54/4. Standard, 26/6, plus 1/- post. Adaptors Type A, 9/3. B, 6/7. C, 4/6, plus 1/- post. **Collaro AC/DC Motor, 12in. Table, £10/8/11 plus 2/6.** Garrard AC8 Speed Controlled 78 RPM Turnover Table, £4/12/6, plus 2/6. Garrard AC72A 3-speed Turnover MAG Head, £16/6/6, plus 3/6.

Denco Coil Pack.—For P.W. Mini Four, 42/10, plus 1/- M800 Wearite IFS, 21/-, plus 1/6. **Metal Rectifiers, RM2, 125 v., 100 ma., 5/9. R.M.1., 125 v. 60 ma., 5/-, plus 1/-.** Type 280 STC 270 v. 80 ma., 10/-, plus 1/6.

Denco "C" T.R.F. Coils Medium and Long wave, 8/- pair, plus 1/-.

Variable Condensers.—Midget 2-gang 500 pf 7/6, with dust cover, 10/6. Standard, 7/6— with Trimmers, 8/6. 3-gang 500 pf., 7/6. All plus 1/- postage.

Speakers. 8in. ROLA, 19/6 10in. Goodmans, 27/6. 12in. Truvox, 30/6 59/6, plus 1/3 postage.

BRANDENBURG H.T. UNIT.—6.9 kv., 6 gns. Coil only, 39/-. Coil with U24 Rectifier, 69/6. 10 15 kv. coils, 55/-.

QUALTAPE "New Principle" 2-SPEED Recorder now available. 16 gns., plus 3/6 post.

Collaro Tape Deck Motors.—Left and right hand drive, 38/6 each, plus 1/6.

Scotch Boy, EMI, GEC Tape, 35/-, plus 6d. **Rexine Player Case.**—Cut for BSR Motor, 39/6, plus 3/6.

MOTEC motor Tape Deck, real value, £15/15/-, plus 3/6.

MOTEC Record and Playback Heads, 39/6 each.

NOTEK OSCILLATOR COILS, 8/6. Transformers.—6.3 v., 1.5 a., 7/6, plus 9d. 4 v., 2 a., 7/6, plus 9d. 12 v., 1 a., 8/6, plus 9d. 6.3 v., 6 a., 19/6, plus 1/6. Williamson Output, £4/10/-, Choke, 27/9, plus 1/-.

Chokes.—10 h. 150 ma., 16/3, plus 1/3. CHS, 10 h. 60 ma. 300Ω, 4/9, plus 1/- 50 h. 30 ma., 1,500Ω, 6/6, plus 1/- 50 h. 20 ma., 1,100Ω, 6/6, plus 1/- 30 h. 20 ma., 6/6, plus 1/- 20 h. 10 ma., 5/6, plus 1/6.

FULL MAIL ORDER FACILITIES

(Please add Postage)

Shop Hours, Monday to Friday, 9—5.30 p.m., Saturday, 1 p.m.

SUPERHET PERFORMANCE FROM YOUR T.R.F. RECEIVER
 Can be obtained if your circuit employs the now **FAMOUS OLYMPIC T.R.F. Coils**
 Obtainable from all Leading Dealers and Wholesalers.

SPECIAL NOTE
SOMETHING REALLY NEW
 Watch this space next month for introductory details of our New, Revolutionary Midget Coil Pack.

OLYMPIC RADIO COMPONENTS, 224, HORNSEY ROAD, N.7

TANNOY PRODUCTS
SOUND EQUIPMENT
 clearly the best for all occasions



WEST NORWOOD S.E. 27. Tel. GIPsy Hill 1131 (7 lines)

★
'Radiospares'
Quality Parts
 The **Service Engineer's First Choice**
 ★



TYPE RX.1

REFLEX CABINETS

Send for descriptive leaflet of this heavily built corner cabinet—size 37in. high and 29in. wide—ideal for best results with Goodmans, Wharfedale, etc. 12in. loudspeakers. Fully lined and beautifully finished in any shade of walnut, oak or mahogany. Early delivery. Rectangular and 10in. & 15in. models to order.

THE CHAFFEY CABINET CO.
 50A CHELTENHAM ROAD, LONDON, S.E.1;
 Telephone: Orpington 3559

THE GENERAL ELECTRIC Co., Ltd., Brown's Lane, Coventry, require for work on guided weapons and like projects, development engineers, senior development engineers, mechanical and electronic for their development laboratories; fields include microwave and pulse applications; salary range £400-£1,250 per annum; vacancies also exist for specialist engineers in component design, valve applications, electro-mechanical devices and small mechanisms: the company's laboratories provide excellent working conditions with social and welfare facilities; superannuation scheme, assistance with housing in special cases; apply by letter stating age and experience, to—The Personnel Manager (Ref. CHC).

MINISTRY OF SUPPLY require Physicist or Electrical Engineer at outstation of R.A.E., Woodbridge, Suffolk, to lead section engaged on application of radar to ballistics and other trials, including responsibility for conduct of trials, maintenance of ground radar equipment, plotting tables, etc., and development of techniques. Experience of operating and maintaining ground radar equipments essential. Minimum qualification H.S.C. (Science) but higher qualifications in Physics or Electrical Engineering may be an advantage. Salary within limits.—Experimental Officer (min age 26) £597-£754. Women somewhat less. Post unestablished. Application forms from M.O.L.N.S., Technical & Scientific Register (K), 26, King St., London, S.W.1, quoting D.415/52/A. 19529

GOLD COAST, NIREYA—British company established throughout West Africa require the services of a qualified radio engineer. Some knowledge of refrigeration servicing an asset but applicants would receive preliminary training in this and other sections of the service departments before starting. Excellent opportunity for the right man covering selling and administrative side of business as well as actual servicing. Good salary, prospects, first-class passage, free furnished quarters, pension scheme. Applications should be in own hand writing, stating age (preferably between 21 and 26), whether married or single, full details education, qualifications, national service, and business experience. Original references should not be sent.—Apply to Box 4024.

THE ENGLISH ELECTRIC Co., Ltd., Luton, invites applications for permanent posts in a laboratory engaged in development work involving radar techniques; senior and junior positions are available to candidates possessing suitable qualifications and a knowledge of one or more of the following: (1) Centimetric systems and measurements; (2) radar or television receiver practice; (3) mechanical layout and design work in connection with the above; salaries according to qualifications and experience from £450 upwards; the laboratories are in a new and pleasantly situated; the company also encourages further study in the case of juniors.—Please reply, quoting ref. 815G, to Central Personnel Services, English Electric Co., Ltd., 336, Strand, London, W.C.2. 19245

THE PLESSEY Co., Ltd. has vacancies in its Telecommunications Engineering Department for Senior Engineers and Draughtsmen to work on long-term private ventures and defence projects; qualifications for senior engineers are a degree in physics or engineering and at least two years' experience in electronic, radio or radar development work; six or more years' experience of advanced work in the above field will be accepted as an alternative to a degree; qualifications for draughtsmen are at least two years' drawing office experience on electronic, radio or electrical devices; the positions are permanent and pensionable and very good salaries are available for experienced men; applicants should be of British birth and nationality.—Apply, in confidence, to the Personnel Manager, The Plessey Company, Vicarage Lane, Ilford, quoting reference T.E.D. 19447

TRANSFORMER engineer is required to take charge of a group dealing with the design, construction and testing of a wide range of transformers and coils in a research and development company. The range includes medium power hermetically sealed, C type transformers, filter assemblies, and high-frequency coils and transformers. The applicant must possess the necessary technical knowledge and be able to lead a fair-sized team. The position is permanent and pensionable. A good salary will be paid, depending upon the qualifications and experience of the applicant. Working conditions are exceptionally pleasant in congenial surroundings; there is a good canteen on the premises, and there is an active social and sports club. Five-day week.—Applicants should write, stating qualifications, experience, age and nationality, to the Technical Director, Cottage Laboratories, Ltd., Portsmouth Rd., Cobham, Surrey. 19439

MINISTRY OF SUPPLY has following vacancies at R.A.E. Signals Experimental Establishment at Bedfordshire. Senior experimental officer for development of calibration procedure for radio test equipment and preparation of calibration publications. Also specialist advice to Radio Equipment Calibration Centres and liaison with Radio Measurements Divisions in Experimental Establishments of Ministry. Assistant Experimental Officers for the calibration of transfer standards involving (a) frequency and pulse measurements or (b) bridge and miscellaneous measurements. Candidates must have minimum H.S.C. (science) or equivalent but higher qualifications in Physics or Elec. Eng. may be advantage. Salary within ranges S.E.O. (minimum age 35) £805-1,035; A.E.O. £264 (at age 18)—555. Women somewhat less. Post is unestablished. Application forms from M.O.L.N.S., Technical and Scientific Register (K), Almack House, 26, King St., S.W.1, quoting D.415/52A. Closing date January 11th, 1953. 19435

QUARTZ CRYSTAL UNITS



For— **AIRCRAFT, MARINE AND COMMERCIAL USE** are available in the complete range from 35 kilocycles to 15 megacycles.

Alternative mountings in standard two-pin A.M. pattern 10X, International octal, and miniature type FT243, can be supplied for most frequencies.

Prices are fully competitive, and we specialise in prompt deliveries for urgent requirements.

WE WELCOME YOUR ENQUIRIES

THE QUARTZ CRYSTAL Co., Ltd.
 63-71 Kingston Road,
 NEW MALDEN, SURREY
 Telephone: MALden 0334

'neo'-MAINTEST
 100/700V A.C. 17/6
 SEARCH LEAD TEST PROD 7/6
THE PERFECT FAULT FINDER
NEO ELECTRICAL INDUSTRIES LTD
 MANCHESTER 4.



COILWINDING ELECTRONIC EQUIPMENT

Engineers required for the undermentioned appointments by a large and expanding engineering company:

1. Time Study Engineers.
2. Estimating Engineers.
3. Planning Engineers.
4. Design Engineers (Transformers)
5. Senior and Junior Design Draughtsmen.
6. Setters—Leeson's Coilwindng Machines.

Excellent Prospects • Pleasant Working Conditions • Good Salaries

Please write, giving details of experience to Box No. 3890—c/o "Wireless World" Quoting Reference N. 46.

-HYNDBURN-

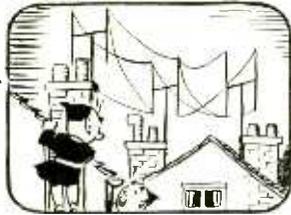
TAPE RECORDER COMPONENTS enable you to build **A TAPE TABLE**

for under **£13**

OR A COMPLETE PORTABLE **RECORDER**

for **£30**

Details from: **HYNDBURN ELECTRONICS LTD.**
 2 & 4, Croft Street, Accrington.
 Phone: Acc. 4526. **LANCS.**



THE "FLUXITE QUINS" AT WORK

"What's this concoction up here?
Someone's gone haywire I fear."
"Yell'd of 't's all right,
Thanks to me and FLUXITE,
Our set will be three times as clear!"

See that **FLUXITE SOLDERING PASTE** is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for over 40 years in Government works and by leading engineers and manufacturers. Of all Ironmongers—in firms from 1/- upwards.

TO CYCLISTS! For stronger wheels that will remain round and true. Here's a time tested tip. Tie the spokes where they cross with fine wire **AND SOLDER**. It's simple—with **FLUXITE**—but **IMPORTANT**.

FLUXITE

SOLDERING PASTE

A staunch Companion to Fluxite Soldering Fluid.

SIMPLIFIES ALL SOLDERING

Write for Book on the Art of "SOFT" Soldering and for leaflets on **CASE-HARDENING STEEL** and **TEMPERING TOOLS** with **FLUXITE**. Price 1/6d. ea.

FLUXITE LTD.
BERMONDSEY STREET, LONDON, S.E.1.

MADE BY PEOPLE WITH A CONSCIENCE



It is the Savage Tradition that only the best is good enough and all employees are individually trained to take a pride in their work. Every instrument which leaves our works is the product of our conscientious best.



SAVAGE TRANSFORMERS LTD.
Nursted Road, Devizes, Wilts.
Telephone: Devizes 536

THE GENERAL ELECTRIC Co., Ltd., has a vacancy on their staff at Head Office for a young man in the age group 25/32 years who has a good personality and initiative; applicants must have had a good general education and obtained an ordinary national certificate in electrical engineering. It is desirable that the applicant should have a knowledge of electronics and ability to read engineering drawings, also some previous experience in handling Government contracts would be an asset.—Apply, in writing, quoting reference 'G & R/KS.' to the Staff Manager, Magnet House, Kingsway, W.C.2. 19375

SITUATIONS WANTED
EXPERIENCED radio and TV engineer desires change, with accom.—Box 4064. 19453
ARMATURE winder (24), experienced in considerable range of windings, and also in maintenance and repair of elec. installations; home or abroad.—Box 4063. 19452

RADIO production foreman. 20 years' experience, requires outdoor work, wiring, assembly, cable forms, etc. Experience of Government specifications, A.I.D. standards; any proposal considered.—Box 3912. 19408

ELECTRICAL engineer (radio communications), Grad.I.E.E., aged 25, available from June, 4 years' experience in all branches of radio teleprinting and by most systems, S.S.B., P.S.K., tone mod., etc.—2 years' i/c TX site, 1 year i/c operating room; married; willing to go anywhere providing wife accompanies.—Box 3769, c/o W.W. 19376

BUSINESSES FOR SALE AND WANTED
FOR sale, radio, TV and electrical business. For any investigation.—Partics. M. Collinson, 3, Horse Market, Middleton in Teesdale, Durham. 19372

FOR sale, wireless, television and electrical business in main road, North West London Suburb, with very little opposition. Lock-up shop, lease nearly 14 years to run, at £300, rising to £325 per annum; fixtures and fittings £2,300; stock at valuation.—Write Box 2990. 19166

PAINTS, CELLULOSE, ETC.
MILLER'S "Panu" air-drying black crackle enamel, 4/6 doz jar.—B. Kenton Park Crescent, Kenton, Mdx. 19357

PAINT spraying handbook 3/6, post free; cellulose and synthetic paints and all spraying requisites, send for free.—Leon Collins, Brooks, 53, Harold Wood, Romford. 10207

PATENTS
THE proprietor of British Patent No. 573313, entitled "Multiple Section Electronic Tube and Method of Making It," offers same for licence or other use to ensure practical working in Great Britain.—Enquiries to Singer, Stern & Carlberg, 14, East Jackson Boulevard, Chicago 4, Illinois, U.S.A. 19445

TECHNICAL TRAINING
CITY & Guilds (Electrical, etc.) on "no pass no fee" terms; over 95% successes; for full details of modern courses in all branches of electrical technology send for our 144-page handbook—free and post free.—B.I.E.T. (Dept. 388A), 17, Stratford Place, London, W.1. 10117

INDUSTRY needs trained men; send for free brochure giving details of our Home Study Courses in radio, television and all branches of electronics; we prepare students for the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations; train with the colleges backed by Britain's largest electronic industry.—Write to E.M.I. Institutes, Postal Division, Dept. WW33, 43, Grove Park Rd., London, W.4 (Associated with H.M.V.). 10179

TUITION
RADIO training.—P.M.G. exams and I.E.E. Diploma; prospectus free.—Technical College, Hull. 10111

NOTHING succeeds like success! What we have done a thousand times we can do again for you—see the B.N.R.S. advt., page 114

WIRELESS operating; attendance and postal courses.—Stamp for reply to Manager, The Wireless School, Manor Gdns, London, N.7. A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, 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. 387B), 17, Stratford Place, W.1. 10118

SEE the world; radio officers urgently required; we train in most in shortest period; training fees payable after appointments secured; scholarships available; boarders accepted; 2d stamp for prospectus from Britain's leading college.—Wireless College, Colwyn Bay. 10018

WIRELESS Telegraphy, Merchant Navy offers to youths 15% upwards when qualified, lucrative positions as radio officers.—Apply British School of Telegraphy, Ltd., 179, Clapham Rd., London, S.W.9. Also postal courses in theory of wireless for P.M.G. Certificates, and Amateur Transmitters licence. 10124

THE Institute of Practical Radio Engineers have available home study courses in every phase of radio and television engineering, specialising in the practical training of apprentices in the retail trade; enrolments limited; fees moderate.—The Syllabus of Instructional Text may be obtained post free from the Secretary, I.P.R.E., Fairfield House, 20, Fairfield Rd., Crouch End, London, N.8. 10068

FREE! Brochure giving details of Home Study Training in radio, television, and all branches of Electronics. Courses for the hobby enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other professional examinations; train with the College operated by Britain's largest electronic organisation; moderate fees.—Write to E.M.I. Institutes, Postal Division, Dept. WW28, 43, Grove Park Rd., London, W.4. (Associated with H.M.V.) 10001

GALPINS

ELECTRICAL STORES

408 HIGH ST., LEWISHAM, S.E.13

Tel.: Lee Green 0309. Nr. Lewisham Hospital

TERMS: CASH WITH ORDER. NO C.O.D.

All goods sent on 7 days' approval against cash.

EARLY CLOSING DAY THURSDAY

ELECTRIC LIGHT QUARTERLY TYPE CHECK METERS, all for 200/250 volts A.C. 50 cycles 1 phase, 5 amps load, 17/6 each, post 1/6; 10 amp 21/- each, post 1/6; 20 amps load, 25/- each, post 1/6.

RESISTANCE BOXES. Sub/Standard 200 ohms, 37/6 each.

H.P. A.C. MOTORS 1425 r.p.m. 110 volts only £2/15/- each.

3 KILOWATT DOUBLE WOUND TRANSFORMERS, 100/110 volts input, 230 240 volts output or vice versa, weight approx. 112 lbs., £12/10/- each, carriage fwd.

MAINS TRANSFORMERS (NEW), input 200/250 volts in steps of 10 volts, output 350/0 350 volts 180 m/amps, 4 volts 4 amps, 5 volts 3 amps, 6.3 volts 4 amps, 45/- each, post 1/6; another 350/0/350 volts 180 m/amps, 6.3 volts 8 amps, 0/4/5 volts 4 amps, 45/- each, post 1/6; another 500/0/500 volts 150 amps, 4 volts 4 amps C.T., 6.3 volts 4 amps C.T., 5 volts 3 amps, 47/6 each, post 1/6; another 425/0/425 volts 160 m/amps, 6.3 volts 4 amps C.T. twice 5 volts 3 amps, 47/6 each, post 1/6.

MAINS TRANSFORMERS (NEW), input 200/250 volts in steps of 10 volts, output 350/0 350 volts 300 m/amps, 6.3 volts 8 amps twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; ditto, 450/0/450 volts 250 m/amps, 6.3 volts 8 amps twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; another, input as above, output 500/0/500 volts 250 m/amps, 6.3 volts 8 amps twice, 6.3 volts 4 amps, 4 volts 4 amps, 5 volts 4 amps, 75/-, carriage 3/6. Another, wound to (electronic) specifications, 350/0/350 volts 250 m/amps, 4 volts 8 amps, 4 volts 4 amps, 6.3 volts 8 amps, 0/2/6.3 volts 2 amps, 70/- each, carriage paid; another, input as above, output 500/350/0/350/500 volts 250 m/amps, 6.3 volts 6 amps, 0/2/6.3 volts 2 amps, 0/4/5 volts 4 amps twice, 75/- each, carr. 3/6.

MAINS TRANSFORMERS (NEW), suitable for spot welding, input 200/250 volts, in steps of 10 volts, output suitably tapped for a combination of either 2/4/6/8/10 or 12 volts 50/70 amps, 95/- each, carriage 7/6.

MAINS TRANSFORMERS (NEW), 200, 250 volts input, in steps of 10 volts, output/0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6. Another as above but 10-12 volts, 55/- each, post 1/6; another, as above but 25/30 amps, 75/- each, carriage 3/6; another, input as above, output 0/18/30/36 volts 6 amps, 47/6 each, post 1/6.

EX-RADAR MAINS TRANSFORMERS, 230 volts input 50 cycles 1 phase, output 4,500/5,000 volts approx. 80 m/amps, 6.3 volts 2 amps, 4 volts 1 1/2 amps, 2 volts 2 amps, these transformers are new, immersed in oil, can be taken out of the oil and used as television transformers giving output of 10 m/amps, overall size of transformers separately, 5 1/2 in. x 4 1/2 in. x 4 in. and 3 in. x 3 in. x 2 1/2 in., price 75/- each, carriage paid.

EX-NAVAL ROTARY CONVERTERS, 110 volts D.C. input, output 230 volts A.C. 50 cycles, 1 phase, 250 watts capable of 50% overload, weight 100 lb., price £10/10/- each, carriage forward.

ROTARY CONVERTERS, 24-28 volts D.C. input, 1,200 volts 70 m/amps, D.C. output, 10/- each, P.F.

MAINS TRANSFORMERS, 230 volts input, 150/0/150 volts 200 m/amps, 6.3 volts 8 amps, 5 volts 2 amps output, 23/- each.

AUTO WOUND VOLTAGE CHANGER TRANSFORMERS, tapped 0/110/200/230 volts 350 watts, 55/- each, post 1/6; as above, but 500 watts, 70/- each, carriage 3/6; as above, 200 watts, 40/- each, post 1/6.

EX-U.S.A. W.D. ROTARY TRANSFORMERS, 12 volts D.C., input 500 volts, 50 m/amps, 275 volts 100 m/amps D.C. output. Complete with smoothing switches, fuses, etc., as new, 17/6 each, carriage 2/6, can be run on 6 volts, giving half the stated output.

MAINS TRANSFORMERS (By well-known makers). Input 100 & 230 volts, output 6 volts 1 1/2 amps twice, price 7/6 each, post 1/-; another 200/250 input, output 25 volt 4 amps C.T., 25/- each, carriage 1/6.

RECTIFIERS, input 75 volts, output 50 volts 1 amp, 10/- each, post 2/-. Condensers 10 M.F.D. 250 volt wkg, 3/6 each; 8 M.F.D. at 1,000 v/wkg, 7/6 each; 8 M.F.D. 2,500 v/test, 10/- each.

B. & H. RADIO
EAST STREET, DARLINGTON

ANTI-STATIC AERIAL
Easily fitted to chimney stack. Complete with coaxial and fittings £3 5 0

BASS & TREBLE SEPARATOR KITS
Mod. A. 6DB per octave £1 19 0
Mod. B. 12DB per octave £2 16 0

SCRATCH FILTER £1 5 0

VARIABLE SELECTIVITY I.F. TRANSFORMERS. 455 K/C.S. per pair £1 7 6

9 K/C.S WHISTLE FILTER
Narrow trough better than 49DB down £2 12 6

INTERFERENCE SUPPRESSORS
Ex-Govt. but fitted 1,000 volt condensers 17 6

FOR ACOUSTIC RESEARCH

Pulse and Square-wave Generators. Pulse width 0.25 to 120 milliseconds. Single or repetitive pulses with provision for square-wave output with external excitation.

Now in use for Medical Research.
Details on request.

DUN (electronics) & CO.,
17 Victoria Gardens, London, W.11. Park 6636

"CALLBOY"

CARRIES YOUR VOICE
COMPLETE INTER-COM.
SYSTEM FOR OFFICE
FACTORY, STORES, ETC.

EASCO ELECTRICAL LTD.
4/B BRIGHTON TERRACE
LONDON, S.W.9

Telephone . . . Brixton 4961-2-3



BRASS, COPPER, DURAL, ALUMINIUM, BRONZE

ROD, BAR, SHEET, TUBE, STRIP, WIRE
3,000 STANDARD STOCK SIZES

No Quantity too Small List on application

H. ROLLET & Co., Ltd.

6 Chesham Place, S.W.1. SLOans 2463
ALSO AT
LIVERPOOL · BIRMINGHAM · MANCHESTER

RADIO G200 OFFERS

50 Ampere Rectifier Units Type 11A. Ref. 5A/2247, S.T. & C. Rated as follows:—36V, 50A., at 50°C., input 380-440 Volts 50 c/ps. 3ph. Price £25 each.

EXPORT—IMPORT

ARTHUR HOILE 55 UNION STREET
MAIDSTONE, KENT
Telephone 2812

U.S. WAR SURPLUS WANTED

APR-4, APR-5, APR-1, ARC-3, etc.; TS-12 13, 34, 35, 36, 45, 120, 146, 155, 173, 174, 175, 323 and other "TS-" units, etc., particularly for the MICROWAVE REGION; also U.S. commercial laboratory equipment General Radio, Ferris, etc.; special tubes, such as 723A/B, 3C22, etc.; spare parts, technical manuals: single units or large quantities.

Sell direct to us, receive the full top price! Describe and price to:

ENGINEERING ASSOCIATES

434 Patterson Road,
Dayton 9, Ohio, U.S.A.

96 BOOKS, INSTRUCTIONS, ETC.
COPIES "W.W.", 1940-52: what offers? [1943
—Box 4021. R.S.G.B. bulletins
FOR sale: "W.W." 43-51: R.S.G.B. bulletins
45-47, s.a.e. details.—19, Jelf Rd., London. [19399
S W 2. [19420

ELECTRONICS (American), 1942/1950 in-
clusive; offers.—Foster, 62, Harlow Terrace,
Harrogate. [19420

I.P.R.E. technical publications. 5,500 Align-
ment Peaks for Superheterodynes. 5/9, post
free; data for constructing TV aerial strength
meter. 7/6; sample copy "The Practical Radio
Engineer" quarterly publication of the Institute.
2/-; membership and examination data. 1/- —
Sec.. I.P.R.E., 20, Fairfield Rd., London. N.8
10089

—THE REPAIRERS—

OF ELECTRICAL INSTRUMENTS
All kinds of Meters, Volt, Amp., Galvo.,
Recording, Electric Clocks, Aircraft
Instruments repaired. We are also skilled
Horologists. Government Ministry enquiries
invited.

Ask for Estimate. Send your enquiries to
Mr. J. R. W. Ridgway, F.B.H.I.
J. R. RIDGWAY & CO.
341 City Rd., E.C.1. Phone: TERminus 0641

TELECRAFT

AERIALS ENSURE THE BEST TELEVISION

TRY ONE AND SEE FOR YOURSELF

WE PAY UP TO £20

for

BC-348 RECEIVERS

BC-221 FREQUENCY METERS

In complete, good, preferably original condition

Reply to Box 3714 c/o "Wireless World"
stating price and condition

BRADMATIC

HIGH CLASS TAPE RECORDING EQUIPMENT
HEADS, DESKS, TAPE, ETC.

Send for lists

BRADMATIC LTD.
STATION ROAD, ASTON, BIRMINGHAM, 6
Telephone: East 0574

LOCKWOOD

makers of
Fine Cabinets

and woodwork of every descrip-
tion for the Radio and allied trades

LOCKWOOD & COMPANY
Lowlands Rd., Harrow, Middlesex. Byron 3704

—WHOLESALE ONLY—

Bona-fide retailers are invited to write
for our Current Comprehensive Com-
ponent Catalogue—Probably the most
interesting in the Trade.

**Importers and Distributors of the
Famous Midget French Potentiometers**

V. L. DEWITT LTD.

117, CHARLOTTE ST., LONDON, W.1.
Mus. 5929/0095

"Quixo" RADIO Cell Tester

Accurate tests
High, Low and Grid
Bias Batteries.
Write for leaflet 30M

RUNBAKEN MANCHESTER 1

WIDE BAND AMPLIFIERS 4-16 Mc/s
C.W. TRANSMITTERS 5-16 Mc/s, 160 w
C.W. TRANSMITTERS 4-18 Mc/s, 1 kW
TRANSCEIVERS 2-16 Mc/s, 20 w
TRANSCEIVERS 3-9 Mc/s, 3 w
ELECTRONIC COUNTER Scale of 2
ANTENNA TUNING UNIT AT2
for HT 4B HALLICRAFTERS
TRANSMITTERS
HEADPHONES, U.S.A. Type HS30

AVINASH ELECTRONIC LTD.

27 OLDHAM ROAD, LONDON, W.10
Telephone: LADbroke 2688

BENTLEY ACOUSTICS LTD.

38 Chalcot Road, N.W.1. PRImrose 9090
Offer coils as used in Bentley receivers

Superhet. All-Wave. Single former. Aerial and
Oscillator. Per pair 15/-

T.R.F. M. and L. with reaction. Per pair 7/6.
Superhet. S.M.L. Variable Iron core. A. H.F. and Osc.
with fixing feet and tags. Each 2/9.
Standard I.F.'s. Iron core. Per pair 10/6.

Full circuits included. Post paid.

QUALITY TELEVISION COMPONENTS



Scanning Coils
6 10 Kv. R.F. E.H.T. Units
E.H.T. and Output Transformers
Line fly-back E.H.T. Units
"TELEVISION CIRCUITS"
4th Edition 3/6.

HAYNES RADIO Ltd.

Queensway · Enfield · Middlesex

14 Day (& Electric) Automatic Switches

Reconditioned. Guaranteed one year, for con-
trolling Window & Poultry lighting, heating, etc.

From **50/- EACH**

Write for illustrated lists:

**DONOHUE'S (Timers), 6, GEORGE ST.,
NORTH SHIELDS, NORTHUMBRLAND.**

RADIO COMPONENT SERVICE

TRF Chassis Punched 4/3 each.
TRF Coils MW dust cored 5/9 per pair.
TRF Coils L.M.W. Air spaced 7/6 per pair.
Superhet Coils dust cored 2/9 each.
I.F.S dust cored 11/- per pair.
Send stamp now for New Catalogue.

All goods Guaranteed. Write to:—

Radio Component Service
68 Chesterfield Road, Leyton, E 10. LEY 4380

COVENTRY RADIO

Component specialists since 1925
10,000

Radio Valves in stock, all types. Im-
mediate delivery at current list prices.
Full range of 1st Grade makes of com-
ponents—Note we do NOT stock
surplus, only new goods.

New list available shortly.

COVENTRY RADIO

189, Dunstable Road, Luton.

**"AUTOMAT" HOME CHARGERS,
CHARGER KITS,
SELENIUM RECTIFIERS**

New Goods with Full Guarantee



"AUTOMAT" HEAVY DUTY HOME CHARGER, virtually unbreakable, for your car battery or radio cells. Selenium rectification, 12 months genuine guarantee, fine workmanship and appearance, damp-proof. Std. model 6 v./12 v., 2 amp. output, 59/6, post 2/-; or 3 amp. model, 12 v. only, 72/-.

ELIMINATOR KIT. Transformer, selenium, H.T. and L.T. rectifiers, 12 plus 12 mids., cond. for 120 v. 20/30 mA., eliminator with 1/2 amp. trickle charge, 35/-; with handsome steel case, 43/-, post 1/3.

FOOLPROOF CHARGER KITS. Really trouble free and reliable, with full instruction sheet and circuit. Standard kit, 12 v., 2 amp. rect., 45 watt trans., ballast/indicator bulb for 2 v., 6 v., 12 v. charger, no rheostat or ammeter needed, 38/6, post 1/8, or with handsome steel case, 52/-, post 2/-. Ditto but 2, 6, 12 v. 3 amp. 46/-; or with case, 58/6, post 2/-; also 12 v. 4 amp. rect., 70 watt trans., ballast bulb for 6 v./12 v., 55/-, Ditto 5 amp., 75/-, Minor kit as above for 6 v./12 v. 1 amp., 27/6, post 1/4; case 11/- extra.

SELENIUM RECTIFIERS, H.T. and L.T., new stock, not surplus. 2 v./16 v. 1/2 amp. h. wave 4/10; 12 v. 1 a. h. wave, 6/-, post 6d.; full wave 6 v. 2 amp., 9/-; 12 v. 2.5 amp., 15/8; 12/15 v. 3 a. to 3.4 a., 16/8. all post 8d.; 6 v. 4 amp., 18/8; 24 v. 3 amp., 33/-; 12 v. 5 amp., 27/6; 24 v. 5 amp., 54/-; large fitted type, 12 v. 6 amp., 33/-, all post 11d. H.T. rect., small space selenium, all new, 250 v. 60 mA., 7/6, post 5d.; 250 v. 120 mA. bridge, 14/6, post 8d.; 250 v. 200 mA. bridge, 24/-; ditto 300 mA., 32/-; Elim. rect. 135 v. 30 mA., 6/6, post 5d.

RENEWBAT, battery desulphater and conditioner, car size, 3/-.

CHAMPION PRODUCTS

43 Uplands Way, LONDON, N.21. Phone LAB 4457

AMPLIFIERS

Sound Equipment for every purpose:

Dance Band, Vocalist, Instrumentalist, Small Public Address, etc. For Guitar, Accordion, Microphone, Radio and Gramophone.

PP/15 Fifteen watts Output - 12 1/2 gns.
PP/18 De Luxe, Hi-fidelity - 14 1/2 gns.
PC/C Suitcase style, 15 watts, with 3 inputs and L.S. Complete - 22 gns.
R/P Electric Record Player - 22 gns.
Mics., Speakers, Record Players, etc.

S.A.E. for catalogues.

G. L. ELECTRONICS

(Sound Specialists since 1942.)
16 PATTISON RD., LONDON, S.E.18.
(Woolwich 0387.)

MORLEY TRANSFORMERS

Quotations for Specials and Rewinds by return.
Mains Trans. Tapped pri. 200-250 v. 80 ma., 350-0-350, 6.3 v. 4 a., 5 v. 2 a. Ditto 300 v. and 250 v. C.T. 21/-.
Constructors' T.V. Ph. Trans. Pri. 0, 195, 210, 230, 245 v. Secs. 6.3 v. 7 a. 6.3 v. tapped 2 v. 2 a., 35/-.
Quality P.P. O/P. Trans. Low leakage windings, Special Stalloy Lams. 4 a. to spec. from 35/-.
Ditto shrouded and tagged, 45/-.
Heater Trans. 6.3 v. 1.5 a. Tapped Pri. 200-250 v., 7/6.
L.F. Chokes. 10 H. 65 ma. 300 ohms, 4/6. 20 H. 150 ma., 12/6. 5 H. 250 ma., 15/-.

2, PAWSONS RD., W. CROYDON. THO 1665

GOODSELL LTD.

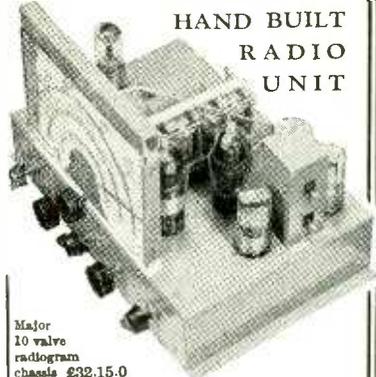
for High Fidelity Equipment

40 GARDNER ST.,
BRIGHTON, I

Tel.: Brighton 26735.

Fidelia

HAND BUILT
RADIO
UNIT



Major 10 valve radiogram chassis £32.15.0

This equipment is a waste of money if you don't really care what sort of reproduction you get from radio and records. There is such a lot built into it that does not really show until you have it in your home—B.F. Stage, 9 watt triode push-pull output, bass and treble controls, 20-20,000 cycle response etc. Full details of this and our other models on request.

- Fidelia De-Luxe, 9 valve model with 7 watt triode push-pull output £25 5 0
- Fidelia plus 8 valve model with B.F. stage and 5 watt output £24 5 0
- Fidelia Standard 7 valve model, 5 watt triode output and electronic tone control £21 15 0
- Fidelia minor 6 valve model with 5 watt push-pull output £17 10 0



ELECTRO Acoustic DEVELOPMENTS

2 AMHURST ROAD
TELSCOMBE CLIFFS
Nr. Brighton
SUSSEX
Tel.: Peasehaven 3156

**SOLONS FOR
ESSENTIAL
JOBS!**



Use SOLONS for the jobs that matter—this modern precision tool makes soldering speedier, simpler and more reliable. 5 models: 65 watt with oval tapered and round pencil bit; 125 watt with oval tapered and round pencil bit; 240 watt with oval tapered bit; each with 6 feet 3-core Henley flexible Voltage ranges from 100 to 250.

W. T. HENLEY'S
TELEGRAPH
WORKS CO. LTD.,
51-53 Hatton Garden,
London, E.C.1



Write for Folder Y.10.

CRYSTALS

TYPE "M"

Range 8 to 17 mc/s
Hermetically sealed metal can 0.75" high under pins, 0.75" wide, 0.375" thick with 3/8" diameter pins at 0.490" centres.



BROOKES CRYSTALS LTD.

10 Stockwell St., Greenwich, London, S.E.10
Phone: GREENWICH 1828. Cables: Xtals, London. Grams: Xtals, Green, London.

ENGINEERS!

Whatever your age or experience, you must read "ENGINEERING OPPORTUNITIES." Full details of the easiest way to pass A.M.I.Mech.E., A.M.I.C.E., C. & G. (Electrical, etc.), General Cert., etc., on 144 PAGES **Free!** terms and details of Courses in all branches of Engineering—Mechanical, Electrical, Civil, Auto., Aero., Radio, etc., Building, etc. If you're earning less than £13 a week, tell us what interests you and write for your copy of "ENGINEERING OPPORTUNITIES" today—FREE

B.I.E.T.

387 Shakespeare Hse.
17-19 Stratford Place,
London, W.1.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

HARK!

WED.
21
JAN.

JOIN US at THE WALDORF Hotel, Aldwych, London on this date and we can promise you something worth hearing.

Radio especially F.M. and records demonstrated on modest priced equipment with not merely high fidelity but—

**THE SOUND OF MUSIC!
QUALITY MART present**

F.M. FEEDER UNIT new and improved model now in production suits any amplifier or radio £8.15s.

THE GRAMOPHONE Amplifier

Kits available for the above items

NEW ★ EPITOME Amplifiers ★ EPIGRAM Player ★ QUALITY CUBE and other EPIC loudspeakers ★ Tuner Units—Coils—Chassis.

Trade enquiries invited

★ Also ACOS, BSR, DECCA WB and other leading makers demonstrating the latest pick-ups transcription motors, long playing records, loudspeakers and radio equipment.

Admission by Ticket only
Fill in Coupon now

1/4d. postage in unsealed envelope.

QUALITY MART

8 Dartmouth Park Ave., London, N.W.5

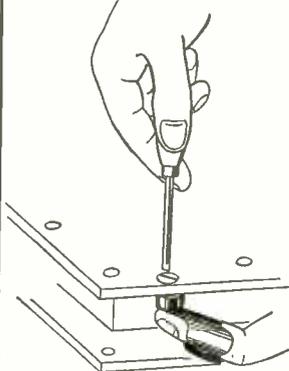
1/4d. stamped self-addressed envelope enclosed.

Please send.....tickets for your London demonstration session at 4 p.m. 6 p.m. 8 p.m. Jan. 21st. Trade and Press session 2 p.m. (delete as applicable)

Name
Address

INDEX TO ADVERTISERS

A.A. Tools	130	E.M.G. Handmade Gramophones, Ltd.	131	Peace, T. W.	124
A.B. Metal Products, Ltd.	29	E.M.I. Factories Ltd.	17	Pearson, M. & J.	122
Acoustical Mfg. Co., Ltd.	12	E.M.I. Institutes	78, 80, 84	Pitman, Sir Isaac & Sons, Ltd.	131
Acoustic Products Ltd.	25	Engineering Associates	134	Post Radio Supplies	124
Acru Electric Tool Mfg. Co., Ltd.	136	English Electric Co., Ltd. The	57	Pratts Radio	110
Adcola Products, Ltd.	48	Enthoven Solders, Ltd.	5	Premier Radio Co.	61, 62, 63, 127
Admiralty—R.N.V. (Wireless) R.	116	Eta Tool Co. (Leicester), Ltd.	88	Pye Telecommunications, Ltd.	488
Advance Components, Ltd.	19, 91	Expert Gramophones, Ltd.	56	Pye, W. G. & Co., Ltd.	90
Aerialite, Ltd.	18	Field, Norman H.	112	Quality Mart	135
Aircraft Radio Industries, Inc.	112	Fluxite, Ltd.	133	Quartz Crystal Co., Ltd.	132
Airmec, Ltd.	12	Franks, H. The	121	Radio & Electrical Mart, The	112
Allen Components, Ltd.	36, 119	Frith Radiocraft, Ltd.	133	Radio Component Service	134
Alpha Radio Supply Co., The	123	Galpins	102, 103	Radio Exchange Co.	110
Altham Radio Co.	60	Garland Bros.	121	Radio Mail	106
Amplex Appliances (Kent), Ltd.	112	Gee Bros. Radio, Ltd.	16b, 21	Radiomenders, Ltd.	120
Anders Radio, Ltd.	28	General Electric Co., Ltd. The	130	Radio Merchandise Co., Ltd.	64
Antiference, Ltd.	22	Glaser, L. & Co.	34, 35	Radio Resistor Co., Ltd. The	132
Arcoelectric Switches, Ltd.	53, 114	Goodmans Industries, Ltd.	68	Radiospares, Ltd.	106
Armstrong Wireless & Television Co., Ltd.	120	Goodsell, Ltd.	88	Radio Traders, Ltd.	108
Arrow Electric Switches, Ltd.	89	Grampian Reproducers, Ltd.	44	Rainbow Radio Mfg. Co., Ltd.	32
Ashdown, H.	89	Gray, Arthur, Ltd.	58	Record Electrical Co., Ltd. The	32d
Ashworth, H.	89	Grundig (Gt. Britain), Ltd.	58	Redifon, Ltd.	114
Associated Cine Equipments, Ltd.	38	Hallam, Sleigh & Cheston, Ltd.	58	Rehance Mfg. Co. (Southwark), Ltd.	27
Audix, B. B.	84	Hall Electric, Ltd.	58	Reproducers & Amplifiers, Ltd.	134
Automatic Coil Winder & Electrical Equip. Co., Ltd. The	1, 166	Hanney, L. F.	58	Ridgway, J. R. & Co.	44
Autoset (Production), Ltd.	134	Harvey Electronics, Ltd.	58	Robinson, F. C. & Partners, Ltd.	86
Avinash Electronic, Ltd.	52	Hatfield Instruments	130	Roding Laboratories	28
A.W.P. Radio Products	134	Hayes Co. The	134	Rogers Developments Co.	82
B. & H. Radio	22	Henley's W. T. Telegraph Works Co., Ltd.	135	Rois Celestion, Ltd.	134
Baird Television, Ltd.	119	Henry's	115	Rollett, H. & Co., Ltd.	134
Bakers "Selhurst" Radio	75	Hifi Ltd.	130	Rollec Electrical Products	128
Barker Natural Reproducers	119	Hivac, Ltd.	16c	Salford Electrical Instruments, Ltd.	49
Belling & Lee, Ltd.	128	Hivou, Ltd.	134	Sallis, A. T.	122
Bel Sound Products Co.	32	Holle, Arthur	125	Samsons Surplus Stores	128
Bennett College, Ltd., The	118	Holley's Radio Stores	58	Sangamo Weston, Ltd.	133
Benson, W. A.	70	Homeab Instruments	110	Savoy Transformers, Ltd.	18
Bentley Acoustics, Ltd.	32b, 70	Howorth, P.	110	Savage, W. Bryan, Ltd.	41
Birmingham Sound Reproducers, Ltd.	134	H.P. Radio Services, Ltd.	132	Simon Sound Service	112
B.K. Partners, Ltd.	113	Hyndburn Electronics, Ltd.	69	Sky-Masts	125
Bradmatic, Ltd.	27	Industrial Electronics	44	Smith, G. W. (Radio), Ltd.	126
British, Chas. (Radio), Ltd.	120, 135	International Correspondence School, Ltd.	20	Smith, H. L. & Co., Ltd.	80
British National Radio School	114	Jackson Bros. (London), Ltd.	129	Solartron Laboratory Instruments, Ltd.	49
British Physical Laboratories	42, 88	Kaye Electrical Distributing Co.	128	Sound Sales, Ltd.	126
British Sarozal, Ltd.	135	Kenoy, Ltd.	92, 93, 94	Southern Radio Supply, Ltd.	56
Brookes Crystals, Ltd.	84	Koskie, B.	85	Spencer-West	100, 101
Brown, S. G., Ltd.	66, Edit. 47	Lasky's Radio	52	Standard Telephones & Cables, Ltd. 48c.	73, 76
Bulgin, A. F. & Co., Ltd.	26	Leak, H. J. & Co., Ltd.	85	Stann Radio, Ltd.	114
Buipers, Ltd.	130	Leevers-Rich Equipment, Ltd.	50	Sugden, A. R. & Co. (Engineers), Ltd.	40
Bull, J. & Sons, Ltd.	132	Lewis Radio Co.	14	Supacolis	129
Candler System Co.	132	Livingston Laboratories, Ltd.	134	Sutton Coldfield Electrical Engineers	104
Chaffley Cabinet Co., The	135	Lowwood & Co.	129	Szymanski, S.	132
Champion Products	122	London Central Radio Stores	42	Tanpox Products, Ltd.	56
Chapman, C. T. (Reproducers), Ltd.	15	Lowther Mfg. Co.	89	Taylor Electrical Instruments, Ltd.	31
Cinema Television, Ltd.	126	L.R. Supply Company, Ltd.	128	Taylor Tunniff & Co., Ltd.	39
Cinesmith Products	36	Lyons Radio, Ltd.	10	Technical Suppliers, Ltd.	36
City & Rural Radio	65	Magnetic Coatings, Ltd.	54, 55	Telecraft, Ltd.	20, 134
City Sale & Exchange, Ltd.	109	Mail Order Supply Co.	8	Telegraph Condenser Co., Ltd.	Cover iii
Classic Electrical Co., Ltd.	111	Marconi Instruments, Ltd.	48a	Telemechanics, Ltd.	30
Clydesdale Supply Co., Ltd.	74	Marconi's Wireless Telegraph Co., Ltd. 16a.	106	Tele-Radio (1943), Ltd.	123
Cohen, D.	134	Marks, C. & Co.	130	Thermionic Products, Ltd.	66
Csmoocord, Ltd.	30, 90, 131	Marris & Cartin, Ltd.	50	Thomas Richard & Baldwins, Ltd.	26, 51
Coventry Radio	68	McElroy-Adams Mfg. Group, Ltd.	124	Transradio, Ltd.	Edit. 45
Davis, Alec, Supplies, Ltd.	48	McMurdo Instrument Co., Ltd. The	53	Trusound, Ltd.	4
Davis, Jack (Relays), Ltd.	116	Metropolitan-Vickers Electrical Co., Ltd. 23	118, 130	Tuvox, Ltd.	13
Day, Will, Ltd.	136	Modern Book Co.	67	United Insulator Co., Ltd.	56
De Havilland Propellers, Ltd.	90	Modern Electrics, Ltd.	135	Unitel Electric	68
Dewitt, V. L., Ltd.	134	Morley Transformers	66	Universal Electrical Instruments Corp.	106
Direct T.V. Replacements	46	M.R. Supplies, Ltd.	66	Universal Electronics	108
Donohoe's (Timers)	32a	Mullard, Ltd.	3, 7, 67, 72	Universal Engineering Co.	126
Drayton Regulator & Instrument Co., Ltd.	124	Multicoore Solders, Ltd.	Cover iv	University Radio, Ltd.	107
Dubilier Condenser Co. (1925), Ltd.	134	Neo Electrical Industries, Ltd.	132	Verdik Sales Ltd.	38
Duke & Co.	134	Newman, J. & S., Ltd.	30	V.E.S. Wholesale Services, Ltd.	90
Dulci Co., Ltd. The	134	Norhall, L. C.	52	Voigt Patents, Ltd.	112
Dun Electronics	134	Northern Radio Services	9	Vortexion, Ltd.	79
Esco Electrical, Ltd.	81	N.S.F., Ltd.	127	Walton's Wireless Stores	130
Edison Swan Electrical Co., Ltd.	40	Nusound Products	112	Webb's Radio	108
E. & G. Distributing Corporation, Ltd.	118	Nu-Swift, Ltd.	132	Westinghouse Brake & Signal Co., Ltd.	128
Egen Electric, Ltd.	126	Oddie Bradbury & Cull, Ltd.	113	Weymouth Radio Mfg. Co., Ltd. The	69
Electradix Radios	126	Olympic Radio Components	43	Wharfedale Wireless Works	46
Electrical Instrument Repair Service, The	135	Oryx Electrical Laboratories	11	Whiteley Electrical Radio Co., Ltd.	16
Electro Acoustic Developments	6	Osmer Radio Products, Ltd.	11	Wilco Electronics	50
Electro Acoustic Industries, Ltd.	96, 97, 98, 99	Painton & Co., Ltd.	87	Wilkesden Transformer Co., Ltd.	108
Electronic Instruments, Ltd.	58	Panda Radio Co.	120	Wilkinson, L.	33
Electronic Precision Equipment	52	Parmeko, Ltd.	117	Winter Trading Co., Ltd.	91
Electronic Service (Hallamshire), Ltd.	45	Parsonage, W. F. & Co., Ltd.	104	Woden Transformer Co., Ltd.	78
Electro Technical Assemblies		Partridge Transformers, Ltd.		Wright & Weire, Ltd.	91
Electronic Tubes, Ltd.		P.C.A. Radio		Young, C. H.	104





SIMPLE
QUICK
EFFICIENT

FINGER TOOLS — PYROGRIPS — COIL & SPRING WINDERS

Write for Leaflets.

ACRU ELECTRIC TOOL MFG. CO. LTD. CHAPEL STREET, LEVENSHULKE, MANCHESTER 19. Tel. RUSholme 4613

Printed in Great Britain for the Publishers, LUFFE & SONS, LTD., Dorset House, Stamford St., London, S.E.1, by THE CORNWALL PRESS LTD., Paris Garden, London, S.E.1. *Wireless World* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. White & Co. CANADA: The Wm. Dawson Subscription Service Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd., William Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co.