

A BEGINNER'S SUPPLEMENT

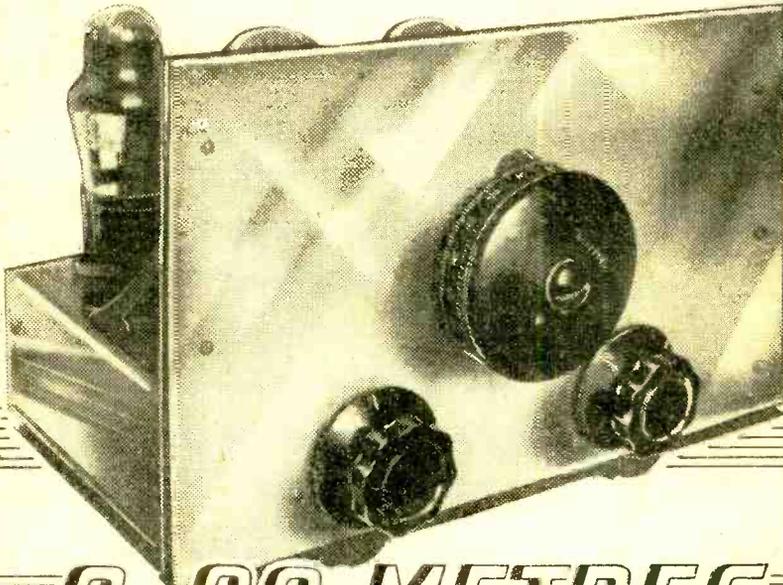


Vol. 29 No. 562

AUGUST, 1953

EDITOR:
F.J. CAMM

PRACTICAL WIRELESS



9-90 METRES

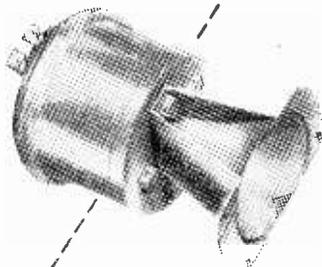
S-W-3

IN THIS ISSUE :

A THERMISTOR-STABILISED
AUDIO OSCILLATOR
A MULTI-RANGE TESTER
EARTH CONNECTIONS

VERTICAL AND FIXED BEAM
AERIALS
AN IMPROVED A.V.C. CIRCUIT
DESIGN OF OSCILLOSCOPES

HIGH QUALITY REPRODUCTION AT MODERATE COST



Since the Tweeter Unit was first introduced at last year's Radio Show, many hundreds of enthusiasts have discovered that when used in conjunction with our standard 10" Speaker, it provides a quality of reproduction that is quite outstanding in relation to the total cost.

STENTORIAN PRESSURE TWEETER UNIT

The Unit is of the moving coil pressure type, similar to that in the 10 in. and 12 in. Concentric Duplex Units. Speech coil of aluminium wire, wound on an aluminium former, rigidly fixed to an aluminium diaphragm. Speech coil and diaphragm are at the rear of the magnet; the centre pole is hollowed out to form the commencement of the horn, in the centre of which is the phase equaliser.

Speech coil impedance: 15 or 30 ohms. Flux density: 14,000 gauss. Response: 2,000-14,000 c.p.s. Power handling capacity: 3 watts. Tax free **75/6**

A suitable cross-over network is available at 26/6

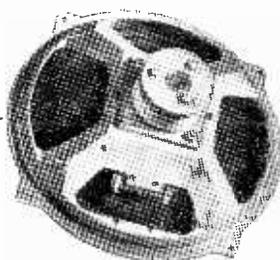
PLUS

STANDARD 10" UNIT (MODEL 1012)

Generally regarded as the most outstanding speaker of its kind. Response 55—11,000 c.p.s. Magnet of 12,000 gauss. Handling capacity 10 watts u.d.o.

Price (tax paid) minus transformer £3.9.0 With universal transformer £4.13.9

WHITELEY ELECTRICAL RADIO CO LTD · MANSFIELD · NOTTS



SHORTAGE OF RADIO & T/V ENGINEERS

The demand of Industry for our trained students is still greater than we can supply—and is likely to remain so for many years. We offer

FULL TIME DAY COURSE

1 year course in Principles and Practice of Radio and Television.

Next course commences 24th August, 1953.

Write for FREE BROCHURES giving details of the above, of our 3-year course, and of others.

E.M.I. INSTITUTES—the only college which is part of a great industry.

E.M.I. INSTITUTES (Dept. 32A)
10, PEMBRIDGE SQUARE
LONDON, W.2.
Tel: BAYwater 5131/2.

Associated with
"H.M.V."
MARCONIPHONE
COLUMBIA
ETC.

1A.1b

HOME CONSTRUCTED TELEVISORS

Smith's
of
EDGWARE ROAD

Component Specialists since Broadcasting started, can supply all or any of the components specified for the

"VIEWMASTER"

"MAGNAVIEV"

"TELEKING"

and "Viewmaster" Wide-angle Conversion.

Also cabinets, valves, aerials, feeder cable, wire, sleeving, solder, nuts and bolts, clips, etc.

Order with confidence c.o.d. or c.w.o. at current prices, or send s.a.e. for Price List.

We also invite your inquiries for all other electronic components.

H. L. SMITH & CO., LTD.
287/9 Edgware Road, London, W.2.
Tel.: Paddington 5891. Hours 9 till 6 (Thursday 1 o'clock).

Near Edgware Road Stations, Metropolitan and Bakerloo.

-if you look for BIG RESULTS



We're not kidding—a vast improvement arises from the use of OSMOR "Q" Range Coils. No wonder our customers are enthusiastic! They tell us these "mighty marvels in miniature" are super-selective and sensitive to a degree they never dreamed possible. And we guarantee them—they're the outcome of scientific research plus the highest technical ability. Note these "plus" points that spell superior performance:—

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

COILPACKS. Now at new lower prices!—A full range is available for Superhet and T.R.F. Mains or Battery. Size only 1 1/2 in. high x 3 1/2 in. wide x 2 1/2 in. Ideal for reliable construction of new sets, also for conversion of the 21 RECEIVER TR.1196. TYPE 18, WARTIME UTILITY and others. Aligned and tested with full circuits, etc. Fully descriptive leaflets available. We keep stocks of many radio components for use in published circuits, including:

" PRACTICAL WIRELESS "

3-Speed Autogram; Modern I-Valver; A.C. Band-pass 3; R1155 Converter; Modern High Power Amplifier-2; Attache Case Portable; Beginners Superhet.

" WIRELESS WORLD "

No Compromise T.R.F.2 Tuner (Osmor coils QA11 and QHF11 for M.W. and QA12 and QHF12 for L.W. are suitable, price 4/- each.) Midget Mains Receiver (Osmor coils QA11 for M.W. and QA12 for L.W. are suitable. Price 4/- each.) Sensitive 2-Valve Receiver. Television Converter (special Coils in Cans available).

MATCHED COMPONENTS

Various types of OSMOR Dials, Chassis, I.F.s, Speakers, Transformers, etc., to match our coils and coilpacks are all listed.



FREE!

Send 5d. (stamps) for CIRCUITS and full lists of coils, Coilpacks and radio Components.

4/-
EACH



Dear Reader.

We can't mention all our products here, but shall be glad to receive your enquiries for Chassis, Tuning Condensers, Switches, Volume Controls and all other Radio Components. If its top quality components and a speedy, courteous service you are looking for—try Osmor. We really shall do our best for you.

radio products Ltd

(Dept. P.38), BRIDGE VIEW WORKS, BOROUGH HILL, CROYDON, SURREY.
Telephone: Croydon 5148/9

RADIO MAIL

I.F. ALIGNER KIT 15/-

Provides a modulated signal, tunable over the 465 k/c.s. range of I.F. frequencies, and is pre-tuned ready for use.

Robust construction in compact welded steel case, 4in. x 4in. x 3in.

Light, fully portable, operates from single "U2" 1.5 volt dry cell.

All metal parts are ready drilled for easy assembly. Full instructions and diagrams.

Post and packing, 1/6. Cash with order or C.O.D.

These Kits are COMPLETE. No valves to buy.

RES/CAP BRIDGE KIT 31/6

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.

NO CALIBRATING

Six fully variable ranges separately scaled, direct reading. Full instructions and diagrams for easy assembly.

Post and packing, 1/6. Cash with order or C.O.D.

AVAILABLE SHORTLY: Inductance Bridge Kit at 42/6. Details on request.

RADIO MAIL, 4, RALEIGH STREET, NOTTINGHAM

Stamp with all enquiries, please.

One fault MAY SPOIL THE SET!

Designers of home constructor sets know that the smallest component can sometimes provide the biggest headache. Don't run risks. Solder those intricate joints with Multicore. Its 3 cores of extra-active non-corrosive Ersin Flux give it the highest liquefaction rate of any solder. Correct proportions of solder to flux prevent oxidation, actually clean surface oxides, and make "dry" or H.R. joints impossible. You need no extra flux.

ERSIN Multicore THREE CORE SOLDER

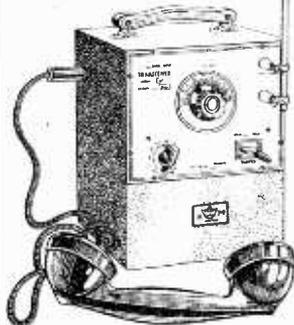
PULL AS REQUIRED
SIZE 222
DIAM.
60784 40 1/2 1/2

CONTAINS 3 CORES OF NON-CORROSIVE FLUX

MULTICORE SOLDERS LTD.
MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS • BOXMOOR 5635

RADIO-TELEPHONES.

U.H.F. (53-75 Mc/s) transceivers Brand new and boxed. Visual range. Complete with vibrator power packs for 12 volt operation. SPECIAL PRICE £21 per pair Carriage 15/-. Can be supplied separately at £9/17/6.



RADIOGRAM CHASSIS. Latest models. Flywheel tuning, negative feedback. Engraved knobs. All complete. Three wave band at £12/12/0. Six wave band at £15/15/0. Also slightly different model, similar specifications, at £10/17/6. Carriage 4/6. Terms available on these chassis.

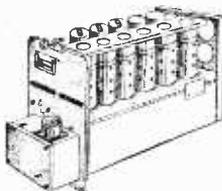
LOCATING DEVICE. Unused ex-W.D. units. Still in maker's (Truvox) boxes. Ideal burglar alarms. Bell works off 4½ volts. PRICE 27/6. Post 1/9.

O.P. TRANSFORMERS. Store soiled. Match all normal O.P. valves to 2.5 ohm speech coil. BARGAIN OFFER 1/9. Post 9d.

TUNING CONDENSERS. Store soiled. Two gang, .0005 mfd. Tested. 2/9 each. Post 6d. SPECIAL OFFER three for 7/-. WIRE. Nickel-chrome. Special run-out mechanism on tins of 50 yards (.014in.) and 25 yards (.032in.). 4/6 per tin. Also spring steel in same sizes. 1/- per reel.

MAIN TRANSFORMERS. Primary auto-wound and tapped 0, 205, 225, 245, 300 volts, at 200 m/A. Secondary 5 volts at 2 amps, and 6 volts at 7 amps. BARGAIN 12/6. Post 2/-.

TELESCOPIC AERIALS. Weather-proof. Extend to 7ft. 6in. Ex-W.D. but unused. 7/9. Post 1/3.



6 VALVE V.H.F. SUPERHET RECEIVER. Ex-W.D. (R.1124), but brand new condition. 30.5-40 Mc/s, I.F. 7 Mc/s. 6-channel switching. Covers T.V. sound. Fire, Amateurs, etc. Convertible to mains (A.C. or A.C./D.C.). Components include 30 ceramic trimmers, 30 small condensers, 30 resistances, 6 valve-holders, cans and covers. 2 transformers, 3 coils, etc. Our supplied complete with valves at

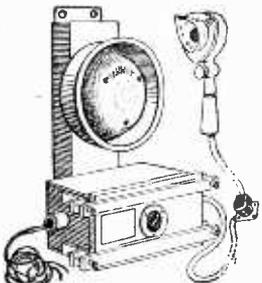
price 7/6, post 2/9. Also drawings available at 1/-.
EXTENSION SPEAKERS. Brand new 6½in. P.M. speaker (low impedance). Mounted on polished and veneered baffle stand, with gold sprayed metal fret. 5ft. lead ready connected. ONLY 19/9. Post 1/9.

LOUD HAILER. Very powerful P.A. system, working off 12 or 24 volts. Brand new. No valves to break or damage. Independent of electricity failures. Weatherproof. Consists of microphone and combined amplifier/speaker. Total weight 20lb. Our price, £8/17/6 carriage 5/6.

ACCUMULATORS. Brand new, 2 volt, 14 a/h, lead acid, 1½in. x 1½in. x 6in. Bargain, 4/6, post 1/-.

MICRO SWITCHES. Latest American midjets. 250 volt, 3 A., ½in. x ½in. x 1½in., 5/-.

INSULATING TAPE. New and wrapped, ½in. wide, ½lb. rolls, list price 3/6. Our price, 1/6.



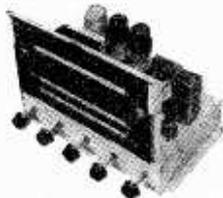
C.W.O.
OR
C.O.D.

DUKE & CO.,

621, ROMFORD ROAD,
LONDON, E.12. GRA. 6677.

STAMP FOR CATALOGUE.
MONEY BACK GUARANTEE.

Armstrong



CELEBRATE
CORONATION YEAR
AND THEIR
21st ANNIVERSARY
OF QUALITY RADIO CHASSIS
WITH AN
OUTSTANDING NEW MODEL
FC 38
A HIGH CLASS CHASSIS AT AN
ECONOMICAL PRICE
£23.13.0 including tax

FOR REALISTIC RADIO & RECORD REPRODUCTION

- NEW AND IMPROVED TUNING SCALE
- MAGIC EYE TUNING INDICATOR
- SEPARATE BASS AND TREBLE CONTROLS
- NEGATIVE FEED-BACK
- 8 WATTS PUSH-PULL OUTPUT
- 8 VALVES INCLUDING TUNING INDICATOR

BRIEF SPECIFICATION

Superheterodyne with I.F. amplifier at 470 kc and A.V.C. on Mixer and I.F. valves. A double diode triode valve for detector and automatic volume control, its triode section providing the first stage of audio amplification. The first section of a double triode valve provides further L.F. amplification and tone control, the second is arranged as a phase inverter feeding two beam power tetrodes operating in push-pull. All the necessary smoothing is incorporated in the chassis and no special field is required for this purpose. The output transformer is also in the chassis and any good quality P.M. loudspeaker with a speech-coil impedance of 3 ohms may be used.

WAVERANGE

16-50 metres, 190-550 metres, 1000-2000 metres. For A.C. Mains, 200-250 volts, 40-60 cycles.

ARMSTRONG WIRELESS & TELEVISION CO. LTD.,

WALTERS ROAD, HOLLOWAY, LONDON, N.7

Telephone: NORth 3213/4

TYPE 25/1196 S'HET RECEIVER

SEE "PRACTICAL WIRELESS" CONVERSION
USUAL PRICE 37/6.

While the stock lasts we offer these perfect sets
COMPLETE 28/- WITH 6 VALVES.

TR9 RECEIVERS.—6-valve Battery Set. Complete, 15/- each. No. 46 Set, less Valves, £1. No. 48 Set, complete with Valves, £4/10/- Type 1368A, a 2-valve Battery Amplifier, complete, 12/6. T1154L, brand new in Transit Case (less Meters), £1. Amplifier No. 18, less Valves, 7/- each. U.S.A. No. 58 Set, complete (less Valves), includes 300 volt Meter, cracked case, 30/- each.

MOTOR FLASHER.—24-volt A.C. D.C. Motor, 60 r.p.m. reduction gear, 4 make-and-break contacts, 8/- each.
METERS.—30, 50, 100, 300 or 500 mA., 5/6 each; 3.5, 4 or 6 amp. Thermo, coupled, 5/6 each.
 We have stock of spares for 1131TX.

SILENIUM RECTIFIERS.—Large stock from 5/6 each.
TRANSFORMERS.—All inputs: 230-250 volt, 50 c.p.s. 12 volt, 70 amp. or 15 volt, 60 amp., £3 10/- each.
 All types for 1131 Transmitter in stock.

AUTO-TRANSFORMER.—Tapped 230 v., 190 v., 110 v., 7 amp., £2 each.
SMALL TRANSFORMER.—230 v. input output, 15 volt, 3 amp., 6/6 each.

VALVES.

EF50	VR91	5/-	SP61	2/6	SP41	2/6
(Red) 6/3	EF54	5/-	EF39	8/-	EBC33	8/-
EF36	EA50	2/-	D1	2/-	EF91	9/6
EB34	EL50	7/6	ECC31	6/-	ECC32	6/-
EL32	5U4G	9/6	VU39	10/-	UU5	10/-
5Z4	6Q7	9/-	6X5	7/6	6K7	6/-
6V4	184	8/-	1S5	8/-	1S5	8/-
1T4	8/-	2/-	Pen20	2/6	KT2	5/6
3S4	HL2K	2/-	KT66	12/6	6L6M	10/-
SG215	LF210	2/-	6B4	9/-	6B8	9/-
6J5M	6J5G	4/6				

VINER'S (Middlesbrough)

Radio Electrical

26, EAST STREET, MIDDLESBROUGH.

TEL. (MID) 3418.

Volume Controls 80 ohm **COAX**
 Midget Bell-wan type. STANDARD 1/2 in. diam.
 Long spinules. Guaranteed Polythene insulated.
 1 year. REDUCED
 L.B.S.S. No. S.P. Sw. PRICE
 9. S.P. Sw. 4-
 D.P. Sw. 4-9

ALL VALUES -10K. to 2 MEG.

BALANCED TWIN FEEDER per yd. 6d. 1 80
TWIN SCREENED FEEDER per yd. 1 10
TRIMMERS, Ceramic, .25, .50, .75, 1.0; 100 pt.
 150 p. 1.3; 250 p. 1.8; 500 p. 1.9.

RESISTORS, All values: 1 W. 4d.; 1/2 W. 6d.;
 1/4 W. 8d.; 2 W. 1s.

WIRE-WOUND RESISTORS, Best makes Miniature
 Ceramic Type—5 W., 15 ohm to 4 K., 19
 to 4 W., 20 ohm to 6 K., 23; 15 W., 30 ohm to 10
 K., 29; 5 W. Vitreous, 12 K. to 25 K., 3-.

WIRE WOUND POTS, 3 WATT, FAMOUS MAKES,
 P.P.S. Mini. Type Standard Size Pots, 2 1/2 in.
 Knurled and Slotted Spindle, High Grade,
 Knob to 20 K, 50 K and All Values, 500-ohms to
 100 K. (Carbon Track), 20 K, 50 K, 100K,
 5 each.

O.P. TRANSFORMERS—Tapped standard, per
 3.9. Heavy duty 70 ma., 4.6. 110V, tapped, 4.9.
 I.P.F. chokes, 100 h. 65 ma., 4 w., 20 25 to 100 150
 ma., 12.6. 5 h. 250 ma., 15 v., 15 h. 100 ma., 10.6.

MAINS TRANS. Made in our own workshops to
 high grade specifications. Fully interlocked and
 interlocked. Heater Trans., tapped prim., 6.3 v.,
 1 1/2 amp., 7.6. 250V-250, 80 ma., 6.3 v., 4 A., 5 v., 2 A.,
 ditto 200-0-200 ditto 250-0-250, 21 v. Wire master,
 auto type, 35 v., Telexing, 30 v., 1 amp. 30 v.

CONDENSERS, new stock, best makes, .001 and
 6 kv. T.C.C., 6 d. 1/10, 12.5 kv., 9.6. .002,
 Multilead, 8 kv., 2.6. 2 pt. to 200 p., 6d. .001,
 .002, .01, .02, .04, .450 v. Tub., and 1/4 in. 350 v.

ELECTROLYTICS, ALL TYPES, NEW STOCK
 ★1450 v. B.E.C. 2.6 16-16 450 v. B.E.C. 5.6
 ★1500 v. Dulliber 3. 32 350 v. B.E.C. 4-
 ★80 500 v. Dulliber 2.6 ★22 500 v. Dulliber 5-
 ★8 500 v. Dulliber 4.6 ★25 500 v. Dulliber 1.9
 ★8 500 v. Dulliber 2. ★50 50 v. T.C.C. 2-
 ★16 250 v. B.E.C. 3.0 60 mfd. 350 v. T.C.C. 4.6
 16 450 v. T.C.C. 3.6 250 mfd. 350 v. 8.6

★48 500 v. Dulliber 4- All others Can. Type.
 8 v. 16 450 v. B.E.C. 5. ★In. Tub. wire ends.
 16-32 450 v. Huns 5.6 T.O. G & E SWITCHES
 84 16 500 v. Dulliber 5.8 Ex-Govt. On-Off: 94

NEW BOXED	VALVES	ALL GUARANTEED
145 5 6GH6	3 6 12AX7	10 6 EY51
185 9 6J3	7 6 12K7	10 6 EY91
185 9 6J7	8 6 12R8	10 6 HVR26
174 9 6K5	7 6 12Q7	10 6 EL41
184 9 6K7	6 6 15L6	10 6 PY80
284 9 6K8	10 6 35Z4	10 6 H123
2X2 5 6GL5	5 6 20L6	9 6 1D1
316 2 6GL6	10 6 807	10 6 U14
314 10 6N7	8 6 956	5 6 6P25 15-
314 9 6N7	10 6 9001	7 6 1P25 8.6
374 9 6E47	3 6 9006	7 6 1P25 9.6
4G5 7 6E47	6 6 KA50	2 1P22 9.6
6AM6 10 6E81	9 6 EB91	8 6 1P25 7.6
6B8 7 6E87	11 6 EB33	9 6 6AT6 12.6
6BE5 10 6E75	13 6 E1	7 6 1A7 10.6
6E25 12 1/2 V63	8 6 1C180	12 6 6E36 9.6
6W6 10 6E76	9 6 1P36	7 6 6K70 12.6
6E4 7 6E75	9 6 1P39	9 6 1P39 10.6
6106 7 6E46	10 6 1P50	7 6 1P50 10.6
6P6 9 6E78	8 6 1P91	10 6 1P82 10.6
6E6 6 6E74	7 6 1P92	9 6 12AT7 10.6

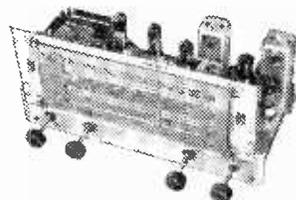
Huge Stock VSA Valves at 1951 Tax Prices.

SPECIAL PRICE PER SET:
 1R5, 1T4, 1R5 and 384... 32.6
 6K8, 6K7, 6G7, 6V6, 5Z4... 40-
VIEWMASTER, Set 12 valves, £6 10/- With
 EY51, 27. **TELEKING**, Set 17 valves, £9 10s.
 LYNX—Set of 17 valves, £9.

BARGAIN CORNER
 Mince solder 60/40, 16oz. 5 6 1 lb., 4d. yd.
 T.C. wire 18 to 22 s.w.g., per yd., 2d. PVC
 connecting wire, 10 colours, single or stranded,
 2d. yd. 1/4 in. Vialcylinder and Sereading Cam, 1.6.
 Vholders, octal, pax., 4d. 7 moulded, 6d.; 1P50,
 BTG, 9d.; BSA, B9A, 1.1; B12A (CRT), 1.3, etc.
LOUDSPEAKERS P.M., 3 OHM,
 3 in. Plessey, 12.6. 5 in. Plessey, 13.6. 6 in. Plessey,
 14.6. 8 in. Tricon, 15.6. 10 in. Lectra, 25.

KNOB'S GOLD ENGRAVED—Walnut or Ivory,
 1 1/2 in. diam., 1.6 each. "Focus", "Contrast",
 "Brilliance", "Brilliance—On/Off", "On-Off",
 "Volume", "Vol. On-Off", "Tone", "Tuning",
 "Tribble", "Bass", "Wavechange", "Radio-
 Gram", "S. M. L. Gram", "Record-Play",
 "Brightness", ditto not engraved, 1/- each.
 P. and P. 6d. Ed. order, post free. Lists 5d.

T.R.S. RADIO COMPONENT SPECIALISTS
 307, WHITEHORSE ROAD, WEST CROYDON
 7110 1015
 Mail order: 71, MEADVALE ROAD, EAST CROYDON



RADIOGRAM CHASSIS, A.C. mains 200/250 v.,
 3 valve 2 wattband superhet. Latest technique
 incorporating delayed A.V.C. and NIG, feedback
 circuits, switched A.M. position and P.U. sockets,
 size 13in. x 5 1/2in. x 2 1/2in. Complete with speaker.
 Huge purchase of current model enables us to offer
 our amazing bargain price of £10 15s., cart. 4/6

W.C. SWITCHES, All at 3.6. 2 p. 2 way, 2 p. 6 way,
 4 p. 2 way, 4 p. 2 way, etc.

I.P. TRANS.—65 K. v. s. Weirite Midget M500
 15.6 pair; Weirite Standard, 12.6 pr.; Jolley
 Type Semi-midget, 12.6 pr.; d.t.t.o. out sold, 8.6 pr.

CRYSTAL DIODE—Very sensitive, G.E.C., 3/6
 B.T.H., 2.6. H.R. PHONES (S.G. Brown) 15.6 a pair
LINE COND.—2in. 100 ohms per foot, 1/2a 60 ohms
 per foot, 2 way 1.6 a yard, 5 way 1.6 a yard

SLEEPING, Various colours, 1, 2 mm. 2d.;
 3/4 mm., 3d. yd.; 5/8 mm. 5d. yd.

MAINS DROPPERS—A4J, sliders, 3/6in. x 1 1/2in.,
 2 amp, 200 ohms, 2 amp., 1,000 ohms, etc. 4.3.

SENTERCEL RECTIFIERS,
E.H.T. TYPE, KR25 2KV., 4.3; KR40 3.2KV.,
 6-; KR45 3.6KV., 6.6; KR50 4KV., 7.3; KR100
 8KV., 12.6; KR 160, 18-.

MAINS TYPE—RM1, 4-; RM2, 4.9; RM3, 5/9;
 RM4, 16-.

COILS—Weirite "P" type, 2.6 each. Midget
 "Q" type, 3.6 each. All ranges.

REACTION COND.—0.001, .0005, .0005 mid., 3/6 ea.
SURPLUS MAINS TRANS.—Prim., 600-250 v.,
 Sec. 275-0-275 v., 60 ma., 6.3 v. 1a., 6.3 v. 1a., 10/8
 ditto, 200-0-200 v., 80 ma., 6.3 v. 3a., 6.3 v. 1 a.,
 12/8. Oscilloscope Transd. Prim., 0-250 v. Sec.
 200 v., 15 ma., 5 v. 25 v., 2 v., 4 v., 1/2 a., 17/6.
 P.P. all Transd. 1/-.

This Month's Bargains

G2AK

SPECIAL TRANSFORMER OFFER—Pri 115, 210, 240v.
 Secs. 260/260 v., 100 ma., 6.3 v. 3 A. and 6.3 v. 1 A. for 6X5
 rectifier. Universal mounting. Limited quantity. 17/6 ea.,
 post free.

Mini Four. All parts from stock. Ready Drilled Chassis Kit,
 7/6. P. & P. 1/6.

High Gain Dual Range Coils with Circuit, 4/-
Miniature 3 Wave Coil Pack L.M.S. with circuit, 27.6.
Miniature 3 Station Fixed Tuned Pack for Mini 4, etc., 33-
Speakers, W.B. 2 1/2 in., 18/6. Phillips 3 in., 15/-.
 Elac 5 in. and 6 1/2 in., 17/6. Celestion 10 in., 27/6. P. & P. 1/-
L.T. Transformers, 230 v. Primaries. 12 v. 1.5 A., 12.6;
 6.3 v. tapped at 4 v. 1.5 A., 8/-; 6.3 v. 2.5 A., 12/6;
 6.3 v. 6 A. and 5 v. 4 A., 25/-
Twin Feeder, 300 ohm 150 watt rating, 6d. yd. Minimum
 quantity, post free, 20 yards; otherwise, P. & P. 1/6.
Morse Practice Sets, with double action buzzer, output for
 phones, excellent key, require only 4 1/2 v. battery. As new,
 7/6 ea. P. & P. 1/-
Output transformers, v. Midget, 3/6. Standard Pen., 4/6.
Microphone, v. Transformers for M.C. Mikes, 2/-; for
 Carbon Mikes, 2/-
Germanium Diodes, B.T.H., 2/-; G.E.C., 2/6 ea.
Potentiometers, Carbon, 50 K., 100 K., and 1 Meg. Spindle
 Type, 1/6 ea.; 25 K. and 1 Meg. Pre-Set Type 1/- ea.;
 Wire Wound 20 K. Spindle type, 2/-; 20 K. and 50 K. Pre-set,
 1/6 ea.
Special Offer, T.V. 1in. Coaxial Cable, 11d. yd. or 9/6 per
 doz. yds., or 9d. per yd. in 100-yd. coils. P. & P. 1/6.
Special Valve Offer, Kit of 4 midget valves 1.4 v. 1 each
 1S5, 1R5, 1T4 and 1S4, 30- or 8/6 ea. separately. 807's 12/6
 ea. or 4 for 45/-
 Postage free on all orders over £1 except where specifically
 stated. **PLEASE PRINT YOUR NAME AND ADDRESS.**

C. H. YOUNG, G2AK

All callers: 110 Dale End, Birmingham (GEN. 1635) Mail Orders: 102, Holloway Head, Birmingham 1 (MID. 3254)

A workshop in your pocket!

FOR ONLY 25/6 Post Free

THE TELEVISION & RADIO SERVICE ENGINEERS' MASTER TRIMMER KIT

- 1 End Trimmer
- 1 Side Trimmer
- 1 Yaxley Switch Contact Adjuster
- 1 Low Capacity Trimmer
- 1 Screwdriver
- 1 Set of Feeler Gauges
- 1 Set of Six Box Spanners from 1 to 8 B.A.
- 1 Set of Four Spanners from 10 to 8 B.A.

In durable black crackle finish metal case.

Export Enquiries Invited **J. & S. NEWMAN LTD.**
 100 HAMPSTEAD RD., LONDON, N.W.1 Tel.: EUSon 5176/7

GARLAND BROS. LTD

CHESHAM HOUSE, DEPTFORD BROADWAY, S.E.8.
5 OBELISK HOUSE, LEWISHAM, S.E.13.

TEL.: TIDEWAY 4412/3
TEL.: LEE GREEN 4038

GARLAND UE7B RECORD PLAYBACK AMPLIFIER

A revised version of our popular amplifier, designed for use with the Truvox Tape Desk, Lane Tape Table, or Morek Tape Unit. New features include higher gain, magic eye record-level indicator, and smaller size to facilitate incorporation in portable recorders. Oscillator and power supplies are included and standard valves are used throughout. Supplied complete with 8 in. P.M. speaker. Price £13.2.6. plus 7/6 carriage and packing.

TAMSA TYPE 100 TAPE RECORDING HEADS. Housed in chromium plated brass case on adjustable mounting. Record/playback heads have 1-thou. gaps and erase heads have 2.5 thou. gaps. These heads are of high impedance. Price 45/- each. Trade supplied.

AMPLION TESTMETER. 10 ranges A.C. and D.C. up to 500 v. Resistance up to 200,000 ohms, 1,800 ohms per volt A.C. and D.C. Price £5.

DECALS. 500 3/4 in. high white transfer letters and words for marking electronic equipment. Price 4/9 per book. The new Decals book for the amateur now available; 29 words per page, 4 pages radio and audio, 4 pages T/V and scope, 2 pages misc. incl. Tx and Tape recording. 3/6 per book.

TYANA SOLDERING IRONS. Light weight, 40-watt irons with easily replaceable elements and bits. Voltages, 6v., 100/110v.,

200/220v., 230/250v. Price 16/9. "The iron that makes soldering a pleasure."

RADAR REFLECTORS. Type MX138/A. These consist of 6—2ft. x 1/2 in. dural tubes covered with fine wire mesh. The whole assembly can be used as an omni-directional aerial, and the mesh has many horticultural applications. Price 3/9 each

GENERAL PURPOSE TRIODES. Type 7193, 6.3 volt heater, similar to 6J5G. Ideal for experimental work. Price 2/6 each.

MICROPHONE STANDS—Desk type with flexible member to ease adjustment. These stands will suit all British and Continental Microphones. Price 16/6 each.

VARLEY MAINS TRANSFORMERS. Primary 10-0-200-220-240 volts. Secondary 300-0-300 volts 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/-.

MAGNETIC TAPE. Scotch Boy MC1-111: 1,200ft., 35/-; 600ft., 21/-; 300ft., 12/3. Spare 7in. spools, 4/3. Ferrovoity, the new kraft-based medium coercivity tape: 1,200ft., 22/6. Spare 7in. spools, 4/6. Trade supplied.

LANE TAPE TABLE MK. IV: 3 new type motors, no tape handling on wind or re-wind. Now available, £17.10.0 plus 10/- carriage.

ALL POST ORDERS to Dept P.W. at our DEPTFORD BRANCH. Post & Pkg. extra. Minimum Charge 1/-

TWIN SCREENED CABLE. Suitable for carrying currents of up to 5 Amps. Cotton covered, 9d. per yard. Ditto uncovered, 8d. per yard.

BRENETTE MICROPHONES. We have been appointed sole distributors in Great Britain and Ireland of these new cell microphones. The following range is now available to trade or public.

Type 7D. Directional in black and chromed case. Price, £4/13/6.

Type 9ND. Multi-directional ball type, in black and chrome. Price, £2/6/6.

Type 11A. Wide frequency response, in brown and chrome. Price, £6/17/-.

Type 13U. Highly sensitive with wide frequency response, in black and chrome. Price, £7/17/6.

ENGRAVED KNOBS. 1 1/2 in. diameter, fluted in Walnut or Ivory, with the following markings: Volume, Vol-On-Off, Treble, Bass, Tone, Tuning, Wavechange, S-M-L-Gram, On-Off, Brilliance, Brilliance-On-Off, Contrast, Focus, RI-R2-PB. Price 1/6 each. Plain knobs to match, 1/3 each.

RECEIVING VALVES. 6SH7, 6/-; 7193, 2/6; 5U4G, 10/-; E1148, 2/6; 6U5G, 7/6; 6I7G, 9/6; NGT1, 5/6; 6Q7G, 9/6; 6K7G, 8/6; KT61, 11/6; MSPEN/7 pin, 5/-; 6X5GT, 6/6; 6J5GT, 6/9; 6SL7GT, 10/6; 6V6, 9/6; CV73, 5/-; VU33, 2/6; 954, 2/-; 6BE6, 13/6; 6K6, 9/6; VU11, 4/-; VU133, 3/6; KT241, 6/6; VR54, 3/6; 1625, 4/9; 14H7, 9/6; 14J7, 9/6; 14R7, 9/6; U22, 6/6; 6K8G, 10/6; 6B4G, 6/-; 1625, 4/9.

NEW!

E·M·I INSTITUTES EXPERIMENTAL SET

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. 32X
Grove Park Rd., Chiswick, London, W.4

Name

Address

★Experimental Kits form part of the following courses: Draughtsmanship, Carpentry, Chemistry, Photography, Commercial Art, Etc.

EMI INSTITUTES
Associated with
MARGONIPHONE & HMV
COLUMBIA (His Master's Voice)

C.12



EASY TERMS TAYLOR METERS
10 months. Near Cash.

Model 120A Universal Multimeter
up to 0.2.500 volts
A.C./D.C.

20B £15.15.0	72A £16. 0.0
45B 25.10.0	77A 15. 0.0
66A 22.10.0	88A 21.10.0
71A 12.10.0	110C 14.10.0



MONTROSE 7-Range 50-

120A £9. 0.0	240A £14. 0.0
130A 15. 0.0	260A 36.15.0
170A 24. 0.0	520A 10. 0.0
190A 22.10.0	290A 29.10.0

RADIO BULLS VALVES
246, HIGH ST. - LEICESTER, ENGL.

Please add 1/- Post.

DEMOBBED VALVES and their Equivalents

2/3



BRITISH AMERICAN BATTERY, A.C. and UNIVERSAL TYPES.

1B4 ... 4/3	KT241 5/-
2A6 ... 5/6	MSPen 5/-
2A7 ... 6/5	VP13C 6/-
2B7 ... 5/11	PX25 ... 15/-
12A ... 3/-	954 ... 3/6
26 ... 2/10	
34 ... 4/3	
6AB7 ... 5/-	

Please mark envelope (P.W.8)

AVO METERS

Model 7 ...	£19.10.0
" 40 ...	19.10.0
" 8 ...	23. 0.0
D.C. Minor ...	5. 0.0
Universal ...	10. 0.0
El. Test Unit ...	19.10.0
Gen. Signal ...	30. 0.0
El. Test Meter ...	40. 0.0
Universal Bridge ...	26. 0.0
Heavy Duty Meter ...	15. 0.0

PIFCO A.C./D.C. Radio Meter
Post 29/6

AVO model 8 in stock
£23. 0. 0

HOME BROADCASTER
Meter 1.800 Self-energising Micro-phones Pst 1/-, 12/6

CONDENSERS Post 6d.
Wire Ends

2 m/d 450 v ...	2/-
4 " 450 v ...	2/6
8 " 500 v ...	2/6
16 " 500 v ...	2/9
25 " 25 v ...	1/3
50 " 50 v ...	2/-

A.C. ELECTRIC PAINT SPRAYER

Just plug in and spray. Easier than a brush—twice as fast. Complete unit. No extras to buy. No bulky compressor. no vacuum cleaner needed. Guaranteed. Nozzles FREE. To spray: Paints, Cellulose Varnish, Lacquer, Light Oils, Insecticides, etc.

IDEAL for outdoor furniture. Machinery, Insect Control. Cars, Rough Surfaces, etc. Tax Free. 75/- Post Free.

FABRIC for Loudspeakers very attractive. 12 x 12 in. 2/6. 12 x 18 in. 3/6.

VALVEHOLDERS
Mazda Octals 6d.
Locals B8G

Latest **BOOKS** Latest
Servicing Instruments ... 5/-
Oscilloscope Book ... 5/6
TV. Receiver Practice ... 5/6
Amplifier Circuits ... 3/-
Audio Handbooks ... 4/-
TV. Faults ... 5/6
Magnetic Recording ... 5/-
Personal Receivers ... 4/6
Radio Charts ... 2/6

ELECTRIC PAINT STRIPPERS 37/6 Tax Free

Paint stripping made easy with our foolproof electric tool. Easier and Faster. Clean and safe. Old paint goes like magic. Cost 1d. per hour. A.C./D.C. Guaranteed. Complete with long cable. Post Free.



Q-MAX.
Chassis Cutters with Keys.

2in. 12/4; 3in. 12/4; 4in. 13/4; 1in., 1 1/2in. and 1 1/4in. 18/- each; 1 1/2in. 19/9; 2 1/2in. 31/9; 2 1/2in. 36/9; 1in. square 24/3. Post 1/-.

SERVICE SHEETS

The one you require enclosed if available in a dozen assorted of our best choice, 10/6.



SALE of Radio Cell Testers. 45/-

PHILIPS Neon Testers, 100-500 v., only 5/-.
Condenser Tester and Rectifier Units, 39/6.
A.C./D.C. Neon Testers, Type 400, only 11/3.
Soldering Irons, 16/9.
Adcola Irons, 25/6.
Everlasting Sapphire Gram Needles, 3/6.

Inspection and Garage Hand Lamps, 6/6.
Morse Buzzer Outfits, ex-Air Ministry, 6/-.
Ex-Govt. Mikes, 12/6.
Amplion Test Meters, £5.
Germanium Crystal Diodes w. Circuit, 3/-.
VCR97 C.R.T. only, 20/-.
Rod Antennas, 1ft. sections, dozen 2/6.

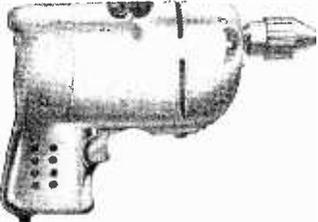
Hydrometers ... 7/6
Gas Blow Lights ... 3/-
Resistor Colour Ind. ... 1/3

EXPORT



BE PREPARED! Save TIME and MONEY with these PROFESSIONAL AIDS.

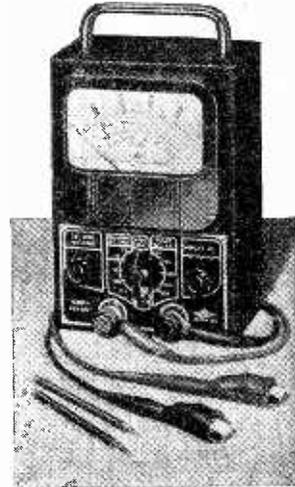
Speed the job with this BLACK & DECKER 1/2in. Electric Drill.
£2. 2s. with & £1 monthly for 3 months order
CASH PRICE, £6.5.0



Present-day service demands a high-resistance meter. The PULLIN "100" is 10,000Ω per volt and has resistance ranges reading up to 1,000,000Ω on internal batteries. 4in. meter in handsome diecast case.

£3. 17s. with order and £1 monthly for 9 months.

CASH PRICE £11.11.0.



Full lists of other high grade equipment free on request.

.....
EASY PAYMENT ORDER BLANK DATE.....
To: Frith Radiocraft, Ltd., Leicester
Please supply.....
for which I enclose £ : : Deposit and agree to pay.....
further monthly payments of £1 commencing on the first day of next month.
SIGNED (usual signature).....
NAME IN FULL (CAPITALS).....
ADDRESS

State if Householder If over 21 Occupation.....

Frith RADIOCRAFT Ltd.
69-71 CHURCH GATE-LEICESTER
PHONE 58927

-and now, a new COSMOCORD Magnetic Pick-up

Both the G.P.32 and G.P.31 have the same characteristics:—

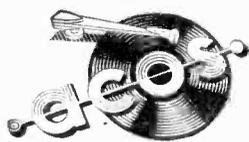
- 1 Pleasing modern appearance. Provides a good standard of reproduction with normal equipment at a reasonable price.
- 2 The pick-up element incorporates a new "high permeability sintered bi-metal magnet" and employs a minimum number of moving parts.
- 3 Designed to feed into a pick-up load of 50,000 to 1,000,000 ohms and therefore suitable for use in conjunction with the majority of radio receivers.
- 4 Extremely robust and reliable with excellent tracking capabilities thus minimising distortion and record wear.

Output voltage :
 $\frac{1}{2}$ volt at 1,000 c/s.

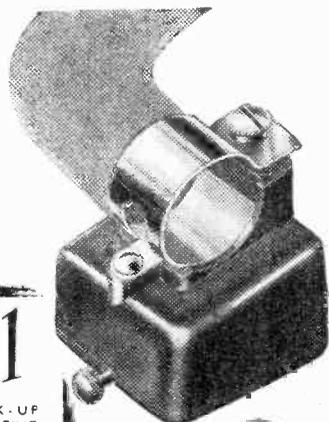
Recommended load resistance :
not less than 50,000 ohms.

Tracking weight (G.P.32) :
56 grammes.

Tracking centres :
7 inches.



always well ahead



For Standard 78 R.P.M. Records only

COSMOCORD LIMITED • ENFIELD • MIDDLESEX

Practical Wireless

EVERY MONTH
VOL. XXIX, No. 562, AUGUST, 1953

Editor F. J. CMM

21st YEAR
OF ISSUE

COMMENTS OF THE MONTH

By THE EDITOR

The BBC and the Coronation

THE BBC comes in for a good deal of criticism during the course of the year, but by general consent it surpassed itself in its broadcasts and its televising of the Coronation ceremony. Both were faultless, and newspapers, without exception, have praised them for the very high degree of quality they achieved in what amounted to a highly complicated technical undertaking, with literally thousands of possibilities of failure. On the sound side the BBC had little fear, for with their 30 years' experience of similar events of a national character they have passed beyond teething troubles. Television, however, is still somewhat in its infancy, and apparatus has not yet reached that degree of perfection which applies to ordinary sound transmitting equipment.

We observed the transmission from our experimental laboratory from beginning to end, looking not so much for entertainment value, which was of a very high order indeed, but for technical failures. There was nothing of which we could complain, and those in charge of O.B. deserve the very highest commendation, not only from the public but from those in the top flight in Broadcasting House.

The Coronation has been responsible for increasing the demand for both sound and vision receivers. It is impossible to estimate with any accuracy the number of people who looked in to the solemn ceremony. It is known that about 3,000,000 television licences are operative, but the number of private parties which foregathered round each screen is incalculable, although estimated to be at least six per screen, bringing the viewing public to, say, 18,000,000. It is certain that the whole of the British nation either heard or saw the ceremony, which taxed to its uttermost limit every physical and technical resource of the BBC. No wonder the press of other countries has made envious praise of this finest BBC achievement, and we add our congratulations to those of the rest of the world.

HOW MANY HOME-BUILT RECEIVERS?

WE have, in the past, criticised the trade for neglecting to supply components for home constructors, who virtually created the

radio industry. We have said that having built their businesses on the demand for components they neglected the foundation and preferred to occupy the upper storeys. One firm has taken us to task on this and says that the home constructor market does not now exist in sufficient volume to support any large-scale manufacturing enterprise. This firm asks a question which it thinks provides its own answer. The question is: How many home-built receivers are in existence to-day? With 21 years of experience of catering for this market, during which our circulation has steadily increased, till to-day it stands higher than ever before, we can estimate with reasonable accuracy that at least 1,500,000 home-built receivers are in operation. The number of experimenters increases year by year, as the sale of our blueprints shows. It is our view that at the present time over 300,000 home-built television receivers are in operation, and we are enabled to arrive at these figures with reasonable accuracy from a knowledge of the number of special components which have been sold for particular receivers. Those firms who have remained faithful to the constructor market report ever-increasing turnover.

We mention these points because one or two firms have expressed a wish to return to the fold, but need to be reassured that there is still a market. Publishers, like radio manufacturers, are business people. They do not publish journals for a market which does not exist, or which exists in such paucity that it does not warrant a special publication. This journal celebrates its 21st birthday this year, and we can assure the trade that it does so in a spirit of enthusiasm, encouraged by the success which continues to reward its efforts.

SERVICING OF RECEIVERS

A SUB-COMMITTEE of B.R.E.M.A. have been considering the length of time manufacturers should be expected to service and repair radio receivers once the model has become obsolete. Their view is that after a period of, say, 12 years it is seldom economical either from the manufacturers' or the users' point of view to continue to service and repair such models. It is realised that individual manufacturers have their own policies.—F. J. C.

ROUND the WORLD of WIRELESS

Broadcast Receiving Licences

THE following statement shows the approximate number of sound receiving licences issued during the year ending April, 1953. The grand total of sound and television licences was 12,912,786.

Region	Number
London Postal ...	1,749,375
Home Counties ...	1,470,905
Midland ...	1,326,708
North Eastern ...	1,754,363
North Western ...	1,360,614
South Western ...	1,033,182
Wales and Border	677,929
Total England & Wales	9,373,076
Scotland ...	1,120,609
Northern Ireland ...	215,758
Grand Total	10,709,443

BBC Wants More

THE BBC has been urging the Cabinet to allow it to keep 95 per cent. of the revenue received in licence charges instead of handing over 15 per cent. to the Treasury.

This would give the BBC another £2,000,000, enabling the speeding up of development plans.

Electronic Equipment Display

A THREE-DAY operational display of Britain's latest military electronic equipment, sponsored by the Ministry of Supply and organised by the Radio Communication and Electronic Engineering Association, was held recently at the Royal Aircraft Establishment, Farnborough.

Exhibits covered fixed and mobile communication sets, telephone apparatus, radio navigational aids, radar equipment, components and valves. Army equipment on display included tanks showing signals and gun-control equipment, an electronically controlled tank turret, and signal equipment vehicles of different kinds.

The automatic training of an anti-aircraft gun on its target by radar was demonstrated together with the latest electronic equipment installed in the Canberra light bomber.

New Scottish Factory

MR. T. JOHNSTONE, chairman of the North of Scotland Hydro Electric Board, performed the official opening of a new factory of Smith Meters, Ltd., at Kinbuck, Dunblane, recently.

From components made in England, electric meters will be assembled at the factory, where forty workers are employed. In due course the components may be manufactured there as well as assembled.

Booklet on Magnets

A BOOKLET entitled, "Permanent Magnets" has been compiled by members of the Permanent Magnet Association, 301, Glossop Road, Sheffield, 10, and is available from them at 10s.

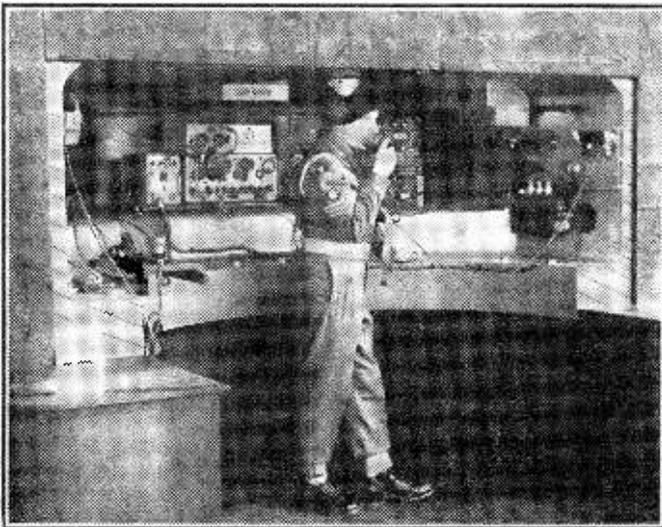
"Model Engineer" Exhibition

MANY of the models entered for "The Model Engineer" Exhibition, at the New Royal Horticultural Hall, from August 19th to 29th, are worked by electricity, while a major attraction is the water-tank where radio-controlled model yachts and boats will be seen manoeuvring.

Other notable features include a miniature Grand Prix racing track, a steam-driven working model roundabout, and passenger-carrying steam locomotives. In the demonstration area all branches of model engineering will be shown.

Communications for Bermuda

WITH only five days' notice, an order for two tons of wireless communications equipment was packed at the Chelmsford factory of Marconi's Wireless Telegraph Co., Ltd., ready for immediate air freighting to Bermuda, to be used to increase existing communications between the island and the rest of the world at the forthcoming Three-Power Conference. It consists of two high-frequency transmitters and three high-frequency receivers, with ancillary equipment, which will go to make an additional telegraph circuit between Bermuda and New



Demonstrated at the Farnborough electronic equipment display in what resembled the turret of a Centurion tank was a new high-frequency wireless receiving and transmitting set, the C12HF, a successor to the well-known wartime No. 19 set.

York for use by delegates, officials and newspaper correspondents covering the meetings.

Coupling units and special oscillators had to be supplied, and consideration was given to the fact that the equipment was designed for 50-cycle operation, whereas the Bermuda main power supply is 60 cycles.

All the gear can be speedily assembled and put into operation at its destination, but for travelling purposes it had to be dismantled into nearly one hundred units of varying sizes and each packed individually.

Improvement of Home Service

THE BBC announces that a three-acre site has been acquired at Pages Lane, Bexhill, approximately one mile west of the centre of the town, for the permanent low-power (2 kW) transmitting station that is being provided to improve reception of the Home Service in the area.

When completed the station will take over the service on 206 m. (1,457 kc/s) at present given by the temporary transmitter of lower power near Hastings. The latter covers little more than the town itself, but it is expected that the permanent station with its higher power and better site will extend the area of satisfactory reception to include also St. Leonards, Bexhill and Eastbourne.

The permanent station is expected to be in service before the end of the year.

Radio Industries Club

EDWARD E. ROSEN was elected president of the Radio Industries Club in succession to Lord Brabazon of Tara, at its 22nd annual general meeting held in London recently. In addition, the following were elected vice-presidents: A. J. Dew, H. de A. Donisthorpe, A. J. P. Hytch and J. H. Williams. The new chairman of the Committee is H. A. Curtis, with R. F. Payne-Gallwey as vice-chairman. The other officers of the Club are unchanged.

The parent Club now has almost 800 members, and affiliated with it are six other clubs in England, Scotland and Ireland.

Obituary

WITH deep regret the death is announced of Brigadier John B. Hickman, C.B.E., M.C., M.A., on June 3rd, 1953. He was

managing director of British Telecommunications Research Ltd., deputy chairman of A. T. & E. (Bridgnorth) Ltd., a director of Automatic Telephone and Electric Co., Ltd., and a director of Hivac Ltd.

Born in 1899, Brig. Hickman was educated at Southall County School and Gonville and Caius College, Cambridge, before attending the Royal Military Academy, Woolwich. He was appointed Deputy Chief Inspector of Telecommunications at the Directorate of Electrical and Mechanical Equipment in 1941, and was seconded to the Ministry of Supply in 1945 as Director of Research and Development, Telecommunications. He became managing director of B.T.R. Ltd. in 1949.

In April, 1950, he received the Diploma of Officier de la 'Legion d'Honneur.

B.I.C.C. "Open Week"

DURING Coronation Week more than 2,000 relatives and friends of employees visited the Helsby Works of British Insulated Callender's Cables Ltd. for the annual "Open Week." Among the visitors were many of the company's former employees who have now retired.

The guests toured the various manufacturing departments and saw the production of power capacitors and the many processes involved in the manufacture of rubber-insulated and thermoplastic-insulated cables of all types.

Continental Visit

A CONTINGENT of the London Fire Brigade left London recently on a visit to France and Italy. The purpose of this visit was, first, to provide an opportunity for personal exchanges of information and, secondly, to give London Fire Brigade service experience similar to their counterparts abroad.

Pye radio equipment was installed to allow firemen to keep in constant touch with their operational headquarters.

More Discoveries

THE new series of Carroll Levis Discovery programmes, in which unknown British artists make their broadcasting debut, will continue each Friday during the summer on the Light Programme under its producer, Trafford White-lock, who has made some changes.



One of the firemen visiting the Continent uses part of the Pye radio equipment which was installed to maintain contact with operational headquarters.

Each week a new British song will be featured by the Song Pedlars, while the judging by the Audience Applause meter is being checked by Carroll Levis. The opening and closing presentation has also been streamlined and music for the artists will be provided by a Quintet, Jackie Brown and his Music.

List of Technical Papers

GOVERNMENT Publications, "Sectional List No. 3 D.S.I.R.," is the title of a 31-page booklet in which technical papers issued by all departments of the Department of Scientific and Industrial Research, including the National Physical Laboratory, are listed, revised to March 1st.

It may be obtained free from H.M. Stationery Office, York House, Kingsway, London, W.C.2.

expectations. Preset controls were completely dispensed with, the thermistor automatically compensating for variations in the gain of the amplifier stages and, most important, reducing to negligible proportions the effects of tracking errors in the ganged potentiometers. Over the range 30 c/s to 40 Kc/s amplitude remained constant ± 0.2 db, for a maximum output of 25 volts R.M.S. and has even been extended experimentally down to 3 cycles per second, and in the upper range, up to 200 Kc/s. with deviations of no more than ± 3 db. A better layout would probably have improved these figures in the model constructed.

The circuit follows conventional technique, the cathode follower giving a low output impedance. This may be loaded with up to 600 ohms without

any serious fall in voltage. The unit may be calibrated by any of the usual methods, the easiest being by direct comparison with a known variable source of audio tones. With the values of R and C shown, ranges should be in multiples of 10. To allow for wiring capacitance Cx has been made variable and should be adjusted, i.e., the generated frequency is a multiple of 10 of the previous range when the resistive portion of the R.C. element in the bridge is fully in.

As a further refinement the inclusion of a low-power monitor section with a small speaker will be found an advantage. Whilst in the circuit shown the versatile S.P.61 combines reliability with low cost, they may be substituted by the B7G based 6AK5. Some component values may, however, have to be altered.

Adding an R.F. Stage

By Col. D. A. K. Redman,
O.B.E., B.Sc., R.E.M.E.

ALTHOUGH the performance of a good quality commercial domestic receiver as used in so many homes is very satisfactory for average purposes, there are conditions or requirements which induce the home experimenter to seek after "that little bit more."

While serving overseas for instance, the addition of an R.F. stage to the normal 4:1 superhet will facilitate reception of signals from BBC stations when these are weak due to distance or poor reception conditions. Alternatively the listener may wish for better quality from local stations.

It was with these two requirements in view that the writer recently made the modifications described below to his H.M.V. table model receiver. They have been most successful and could be applied to almost any similar instrument, with minor adjustments depending on its circuit and the position of added components. A block diagram of the general arrangement is shown in Fig. 1.

R.F. Stage or Tuned Pre-amplifier (See Fig. 2)

This consists simply of an E.F.50 valve choke coupled to the normal aerial input circuit of the receiver. The extra aerial/grid coils used were the well-known Osmor type, but any other similar modern coil will do. They were tuned by the usual variable condenser; this gives an extra tuning control, but it is only necessary to "peak up" the signal with this control after the main tuner has been correctly adjusted.

Slight instability was at first experienced but cured by the addition of the 10 K Ω resistance in the anode circuit and choice of a suitable valve for the screen resistor. Any similar R.F. pentode could be used.

Power supply was taken from the normal H.T. and L.T. system of the set; if thought necessary a

filament transformer for the E.F.50 could be used, but in any case there should be no difficulty in providing the 10 mA or so for the anode and screen from the set H.T. line.

S1 gives normal wave-band switching, and an OFF position which connects the aerial straight through to the normal input circuit of the receiver. This switch is also operative for the local station channel described below.

Local Station Channel

This employs simply a germanium crystal working into the pick-up terminals of the set (Fig. 2). For tuning purposes the same set of coils is used as for the R.F. stage. If this is insufficiently selective to separate two local stations a simple wave-trap can be used in the aerial lead.

The writer used a G.E.C. high resistance G.E.55/1 crystal diode, but these cost 30/- and a G.E.X35 44/1 or 45/1 would probably serve quite adequately.

It is desirable, of course, to choose a crystal with high enough resistance to match sufficiently well with the set volume control without a transformer.

The two 100 pF capacitors and the 75 K Ω resistor filter the R.F., while S2 gives choice of:

- crystal and A.F. amplifier—3.
- R.F. stage, crystal and A.F. amplifier—2.
- R.F. stage and main set, or main set only, or P.U., to A.F. amplifier—1.

The second combination is used if there are no "very local" stations to give a strong enough signal for the crystal alone.

Construction

Details of this must depend on the receiver, but the

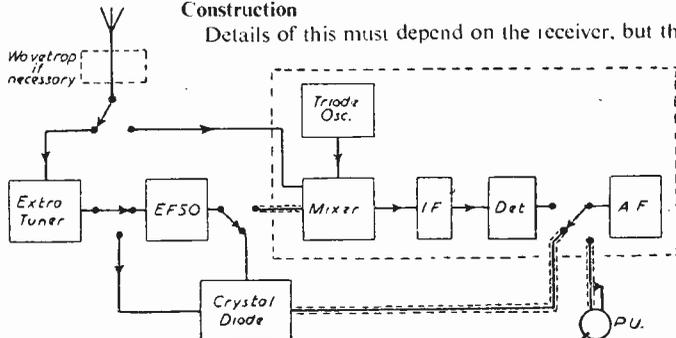


Fig. 1.—Schematic diagram of the arrangement described here.

A MULTI-RANGE TESTER-2

FULL CONSTRUCTIONAL DETAILS OF A VERY HIGH QUALITY TEST SET WITH A SENSITIVITY OF 10,000 Ω PER VOLT

By E. N. J. Marguerit

(Continued from page 405 July issue)

As stated earlier, there are two types of resistance measurements, the high-ohm and the low-ohm, each having four ranges. The high-ohm ranges are based on the series principle, while the low-ohm ones operate on the shunt system. The O calibration of the high-ohm scale corresponds to Infinity on the low-ohm scale.

Both high and low-ohm ranges are operated by two 4½ volt flashlight batteries connected in series to give 9 volts; these are housed in the special compartment provided in the instrument case.

It is not advisable to use a grid-bias battery, for this purpose, as the drain on it, when using the lowest ranges, is 100 mA.

Alternative Circuit

The second circuit proposed (Fig. 10b) differs only in the fact that a second potential divider is used for the A.C. voltage ranges. The additional items are the 15 High Stability resistors, and the substitution of a four-pole two-way switch in place of one of the two-pole two-way type.

Controls

There are five electrical controls on the front panel:

- 1—Top left-hand corner: A.C./D.C. switch.
- 2—Top right-hand corner: mA/V switch.
- 3—Bottom left-hand corner: mA and V—R/10-R-10R-100R—Audio.
- 4—Middle: Adjust Ohms.
- 5—Bottom right-hand side: High-Low—and 10 mA and V ranges.

All measurements are obtained through three

terminals, one being the common negative; the second is for volts and milliamps and low-ohm readings; the third is reserved for high-ohm and audio.

Those three terminals take the form of a three-way female socket, being an ex-A.M. unit No. 10H/7394. It is easily fixed to the panel by 2 6 B.A. bolts and nuts.

Switch No. 1 is a two-pole two-way self-cleaning instrument type switch; if circuit 10b is adopted, this is replaced by a similar type but having four-pole two-way.

Switch No. 2 is a similar type, two-pole two-way.

Switch No. 3 is a three-bank one-pole six-way low contact resistance.

Switch No. 4 is a three-bank one-pole 12-way, also of low contact resistance.

The adjust ohm is a Colvern 5,000 ohm wire-wound potentiometer.

LIST OF COMPONENTS
Circuit of Fig. 10b.

Switches
 S1—4-Pole 2-way | low contact resistance.
 S2—2-Pole 2-way |
 S3—1-Pole 12-way 3 banks low contact resistance.
 S4—1-Pole 6-way 3 banks low contact resistance.

Resistors (assuming meter resistance=500 ohms).
 R1 to R10—Same as for circuit 10a.

R11	85,000 ohms	} 1 W. Dubilier H.S. carbon ± 1%.	
	+ 4,000 ohms		
	+ 500 ohms		
R12	800,000 ohms		
	+ 10,000 ohms		
R13	1 Megohm		
	+ 350,000 ohms		
R14	2 × 1 Megohm		
	+ 250,000 ohms		
R15	4 × 1 Megohm		
	+ 0.5 megohm		
R16 to R24	shunts, same as for circuit 10a.		
R25 = R20	R28 = R23	R31 = R26	
R26 = R21	R29 = R24	R32 = R27	
R27 = R22	R30 = R25	R33 = R28	
		R34 = R29	

C.—0.1 μF. 1,500 v. D.C. paper condenser.
 WX—1 Westinghouse Westectors.

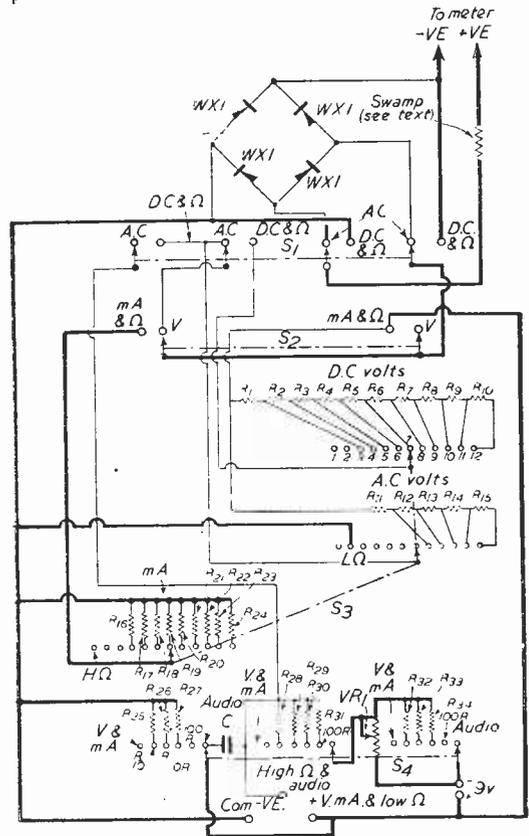


Fig. 10(b).—An alternative circuit for which a list of components is given on the left.

All resistors including the four Westectors are mounted on tag boards, from which wires are taken to the different switches. The wiring is carried out with 24 s.w.g. insulated copper wire. Here different colours of insulation would make the wiring easier. Particular attention must be paid to the wiring of the low-resistance ranges. Short lengths of thick wire (16 s.w.g.) should be used. The actual resistance of the wiring of these ranges should not exceed 0.01 ohm, otherwise it will not be possible to obtain zero setting.

The writer's instrument contains some wire-wound precision resistors of ± 1 per cent. tolerance. These were of ex. W.D. origin. If such resistors of the appropriate values can be obtained they can replace with advantage the carbon high-stability type. Commercial equivalents are rather expensive.

As already stated the shunts are "home-made." The formers may take the form of small, wooden dowels, dipped in dilute shellac varnish and allowed to dry. When the winding is completed the shunts are given a coat of shellac. They are mounted on a panel made of insulating material which is fixed under the scale by means of the four $1\frac{1}{2}$ in. long bolts previously mentioned.

Marking the Scale

The marking of the scale is made with Indian ink on best quality Bristol card. Green ink is used for the low ohm scale. Red ink for 0-10 v. A.C. scale. (See illustration.)

The calibration of the ohm scales can be made by placing resistors of known values across the leads and marking the scales accordingly.

There is, however, a mathematical formula to enable one to draw a calibration curve. For high-ohm the formula is:

$$\frac{I_1}{I_2} = \frac{I}{I+A} \quad \text{where } A = \frac{R_x}{R_1 + R_m}$$

where

I_1 = current given by meter when R_x is in circuit

I_2 = full scale deflection of instrument (when $R_x = 0$)

R_x = resistance to be measured.

R_1 = limiting resistance to obtain f.s.d. when $R_x = 0$ (R_{31} and VR_1 in diagram for 100R range). Fig. 10b.

For low-ohm the formula is:

$$\frac{I_1}{I_2} = \frac{I}{I+1} \quad A = \frac{R_x}{R_1 + R_m}$$

where the symbols are the same as previously.

In each case R_1 represents the value of resistance that will be shown by half-scale deflection. To draw the curves, the values of $\frac{I}{I+A}$ or $\frac{I}{I+1}$ are plotted on

the horizontal line, while values of A , from 1 to 10, are plotted on the vertical line of a special log-linear graph paper.

Replace A in the formulae by a series of numbers from 1 to 10 and calculate the corresponding values of $\frac{I_1}{I_2}$. Mark the points on the graph paper and join them by a smooth curve. The appearance of the two types of curves is shown in Fig. 12.

These curves apply to any type of ohmmeter and are, therefore, universal.

To mark them in resistance values, a strip of this special log paper is cut lengthwise from a fresh sheet.

This strip is marked, say from 0-1,000 ohms, 0.1 to coincide with 0 ohm and 10.0 with 1,000 ohms. R_1 , which is determined from the circuit values ($R_{31} + VR_1$), Fig. 10b, on the strip is made to coincide with the 1.0 mark on the sheet where the curve is drawn. Hence the most usual value of resistance, such as 10, 15, 20, 25-ohms, etc., is referred to the horizontal line by means of the curve. This line is equally divided and represents the linear D.C. current scale or voltage of the meter. Therefore, by referring to the graph it is easy to mark the meter scales directly in ohms.

Each of the four ranges being decimal multiples of one another, one calibration is sufficient.

Calibration of A.C. Volts Scales

Depending on the circuit chosen there are either two or three A.C. volt scales.

If one uses the circuit incorporating a separate potential divider then the ranges 0-250, 0-500 and 0-1,000 v. are read directly on the D.C. volt scale, as the necessary correction has been applied in the choice of resistors.

The other circuit requires a separate scale for these ranges. Although the scale above 100 v. is a linear one, it is 1.11 times higher in values than the D.C. scale. Therefore, the ranges are 0-277.5, 0-555 and 0-1,110 volts.

In both circuits the 0-10 volt range is calibrated as follows. A transformer, of suitable mains primary, and having a secondary of 0-30 volt, is used. A 50-100 ohm wire-wound potentiometer is connected across the secondary as shown in the circuit in Fig. 13. An Avo Model 7, or other suitable voltmeter is used as standard. The potentiometer is adjusted until a reading of 1 volt A.C. is obtainable on the standard voltmeter, the deflection on the instrument being calibrated is then noted by reference to the D.C.

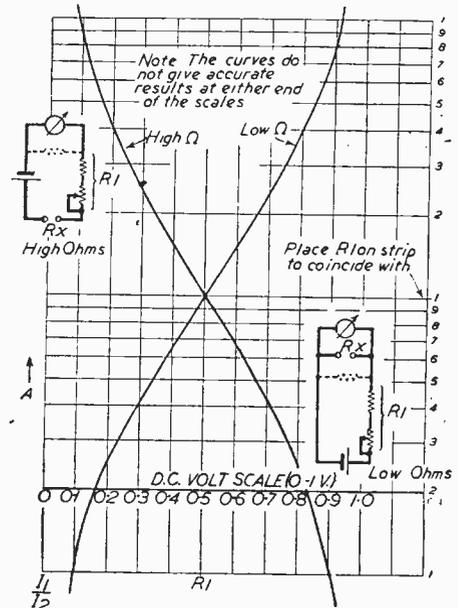


Fig. 12.—Curves for marking out the scale, as described above.

volt scale. A number of voltage points are then taken in the same manner from 0-10 volt, including 6.3 volt for filament checks.

Calibration of the 100 volt A.C. Scale

The principle is similar to calibrating the 10 volt scale. If a suitable transformer is available, say with a 0-150 volt secondary, it can be incorporated in a similar circuit employing a 1,000-w.w. 5 watts potentiometer for VR₁. Points are then taken at 5 volt intervals with reference to the D.C. volt scale.

Alternatively, two power resistors, as used in A.C./D.C. receivers can be employed connected in series, one being kept fixed while the resistance of the second one is varied by means of the slider, which is usually incorporated in these units, to give readings on the standard volt-meter equidistant by 5 volts. Again reference is made to the D.C. volt scale for plotting the values. To avoid fluctuations due to the heat developed by these resistors, it is advisable to have a switch in the circuit, so that the current only flows when a reading is to be made.

In the description of the instrument mention was made of an anti-parallax mirror. This may sound more difficult to incorporate than it actually is. It consists, as the illustration shows, of a 3/16in. wide segment cut in the Bristol card with a sharp razor blade thus exposing a segment of similar width on the aluminium panel on which the scale is glued. This panel can be given a high polish by means of a fine abrasive such as a good quality metal polish. The polish is then prevented from tarnishing by the application of a thin layer of clear varnish.

Care of the Instrument

When the wiring is completed, check it against the circuit diagram to make sure that no error has crept in.

German Radio Show

THE second post-war exhibition of the radio and gramophone industry will again be held at Dusseldorf from August 29th to September 6th, 1953. New and extended halls will offer space for a representative exhibition of all branches of the many fields of radio and television engineering and the gramophone industry.

As indicated by its official name, the Grand German Radio, Gramophone and Television Exhibition will show radio and television alongside each other.

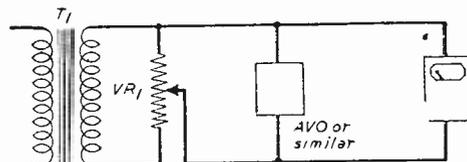
The main emphasis will be placed on FM radio. The quality of the programmes broadcast by the German FM stations is higher today than ever before. The way in which various problems were solved will be shown by the receivers on exhibition; in accordance with tradition, the Radio, Gramophone and Television Exhibition will at the same time start the new radio year. The industry will show all its new developments, so that the Radio, Gramophone and Television Exhibition will offer both the radio trade and the friends of radio a unique opportunity to examine everything in one place.

The exhibition will be the large show-window for all branches of the electro-technical industry and its subsidiary fields. The increasing attention being paid in all countries of Europe to frequency-modulated UHF broadcasting, with its reception free of interference and static, makes a visit to Germany

If the wiring is satisfactory, try the different ranges to see that they are working well and check the calibration.

Do not measure volts when S₂ is on the current position, as this will undoubtedly destroy the pointer and probably also burn out the coil.

Although the pointer is made of glass, it is re-



T₁ = Pri. To suit local mains VR₁ = 50-100Ω WW Pot 5W.
Sec. 0-30V. approx.

Fig. 13.—Circuit for calibrating the A.C. volt scales.

markably robust and a slight overload will not damage it, but it is wise to make sure that the knobs are in the correct position for the reading required. If you are not sure of the quantity you are measuring, always set the switch to the highest value. This will save disappointment.

Try to get your readings so that they are as near the right-hand side of the scale as possible. This is where the accuracy is highest.

The test leads are taken from a 3-core rubber covered cable capable of carrying 15 amps. Thin wires should not be used as their resistance will affect the low-ohm ranges.

One end is fitted with a banana plug to fit in the socket on the instrument while on the other end can be accommodated a socket to receive either a crocodile clip or a test prod.

particularly attractive. At the present time there are approximately 70 FM stations on the air in Europe with powers between 0.1 and 10 kilowatts, while there are about three million combination receivers, i.e., radios equipped for the reception of FM and short, medium and long waves, in operation. The German firms therefore have considerable experience in the design of FM receivers.

F.M.

New radio receivers will be on hand for the visitors. These sets have an FM range with an efficiency virtually unknown until now. The tone has once more been made the subject of special attention, so that it has been possible to increase even further the fullness of tone and brilliancy of the music being reproduced and the clarity of the speech. Improved circuits with high amplification valves offer the maximum performance on all wavelengths in spite of the not very satisfactory distribution of wavelengths in the medium wave range, whereas push-button tuning further simplifies the operation of the receivers. The range of receivers offered in the low and medium price classes is particularly wide. Receivers with built-in gramophones and record players with a number of speeds, as well as radio receiver and magnetic recorder combinations at reasonable prices will probably be the hit attractions at the Exhibition, as well as a series of new magnetic tape and wire recorders for the home recording of radio and microphone shows which are expected to be on view.



The Beginner's Guide to RADIO

The Fourth of a Series of Articles for Those New to Radio. This Month I Explain the Purpose of Grid Bias in Relation to Characteristic Curves By F. J. CAMM

THE three-valve circuit shown last month represented a receiver incorporating a detector valve with two amplifying valves in its simplest form. The valves were *unbiased*. Now, valves which are used for audio frequency (low-frequency) amplification need to operate at a special part of the characteristic curve of the valve. The circuit given below (Fig. 20) shows the modifications necessary to Figs. 18 and 19 given last month, in order to apply correct bias to the valves. A pictorial representation of these modifications is shown by Fig. 21. So that the valve can function at its best, according to the characteristic curve, grid bias should be applied, and it now becomes necessary to explain what a characteristic curve means. A typical characteristic curve is shown in Fig. 24, and it will be seen that the vertical line at the extreme right (known as an "ordinate") represents anode current in milliamperes, and the bottom line (abscissa) the grid volts. Not all characteristic curves express this relationship. Some show anode current in relation to anode volts. The standard terms used in connection with characteristic curves are V_g for grid volts, V_a for anode volts, and I_a for anode current. The grid volts line is sometimes divided into two parts, a zero line being placed near the right-hand edge and the volts to the left of this being marked negative, those to the right positive. Now this set of curves will give us all the details which are known of the characteristics of the valve. We can plot a characteristic curve ourselves. First obtain a

piece of graph paper and mark it off as shown in Fig. 24. Connect up a valveholder, grid-bias battery, H.T. battery and L.T. battery and connect a milliammeter in the anode lead between plate and H.T. positive. With no grid bias and 60 volts H.T., note the current indicated by the milliammeter. On the square paper on the zero line make a dot where the line corresponding with the anode current intersects. Now plug the grid-bias plug into the 1.5 volt socket and note the anode current, making a dot on the chart about the 1.5 volt line at the point of intersection with the new anode current. Proceed in this way with various H.T. and G.B. values, finally joining up all the dots to form a *curve*. The result of this will be, or should be, a set of curves exactly the same as those supplied by the valve makers, and the various figures such as *amplification ratio*, *slope*, etc., may now be found.

The amplification ratio is the ratio of change in anode voltage to change in grid volts. When preparing the curves as explained above, it will be noted that as the grid bias is increased, the H.T. voltage remaining unaltered, the anode current decreases. For example, with 100 volts H.T. and no volts on the grid the anode current may be, say, 50 milliams. When the grid-bias is increased by three volts the anode current will drop to just under 10 milliams, a drop of 6 milliams. Therefore, to obtain the same anode current without altering the bias it will be necessary to increase the H.T., and in the example quoted about

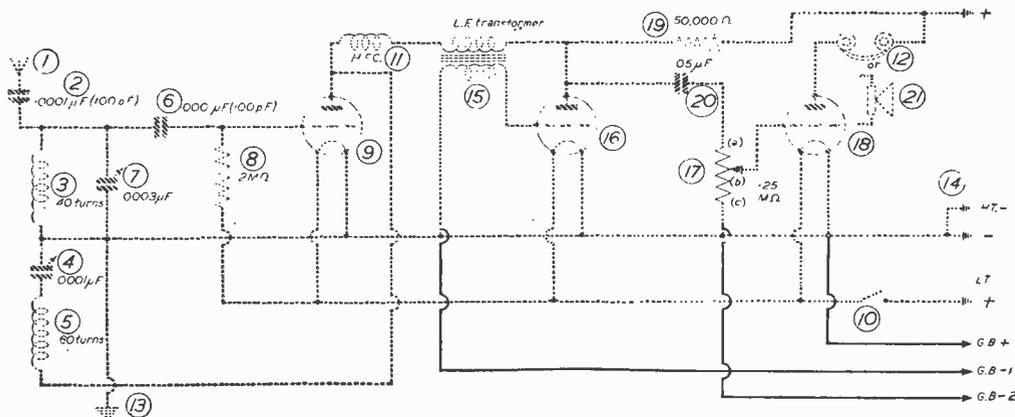


Fig. 20.—The circuit revised for applying bias to both L.F. stages.

24 volts are required to obtain the same anode current. From this it can be concluded that it is necessary to add 24 volts H.T. for every 3 volts G.B. added and this ratio, $\frac{24}{3}$ or 8 : 1, is the amplification ratio.

The term *slope* is another name for mutual conduc-

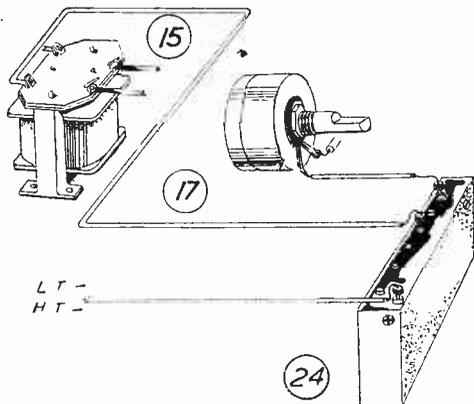


Fig. 21.—Pictorial illustration showing connections to the grid bias battery.

tance and it refers to the change in anode current divided by change in grid volts : or to put it another way, the anode current change per volt grid potential change. For this factor the anode potential, or H.T., must be left unaltered. Only the grid bias must be varied. It will be found that as the bias is increased the anode current will decrease and, therefore, a set of figures are obtained from which it will be observed that the anode current decreases, say, 2 milliamps for every volt increase in grid bias. In this case the slope would be known as 2 milliamps per volt or, as it is expressed on the valve chart, 2 mA/V.

Impedance

The impedance of a valve has a bearing on the value of resistance, etc., which is used in coupling a valve to its next stage. No further calculation needs to be made to obtain this figure as the two previous items, slope and amplification ratio, are used to ascertain the impedance. You simply divide the amplification ratio by the slope, multiply the answer by 1,000, which in the example given will be $\frac{8}{2}$; which multiplied by 1,000 equals 4,000 and this gives the impedance in ohms.

It is important to remember, however, that these figures are *static* characteristics, which means that they are only applicable to a valve which receives constant voltages. When the valve is operating in the receiver, the grid and anode voltages are constantly changing and it is therefore impossible to ascertain from the curves such details as the *maximum undistorted output*, the *correct anode load*, the percentage of *second harmonic distortion*, etc., and it is therefore necessary to prepare a set of curves known as *dynamic* curves. I shall not explain how to plot these curves this month except to say that when they are plotted it will be observed that the values of both grid bias

and H.T. are carried to a value higher than is normally used.

In order to make use of these curves the current at the correct working point must be shown, that is to say, the correct anode volts and correct grid volts and, in addition, at half and double these values. During the operation of the valve (dealing with the valve as an L.F. amplifier), the grid potential varies when the valve is operating on the proper part of its characteristic from half the applied bias to double that bias. If it does not do this then distortion is taking place. The effect of the variation in bias is equivalent to a change in anode volts and therefore the dynamic curves will show the anode current at various grid and anode volts.

Receivers operated from the mains dispense with batteries, including the grid-bias battery. I shall explain how this is effected when I deal with mains receivers.

Automatic Bias

It is possible with battery receivers to employ automatic bias. The object of bias in a valve is to render the potential of the grid less than that of the cathode or filament. With ordinary battery bias the filament is at a potential equal to the potential at the negative end of the high-tension supply, and by connecting the positive pole of the grid-bias battery to the same spot the grid potential is equal to the voltage of as much of the grid battery voltage as is included in the grid circuit. In order to bias the valve it does not matter whether the cathode is at zero voltage and the grid at some negative potential, or whether the grid is at a zero potential and the cathode at some positive potential. This is the condition which usually obtains when automatic bias is used. In most mains arrangements the grid is maintained at the same potential as the negative terminal of the high tension supply, while the cathode is raised to a higher potential by the inclusion of a resistance in the lead connecting the cathode to the negative high tension terminal. Battery auto-bias is carried out by including a resistance in the H.T. lead. Fig. 22 shows the arrangement of the two resistors for the two values of bias required. Experimenters may try different values to see the effect. For example, a voltmeter may be connected across the resistor to ascertain what value is applied.

The advantages of automatic or self-biasing are many. In the first place, if the value of the biasing resistance is correct there is no possibility of under-

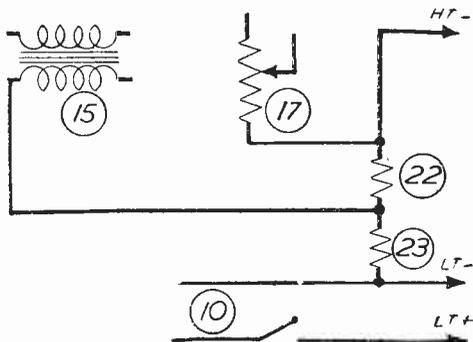


Fig. 22.—Modified circuit for providing automatic grid bias.

biasing or over-biasing the valve. The biasing resistance automatically controls the value of the anode current, for should the anode current rise, due perhaps to an increase in anode voltage, the

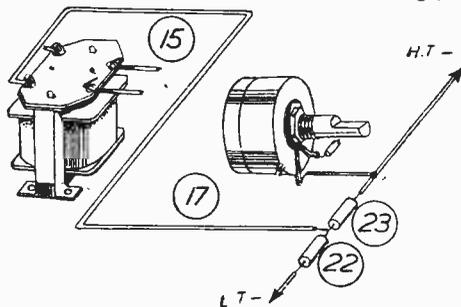


Fig. 23.—Pictorial diagram of the auto-bias wiring.

drop through the biasing resistance will rise in proportion; the negative bias will be increased and the anode current reduced to a safe value. Further, the biasing resistance does not deteriorate as does a grid-bias battery; it does not vary in value, and needs no replacement. If desired, the biasing resistance can be made variable or semi-variable.

There is, however, one disadvantage. Any biasing voltage thus applied is deducted from the total H.T. voltage. This, of course, makes no practical difference to the efficiency of the average mains set where 200/250 volts H.T. is available from the mains and the maximum bias voltage required does not exceed 30 volts. In the case of some of the bigger output valves, however, which are designed to operate at about 400 volts on the anode, as each valve requires over 100 volts grid bias, the loss if this amount of bias were subtracted from the available 400 volts H.T. would be serious.

Biasing resistances generally should be of the stable type and must be capable of carrying the full anode current of the valve continuously without overheating. In the case of early-stage low-frequency amplifiers and screened-grid valves, ordinary fixed resistances are quite suitable, but for output valves, where a certain amount of preliminary adjustment of grid bias is usually necessary, it is advisable to use a variable resistor, or preferably a fixed resistor and a variable resistor in series. This allows of adjustment, but at the same time prevents the valve from being run entirely without bias if, by mistake, the variable portion is reduced to zero. For variable-mu valves, where continuously adjustable bias is required, the resistance must naturally be of the variable type. The calculation of the correct value of biasing resistance is a simple matter, and is merely the application of Ohm's Law. The formula is:

$$\text{Value of biasing resistance in ohms} = \frac{\text{Desired bias in volts}}{\text{Anode current in amps.}}$$

As the anode current is usually expressed in milliamps, the value of the biasing resistance is found by multiplying the desired bias voltage by 1,000 and dividing by the anode current in milliamps.

As a typical example, take an output valve requiring a grid bias of 32 volts at full anode voltage, the anode current being 30 milliamps., the correct resistance for self bias would be 32 multiplied by 1,000 and divided by 30, or 1066.6 ohms. Actually,

a total resistance of 1,250 ohms would be used, consisting of a 750-ohm fixed resistor in series with a variable resistor of 500 ohms maximum.

In mains receivers, in addition to the biasing resistance itself, certain additional apparatus is usually required, by way of decoupling. If the anode supply is not efficiently smoothed, and a bad mains ripple is present, there is a risk that this may be transferred to the grid by the bias arrangement, when the anode current will be correspondingly modulated and serious main hum result. Moreover, there is always a chance that the biasing circuit may pick up mains hum from some other part of the apparatus, while any other low-frequency component in the anode circuit will have a similar effect. To reduce this risk, a grid decoupling or smoothing circuit may be employed. This consists of a high resistance, usually of about 50,000 ohms, included in the grid return and by-passed to the cathode through a condenser which, in the case of most low-frequency valves, should be of at least 2 μ F capacity.

Such decoupling is not essential, but should be added without hesitation if serious hum cannot be cured by other means. Different designers prefer different arrangements of the auto-bias circuit, but the circuits given on pages 448 and 449 are tried arrangements and quite suitable for the types of battery circuit for which they are recommended. The manner in which the automatic bias is obtained in the circuit shown in Fig. 22 is quite simple. When a voltage is applied across the ends of a resistance there is a voltage drop through the resistance caused by the current flowing, and this in turn is dependent upon the voltage which is applied, and the value of the resistance.

(To be continued)

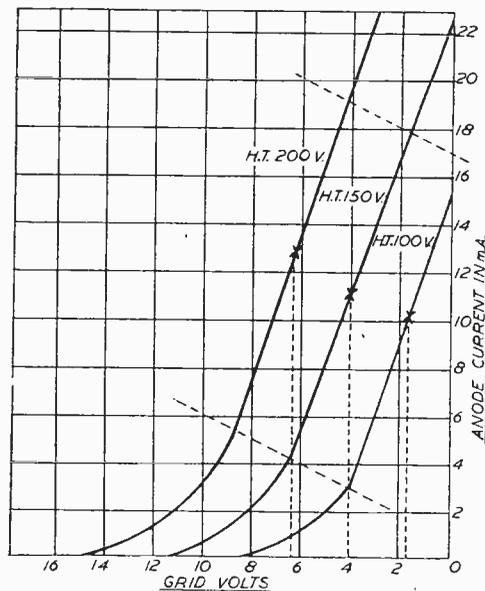
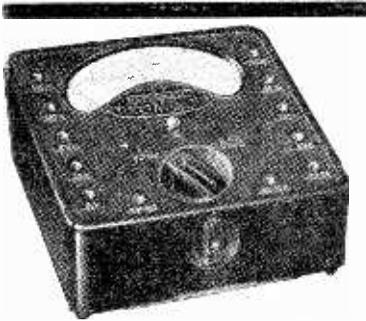


Fig. 24.—Typical characteristic curve of an amplifying valve, showing the variation in grid bias resulting from variation in H.T. voltage.



'AVO' Precision ELECTRICAL TESTING INSTRUMENTS

A dependably accurate instrument for testing and fault location is indispensable to the amateur who builds or services his own set.

The UNIVERSAL AVOMINOR

(as illustrated) is a highly accurate moving-coil instrument, conveniently compact, for measuring A.C. and D.C. voltage, D.C. current, and also resistance; 22 ranges of readings on a 3-inch scale. Total resistance 200,000 ohms.

Size: 4 1/2 ins. x 3 3/4 ins. x 1 1/2 ins.

Net weight: 18 ozs.

Price: £10 : 10 : 0

Complete with leads, interchangeable prods and crocodile clips, and instruction book.

The D.C. AVOMINOR

is a 2 1/2-inch moving coil meter providing 14 ranges of readings of D.C. voltage, current and resistance up to 600 volts, 120 milliamps, and 3 megohms respectively. Total resistance 100,000 ohms.

Size: 4 1/2 ins. x 3 3/4 ins. x 1 1/2 ins.

Net weight: 12 ozs.

Complete as above
Price: £5 : 5 : 0

D.C. Voltage
0-75 millivolts
0-5 volts
0-25 " "
0-100 " "
0-250 " "
0-500 " "

A.C. Voltage
0-5 volts
0-25 " "
0-100 " "
0-250 " "
0-500 " "

D.C. Current
0-2.5 milliamps
0-5 " "
0-25 " "
0-100 " "
0-500 " "

Resistance
0-20,000 ohms
0-100,000 " "
0-500,000 " "
0-2 megohms
0-5 " "
0-10 " "

GUARANTEE: The registered Trade Mark "Avo" is in itself a guarantee of high accuracy and superiority of design and craftsmanship. Every new AvoMinor is guaranteed by the Manufacturers against the remote possibility of defective materials or workmanship.

Sole Proprietors and Manufacturers:—

AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
Winder House, Douglas Street, London, S.W.1.

Phone: VICTORIA 3404-9



ELECTROLYTIC CONDENSERS

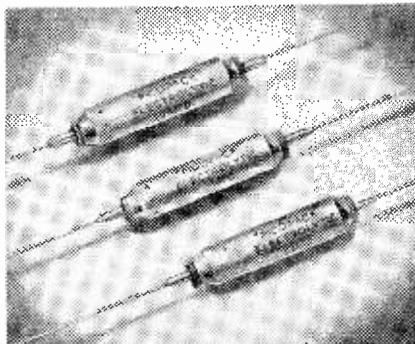
These abbreviated ranges of two popular types are representative of the wide variety of T.C.C. Condensers available.

'MICROPACK' (Regd.) ELECTROLYTICS All Aluminium Construction

Cap. µF.	Wkg.	Dimensions		Type
		Length	Dia.	
100	6	1 1/2 in.	3/8 in.	CE32A
50	25	1 3/4 in.	1/2 in.	CE18C
32	150	2 1/2 in.	1 in.	CE19F
2	200	1 1/2 in.	1/2 in.	CE31G
8	450	2 1/2 in.	1 in.	CE19P

'PICOPACK' (Regd.) MINIATURE ELECTROLYTICS (Plain Foil)

Capacity µF.	Peak Wkg. Volts	Dimensions		Type No.
		Body L'gth	Dia.	
8	6	1 1/8 in.	.25 in.	CE72A
20	12	1 1/2 in.	.34 in.	CE30B
30	15	1 3/4 in.	.43 in.	CE71B
10	25	1 1/2 in.	.34 in.	CE30C
5	50	1 1/2 in.	.34 in.	CE30D
2	150	1 3/4 in.	.34 in.	CE30G
1	350	1 3/4 in.	.34 in.	CE30N



THE TELEGRAPH CONDENSER CO. LTD.

Radio Division: North Acton, London, W.3. Tel: Acorn 0061

"You Can Rely on Us"

'Q-MAX' CUTTERS.—Chassis Punch complete with Key; $\frac{3}{16}$ in., $\frac{3}{8}$ in., 12/4; $\frac{3}{8}$ in., 13/4; 1 in., 1 1/2 in., 1 1/2 in., 16/-; 1 1/2 in., 1 1/2 in., 17/9; 1 1/2 in., 19/9; 2-3/32 in., 31/9; 1 in. Square, 24/3.

HUNTS' MIDGET MOLD-SEAL CONS.—1 mfd. 150v., 1/6; .02 mfd., 150v., 1/6; .005 mfd. 350v. 1/6; .01 mfd. 350v., 1/6; .02 mfd. 600 v., 1/2; .001 mfd. 350v., 1/3; .002 mfd. 350v., 1/3; Midget Electrolytics, 32-32 mfd. 250v., 2in. x 1in., 9/-; 16 mfd. 350v., 4/-.

WAVE CHANGE SWITCHES.—New Midget 2p. 2w., 2p. 3w., 2/6; 1p. 12w., 2p. 6w., 3p. 4w., 4p. 3w., 3/6. Standard Yaxley type; (two bank) 4p. 5w., 6p. 3w., 8p. 2w., 2p. 11w., 7/6. All above have 2in. spindles and are NOT Surplus.

METAL RECTIFIERS.—Westinghouse, 14A86, 20/-; 14D36, 11/-; WX3, WX6, 3/9; 36EHT100, 29/4; LT52 (12v. 1ja.), 19/6; 1 m.a. Meter, 12/6; 36EHT40, 21/6; 36EHT45, 23/8; 36EHT50, 26/-; S.T.C. Type K3/100, 14/8; K3/45, 9/-; RM1, 5/3; RM2, 6/3; RM3, 7/-.

MAINS DROPPERS (New).—2a 950 ohms, .3a., 800 ohms, 5/-; Midget, 6/3; Linecord 2a. 100 ohms ft., .3a. 60 ohms ft., 8d., per ft. ADCOLA Pencil Bit Irons, 200-220v., 230-250v., 25/6.

I.F. TRANSFORMERS.—RS/GB., 12/6; Wearite M800, 21/-; Super Midget RSRS, 21/-; All for 465 Kc/c. incl. Weymouth P4 type, 15/- per pair.

VOLUME CONTROLS.—Less Switch, 2/9; with switch, 4/3. Midget, 3/6 and 5/6. All values.

JACKSON.—Midget Perspex enclosed Twin Gang with Trimmers, 11/-; SL8. Scale Drive Assembly, 27/6; SL5, 27/6; Full Vision, 13/9; Square-plane, 13/-.

COILS.—All Wearite "P" type, 3/- each Weymouth "H" type, 3/9 each; "K" type, 5/-; CT2W2, 10/6 a pair; CS3W3, 12/6 a pair; T.R.F. Coils, MW/LW, with reaction, 7/6 a pair. "View-master" Coils, London, 20/-; Birmingham, Holme Moss, Kirk o' Shotts, Wenvoe, 28/6 per set.

CATALOGUE No. 12.—This will soon be ready for distribution—70 pages, 250 pictures. Price 1/-.

PLEASE NOTE: We have moved to new larger premises at

82, South Ealing Road, London, W.5

NEXT DOOR TO SOUTH EALING TUBE STATION. Telephone EALing 5737

RADIO SERVICING COMPANY

FREE

A 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.

NEW!

HOME EXPERIMENTAL KITS NOW AVAILABLE

EMI
Institutes
associated with
MARGONIPHONE
COLUMBIA

H.M.V. ETC.
COURSES FROM
£1 PER MONTH

POST NOW

Please send, without obligation, the FREE book.
E.M.I. INSTITUTES, Dept. 32K
43 Grove Park Road, London, W.4

Name.....

Address.....

IC 10EK

BUILD THIS AMAZING RADIO

POWERFUL! PERSONAL! PORTABLE!

- Selective tuning.
- Acorn low drain valve.
- Loud clear tone.
- Long range.
- No earth.
- Short aerial, 2ft.
- Welded steel case.
- Easy to assemble.
- All parts for this set are sold separately

FOR **30/-**
POST FREE



MAIL ORDER ONLY

This little set was designed to give you a real personal portable radio that you can enjoy anywhere without disturbing others. Use it on camping trips, in bed, in your office, or just anywhere. Send 2/- for layout, Wiring diagram and Component Price List. This will be refunded on all orders over £1.

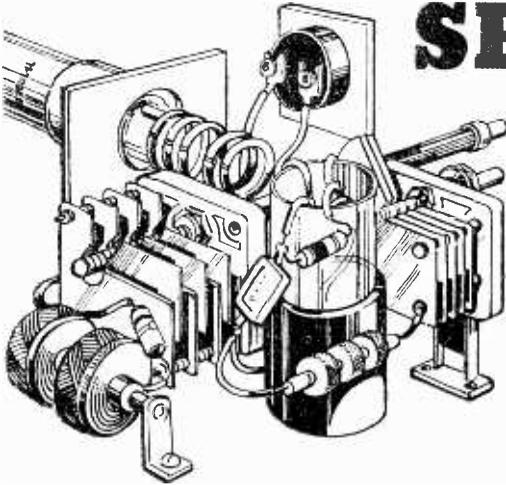
R. C. S. PRODUCTS
11, OLIVER ROAD, LONDON, E.17

SHORT-WAVE SECTION

VERTICAL AND FIXED BEAM AERIALS

WITH SUGGESTIONS FOR COMPARATIVE TESTING

By A. W. Mann



IN the author's opinion one of the most interesting branches of short-wave radio experiment centres around aerial design and comparative efficiency tests. This applies especially to directive aerial systems which of necessity are developed on original lines rather than on text book recommendations.

Rotary Aerial Systems

With aerials of this type testing is to some extent straight-forward. A soundly-designed system used in conjunction with a sensitive receiver, a pair of headphones and some form of output indicating device, as for example, an S meter or alternatively an L.F. output meter, will enable the experimenter to check signal gain and decline by oral and visual means, and with the minimum of trouble.

It will be noted that I specify a pair of headphones and not a loudspeaker, for this applies to all types of set. The reason is that one is thus in more intimate contact with what is taking place, as compared with listening via a loudspeaker. Actually, it is surprising how minute variations and slight defects pass unnoticed using the latter method.

This applies especially to improved selectivity and the clearing up of the hash created by jamming, especially on the short-wave broadcast bands.

Fixed Beam Systems

While we can effectively test rotary aerial systems on short-wave commercial broadcast and amateur 'phone transmissions, the same does not apply to fixed beams unless we have two or more which can be instantaneously switched in and out of circuit.

The only alternative when live transmissions are the test medium, is to test the new beam against a check aerial. That the check aerial should be an efficient one should not be overlooked. If such is not the case the experimenter will find the results to be very misleading. For example, what is intended to be a beam aerial with focusing properties may, when tested against a really efficient check aerial of horizontal or vertical type, be found to possess very little in the way of directive properties, and, in fact, compare unfavourably with the checking aerial.

If, however, the checking aerial is an inefficient

one, the gain obtainable with the new beam may not be due to its more marked directional properties, but to the fact that as a collector of signals, it is a more efficient piece of wire having better pick-up.

This state of affairs could, of course, be due to increased height, length comparatively and angle of inclination, etc.

As is well known, individual copies of text book beams do not always come up to expectations. It follows, therefore, that some of those based on individual theories may in some instances fail to please. An unsuitable location, screening, space restriction, are all factors with which one may have to contend. Of equal importance, and do not let it be disregarded, is the inability to install an efficient earthing system.

Professional radio engineers have also to consider the suitability of terrain, and the attractions of a site high above sea-level will soon fade if it is found that the subsoil mitigates against the installation of a satisfactory earthing system.

While the short-wave listener and amateur is not likely to be tied down by such highly technical requirements, he cannot afford to sacrifice efficiency, neither can he, as a rule, choose another site. The earthing system should, therefore, be the best possible under the circumstances.

It may be that the beam is more efficient when used with an unearthed receiver. On the other hand the receiver to be used may be at its best when an earth is used.

In the writer's opinion the most satisfactory aerial to use for checking purposes is one which does not discriminate as to direction. In this respect the vertical type is ideal.

A Vertical Aerial

Fig. 1 shows in detail the vertical rod aerial used by

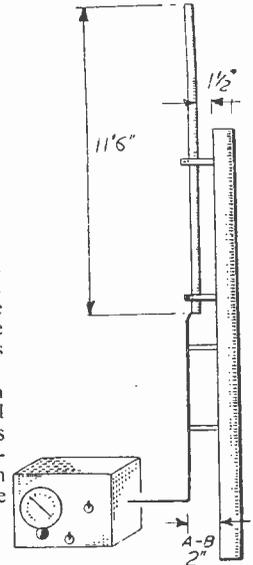


Fig. 1.—Typical vertical rod aerial arrangement.

On your Wavelength

By THERMION

Radio Taxis

THE new radio taxi service, which is operated in London and other cities, is a further example of the harnessing of the benefits of radio to the practical service of the public as distinct from pure entertainment. Almost everyone at some time has tried to hail a taxi in vain, usually in wet weather. You will see, even at London termini, queues of travellers waiting for the taxi to pick them up with their luggage. People in the remoter parts of cities and towns where taxi services, other than private cars, are non-existent, are particularly unfortunate when they have to make an awkward journey not covered by a bus route, or at a time when bus services are not running.

Now, you ring up Radio Taxis, explain where you are and they immediately put a call out to all of the taxis operating their system, which are equipped with two-way radio. The driver nearest to the fare will reply to central control stating that he is on the way to pick up the fare. The other drivers are then told to carry on.

This radio taxi service is spread over London and most of its suburbs, and consequently there is always a radio taxi in or around a particular vicinity with an owner-driver ready to serve you.

The company operating this system do not own the taxis. The taxi-owner-driver pays 35s. a week and the company installs the radio transmitter and receiver. Needless to say, most London taxi drivers are adopting this new system which puts them in touch with fares all day long and prevents wastage of time on the rank. I travelled in one of these radio taxis the other day and listened-in to the various calls put out from central control, and I must say I am most impressed with the general efficiency of the system. Taxis are despatched immediately upon receipt of telephone calls and are at your door within a few minutes. You may pre-book your taxi to arrive at any specified date or time and, as in the case of immediate requirements, the driver will take you any distance from anywhere. For coast or country runs, airport, docks, etc., charges are based on 1s. a mile return, and all drivers serving through Radio Taxis have agreed to execute all such hirings at prices arranged between the customer and control.

A Plea for the Beginner

MR. J. H. WHITE, of Swinton, in a ten-page missive, enters a plea for more articles in this journal for beginners. Although he has only just taken up radio, he came across No. 34 of this journal dated May 13th, 1933, in which we gave some prominence to our aims to produce material which can be easily assimilated by the non-technical. Ah, yes! But that was twenty years ago and our readers have graduated from the tyro stage since then. I am certain if the entire contents of this journal were based on the 1933 formula, our long-standing readers would object—*O tempora! O mores!* This journal came into

the field when broadcasting was about ten years old, but the passing of two decades and the publication of thousands of articles dealing with the elementary side of radio have created a public which, in the main, requires articles of a more technical nature.

This does not mean that the beginner is overlooked. Every year there are new recruits to our hobby and, as with a school, it is necessary to have Standard I matter for them, so that in the course of time they can move up through the various classes to Standard 7. It is a problem which confronts every technical journal. No journal can remain static. It must progress as its readers progress.

One point often overlooked by new readers is that the very type of article they require has probably been published about a month before they enter the fold. This journal has always made a point of catering for the very beginner. We publish many books, such as "Everyman's Wireless Book," which take the reader in a non-technical and a non-mathematical way right through the fundamentals, and I suggest that beginners could make up some of the leeway by studying these books.

Mr. White makes a plea for pictorial layouts such as those we used twenty years ago, with all the components drawn in perspective and point-to-point wiring. Is there to-day really a demand for this style? If so I gather there would be no objection to re-introducing it. For myself I am of the opinion that most beginners are able to follow a simple circuit in conjunction with a wiring diagram. However, I invite readers who are new to the hobby to write to me regarding this.

Mr. White's particular interest is short-wave sets, and he wants designs which may be easily built from spare parts in the amateur's junk box. Unfortunately, most of the components of this character are unsuitable for modern circuits.

Beginners also should bear in mind our free advisory service, which daily deals with dozens of their problems. This journal is entirely behind its readers, it will help to solve their problems, and its pages will reflect their majority requirements. I understand that the circulation of this journal is far greater to-day than it was before the war, and one is entitled to conclude from this that its policy suits the majority. It is not possible to design a journal which will appeal to every reader, any more than a daily paper can guarantee that none of its readers will disagree with its views. Those who disagree with mine are entitled to their opinions and I do not hesitate to air opposing points of view. Our correspondence pages show also that we do not hesitate to publish criticisms of contributed articles. The running of a journal is a complicated task. A contributor or a draughtsman has to make only a trifling mistake and the critical eyes of our readers will immediately spot it. How nice to be a doctor! He buries his mistakes. We can't!

Standard Frequency Transmissions

DETAILS OF A NEW SCHEDULE OF N.P.L. BROADCASTS FROM RUGBY

STANDARDS of frequency and time differ from the other standards of measurement in that they can be made available continuously over wide areas by means of radio transmissions. The frequencies of 2.5, 5, 10, 15, 20, 25 Mc/s have, by international agreement, been allocated to this purpose and a continuous service on all of these frequencies is in operation from station WWV of the National Bureau of Standards situated near Washington D.C.

Such transmissions enable the user to standardise his equipment without having to install and maintain costly and elaborate equipment, but to be fully effective they must be received in all parts of the world at all times. The WWV transmissions do not meet this requirement, and experiments on an international scale are, therefore, being conducted under the general direction of the International Radio Consultative Committee in order to discover the best means of securing world-wide coverage.

Transmissions from the United Kingdom

As the United Kingdom's contribution to this programme, transmissions, each of 31 minutes duration, on 5 and 10 Mc/s have been made daily since February, 1950, from the Post Office station at Rugby, under the call sign MSF. Numerous reception reports have been received and have helped in the planning of the second stage of this experiment which was inaugurated on May 26th, 1953. The transmission period is now extended to 24 hours per day and the power reduced from 10 kW to 0.5 kW. The transmission is interrupted during the interval between 15 and 20 minutes past each hour to enable one station alone to be measured under those conditions in which two stations such as MSF and WWV are being received at nearly equal strengths. The break in transmission also permits radio noise measurements to be made if no other transmission is present.

Transmissions at present are made on 2.5, 5 and 10 Mc/s; later, 15 and 20 Mc/s may be used, but only three frequencies will be broadcast simultaneously. The carriers are modulated in accordance with the following 60 minute schedule:

Minute past each hour	Modulation
0 - 5	30 - 35 45 - 50
5 - 10 20 - 25 35 - 40 50 - 55	1,000 c/s
	pulses, the 59th pulse in each minute being
10 - 14 25 - 29 40 - 44 55 - 59	omitted unmodulated
14 - 15 29 - 39 44 - 45 59 - 60	speech announcement

Accuracy of the Transmissions

The carrier and modulation frequencies are all derived from the same 100 kc/s standard and are maintained within \pm two parts in 10^8 of their nominal values. The frequency of the received signal may vary throughout the day, however, if there are ionospheric reflections in the transmission path. This frequency error is due to the movement of the reflecting layers; it seldom exceeds \pm two parts in 10^7 and for a large part of the day is not more than a few parts in 10^8 . The transmitted frequencies do not, in general, vary from day to day by more than \pm two parts in 10^8 .

Uniform Time—A New Time Scale

The frequencies and, therefore, the time intervals

marked by the seconds pulses are measured on what may be called an estimated uniform time scale.

There is evidence that the length of the day varies by about one millisecond in a periodic manner in the course of the year, partly due to a variation in the position of the earth's poles and partly due to a variation in the rate of rotation of the earth on its axis. For precise physical measurements such as the checking of the long-term stability of a quartz standard it is desirable to remove this fluctuation.

Frequencies measured on the uniform and the astronomical time scales do not differ by more than 1.5 parts in 10^8 , and the maximum difference in time on the two scales is about 60 milliseconds. The difference is, therefore, of significance only for the most precise measurements.

Special Experimental Transmission on 60 kc/s

The frequencies allocated to standard transmissions are not the most suitable for use within the United Kingdom. A lower frequency has some advantages because the ground wave is then received and errors due to the Doppler changes at the reflecting layers are avoided. A special transmission at a frequency of 60 kc/s and a power of 10 kW is, therefore, made for use in the United Kingdom. The transmitter used for this purpose is a standby transmitter for a communication channel and is not always available for standard frequency transmissions. Experience has shown that a reliable service can be maintained if the transmissions are restricted to one hour per day. This transmission period is 1429-1530 G.M.T. and the modulation programme will be the same as for the short waves.

Some adjustments to the frequency of the standard are necessary in order to keep within the stated tolerance of \pm two parts in 10^8 . The standard, which is an Essencing oscillator made by the Radio Branch of the General Post Office, has increased in frequency fairly steadily at the rate of about two parts in 10^9 per month since its installation in February, 1950. It is therefore set to be 1×10^{-8} less than its nominal value and is reset when it has drifted to 1×10^{-8} above nominal.

The seconds pulses are derived from the standard by division and consist of five cycles of 1,000 c/s tone. The precision of the pulses is $\pm 1 \mu$ s and the time interval between two pulses is, therefore, accurate to \pm two parts in $10^8 \pm 2 \mu$ s. For example, if the frequency is 1×10^{-8} high then the time interval between corresponding pulses on consecutive days is 1×10^{-8} (approximately one millisecond) less than one day. The time error is integrated and in general no attempt is made to alter the phase of the pulses so as to make them coincident with uniform time. If, however, they are in error by more than 50 milliseconds an adjustment of 50 or 100 milliseconds is made. Such adjustments are made on the first day of the month and the extent of the adjustment is announced.

Reception Reports

The MSF service of transmissions is still experimental and reports concerning reception will be welcomed.

They should be addressed to The Director, National Physical Laboratory, Teddington, Middlesex, England.

DESIGNING A RESISTANCE CAPACITY-COUPLED STAGE

By J. S. Kendall

IN these days it is usual to have at least one stage of voltage amplification before the output stage in order that it may be fully loaded. Fig. 1 shows a simple voltage amplifying stage, in which the valve is chosen to give the required gain, and the other components to suit it. It should be pointed out here that it is impossible to get a stage gain equal to the μ of the valve chosen.

Most amateurs are now using the 6.3 volt range of valves or the equivalent universal types, although some are still using the four-volt series.

Perhaps it would be as well to consider just how the valve amplifies. If an alternating voltage is applied to the grid it will be taken alternately positive and negative of the normal standing grid voltage. If the grid is taken in a positive direction the current through the valve increases, and by Ohms law the voltage across the anode load resistor increases, thereby reducing the actual anode voltage. Conversely, if the grid is taken negative the current through the valve is reduced with the result that the anode voltage rises, with a reduction in the drop across the resistor. From this it will be seen that there is what is known as a phase shift of 180 degrees between the input and the output voltage of the valve; this is also known as a phase reversal, i.e., a change over from negative to positive and vice versa. So far we have omitted the effect of the internal impedance of the valve. This valve impedance must not be confused with valve resistance, which would be found by dividing the anode voltage by the anode current, whereas the impedance is found by applying a standing voltage and fixed grid voltage, and measuring the anode current; after recording these two increase the anode voltage and not the current. After recording these two sets of readings, the change in anode volts is divided by the change in anode current. The impedance, it should be noted, is far higher than the D.C. resistance of the valve.

If, then, a voltage V_G is applied to the valve, a voltage of μV_G will be developed by the valve, in series with its impedance R_a . The complete circuit can be regarded as being as shown in Fig. 2. From a simple application of Ohms law it is possible to prove that the voltage in a series circuit is inversely proportional to the value of the two resistors, so that the

portion of the output voltage developed across the load will be $\frac{R_L}{R_L + R_a}$, and since the valve can be regarded as a generator of μV_G , then the output voltage will be $\mu V_G \frac{R_L}{R_L + R_a}$.

The ratio of input to output voltage will be,

$$\frac{V_G}{\mu V_G} = \frac{\mu R_L}{R_L + R_a}$$

$$= \frac{\mu R_L}{R_L + R_a} = \alpha \text{ (stage gain).}$$

This is a very useful

formula and should be committed to memory by the reader. Another useful version of this formula is

$$R_L = \frac{\alpha R_a}{\mu - \alpha}$$

as from it is simple to calculate the anode resistor R_L to obtain a specified voltage gain. Take, for example, a valve required to deliver four volts r.m.s. to a high-slope output pentode of the PenA4—EL33 type, from a gramophone pickup capable of an output of 0.5 volts maximum. To ensure that there is gain to spare to compensate for low power recordings, a voltage gain of 15 would be chosen. This gain of 15 means that the amplification factor of the valve chosen must be over 15. On looking over our valve stocks it is perhaps found that a 6J5G is available, and the amplification factor of this is 20 and its impedance is 8,000 ohms with 100 volts on the anode.

Applying the formula $R_L = \frac{\alpha R_a}{\mu - \alpha}$ and substituting the known factors we get $R_L = \frac{\alpha R_a}{\mu - \alpha} = \frac{8,000 \times 15}{20 - 15} = 24,000$ ohms.

Having thus calculated the anode load resistor the next step is to calculate the values of two resistors that will, in parallel, give this value of resistance, as to

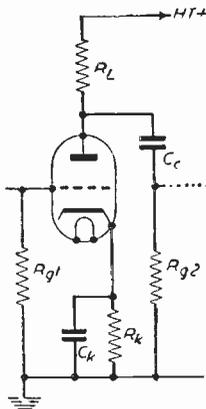


Fig. 1.—A simple voltage amplifying stage.

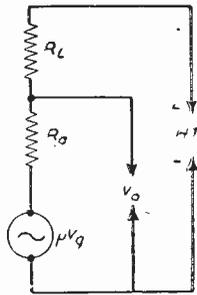


Fig. 2.—Equivalent circuit of a simple valve stage.

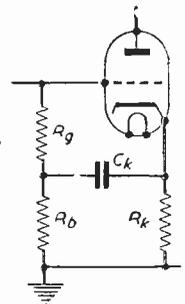


Fig. 3.—One form of bass boosting circuit.

all intents and purposes the load presented to the valve consists of the anode resistance and the grid resistance of the following valve in parallel. If the ratio of the calculated anode resistor to the maximum grid resistor is greater than 10 : 1, then no further calculations are necessary, as the tolerance of the resistors is only 10 per cent. With the case quoted, the valve following would have a slope of 10 m/a/V, so that a grid resistor in excess of 100 K Ω should not be used. The anode resistor of the drive valve would, therefore, have to be raised to 35 K Ω .

The calculation of the bias resistor and condenser are the same for any type of valve in any type of circuit, and is the bias voltage required divided by the total cathode current. In the case of a triode requiring 10 volts with a total anode current of 5 mA, a resistor of 10/5 K Ω would be required. The by-pass condenser should be as high as possible in order that the low frequencies are not unduly cut.

The power rating of the cathode resistor must not

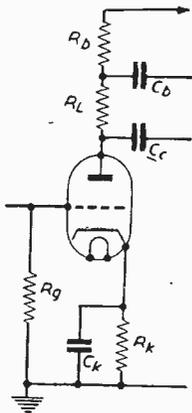


Fig. 4.—Simple bass compensation circuit.

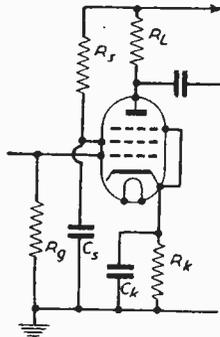


Fig. 5.—A typical 6J7 A.F. stage.

be overlooked, but in most resistance-capacity stages it can be ignored. Take the foregoing resistance calculations, for instance, that would require a power of E^2/r equals $10 \times 10/2,000$, which is only 1/20 of a watt!!!!

Bass Response

There are several ways of improving the bass response. One is to use the circuit shown in Fig. 3. In this there is a condenser joined between the bottom of the grid resistor and cathode, whilst another resistor provides a path to chassis to supply the valve with bias. It must be realised that the condenser must be a high-grade paper one and not an electrolytic. If the maximum permissible grid resistor is used, divided into two equal parts, and as large a condenser as possible employed, the best low-frequency response is obtained. It should, however, be pointed out that a 10 μ F electrolytic with a 2,000 Ω resistor, will give the same result as a 0.1 μ F and 200,000 Ω in this circuit. The cost of the components resulted in this circuit falling out of use many years ago.

Another bass compensation circuit is given in Fig. 4. In this, it is best if the stage gain at normal frequencies is about half the amplification factor of the valve,

i.e., R_1 equal to R_a , then R_b is designed to give the required bass lift at a frequency determined by C_b . The actual calculations for the values of these components are rather complex and the writer has found that if R_b is twice R_1 , the value of C_b can be found by trial and error and usually lies in the range of 0.001 to 0.1 depending on just what response is required.

Many people have great difficulty in calculating the component values of H.F. pentodes used as R.C. amplifiers. The calculations of the stage gain and the cathode components are the same as with a triode; it is the calculation of the screen resistor and condenser that gives the trouble. In R.C., H.F. pentode stages the anode voltage must not be allowed to fall below that of the screen or distortion will result. If, for example, we take the old favourite the 6J7G being used with an anode load of 100 K Ω we see that under normal conditions the anode current is 3 mA. and the screen current 0.8 mA. with a voltage of twice that on the screen applied to the anode (250) this makes a current ratio of 4 : 1 if then the two electrodes were to be supplied with the same voltage, then the screen resistor would be four times that on the anode, but as it is being worked at half the anode voltage then it will have to be eight times that of the anode load.

The method then is to multiply the value of the anode feed resistor by the ratio of anode to screen current of the valve, then multiply the result by the ratio of anode voltage to screen voltage, usually two, quite simple isn't it?

The screen condenser should always be of paper and should at the lowest frequency required have an impedance of about one-fifth of the screen resistor.

Transistor Hearing Aid

THE first British commercial device incorporating a germanium crystal triode was recently demonstrated in London by Multitone Electric. The new device consists of a simple attachment which can be used with most hearing aids to extend the range of hearing by providing the user with a much higher maximum amplification and power output, enabling him to understand speech at a far greater distance. The attachment relies on a germanium crystal triode transistor of the point contact type made by The General Electric Co., Ltd. Its use amplifies the sound given by a deaf aid by 15 decibels (which in layman's language is about 30 times) when operated from a 22½-volt battery. This range extender could never have been introduced were it not for the development of the transistor.

The attachment, which will be marketed at six guineas (including a high-impedance earpiece) can be used with most hearing aids. It is plugged into a battery and has two leads, one to the hearing aid and the other to the earpiece. A neat device, it can be accommodated with its associated battery in a waistcoat pocket or inside a jacket or blouse. The attachment can be operated from batteries of 9 volts to 45 volts, the size of battery depending upon the degree of deafness of the wearer. It is not thought, however, that even the severest cases of deafness will demand the use of a battery of a higher voltage than 22½ volts.



OPEN TILL 6 AM SATURDAYS

TELEPHONES: AMBASSADOR 4033 & PADDINGTON 5271/2

PREMIER RADIO Company

(REGD.) B. M. MORRIS & CO (RADIO) LTD. EST. 40 YRS.

THIS IS OUR ONLY ADDRESS (Dept. P.W.) 207 • EDGWARE ROAD • LONDON • W2 (THIS IS OUR ONLY ADDRESS)

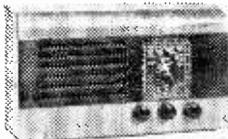
BUILD A PROFESSIONAL LOOKING RADIO SET AT LESS THAN HALF TO-DAY'S PRICE

We can supply all the parts to help you.

- Drum (2 1/2 in. diam.) 1/6
 - Driving head 1/8
 - Trouble pointer 4d.
 - Spring 3d.
 - Nylon Cord (Car) 6d.
 - Dial Front Plate 2/6
 - Engraved Glass Dial, 180-550 and 800-2,200mc With station names, new wavebands ... 1/8
 - T.R.F. Coils, 180-550, 800-2,200 metres, pair 6/8
 - Punched chassis, 5-valve plus rectifier T.R.F. Cabinet, Bakelite, in Walnut or Ivory or Wooden in Walnut finish ... 3/9
 - 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 £5/19/6, 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 5 1/2 in. x 6in. presents an attractive appearance. The valve line-up is: 717A—R.F. Pentode, V8116—Detector, AP74—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).

WILLIAMSON AMPLIFIER KIT

A complete kit of parts for the construction of the latest version of this famous amplifier complete with valves, output and tuning transformers. **15 Gns.** Plus 7/6 pkg., carr. and ins.

WILLIAMSON AMPLIFIER TRANSFORMERS (To specification)

The Output Transformer 3.0 ohms sec. £4/4. The Mains Transformer PREMIER SP255A. £3 7/6.

MOVING COIL MICROPHONE

Low impedance. Incorporates press-to-talk switch. Housed in strong black bakelite case. Dimensions: 2 1/2 in. wide, 2 1/2 in. high, 1 1/2 in. deep. Plus 1/6 post and 19/6 packing. A matching transformer for high impedance can be supplied at 3/6 extra.

H.T. ELIMINATOR AND TRICKLE CHARGER KIT

All parts to construct an eliminator to give an output of 120 volts at 20 mA. and 2 volts to charge an accumulator. Uses metal rectifier. £2.

Govt. Surplus Ex. W.D. STEEL AERIALS

Also ideal for fishing rods—A L.L. BRAND NEW 1 1/2 l. 3 ft. sections of copper-plated steel highly flexible tapering 1/2 to 1/4 in. Brand new in container. Plug-in type 6/9. Screw-in type 7/9. Packing and carriage 1/6. Insulated Base 6/9. Weatherproof carrying case with shoulder strap. 2/6

ACCUMULATORS

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

Famous Set Manufacturer's 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 available at approx. half list price.



£4.2.6 Plus 2/6 pkg. carr. ins.

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



The Chancery Light Weight GPX 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, 1 L.P. and 1 Standard. Price £2/6. Additional L.P. or Standard Cartridge can be supplied from stock at £1/11/6 each.

GRAMOPHONE UNITS

GARRARD Type 75. Latest 3-speed Autochange Unit complete with 2 Acos High Fidelity G.P.L.P. Pick-up Heads. 1 L.P. and 1 Standard. £14.19.6

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 recordings ... £8.8.0

Packing and carriage on each of the above units, 2/6.

B.S.R. "MONARCH" "AUTO-CHANGER"

This is a 3-speed automatic mixed record changer designed to play 12in., 10in. and 7in. records intermixed 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 £16.10.3 plus 5/- pkg., carr.

LOUDSPEAKERS—TAX FREE!

- ELAC—2 1/2 in. dia., Moving Coil 15 ohms Imped. ... 15/-
- PLESSEY—3 in. dia., Moving Coil, 3 ohms Imped. ... 15/-
- ELAC—3 1/2 in. dia., Moving Coil, 8 ohms Imped. ... 15/-
- ELAC—5 in. dia., Moving Coil, 3 ohms Imped. ... 14/8
- E.M.C.—8 in. Elliptical, 15 ohms Imped. ... 27/6
- PLESSEY—8 in. dia., Moving Coil, 3 ohms Imped. ... 14/6
- PLESSEY—8 in. dia., Mains Energised, 3 ohms Imped. (600 ohms field) with Pentode Transformer ... 22/6
- PLESSEY—8 in. dia., Mains Energised, 3 ohms Imped. (600 ohms field) ... 19/6
- PLESSEY—10 in. dia., Moving Coil, 3 ohms Imped. ... 23/6
- GOODMANS—12 in. dia., Moving Coil, 15 ohms ... £8/8/-
- Plus 5/- packing and carriage.
- VITAVOX—K12 20 12 in. dia., Moving Coil, 15 ohms Imped. ... £11 11
- Plus 6/- packing and carriage.

PREMIER MAINS TRANSFORMERS

- All primaries are tapped for 200-280-250 v. mains on 110 cycles. All primaries are screened. All L.T.s are centre tapped.
- SP175B, 175-0-175, 50 mA., 4 v. @ 1 a. 4 v. @ 25/-
 - SP250B, 250-0-250, 60 mA., 4 v. @ 1.2 a. 4 v. @ 25/-
 - SP300A, 300-0-300, 60 mA., 6.3 v. @ 2.0 a. 5 v. @ 2.0 a. ... 25/-
 - SP300B, 300-0-300, 60 mA., 4 v. @ 2.0 a. 4 v. @ 2.0 a. ... 25/-
 - SP301B, 300-0-300, 120 mA., 4 v. @ 2.0 a. 4 v. @ 2.0 a. 4 v. @ 3.5 a. ... 28/-
 - SP350A, 350-0-350, 100 mA., 5 v. @ 2.0 a. 6.3 v. @ 2.0 a. ... 29/-
 - SP351, 350-0-350, 150 mA., 4 v. @ 1.2 a. 4 v. @ 2.0 a. 4 v. @ 3.0 a. ... 36/-
 - SP352, 350-0-350, 150 mA., 5 v. @ 2.0 a. 6.3 v. @ 2.0 a. 6.3 v. @ 2.0 a. ... 38/-
 - SP375A, 375-0-375, 250 mA., 6.3 v. @ 2.0 a. 6.3 v. @ 2.0 a. 5 v. @ 2.0 a. ... 55/-
 - SP501, 500-0-500, 150 mA., 4 v. @ 2.0 a. 4 v. @ 2.0 a. 4 v. @ 2.0 a. 4 v. @ 3.5 a. ... 47/-
 - SP501A, 500-0-500, 150 mA., 5 v. @ 2.0 a. 6.3 v. @ 2.0 a. 6.3 v. @ 2.0 a. ... 50/-
 - SP425A, 425-0-425, 200 mA., 6.3 v. @ 2.0 a. 6.3 v. @ 2.0 a. 5 v. @ 2.0 a. ... 67/6-

Famous Manufacturer's Surplus of ANTI-INTERFERENCE AERIALS offered at a fraction of original cost



The aerial is designed for reception of long, medium and short waves with any ordinary or communication receiver, having an input impedance greater than 1,000 ohms long medium waves and 150 ohms short waves. The installation discriminates against locally generated electrical interference, especially on the short wave band. The equipment enables the installation of an 8.3 Mc. sharply-tuned dipole which operates as a "T" aerial on medium and long waves. The aerial and receiver transformers are intended to be interconnected with a 70 ohms constant cable. The aerial transformer comprises a dual transformer matching network whose function is to transfer the energy picked up by the aerial to the down lead. This transformer is inserted in the centre point of a 60ft. aerial. The set transformer is a dual transformer matching network which transfers the energy from the down lead to the receiver.

COMPONENT PARTS Aluminium Aerial Transformer Assembly

Comprising one each: Aluminium transformer. Transformer clip, Rubber sucker, 3/4 in. x 1/4 in. brass screw, 4 BA 1/4 in. brass bolt. 4 BA nut.

Receiver Transformer Complete with Insulators, clips, etc.; porcelain Insulators 2 each. 30ft. Insulated Aerial Wire, 60ft. Screened Co-Axial Down Lead. Installation Instruction Leaflet included.

LESS CO-AXIAL CABLE & AERIAL WIRE 15/- plus 1/6 pkg. & carr.

COMPLETE WITH CO-AXIAL CABLE & AERIAL WIRE 37/6 plus 1/6 pkg. & carr.

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.

HENRY'S

EXCEPTIONAL VALVE OFFER

Ten EF50 (Ex. Brand New Units), 6/- each 55/- Set
 6K8C, 6K7G, 6Q7G, 5Z4G, 6V6G (or KT61) 42/6 ..
 IR5, 1S5, 1T4, 1S4 or (3S4 or 3V4) 32/6 ..
 TP25, HL23/DD, VP23, PEN25 (or QP25) 27/6 ..
 6K9G, 6K7G, 6Q7G, 25A6G, 25Z5 or 25Z6G 42/6 ..
 12K9GT, 12K7GT, 12SQT, 35Z4GT, 35L6GT, or 50L6GT 42/6 ..
 12S4GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT, or
 50L6GT 42/6 ..
 Complete set of specified valves for "P.W." Personal TV,
 5 6AM6, 2 6AK5, 1 6J6, 1 6C4, 1 EA50, and 3BP1 C/R. Tube with
 base. £5.12/6.
 PX25, KT35G, KT66, GU50, 12 6 each (PX25's Matched Pairs
 25/- pair). CK150AX sub-min. valve, 7/6. Brand new.

CATHODE RAY TUBES :

VCR97. Guaranteed full picture. 40"- carr. 2-/.
 VCR517. Guaranteed full picture with mu-metal screen. 40"-
 carr. 2-/.
 3BP1. Suitable for scopes and Tel. 25"- carr. 3-/.
 MU-METAL SCREEN for VCR97 or 517. 10/-.

VCR135A (ACR10). 21in. C.R. Tube. brand new and boxed, 35-
 P.P. 1/6.

PYE 45 Mc/s STRIP. TYPE 3583.

Units. Size 15in. x 8in. x 2in. Complete with 45 mc/s. Pye
 Strip, 12 valves, 10 EF50, 1 EB34 and 1 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.

"Weymouth Super het 3-Wave Band Coil Packs."

Short, Med. and Long with Gram. Switch.
 Brand New Miniature type complete with circuit. 19/6d.
 P.P. 1/6; absolute bargain.

INDICATOR UNIT TYPE 182A. This unit contains VCR517
 Cathode Ray 6in. 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. Offered
 BRAND NEW (less relay) in original packing case at 79/6d. Plus
 7/6 carr.

INDICATOR UNIT TYPE 51C5

This Unit is ideal for conversion for a "Scope" Unit or basis
 for Midget Television. It contains C.R. Tube type ACR10
 (VCR130A) complete with holder and cradle also earthing
 clip. 1 VCR97, 2 VR85, 24 mfd. 550v. wkg. condenser, potentiometers
 and a varied assortment of resistors and condensers.
 These Units are in a new condition. The C.R. Tube will be tested
 before despatch. Dimensions 8 1/2in. x 6 1/2in. x 11 1/2in.
 57/6 plus 2/6 carr.

VCR 517C Blue and White 6in. Tube.

This Tube replaces the VCR97 and VCR517 without alteration
 and gives a full Blue and White picture.
 Brand new in original crates, 45/-, plus 2/- carr.

9in. Escutcheon. Brown bakelite with glass and mask for 9in.
 Tube, 7/6 complete.
 Clearax Enlarging Lens for VCR97 or 517C. 17/6, P.P. 1/6.

SEND POSTAGE FOR NEW 1953 COMPREHENSIVE 23 PAGE CATALOGUE; OVER 20,000 B.V.A. and EX. GOVT. VALVES IN STOCK.
 Open Mon.-Sat. 9-6.0. Thurs. 1 p.m.

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

TEL: PADDINGTON 1008/9, 0401.

ALUMINIUM ALLOY SHEETS

Ex-Government Surplus

SUITABLE FOR CHASSIS, etc. (undrilled)

Limited Quantity Available

Type No. 1. 14 1/2 in. x 12 in. x 20 G., 2/6 each.

Type No. 2. 17 1/2 in. x 12 in. x 20 G., 3/- each.

Type No. 3. 26in. x 23in. x 20 G., Round
 Corners, 5/- each.

Type No. 4. 22 1/2 in. x 18 1/2 in. x 18 G., 5/- each.

SIZES STATED FOR TYPES NOS. 1 and 2 are
 the maximum rectangular pieces that can be
 cut from irregular shapes.

CARRIAGE PAID.

REDUCTION FOR QUANTITIES.

TRADE ENQUIRIES WELCOMED.

JOHN CASHMORE LIMITED,

Steel Department,

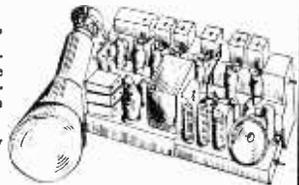
GREAT BRIDGE, TIPTON, STAFFS.

TIPTON 2181/5

COMPACT TV.

The NEW 1355 Conversion data for all five
 Channels, Sound, Vision,
 T.B.'s, Power, on
 one 1355 Chassis.

NEW EDITION, now
 only 2/8 1/2 (post free).



1355's in original cases, (carr. 7/6) 35/-.

NEW VALVES

EF50 : Grey 4/6,
 Red (Sylvania).
 6/6; 5U4G 7/6.

CHASSIS,
 with 5Z4, VU120
 (E.H.T. rect.),
 Transformer,
 choke, relay,
 etc. 9/6

AMPLIFIERS

with full instructions
 to convert
 into a miniature
 mains operated
 amplifier or
 receiver : com-
 plete with three
 valves. 19/6

RECEIVERS

S450. 4 EF54's.
 (RF, mixer, LO
 multipliers), 2
 EF39's (2.9 mc/s
 IF's), EB34 (det)
 6J5 and 6V6
 (audio). 65/85
 mc/s. Measuring
 12 x 5 x 6, with
 circuit. (Post 2/-)
 49/6

INDICATOR 182A

with 6in. C.R.T., 3 EF50's, 4 SP61's,
 5U4, dozens of resistors and con-
 densers, 9 W/W pots, these are
 suitable for conversion to 'scope or
 TV. BRAND NEW (less relay) in
 original cases. Only 89/6 (carr 7/6)

TRANSFORMERS

230/24 v. 2A., 7/6 ;
 230 v./115 v., 40
 watts, 5/3.

DINGHY Tx
CHASSIS (partly
 stripped), 7/6 to
 clear.

RADIO EXCHANGE CO.

14 ST. MARY'S STREET, BEDFORD
 Phone 5568

Those Were the Days!

A SERVICE ENGINEER AND EX-SHIP'S OPERATOR LOOKS
BACK ON THE EARLY DAYS OF RADIO

By F. E. Apps

FORTY-FOUR years is quite a space in a man's life, but that is the time I have spent in radio, or as it was called in its infancy—Wireless Telegraphy.

In those early days, when I first became a "Sparks," the standard receiver was the "Magnetic Detector," this having succeeded the old "Coherer." This receiver (a Marconi invention) was a clockwork device, which had to be wound up every half-hour. Fig. 1 will show how it worked.

As the soft-iron band slowly revolved it caused the field of the permanent magnets to be bent over in the direction of rotation. When a wave train induced a voltage in aerial it passed through primary winding to ground. This set up a field which caused the permanent magnet field to flick back, cutting across the secondary and inducing a voltage there, which was passed to headphones. Of course, under present-day standards, this was a very insensitive job, but it was definitely a great advance on the coherer. In those days, signals were few and far between and unless one was very careful and remembered to wind up every half-hour, one could set on watch, listening very carefully but with the M.D. stopped. It could only be used for telegraphy, but as telephony had not yet become possible, it did its job.

In those days, when at sea, one had to rely for news from the Marconi station in Cornwall (the one he used for first bridging the Atlantic), Poldhu. The transmission was spark, of course, and generally started about 11 p.m. and consisted of about 2,000 words sent at a speed of approximately 15 words per minute. About every quarter of an hour, a short break occurred, during which one seized the opportunity of winding up the M.D.

A notable transmission I remember receiving was the one giving the news of the sinking of the *Titanic*. We were at sea at the time, proceeding from Harwich up to the north of Scotland and I shall always remember the shock it gave everybody on board.

As a point of interest, the distress signal in those days was CQD, the CQ, of course, being—All Ships, and the D—Distress. It was quite a while before the SOS came in. The alteration took place so that automatic receivers on board one-operator ships could

respond. The morse symbols for CQD are too complex for automatic receivers so the much simpler SOS was adopted.

The transmitters on ships at that period were either (a) 10in. spark induction coil, (b) synchronous or asynchronous rotary spark gap, (c) spark gap with blower, (d) telefunken multi-gap.

The first type was obsolescent in my early days and the fixed and rotary gaps were coming in. As transmitters they were very inefficient, their range was very limited and the selectivity awful.

Selectivity

This selectivity business meant some very cumbersome devices in the receiving gear. The rejector principle was the one used to try to overcome this. It was quite a big job in itself; larger, in fact, than the complete present-day communications set. Theoretically it was as Fig. 2.

The dimensions of the rejector were governed by the fact that the resistance of the circuit had to be kept as low as possible. Thus the inductance of the circuit had to be low, consisting of a tapped coil of heavy gauge wire and a fine tuner which was a semi-circular copper strip of approximately 18in. diameter, over which a large wiping contact arm was moved. Owing to the low inductance of the circuit, the capacity had to be large (due to the frequencies being used at that period). It consisted of blocks of condensers which were plugged in as required with capacities ranging from about four jars to 2,400 jars. By the way, the jar was a standard of capacity at that time. It was the approximate value of the original Leyden Jar and was one nine-hundredth part of a microfarad. Normally the rejector was not in circuit but was kept tuned to the frequency being used. On interference one connected the rejector to earth by means of a plug and, by careful manipulation of the fine tuning inductance, a signal comparatively free of interference could be received.

Crystal Receiver

It was about 1911 when the crystal receiver became the regular job. It was not the cat-whisker and hertzite type, but at the commencement two different crystals were used in contact. Bornite and Zincite being a usual pair. Their use brought about a

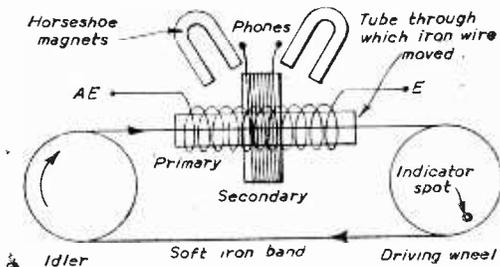


Fig. 1.—Circuit arrangement of the magnetic detector.

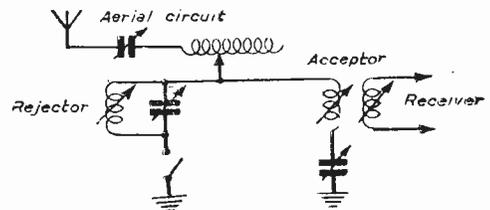


Fig. 2.—Aerial circuit arrangement in early receivers.

great increase in range, their sensitivity being approximately 200 per cent. up on the now-obsolete M.D. After this type came the semi-permanent type, carborundum and steel using a small battery and potentiometer. This type was a definite boon on a ship, where vibration would cause loss of necessary contact at the psychological moment.

During the Dardanelles campaign of the 1914/18 war I was serving on a coal-burning destroyer. These old-type destroyers had no protection for guncrews against shrapnel and shell splinters, so round the guns were placed coalsacks full of clinker from the stokehold. My last piece of carborundum was losing its sensitivity, so having noticed amongst the clinker some small pieces that were noticeably crystalline, I tried two or three pieces as a detector. The first piece was no good, but the second piece I tried was quite successful and in every way as good as a piece of carborundum. It would have been interesting to have this piece examined by a metallurgist and know what it really was.

An interesting event that occurred about this time was the sinking of the *Britannic*. She was a ship of about 50,000 tons and at the outbreak of the war had just been completed by Harland and Wolff's at Belfast. She was immediately converted into a hospital ship and at the time was on a trip to Salonika to pick up wounded. I was on a destroyer at the time and we were rescuing the survivors from a Greek cattle boat that had been torpedoed off the Piraeus (Port of Athens). At about 8 a.m. I picked up a faint SOS from a "G" call sign accompanied by a position. I checked the call and found it was from a British ship—the *Britannic*—and the position was just in the "Zea channel," about 200 miles from our position. The Greek ship was now aground and crew could easily be picked up by shore boats, so we proceeded at our maximum speed (25 to 26 knots) to the rescue. We arrived in the afternoon, just after she had sunk, and were immediately surrounded by innumerable lifeboats full of the survivors. A wonderful sight was a lifeboat full of Red Cross nurses, pulling valiantly at the oars, to get alongside us. We took all we could on board, and I have never known a destroyer with such a ship's company as we then had. The sea had got up a bit, so we put the nurses in out of the elements as much as possible. The wardroom and the officers' cabins were allocated to them and I even had six of them in the W/T cabin. We took as many lifeboats as possible in tow and proceeded at a slow speed back to Piraeus. We arrived after dark and landed them.

Having had such a multitude to feed, we found after they had landed that there was no bread and very little of anything else to eat left on board. Happily, a depot ship was stationed off Athens and we did not have to go hungry for the next few days.

Continuous Waves

It was about this time that C.W. began to be used for W/T. The first transmitters used the Poulsen arc. This consisted of an electric arc with a carbon and a water-cooled copper electrode. The arc was struck in an airtight chamber and burnt in methylated vapour from an automatic drip. The arc was across an L/C circuit, tuned to the frequency to be transmitted. This resulted in a C.W. oscillation being set up in the L/C circuit. This was passed to the aerial via a coupled tuned circuit. Some transmitters used a marking and spacing wave arrange-

ment, others an aerial circuit break by means of a magnetic key.

The Valve

Valve receivers had, of course, now appeared, as a local oscillator was necessary for the reception of C.W. The first ones I used were a single valve type, using a local oscillator circuit for setting the valve in oscillation and then detecting the resultant beat frequency. Some of these circuits were very interesting. One I remember had what was called a musical inductance. This had an iron core inside the local oscillator coil which altered the note of the signal received by varying the amount of iron inside the coil. As it was easily variable, one could tune in on a steady carrier and then play a tune by judicious variation of the coil. Hence, I suppose, the term musical inductance.

Things now began to move in radio. Multi-valve receivers appeared, generally consisting of two or three R.F. stages, mostly aperiodic, a detector, and then two or three L.F. stages. Telephones were being replaced by loud speakers. The arrival of C.W. transmission and the valve also made possible telephony, and with telephony the experimental station at Writtle, the ham, and the BBC.

Broadcasting

For the general public, for receiving broadcast programmes, the average valve receiver at this time was too expensive. A one-valve receiver was about £20, so crystal sets were used. A popular crystal set with one pair of headphones and a length of aerial wire was sold at £4 19s. 6d., and they sold like hot cakes.

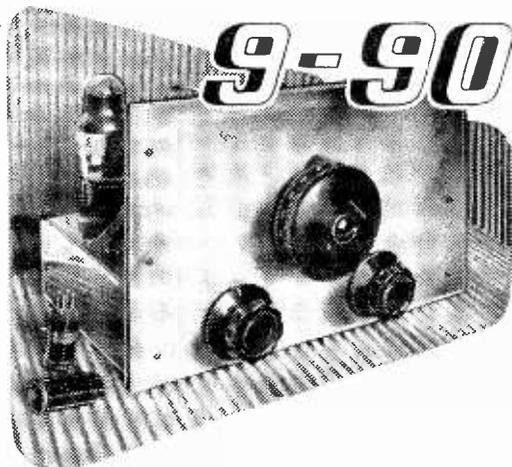
The receiver circuits used were either aperiodic radio frequency, or tuned radio frequency with a detector stage and L.F. stages. As the screened grid valve had not yet appeared, it was necessary, to prevent tuned radio frequency stages from bursting into oscillation, to use small pre-set condensers between anode and grid of each R.F. stage, to offset the inter-electrode capacity of the valve.

The Superheterodyne

A notable advance now occurred. The invention of the screened grid valve, the pentode and the first super-het. These were enormous jobs. The intermediate frequency stages or, as they were often called then, supersonic stages, were themselves about half as big as a complete receiver now. In fact one commercial superhet I saw was approximately 4 ft. long and about 1 ft. wide. The I.F.s were tuned with a condenser about the size of one section of the modern average gang.

Valves were still bright emitters, the indirectly heated valve still had to appear, but the number of people getting radio-minded was growing rapidly. Even the schoolboy was now building his own set and learning from his mistakes. This has no doubt contributed to the vast strides we are making now, so that in these days of world-wide communication, frequency modulation, radar and television, one can ponder, how did we ever get on without it?

READ OUR COMPANION JOURNAL
Practical Television
1/- Every Month



9-90 METRES

S-W-3

A SIMPLE RECEIVER FOR THE
SHORT-WAVE ENTHUSIAST

A RECEIVER such as this may be said to provide the maximum degree of efficiency with the minimum complication. As many users of short-wave equipment know, "straight" receivers can achieve an exceedingly high degree of sensitivity. This is primarily due to the presence of reaction, which increases the volume of weak transmissions to a very great extent. The noise level of such receivers is low, and signals which are inaudible with the simpler type of superhet may be resolved with a straight receiver, if reaction is correctly used. Such a receiver as that described here should not, therefore, be looked upon as a "local station" set. When conditions are normal, the range of reception is literally world-wide.

The receiver employs plug-in coils. Consequently, the user is not restricted to one waveband, though any losses which might arise from wavechange switching are avoided. For general use, the coil which covers approximately 17.5 to 45 metres is most

useful. With a second coil, the bands up to approximately 90 metres may be tuned. A third coil permits tuning down to approximately 9 metres. With three coils, therefore, the coverage is from 9 to 90 metres—and this embraces all the bands in most general use. If desired, higher bands may be tuned by using suitable coils, and coils for the usual medium- and long-wave bands are also available. (Though the latter increases the field of utility of the receiver, it should be emphasised that it is not primarily intended for long- and medium-wave reception, and not designed with such wavelengths in view. As a result, selectivity is not high, though it reaches a fair level, due to the type of coil employed.)

Auto-bias circuits have not been provided, since their presence restricts the builder to certain specified valves. With battery bias, a wide range of valve types can be used with success. For this reason, a separate feed has been provided for the detector H.T., rather than deriving this from the maximum H.T. point, with a dropping resistor.

Tuning is simplified by using a reduction drive of high quality. Since the design of the coils makes it necessary for the reaction condenser to be wired directly to the detector anode, an insulated extension shaft is added here. The third control is for on/off switching and volume. Low-loss components and

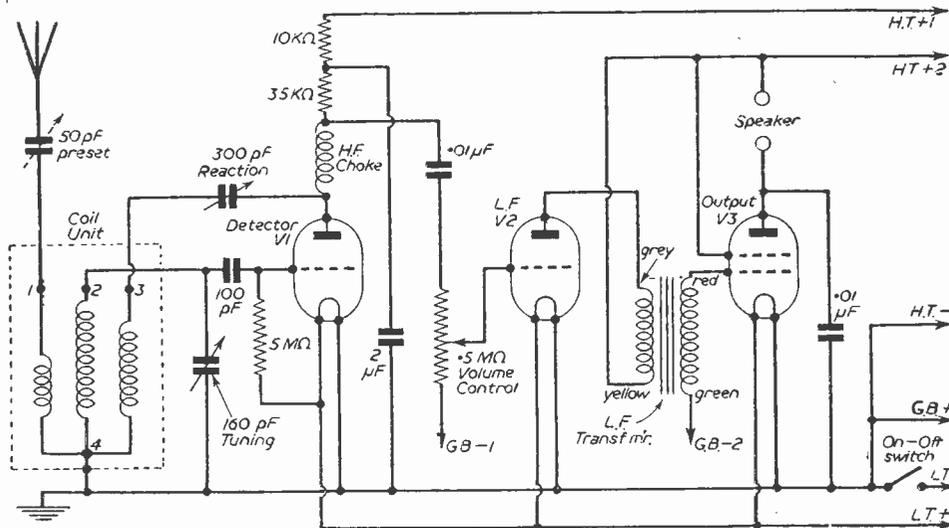


Fig. 1.—Theoretical circuit of the receiver.

sound construction help to assure maximum efficiency and reliability.

Chassis and Panel

The positions of the valveholders and other parts are clearly shown in the diagram. For the valveholders, holes approximately $\frac{1}{16}$ in. in diameter are necessary, while the coil-holder requires a $\frac{3}{16}$ in. diameter hole. These parts, and the stand-off insulator used for aerial connection, are held in position by 6 B.A. bolts. These should not be tightened with undue force, or the insulating material may be fractured. The large holes may most easily be made with one of the special cutters intended for this purpose.

The sockets for speaker connections pass through clearance holes roughly $\frac{3}{8}$ in. in diameter. Three holes of this size are also required in the panel, and two smaller holes, to secure the reduction drive. It is preferable that all drilling be done before any components are mounted. Erratic operation may arise from fragments of metal dropping between the condenser plates, or elsewhere.

If the receiver is not to be mounted in a cabinet, it is recommended that two panel brackets be added. These can, if desired, be made by cutting a 4 in. square of aluminium diagonally, bending over flanges, and drilling these. Each bracket should be secured by four bolts, two passing through the panel, and two through the chassis.

Approximately $\frac{1}{16}$ in. required to be cut off the condenser spindle, with the tuning dial listed. If this is not done, the dial will project excessively. It is also necessary for the condenser to be spaced back from the panel, so that the fixing bush does not foul the dial. This may be done by adding several washers, or a nut, behind the panel. The dial should be set to read 180 deg. with the tuning condenser fully closed.

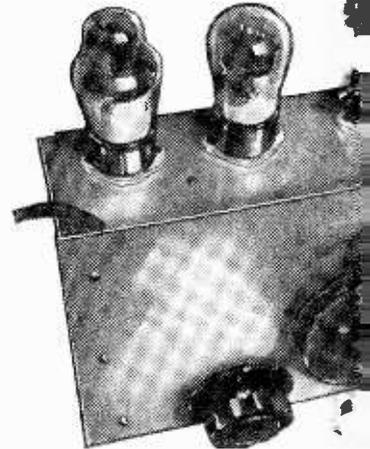
The reaction condenser should be carefully

positioned exactly in line with the panel bush, or operation will be very stiff. If a length of $\frac{1}{16}$ in. diameter metal rod is to hand, this can be used with an insulated shaft coupler. A flexible coupler may be used, with either metal or insulated rod. As the insulated bracket is adjustable, proper alignment is simplified.

Wiring Details

Only two leads pass through the chassis—one from the 50 pF. aerial condenser to socket 1 of the coil-holder, and one from the fixed plates tag of the tuning condenser to socket 2 of the holder. For wiring, 20 s.w.g. tinned-copper wire, with insulated sleeving, is convenient. A number of points are connected to the metal chassis; these are marked "M.C." in the diagrams. For these, it is as well to use soldering tags.

All leads associated with the coil, tuning and reaction condensers, and



Another view of

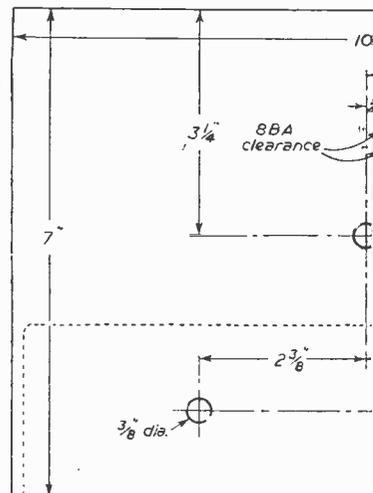
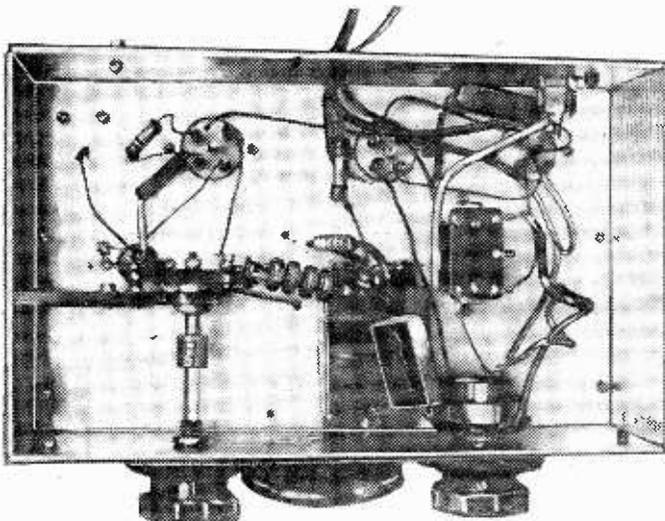


Fig. 4.—Panel



A view of the underside of chassis.

detector valve should be kept short and direct, yet away from the chassis. No difficulty should then arise in reaching the minimum wavelength of the smallest coil.

The coupling transformer shown is specified because of its efficiency, with triode stages, and because its primary can carry a moderately heavy direct current. It has a

centre-tapped secondary. This centre-tap is not used. The remaining leads are colour-coded as indicated.

Lengths of flex are required for battery connections, and these should terminate in identified tags and plugs. These leads may be corded together, and pass through a hole at the rear of the chassis. An earth terminal is also secured directly to the rear runner.

Beginners who have not previously built a receiver should note one or two further points. The coil-holder has one large socket, so that coils may only be inserted in one position. This large socket should be positioned as illustrated, and wired to the chassis. The valvholders must also be placed so that the sockets come as shown, and a ample clearance should exist between the sockets of both coil and valve-

holders by the receiver will depend to some extent upon individual wiring and stray capacitances, but the influence of these factors would be comparatively slight. Accordingly, it is possible to give a list of logging points for each coil. The constructor should not expect these to be *exactly* correct for any particular receiver. Nevertheless, in the majority of cases they will be sufficiently accurate to prove a real guide to tuning. The various bands can then be located with ease, and individual readings noted.

The dial readings for various wavelengths are as follows :

Red Spot Coil

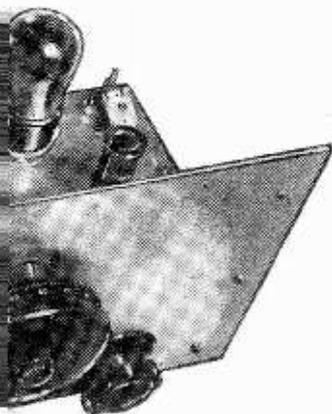
100 metres	...	...	...	...	180 degrees
90 "	...	...	...	...	148 "
80 "	...	...	...	...	114 "
70 "	...	...	...	...	85 "
60 "	...	...	...	...	60 "
55 "	...	...	...	...	50 "
50 "	...	...	...	...	38 "
45 "	...	...	...	...	24 "
40 "	...	...	...	...	14 "

Yellow Spot Coil

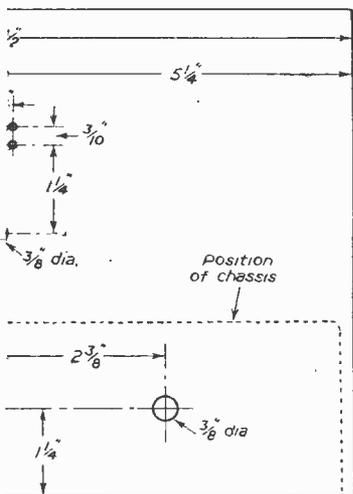
40 metres	...	...	...	...	163 degrees
35 "	...	...	...	...	130 "
30 "	...	...	...	...	98 "
25 "	...	...	...	...	55 "
22.5 "	...	...	...	...	40 "
20 "	...	...	...	...	32 "
17.5 "	...	...	...	...	18 "

Blue Spot Coil

17.5 metres	...	...	...	...	162 degrees
15 "	...	...	...	...	124 "
12.5 "	...	...	...	...	71 "
10 "	...	...	...	...	24 "



the receiver.

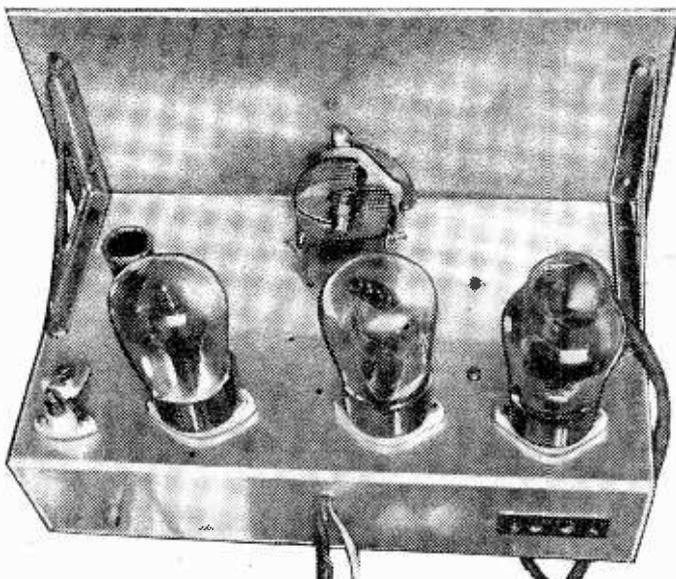


drilling data.

holders and chassis. Finally, all connections should be carefully checked before connecting the batteries. A wrong connection could render the set inoperative, or cause actual damage to valves or other parts.

Operation

The exact wavelengths covered



Rear view of the completed receiver.

When tuning, the operator should note a few wave-lengths of stations actually received. With the Amateur bands, it must be noted that the wave-lengths are not exactly those expected. For example, the so-called 40-metre band is centred round an actual wavelength of 42 metres. However, many stations announce their wavelengths, in English, quite frequently, with transmitting schedules.

Receiver Adjustments

A wide range of valves may be used, with satisfactory results, and ex-Service valves in good condition may be employed. The valves used in detector and L.F. positions may be either clear or metallised. It is also possible to use a triode, preferably of small-power type, in the output stage. Amplification will be slightly reduced, but good loudspeaker reception may still be expected. Detector, L.F. and output valves will be found listed by all manufacturers, and no difficulty should arise in obtaining suitable valves. If it is desired to try a triode in the output stage, no connections require to be altered.

Grid bias should be adjusted to the highest voltages which can be employed without distortion or loss of volume. Values of 1.5 to 4.5 volts for G.B.1, and 4.5, to 7.5 volts for G.B.2, according to type of valves and H.T. voltage, are usual.

A 90 or 120 volt H.T. battery can be used. With the latter, the H.T.1 plug should be inserted in a socket providing roughly 90 volts, or reaction will be excessively fierce. The voltage applied to H.T.1 may subsequently be adjusted to obtain smooth reaction with the detector valve employed.

For low-tension, a 2-volt accumulator should be used. More than 2 volts must not be applied to the valve filaments.

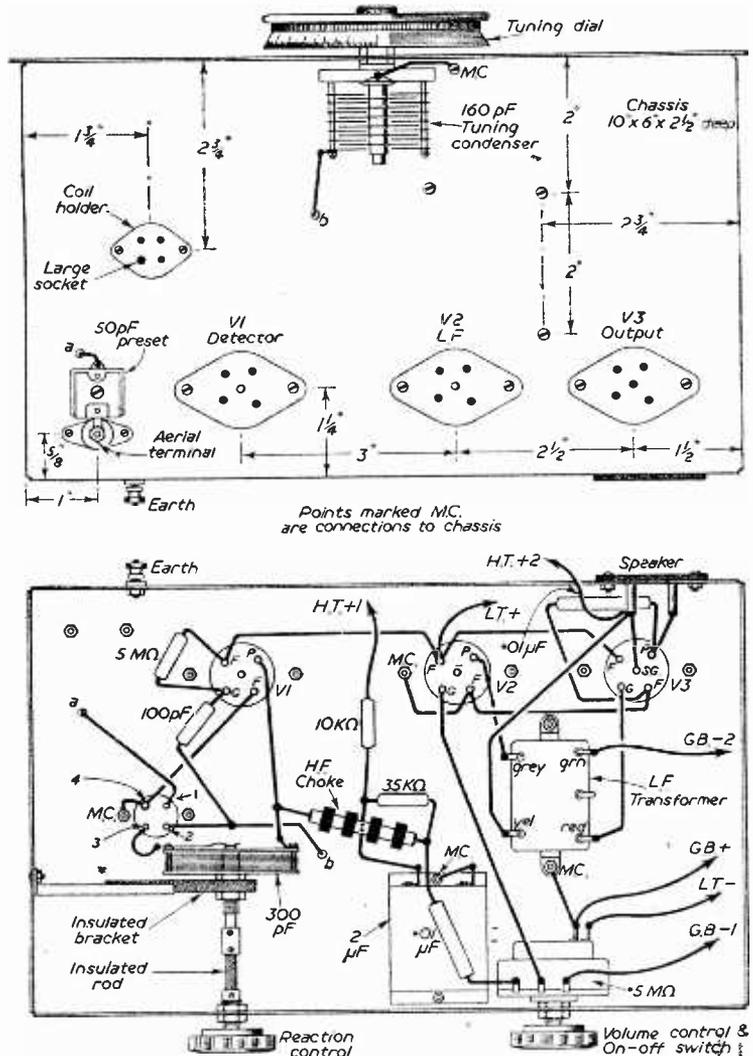
For loudspeaker reproduction, almost any permanent-magnet moving-coil speaker is suitable. Miniature speakers are not recommended, one with a cone about 5in. to 7in. in diameter being usual. The speaker must have a matching transformer, and this should be for output triode or pentode, according to the type of output valve used. If the speaker has a multi-ratio transformer, the ratio giving best results should be selected, or the optimum load of the output valve looked up, and

the tags giving this load employed. Transformers suitable for mains-operated pentodes have insufficient impedance for best results, with a battery-operated pentode or tetrode. They may, however, be used with a battery-operated power triode. The loud-speaker must be enclosed in a cabinet, or secured to a baffle-board, for proper results.

Tuning Points

Many of the more powerful stations will readily be picked up, but additional care in tuning and the use of reaction becomes essential, for really long-distance reception. The reaction condenser should be closed to a sufficient extent to keep the detector in its most sensitive condition. This will be shown by a faint hissing in the speaker, and by the receiver

(Continued on page 469)



Figs. 2 and 3.—Above and below chassis wiring information.

ALPHA RADIO SUPPLY CO.

Headphones. High Res. 4,000 Ω 10/6 pair. Wearite "P" Coils, 3/- ea. 2-Gang Condensers, .0005 mfd., 5/6. 4-Pin Vibrators, 6 and 12 v., 6/6 ea. Condenser Clips, all sizes, 3d. ea. Grommets. Mixed, 6d. doz. 25 mfd. 25 v. Condensers, 1/3 ea. T.C.C. 1 mfd. 500 v., 5/- doz. Mains Suppressor, 2/6 ea. 16 x 16 mfd. 450 v., 4/9 ea. 16 x 16 mfd. 350 v., 2/9 ea. Spindle Couplers, 6jd. ea. Crocodile Clips, 2jd. ea. Co-Axial Plug and Socket, 8jd. ea. Screened Grid Caps, 3d. ea. Jack Plugs, 1/3 ea. 2 Ratio Output Transformer, 1/11 ea. 4-way 30 amp. Rotary Switch, 3/6 ea. Mic and Tel Jack Sockets, 2d. ea. I.F. Transformers 465 kc/s., 6/6 pair. Tag Board, 2 tag and earth, 2jd. ea.

VALVES
Guaranteed New and Boxed. Majority in Makers' Cartons.

1H5G	10/-	6C5	7/6	6SQ7	9/-
OZ4	7/-	6C6	7/3	6SS7	8/-
1A5GT	7/6	6C9	8/-	6ST7	8/-
1C5GT	9/-	6D3	7/6	6U5	8/6
1G6GT	6/9	6D6	7/3	6V6G	8/-
1L4	7/6	6F6G	7/6	6V6GT	8/-
1LD5	6/9	6F6M	8/6	6V6M	9/-
1R5	8/-	6F8G	6/-	6X5GT	7/6
1S4	8/-	6G6G	7/6	7H7	8/6
1S5	8/-	6H8	4/6	7C5	8/6
1T4	8/-	6J5G	5/6	7C6	8/6
1U5	10/-	6J5GT	5/6	7H7	8/6
2155G	4/-	6J5M	6/-	7R7	8/6
2X2	5/3	6J7G	6/6	7S7	8/6
3A4	9/-	6J7M	7/6	7X4	8/6
3Q4	9/-	6K7G	8/-	80	8/9
3S4	9/6	6K7GT	6/6	807	8/9
3V4	9/-	6K8G	9/6	8D2	2/9
4D1	9/-	6K8GT	9/6	954	2/-
4E	9/-	6L6	9/-	955	4/9
5U4G	8/6	6L6G	10/6	956	3/6
5Y3GT	8/-	6L7M	7/6	9D2	3/-
5Z3	8/6	6N7	7/9	9001	6/3
5Z4G	8/6	6P28	10/-	9002	6/3
6A8G	10/6	6Q7G	9/-	9003	6/3
6A7	10/6	6Q7GT	9/6	9004	6/3
6AG5	8/-	6SA7GT	9/-	10C1	11/-
6AK5	9/-	6SG7	8/9	10F9	11/-
6AL5	8/-	6SH7	6/-	10LD11	11/-
6AM6	9/-	6SJ7GT	9/6	12A5	9/6
6AT6	10/-	6SK7	6/9	12A17	9/6
6B4	7/6	6SL7	8/6	12H6	5/-
6B8	7/-	6SN7GT	10/-	12J5	6/-
6C4	8/-				

SLEEVING (INSULATED)
Bright colours. Regret it has to be our choice at these special prices. 1 mm., 1/- per doz. yds.; 2 mm., 2/- per doz. yds.; 2 1/2 mm., high voltage type, black only, 2jd. yd.

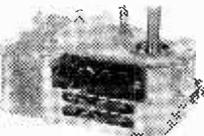
KNOBBS
Engraved Knobs, 1 1/2 in. dia. for 1/2 in. spindles. Available Cream or Brown, as follows: "Focus," "Contrast," "Brilliance," "Brightness," "Brilliance On/Off," "Wavechange," "On/Off," "Tuning," "Volume," "SML Gram," "Tone," "Vol. On/Off," "Radio-gram," "Bass," "Trebble," "Record-Play." Also Plain Knobs to match, 1/6 ea.

BATTERY CHARGERS
Type BC1, 200/250 v. A.C., charge 6 v. 1 amp. All enclosed, just 2 leads for input and two leads for output, complete with bulldog clips, 35/- each.

WIRE WOUND VOL. CONTROLS
5 Z, 200 Ω , 1000 Ω , 2000 Ω , 10K Ω , 15K Ω , 20K Ω , 25K Ω , 50K Ω , all 2/- each.

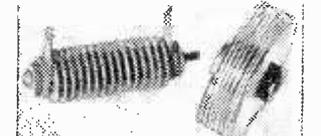
SATCHWELL THERMOSTATS
Complete with two heaters 230 v. 230 v., 37/6 each.

COLLARO AC37 Motor.
Variable Speed 0-100 r.p.m. 100/125 v. 200/230 v. 3in. spindle. 32/6 ea. Post 1/6.



LOUDSPEAKERS
Plessey 3in. Round Type for Personnel Portables, 3 ohm ... 12/9
Eiac 3in. Square Type 3/09, 3 ohm ... 13/6
Eiac 5in. Round Type ... 12/3
Electrona 5in., Latest Type ... 12/3
Goodman's 5in. Round Type, 2 to 3 ohm ... 13/6
Goodman's 6in. Lightweight, 2 to 3 ohm ... 13/6
Truvox 6in. Wafer, 1 1/2 in. deep ... 20/-
Plessey, 8in. Lightweight, 2 to 3 ohm ... 15/-
Eiac 8in. Type 8/37, 2 to 3 ohm ... 15/9
Electrona 8in. ... 14/-
Rola 8in. ... 16/6
Plessey 10in. Lightweight, 2 to 3 ohm ... 19/6
Rola 10in. 2 to 3 ohm ... 28/6
Electrona 10in. ... 16/6
Truvox 12in. BX11 Lightweight, 2 to 3 ohm ... 57/6
Truvox 12in. Heavy Duty Model. 15 ohm Speech Coil. Model S59 £5.15s.

METAL RECTIFIERS
12 v. 1/2 a., 1/6 each; 2 to 6 v. 1 a., 3/- each; 12 v. 1 a., 4/9 each; 12 v. 5 a., 18/6; 250 v. 45 ma., 6/9 each; 250 v. 75 ma., 9/6. 300 v. 60 ma., 7/6; 12 v. 2 a., 10/6.



S.T.C. RMI, 4/-; RM2, 4/6; RM3, 5/9; RM4, 16/-.

EX-GOVERNMENT VOLUME CONTROLS
500 Ω , 600 Ω , 10K Ω , 5K Ω , 100K Ω , 50K Ω , 2 MEG Ω , 1/2 MEG Ω , 1/3 MEG Ω . Double 1500 Ω one spindle. Double 25K Ω one spindle. Double 50K Ω one spindle. All 1/- each.

LINE CORD, 3-way, .3 amp., 1/6 yd.
MICRO SWITCH, 2/- each.

ALADDIN COIL FORMERS
1in. and 1 1/2 in. complete with iron dust cores. 9d. ea.

V.C.R. 139A TUBE
Complete with base and screen, 19/6 ea. Post and packing 1/6.

CABINETS
Size 10" x 7" x 5" approx. Cream or Brown. Complete with chassis and back, 15/6 ea. Post 1/6.

PANELS
We have a quantity of condenser and resistor panels, removed from new ex Government equipment. All contain a good selection of resistors and condensers, 6 types available, 1/3 ea., or 6 for 6/6.

FOUR TV VOLUME CONTROLS
Sizes 50K carbon 5.P.S., 750 Ω wire wound. 25 K carbon, 5 k Ω wire wound. Mounted on a bracket with flexible lead, with 1 4.7 k Ω resistor and 1 5 watt wire wound fixed resistor. Complete, 8/- ea.

VALVES

12K7	9/-	EY51	12/-	EK92	8/-
12K8	9/-	FW4500	9/-	SP41	3/6
12SG7	5/6	KTW61	8/9	SP41	3/6
12SHT	5/6	KTZ41	6/9	P61	3/9
12SK7	7/6	KTZ63	6/6	EF50	6/-
12SR7	6/6	MH4	5/6	EF50 Syl	8/-
12SQ7	9/-	MS/PEN	9/-	VR98A	13/-
12Q7	9/-	OM9	9/-	VR98A	13/-
12Y4	7/6	Pen25	8/-	BL63	7/6
EZ40	9/6	Pen46	8/6	VR116	4/6
EZ41	9/6	Pen220A	4/9	EF8	6/6
15D2	4/-	PEN383	10/-	VR136	7/-
20D1	10/6	PENDD2530		VR137	5/-
25AG6	9/-			VR150/30	
25L6GT	8/6	PL82	11/6	EL32	8/-
25ZAG	9/-	PY80	11/6	KT44	7/6
35L6GT	9/6	QF22	3/6	VT105	4/-
35Z3	9/6	R12	12/-	Pen46	8/6
35Z4GT	9/-	SP4B	9/-	VP23	8/-
50L6GT	8/6	U22	9/-	VP133	8/6
AC6Pen	5/6	UB41	9/-	VU39	8/6
DD13	4/6	UBC41	11/6	VU111	3/6
DDL4	4/-	UCH42	11/6	VU120A	3/6
DH7M3	9/-	UP41	12/-	VU133	3/6
DL7M	9/6	U9	9/-	W77	8/6
EB41	10/-	UY41	10/-	W81	10/-
EB41	11/-	UY21	6/6	X18	9/-
ECH42	10/6	VR35	3/6	X24	7/-
ECL80	11/6	EF39	7/6	X68	13/-
EF36	7/-	EB34	3/6	X71M	10/6
EF41	10/-	EF30	7/6	X73M	10/6
EF80	11/6	EPC33	7/3	X73M	10/6
EM31	9/-	EF36	7/-	Y63	9/-

INDICATOR UNIT TYPE 6L
Contains 1 VCR97 tube, 4 EF50, 3 VR54, 10 wire wound controls, and all condensers and resistors. In perfect condition, 72/6, carriage 7/6.

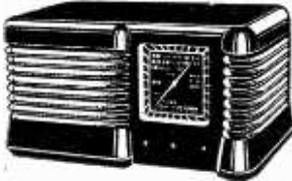
CONDENSERS
Dubitler BR 850, 8 mfd. 500 v., 2/9 ea.; Dubitler BR 1650, 16 mfd. 500 v., 3/6 ea.; Dubitler BR 501A, 50 mfd. 12 v., 1/9 ea.; Dubitler BR 505, 50 mfd. 50 v., 2/3 ea. Metal Tubular, with wire ends. 1 mfd. 350 v., Sprague, 9d. ea.; .001 mfd. 1,000 v., Sprague, 9d. ea.; .001 mfd. 1,000 v., Sprague, 4jd. ea.; .02 mfd. 750 v., Sprague, 9d. ea.; .05 mfd. 350 v. T.C.C., 9d. ea.; .5 mfd. 350 v. T.C.C., 6d. ea.; .01 mfd. 750 v. T.C.C., 9d. ea.; .05 mfd. 500 v. T.C.C. Metallimite, 1/- ea.

1 1/2 METRE SUPERHET. 10 valve 1 1/2 metre Superhet. Ideal for TV conversion. I.F. 12 MEGS Band width 4 MEGS. Co-axial input and output. Mazda valves with 6.3 v. Filaments, 65/- each. Carriage, 5/6.

BUILDING A SCOPE. An ideal Breakdown Chassis. Includes: VCR138, 12 valves by Mazda and a host of condensers and resistors, 40/- each, 5/6 carriage.

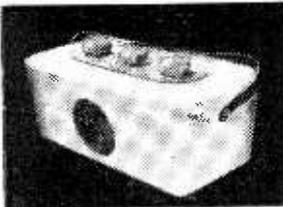
TERMS: Cash with order or C.O.D. **MAIL ORDER ONLY.** Full illustrated List available; send 6d. in stamps. Postage, 6d. to 10/-; 1/- to 20/-; 1/6 to £2; 2/- to £5. Minimum C.O.D. and postage charge 2/3.

5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS, 1



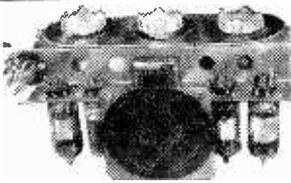
CABINET as illustrated in walnut or cream, complete with T.R.F. chassis, 2 waveband scale, station names, new waveband, back-plate, drum, pointer, spring, drive spindle, 3 knobs and back, 22 6. P. & P. 3/6.
As above but complete with 5in. Speaker and O.P. trans. (These speakers have been used but tested O.K.). P. & P. 3/6. 30/-
As above but complete with 5in. Speaker and O.P. trans. (These speakers have been used but tested O.K.). P. & P. 3/6. 30/-

Gang with trimmers to suit above, 7/6. Medium and long T.R.F. coils to suit, 5/6. Three ex-Govt. valves, 3 v h and circuit, A.C. mains, 3 valve plus rec., T.R.F. (built for approx. £4), 8/6. Heater trans., 6/-. Volume control with switch, 3/6. Wavechange switch, 2/- 32+32 mid. condenser, 4/-. Bias condenser, 1/-. Resistor kit, 2/-. Condenser kit, 4/-. Metal rectifier, 250v. 100 ma., 7/6.



PERSONAL PORTABLE CABINET in cream-coloured plastic, size 7 x 4 1/2 x 4 1/2 in. Complete 4-valve chassis. Scale and 3 knobs. Takes miniature 90v. and 7iv. batteries. 9/-. P. and P. 1/6.

2 1/2 in. P.M. SPEAKER to fit above, 15/6. Miniature output transformer, 5/-. Miniature wave-change switch, 1/6. Miniature 1-pole 4-way used as Volume and Off, 1/6. 4 BTG



View of chassis as it would look when assembled with valves inserted.

valveholders, 2/4. Midget twin gang 1in. dia., 1in. long and pair medium and long-wave T.R.F. coils 2in. long x 1in. wide, complete with 4-valve all-dry mains and battery circuit, 8/6. Condenser Kit, comprising 11 miniature condensers, 3/6. Resistor Kit, comprising 16 miniature resistors, 4/-. The above receiver (less valves and batteries) could be built for approximately 51/-. P. and P. 2/6. Valves to suit above 10/- ca. Point to Point Wiring Diagram, 1/-.

Standard Wave-change Switches, 6-pole 3-way, 2/-; 4-pole 3-way, 1/9; 5-pole 3-way, 1/9. Miniature 3-pole 4-way, 2-pole 5-way, 4-pole 3-way, 2/6.
Valveholders, Paxolin octal, 4d. Moulded octal, 7d. EF50 octal ceramic, 7d. Moulded BTG, 7d. Loctal amphenol, 7d. Loctal ceramic, 4d. Mazda Amph., 7d. Mazda pax., 4d. B8A, B9A amphenol, 7d. BTG with screening can, 1/6.
Trimmers, 5-40 pf., 5d.; 10-110, 10-250, 10-450 pf., 10d.
Twin-gang .0005 Tuning Condensers, 5/-. With trimmers, 7/6.
Midget .00037 dust cover and trimmers, 8/6.

P.M. SPEAKERS

	with trans.	less trans.
2 1/2 in. ...	15 6	13 6
3 1/2 in. ...	18 6	16 6
5 in. ...	18 6	16 6
6 1/2 in. ...	18 6	16 6
8 in. ...	18 6	16 6
10 in. ...	18 6	16 6

Post and packing on each of the above, 1/6 extra.
Crystal pick-up with Sapphire Traiter Needle, with volume control, 23/-. P. and P. 1/-.
Constructor's Parcel, comprising chassis 6in. x 4in. x 1 1/2in., with speaker and valveholder cut-outs, 5in. P.M. speaker with transformer, twin gang with trimmers, pair T.R.F. coils long and medium, iron core, four valveholders, 20 K. volume control and wave-change switch, 23/-. Post and packing, 1/6.
Output Transformers. Standard type 5,000 ohms imp., 2-ohms speech coil, 4/9; Miniature type 42-1, 3/3. Multiratio 3,500, 7,000 and 14,000 2 ohms speech coil, price 5/6. 10-watt push-pull 1/6 matching 2 ohms speech coil, 7/-.
Mains Trans., Pri. 200-250v. Sec. 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., 13/-. P. & P. 1/6.
Germanium crystal diode, 2/3, post paid.

Heater Transformer, Pri. 230-250 v. 6 v. 1! amps., 6/-; 2 v. 2! amp., 5/-. P. & P. each 1/-, 2, 4 or 6 volt 2 amp., 7/6. Kit of Parts for **Signal Generator**, Coverage 110 Kc's-320 Kc's., 320 Kc's-900 Kc's., 900 Kc's-2.7 Mc's., 2.75 Mc's-8.5 Mc's., 8.5 Mc-s 20 Mc's. Metal case 10in. 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 cps. to a depth of 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. & P. 4/-. Circuit diagram and point-to-point, 3/6. This includes the return to us for checking and calibration. We will build for 15/- extra.
Terms of business—Cash with order. Dispatch of goods within three days from receipt of order. Where post and packing charges are not stated, please add 1/- up to 10/-, 1/6 up to £1 and 2/- up to £2. All enquiries and Lists, stamped addressed envelope.

D. COHEN

RADIO AND TELEVISION COMPONENTS
23, HIGH STREET, ACTON, W.3.
(Opposite Granada Cinema)

Hours of Business: Saturdays 9-6 p.m. Wednesdays 9-1 p.m.
Other days 9-4.30 p.m.

B.A. SCREWS, NUTS, WASHERS, ETC.

Prices per gross

	Brass Nuts			Brass Washers
	Full	Lock		
Assd. Screws 2/6	OBA 6/9	6/-	Assd. 1/6, OBA 2/-	
Assd. Nuts 2/6	2BA 5/6	5/-	1BA 2/-, 2BA 1/10,	
Screws and Nuts	4BA 5/-	4/-	3BA 1/9, 4BA 1/8,	
1/2 gr. each 2/6	5BA 4/-	3/9	5BA 1/6, 6BA 1/6,	
Brass Screws	6BA 4/-	3/6	8BA 1/6	
Assorted	7BA 4/6	4/6		
2BA 5/6, 4BA 5/-	8BA 4/6	4/6		
6BA 4/-, 8BA 4/6				

Soldering Tags, Assd. 2/-, 2BA 2/3, 4BA 2/-, 6BA 1/10, 8BA 1/10. Eyelets and Rivets, assd. 1/6. Aluminium Rivets, assd. 1/6. Br. Knurled Terminal Nuts, 6BA 8d., 4BA 1/-, 2BA 1/6 doz. Br. Terminals, w/nuts, heavy type, NP. 6d. each, 5/6 doz. GRUB SCREWS, Assd. 1/6, 6BA 1/3, 4BA 1/4, 2BA 1/6 per 3 doz.

A SELECTION FROM OUR HUGE STOCK OF SCREWS

PRICES PER HALF-GROSS.

ABBREY.: Heads. CH., Cheese. RH., Round. CS., Counter-sunk. NP., Nickel Plated. CP., Cadmium Pl. SC., Self-colour.

6BA		BRASS				STEEL	
1/2"	CH NP	1/6	1/6	RH NP	1/5	1/6	CH NP 1/-
3/8"	" "	1/7	1/7	" "	1/6	1/6	RH SC 1/-
1/2"	" "	1/9	1/9	" "	1/7	1/7	CS CP 1/-
5/8"	" "	1/10	1/10	" "	1/11	1/11	RH SC 1/2
3/4"	" "	1/11	1/11	" "	2/-	2/-	CS CP 1/2
7/8"	" "	2/-	2/-	SC 2/1	1/1	1/1	RH SC 1/2
1"	SC 1/11	1/11	1/11	NP 2/3	1/3	1/3	CS CP 1/4
1 1/8"	NP 2/11	2/11	2/11	CS 2/4	1/4	1/4	CS CP 1/5
1 1/4"	" "	2/3	2/3	NP 1/6	1/6	1/6	RH SC 1/5
1 1/2"	" "	2/6	2/6	" "	1/7	1/7	CS CP 1/7
1 3/4"	Inst/H	1/9	1/9	" "	1/8	1/8	1" CH .. 2/6
2"	NP 1/9	1/9	1/9	" "	1/9	1/9	" " 1/9
2 1/4"	CS ..	2/-	2/-	" "	1/10	1/10	1 1/2" H/H .. 2/9

4BA		BRASS				STEEL	
1/2"	CH NP	2/-	2/-	RH NP	1/10	1/10	CS CP 1/2
3/8"	" "	2/1	2/1	" "	2/3	2/3	" " 1/4
1/2"	" "	2/1	2/1	" "	2/9	2/9	RH .. 1/4
5/8"	" "	2/2	2/2	" "	3/-	3/-	SC 1/2
3/4"	" "	2/6	2/6	CS ..	1/8	1/8	" " 1/4
7/8"	" "	3/3	3/3	" "	1/2	1/2	CS CP 1/6
1"	Hex H	2/6	2/6	" "	2/3	2/3	RH SC 1/4
1 1/8"	" "	3/6	3/6	" "	1/10	1/10	CS CP 1/9

8BA		BRASS				STEEL	
1/2"	CH NP	2/-	2/-	CH SC	2/2	2/2	CH CP 2/-
3/8"	" "	2/6	2/6	RH NP	2/2	2/2	CS .. 2/-
1/2"	" "	1/8	1/8	" "	2/6	2/6	CH .. 2/2
5/8"	CS ..	2/3	2/3	" "	2/9	2/9	RH .. 2/2
3/4"	" "	1/9	1/9	Hex ..	2/9	2/9	CH NP 2/3
7/8"	" "	2/6	2/6	" "	2/10	2/10	RH CP 2/3

ALL ABOVE POSTAGE EXTRA.

G.E.C. & B.T.H. GERMANIUM CRYSTAL DIODES

G.E.C. GLASS TYPE 1/4in. — 1/8in.
B.T.H. LATEST TYPE MOULDED IN PLASTIC
Both Wire Ends for Easy Fixing, 4/6 each, postage 2 1/2d.
B.T.H. SILICON CRYSTAL VALVE
3/6 each, postage 2 1/2d. Fixing Brackets 3d. Extra.
Wiring instructions for a cheap, simple but high quality Crystal Set included with each Diode and Crystal Valve.

Large stocks of Copper and RESISTANCE WIRES: Paxolin type TUBING; Laminated Bakelite and Ebonite PANELS; TUBULAR and EBONITE TUBES and ROD; ERIE and DUBILIER RESISTORS; GERMANIUM and SILICON DIODES.

POST ORDERS ONLY PLEASE.

Send stamp for comprehensive lists. Trade supplied

POST RADIO SUPPLIES
33, BOURNE GARDENS,
LONDON, E.4

(Continued from page 466)

almost oscillating, when being tuned through a station. Slow tuning is essential, despite the high reduction ratio of the drive. Final, careful adjustment of both tuning and reaction will bring any station up to maximum volume.

Volume may be reduced by turning back the volume control. This is particularly necessary if headphones are used, but must not be confused with the reaction control. When the latter is turned towards minimum, sensitivity will be reduced, and weak stations will not be heard.

The aerial should preferably be high, and well away from earthed objects. A length of about 30 to 60ft. is suitable. Excellent results may be obtained with a short indoor aerial, but the greater efficiency of the outdoor aerial will become apparent when listening to weak, distant transmissions. The 50 pF. aerial condenser may be adjusted until satisfactory results are obtained with all coils. If screwed down excessively, reaction will begin to fail as the lower wavelengths are tuned. On the other hand, a setting of very low capacity will reduce volume, especially on the higher wavelengths. The result of adjustments to this condenser may readily be discovered; it is in no way critical.

Stations will be found congregated into "bands," with few transmitters (other than Morse) between. Amateur transmitters will be found in the 10, 20, 40 and 80 metre bands. These are most active over the week-end, with the 40 metre bands generally giving best reception, from Europe, during the afternoon and early evening. At this time many American and more distant stations will be audible on the 20 metre band. Long-distance reception on the 80 metre band is not usual, while the 10 metre band may at times be almost dead, according to conditions.

Commercial stations are best heard on the 13, 17,

19, 25, 31, 41 and 49 metre bands. The lower bands (19 to 31 metres) will give best results, generally, during the afternoon and early evening. Later, many stations will be heard upon the 41 and 49 metre bands, but the lower wavelengths will begin to deteriorate. Short-wave propagation is greatly influenced by daylight and darkness, and this should be allowed for, when searching for distant transmitters. However, even cursory tuning should bring in quite a large number of stations, at most hours of the day or night.

Finally, though a good standard of performance is maintained with no earth lead, it is best to provide an earth, if convenient; so that sensitivity and stability are not unnecessarily sacrificed.

COMPONENT LIST FOR 9-90 METRE S-W-3

- 50 pF pre-set condenser.
- 706/L.B. 706/Y and 706/R plug-in coils. (Eddystone.)
- Type 707 coil-holder. (Eddystone.)
- Type 1007 adjustable insulated bracket. (Eddystone.)
- 160 pF low-loss tuning condenser. (Wavemaster.)
- 300 pF reaction condenser. (Wavemaster.)
- Muirhead 50 : 1 slow-motion drive.
- Two 1½ in. diameter control knobs.
- Insulated extension spindle with bush.
- Three low-loss ceramic valveholders. (S.W.41 : Bulgin.)
- S.W. H.F. choke. (Eddystone.)
- 1 : 4 intervalve transformer.
- .0001 µF and two .01 µF mica condensers. (T.C.C.)
- 2 µF 250 v. working condenser. (T.C.C.)
- 10 K Ω, 35 K Ω and 5 megohm, ½ watt resistors.
- .5 megohm volume control with single-pole switch (Reliance Type SG/1.)
- Chassis, 10in. x 6in. x 2½in. Stand-off insulator.
- Speaker sockets, wire, etc.
- Valves—HL2, HL2 and 220/OT, or similar.

The Top Band

DURING the currency of the Cairo Radio Regulations, the band 1,715-2,000 kc/s has been available (shared with other services) for use by radio amateurs throughout the world. United Kingdom amateurs have been permitted to use the band subject to a power limitation of 10 watts.

The Post Office has given very careful consideration to the question as to how far it will be practicable for U.K. amateurs to continue to use the band without causing harmful interference to the authorised services of other countries.

The Post Office has, therefore, decided to assign to U.K. amateurs a band 200 kc/s wide in this part of the spectrum subject to strict non-interference with other services (United Kingdom and Foreign).

The Post Office points out that, for some time, conditions in the band will be particularly difficult as stations settle down to their new assignments.

Following a meeting between representatives of the Post Office and the R.S.G.B. it was announced that the 200 kc/s band is to fall between 1,800 kc/s and 2,000 kc/s. We are asked to stress the importance of licensed power not being exceeded under any circumstances.

The Post Office has issued a list of assignments which are likely to be particularly vulnerable to

interference. In the list which follows centre frequencies are quoted but all the assignments are for A3 working and normally occupy a bandwidth of 6 kc/s.

Frequencies kc/s	Assignments
1,827	Wick and Folkestone.
1,834	Niton.
1,841	Cullercoats and Land's End.
1,848	North Foreland and Oban.
1,855	Burnham, Stonehaven and Newhaven.
1,869	Humber.
1,883	Portpatrick.
1,911	Land's End, Niton and Scaforth.
1,925	Land's End, Niton and Scaforth.
1,953	British ships.
1,960	French ships.
1,974	Dutch ships.
1,981	British ships.
1,988	Danish ships.
1,995	Dutch ships.

In the interests of all concerned U.K. amateurs would do well to avoid the vulnerable frequencies which are in use by the marine services in their own particular locality.

Design Considerations for Oscilloscopes

THE EXPERIMENTER WILL FIND THIS ARTICLE OF ASSISTANCE IN DESIGNING HIS OWN TEST SET

By E. G. Bulley

MANY designs of oscilloscopes have in the past appeared in this journal and they have been ably described so that the reader can construct them with very little difficulty.

For the newcomer to radio these are ideal, as one can learn a great deal by constructing such apparatus. Nevertheless, the time arrives when the constructor likes to experiment with his own designs, and this article is written to assist such constructors in designing their own oscilloscopes.

The first consideration in the design of an oscilloscope is that of the power supplies, bearing in mind that such apparatus requires fairly high voltages and exceptionally good filtering. Selection of transformers is important, because one must not forget that the cathode-ray tube is a device which is sensitive to either electrostatic or magnetic fields. Such fields can originate from transformers, and care must therefore be taken to ensure that such components are suitably screened and positioned so as to prevent any interference with the electron beam.

Transformer Position

The location of the high-voltage transformer (assuming a separate one is used for the low-power supplies) is important, because not only does it affect the deflection of the beam, but the actual balance of the instrument. This balance will be appreciated more if one plans to design a portable instrument and does not want it to be top-heavy. However, it is good practice to locate the power supplies at the rear of the tube, so that the other units of the oscilloscope can be located under or alongside the tube. The positioning of these units should be such as to balance the weight of the power supplies.

Another safeguard against stray fields is to screen the tube itself. Suitable screens or shields can be obtained quite reasonably on the surplus market.

Insulation

Insulation of power supplies is also an important factor, and consideration must therefore be given to the insulation of the high-voltage transformer, as well as the operating frequency at which the oscilloscope will be required to work.

It is advisable to endeavour to use a transformer with a high turns-per-volt ratio and that the windings are made upon a laminated stack. Reduction of transformer ratings in order to get a transformer of smaller physical size is not good practice; in fact, it is false economy, because the insulation usually suffers. Furthermore, it is advisable when selecting a transformer to endeavour to obtain one with the primary winding screened with an electrostatic shield. The shield is always at earth potential and the purpose of this earthed shield is to eliminate the possibility of capacitive coupling to the high voltage windings on the secondary.

Capacitive coupling causes pattern distortion, which

can also be due to the heater winding for the C.R.T. not being suitably screened.

Power Supply

Generally speaking, it is good practice to use a separate power supply for the tube and another one for the amplifier and timebase, etc.

The output from the low-voltage power supply must be filtered to the best of one's ability. It is, of course, advisable to stabilise the output, bearing in mind that good smoothing and regulation will prevent unwanted signals to be introduced into the amplifier, which in turn would be passed on to the tube. There are, however, many types of voltage stabilisers on the surplus market which can be purchased at quite a small cost.

Oscilloscope amplifiers are perhaps treated too lightly, but here again it is advisable to pay special attention to the design. The amplifier that is most suitable is one that is sensitive to the signal applied to it. That is to say, no matter how minute the signal may be, the amplifier is such that it is sensitive enough to amplify it and reproduce the effect on the tube. Furthermore, stability is essential bearing in mind that any inherent noise, such as microphony, hum, etc., must at all costs be avoided. One may, of course, have to sacrifice some of the amplifier's gain to obtain this. Failure to do this will, however, cause pattern distortion.

Linearity

The linear timebase is best described as the unit that is to generate the sweep voltage. This is accomplished by means of a suitable oscillator or trigger circuit in which a thyratron or a suitable hard valve is incorporated. The hard valve timebase was originated by O. S. Puckle, and is to-day very popular. Nevertheless, one need have no fears on the timebase question, because whatever suitable valve one decides to use, a circuit can always be obtained from the valve manufacturer.

Alternatively, a great many timebase circuits have been developed and one can, therefore, select a suitable one. These are to be found in most of the well-known radio textbooks.

It is important when deciding upon the actual timebase to bear in mind that an ideal timebase must have the sweep as near linear as possible, not forgetting that the ratio of the actual sweep to the return time must be very short. Naturally, one must give attention to the frequency range as well as the synchronising of the frequency of the timebase to that of the unknown signal.

In conclusion, however, the tube, being the heart of the instrument, must also be given consideration. There are many types available from surplus and should, wherever possible, be selected. The operating voltages are a major point, because the lower the operating potentials required by the tube the smaller and cheaper will be the high voltage transformer.

RADIO SUPPLY CO.

(LEEDS) LTD.

32, THE CALLS, LEEDS, 2

Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. FULL PRICE LIST, 5d. TRADE LIST, 5d. Please enclose S.A.E. with all enquiries.

Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/1 extra under £1. 1/9 extra under £3.

SPECIAL OFFERS. Midget Mains Transformers (size approx. 2 1/2 x 3 x 2 1/2 in.). Screened Primary 220-250 v. 50 c/s. Output 250-0-250 v 60 mA. 6.3 v 2.5 a. Only 11/9. 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.

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 or 80 v at up to 40 ma. and fully smoothed l.t. of 2 v at up to 1 a. Price complete with circuit, point to point wiring diagrams and instructions, only 48/9. Or ready to use, 7/9 extra.

PERSONAL SET BATTERY SUPER-SENDER KIT. A complete set of parts for construction of a Unit (housed in Metal Case) to replace Batteries where A.C. Mains supply is available. Input 200-250 v 50 c/s. Outputs 90 v 10 mA and 1.4 v 250 ma, fully smoothed. For 4-valve receivers. Price complete with circuit. Only 31/6. Or ready for use, 7/9 extra

H.T. ELIMINATOR AND TRICKLE CHARGER KIT. Input 200-250 v A.C. Output 120 v 40 ma, fully smoothed, and rectified supply to charge 2 v acc. Price with steel case and circuit, 29/6. Or ready for use, 7/9 extra.

BATTERY CHARGER KIT'S For Mains 200-250 v 50 c/s. To charge 6 v acc. at 2 a. 25/6. To charge 6 or 12 v acc. at 2 a. 29/6. To charge 6 or 12 v acc. at 4a. 49/9. Above consist of transformer, full wave rectifier, fuse, fuseholder and steel case. The kits can be supplied fully assembled at an extra cost of 6/9 each.

EX-GOVT. VALVES (NEW)

Each	Each	Each	Each
1T4 8/11	6SN7GT 11/9	1625 5/3	
1S5 9/6	6S7GT 8/9	3S24GT 10/6	
1R5 6/11	6V6GT 9/11	6X5L6GT 9/11	
3S4 9/9	6V6GT 10/6	D 11	
5Y3G 9/6	6X5GT 8/9	EF36 6/11	
5U4G 10/6	7V7 6/9	EF39 7/6	
5Z4G 9/6	7C5 6/11	EB91 9/9	
6AL5 9/9	6Y2 7/11	EF91 11/9	
6FG 8/11	9D2 2/11	EL32 7/9	
6AM6 11/9	9S4 1/11	KT66 11/6	
6J5G 5/11	12H6 2/3	MU4 9/6	
6J6 6/6	12K7GT 10/6	MS/Pen 5/9	
6J7G 7/6	12K8GT 10/6	RK34 1/11	
6K7G 6/11	12Q7GT 10/6	SP4 5/9	
6K8G 11/9	12S7J 7/11	SP61 2/11	
6L6G 11/9	12SR7 7/9	U50 9/6	
6Q7G 9/11	15D2 5/9	VU120 2/11	

CATHODE RAY TUBES.

VCR517, 29/6 (Full Picture), plus Carr. 5 - VCR139A, 19/6, plus Carr. 5/-.

EX-GOVT. ITEMS. Pye coaxial plugs and sockets, 7/8 doz. DRS. Boiling-Less moulded type 5-pin and 7-pin plugs and sockets, 1/11 pr. Int. Octal Valve Screening Cans, 3 piece, 13 each, 11/9 doz. Bak. Tubulars, .02 mid 5,000 v, 1.9. Meters M/C. 2in., scale 0.5 amps, 12/6.

ELECTROLYTICS (Current production. Not ex-Govt.)

Tubular Types	Can Types
84F 350 v 1/9	84F 450 v 2/3
84F 450 v 1/11	84F 500 v 2/9
84F 500 v 2/11	84F 450 v 2/11
164F 350 v 2/3	244F 350 v 2/11
164F 450 v 2/9	324F 350 v 2/11
164F 500 v 3/11	404F 450 v 2/11
244F 350 v 3/6	8-84F 350 v 3/9
324F 350 v 3/6	8-84F 450 v 3/11
324F 500 v 5/9	8-164F 450 v 4/6
8-164F 500 v 4/11	16-164F 450 v 4/11
254F 25 v 1/3	16-324F 350 v 5/3
504F 12 v 1/3	32-324F 350 v 4/11
504F 50 v 2/3	32-324F 450 v 5/11

WILLIAMSON AMPLIFIER KIT. All parts to Author's Spec. Only 14/9s.

A PUSH-PULL 3-4 watt HIGH-GAIN AMPLIFIER FOR £312 6. For Mains input 200-250 v 50 c/s. Complete kit of parts including circuit diagram and instructions. (Point-to-point wiring diagrams available for 1/6 extra. Amplifier can be used with any type of Feeder Unit or Pick-up. This is not A.C./D.C. with "live" chassis but A.C. only with 400-0-400 v trans. Output is for 3 ohm speaker. (We can supply a very suitable 10in. unit by R.A. at 31/-) The amplifier can be supplied ready for use for £1 extra. Full descriptive leaflet 1/-.

MASTER INTERCOM. UNIT with provision for up to 4 "Listen-Talk Back Units." A high gain amplifier enables speech and other sounds emanating from the rooms containing remote control units to be heard at the master control. The unit is in kit form and point-to-point wiring diagrams are included. A Walnut veneered cabinet is supplied. Mains input is 200-250 v 50 c/s to 300-0-300 v trans. Sound amplification 4 watts. Price only £5/19/6. "Listen-Talk Back Units" can be supplied at 21/- each. Full descriptive leaflet, 1/-.

EX-GOVT. SMOOTHING CHOKES.

250 mA 40 H 200 ohms, trop	17/8
250 mA 10 H 50 ohms, potted	17/6
200 mA 20 H 200 ohms, trop	15/6
200 mA 20 H 200 ohms, trop	15/6
150 mA 10 H 200 ohms, potted	10/9
100 mA 8-10 H 150 ohms, potted	8/9
100 mA 7-10 H 100 ohms	6/11
100 mA 5 H 100 ohms	4/9
100 mA 5 H 100 ohms, trop	3/11
60 mA 10 H 150 ohms	3/11
50 mA 50 H 1,000 ohms	3/11

EX-GOVT. BLACK PAPER MANS-BRIDGE TYPE CONDENSERS

4/F 500 v T.C.C.	2/6
4/F 600 v T.C.C.	2/11
4/F 750 v T.C.C.	3/3
4/F 1,000 v T.C.C.	3/11
6/F 1,500 v	4/11
8/F 500 v	5/9
10/F 500 v	4/11

R.S.C. MAINS TRANSFORMERS (FULLY INTERLEAVED AND IMPREGATED. PRIMARIES 200-230-250 v 50 c/s SCREENED.)

TOP SHROUDED DROPT THROUGH

250-0-250 v 70 mA, 6.3 v 2.5 a	12/11
360-0-360 v 70 mA, 6.3 v 2 a, 5 v 2a	14/11
350-0-350 v 80 mA, 6.3 v 2 a, 5 v 2a	17/9
350-0-350 v 80 mA, 6.3 v 2 a, 4 v 2.5 a, 16/9	
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 150 mA, 6.3 v 4 a, 5 v 3 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 21-3-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, 0-4-6.3 v 4 a, 0-4-5 v 3 a	25/9
205-0-250 v 100 mA, 6.3 v 6 a, 5 v 3 a, for R1355 conversion	29/9
300-0-300 v 100 mA, 0-4-6.3 v 4 a, 0-4-5 v 3 a	25/9
350-0-350 v 100 mA, 0-4-6.3 v 4 a, 0-4-5 v 3 a	25/9
350-0-350 v 150 mA, 6.3 v 1 a, 5 v 3 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, 0-2-6 v 2 a, 4 v 3 a for Electronic Eng. Television	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/-
450-0-450 v 250 mA, 6.3 v 6 a, 6.3 v 6 a, 5 v 6 a	65/6

ELIMINATOR TRANSFORMERS

Primaries 200-250 v 50 c/s, 120 v 40 mA	7/11
120 v 40 mA, 6-0-6 v 1 amp	14/9
90 v 10 mA, 9-0-9 v 250 mA	10/6

EX-GOVT. ITEMS (EX EQUIP.). Valves: EB34 (6H6), 1/6; SF61, 2/3; EF50, 4/9. Mains. Trans. 230 v Input, Outputs 350-0-350 v 180 mA, 6.3 v 6 a, 5 v 3 a, 27/6. Motor Generators, 6 v Input, Output 180 v D.C., 5/9.

COAXIAL CABLE, 75 ohms, 1in., 10d. yard.
DIAL BULBS, M.E.S.: 6.5 v 0.15 a 8 v 0.15 a 8/9 dozen.

SELENIUM RECTIFIERS, 230 v 50 mA, H.W. (small), 6/9. 120 v 40 mA, H.W. (small), 3/11. 2.6 v 1 a H.W., 2/11. 2.6 v 1 a H.W., 3/11. 6.12 v 1 a H.W., 4/6. 6/12 v 2 a F.W. (bridge), 10/9. 6/12 v 4 a F.W. (bridge), 18/9. 6/12 v 6 a F.W. (bridge), 22/9.

CHASSIS, 16 s.w.g. Un drilled Aluminium. Receiver Type 6 x 3 1/2 x 1 1/2. 2/6; 7 1/2 x 4 1/2 in. 3/3; 10 x 5 1/2 x 1 1/2 in. 3/6; 11 x 6 x 2 1/2 in. 4/3; 12 x 8 x 2 1/2 in. 5/3; 16 x 8 x 2 1/2 in. 7/6; 20 x 8 x 2 1/2 in. 8/11; Amplifier Type (4 sided), 12 x 8 x 2 1/2 in. 7/11; 16 x 8 x 2 1/2 in. 10/11; 14 x 10 x 3 1/2 in. 13/6; 20 x 8 x 2 1/2 in. 13/6.

SILVER MICA CONDENSERS, 5, 10, 15, 20, 25, 30, 35, 40, 50, 100, 120, 150, 200, 230, 300, 330, 400, 470, 500, 1,000 (.001 mfd), 2,000 pfd. (.002 mfd), 5d. each. 3/9 doz. one type.

VOLUME CONTROLS with long (in.) spindles, all values less switch, 2/9, with S.P. switch, 3/11.

WIRE WOUND POTS: 20 ohms, 5K, 20K, 25K, 50K (medium length spindles) 1/11.

P.M. SPEAKERS. All 2-3 ohms. 5in. Goodmans 14/9, 6in. Elac 14/11, 6in. Plessey with 5,000 ohm trans. 14/11, 6in. Goodmans 18/9, 8in. Plessey 15/9, 8in. R.A. Heavy Duty 18/9, 10in. Rola 29/6, 10in. Plessey 18/6.

M.F. SPEAKERS. All 2-3 ohms. 6in. Rola field 700 ohms, 11/9. 8in. R.A. field 800 ohms, 12/9. 10in. R.A. field 1,000 ohms, 23/9. 10in. R.A. field 1,500 ohms, 23/9.

EX-GOVT. TRANSMITTER RECEIVERS, Type TR39. Complete with all valves. Only 50/- plus 5/- Carr.

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

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, 9/11; 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.

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; 0-4-9-15-24 v 3 a, 22/9.

SMOOTHING CHOKES 250 mA 8-10 H 200 ohms, Potted ... 16/9
250 mA 3-5 H 100 ohms ... 10/11
200 mA 3 H 80 ohms ... 5/9
150 mA 7-10 H 100 ohms ... 10/11
100 mA 8 H 100 ohms ... 10/9
80 mA 10 H 350 ohms ... 5/6
60 mA 10 H 400 ohms ... 4/11

E.H.T. TRANSFORMERS 2,500 v 5 mA, 2-0-2 v 1.1 a, 2-0-2 v 1.1 a, for VCR97, VCR517, etc. ... 35/-

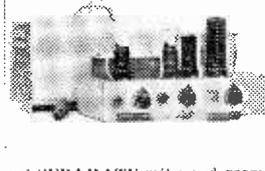
OUTPUT TRANSFORMERS Midget Battery Pentode 66 : 1 for 3S4, etc. ... 3/9
Small Pentode, 5,000Ω to 3Ω ... 3/9
Small Pentode, 8,000Ω to 3Ω ... 3/9
Standard Pentode, 5,000Ω to 3Ω ... 3/9
Standard Pentode, 8,000Ω to 3Ω ... 4/9
Multi-ratio 40 mA, 30 : 1, 4.5 : 1, 60 : 1, 90 : 1, Class B Push-Pull ... 5/6
Push-Pull 10-12 Watts 6V6 to 3Ω or 15Ω ... 15/9
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, sectionally wound, 6L6, KT66, etc., to 3-8 or 15Ω 47/9
Williamson type exact to Author's spec. ... 85/-

PRATTS RADIO

1070 Harrow Road, London, N.W.10

Tel.: LADbroke 1734.

(Nr. Scrubs Lane)



AMPLIFIERS.—College General purpose units. **MODEL AC10E** (as illustrated) 10 watt, 4 valve unit. Neg. feedback. **SEPARATE** mike stage and gram inputs. 2 faders and tone control. Input volts, mike .003, gram .35 v. **£10.7.8.** **MODEL AC18E** 6 valve unit with P.P. output of 18½ watts. **SEPARATE** mike stage

and **SEPARATE** mike and gram inputs. 2 faders and tone control. Feedback over 5 stages. Input volts mike .003, gram .3 v. **£15.5.0.**

MODEL AC32E.—Spec. as AC18E, but with a larger output stage of 32 watts. **£18.18.0.** **MODEL U.10E.**—D.C./A.C. mains. P.P. output of 10 watts. Spec. as AC18E. **£12.19.6.** All above amplifiers are **COMPLETE** with metal case, chrome handles, and outputs to match 3, 8 or 15 ohm speakers. All A.C. models have H.T. and L.T. output sockets for tuning units etc.

QUALITY AMPLIFIER CHASSIS FOR RECORDS, ETC.—**MODEL Q9C** 6 valve unit with bass and treble controls. Inputs for radio L.P./standard records. Output impeded to choice. This amplifier uses a Williamson 18 section output transformer. Output of 9 watts. Adjustable negative feedback. **£13.19.6.** **MODEL Q4C** 4 valve unit similar to Q9C. Output 4 watts. **£9.15.0.**

FULL RANGE OF PLAYERS, MICROPHONES, PICK-UPS, SPEAKERS AVAILABLE.

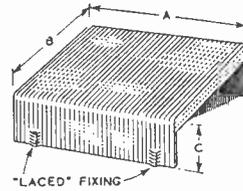
COLLEGE TRANSFORMERS, etc.—Filament. 6 v. 2 a. 6.9 ; 6 v. 3 a. 8/6 ; 12 v. 1 a. 8 6 (Charging 0.9-1.5 v. 3 a. 15 ; 0.9-1.5-21 v. 2 a. 18/6. Mains 2 x 350 v. 80 m.a. 0.4-5 v. 0.4-6 v. ; 2 x 250 v. ditto. 2 x 275 ditto. all 17 6 each. 2 x 450 v. 250 m.a. 6 v. 5 v. 49 6 (wt. 10½ lbs.). **High Quality Output Transformers.** CA1. 10,000 to 3, 8, 15 ohms. (P./P. 6V6, 6P6, etc.). 20 watt rating. Wt. 4½ lbs. **£8 6.** CA2. 6,600 to 3, 8, 15 ohms. 30 watt rating (P./P. 6L6), wt. 5½ lbs. 27 6. Williamson. Exact to spec. 1.6 or 3.6 ohm types. 75 6.

CHOKES.—60 m.a. 20 hv.; 50 ; 60 m.a. 10 hv. 4.9 ; 100 m.a. 10 hv. 6.9 ; 150 m.a. 20 hv. 17 6 ; 250 m.a. 20 hv. 19 6.

All goods are brand new, no surplus used. Amplifiers are carriage paid. Transformers, etc., postage up to 10 s. 6d. ; £1. 1/- ; above £2 free. Stamp for lists. State interest.



BLANK CHASSIS IN ALUMINIUM OR STEEL



REF.	DIMENSIONS			PRICE	
	'X'	'B'	'C'	ALL	STL.
CH.8	7"	4"	2"	6/1-	5/1-
9	9"	5"	2½"	7/3	6/3
10	10"	6"	2½"	8/-	7/-
11	10"	8"	2½"	8/9	7/9
12	12"	9"	2½"	10/-	9/-
13	14"	9"	2½"	9/6	
14	16"	8"	2½"	9/6	
15	16"	8"	3½"	10/9	
16	20"	9"	2½"	11/3	
17	17"	9"	2½"	10/3	
18	17"	10"	2"	10/3	

This extensive range of Steel chassis is manufactured from 19 s.w.g. Steel and finished in Black Matt Cellulose. The Aluminium chassis are made in sizes CH.8 to CH.12 only. A feature of both ranges of chassis is the lattice fixing holes which enables the mounting to the cabinet with self tapping or wood screws only, thus saving the constructor a lot of time making brackets and holes, etc., and presenting a much firmer method of fixing.

GOOD NEWS FOR HOME CONSTRUCTORS AND SMALL MANUFACTURERS

Chassis made to your requirements with a scale of charges that enables you to work out the cost of your prototype. Material is in either 16 s.w.g. bright Aluminium or Matt Black 19 s.w.g. Steel at 3d. per square inch plus 3d. per lb. plus 2d. per round hole, plus 6d. per shaped hole, plus 1/- postage.

DENCO (GLACTON) LIMITED,

357, 9 Old Road, Clacton-on-Sea, Essex.



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 ★ Locomotive Eng. ★ 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. H.104), SHEFFIELD.

Please send me your prospectus on..... (Subject)

NAME

ADDRESS

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

PLEASE WRITE IN BLOCK LETTERS

SOUTHERN RADIO'S WIRELESS BARGAINS

TRANSMITTER-RECEIVERS (Walkie-Talkie) Type 38 Mark II. Complete with 3 Valves, Microphone, Headphones and Aerial. Less Batteries. Guaranteed fully ready for use. **£4 15s.** post paid. Extra Junction Boxes for above. 2/6.

TRANSMITTER-RECEIVERS No. 18 Mark III. Complete with all Valves but less Batteries and attachments. Guaranteed Ready for Use. **£7 17s. 6d.** Carriage Paid. No. 18, Mark III, BRAND NEW Complete original packing cases with ALL attachments and full set of Spares including duplicate Set of Valves (Less Batteries). **£15.**

TELESONIC 4-Valve Battery Portable. Complete with 4 Hivac Valves. Contained in Metal Carrying Case. Easily Convertible to Personal Portable. Brand New. **£2.** including Conversion Sheet and post.

RECEIVERS R109, COMPLETE WITH 8 VALVES. Vibrator Pack for 8-Volts. Contained in metal case with built-in Speaker. 1.8 to 8.5 megs. **GUARANTEED. 27.** Carriage Paid.

MICROPHONES, G.E.C. 8881E, BRAND NEW, COMPLETE IN CARRYING CASE WITH PLUGS. £12 10s.

RESISTANCES, 100 Assorted useful values wire-end. 12/6.

CONDENSERS, 100 Assorted Mica and Tubular, 15-1A, FERRA HOLE, 4 CTTTERS, Adjustable 1in. to 3/16in. For use on Wood, Metal, Plastic, etc. 5/9.

THROAT MICROPHONES. Brand New Magnetic with Long Lead and Plug. 4/6. American Type. 4/6.

PLASTIC MAP CASES, 14in. by 10½in., 5/6.

STAR IDENTIFIERS, Type 1. A-N. Covers both Hemispheres. Complete in case. 5/8.

WESECTORS WX6 and W112, 1/- each.

MARCONI AERIAL FILTER UNITS (P.O. Spec.) 4/6.

CONTACTOR TIME SWITCHES, 2-impulses per sec. Complete in Sound-proof case. Therm Control. 11/6.

RANGE CONTROLS for use with above, 7/6.

SPECIAL OFFER TO EXPERIMENTERS, TWELVE METERS and AIRCRAFT INSTRUMENTS. Only needs adjustments or cases broken. **TWELVE INSTRUMENTS** (including 3 Brand New Aircraft instruments). 35/-.

Full List of Radio Books 2/6d.

HUNDREDS OF FURTHER LINES FOR CALLERS.

SOUTHERN RADIO SUPPLY LTD.

11, LITTLE NEWPORT STREET, LONDON, W.C.2

GERrard 6653

A SUPERHET FOR BEGINNERS

CONSTRUCTIONAL DETAILS OF A 6-VALVE A.C. RECEIVER USING MINIATURE VALVES

By R. Hindle

(Continued from page 390 July issue)

THE dial can now be put on and the pointer, with the vanes fully meshed, fitted horizontally. The final operation in preparation for wiring is to fit the coilpack in the central hole of the front of the chassis (it is a single-hole fixing component) to ensure that there is nothing in its way. The pack must be handled with care if trouble later is to be avoided. Under no circumstances should any of the trimmers or cores be touched until final testing of the finished receiver and, when satisfied that all is as it should be, the pack should be removed again and put carefully aside until a later stage in the wiring.

Wiring

Connections have to be soldered and this is the only exacting demand made on the beginner. No receiver, no matter how simple, can be made using modern technique and components without soldering. On the other hand, all the worry has been taken out of soldering by modern electric irons and cored solder and the process is nothing like so difficult as it used to be.

The material used for wiring is 24 S.W.G. tinned copper wire and sleeving, which is easy and quick to use. The important thing is, of course, to avoid undesired points of contact and to make sure that the connections required are well made. The valve pins of these miniature valve-holders are near together and an excess of solder on one of the connections might well run over on to the next pin, so take care not to draw too much solder for these connections.

The sequence of connections following will enable the constructor to avoid any pitfalls and the actual route of the wire will be seen by reference to the wiring diagram, Fig. 4. The leads carrying mains and the A.C. heater supply are run along the inner surface of the chassis throughout their length, but all other leads take the shortest route, direct from point to point. Where there are slight deviations from the shortest route on the wiring diagram these are merely for the purpose of clarity on the two-dimensional drawing. If the constructor can follow the theoretical circuit it is a good plan to follow the leads in Fig. 1 as they are wired in, and finally, when all wires have been put on, a final check can be made to the wiring diagram.

The output transformer used is a single ratio type to match the output valve used to a standard 3-ohm speaker. The two outside tags of the six-way tagboard fitted are connected to the primary winding and the two secondary connections are brought out on flexible wires. The first step is to shorten these two secondary wires and solder them on to the two centre tags of the tagboard. Then proceed as follows, bearing in mind that the valve pins are numbered clockwise, as seen from underneath the chassis, the pin on the clockwise side of the wide gap being No. 1. Check to the wiring diagram at each step to see how the wire is run and tick off on the wiring sequence below as each connection is com-

pleted. Where a component is specified at the left-hand side of the sequence this component is connected between the two points mentioned to the right; where no component is specified the points given are connected together. Refer to the wiring diagram, Fig. 4, for the numbering of the tags on the components referred to in the wiring sequence. It is very important that the I.F. transformers should be mounted with their connecting wires in the positions shown in the wiring diagram; these numbers are on the bottom of the transformer and they should have been carefully checked before screwing the component on to the chassis.

Components Required	Connections
	V1 pins 4 and 5 and centre ring to earth. (No sleeving.)
	V2 pin 3 and centre ring to earth. (No sleeving.)
	V3 pins 1, 3, 5, 6 and centre ring to earth. (No sleeving.)
	V4 pins 5 and 6 and centre ring to earth (No sleeving.)
	V5 pin 3 and centre ring to earth. (No sleeving.)
	V6 pin 3 to earth. (No sleeving.)
	Mains transformer tag 1 to tag 6 to earth.
	Mains transformer tag 3 to V6 pin 4. Run near to chassis.
	Mains transformer tag 3 to V1 pin 9 to V2 pin 4 to V5 pin 4. (Run near to chassis.)
	V1 pin 9 to V3 pin 4 to V4 pin 4. (Run near to chassis.)

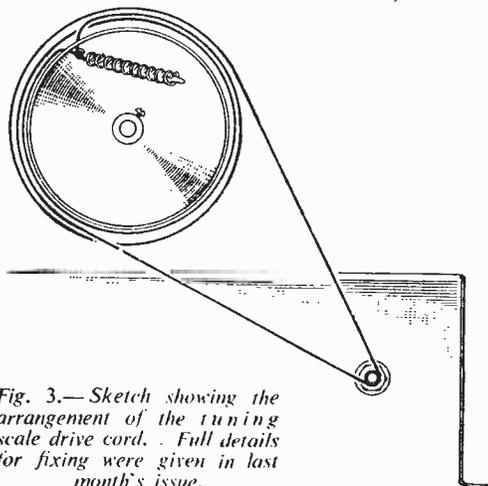


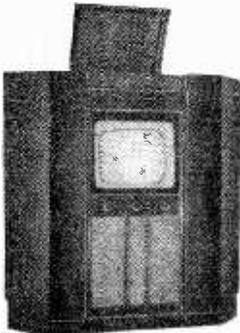
Fig. 3.—Sketch showing the arrangement of the tuning scale drive cord. Full details for fixing were given in last month's issue.

Components Required		Connections	Components Required		Connections
		Mains transformer tag 5 to V 6 pin 6.			V4 pin 8 to tag 1 of C16, C18, electrolytic.
		Mains transformer tag 7 to V6 pin 1.	R15	220 K Ω	From V4 pin 7 to tag 2 of C16, C18 electrolytic.
		V6 pin 7 to C21 (8 μ F in 8-16 μ F electrolytic. Identify as indicated on can).	R12	1 M Ω	From tag 1 of C16, C18 electr. to 2nd I.F. tfr. pin 6.
		Smoothing choke wires, one to C20 and one to C21.	R14	22 K Ω	From tag 2 of C16, C18 electr. to 2nd I.F. tfr. pin 6.
C5	.1 μ F		C19	.1 μ F	From V4 pin 7 to unearthed tag of tagboard by V5.
R4	220 Ω	Connect both between V1 pin 3 and earth.	R17	4.7 K Ω	From unearthed tag of tagboard to V5 pin 7.
		V1 pin 6 to 1st I.F. transformer pin 4.	R18	220K Ω	From unearthed tag of tagboard to earth.
		Connect 2in. of wire to V2 pin 1 and another 2in. to V2 pin 5. (Other ends not connected at present.)	R19	220 Ω (1 W.)	From V5 pin 2 to earth (pin 3 of V5).
		V2 pin 2 to V2 pin 7.			V5 pin 5 to output tfr. tag 6.
C12	.1 μ F				V5 pin 6 to output tfr. tag 1.
R9	100 Ω	Connect both from V2 pin 2 to earth.			2nd I.F. tfr. tag 6 to output tfr. tag 1 to 1st I.F. tfr. tag 6 to C20 tag on 16-8 μ F electr.
R7	33 K Ω	From V2 pin 6 to 2nd I.F. transformer pin 6.	C22	25 μ F	From V5 pin 2 to earth.
C9	.1 μ F	From V2 pin 6 to earth.			Clip off lead soldered to tag 4 of mains transformer and shorten to 1 $\frac{1}{2}$ in. the other lead coming out of the transformer windings.
		Wire previously connected to V2 pin 1 to 1st I.F. transformer pin 3.			Solder one end of a piece of twin flex 2ft. long (transparent PVC type), one lead to tag 4 of mains tfr. and one to the shortened mains input lead, in the latter case covering the joint with sleeving or rubber tape.
		Wire previously connected to V2 pin 5 to 2nd I.F. transformer pin 4.			Pass a second piece of the same type of flex through the grommet at the back nearest to the mains tfr. leaving outside the chassis sufficient length to reach the power socket from where the receiver is to be used and inside the chassis about 2ft. Make a knot in the wire inside the chassis to prevent the lead from pulling through.
C11	100 pF	From 2nd I.F. transformer pin 4 to V3 pin 7.			Pass both flex leads together round the chassis as indicated in the wiring diagram, keeping them near the chassis.
R10	1 M Ω	From V3 pin 7 to earth.			Connect one pair to tags 4 and 5 of VR1 and the other pair to tags 6 and 7 of VR1, cutting away any surplus.
R8	1 M Ω	From V3 pin 7 to 1st I.F. transformer pin 1.			Now fit the coilpack.
C10	.05 μ F	From 1st I.F. transformer pin 1 to earth.			The wire passing through the chassis from the section of the tuning condenser farthest from dial to coilpack tag 3.
C13	100 pF	From 2nd I.F. transformer pin 1 to earth.			The wire from section of tuning condenser nearest to dial to coilpack tag 4.
R11	47 K Ω	Connect one end to 2nd I.F. transformer pin 1, making wire as short as possible without damaging resistor ($\frac{1}{2}$ in.). Shorten other end wire of R11, connect inner of 4in. of screened wire to this end and connect outer braid to earth at V4 holding bolt.			Coilpack tag 3 to V1 pin 2.
		Open braid of wire to R11 at 1in. from end not yet connected, using pricker, and pull through inner without damaging it. (If wire is type not having loose outer braid it will be necessary to strip braid off to connect inner, when a piece of 24 s.w.g. wire can be soldered to the braid for earthing.)			
		Connect inner of the screened wire to VR1 tag 1.			
		Solder braid to case of VR1 and to tag 3 of VR1.	R6	100 Ω	
C14	100 pF	From pin 1 to pin 3 of VR1.	C3	100 pF	Connect in series; the free end of C3 to coilpack tag 5 and the free end of R6 to V1 pin 8.
C17	25 μ F				
R16	2.2 K Ω	Connect both from V4 pin 9 to earth.			

(Continued on page 477)

ELECTRONIC PRECISION EQUIPMENT LTD.

**TV. CABINETS
THE CORONATION CONSOLE**



This very handsome cabinet will put your TV. into the £200 class.

The Tube cut-out is for the standard 15in. Tube, but can be easily modified for other sizes.

The storage space at the top if desired can be used for an auto-changer or tape recorder, and the sloping panel can be used as a control panel or for a pre-set radio.

The cabinet is 47in. wide, 31in. deep, to the corner, and 50in. high. It is already polished and supplied flat for you to screw together; price is £18, plus 10/- carriage and insurance, or you can buy it on Hire Purchase if you wish, the deposit is £6, then 12 monthly payments of 25/-.

THE REGINA

TV Console Cabinet, undrilled, but cut for 12in. tube, with adjustable platform. This cabinet looks really superior and is ideal for all popular sets—Viewmaster, Tele-King, etc. Price £7/17.6. Carriage 10/- extra.



**THE
ENSEMBLE**

A 12in. Table Model complete with armour-plate glass and surround as illustrated £3,17.6, plus 7.6 carriage and insurance.



PARCEL OF METAL WORK, for Table Model: Punched and prepared metal chassis, punched out-rigger, valve plate, spacers. Tube clamping ring, tube rear support, brackets, etc., etc. Price 25/-, plus 2.6 post. Included free with this parcel is circuit diagram of 5-Channel 12in. TV to use with this chassis.

AUTO - RADIOGRAM 26 gns.

To those who want an auto radiogram at a low Price, we offer the cabinet illustrated alongside complete with Collaro three-speed record-changer with dual purpose crystal pick-up, at a special bargain price of £17/18/8, plus 12.6 carriage and insurance or H.P. terms £8.7/- deposit. A Superhet Chassis is available. L.M. and S. waves, 3 colour scale A.V.C. Tone control, etc., complete with 8in. P.M. Speaker. Price £9/19/6 or H.P. £3,7.0 deposit. Carriage 7.6 extra. Cabinet separately £7/10/0 (or £2/10.0 deposit), plus 10/- carriage and insurance.



SPECIAL SUMMER OFFER

The cabinet—radio chassis and auto-changer, if ordered together will be supplied for 26 gns. (carriage and insurance 15/-). H.P. terms as above.

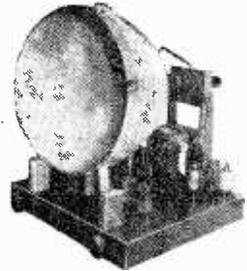
SUMMER SALE

Terrific bargains will be available at Fleet Street and Ruislip during the next two months. Please pay us a visit or send S.A.E. for summer sales list.

THE SUPERIOR 15-INCH TELEVISION RECEIVER

Up-to-the-Minute TV. for only £35

A 20-valve television for the amateur constructor. Components, valves and 15in. Cossor Cathode Ray Tube costs £35, plus £1 carriage and insurance, or £11/14/- deposit. Constructor's envelope giving full details and blue-prints 7.6, returnable within 14 days if you think you can't make the set.



READY-MADE 15" CHASSIS

Complete with all valves, tube and speaker. Sale price £42.10.0. cash or £15 deposit. Carriage and insurance 20/- extra. Limited quantity. ORDER AT ONCE.

AUTO-RADIOGRAM 29 GNS.

Full-size walnut Console CABINET £11/10/-, plus 15/- carriage. 5-valve all-mains superhet RADIO. 3 wave-band coloured illuminated scale, fully guaranteed, £8.18.6, plus 7.6 carriage and insurance. **SPECIAL OFFER.** Three units for 29 gns. or £10.14/- deposit and 12 monthly payments of £2.3/-, plus carriage and insurance. Booklet of photos, circuit diagrams, etc., 2.6 (returnable).



VIEW MASTER OWNERS

You probably know that a 15in. tube gives approximately 3 times as many square inches of actual picture as does a 9in. tube. You may not know, however, that without any modification at all your View Master will scan the 15in. Cossor type 83K which we offer for cash or on H.P. (See advert. last month.) If you would like to go over to the big 15in. picture, the easy way is to send for 'View Master Big Picture Parcel' as follows:

- | | |
|-------------------------|--|
| 1. 15in. type tube 83K. | 5. Sundries, plugs, etc. |
| 2. Moulded rubber mask. | 6. Blue print showing connections, and method of fixing tube, ion trap, etc. |
| 3. Tube clamping ring. | |
| 4. Special ion trap. | |
- We offer the above six items at less than what a new 9in. or 12in. tube alone would cost, namely, £14.10.0 cash with order or £5.0.0 deposit and balance over 12 months. Limited quantity only at this price so order by return.

TWO ITEMS FOR VCR97 USERS

(1) RF E.H.T. UNIT

To take the place of the 2kv. mains E.H.T. transformer, has the following advantages:

- (a) Is more reliable.
- (b) Is cheaper.
- (c) Can be repaired.

Complete kit comprises 2 valves smoothing condenser, filament transformer and all necessary parts. Price 20/-, plus 1.6 post.

Constructional and operational data free with kit or available separately, price 2.6.

(2) INTERNAL MAGNIFIER KIT

The kit comprises a veneered and polished wooden surround, special mask, oil filled enlarger and four chrom-head fixing screws.

- Has these advantages:—
- (a) It gives the impression of being a standard 9in. tube.
 - (b) Saves the cost of a 6in. mask
 - (c) Protects magnifier from accidental damage.
 - (d) Is equally suitable for use with a 9in. tube.
- Price of kit 39/6, plus 2.6 post and insurance.



ELECTRONIC PRECISION EQUIPMENT DEPT. 7
42-46 ARNDMILL HILL RUISLIP MIDDLESEX ● 152-3 FLEET ST. LONDON E.C.4.

FIRST-CLASS RADIO COURSES . . .

GET A CERTIFICATE!

QUALIFY AT HOME—IN SPARE TIME

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

FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success-compelling qualifications as **A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs, Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship** (all branches), etc., together with particulars of our remarkable Guarantee of

SUCCESS OR NO FEE

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

FOUNDED 1885—OVER 150,000 SUCCESSES

NATIONAL INSTITUTE OF ENGINEERING
(Dept. 461), 148, HOLBORN, LONDON, E.C.1

Hi-Q Coils. Dual wave. A.E. & Det. with reactn., or A.E. & H.F., 7/- pr. S/het. A.E. or Osc. M. & L.W., 3/- ea. 465K/c. I.F.T. in cans 2/1 & 12/6 pr. All types new & boxed with ckt. Cores tuned. 80Ω Co.-Ax. cable 9d. yd. 125 x 6Cmf. x 275v., 6/6. 1 meg. D/p., 4/- ea. Stamp for list.

THE TELETRON CO.
266, Nightingale Road, London, N.9.

TELEVISION COMPONENTS

for the "Practical Television Receiver"
P.T. LYNN; TELE-KING VIEWMASTER, E. E. TELEVISOR and VM wide angle modifications in STOCK
Price Lists available on request

J. T. FILMER,
Maypole Estate, Bexley, Kent.
Tel.: Bexleyheath 7267

Aluminium TV Tube, 3in., 6d. It.: 3in. 7d. ft.
Co-Axial Cable, 50 ohms, 9d. yd.: 75 ohms 10d. yd.
Twin-Feeder, 75 ohms, 6d. yd.: Screened, 1/3 yd.
Valves (New but Unboxed), EC54 Grounded Grid Triode, 4/6 ea., 3 for 12/6; ECC31 Twin-Triodes, 4/6 ea., 3 for 12/6.
Headphones. Low Resistance Moving Coil, 9/6 pr.
Condensers. 3 gang. .0005 mfd. New and Boxed, 7/6 ea.
Solar 50 Mfd., 12 volt, 1/- ea
Carriage 1/3 under £2, over free.
Send 6d. for 24 page Catalogue. Visit our Shop, open 8.30 to 6 incl. Sats.
Tel.: St. Albans 5951.

BOLD & BURROWS
12-18, VERULAM ROAD (A5), ST. ALBANS, HERTS.

FREQUENCY CRYSTALS, 5.8 to 8.6 Mcs. in 25 Kcs. steps. Odd 5/6. Spot 8/-.

2-VALVE BATTERY. U.H.F. radios 160 Mc s. easily converted to 144 Mc s. 15/-

NEW OLDHAM 2v. 16 A.H. accumulators, 1 x 4 x 2 ins., 8/6.

GERMANIUM DIODES, 3/9. BTH. or GEC.

P.M. SPEAKERS, 8in., 20 - 5in., 14/6. 6in., 16/6. 10in. 27/6.

SELENIUM RECTIFIERS, F.W. 6 or 12v.: 4 A., 22/6; 6 A., 30/-; 3 A., 14/6; 1 A., 8/6; 2iv. 2 A., 30/-; 250v. 100 mA. H. W., 9/-; 80 mA., 6/6.

TRANSFORMERS, 200-240 volts, tapped 3-1-5-8-9-10-12-15-18-20-21 and 30 volts at 2 A., 21/6. One year guarantee.

NEW G.E.C. 0-75 MILLIAMMETERS, 11in. x 1 13/16in. 8/-.

M.C. MICROPHONES AND TRANSFORMERS, 14/6.

EX-W.D. PHONES, Low Resistance, 8/6.

MINIATURE VALVES, New, CK512AX, 9/-; 9001, 9002, 9003, 7/6; 6AG5, 184, 185, 11/-; 1R5, 10/6; 6AL5, 8/6; 12ATT, 6AM9, DH77, 6AT6, EY31, 6BB6, 12/6.

NEW VALVES, 3524, 35L6, 2524, 25L6, U281, VP4B, U90, 5Y30T, 6K7GT, 6V6GT, 50L6, 42, 80, 11/-; 6K93T, 11/25, 12/6.

0-500, MICROAMMETERS, 2in., 15/6.

MULTIMETER KIT, 2 1/2in. M/c calibrated meter, D.C. Volts 0-3-30-150-300 and 600, mA. 0-50. Black ebonite case. Also reads 0-5,000 ohms with 11v. battery, 24/6.

AERIAL RODS, 4ft., 3 sections, 6/- Base 3/6.

NEW 6v. ROTARY CONVERTERS, 350v. 120 mA, 27/6.

ALL POST PAID IN U.K.

THE RADIO & ELECTRICAL MART

253b, Portobello Road, London, W.11.
Phone: Park 6028

MICROGRAM AMPLIFIERS

NEW MODEL



£3.19.6 P. & P 2/6d

Fits inside your record player leaving room for speaker. Dimensions 10in. x 3 1/2in. x 2 1/2in. 4 watts quality output. Suitable for all speakers and with standard or L.P. pick-ups. Built in powerpack for 200-250 v. A.C. only. Valves 6J7 and 6V6 available at 20/- per pair extra, if required. Other models up to 10 watts.

6d. stamp for illustrated details
ELECTRO-ACOUSTIC LABS
TAIN—ROSS-SHIRE, SCOTLAND

No. 18 TRANSMITTER-RECEIVERS.

6-9 M/cs. Brand new with Phones, Mike, Key, Rod Aerials etc., £10. C. & P. 10/-.
As above but used. Good condition. £6.10.0. C. & P. 10/-.

Send for Lists of other equipment.

ELECTROSURP
EDMUND STREET,
EXETER. 56687.

"MAGNUM OPUS"!

If you have any doubts just what our NEW "HOME CONSTRUCTORS HANDBOOK" can mean to you, see what one delighted customer writes: . . . after careful perusal, amongst many others, I feel sure yours is truly the 'magnum opus' for the Home Constructor. The mode of presentation of data, details and circuits has been rendered without the usual forms of embellishment, and I still find humour in your Introduction. It is my intention to build a 'Rolls-Royce', so I have decided upon your 10 watt quality amplifier and R.L.40 Feeder using the Goodmans 12in. speaker. This conclusion has been reached after receipt of brochures, etc., from many sources, famous and not so famous, and I shall certainly find pleasure in recommending your service to my friends.—C. R. W., B'ham, 31/.

Our modernised issue contains the following time-proven outfits, especially designed for building the E-A-S-Y way.
● 3-V. 3-Band Super Norm Hi-Fi/Gram. Feeder ● 5-V. 3-Band AC Super. ● 5-V. 3-Band AC/DC Super. ● 6-V. 3-Band AC/DC Super. ● 3-V. 2-Band "Local Station" T.R.F. Super Quality Feeder ● Feeder Amp. and Power Pack ● Magic Eye Tuning Indicator Unit ● Signal Tracer AC ● 5-W. Amp. AC ● 10-W. Push-pull Quality Amp. AC ● Signal Generator, AC, Etc., Etc.

Apart from DETAILS for construction, LARGE BLUEPRINT circuits, COMPLETE parts lists and TECHNICAL DESCRIPTIONS, there are Set Building Hints, Servicing Hints, Facts and Formulae, Resistance Colour Code, Symbols, etc., etc., AND our Catalogue.

RODING LABORATORIES

BOURNEMOUTH AIRPORT, HANTS.

Amateur Radio Enthusiasts
THE INCOMPARTABLE
GLOBE-KING
SINGLE VALVE S.W. RECEIVER
● WORLD-WIDE RANGE 11-100 METRES ● CRYSTAL-CLEAR NOISE-FREE RECEPTION ● ELECTRICAL BAND SPREAD TUNING ● EXTREMELY LOW RUNNING COSTS
Catalogue Free. Stamp for postage.
JOHNSON (RADIO)
46, FRIAR STREET, WORCESTER

REP
HIGH GAIN DUAL RANGE COIL WITH REACTION.
Complete with 2 Battery and 2 Mains Circuits.
PRICE 4/- Post 3d.
(Trade Supplied.)
RADIO EXPERIMENTAL PRODUCTS LTD.
33, Much Park Street, Coventry



CONSTRUCTORS! BUILD THE PICNIC PORTABLE

Using our drawings and instructions, and easily-obtainable British components, you can build a portable receiver giving really good loudspeaker results without any aerial, earth, or external power supply. An unusual type of self-contained frame gives maximum pick-up on both long and medium waves. Extra gain and sensitivity are obtained by the provision of an RF stage and a specially efficient output valve. This set is ideal for all occasions, indoors and out, where a portable source of listening is required. Illustrated instructions and point-to-point wiring diagram.

PRICE 3/6 POST FREE.
These instructions can only be sent to addresses in the United Kingdom and the Irish Republic.
V. G. COLES, 2 BROCKHAM TERRACE, WILLSBRIDGE, Nr. BRISTOL.

(Continued from page 474)

Components Required		Connections	Components Required	Connections
R5	47 K Ω	From V1 pin 7 to V1 pin 3.		
C4	50 pF	From V1 pin 7 to coilpack tag 4. R.F. choke, tag farthest from coilpack to earth.		of the R.F. choke. Strip $\frac{1}{2}$ in. of outer insulation at this point. Solder the middle of a piece of connecting wire 2in. long to the earthed tag of the R.F. choke to leave two 1in. ends. Put the coaxial cable back into position and solder the two bared ends of the cable, one to tag 1 of the coilpack and the other to the inner of the coaxial socket projecting inside the chassis. Pass the 1in. ends of the wire soldered to the R.F. choke round the bared braid of the coaxial cable and with a hot soldering iron solder the wire to the braid.
C23	.1 μ F	From coilpack tag 2 to R.F. choke, nearest tag.		
R1	100 K Ω	From coilpack tag 2 to 1st. I.F. tfr. tag 1. Pass a piece of flex, long enough to go to speaker in working position, through grommet nearest output tfr. and connect to output transformer tags 3 and 4. Output tfr. tag 4 to earth. Take a length of coaxial cable (as used for television leads) about 6in. long. Strip back $\frac{1}{2}$ in. of the outer insulation at both ends and remove screening braid. Try the cable in position from the aerial input socket to the coilpack tag 1 and mark the cable where it passes nearest to the earthed tag		

Note.—Where one side of a .1 μ F or .05 μ F condenser is connected to earth this should be the lead from the end of the condenser marked "O.F." (i.e., outside foil) on the cardboard case of the component.

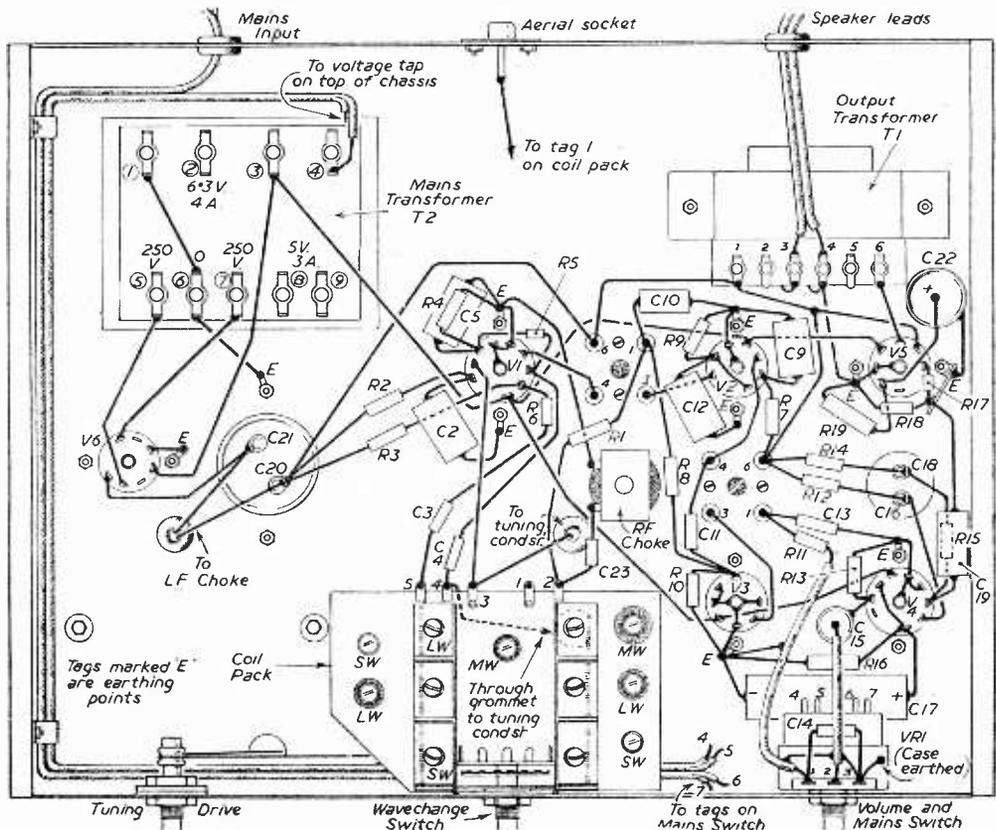


Fig. 4.—Underchassis wiring diagram.

Perhaps it is a little unusual to use a coaxial socket for the aerial and earth connections to a sound receiver, but it is a practice followed by the designer for some time and it makes for neatness as well as efficiency. The arrangement is to run the aerial and earth leads (underneath the floorboards if possible) to a point on the skirting board near to where the receiver is to be used. Here they enter a junction box from which comes the single coaxial cable to the receiver. A good aerial and earth should be used if possible and it is recommended that the aerial system should be put up before finally adjusting the receiver. It should be mentioned, however, that the chassis gave a good account of itself when tried out in far from perfect conditions using only a yard of wire for aerial, this dangling over the side of the bench.

It will be an encouragement to the beginner who is a little doubtful as to his ability to set up such a receiver as this to know that the prototype played as soon as it was switched on, and there remained only the minor adjustments necessary to get the best results. Of course, this would not have been so if care had not been taken to avoid alteration of the adjustments made by the manufacturers of the coilpack and I.F. transformers.

Before commencing the adjustments, temporarily connect a piece of wire across the AVC condenser C10 (i.e., from tag 1 of the first I.F. transformer to earth). This will stop the AVC action and it will be easier to detect the peak tuning points. This link should be removed, of course, when adjustments are complete.

Connect up the receiver to the mains and speaker, plug in the aerial plug and switch on, waiting then until the valves have warmed up. Then switch to the medium waveband (the central position on the wavechange switch) and search for a signal which should be tuned in to maximum strength on the tuning knob (i.e., until the tone is at its deepest).

Now adjust the four I.F. transformer cores for maximum signal. Each transformer has one adjusting screw in the top of the can and one accessible through the centre hole of the base. If a signal generator was available, of course, these adjustments would be made whilst injecting a 465K.c. signal into the frequency changer grid, but the possession of such a generator is not assumed and, in fact, it was found that the makers' adjustment of these transformers was such that, after adjusting the prototype by the method suggested above, a test was made with the generator and the setting was found to be almost exactly correct; near enough to make not the slightest difference to the final results.

Now find a transmission towards the top end of the waveband that can be identified. It should appear not far from the position marked on the dial if the pointer was placed correctly as previously explained, i.e., horizontal with the condenser vanes fully meshed. Tune the signal to maximum by adjustment of the medium wave aerial coil core, using an insulated tool. A piece of broken plastic knitting needle filed at one end to form a screw-driver will be ideal for the purpose. Now swing the condenser slightly towards the calibrated position, bringing the signal back into tune with the oscillator and aerial cores, until the signal tunes accurately at the correct position. Remember that the coilpack was aligned by the manufacturers, so that if the signal appears to be a long way from its calibration point to start with, suspect that it has been incorrectly identified and check carefully before moving the cores. Then find a transmission at the lower end of the scale which can be identified and tune to maximum, using the aerial trimmer and without touching the cores. Bring this transmission on to its correct calibration point by swinging the tuning condenser slightly and following up by adjustment to the oscillator and aerial trimmers but leaving cores alone. Again the amount of adjustment should not be great. Now return to the transmission at the upper end and repeat the adjustment, using cores only, followed by a further adjustment at the lower wavelength, using trimmers only. Alternately adjust at the upper and the lower end of the scale in this manner until satisfied that no further improvement can be effected. Ideally, these adjustments should be made on 450M. and 250M., and these points would be used when adjusting by means of a signal generator, so if possible use stations near these two positions.

On long waves a similar procedure is followed, the theoretically correct points being at 1,000M. and 1,800M. Be very careful to use the long wave cores and trimmers and not to upset again the medium wave adjustments, which will have no effect on this waveband. The short wave oscillator adjustments are less easy to make without a signal generator. They will not be far out and it will be better to leave them alone unless the constructor is quite sure what he is doing. The aerial adjustments can be made, of course, and a signal at the upper end of the waveband should be brought in, using the aerial core, and a signal at the lower end using the aerial trimmer, alternating these as before to secure best results. The theoretically correct points are at 45M. and 20M. Do not forget, when adjustments are completed, to remove the temporary link across the AVC condenser.

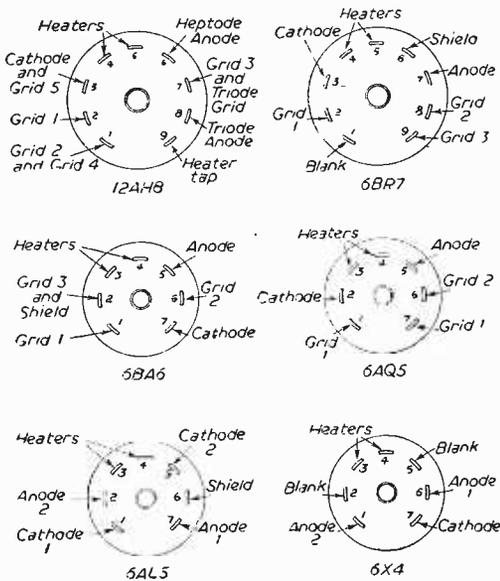
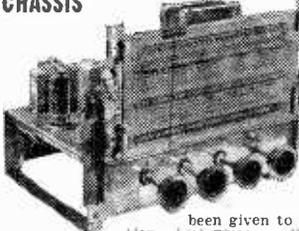


Fig. 5.—Valve base data.

A COMPLETELY ASSEMBLED "ALL-WAVE" SUPERHET CHASSIS



MODERNISE YOUR OLD RADIOGRAM FOR

£ 25

A GENUINE SPECIAL OFFER!

PLESSEY 3-SPEED AUTO CHANGE UNITS

INCLUDING 10' P.M. SPEAKER

PLUS 10' CARRIAGE AND INSURANCE

£11 . 3 . 6

(Normal price is £23/10/-)

MODEL B.3. - A 5-valve 3-waveband Superhet Receiver, for operation on A.C. mains 100-120 volts and 200-250 volts, employing the very latest miniature valves. It is designed to the most modern specification. Great attention has been given to the quality of reproduction which gives excellent clarity of speech and music on both Gram and Radio, making it the ideal replacement Chassis for that "old Radiogram," etc.

Brand New in maker's cartons, complete with mounting instructions.

- 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.
 - Minimum base-board size required 16in. x 12in. with height above 5 1/2in. and height below baseboard 2 1/2in.
- A bulk purchase enables us to offer these BRAND NEW UNITS at this exceptional price. Please include 7/6 packing, carriage and insurance.

been given to the quality of reproduction which gives excellent clarity of speech and music on both Gram and Radio, making it the ideal replacement Chassis for that "old Radiogram," etc. Brief specifications - Model B.3. - Valve line up, 6BE6, 6BA6, 6AT6, 6BW6, 6X4. Waveband coverage. Short 16-30. Medium 167-550. Long 900-2,000 metres. Controls (1) Volume with on/off; (2) Tuning (flywheel type); (3) Wave change and Gram; (4) Tcne (3 position switch operative on Gram and Radio). Negative Feedback is employed over the entire audio stages. Chassis size, 11in. x 7 1/2in. x 9 1/2in. high. Dial size, 9 1/2in. x 4 1/2in. Price, complete and READY FOR USE, excluding speaker, £12/12/- (Carr. and Pkg. 7/6 extra.)

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. Can be used with any Amplifier and 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. The Unit measures only 7in. x 4in. x 2 1/2in., including self-contained Power Supply, and can be accommodated either on or away from the main Amplifier, i.e., in the front panel of a Cabinet or any other position. Price including drilled chassis, valves (6SN7 and 6J5), £3/16 9. Complete assembly data is available separately for £3. Completely assembled and ready for use, 25/5/-.

THIS IS THE "TELE-VIEWER"

5 CHANNEL TELEVISOR - A design of a complete SUPERHET T.V. RECEIVER FOR THE HOME CONSTRUCTOR

This receiver has been developed after most careful research to provide a Televisor employing SUPERHET circuit for 12in. or 9in. tubes, which can be readily assembled by the home constructor. In designing it we had three objectives: - (a) OUTSTANDING QUALITY AND DEFINITION; (b) EASE OF ASSEMBLY; (c) ECONOMY IN COSTS. We confidently believe that not only have we achieved a T.V. receiver that surpasses in efficiency any other designed for the home constructor, but also the stage by stage diagrams permit the inexperienced to successfully assemble it at about half the total cost of a similar type of commercial receiver.

SOME OUTSTANDING FEATURES

- A SUPERHET CIRCUIT suitable for reception of all present transmissions, i.e., LONDON, SUTTON COLDFIELD, HOLME MOSS, WENVOE and KIRK-O'-SHOTS.
 - A BRILLIANT and SHARP PICTURE afforded by provision of high E.H.T. (approx. 10 K.V.).
 - Outstanding QUALITY AND DEFINITION for daylight viewing.
 - NEGATIVE FEEDBACK in the Audio Frequency Stages.
 - Simple control. Only two controls on the front of receiver.
 - Simple and compact design with rigid C.R.T. mounting.
 - The complete Televisor, including all A.C. mains Valves can be built for only £28 plus cost of C.R.T. tube.
- We are able to supply a New Mullard 12in. C.R.T. to purchasers of this T.V. at the specially reduced price of £12/19/6.

A MAINS OR BATTERY PORTABLE KIT



A midget 4-valve Superhet Portable Set covering medium and long wave bands. Designed to operate on A.C. mains 200-240 volts or by an "All-dry" 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 "All-dry" Battery Superhet Portable Set which can be accommodated in the Attache Case as illustrated (size 9 1/2in. x 4 1/2in. x 7 1/2in.). 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. Transf. and drilled chassis, etc. Overall size of assembled chassis 8in. x 4in. x 2 1/2in. 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 FOUR." - A 4-valve Battery Superhet Receiver, designed by "Practical Wireless" to receive 4 Pre-set Stations, no tuning being necessary. The complete Receiver can be built for £9/10/- (plus case 15/6). Send 1/6 for Assembly Instructions, Layouts and Component Price List.

THE "MINI TWO-THREE." - Complete diagrams and layouts from which either a T.R.F. 3-valve set or a 2-valve set (afterwards easily converted to 3-valve) can be made for £5/3/- or £4/3/6 respectively (plus case 15/6). Full Instructions, Layouts and Components Price List, 2/-.

THE "MINI TWIN." - The ideal set for the beginner! A simple 1-valve 2-stage Battery Set covering Long and Medium Wavebands. Can be built for 3/7/6, plus 0/6 for attractive Plastic Case and 14/9 for suitable headphones.

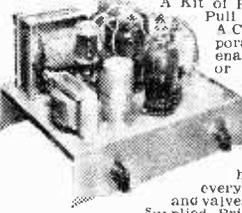
Complete instructions, layouts and price list 1/3.

As no hire purchase terms are available the receiver can be bought in five separate stages (practical diagrams and circuits are provided for each stage), thus enabling Hire Purchase interests rates to be avoided. The complete set of ASSEMBLY INSTRUCTIONS are now available, price 5/- (refunded against first order). The instructions include really detailed PRACTICAL LAYOUTS, WIRING DATA AND COMPONENTS PRICE LIST.

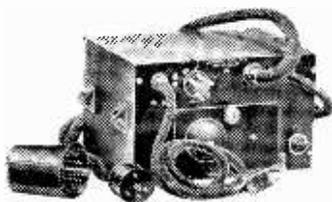
- ALL COMPONENTS ARE AVAILABLE FOR INDIVIDUAL PURCHASE.
- A CABINET WILL ALSO BE AVAILABLE.
- "Personal Set" Battery Eliminator
- A complete kit of parts to build a Midget "All-dry" Battery Eliminator, giving approx. 69 volts and 1.4 volts.
- This Eliminator is for use on A.C. mains and is suitable for any 4-valve Superhet Receiver requiring H.T. and L.T. voltage as above or approx. to 69 volts. The kit is quite easily and quickly assembled and is housed in a light aluminium case, size 4 1/2in. x 1 1/2in. x 3 1/2in. Price of complete kit with easy-to-follow assembly instructions, 42/6.
- We can offer a similar COMPLETE KIT to provide approx. 60 volts and 1.4 volts. Size of assembled Unit 7in. x 2 1/2in. x 1 1/2in. Price 47/6.

A QUALITY "PUSH-PULL" AMPLIFIER

A Kit of Parts to build a 6-8 watt Push-Pull Amplifier for operation on A.C. mains 200-250 volts. Incorporates a simple arrangement to enable either a magnetic crystal or light-weight pick-up to be used. A 10-watt Output Transformer is designed to match from 2 to 15 ohm speakers. Tone control is incorporated in the overall design. The size of the assembled chassis is 10in. x 8in. x 7 1/2in. high. Price of kit complete in every detail, including drilled chassis and valves, £6/12/6. Component layout is supplied. Price of assembled chassis, supplied ready for use, £8/12/6. Instructions, layouts and price list 1/-.



STERN RADIO LTD. 109, & 115, FLEET STREET, E.C.4 TELEPHONE: CENTRAL 5812/3/4.



GET THE BEST FROM YOUR RECORDS...

Battery Amplifiers, complete with 2 valves for use as Intercom. or with slight modification, as Gram. Amplifier. In metal case, 7in. x 4 1/2in. with instructions. 15/- each.

VALVES BY RETURN:

0Z4	6/6	6BE5	8/6	6X4	8/8	50L6gt10	3/6	HL2	3/6
1A5gt	7/6	6BA6	8/8	6X5gt	7/6	75	12/6	KT24	5/6
1L5D5	6/6	6C58	6/-	7C7	7/6	78	7/6	KT44	9/6
1L5N5	6/6	6CD3	11/6	7D7	8/-	77	7/6	KT83	8/6
1R5	8/6	6CH3	9/-	7Q7	7/6	21SSG	5/-	KT86	10/6
1S4	8/6	6F6	8/6	8D2	3/-	84GZ4	7/6	KTZ4	7/6
1S5	8/6	6G3	7/6	9D2	3/-	807	12/6	KTW61	7/6
1T1	8/6	6H6	3/6	10F9	7/6	956	3/6	N78	10/6
1G25	4/6	6J5	6/6	12A17	10/6	1625	4/-	P61	3/-
2C26	5/-	6J6	10/-	12BA6	8/6	1632	7/6	PEN46	8/-
2C34	4/6	6J7	9/-	12BE6	8/6	A915	5/-	PEN20A	5/-
2V38	3/6	6K5	7/6	12C8	9/-	DI	2/6	QP21	5/-
3D6	2/3	6K7gt	6/6	12J5	5/-	E1148	3/6	RK31	3/6
3S4	8/6	6K7gt	6/6	12K7	12/6	EA50	3/6	SL30	5/-
4D1	3/-	6K8m	10/6	12S A7	8/6	3 for 5-	EB91	9/6	
5R4	12/6	6K8L	10/6	12S C7	6/-	ECC32	5/-	SP41	3/-
5U4g	9/-	6L38	10/6	12S G7	5/-	10/6	EF33	6/6	
5Y3	10/-	6Q7	10/6	12SH7	5/-	10/6	EF39	6/6	
5Z1	10/-	6SA7	9/6	12S J7	6/-	10/6	EF50	5/6	
6AB7	6/6	6SH7	6/-	12SK7	8/-	10/6	EF54	5/6	
6AC7	10/-	6SL7	11/6	12SQ7	3/-	10/6	EF91	10/6	
6AT5	8/6	6SN7	10/6	12V4	7/6	10/6	EL32	7/6	
6AL5	8/6	6SQ7	7/6	15D2	4/-	10/6	EL35	5/-	
6BT	9/-	6SS7	7/6	25L6	8/6	10/6	EL91	8/6	
6B9	7/-	6V9g	9/-	35L6	10/6	10/6	U21	8/6	
6BW6	8/6	6U5	8/6	39 41	5/-	10/6	U77	8/6	

The Ham's Shop with helping hand—G3DBL

NORMAN H. FIELD (Dept. B5), 68, Hurst Street, B'ham. 5.

A SELECTION FROM OUR LIST

NUTS, BOLTS, WASHERS & SOLDERING TAGS

		Packets of		
8Ba x 1" screws	...	12	36	72
8BA x Full Nuts	...	5d.	L/1	2/-
6BA x 1" screws	...	4d.	11d.	1/9
6BA x 1" screws	...	4d.	10d.	1/8
6BA x 1" screws	...	4d.	10d.	1/8
6BA x 1" screws	...	4d.	11d.	1/9
6BA x 1" screws	...	5d.	1/2	2/3
6BA Full Nuts	...	4d.	10d.	1/7
6BA Washers	...	2d.	4d.	7d.
6BA Soldering Tags	...	3d.	8d.	1/2
4BA x 1" screws	...	4d.	11d.	1/9
4BA x 1" screws	...	5d.	1/1	2/-
4BA x 1" screws	...	5d.	1/2	2/3
4BA x 1" screws	...	7d.	1/8	3/3
4BA Full Nuts	...	5d.	1/1	2/-
4BA Washers	...	2d.	5d.	9d.
4BA Soldering Tags	...	3d.	8d.	1/2

All the above are first quality brass, the bolts being Round-head. The soldering tags are tinned, double-ended.

ENAMELLED COPPER WIRE - 1st GRADE

16, 18, 20 S.W.G.	...	2oz.	4oz.
22, 24, 26 S.W.G.	...	1 1/2	2 1/2
28, 30, 32 S.W.G.	...	1 1/2	2 1/2
34 S.W.G.	...	2	3 1/2
36 S.W.G.	...	2	3 1/2
38 S.W.G.	...	2 1/2	3 1/2
40 S.W.G.	...	2 1/2	4

RUBBER GROMMETS

No.	Overall Diameter	Hole Diameter	Centre Hole Diameter	Per Dozen	Per gross
1	1"	1"	5/32"	1-	5/8
2	7/16"	1/4"	3/16"	1-	5/8
3	1/2"	5/16"	3/16"	1-	5/8
4	7/16"	3/16"	3/16"	1 1/2	6/-
5	1 1/16"	1/2"	3/16"	1 1/2	6/-
6	1 1/8"	9/16"	7/16"	1 1/2	6/-

Please add postage on all orders under £2.

All components for the TELEKING, VIEWMASTER and MAGNA-VIEW are still available as previously advertised.

SEND 6d. in stamps for our list now. Details of the WIDE ANGLE VIEWMASTER and SOUNDMASTER will be available shortly

L. F. HANNEY

77, LOWER BRISTOL ROAD, BATH. Tel. 3811

FREE TO AMBITIOUS ENGINEERS!

This 144-page Book

Have you sent for your copy?



'ENGINEERING OPPORTUNITIES'

is a highly informative guide to the best-paid Engineering posts. It tells you how you can quickly prepare at home on "NO PASS—NO FEE" terms for a recognised engineering qualification, outlines the widest range of modern Home-Study Courses in all branches of Engineering and explains the benefits of our Employment Dept. If you're earning less than £15 a week you cannot afford to miss reading this unique book. Send for your copy to-day—FREE!

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

NAME
ADDRESS
Subject or Exam. that interests me
British Institute of Engineering Technology,
409B, Shakespeare House,
171/9, Stratford Place, London, W.1

WHICH IS YOUR SUBJECT?

- Mechanical Eng.
 - Electrical Eng.
 - Civil Engineering
 - Radio Engineering
 - Automobile Eng.
 - Aeronautical Eng.
 - Production Eng.
 - Building, Plastics, Draughtsmanship
 - Television, etc.
- GET SOME LETTERS AFTER YOUR NAME!**
A.M.I.Mech.E.
A.M.I.C.E.
A.M.I.P.E.
A.M.I.M.I
L.I.O.B.
A.F.R.Ae.S.
B.Sc.
A.M.Brit.I.R.E.
CITY & GUILDS
GEN. CERT.
OF EDUCATION
etc., etc.

BIET

A First Course in Wireless

By "Decibel"

Third Edition

This is one of the most popular books ever written on wireless for the beginner. The new edition takes into account the latest developments in radio, radar and television, but the essential character of the book is retained, and fundamental principles are as carefully explained as ever. With 93 illustrations. 12/6 net.

"In clearness and simplicity this book marks an advance in elementary radio literature and forms an excellent introduction to more technical books on the subject."—*Technical Journal*.

Pitman

Parker Street, Kingsway, London, W.C.2

An Improved A.V.C. Circuit

DETAILS OF AN AMERICAN CIRCUIT FOR SCREEN GRID CONTROL

By P. Dodson

FIG. 1 shows a simple detector and A.V.C. circuit employing a single diode, a modification of which is to be found in almost all modern superhet receivers.

On each positive half-cycle of signal voltage, when the diode plate is positive with respect to the cathode, the diode passes current. Due to the flow of current through R1, the diode load resistor, there is voltage drop across R1, which makes the top end of R1 negative with respect to earth. This voltage drop across R1 is applied through R2 and C2 as negative bias to the grids of the controlled valves. Thus, when the signal at the aerial increases, the signal applied to the A.V.C. diode increases, the voltage drop across R1 increases, the negative bias voltage applied to the R.F. and I.F. stages increases and the gain of these valves is reduced.

When the signal strength at the aerial decreases from a previous steady value the A.V.C. circuit acts in the reverse direction, applying less negative bias, and permitting more gain from the R.F. and I.F. valves.

The main disadvantage of this method of A.V.C. is that on strong signals the controlled valves may receive too much bias, and be operated over the curved portion of the characteristic; thus appreciable modulation distortion would be evident and, in the R.F. stages, excessive cross-modulation.

To overcome this the circuit shown in Fig. 2 has been devised. The action of the circuit is different from the one just described. Instead of a negative control voltage, a positive A.V.C. voltage is developed and applied to the screen-grids of the controlled valves. As the control-grid voltage does not change nearly so much as when the A.V.C. voltage is applied to it, the valves are being operated over the most linear portion of the characteristic at all times.

The control valve is a high- μ , sharp cut-off, R.F. pentode. Resistors R2, R3 and R4 make up a voltage divider across the H.T. supply. The junction of R2 and R3 feeds the screen, and the cathode is fed from the junction of R3 and R4. The screen

should operate at its maximum permissible voltage. The cathode should be three to four volts positive with respect to the grid. The size of the resistors should be selected so that the above conditions are fulfilled. R1 is the dropping resistor supplying the screen grids of the R.F. and I.F. valves controlled by the A.V.C. Its value should be chosen so that the screen voltages of all the valves being controlled are normal with no signal. The grid of the control valve is connected to a point which goes positive with increasing signal. This can be the cathode end of the metal rectifier, which is used as a diode detector.

Operation

The operation of the circuit is quite easy to follow. From the description of the diode action, it follows that, as the signal in the aerial increases, the grid of the control valve will be driven more positive. This will cause the valve to conduct more heavily with a consequent drop in the voltage across R1. As the screen grids of the controlled valves are fed from the anode end of R1, this will lower the screen voltage and reduce the gain of the receiver.

When the signal in the aerial decreases the circuit operates in the reverse direction, the screen voltage increasing, with a consequent increase in the receiver gain.

This system of A.V.C. is suitable for controlling the R.F. and I.F. valves, but should not be used to control a single valve frequency changer, as a change in screen volts will result in a change of frequency. However, if a separate oscillator valve is used, the mixer may be controlled.

By using a metal rectifier, such as a WX type, for the detector existing receivers can easily be converted. The control valve can occupy the holder which was used for the detector/A.V.C. valve. The circuit eliminates much of the elaborate A.V.C. network previously necessary with the negative biasing system.

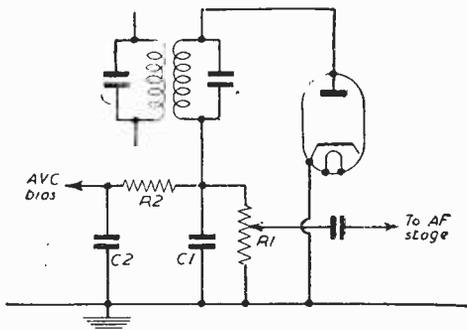


Fig. 1.—Simple diode detector and A.V.C. circuit.

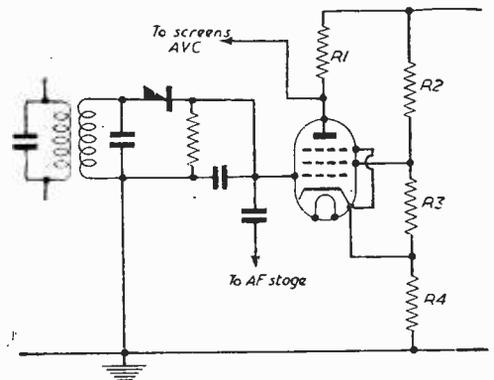


Fig. 2.—Circuit of diode detector and control valve for supplying A.V.C. to screen grids for improved control.

EARTH CONNECTIONS

SOME INTERESTING INFORMATION AND SOME EXPERIMENTS FOR THE BEGINNER

By W. J. Delaney (G2FMY)

THE earth connection is regarded by many amateurs as an "incidental" which can easily be ignored. It is true that in many cases removal of the earth connection apparently makes no difference to the performance of the receiver, and in some commercial receivers the warning not to connect an earth lead has served to give the impression that it is, in fact, unnecessary in modern receivers. It should be remembered, however, that the transmitted signal may be regarded as being in two parts—a ground wave and a sky wave—and depending upon the distance from the transmitter, the weather conditions, time of the day and various other factors, these two waves will arrive at the receiving point at different times and in different strengths. Theoretically, the ground wave is unaffected by weather conditions, etc., whereas the sky wave is reflected from an upper layer which is not constant in height. An aerial system may be regarded as a wire above the ground connected to its "reflection" in the ground through the tuning coil and, strictly speaking, for maximum performance the system should be complete. Absence of an earth connection will mean that only a portion of the system is in use and this should result in weak signals.

Why is it, then, that many receivers seem to operate quite satisfactorily without an earth lead? First of all, in the receiver there is a tuning circuit connected to aerial and earth sockets. This circuit has been designed by the makers to cover a certain band of frequencies when properly loaded, and on some wavebands absence of an earth (or aerial) will affect the band over which the circuit tunes. In most receivers this circuit is tuned by a ganged component which tunes other circuits, to which, under normal operating conditions, no additional connections have to be made. Obviously, therefore, unless the various circuits are properly tuned maximum results will not be obtained, and absence of the proper loading on the aerial circuit will result in a lowered performance. To some extent this is avoided by making the circuit flatly tuned, or otherwise arranging that the actual loading does not make a great deal of difference, but the actual power of the signal which is received does, in fact, depend upon the connections which are made to the receiver.

Some Experiments

If you remove the earth lead from a receiver at present working with one, and the signal strength of a received station increases, try slightly retuning. If the ganged tuning arrangements are not accurately set it is quite possible for the removal of the earth lead to bring the circuits into line and thus give an apparent increase in signal strength. If there is a trimmer across the aerial circuit, therefore, in such a case this should be re-adjusted. Another interesting experiment is to tune in a weak distant station and then remove both aerial and earth and plug the earth into the aerial socket. If the receiver is an A.C./D.C. or D.C. model, care must be taken to ensure that adequate isolating condensers are fitted

or there may be a danger when doing this of damaging the receiver. If the wavelength, distance of the station and other factors are suitable, it may be found that this arrangement will provide a stronger signal than from the aerial itself, proving that the ground wave is stronger, and therefore an efficient earth *plus* the aerial should give an even stronger signal.

The general cause of the earth being regarded as unimportant is because it is inefficient, and this can be due to a variety of causes. The ideal earth connection is a short direct wire to a buried plate in moist conditions, thus giving a low-resistance connection. In flats, etc., it may not be possible to obtain this desirable condition, but where three-point electric sockets are provided the earth connection here should be ideal. A gas pipe is not by any means satisfactory, firstly because joints in the piping are usually painted before screwing up to prevent leakage and as a result may provide high-resistance joints, and secondly, in the case of mains receivers, a leakage may result in arcing at the joints, with risk of fire, if there is a gas leak. A water system, too, can give rise to inefficient working if there are screwed joints between the receiving point and the actual earth. Such screwed joints may also be painted or made with the aid of hemp which, whilst providing a watertight joint, will electrically be very poor. Therefore, if a connection is made to a water system, try to find a pipe which is rising from earth, not going up to a tank or cistern in the roof.

Capacity Earths

Where earth connections are made to gas or water systems which are not effectively earthed the results are obtained by capacity coupling to earth. A popular type of transmitting aerial some time ago utilised what was known as a "counterpoise" earth. The aerial proper was slung between two masts, and below the aerial and a few feet above ground level a similar erection was placed and connected to the earth terminal. Due to its capacity loading it was very efficient, and a similar arrangement may, in flats and similar places, give better results than a long, wandering lead to the ground or a connection to a water system. In fact, in larger types of receiver the metal chassis upon which the receiver is built actually acts in this manner, and if a similar or larger plate of sheet metal is placed underneath the receiver (*not in actual contact with it*) and connected to the earth socket it may be found that this will provide better results than an apparent orthodox connection. An experimental arrangement for use in the larger types of radio-gramophone is to cut two pieces of thin copper or aluminium which will just fit inside the lid, and to place one in this position, connected to the aerial socket, and the other piece to be placed on the floor under the cabinet (under the carpet on which it stands, for instance) connected to the earth terminal. At certain frequencies this will be found to offer all that is necessary and will avoid the necessity of erecting an outside aerial. Similarly,

(Concluded on page 493.)

Five Tips FOR FASTER SOLDERING

TRIGGER-FEED SOLDERGUN

The Wolf Type 51 with its trigger-feed action is indispensable to all modern assembly

GENERAL INDUSTRIAL PURPOSES



Type 21—complete with case, etc., and perfectly balanced easy-grip handle. Heavy chrome finish. Net weight 7 1/2 oz.

FINE INSTRUMENT WORK



Type 31—complete with two bits, one straight and one angular—easily interchangeable. Net weight 6 oz.

FINE TO MEDIUM WORK



Type 41—complete with easily adjustable diagonal bit—the temperature can be controlled by extending or shortening the bit. Net weight 8 oz.

MEDIUM TO HEAVY WORK



Type 71—complete with square section bit, heavy chrome finish, plastic easy-grip handle. Net weight 9 1/2 oz.

EXTRA HEAVY WORK



Type 81—complete with 16 oz. bit and easy-grip plastic handle heavy chrome finish. Net weight 2 lb.

SOLDERING IRONS

Models 21 and 31 also available with straight handles and heat deflecting skirt. Ask for models 22 and 32



* Obtainable from all leading tool merchants and factors.

WOLF ELECTRIC TOOLS LTD

PIONEER WORKS · HANGER LANE · LONDON · W.5
Branches: Birmingham Manchester Leeds Bristol Glasgow Tel. Perivale 5631-4

Use a

BRIMISTOR

for current surge protection

Designed to protect your valves and reservoir condensers by reducing the switch-on surge, the Brimistor is an essential component in modern radio and electronic equipment.

Here are some typical uses:

- (a) Surge suppression in heater chains of A.C./D.C. receivers.
- (b) To assist the efficient operation of dial lamps.
- (c) The protection of rectifier valves and reservoir condensers.
- (d) The delay of H.T. Voltage from directly heated rectifiers.
- (e) Compensation for increase in the resistance of focus coils.

The effect of the Brimistor in a valve heater chain is shown below.

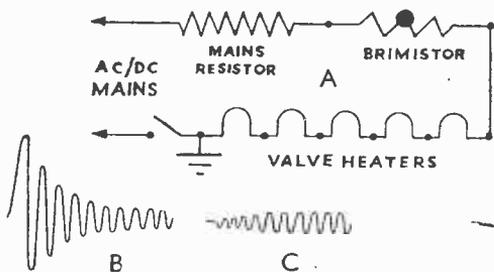


Diagram "A" shows the correct positioning of a Brimistor in the average circuit.

Diagram "B" shows an oscillogram of the normal "switch-on" surge which damages valves and dial lights.

Diagram "C": this oscillogram shows the gentle rise of BRIMISTOR controlled current and complete surge suppression.



Write for your copy of the NEW Brimistor Booklet to Publicity Dept.

Standard Telephones and Cables Limited
FOOTSCRAY, SIDCUP, KENT

Identifying Musical Interval Signals—2

A SUMMARY OF SOME OF THE MORE POPULAR MUSICAL INTERVAL AND IDENTIFICATION SIGNALS USED BY FOREIGN TRANSMITTERS. A SPECIAL ARTICLE FOR THE LONG-DISTANCE LISTENER

THE next country in alphabetical order is Germany, and even greater confusion can be caused here due to the use of certain transmitters by the occupying authorities. In the American zone there are two main transmitters—"Bayerischer Rundfunk" and "Hessischer Rundfunk." The former has two transmissions known as 1st and 2nd programme. The latter is carried out on F.M. and unlike the other uses a musical identification signal in addition to the various announcements which are made in several languages. The programmes are heard on medium and long waves. The musical signal most likely to be heard in the F.M. transmissions is the following :



The Hessischer station radiates from Frankfurt and Meissner on medium and short waves and the interval signal consists of an air from Humperdinck's opera "Koenigskinder," the usual tune being this :



The West Berlin transmitter (Radio in American Sector—RIAS) provides also A.M. and F.M. signals on medium and short waves and uses the following tune as its identification signal :



The call "Hier ist RIAS-Berlin" will also serve to identify this transmission.

Transmissions are also made in Czech and Hungarian, with various calls and on various wavelengths. The Czech transmissions are usually accompanied by the following air :



and the Hungarian by this :



The Slovakian air



may also be heard and will identify the transmissions in this particular sector.

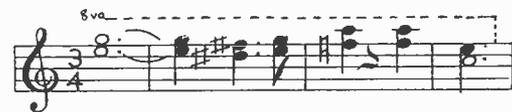
British Zone

In the British zone the main German transmitter is the Nordwestdeutscher Rundfunk, which also, incidentally, has an experimental television transmitter radiating from Hamburg. An interesting point about the interval signal which is used by the NWDR is that the air is taken from Brahms' 4th Symphony but is played by different instruments according to the area from which it is played. The air is this :



From Hamburg it is played on two oboes, from Cologne on two horns, from Berlin on two clarinets, and from Hanover on two trumpets. These will be heard on short waves only.

The British Forces Network will easily be identified as all announcements are in English, but in addition there is a delightful little air played on a celeste. thus :



which most musical readers will recognise as part of "Moonlight on the Alster."

French Zone

In the French zone the most important transmitter is the Südwestfunk, and from Baden-Baden the following motif, taken from Mozart's "Zauberflöte," is used as the interval signal :



From Freiburg the following tune may be heard,



whilst from Tübingen this is the tune which is used :



A further melody is heard from Mainz (Rheinland-Pfalz) and goes thus :



Another melody may be heard from Saarbrücken as 211.1 metres and is the following :



In the broadcasts from the German Democratic Republic, which also includes a number of F.M. stations, there are two tunes which are often heard as interval signals, the actual instrumentation varying not only from transmitter to transmitter but also apparently from time to time. The following are the two usual airs which are heard :



Owing to the political situation it is not possible to make any definite recommendations regarding certain transmissions, although the main transmitters appear to remain constant. A signal, for instance, on the following lines :



may sometimes be heard from Leipzig on 287.6 and 30.83 metres. It may be heard on a xylophone or bell-like instrument.

Greece

The National Broadcasting Institute radiates on medium and short waves, and the transmissions come from several stations and are referred to as Home and Foreign service transmissions. On the short waves the interval signal most likely to be heard is an air from a folk-dance played on a clarinet :



(To be continued.)

Book Received

"**RADIO Designer's Handbook.**" 4th Edition. Edited by F. Langford-Smith, B.Sc., B.E. (1st class honours), Senior Member I.R.E. (U.S.A.), A.M.I.E. (Aust.). Published by Iliffe & Sons, Ltd. Price 42s. (postage, 1s. 6d.). 1,474 pages.

This is a comprehensive reference handbook for all who are interested in the design and application of radio receivers and audio amplifiers.

Previous editions of "Radio Designer's Handbook" have achieved exceptional success, many thousands of copies having been sold throughout the world. The work deals in detail with basic principles and the practical design of all types of modern radio receivers, audio amplifiers and recording-reproducing equipment.

This fourth edition is more than four times as large as the previous edition and is the work of 10 authors and 23 collaborating engineers, under the editorship of F. Langford-Smith. The enormous amount of data it contains has been made readily accessible by means of a fully-detailed list of contents and a very complete index. The book is a self-contained source of information but exhaustive bibliographies are provided.

The main subjects are : valves and valve testing ; general theory and components ; audio frequencies ; radio frequencies ; power supplies ; design of complete A-M and F-M receivers ; and reference information.

CLUB NEWS

RAVENSBORNE AMATEUR RADIO CLUB

Hon. Sec. : Mr. W. Wishaw, 4, Station Road, Bromley, Kent. THE club meets every Wednesday evening at 8 p.m., at Durlham Hill School, Downham. The club transmitter G3HEV has now QSO'd 125 stations on four bands A1/3 in 12 countries. Morse practice is given. Equipment includes : 6V6-CO-6V6 PA ; 6AC7-6AC7-T111 PA ; Edystone 640RX, Denco RX, class D wavemeter and 200ft. marconi aerial.

New members welcomed. It is also proposed to visit places of interest in the radio sphere.

SOUTH MANCHESTER RADIO CLUB

Hon. Sec. : M. Barnsley (G3HZM), 17, Cross Street, Bradford, Manchester, 11.

THE Radio Amateurs Examination Course has now commenced, and is held every Monday night at headquarters. Time 7.45 p.m. Persons interested are invited to attend.

The Annual Direction Finding Contest is about due and arrangements are in hand to see if it can be held this month.

GRAVESEND AMATEUR RADIO SOCIETY

Hon. Sec. : R. Appleton, 23, Laurel Avenue, Gravesend.

AT the Special General Meeting, held in May, Eric Woods (G3FST) asked to be released from his office of chairman, owing to pressure of work. Leslie Belger was elected in his place.

Three members sat for R.A.E. on May 1st last. Medway and Grays Clubs have been invited to a lecture on T.V.I.

ENFIELD RADIO SOCIETY

Hon. Sec. : F. A. Tickell (G3ICV), 10, Cowdrey Close, Enfield.

THE above club has just moved into new quarters, and although the meetings at the moment are informal, a varied programme is being arranged which will include at least two field events in the near future.

The Secretary would like to hear from any new members in the district and from older members who have not been contacted.

Programme Pointers

By MAURICE REEVE



Talks

SIR COMPTON MACKENZIE has recently become a radio star of the first importance. Amongst other things he has made us realise that, in not having come forward as such years ere this, we have been denied a personality of the greatest charm, force and culture. He is that rare being, someone who talks with us instead of constantly at us. He makes us feel we are being privileged to share his experiences with him, and many of those experiences are well worth the sharing.

There are two first class Mackenzie features now running concurrently: a radio adaptation every Sunday evening of his early eighteenth century romance, "The Passionate Elopement": and on Tuesdays "Beaux and Belles," recollections of Edwardian songs, shows, dances and personalities. Both are very gay, colourful and nostalgic entertainments. Early in life, Sir Compton made himself a master of both English and the eighteenth century—the century which gave us Tom Jones. Sir Peter and Lady Teazle, Clarissa, Pamela and a galaxy of other charmers of both sexes—to such an extent that not only did "The Passionate Elopement" first see the light, but passages from it were included in *The Oxford Book of English Prose*.

Sunday Evenings

Its presentation on Sunday evenings suffers from the same *malaise* that all the serials do, inseparable, perhaps, from the change of medium and the twelve "signings on" and "signings off." The latter, however, are reduced to the minimum by the enchanting voice and personality of the author's sister, Fay Compton, a radio star in her own right. The memories revived by "Beaux and Belles" are very vivid to quite a number of us, and are charmingly recalled by a number of well-chosen artists, a weekly guest star of Sir Compton's, and, of course, Sir Compton's gracious and infectious personality, knitting the whole thing together most admirably. May we have plenty more of Sir Compton Mackenzie please.

"Coronation Concert"

The concert I heard in the "Coronation Concert" series was devoted to three works by British composers, Vaughan Williams, William Walton and the late Gustav Holst, with William Primrose the brilliant soloist in the Walton viola concerto. It made me realise how British music has flourished during its renaissance of the last fifty years. With even greater masters such as Elgar, Delius, etc., listening, as it were, from the wings, whilst—to continue the metaphor—Sullivan and German, etc., were acting as ushers, there was still sufficient material to make up an opulent programme.

Music Criticism

To the Third Programme intelligentsia the six Studies in Music Criticism, arranged by William

Glock, are absorbingly interesting. I heard the third in the set, "Late Beethoven," which was preceded by the Element String Quartet rendering the immortal Op. 131 in C sharp minor.

"Our Island Music"

The third musical event I signal out for mention is Stephan Williams's series (on records), "Our Island Music." A very mixed bag, but well compiled and documented. So far it has been classified under the headings, "Brass Bands," "Songs," "Opera," "In the Home," "Poets in Songs," "Light Opera Stage" and "Songs that Made History." The interest has been maintained throughout.

"Variety Playhouse"

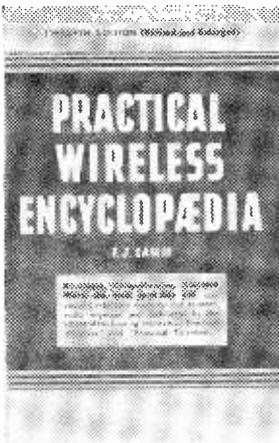
The Saturday evening "Variety Playhouse"—"Music Hall's" latest title—has taken on yet a new lease of life with the assumption of the mastership of ceremonies by Vic Oliver. We can only hope that these duties will not prevent Mr. Oliver introducing himself in what must surely be radio's best music-hall turn.

Plays

There were so many departures from the original story in Terence Rattigan's and John Gielgud's dramatisation of "The Tale of Two Cities" that it is difficult to know just where to begin a criticism. The whole thing has been bedevilled ever since the authors of "The Only Way" magnified out of all proportion Sidney Carton's and Charles Darnay's physical resemblance and change-over in prison, so that Martin Harvey could have a star acting vehicle. All adaptations of the great book distort this episode which, in Dickens, is not even hinted at till three parts of the way through. And when Carton does eventually take Darnay's place under the guillotine's knife, it is not the sacrifice of a lover for a lady who prefers another—if it was, Carton would be the greatest of all lovers, which he most certainly is not—but an easy and spectacular way out for a shiftless and good-for-nothing, if charming, waster.

The whole centre and purpose of the story is the French revolution and nothing else. And the two greatest characters, and two of the glories of all Dickens, are Monsieur and Madame Defarge. Gerry Cruncher is not missed because he is very minor Dickens. Here I disagree with the writer in *The Radio Times*. Nevertheless, it made good entertainment for those who do not mind Dickens diluted, and it suited Eric Portman down to the ground.

Miss Rebecca West continued the delightful series of unscripted interviews. Rene Cutforth's "London Journey" was good but too long. The bus conductors were very poor imitations. I will not say whether this is flattering the originals or not.



... standard radio books with a world-wide reputation

... just five books—
by F. J. CAMM, editor of this
journal—from the Newnes technical catalogue
(see list below for details and other titles)

PRACTICAL WIRELESS ENCYCLOPÆDIA

F. J. Camm 12th Edition 21s. net

PRACTICAL WIRELESS SERVICE MANUAL

F. J. Camm 9th Edition 8s. 6d. net.

EVERYMAN'S WIRELESS BOOK

F. J. Camm 11th Edition 12s. 6d. net.

NEWNES SHORT-WAVE MANUAL

F. J. Camm 7th Edition 6s. net.

NEWNES RADIO ENGINEER'S POCKET BOOK

F. J. Camm 10th Edition 5s. net.

RADIO TRAINING MANUAL

F. J. Camm 7th Edition 6s. net.

WIRELESS TRANSMISSION

F. J. Camm 8th Edition 6s. net.

WIRELESS COILS, CHOKES AND TRANSFORMERS

F. J. Camm 8th Edition 6s. net.

Q. & A. ON RADIO AND TELEVISION

E. Molloy 4th Edition 5s. net.

RADIO ENGINEERS' SERVICING MANUAL

General Editor : E. Molloy, Advisory Editor : W. F. Poole 42s. net.

OUTLINE OF RADIO

Edited by E. Molloy 21s. net.

THE MATHEMATICS OF WIRELESS

Ralph Stranger 3rd Edition 7s. 6d. net.

From all booksellers—



or in case of difficulty use this special C.O.D. Order Form.

Please send me cash on delivery the following NEWNES Radio Books.

Title {
.....
.....

Name

Address

Post to-day to George Newnes, Ltd. (Book Sales Dept.), Tower House, Southampton Street, London, W.C.2. Send no money now—simply pay on delivery plus the normal C.O.D. postal charges.

PW 8/53

OPEN TO DISCUSSION

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Beginners Transmitter

SIR,—I thought that you may be interested in my version of the "beginners transmitter" details of which were given in the May issue of PRACTICAL WIRELESS. Not having an ex-U S tuning unit to spare, I made the chassis from 16 gauge aluminium, having the completed job "black cracked" for a few shillings. Facilities are available for switching in the 80 and 40 metre bands at a later date, but as it stands, the circuit is yours, but for two slight modifications. A 6SH7 was tried in the oscillator stage, but with the 350 volts supply available, the tube ran very hot, and the frequency drifted badly. To stop this, two VR150/30's, with a resistor in series were placed across the 350 volts, and the anode supply for the oscillator taken from their mid point—150 volts. With this arrangement, the 6SH7 would not oscillate, and was replaced by a 6AC7, which works extremely well. The other modification was designed to help my one and only 807 to a ripe old age, namely a thermal delay valve, which switches the 807's H.T. on after an interval of 50 seconds. This valve can be seen in centre foreground of the photograph, whilst the 6AC7 and the two VR150's can be seen in the left side compartment.

Since the photographs were taken, the white ceramic former has been rewound to act as the aerial loading coil, along with the condenser underneath. The split stator condenser in the tank circuit was paralleled to give the required capacity, per your original diagram. A point is that the three coil cases in the oscillator contain the 80 and 40 metre coils, but have not yet been wired up.—H. N. KIRK (Rotherham).

Correspondent Wanted

SIR,—I would like, through your very good magazine, to correspond with another boy who is 16 years old. I am a regular reader of PRACTICAL

WIRELESS and though I sometimes find it a bit too advanced for me, I intend to become a ham before very long.—H. M. WILSON (Leuchars).

The Amateur Transmitter

SIR,—I would like to thank Mr. Cole for his letter in the June issue of PRACTICAL WIRELESS. At last someone has the courage to put forward an argument for the would-be transmitter! As a reader of your paper for some years now, I have often wondered why the P.M.G. requires an intending "ham" to pass a Morse test and the City and Guilds exam. If the TX is crystal controlled and the

operator complies with all the regulations, what more is needed?

Under the present conditions amateur radio is only for those who have the time and money to study for their licence. Let us have a better deal for the novice, who is the true "amateur" in amateur radio.—KENNETH FRASER (Fife).

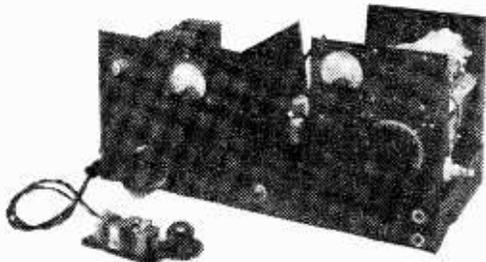
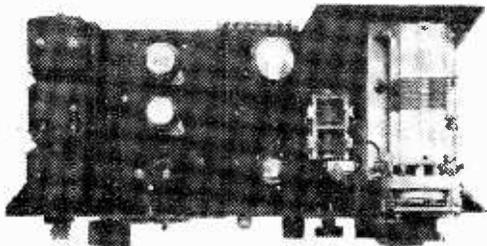
SIR,—With regard to Mr. H. Cole's letter (June issue), may I, as an ex-Leading Telegraphist (Royal Navy) venture some remarks on the use of Morse.

As any experienced operator will tell you, Morse transmissions are often readable through a high level of QRN or QRM which would render speech modulation absolutely unintelligible (and using less power). That is why Morse is favoured—especially on the congested channels available for H/F ship-to-shore traffic.

As to why the P.M.G. insists on amateurs possessing a good knowledge of Morse, surely it is evident that the amateur should be able to distinguish that he or the person he is working, are not causing interference to essential services on adjacent channels.

Alternatively, there have been occasions where

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



Two views of Mr. Kirk's transmitter built from details given in these pages.

the amateur has been of great value (through ability to read Morse) in intercepting distress signals, etc., which for some reason or other (skip distance, etc.), have not been received by the proper authorities.

He mentions an allocation of VH/F or UH/J. bands to "speech only" enthusiasts, surely a very limited field, precluding any DX work, which is the chief joy of the amateur I understand.—A. F. THOMPSON (Banchory).

[Many other letters have been received in the same strain, and obviously a really keen amateur would be prepared to understand and try to perfect every branch of his hobby.—ED.]

Quality Amplifiers

SIR,—Reading your article, "The 'Modern' High-power Quality Amplifier" (March), I wondered if any readers have seen the American modification of the popular Williamson circuit. A new output transformer, with tapped primary for screens, has been used in this. Valves 807, 5881, KT66 can be worked in this "ultra linear circuit."

Output increased from 15 w. for 2 v. input to 30 w. 1 v. input, at levels of 1-2 w. The intermodulation is in vicinity of .06 per cent. at 13 w., .3 per cent. at 20 w. approx. 1 per cent. power 450 v. at 130-140 mA.

I should like to see an article on design and construction of P.P. output transformers, such as inductance required, and easy formulae for number of turns and type size of stampings. Seems most books can only bother to give method of finding turns ratio.—R. ALLEN (Wellingboro').

A Multi-range Tester

SIR,—I was interested in the article by E. N. J. Marguerit on the multi-range tester. It is definitely the type of article that helps the amateur to get the best out of radio. The possession of a good meter, such as this, is essential, but in many cases too expensive. Here we have a first-class meter at reasonable cost.

The method of measuring the resistance of the meter is very similar to the one used in our laboratory. The power supply we use is a variable one, covering 100 to 400 volts; it is stabilised, but has no reference standard. The resistors used for those in series are of the Dubilier high stability carbon type of ample wattage rating. The variable resistor shunted across the meter is a resistance box that can be altered in steps of 1 ohm. Resistance readings are taken at three points on the scale, $\frac{2}{3}$, $\frac{1}{2}$ and $\frac{1}{3}$ deflection. The resistance of the box is then double, equal and half the meter resistance. The taking of the three readings and taking of the average reduces the error of the resistance calculations.—JAMES S. KENDALL (Kendall and Mousley) (Tipton.)

L.F. Couplings

SIR,—After reading Mr. Bryan A. Cox's letter in the July issue I am not sure whether I wrote too little or too much in my article on A.F. transformers (May issue). I could have gone on to give practical examples to illustrate the principles I stated; on the other hand, it is evident that what I did write was too much for Mr. Cox to read in its entirety. Two points seem basic in his letter:

(a) He has missed the whole point of my article,

which recommended giving transformers their *rightful* place, which is certainly not to replace a capacitor and resistor costing much less. I did not suggest that. Maybe Mr. Cox has never met an equipment in which the supply section constitutes the major part of weight and cost. In such equipments, proper design and/or use of A.F. transformers would often save a lot on the supply side, resulting in lower overall cost, weight and bulk.

(b) He makes the common mistake of thinking most other people have the same viewpoint as himself; the letters in "Open to Discussion," as well as many I receive, show that *some* people like to be original. Also those clever people who design for others to make *occasionally* read what someone else has written. Bad choice of values for circuits in which transformers are used is a fault not confined to constructors, but also applies to many professional designers—including transformer manufacturers themselves.

To the bigot, an open-minded man is bigoted, because he disagrees. That is the only basis on which I can see Mr. Cox's allusion to my "passion" for transformers is justified. I say use a transformer where it is the best component to use, rather than using an extra valve and bigger mains transformers and chokes to avoid using it. I also say use the capacitor and resistor where that is the best and cheapest arrangement. *But consider each case on its merits.*—N. H. CROWHURST (S.E.27).

Transistors

SIR,—Re Mr. Law's most interesting and helpful letter on this subject, when these transistors are available in this country, is it too much to hope that British manufacturers will agree to some *definite standardisation of fitting, mounting and connecting?*

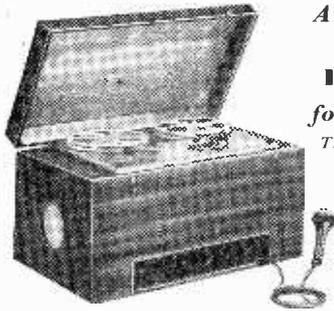
Not only to avoid ruining these valuable instruments by wrong connections, as Mr. Law so aptly explains, but to save the radio fraternity the unending nightmares caused by literally hundreds of valve types, valve patterns, valve shapes and base connections. To say nothing of servicing sets with valves of unheard of types. Why on earth must English octal valve bases and holders be different from American? Many English manufacturers who, as Mr. Law points out, have shown lamentable weakness for individualism over standards and identification figures and letters, must long ago have defeated their own objects. Is it really too late to rectify all this chaos?—A. J. SWEENEY (Gloucester).

(Concluded from page 482.)

if an indoor aerial is fitted, say, round a picture rail, a similar wire running along the skirting board connected in place of an earth lead may also provide better results.

Warning

In any experiments with earth connections in A.C./D.C. or D.C. receivers the greatest care is necessary, as one side of the mains forms the H.T. connection and may be in contact with the chassis or "earth" socket, and apart from damage to the receiver or fuses there may actually be a risk of personal injury of a serious nature. As a general rule, a direct earth connection should not be made to these types of receiver and the maker's instructions should be carefully studied in this connection.



**A Professional
TAPE
RECORDER**
for only 32 gns!
THE REMARKABLE
BURGOYNE
DUAL TRACK
TRANSPORTABLE
TAPE RECORDER

We are proud to offer to-day's greatest value in tape recording—built to professional standards and giving greater reliability and performance. Now being demonstrated at the Radio Centre.

- 64 mins. playing time from a standard 7in. reel—dual tracks.
- Instantaneous braking of tape reels.
- Fast forward and rewind.
- Record/Playback change-over switch with visual indication of position.
- Frequency response 30-9,000 c/s at 7½ in. per second.
- Supplied with Ronette high-fidelity crystal microphone.

These and many other outstanding features are incorporated in this wonderful instrument.

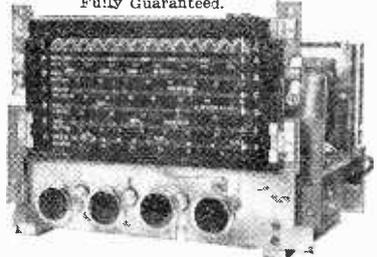
Price 32 gns. with crystal microphone or H.P. terms £11.4.0 deposit and 12 monthly payments of 42/9. Carr. and packing 21/-.

DON'T take our word for it—come and **HEAR** this amazing instrument!

M. O. S. MAIL ORDER SUPPLY CO.
33, Tottenham Court Road, London, W.1.

DIRECT FROM THE MANUFACTURER

DULCI RADIO/RADIOGRAM CHASSIS
A/C 100-120 & 200-250 VOLTS
Fully Guaranteed.



All chassis 11in. x 7in. x 8in. high. Latest type valves 6BE6, 6BA6, 6AT6, 6DW6, 6X4. Flywheel tuning. Negative feedback over entire audio section. Engraved knobs.

Model B3. Three Wavebands, Long, Medium, Short. Gram. switching on W.Change switch. **£12/12/0**
3 Position Tone. Price, Tax Paid

Model B3. Plus Push Pull Stage. As B3 with extra valve 6BW6. Output 6 watt max. Consumption 55 watt. Price, Tax Paid **£15/15/0**

Model B. Six Wavebands 11-115 metres continuous in 5 ranges (4 BANDSPREAD) and MW.185-550m. Six Position Tone Switch (3 radio-3 gram). Price, Tax Paid **£15/15/0**

**BUILT TO HIGHEST PERFORMANCE
STANDARD & SPECIFICATION**

Escutcheon for 9in. x 5in. dial, 4/9 extra. Matching speakers P.M. type 3 ohms, 8in. or 10in. available. Chassis sent under money back guarantee conditions against remittance. Free particulars from—

THE DULCI CO. LTD.,
99 VILLIERS RD., LONDON N.W.2. Telephone: Willesden 7778

CLYDESDALE

Bargains in Ex-Services Radio and Electronic Equipment



For the Intermittent-fault Finder ("P.W." Jan. issue)
TYPE I.—VISUAL INDICATOR
Ref. : 100/2. For R1155 D.F. Section.

Dual reading, Left/Right D.F. meter, 2½ in. scale. Dim. : 3½ x 2½ in. overall, 4-hole fixing, 2½ x 2½ in. between centres. In used condition.
ASK FOR **12/6** Each POST
No. P/H862A

Also a few in original cartons.
ASK FOR **21/-** Each POST
No. P/H862

DRIVER TRANSFORMER for ET-4336 **TRANSMITTER**
Ref. No. 110K/117, part XT-3202

Centre-tapped primary. Inductance 3.4 henries. Two Secondaries, Inductance 14 henries each. Ratio whole primary to one secondary 1-2 approx. Dim. : Ht. 4½ in. x 3½ in. x 3½ in. Weight 6½ lb. 4-hole fixing.
ASK FOR **18/6** POST
No. P/E562

LOOP AERIAL. Type 17. REF. 10D/16950

This aerial has wiper contacts, a ball race, also spring clip device for mounting. Complete with scale marked 0-350 degrees. (No housing.) Weight 2½ lb.
ASK FOR **£11.10** POST
No. P/H938

TRADE ENQUIRIES INVITED
GENEROUS DISCOUNTS — GOOD BARGAINS

Order direct from :

CLYDESDALE SUPPLY CO. LTD.

2, Bridge St., Glasgow, C.S. Phone: SOUTH 2706/9
Visit our Branches in Scotland, England and N. Ireland.

CORONATION OFFER !

★ The coupon below will save you MONEY!

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

To mark the Coronation International Correspondence Schools offer their standard Home Study Courses at specially reduced fees for a limited period only. These include **RADIO ENGINEERING · RADIO SERVICE ENGINEERING · RADAR · ELEMENTARY ELECTRONICS · ADVANCED SHORTWAVE 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.

But **ACT NOW**—Don't miss this chance of obtaining an I.C.S. training at reduced fees! Fill in the coupon, stating the subject in which you are interested, and **POST TODAY.**

Dept. 170C, I.C.S., 71 Kingsway, W.C.2.

INTERNATIONAL CORRESPONDENCE SCHOOLS

(Dept. 170C), International Bldgs., Kingsway, London, W.C.2.

I am interested in your Coronation Offer.

Please send **FREE** Book on.....

Name..... Age.....
(Block letters, please)

Address



Since 1945 I.C.S. have trained 150,000 ambitious men.

VALVES. 6J3, 6SN7, 6BW6, 6BA6, 6BE6, 6AG, 6SL7GT, 6K8C, 6K8CT, 6L6MET, 12B6B, 12BA6, 807, OC3-VR105, EF39, 5Y3GT, 9/6, PEN 383, VP133, 12SG7, KT56, 12 6, EF37A, 15, 17, 17A, V570, V510A, VU503, CV57, CV18, 8012, KT741, 6N7GT, VT501, 6V6G, 6V6GT, 6A176, 6AM6 (EF91, Z77, 6P12, 8-, EF92 (W77, 9D6), IT1, IS5, IS4, IU5, 3A4, 3V4, 6AG5, 7 6, 6B8G, 6B8MET, PEN45, 12SL7GT, 12J5CT, 12SH7GT, PEN29, 6AL5 (EB91, D77, 6D2), 6 6, VR08, VG1128, VR137, VR56, 129A, 1625, 1ASGT, 5 6, 7193, VR51, VR92 (EA50), 2 6.

VALVEHOLDERS. Int. Octal Amphenol, 2/6 for 3, or Stripped 1.6 for 3. EF50 Ceramic or Micalox, 1/6 for 3. Mazda Octal Paxolin or Amphenol, 1/6 for 3. B8A Amphenol with Base Screen, 2/6 for 3. British 4-pin Ceramic or Amphenol, 1/- for 2. UXT-1 Pin Ceramic, 2/6 for 2. UX 5-pin (for 807, etc.), 1/6 for 2. British 5-pin high voltage type, 1/6 each. EA50 Diode type, 4d. each. VCR97 Base, 2/6 each. EF50 valve retainers, screw type, 1/- complete.

THROAT MIKES. moving iron, 2/6.

NEONS. 200 220 volt S.B.C., 2/6.

RECORDING HEADS (Direct Disc), high resistance, chrome plated, last few to clear at silly price, 12/6.

METERS. 0-500 microamps, 2 1/2 in. diameter, M.C., 17/6.

METERS. 840-0-840 microamps, 3 1/2 in. diameter, 12/6.

ROTARY TRANSFORMERS. Converted in 5 minutes to fractional H.P. Mains motor. With gear box. Blower, etc., 15/-.

BLOWER MOTORS. 271 volt, 24 volt, 12 volt A.C. or D.C. All at 12/6 each. Please state type required.

SIGNAL GENERATOR TYPE 22. with 6 volt vibrator, Pack, 35/-.

SWITCHES. Rotary Stud type, 2 pole 36 way. Contains 42 High Stab. Resistors, 15/-.

CHOKES. 20 H.v. 10 m.a. Approx. 2 1/2 in. x 2 1/2 in. Brand New, but soiled, 2/6 each or 12/6 for 6.

J. B. SERVICE (BEXLEYHEATH) LTD.,
5, Mayplace Road West, Bexleyheath, Kent

ARE YOU STUCK? for a ROTARY CONVERTER, obsolete VALVES, M. Ampmeter, Voltmeter, Wavemeter or Selenium Rectifier.

TRY LAWRENCE FRANKEL MAIL ORDER,
134, Cranley Gardens, N.10.
Tel: TUDOR 1404 or GLI 5641.

★ An Interesting Design For The Home Constructor ★
THE "TWIN" ONE-VALVE POCKET RECEIVER

This interesting circuit is designed around the famous "twin" valve now available as a British midget type operating from dry batteries. The receiver requires no aerial, earth, or external power supplies, the batteries being entirely self-contained. As a result of the use of midget components, and the elimination of tuning coils, the set when not in use slips easily into the jackie pocket. This receiver can be used anywhere, indoors or out, giving powerful headphone reception of many stations on the medium waveband. It can also be adapted for long waves. Full Instructions, Circuit, Point-to-Point Wiring Diagram, and Component List

PRICE 3/6 POST FREE

This offer applies only to Gt. Britain, Irish Republic, and Northern Ireland.

SWIFT RADIO (W),
137, COTHAM BROW, BRISTOL, 6
ORDERS BY POST ONLY.

COMMUNICATIONS RECEIVER R.1155. The famous ex. Bomber Command Receiver known the world over to be supreme in its class. Covers 6-wave ranges 15.75 mc/s. - 7.5-30 mc/s., 1500-900 kc/s., 500-200 kc/s., 200-75 kc/s., and is easily and simply adapted for normal mains use, full details being supplied. Aerial tested before despatch these are BRAND NEW AND UNUSED IN MAKERS' ORIGINAL TRANSIT CASES, ONLY £11-19-6.

A few used receivers, also tested working before despatch, are available at £7-19-6. A few of the R.1155 N model can also be supplied. This is the latest version which covers the Travler Bands, and in addition is fitted with ultra slow motion tuning. Used, but tested working before despatch, ONLY £17-19-6.

A factory made Power Pack, Output Stage and Speaker, contained in a black cracked cabinet, to match the receiver, can be supplied at ONLY £5.10.10. Operates receiver immediately.

DEDUCT 10/- IF PURCHASING RECEIVER & POWER FACTOR CORRECTOR. Please add carriage costs of 10/6 for Receiver, and 5/- for Power Pack.

R.F. UNITS TYPE 26 & 27. The very popular variable tuning units, which use 2 valves EF54 and 1 EC52. Type 26 covers 60-50 mc/s (5-6 metres) and Type 27 covers 95-65 mc/s (3.5-5 metres). BRAND NEW IN MAKERS' CARTONS, ONLY 59/6.

VIBRATOR UNITS, 2-VOLT TYPE. American made, delivers 67 volts at 4.7 m.A., 130 volts at 22 m.A. and 144 v. L.T. Easily adapted for use with any battery receiver, full details being supplied. ONLY 50/- (postage 2/-).

6-VOLT TYPE, made by the National Co. of America for use with HRO Comm. and IBC receivers, supplying 185 volts at 25 m.A., fully smoothed D.C. Complete with vibrator and 6X5 rectifier in black crackle cabinet, size 7 1/2 in. x 7 1/2 in. x 6 1/2 in. ONLY 39/6.

INDICATOR UNIT TYPE 62A. Contains GUR7 tube with mu metal screen, 12 valves EF50, 4 of SP61, 3 of EA50, and 2 of EB31. Built on a two deck chassis containing hundreds of condensers and resistors, potentiometers, etc. IN BRAND NEW CONDITION. IN MAKERS' P.B.A. N'S 1/T CASE. ONLY £7-10-0 (carriage, etc., 9/6).

ADMIRALTY TEST SET TYPE 8E2. For 160/230 mcs, this contains standard 230 230 v., 50 c. AC Mains power pack, 2 in. 500 microamp meter, and 7 valves as follows: 2 each 6X5 and EA50, 1 each 6X5, VR137, CV172. Fitted in metal lined wood case with removable front. ONLY 50/- (carriage, etc., 10/-).

6-VOLT BATTERIES 90 A.H. By famous American makers. They have genuine high capacity cases and are BRAND NEW & UNUSED IN MAKERS' PACKING. Size 8 1/2 in. long x 6 1/2 in. wide x 7 1/2 in. high. ONLY 59/6 (carriage, etc., 7/6).

208 AMPLIFIER. Ideal for conversion into a high gain TV pre-amp. Complete with 2 valves EF50. ONLY 15/- (postage, etc., 1/6).

TRANSFORMERS E.I.T. Upright mounting.

E.H.T. for VCR37 Tube, 2,500v. 5 mA. 2v. 2-2v. 1.1 a., 2v. 0-2v. 2 a. ... 37/6
E.H.T. 5,500v. 5 mA., 2v. 1 a., 2v. 1 a. ... 72/6
E.H.T. 7,000v. 5 mA., 4v. 1 a. ... 82/6
Please add 2/- per transformer postage.

6 in. MAGNIFYING LENS FOR M197 TUBE. First grade oil filled. ONLY 25/- (postage, etc., 2/-).

TELESCOPIC AERIAL. Pulls out of metal tube, 15 in. long to 73 in. BRAND NEW. ONLY 7/6 (post 10d.).

GERMANIUM CRYSTAL DIODES 4 6.
CHANGED POTENTIOMETERS. Double 50 K. and Double 1 Mez., 7/6 ea.
CERAMIC 2-WAY 3-BANK SWITCHES. 7/6 ea.

TRANSFORMERS. Manufactured to our specification and fully guaranteed. Upright mounting, fully shrouded, normal primaries.
325v. 0-425v. 200 ma. 6.3v. 4 a., 6.3v. 4 a., 5v. 3 a. ... 59/-
350-0-350v. 190 ma., 6.3v. 6 a., 6.3v. 4 a., 5v. 3 a. ... 42/6
250v. 0-250v. 100 ma., 6.3v. 6 a., 5v. 3 a., 42/6
Please add 2/- per transformer postage.
Cash with order, please, and print name and address clearly. Amounts given for carriage refer to inland only.

U.E.I. CORPORATION
138 Gray's Inn Road, London, W.C.1

(Phone TERMINUS 7937)
Open until 1 p.m. Saturdays. We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.)

ELECTROLYTICS

recent manufacture, not Ex-Gov.

Tubular		Cyl. al. can.	
8mf, 150v. B	1/3	16-16mf, 350v. D	2/-
8mf, 200v. T	1/6	16-16mf, 500v. D	5/6
8mf, 500v. D	2/6	32-32mf, 275v. D	2/9
16mf, 500v. D	3/3	45mf, 350v. T	6/-
25mf, 25v. T	1/2	40-40-30mf, 275v. D	3/3
25mf, 25v. D	1/4	24-24-24mf, 350v. D	3/6
25mf, 50v. D	1/9	60mf, 350v. T	5/-
250mf, 25v. B	2/3		

D=Dubilier, T=T.C.C., B=B.E.C.

25 std. value resistors all different	5/-
20 mixed condensers 10pf-1mf...	5/-
Germanium Xtal diodes	2/3
Germanium Xtal diodes (in wires)	1/6
G.E.C. selenium rectifiers, 230v. 30ma.	7/6
Mumetal shield, 100 x 45 x 1mm.	1/3
3-gang .0005mf	3/-
30pf mica trimmer	8d.
Plessey vibrator 12v. 4-pin 1214	6/6

Tubulars, metal cased. 1mf, 250v., 9d.; .1mf, 600v., 1/-; .1mf, 500v., 10d.; .1mf, 350v., 7d.; .05mf, 500v., 9d.; .02mf, 750v., 9d.; .01mf, 1,000v., 10d.; .001mf, 1,000v., 9d.

Silvered mica. 10, 12, 15, 18, 20, 22, 25, 30, 33, 50, 82 and 100pf, all 3d. each.

Coil pack, with diagram, 7-short waves, medium and long completely wired, 20/-; other items include switches, cabinets, etc.

All Goods Guaranteed—All New.

REBUS ELECTRIC LTD.

GLADSTONE PLACE,
NEWTON ABBOT, DEVON Tel. 1824

MORSE CODE Training

Send for the *Candler BOOK OF FACTS*
it gives details of all Courses which include a Special one for securing Amateur Licence.
CANDLER SYSTEM CO., Dept. 5L0
52b, Abingdon Road, London, W.8.
Candler System Co., Denver, Colorado, U.S.A.

CITY OF COVENTRY EDUCATION COMMITTEE
COVENTRY TECHNICAL COLLEGE
Session, 1953-54

ELECTRONIC ENGINEERING

Applications are invited for entry to the next 3-year full-time course commencing in September, 1953, from those requiring a comprehensive training to an advanced level in ELECTRONIC ENGINEERING, to qualify them for technical posts in radio, telecommunications, television and industrial electronics. The syllabus will cover the requirements of C. & G., Brit.I.R.E., and I.E.E. examinations. Entry age 16 years or over. Application forms and further information available from the Principal, Coventry Technical, College.

W. L. CHINN, M.A.,
Director of Education
Council House, Coventry.

News from the Trade

H.M.V. Record Cabinet

THE record-filing cabinet illustrated below forms a worthy housing for a library of gramophone records. It has a capacity of over 700 records of all sizes and types, including the new 7in. 45 r.p.m. records, for which there is a special centre section. It will also take every type of record album.

The doors are of the folding type with centre hinges; a lock and key are provided.

As will be seen from the illustration, this cabinet, finished in highly polished, figured walnut, is a most distinguished article of furniture and fully representative of the fine craftsmanship for which "His Master's Voice" have always been renowned. The overall size of the cabinet is 33½in. high, 34½in. wide, 17½in. deep. Price 28 gns. (tax paid).—The Gramophone Co. Ltd., Hayes, Middlesex.

New Ever Ready Portable

THE latest all dry portable is the "Sky Queen," which has been designed around the new low-consumption valves combined with the new Ever Ready radio battery "Batrymax" B.136, which is of advanced construction compared with other radio batteries. The whole object of the new set is to reduce the cost of battery-operated radio listening—the "Sky Queen" operates at less than three farthings per hour.

The set is of handsome appearance, looks expensive, but is reasonably priced.

The cabinet is of strong wood covered with good quality grey imitation lizard skin leatherette. Loudspeaker grille of convex shaped expanded metal gold finish, surrounded with cream plastic fillet. Folding clear Perspex handle and clear opening scale. The aerial is a self-contained directional loop. The circuit is a four-valve superhet covering 930 metres to 2,000 metres, and 194 metres to 540 metres.

Ever Ready low-consumption valves, type DK96, DF96, DAF96 and DL96 are employed, and the price is: Receiver, less battery, £9 10s., plus purchase tax £3 1s.; "Batrymax" B.136, 16s. extra.—The Ever Ready Co. (Gt. Britain) Ltd., Hercules Place, N.7.

New Low-noise Voltage Amplifying Pentode

OSRAM valve Z729, which is the latest addition to the range of valves marketed by the General Electric Co. Ltd., is a low microphony, low hum, voltage amplifying pentode of all-glass construction on a B9A (Noval) base.

The new valve has been designed primarily for use

in the early stages of high gain amplifiers where the hum and microphony introduced by the valve must be kept to a minimum. Typical applications include record reproduction and sound reinforcement equipment, tape recording and microphone head amplifiers, as well as tone control apparatus incorporating bass boost circuits.

The rigid electrode structure materially assists the reduction of microphony, and specialised design, including a double helical heater, internal screening and the disposition of the pin connections have enabled the very low hum level of 1.5 microvolts referred to the control grid to be realised. This figure represents at least a sevenfold improvement on that given by a valve of normal construction, and has been obtained without the necessity for specialised circuitry. A hum-balancing resistor is not necessary if the heater is supplied from a winding with an earthed centre-tap. A stage gain of the order of 180 is obtainable.

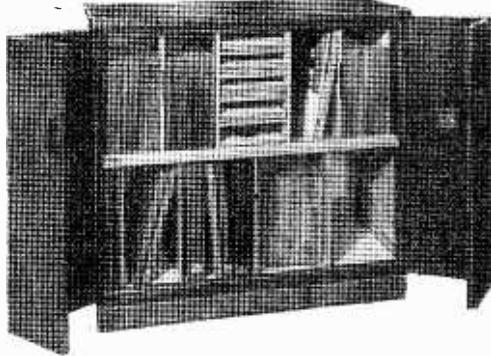
Application to Instrument Design

The low value of reverse grid current of Osram valve Z729 renders it particularly suitable for use in valve voltmeters and other instrument applications where this characteristic is of importance, and in cases where a valve better in this respect than normal is essential but the high cost of an electrometer valve is not justified.

Characteristics :

Heater voltage	...	...	...	6.3 v.
Heater current	...	...	...	0.2 A.
Anode voltage max.	...	...	...	300 v.
Mutual conductance	...	...	...	1.85 mA/volt

General Electric Co. Ltd., Magnet House, Kingsway, W.C.2.



The new E.M.I. record storage cabinet.

Editorial and Advertisement Offices :
 "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Phone : Temple Bar 4368.
 Telegrams : Newnes, Rand, London.
 Registered at the G.P.O. for transmission by Canadian Magazine Post.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Wireless." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed : The Editor, "Practical Wireless," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent. Copyright in all drawings, photographs and articles published in "Practical Wireless" is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A.: Reproductions or imitations of any of these are therefore expressly forbidden. "Practical Wireless" incorporates "Amateur Wireless."

BOOKS

LATEST AMERICAN RADIOS.—New and novel miniature receivers, portable, all-wave receivers, 1 to 6 tube; Electronic equipment, etc. Build your own from available parts. Complete list of blue-prints and parts lists available, with full details. 3d. **AMERICAN PUBLISHERS**, Sedgford, Norfolk.

BOOKLETS: "How to Use Ex-Gov. Lenses and Prisms." Nos. 1 and 2, price 2/6 ea. Ex-Gov. Optical lists free for s.a.e. **H. ENGLISH**, Rayleigh Rd., Hutton, Brentwood, Essex.

THE SHORT WAVE MAGAZINE will keep you in close touch with all that is worth while in Short Wave Radio, whether you are a listener, an experimenter or an amateur transmitter. Annual subscription 24/-. **THE SHORT WAVE MAGAZINE, LTD.**, 55, Victoria Street, London, S.W.1.

AMERICAN MAGAZINES, 1 year incl. "Audio Engineering," 28/6; "High Fidelity," 43/-. "Radio Electronics," 32/3, etc. Send for free booklet. **WILLEN LTD.** (Dept. 40) 101, Fleet St., London, E.C.4.

I.P.R.E. TECHNICAL PUBLICATIONS: 5,500 Alignment Peaks for Super-heterodynes, 5/9, post free. Date 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/-; Secretary, I.P.R.E., 20, Fairfield Rd., London, N.8.

RECEIVERS & COMPONENTS

OSMOR for really efficient coils, coil-packs, and all radio components as specified for many "Practical Wireless" circuits. See our advert, on page 433 of this issue for free circuit offer, or send 5d. stamp to address below. **OSMOR RADIO PRODUCTS, LTD.** (Dept. PC6), Borough Hill, Croydon, Surrey. (Tel: Croydon 5148 9.)

RADIO AND T.V. Components B.V.A. Valves, Chassis, Instrument Cases, Laboratory Equipment. Quick postal service. **KENDALL AND MOUSLEY**, 99, Dudley Port, Tipton, Staffs.

EVERYTHING for radio constructors, Condensers, Coils, Valves, Resistors, etc. Send stamp for list. **SMITH**, 93, West End Road, Morecambe. Quick service.

LOOK !! Look at this bargain lot for Five Bob: 6 Electrolytic Condensers, comprising 2 at 8 mfd x 500v, 2 at 2 x 3300 x 200 x 12v; 6 Mazda Octal Valveholders, 12 ass't Tag Strips; 12 Cable Clips; 60z approx 2 gr. assrt. BA Nuts, Bolts, Washers, etc.; 12 Yaxley-type Wafers; 3 Screened Grid Caps. The above are ex-new equip. and are in perfect condition. Latest list 3d. The lot for 5/-, plus 1/- post. **SUSSEX ELECTRONICS LTD.**, Princes Street, Brighton.

HR PHONES, 12/- p.f.; T.V. Formers, 6d.; 4 B.A. Wrenches, 6d.; Blowers, 24v, 12/6 p.f.; Chokes, 10h, 250 m.f., 10/6 p.f.; J Box No. 240, 6/6 p.f.; Control No. 227, 4/6 p.f.; Rem. Con. No. 223, 5/6 p.f.; 6KT6, 5/6. Free lists. **ANN AKIN**, 25, Ashfield Place, Otley, Yorks.

WALNUT Radiogram Cabinets. Stamp details. **E. WISKER**, 501, Hale End Road, Highams Park, E.4.

RATES: 5/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1 - extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., Strand, London, W.C.2.

5,000 METERS from 7/- upwards: 10,000 surplus Valves from 2/6; Base-board Mtg. Valveholders, octal 3/- doz.; 50mfd. 50vw Block Conds., 1/-; IPTs 10/13mcs canned, new, 1/6; 7mcs (R1355 diode type), 1/6; 7mcs 1" Trap Coil, 9d.; RF24 Coils, bak., 6d.; Ceramic, 9d.; RF Units, type 24 18/-, 25 25/-, 27 40/-; R1082 bat. Rxs, 6 valves, less coils, 25/-; carr. 3/6; Coliars AC37 Gram Motors, 4in. dia. spindle, 30/-. Terms: Cash with order; immediate delivery. S.A.E. for list or enquiries. Closed last week in July. **W. A. BENSON**, 308, Rathbone Rd., Liverpool, 13.

VALVES

6V6G AND 6T, matched in pairs, new, boxed, 17/- per pair; p. and p. 1-. **R. J. COOPER**, 32, South End, Croydon, Surrey.

NEW VALVES WANTED, small or large quantities; all Television Valves and ECL80, EF80, EBC33, FN4/500, VU39, 6SJ7, 6V6, 6K8, 524, etc., etc. Prompt cash. **WM. CARVIS**, 103 North Street, Leeds, 7.

1,000 CHEAP VALVES, etc. List: **ROGERS**, 2, Matlock Avenue, Southport.

SPECIAL VALVE CLEARANCE.

6U7G, 16KT6G, 1250 tested, 4 for 10/6; 12J5, SP61, 9D2, 6H6, LP2, ARP12, 4/- each; 6K7, 6K8, 6Q7, 6V6, 5Z4, set of 5, 35/-; IT4, IS5, 1R5, 354, 27/6 set; 807, EF39, EBC33, EL32, 6V6, 6X5, EC31, 5U4, 6P6, 6J7, 7S7, 25L6, 35L6, 50L6, U14, all at 8/- each; Weyrad 465Kcs I.F. Trans., 8/6 pair; mains Trans., 350-0-350, 6v, 5v, 4v, 4v, 80ma, 19/6; Fil. Trans., 6.3v at 1.5 amp, 6/3; 10in. P.M. Speakers, 18/6; V/controls, all values, 2/6; SP/sw., 3/9, 4/9; Midget 465Kcs I.F. Trans., 9/9 pair. Stock list available. **WINWOOD**, 12, Carnarvon Road, Leyton, E.10. (Mail only.)

"VIEWMASTER" Valves, exact to specification, guaranteed new and boxed, comprising 5 EF50, 1 6P25, 1 6T61, 1 EBC33, 1 EB91, 2 6K25, 1 6P28, set of 12 6E2/6, with EF91 or EF91 7/6 extra (post and insurance 2/-); 6AM6, EF91, 6P12, Z77, 8D3, 6C4, L77, W77, EF92, 6AM5, EL91, N77, 12AX7, 7/9; EB91, 6A15, HVR2A, 6/9; 1.4v miniatures, IS5, 1R5, IT4, 3S4, 3V4, IS4, IL4, 3A4, 7/6, set of any 4, 27/6; 6V6G, 6F6G, KT63, EF39, EF8, EF50, 20D1, 7B7, 7C5, 7C6, 7H7, 7S7, 7Y4, 7/6; 5Z4G, 5U4G, MU14, U22, U78, DH77, 6A76, EBC33, 6J6, 12AT7, ECC81, 6BA6, 6BE6, 6BW6, EC91, Pen46, 6V6GT, PY82, PL81, 6P15, 6LD20, 8/6; PZ30, GZ32, 16/6; N78, 15/-; 6P25, CL33, U25, 12/6; 6K25, 12/6; ECC91, UF42, UB780, 6/4; 6F1, DK32, 1ATG, DF33, 1N5G, 12/-; PL82, PY81, 6L6G, KT66, X65, 10F9, 10D1D1, 10C1, 10C2, 11/-; ECL80, EF80, EY51, PY80, 6K8GT, 12K8GT, UL41, EAF42, KT33C, 6C9, 10F1, 10P13, R10, 10/6; 25Z6GT, ECH42, EBC41, UBC41, DL35, LC5G, DAC32, 1H5G, DL33, 3Q5G, 10/-; 6SN7GT, 6SL7GT, 6Q7G, 12K7GT, 12Q7GT, 25Z4G, 23A6G, EF41, 9/6; U50, 5Y3GT, 25L6GT, 35L6GT, 30L6GT, 35Z4GT, 6X5GT, 80, U09, U404, UY41, UF41, EZ40, 9/-; 6K7G, 6K7G, 6/-; all new and boxed; postage 4d. per valve extra. **READERS RADIO**, 24, Colberg Place, Stamford Hill, London, N.16. (STA. 4587.)

ELECTROLYTICS, capacity, voltage, size, type of mounting; price post paid, in that order: 16 + 32, 450/525, 1 1/2 x 2, clip, 5/6; 24 + 24 + 16, 350/425, 1 1/2 x 2, clip, 4/9; 60 + 200, 275/350, 1 1/2 x 4 1/2, clip, 6/6; 1,000, 12v, 1 x 2, clip, 2/9; 4, 150v, 1 1/2 x 1 1/2, clip, 1/1; 60 + 100, 350/425, 1 1/2 x 4 1/2, clip, 6/6; 500, 12v, 1 1/2 x 2 1/2, clip, 2/6; 8, 350v, 1 1/2 x 2, 2/-; 6,000, 12v, 1 1/2 x 4 1/2, lug, 4/6; 100 + 200, 275/350, 1 1/2 x 4 1/2, clip, 6/-; 8 + 16 + 16, 450 525v, 1 1/2 x 2, lug, 5/9; 32 + 32, 350/425v, 1 1/2 x 2, clip, 5/-; 2,000, 6v, 1 x 3, clip, 3/3; 8 + 16, 450/525v, 1 x 2, clip, 4/-; 2, 450/525v, 3 x 1 1/2, tag, 1/6; 2, 350v, 1 1/2 x 1 1/2 tag, 1/3; 8, 350/425v, 1 1/2 x 2, clip, 1/9; 16 + 32 + 8, 450 525, 1 1/2 x 3 1/2, lug, 5/9; 8, 450v, 3 x 2, clip, 1/11; 1,000 + 1,000, 6v, 1 x 3, lug, 3/6. All are All cans; some with sleeve; all new stock; all voltages WKG, with surge v where marked. Television! Set of 3 Components, comprising line output trans, with E.H.T. winding to give 7kV, using EY51, (breathe winding for EY51 also included), and fitted with wide control. Scanning coils, low impedance line and frame, focus coil, optional high (10,000 Ohm) or low (200 Ohm). Set of 3, 42/-, plus 2/- postage. Diagram of line trans, supplied. **RADIO CLEARANCE LIMITED**, 27, Tottenham Court Road, London, W.1. (Telephone: Museum 9188.)

NEW PLESSEY SPEAKERS, 5in., 12/-; 10in., 18/6; all 2-3 ohm P.M., less trans. Rola energised 1,000 ohm coil, 6jin., 10/-. Walnut Cabinet for 6jin., 20/-; with fret and back; add 1/- reg. post all items; satisfaction guaranteed. **C. WARD**, "Corfield," West Cliff, Dawlish, Devon.

BARGAIN OFFER, Decca type, 78 r.p.m., single player gram unit, high impedance, magnetic pick-up, press lever start for 10in. or 12in. records, auto-stop, £4/10/- and 2/6 carriage. **T.R.S.**, 71, Meadvale Road, East Croydon, Surrey.

EDUCATIONAL

RADIO OFFICERS urgently reqd. We train most in shortest period. Training fees payable after appointments. Secd. Scholarships available. Boarders accepted. 2d. stamp for Prospectus. **WIRELESS COLLEGE**, Colwyn Bay.

A.M.I.ME.CHE., 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. 242B), 17, Stratford Place, London, W.1.

MERCHANT NAVY and Air Radio.—Here is an opportunity to train as Radio Officer. The big liners are open to you, but you must qualify for the P.M.G. Certificate, Day Evening and "Radiocerts" postal courses. Estd. 30 years; s.a.e. for prospectus from Director. **THE WIRELESS SCHOOL**, 21, Manor Gardens, London, N.7. (Tel: ARC. 3694.)

WIRELESS—Evening Class instruction for P.M.G. Certificate of Proficiency and Amateur Wireless Licence. Morse instruction only, if required. Also postal courses. Apply **B.S.T. LTD.**, 179, Clapham Rd., London, S.W.9.

THE INSTITUTE of Practical Radio Engineers Home Study Courses are suitable coaching text for I.P.R.E. and other qualifying examinations. Fees are moderate. Syllabus of seven modern courses post free from **SECRETARY I.P.R.E.**, 20, Fairfield Road, London, N.8.

HOMELAB, Sig./Gen., once used. £5/10/- BRAMBLE, 34, Chevewedge, Halifax.

WALNUT Radiogram Cabinets of distinction, stamp details. R. SHAW, 69, Fairlop Rd., E.11.

EX-W.D. unused Fluorescent Lighting Sets for 12 and 24v D.C. input, 230v A.C. output; Rotary Converter, Choke, P.F. Condenser, Leak Transformer, for 85 watt Sodium Lamps; the whole enclosed in metal box £5 to clear. A. J. PHILPOTT, Fountain-sq., Fenton, Stoke-on-Trent.

"QUALTAPE" Tape Deck, practically unused, £8/8/-, 54, Rosebery Road, West Hartlepool.

LINE-A-TONE Tape Recording Panel, fast forward and rewind, 3 speeds, complete, £20, MORECAMBE SOUND SERVICE, 249, Heysham Rd., Morecambe.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 16-64, inclusive, or a woman aged 15-59, inclusive, unless 12 or over, or the employment, is exempt from the provisions of the Notification of Vacancies Order, 1952.

SKYWAYS, of London, have vacancies for a Radio Engineer i/c and a Radio Section Inspector with A and/or B licences at Stansted Airport, Essex; Hostel accommodation available; salary £715 to £815 p.a. Apply to the PERSONNEL MANAGER, 7, Berkeley Street, W.1.

AIRCRAFT Radio Mechanics skilled in workshop practice or aircraft installations to work at Stansted Airport, Essex; hostel accommodation available; minimum hourly rates 3/9. Write to the PERSONNEL MANAGER, 7, Berkeley St., W.1.

NEW GOODS ONLY

CONDENSERS—450 v. wkg., 1 mid., 2.9; 4.32; 8.3; 16.46; 32.510; 8-8.4/8; 8-16.5/8; 16-16.6/9; 500 v. wkg., 1 mid.; 3; 2.3; 4.33; 8.3/6; 16.6; 32.8/7; 8-8.7; 8-16.8/3; 16-16.9/8; 25 x 25 v. 25 x 50 v., 50 x 12 v., 2.9; 50 x 50 v., 2.6; Tubulars, 500 v. wkg. up to .0005, 6d.; to .006, 9d.; to .04, 11d.; to 1.12; 2.25, 1/6; 5.23; Moulded Mica, up to .002, 1/-; to .01, 1.6; Sil Mica, 500 v. wkg. up to 100 pf., 9d.; to 500 pf., 1/-; to 1,000 pf., 1.2; 2,000, 3.000 pf., 1.3.

VOLUME CONTROLS—Lg. Spdls., all values, 3/-; with Sw., 5/-; with D.P. sw., 5/9; Semi Midg. type, 4/1, 1.2 wkg. 4/-; with sw., 5/9; D.P. sw., 6/6; 2 Wire Wound, less sw., 1 k. to 100 k., 7/9.

RESISTORS—All Std. values, 20%. Tol. 1 w., 5d.; 1 w., 6d.; 1 w., 8d.; 2 w., 1/-; 10%. Tol., 50% on ABOVE PRICES. Wire Wound, 3 w. to 5 k., 1/9; 5 w. to 5 k., 2/-; 10 w. to 10 k., 2/9. Terms: Orders up to 100, post 6d. up to £1, 9d. over, post free. Cash with order, no C.O.D.; lists 5d.

RADIOELECTRON

22, FRANCES STREET, SCUNTHORPE, LINCOLNSHIRE.

ASTRAL RADIO PRODUCTS
(T. G. HOWELL)

Dual-wave H.F. coil as used in the original models. SUMMER ALL DRY PORTABLE, B.7.G. BATTERY MINIATURES, THE MODERN I & 2 VALVERS, etc., 4/3, or with 5 circuits, 5/-, post and packing 3d. T.R.F. coils L. and M. wave as used in the original models ALL DRY 3 BAND 3, August, 5/1, P.W., 3 BAND ALL-DRY 3, April, 5/3, P.W., 6/6 per pair, extra circuit inc. postage, 6d. T.R.F. coils as above but without reaction winding suitable for standard T.R.F. circuits or American set replacements, 5/6 per pair, postage 6d. "K" type coils as used in the original model A.C. BAND PASS 3, 3/3 each coil, I.F.T.s 465 K/cs miniature brand new, 6/- pair. M.W. frame aerials, 3/6 each extra. High Q 5/- OSMOR Q.C.I. ALL WAVE CHOKE 4/-.

138, The Ridgeway, Woodingdean Brighton, 7.

Best Buy at Britain's SPECIAL BARGAIN OFFER Admiralty Receiver A.2074 contains 200/250 volt 50 cycle mains transformer giving 315-0-315 v. 70 mA., 6.3 v. 2 A., and 5 v. 2 A. (These are Admiralty ratings and can be safely exceeded), paper smoothing condensers and 10 H.V. choke. Receiver section has two 0003 mF. variables, 34 Resistors, 34 Condensers and a huge quantity of other useful components including output transformer and 6:1 trans. All contained in grey metal case size 11in. x 6in. x 18in. and in mint condition. The Bargain of the Year at 27.6. plus 5/- carriage.

R1355 RECEIVER complete with all valves, slightly used but in very good condition. Only 29/6, plus 5/- carr. Also offered complete with RF24 unit tuned to required channel for 62.6 plus 7/6 carr. These two items make the basis of a T.V. receiver. Send for the book—"Inexpensive T.V." price 2/9 post paid for details.

STANDARD TRANSFORMERS. Two types, both standard primaries, universal mounting. (1) 250-0-250 v. 80 mA., 0-4.5 v. 2 A., 0-4-6.3 v. 4 A. (2) 250-0-250 v. 80 mA., 0-4.5 v. 2 A., 0-4-6.3 v. 4 A. Both new and boxed, fully guaranteed. Price 18/- post paid.

30 VOLT TRANSFORMER, standard primary, secondary 30 v. 2 A., tapped to give 3 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v. Has countless uses. New and boxed, 17/6.

RECTIFIER, 12v. 2 A. Full wave bridge or use with above transformer. Price 12/6.

R1155 RECEIVER, Brand new at £11.19.6. plus 10/6 carr. All air tested prior to despatch. Send 1/3 for circuit and details. Mains power packs available for £4.10.0, plus 3/6 carr. Guaranteed six months.

CHARLES BRITAIN (RADIO) LTD.



11, Upper Saint Martin's Lane, London, W.C.2. TEM 0545

Shop hours, 9-6 p.m. (9-1 p.m. Thursday)

OPEN ALL DAY SATURDAY

WILCO ELECTRONICS

45 M.S. P.YE STRIP vision unit for London; condition new, complete with 6 EF50 and EA50 valves, 65/-. Carriage 2/6.

RED SYLVANIA EF50 valves, 7/6 each, or British 10 for 50/-.

RECEIVER R1355, as specified for "Inexpensive Television" in original packing as new. Complete with 11 valves, 38/6. Carriage 7/6.

VOLTMETERS—2in. Flush D.C. 0.20, 7.6; 0.40, 10.6; 0.300, 10.6; 3in. Surface A.C. 0.300, 25/-; 2in. Flush Electrostatic, 0.2000, 40/-.

MILLIAMMETERS—2in. Flush M.C.C. 0.30, 12.6; 0.200, 12.6.

P.M. SPEAKERS in cases, ideal for extension speakers. 6in., 30/-; 5in., 17.6. Post 2/6.

SLOW-MOTION DIALS, lin. scaled, 0.100 reduction, 200 to 1 or direct, only 5.6. Post 1/6.

POWER PACK—I.P. 230 v., O.P. 350-0-350, 80 mA., with 5Z4 valve, 2.63 v. windings, 40/-; Carriage 2/6.

COMPREHENSIVE LIST NOW READY 6/1. 204, LOWER ADDISCOMBE ROAD, CROYDON. Tel.: ADD 2027.

CERAMIC V/HOLDERS, B7G 8d. ea., 6/- doz; UX5, UX7, I.O., 1/- ea., 10/- doz; 16+16+16uF/450, 2in. x 2in. x 4 1/2in., surge proof, 3/9; 32uF/450, 2in. x 2in. x 4 1/2in., s/proof, 3/9; 16uF 450, 1in. x 2in. x 2in., 2/6; 2uF/1000, 2in. x 2in. x 2in., 2/6; 1/1000, 2/6 doz.; 1 1200 bak. tub., 1/-; 1/2000 paper, 1/6; 1 3000, 2in. x 2in. x 4 1/2in., 3/6; WW 2/- Resist., 1W, 1/3; IOW, 1/6; most values from 102 to 22K(2), instr. type, 100 (2 ex-equip.), 1.5K (new), 1/-; All above brand new. Guaranteed Valves, VR91, silv. red, 6V6G, 7/6; KTW63 (6K7G), VR91, 4/6; VR65, 3/6; VR92, 2/-; 954, 1.6. Transformers, step down (100-300w) and normal, I.F.T.s, more Valves, Components, as free list. Please s.a.e.; packing free, postage extra. THE RADIO SERVICES, Lr. Bullingham, Hereford.

ORGAN KEYBOARDS, 3-actave, on solid base; 19 by 4in.; no key contacts; professional job; ebony and ivory finish; £4/15/-; carriage paid G.B. Send now to CIRCUITS & SUPPLIES, 10, Duke St., Darlington, Co., Durham.

NEW CONTROL UNITS, in maker's boxes, contain: W C switch, 3 banks, 1 pole, 6-way on each, 2 on off switches, 1 flush mounting, 1 heavy duty, a 5-way chassis mounting, plug and socket, a 7-way ditto, 1 jack socket, 3/6 (p. 1/-); high impedance Headphones, new cond., 9/6 pr.; "Weymouth" Coil Packs, S.M.L.G. 465k's IF, complete with circuit and instructions, 19/6; new 465k's IF Transformers, iron dust cores, stand. cans, 7/6 pr.; "Avo" Valve Tester, with latest valve panel with selector switch, new condition, £12/10/- (one only); Ceramic stand-off insulators, 1/- per doz. Write for new list. SERVO RADIO, 156/8, Merton Rd., Wimbledon, S.W.19. (Phone: LIBerty 6525.)

RADIO G200 ANNOUNCES

Valves at 2/9: RK34, 2C35, VR78, D1, 954, 12H6; at 4/6: 7193, 2X2/879, 4D1, VU111, GDT4C, NGT1; at 5/9: 125H7, SP41/VR65A; at 7/6: 6U5G, 12SC7, 12S7L, EC52, EF54, VR136, CV73, 6C6, U78; at 8/6: 1619, 024, 6AG5, 6SK7/6, 2A3; at 9/6: 757, 7C5, 7B7, 7H7, 7R7, 7Y4, PT25H, VT46, IT4, 3A4, 3Q4, N18, V77, 6K7, 25L6/6t, 50L6/6t, 6V6, 6K6/6t, KL35, PM2HL, 6D6, 6X6/6t, IR5, IS4, 3V4, IA5gt, IG6gt, 68B, 6CH6, 6Z4, 65L7, 12AX7, 6AT6, 6BE6, 6BW6, 6E4, 6BA6; at 11/6: X66, 12K8gt, 6J7, 5763, 8012, 801; at 12/6: 6CD6.

ARTHUR HOILE 55, UNION STREET, MAIDSTONE, KENT. Phone: 2812.

STAN WILLETTS

43, SPON LANE, WEST BROMWICH, STAFFS. Tel: WES. 2392.

VALVES. Brand New, Guaranteed. 6X4, 6V6, 6X5, 8D3, 5U4, 5Z4, 6F6, 7/6, VU39, 8.6, EF55, 9.6, 6AC7, 4.6, 6SJ7, 4/6, 3D6, 2.6, 6K7, 5.6, EC52, 4.8, VR92, 1/9, RF34, 1.9, RT241, 3.6, VU120, 3.6, ATP4, 3.6, 954, 1.6, 956, 2.6, 8D2, 1.9, EB34, 1.6, V570, 3.6, SP61, 3.6, 807, 8/6, Post 6d.

OUTPUT TRANSFORMERS. 32-1, 55-1, 80-1, 60 ma. Brand New. 3/6. Post 9d.

YANLEY SWITCHES, 4 pole, 3 way, 2 bank, Brand New. 2/- Post 4d.

GERMANIUM CRYSTAL DIODES, (G.E.C.) Brand New. 2/- for 3-5. Post 3d. 1 m.a. Meter Rectifiers, New, 5/6.

50 ohms 10 watt W/W Pots., 2.6.

200 ohms 20 watt W/W Pots., 2/-.

THROAT MIC., New, 1 1/2 pair. Post 4d. Urgently Required: AR88, CB221, Edlystone 640, etc. Taylor, Avo Test Meters, Valves, T.V. Tubes.

Television, Radio, Record CABINETS MADE TO ORDER

ANY SIZE OR FINISH
CALL OR SEND DRAWINGS FOR QUOTATION

B. KOSKIE
(DEPT. C.)

72-76 Leather Lane, Holborn, E.C.1

Phone: CHAncery 6791/2

LYONS RADIO LTD.

3, GOLDHAWK ROAD, Depl. M.P. SHEPHERDS BUSH, LONDON, W.12.
Telephone: SHEPHERDS Bush 1729

INDICATOR UNITS TYPE 96.—Containing a cathode ray tube type VCR97. (Full picture guaranteed) 6-VR65's, 3-VR54's, 1-VR92. Mu-metal screen, pots., H.V. condensers, extension spindles, spindle couplers, slugged coils and dozens of other useful parts. Overall size of unit approx. 19 x 9 x 7in. Condition as new and unused supplied in maker's transit crate. AT THE SPECIAL LOW PRICE OF 59/6 or less valves, 45/- Carriage each case 6/6.

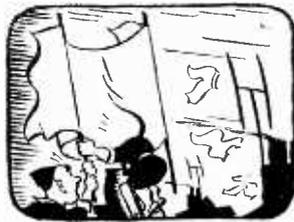
BETAMIC ROTARY SWITCHES.—3 wafers, each wafers single-pole 5-way. Single hole fixing. PRICE, 4/3 each; 3 for 11/9; or 12 for 36/-.

AMP METERS.—Bakelite cased projection type 4 1/4in. dia. moving iron. Calibrated, at 50 c.p.s., 0.15 amps. Can also be used on D.C. PRICE, 32/6, post 2/-.

VALVE BARGAINS. This month only
Type Each 2 (or
GV6 10/6 2/1
VU111 4/6 7/-
VR136 (EF54) 5/6 10/-
VR137 (EC52) 5/- 9/-
VR99A (6K9) 8/6 15/6
CV66 (RL37) 5/6 10/-

All removed from new, unused equipment which we retest and guarantee.

POWER UNITS TYPE 222.—Neat metal cased units, overall dimens. 9 x 9 x 6 1/2in. containing a rotary converter for 24 v. D.C. input and having a twin D.C. output of 300 v. at 30 ma. and 6.5 v. at 32 A., carbon pile voltage regulator, a four section filter unit in die cast metal box, wire-wound resistors, jack socket, relay, fuses, etc. Can be operated in reverse from D.C. mains or 6 v. accumulator. Contents can easily be dismantled to provide a nice case in which to build a mains unit, test oscillator, etc. Condition as new and unused. PRICE 19/6, carriage 4/-.



The "Fluxite Quins" at Work

"We've never known FLUXITE to fail, We've finished, in spite of the gale,"

"Hey look! Down the street!
Here comes someone's sheet.
Our aerial's now in full sail."

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 this, from 1/- upwards.

FLUXITE

SOLDERING PASTE

A Staunch Companion to Fluxite Soldering Fluid.

SIMPLIFIES ALL SOLDERING
Write for Book on the Art of a "SOFT" Soldering and for leaflets on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE.

FLUXITE Ltd.,

Barnoldsey Street, London, S.E.1.

VALVES

All Guaranteed—24 hours service

41MP	6/-	ECL80	12/6	6K7	6/-
41MPT	6/-	EF91	10/6	6K8	10/9
DDL4	4/6	EY51	12/6	GZ4	9/6
MH4	4/6	25Z4	10/-	FW4/500	9/3
425PT	6/-	6SN7	10/6	EA50	2/6
CV66	5/-	VR55	4/6	954	2/6
2X2	4/6	VR63	1/6	1T4	8/5
8D2	4/6	SP41	4/6	1R5	9/-
9D2	4/6	VR116	4/6	1S4	9/-
30	10/-	VR54	2/6	1S5	9/-
KT44	5/-	MSPEN	4/6	12K8	9/6
AR6	4/6	EF50	5/-	5U4C	8/6
KT24	4/9	EDT19	2/6		
807	9/-	6L6	11/6	KTZ41	
50L5	9/-	35Z4	10/-	(VP1B) 4/6	
EBEC3	10/-	6H6	5/-	35L6	10/-
35A	9/6	EF8	8/-	EF50 Red	
APV4	9/6	6Q7	10/-	6YL	8/-
EF90	11/6	6V6	9/6	12K7	10/6

AMPLIFIER CHASSIS.—Two-valve plus rectifier, two-stage audio amplifier for operation on A.C. mains, 200-250 volts, 50 cycles. Input circuitry is loaded to suit most high impedance needs. (Magnetic or crystal pick-ups). Complete with valves, £3.10. Post 2/6.

MAINS TRANSFORMERS.—125-0-125, at 200 mA. 6.3, 6.3, 4a., 5v. 3a. Fully shrouded, 1/5 plus 2/- post.

5v. Co-axial Plug and Sockets. 6d. pair. Post 3d.

RECTIFIERS.—RM2 S.T.C., 4/6. RM1, 18/6.

FILAMENT TRANSFORMERS.—6.3, 15a. Primary 200v., 220v., 240v. 8.9, post 6d.

CONDENSERS.—Dudliser 8 mfd.-500v w 2.6, 16 mfd.-500v. 3/6. Bias 25 x 25 1/6.

MAINS DROPPERS.—3-750 ohms, resistance, 5/-

Post ad. CO-AXIAL CABLE 30 ohms 100 yd. TELEVISION—Iron cored Coils. Contents:

14 permeability tuned coils and 1 R.F. choke. London and Holme Moss. 18/6.

SEMI-MIDGET IF465 k.c. Transformers. 17/6 pair. CHOKES 10 hen. 150 mA. 5/6

Post 1/6. TRIMMERS—50 pf., 8d. Sprague 1-350, 7.6 doz. Dudliser .01, .02, 7.6 doz.

SEND 6d FOR NEW CATALOGUE.

Mail Order, Only. REX RADIO 37, LOUIS STREET LEEDS, 7.

OF SPECIAL INTEREST TO ALL OWNERS OF R.1155 RECEIVERS

We have been fortunate to secure a limited number of spare kits for these famous sets, and if you are one of the lucky owners send your order now!

EACH KIT CONTAINS—A set of 7 Valves Types: 4—KTW61 or 62, 1—X66 or 65, 1—BL63, 1—MHL06, Strong metal outer case, spare knobs and S.M. Drive, I.F. Transformers, V controls and many other useful spares.

Our price for the complete kit only 50/- (less than the normal price for the valves only !!)

GENUINE M.O.S. Spares, all Ex-1155 Sets.

WALTON'S WIRELESS STORES

48, STAFFORD STREET, WOLVERHAMPTON

SPARKS' DATA SHEETS

Constructional Sheets of Guaranteed and Tested Radio Designs

ALL-DRY BATTERY DESIGNS

THE "POCKET PAK." 1-valve Med-wave portable. Good 'phone signals. Self-contained aerial and batteries.

THE "CHUMMY." 2-valve portable. Fine 'phone results M/L waves. No aerial required. Just switch on.

THE "MIDDY." 2-valver. M.L waves. Fine speaker results. V Popular. All praise its performance.

THE "BOSUN." 3. A more powerful version of the above.

THE "CRUISER." 2-valve T.R.F. circuit. Good range and power. M.L waves. Ideal for caravans, camping, etc.

THE "SKIPPER" 4-valver. High sensitivity T.R.F. circuit. Safe any area. M.L waves. A fine set. Range and power.

THE "CORVETTE." 4-valve all-wave superhet. Great range and very selective. Ideal for a portable. Very compact.

Data Sheets of above, 32/- each, post free.

Many other designs available. Send 2/6d. stamp for my latest list.

L. ORMOND SPARKS (P), 48A, HIGH STREET, SWANAGE, DORSET.

NEW SELENIUM RECTIFIERS

S.T.C., Westatite, G.E.C., etc. These are new, not ex-Govt. recon-structed rectifiers. 6v. 2 amp., 9/-, p. 8d.; 12v. 3a. 2a. 16/6; 12 1/2v. 5a., 27/6, p. 11d.; large fitted type, 12 1/2v. 6 amp., 32/-, p. 1/3; 24v. 3a., 33/-; 5a., 54/-, p. 1/6, also h.wave, 12v. 1a. trickle type, 5/3, p. 6d. Transformers for any of above.

H.T. types. R.M.2.4.2. p. 6d.; 150v. 30ma. elim. type, 6/-; 250v. 60ma., 7/6, p. 1d.; 250v. 100ma. bridge, 14/6; 250v. 200ma. bridge, 22/6, p. 9d.; 250v. 300ma. bridge, 36/-, also twin 250v. 150ma. h.wave rep. for J.Z.30 tube, 35/-.

Many others. Eliminator kit for 120v. 30ma., trans., rect., trickle rect., twin 12 plus 12 mfd., special steel case, 37/6 only, p. 1/6.

CHAMPION PRODUCTS

43, Uplands Way, London, N.21



Fidelia

HAND BUILT RADIO UNITS

THE FIDELIA MAJOR 10

Hand built high quality radiogram chassis at economic price, 10 valve, model illustrated £31-8-4. De-luxe 9 valve model £23-6-5. 7 valve £20-12-0. 9 valve £24-8-4.

Technical data sheets free. Electro Acoustic Developments, 2, Amhurst Road, Tetscombe Cliffs, Sussex.

10% DISCOUNT !!!

off the price of non-proprietary goods, WHEREVER YOUR ORDER EXCEEDS £1. To obtain the maximum benefit, send 3d. for list.

VALVES YOU CAN TRUST!

—Makers cartons, 15 Plain or service cartons.

Type	A	B	Type	A	B	Type	A	B
2C26	4/9	4/3	6K7G	6/9	—	554	3/6	—
6AM6	—	10/6	6K7GT	6/6	5/9	EA50	—	2/6
6EF4	9/6	—	792	3/6	—	EB31	—	3/6
6H6	9/6	—	6Y2	3/6	—	EZ50	—	7/6
6L6T	5/9	—	6Y2GT	12/6	10/9	KTW41	3/6	—
6N6	—	11/6	6SK7	7/3	—	KTZ41	9/6	—
6Q7G	—	6/6	6V6GT	11/6	—	KTZ61	7/6	—
6X4	—	—	6V6	—	9/6	RK4 23	—	—
6X5	7/9	6/9	12H6	—	2/9	VU11 3/6	—	—

All types can be supplied at makers' prices.

ELAC 5in. SPEAKERS. in cartons, 13/9, post 1/-.

TOGGLE SWITCHES SPDT. tropical pack, 9d.

VALVEHOLDERS. EF50, 6d. I.O. subdued, 3d. RK34 valveholders, limited stock, 1/3.

SPECIAL RK34 type, 1s with holder, 3/-.

0.1 MFD. CONDENSERS. 500v. new, 3/8 doz. 6v. ERIE RESISTORS, 700 ohms, 3k., 4k., 5.0k., 12k., 20k., 30k., 200k., 3d.

REED & FORD, 2A, BURNLEY ROAD, AINSDALE, SOUTHPORT.

Practical Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS

No. of
Blueprint

CRYSTAL SETS

- 1s. 6d. each.
1937 Crystal Receiver ... PW71*
The "Junior" Crystal
Set ... PW94*
2s. each.
Dual - Wave "Crystal
Diode" ... PW95*

STRAIGHT SETS

Battery Operated

- One-valve : 2s. each.
The "Pyramid" One-
valver (HF Pen) ... PW93*
The Modern One-
valver ... PW96*
Two-valve : 2s. each.
The Signet Two (D &
LF) ... PW76*
Three-valve : 2s. each.
Summit Three (HF Pen,
D. Pen) ... PW37*
The "Rapide" Straight
3 (D, 2 LF (RC &
Trans)) ... PW82*
F. J. Camm's "Sprite"
Three (HF, Pen, D,
Tct) ... PW87*

- Four-valve : 2s. each.
Fury Four Super (SG,
SG, D, Pen) ... PW34C*

Mains Operated

- Two-valve : 2s. each.
Slectone A.C. Radio-
gram Two (D, Pow) ... PW19*
Three-valve : 2s. each.
Double - Diode - Triode
Three (HF Pen, DDT,
Pen) ... PW23*
Four-valve : 2s. each.
A.C. Fury Four (SG, SG,
D, Pen) ... PW20*
A.C. Hall-Mark (HF
Pen, D, Push-Pull) ... PW45*

SUPERHETS

- Battery Sets : 2s. each.
F. J. Camm's 2-valve
Superhet ... PW52*

No. of
Blueprint

SHORT-WAVE SETS

Battery Operated

- One-valve : 2s. each.
Simple S.W. One-valver ... PW88*
Two-valve : 2s. each.
Midget Short-wave Two
(D, Pen) ... PW38A*
Three-valve : 2s. each.
Experimenter's Short-
wave Three (SG, D,
Pow) ... PW30A*
The Perfect 3 (D, 2 LF
(RC and Trans)) ... PW63*
The Band-spread S.W.
Three (HF Pen, D
(Pen), Pen) ... PW68*

PORTABLES

- Four-valve : 2s.
"Imp" Portable 4 (D,
LF, LF, Pen) ... PW86*
1s.
The "Mini-Four" All-
dry (4 valve superhet) PW

MISCELLANEOUS

- 2s. each.
S.W. Converter-Adapter
(1 valve) ... PW48A*
(2 sheets), 7s. 6d.
The P.W. 3-speed Auto-
gram.
The P.W. Electronic Organ
(2 sheets), 7s. 6d.

TELEVISION

- The Practical Television Receiver.
(3 sheets), 10/6
The "Argus" (6in. C.R. Tube), 2/6

AMATEUR WIRELESS AND WIRELESS MAGAZINE STRAIGHT SETS

Battery Operated

- One-valve : 2s.
B.B.C. Special One-
valver ... AW387*
Two-valve : 2s. each.
A modern Two-valver ... WM409*

Mains Operated

- Two-valve : 2s. each.
Consoelectric Two (D,
Pen), A.C. ... AW403

SPECIAL NOTE

THESE blueprints are drawn full size. The issues containing descriptions of these sets are now out of print, but an asterisk beside the blueprint number denotes that constructional details are available, free with the blueprint.

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

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

No. of
Blueprint

SHORT-WAVE SETS

Battery Operated

- One-valve : 2s. each.
S.W. One-valver for
America ... AW429*
Two-valve : 2s. each.
Ultra-short Battery Two
(SG, det Pen) ... WM402*
Four-valve : 3s. each.
A.W. Short Wave World-
beater (HF Pen, D, RC,
Trans) ... AW436*
Standard Four - valver
Short-waver (SG, D,
LF, P) ... WM383*

Mains Operated

- Four-valve : 3s.
Standard Four-valve A.C.
Short-waver (SG, D,
RC, Trans) ... WM391*

MISCELLANEOUS

- Enthusiast's Power Am-
plifier (10 Watts) (3/-) WM387*
Listener's 5-watt A.C.
Amplifier (3/-) ... WM392*
De Luxe Concert A.C.
Electrogram (2/-) ... WM403*

QUERY COUPON

This coupon is available until August 6th, 1953, and must accompany all Queries, sent in accord with the notice on page 489.

PRACTICAL WIRELESS, August, 1953.



PORTABLE TAPE RECORDERS

Brand New — Unused — Complete Fully assembled and wired. Ready to operate. Attractive carrying case. Twin track recording. Instant playback. Total playing time of 66 minutes. 5 Valves. A.C. Mains 200-230 volts. Fast rewinding. Complete. Ready to switch on.

Write for full illustrated details and circuit diagrams. **LASKY'S PRICE £34.19.6** Carriage 10 - extra.

THE RECORDING AMPLIFIER, as used in the above recorder, can be purchased separately. Complete with 6 valves. 1 574, 1 645, 2 6Y3, 2 647, 5in. P.M. speaker, etc. Fully assembled and wired. Size: 15in. wide, 8in. deep, 6in. high. Circuit available.

Although new, these amplifiers are untested, and may have minor faults. The price has been reduced accordingly to £7.15.0 complete with valves. Carriage 10 - extra.

R.1132 RECEIVERS. BRAND NEW AND UNUSED.

Complete with all valves, in original wood case. **£5 19.6**. Carriage 10 - extra.

SPECIAL CATHODE RAY TUBE OFFER

Brand new and unused 12in. ion trap C.R. tubes, 6.3 volt heater, 7-9 Kv. E.H.T. 35 min. neck. Black and white picture. By famous manufacturer. £11 19.6 screen has very slight blemishes. **£12 19.6 PERFECT.** Carriage and insurance 15/- per tube extra.

MAINS TRANSFORMERS

All 200-250 volts e.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/-.

AT 3. Auto transformer. 0-10-120-200-230-240 volts. 100 watts. Price: 17.6.

FILAMENT TRANSFORMERS

6.3 v. 15 a., 7.11, 8.3 v. 3 a., 1.6.

Special Transformer. 2 amps., with the following tappings: 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volts. Price 17.6.

FIG. 4. Heavy duty filament transformer. 6.3 v. 8 a., 6.3 v. 3 a., 5 v. 3 a. Shrouded, drop-through type. With mains tapping board. Price 32/-.

PENPEN. 13 1/2 x 10 1/2 x 1/2 inch. Neutral shade, slightly marked. 5 11 per piece.

TEST PRODS. Fused, with fully retractable points. Price 4 11 per pair.

ANTENNA ROD SECTIONS

Each rod is steel heavily copper plated. Any number can be fitted together. 12in. long, 1/4 in. diameter. Price 2.6 per dozen post free.

TWO-WAY TALKIE. Sound powered inter-com. units. Can be set up anywhere, and gives effective communication up to a distance of 500 feet. Units can be purchased to give up to 4-way intercommunication. In metal case, brown crackle finish, size 6 x 5 1/2 x 8 in. Incorporates a 5-inch speaker and two U2 torch batteries.

MASTER UNIT. With 4-section selector switch. 37.6.

SUB-STATIONS. 27.6. Carriage 2.6 each.

CAR RADIO PLUG SUPPRESSORS, 1/6 each

CONDENSERS

All types available from stock. Electrolytic, miniature bias, Mica and Tubular cardboard, ceramic and silver mica. Send us your requirements.

C.R.T. MASKS. Brand New. LATEST ASPECT RATIO.

9in.	7
10in.	7.6
12in.	15
12in. Flat face	15
14in. Rectangular	21
15in. With dark screen filter and escutcheon	21
12in. Ditto	17.6
15in. Rubber	17.6
10in. Double D	31
17in. Rectangular. Soiled	25
9in.	5
12in.	11.6
12in. With fitted armour glass. Cream	7.6
12in. Ditto. Black	8.6

DINGHY AERIALS WITH REFLECTORS

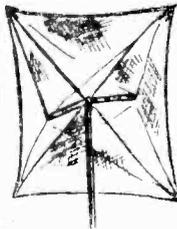
As illustrated, wire mesh, complete with setting up instructions. Mast not supplied.

LASKY'S PRICE, 7.6. Post 1/6.

4 VALVE AMPLIFIER

For operation from 110-250 volts D.C. Uses 4 valves type PEN383. Very easily adapted for A.C./D.C. working. In wood cabinet size: 9 x 16 x 8ins.

LASKY'S PRICE. Soiled, Less Valves. 10/- Carriage 5 - extra.



I.F. TRANSFORMERS

465 Kcs Iron dust cores in cans, midret type. Size 1 1/4 in. x 1 1/2 in. x 2 1/2 in. Price 12.6 per pair.

WEARITE TYPE 550. 445-520 Kcs. 12.6 per pair.

WEARITE TYPE 500. 450-470 Kcs. 12.6 per pair.

P.M. LOUDSPEAKERS

All less o'trans, new and unused. First quality.

3in. Elac. 12.11

3in. Plessey 12.6

8in. 13.6

10in. 25/-

SUPERHET COIL PACKS

3 Wavebands: 12-3 metres.

15-100 metres: 200-550 metres. Size: 4 x 4 x 3in. Price 16/-.

OUTPUT TRANSFORMERS

40 mA. Multi-ratio	6.11
80 mA. Multi-ratio	14.11
80 mA Pentode	12.11
60 mA Plessey, 6,000 ohms	5.11
Standard pentode	4.11
Pentode	3.6
Midret pentode	4.3
Miniature pentode, 35A.	4.6
15A	4.6
PX4 Intervalve	3.6
5:1 Intervalve	5.11

GARRARD RECORD PLAYERS

For 6- or 12-volt operation. Complete with magnetic pickup and volume control. In metal cabinet, size 17 x 14 x 1 1/2 in. Very limited quantity.

LASKY'S PRICE. **£5.19.6**. Carriage 10 - extra.

VALVES. 10,000 IN STOCK AT THE LOWEST POSSIBLE PRICES. Write for complete list.

SPECIAL OFFER. 4 Valves: 1 each 1R5, 1T4, 1S5 and 35A. **LASKY'S PRICE 32/6.** POST FREE.

50L1	10/-	9- 6J7	6.6	6F9	7.6
35Z4	9/-	5- HL2	3.6	12K7	10.6
6A8G	9/-	9- KP	5-	6L5	10.6
6H6	2.6	1R5	9-	XH	2.6
EF50 Red		1S3	9-	3Q2	9-
New Sylvania	12/6	1C3	9-	6K7	6.6
				U50	9-
				6C33	7.6
				ECH33	13.6
				50L5	10-

LASKY'S RADIO

Lasky's (Harrow Road), Ltd.,

370, Harrow Road, Paddington, London, W.9

Telephones: CUNningham 1979-7214. All Depts.

MAIL ORDER AND DESPATCH DEPARTMENTS: 495-497, HARROW ROAD, PADDDINGTON, LONDON, W.10.

Hours: Mon. to Sat. 9.30 a.m. to 6 p.m.; Thurs. half day. 1 p.m. Postage and packing charges (unless otherwise stated); on orders value £1-1s. 6d. extra; 2s.-2s. 6d. extra; £10-3s. 6d. extra; over £10 carriage free unless specially stated otherwise. All goods fully insured in transit.

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
120 mA. 10 H.	15/-
200 mA. 5 H. 50 ohms	12/6

TELEVISION SELENIUM RECTIFIERS

The very latest "Sentercell" S.T.C. range.

K3 40.32 kV.	7/6
K3 45.35 kV.	8/3
K3 50.40 kV.	8/3
K3 100.80 kV.	13/8
K3 160.128 kV.	21/6

S.T.C. METAL RECTIFIERS

RMI	3/11
RM2	4/6
RM1	18/-

AMPLIFIERS

4-Watt Model. Ex Government. Complete with 10 valves: 2 251A, 1 6H5, 1 252B, 2 6SK7. For operation on 110 volts A.C. Balance and push pull. High, medium and low impedance inputs. A.G.C. etc. **LASKY'S PRICE £5 19.6** complete. No circuits available. Carriage 10 - per unit extra.

CRYSTAL DIODES

Germanium. Price 2/3 each. Post Free.

TANNOY PRESSURE UNITS

10 watts, 7.5 ohms impedance. **LAST FEW ONLY 59.6**. Carriage 3.6 extra.

T.C.C. VISONCAL HIGH VOLTAGE CONDENSERS

(Cathodray)

.001 mfd. 15 kV.	10/-
.001 mfd. 25 kV.	13/-
.0005 mfd. 25 kV.	13/-
.0005 mfd. 12.5 kV.	10/-
1 mfd. 7 kV.	15/-
0.04 mfd. 12.5 kV.	7.6
.01 mfd. 12.5 kV.	7.6

Plastic case, single bolt fixing.

EX-AM. RECEIVER TYPE R1155.

Brand new and unused. Aerial tested before despatch. Supplied complete with 10 valves. Circuit: B.F.O., A.V.C., I.F. Amp. two I.F. Stages, Magic Eye, etc. etc.

Frequency ranges: 18.5-7.5 Mcs.; 7.5-3.0 Mcs.; 1,500-600 Kcs.; 500-200 Kcs.; 200-75 Kcs.

Supplied in maker's original wood transit case. **LASKY'S PRICE. £11 19.6** Complete. Carriage 12.6 extra.

USED MODEL R1155 RECEIVERS.

Aerial tested before despatch. Complete with 10 valves. **LASKY'S PRICE £7 19.6**. Carriage 12.6 extra.

FULLY ASSEMBLED POWER PACK AND OUTPUT STAGE FOR R1155 RECEIVERS.

For use on 200-250 volt A.C. mains. Wired and complete with valves. **LASKY'S PRICE. 79.6** Carriage 5 extra.

INDICATOR UNITS TYPE 233

Contains 1 cr. tube type VCR97 and 11 valves: 2 1R50 - 3 EB94 - 2 5P61 - 2 1A50. Also hundreds of components, resistances, switches, etc. etc. On metal chassis, in grey enamel steel case. Size 2-1/8 x 8 x 8ins. **LASKY'S PRICE. 69.6**. Carriage and packing 10.6 extra.