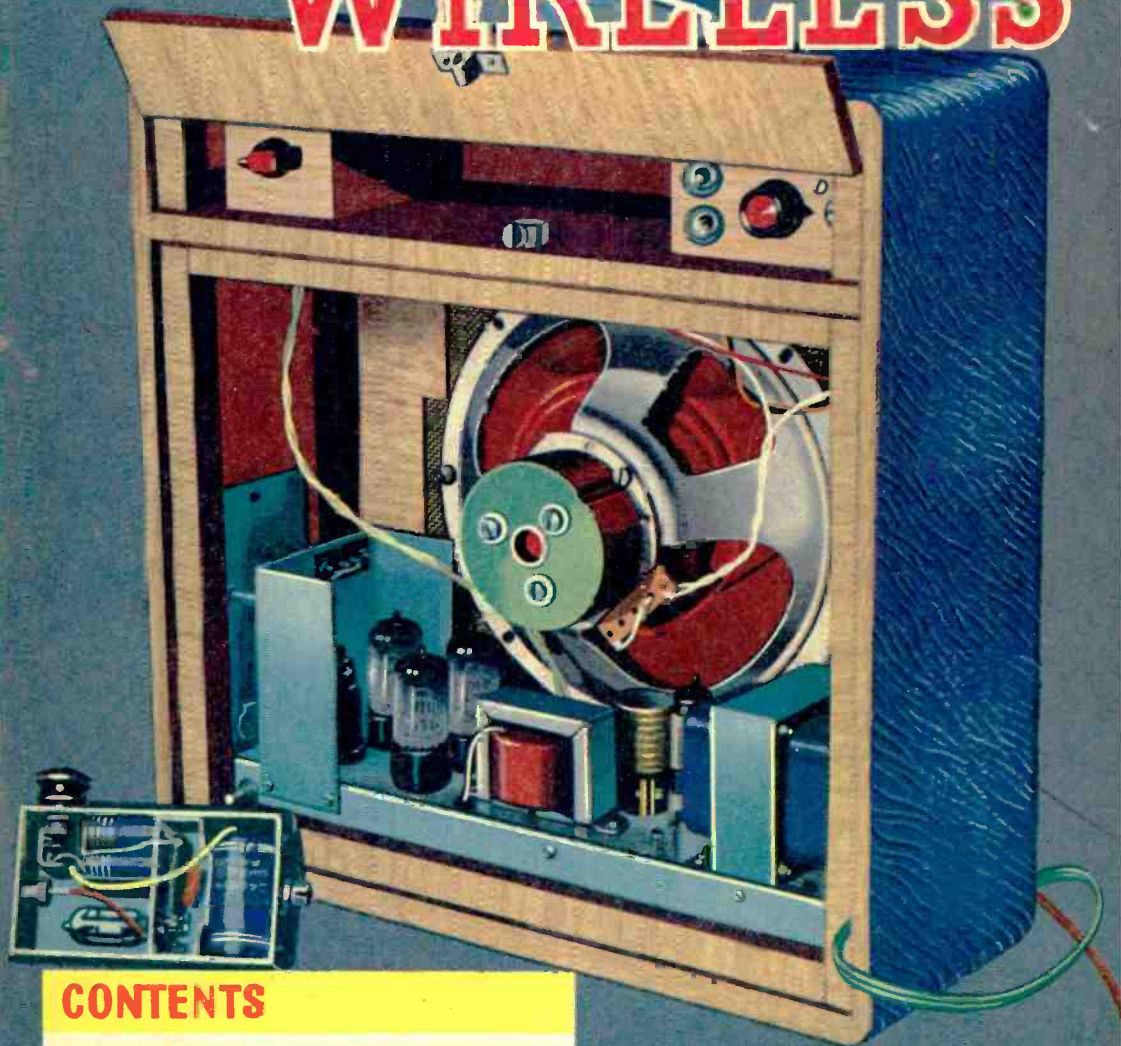


INEXPENSIVE P.A. EQUIPMENT

PRACTICAL 16

AUGUST
1960

WIRELESS



CONTENTS

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SIMPLE TUNING METER
ETC. ETC. ETC.



RADIO & TV TABLES

"NEWSTEAD" (as illustrated). This contemporary "Slimline" TV Table is finished in highly polished walnut veneer. Measures 19" x 13" x 20" high

Price £3. 7. 6 (inc. P.T.)

"CHATSWORTH." Finished in highly polished walnut veneer. Measures 19" x 14" x 21" high.

Price £4. 0. 0 (inc. P.T.)

"WELBECK" (as illustrated) measures 20" x 20" x 20" and is fitted with self-adjusting gliders.

Price £3. 15. 0 (inc. P.T.)

"SHERWOOD" will accommodate the largest television receivers: measures 23" high x 25" wide x 22" deep.

Price £5. 5. 0 (inc. P.T.)

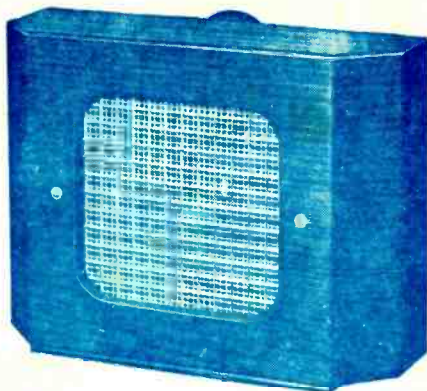
"SENIOR," of ample dimensions (18" x 24" x 25" high).

Price £4. 18. 9 (inc. P.T.)

All are supplied packed flat ready for instant assembly and with the exception of the Welbeck and the Chatsworth have easy running 2" castors.



*The symbol
of extra
High Quality*



Stentorian
EXTENSION SPEAKERS

These well designed speakers demonstrate the traditional Whiteley quality at really competitive prices. This range of extension speakers has finger-tip volume control, is superbly finished in polished walnut veneer and provides excellent reproduction.

**WHITELEY ELECTRICAL RADIO CO. LTD.
MANSFIELD . NOTTS**

**WITH THE
EXCLUSIVE
FINGER-TIP
VOLUME
CONTROLS**

- 'BUDE' 60/-
- 'BEDFORD' 72/-
- 'BRISTOL' 86/6

Prices include P.T.

ERSIN MULTICORE SOLDERS

for a first class joint every time

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

**SIZE 1 CARTON
5/-**



**HANDYMAN'S
CARTON**

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

**HOME CONSTRUCTORS
2/6 PACK**

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



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

SAVBIT TYPE 1 ALLOY

A specially formulated alloy to reduce the wear of soldering iron bits. Contains 5 cores of non-corrosive Ersin Flux and is ideal for all soldering purposes.



SIZE 1 CARTON 5/-

Available in three specifications.

**BIB WIRE STRIPPER
AND CUTTER**

Strips insulation without nicking wire, cuts wire cleanly, splits extruding flux. **3/6 each**



MULTICORE SOLDERS LTD.,

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

**SPECIAL FOR THE "HAMS"
RADIO STATION**

Illustrated

$\frac{1}{8}$ inch detachable bit soldering instrument
List No. 70

Combined Protective Unit with Wiper/Abrasion Pad and Solder Reel
List No. 700



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Stern's "fidelity" TAPE EQUIPMENT

YOU CAN BUILD A COMPLETE TAPE RECORDER

A SELECTION OF HIGH FIDELITY PORTABLE TAPE PREAMPLIFIERS

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

IN ALL MODELS WE INCORPORATE THE TYPE "C" PREAMPLIFIER

AND OFFER IT COMPLETE IN CASE WITH . . .



for **£36.0.0**

H.P. TERMS Deposit **£7.4.0**, 12 months **£2.12.10**.

FOR THIS WE SUPPLY:

- ★ COMPLETE KIT OF PARTS TO BUILD THE HF/TR3 TAPE AMPLIFIER
- ★ THE NEW COLLARO "STUDIO" TAPE DECK
- ★ PORTABLE CARRYING CASE (as illustrated).
- ★ ROLA/CELESTION 10in. x 6in. P.M. LOUDSPEAKER.
- ★ ACOS CRYSTAL MICROPHONE 1,200ft. SPOOL E.M.I. TAPE.

For those who prefer another type of TAPE DECK we will supply precisely as above—but IN PLACE OF THE COLLARO "STUDIO" DECK—WE INCLUDE:

- (a) The Mk. IV COLLARO "TRANSCRIPTOR" DECK **£39.15.0**
(£1 extra to wire up the Transcriptor Switchbanks.)
- (b) The New TRUVOX Mk. VI DECK **£45.0.0**
H.P. Deposit **£9.0.0** and 12 months **£3.6.0**. (Carriage and Insurance on all above is 12/6 extra.)

For constructors with their own Cabinet WE OFFER

- (a) COMPLETE KIT to build the HF/TR3 together with the COLLARO "STUDIO" DECK **£25.10.0**
- (b) As above but with HF/TR3 supplied ASSEMBLED and TESTED **£29.0.0**
H.P. Deposit **£5.16.0** and 12 months **£2.2.6**.
- (c) COMPLETE KIT to build the HF/TR3 together with the Mk. IV COLLARO "TRANSCRIPTOR" TAPE DECK **£30.15.0**
- (£1 extra if we are required to wire up Deck Switch Banks.)
- (d) As above but HF/TR3 supplied ASSEMBLED and TESTED **£34.10.0**
H.P. Deposit **£7.0.0** and 12 months **£2.10.5**. (£1 extra if we are to wire up Deck Switch Banks.)
- (e) COMPLETE KIT to build the HF/TR3 together with the NEW TRUVOX Mk. VI TAPE DECK **£36.0.0**
- (f) As above but HF/TR3 supplied ASSEMBLED and TESTED **£39.10.0**
H.P. Deposit **£7.18.0** and 12 months **£2.17.11**.
- (g) COMPLETE KIT to build the HF/TR3 AMPLIFIER with the BRENNEL Mk. V TAPE DECK **£41.10.0**
- (h) As above but HF/TR3 supplied ASSEMBLED and TESTED **£45.0.0**
H.P. Deposit **£9.0.0** and 12 months **£3.6.0**. Carriage and Insurance on each above is 10/- extra.

Attractive PORTABLE CASE is available to accommodate the TRUVOX or COLLARO TAPE DECKS and we offer it, together with ROLA/CELESTION 10 x 6in. LOUDSPEAKER—ACOS CRYSTAL MICROPHONE—1,200ft. SPOOL E.M.I. TAPE—ALL FOR **£9.0.0** Carriage and Insurance 5/- extra.

STERNS MULLARD TYPE "C" TAPE PREAMPLIFIER-ERASE UNIT

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



ALSO AVAILABLE EXCLUDING POWER SUPPLY UNIT FOR **£11.15.0** and **£14.10.0**, respectively. WHEN ORDERING PLEASE STATE MAKE OF TAPE DECK TO BE USED. We present this "Hi-Fi" Preamplifier strictly to Mullard's specification incorporating ONLY NEW HIGH-GRADE COMPONENTS and the SPECIFIED NEW MULLARD VALVES. It comprises a COMPLETELY SELF-CONTAINED UNIT, neatly finished in Hammered Gold with a very attractively engraved FERROX FRONT PANEL.

FOR PERMANENT HIGH FIDELITY INSTALLATIONS WE ALSO OFFER (excluding case)

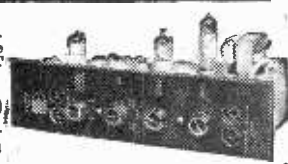
- (a) The COLLARO "STUDIO" TAPE DECK and our Mullard Type "C" PREAMPLIFIER and Power Unit Assembled and Tested **£30.10.0**
H.P. Deposit **£8.2.0** and 12 months **£2.4.9**.
- (b) As above but TYPE "C" PREAMPLIFIER supplied as complete KIT OF PARTS **£26.10.0**
- (c) The COLLARO Mk. IV TAPE DECK and the MULLARD TYPE "C" PREAMPLIFIER & Power Unit assembled, tested **£35.0.0**
H.P. Deposit **£7**, and 12 months **£2.11.4**.
- (d) As (c) but Type "C" as COMPLETE KIT OF PARTS **£32.0.0**
- (e) The TRUVOX Mk. VI DECK and the assembled Type "C" Preamplifier and Power Unit **£40.0.0**
H.P. Deposit **£8.0.0**, and 12 months **£2.18.3**.
- (f) As above but Type "C" as complete KIT OF PARTS **£36.10.0**
- (g) The BRENNEL Mk. V DECK and the assembled Type "C" PREAMPLIFIER and POWER UNIT **£46.0.0**
H.P. Deposit **£9.4.0**, and 12 months **£3.7.6**.
- (h) As (g) but Type "C" as complete KIT OF PARTS **£43.0.0**
- (i) THE WEARITE 4A DECK with TYPE "C" assembled and tested **£56.0.0**
H.P. Deposit **£11.4.0**, and 12 months **£4.2.1**. (Carriage and Insurance on above quotes 10/- extra.)

PLEASE ENCLOSE S.A.E. WITH ALL CORRESPONDENCE

WE HAVE THE NEW 2-SPEED TWIN TRACK TRUVOX Mk VI TAPE DECK IN STOCK £26.5.0
DEPOSIT: **£5.5.0** and 12 MONTHS **£1.18.6**.

THE MODEL HF/TR3 TAPE AMPLIFIER

INCORPORATING 3-SPEED TREBLE EQUALISATION by means of the latest FERROXUCBE POT CORE INDUCTOR. PRICE FOR COMPLETE KIT OF PARTS **£12.15.0**
PRICE FULLY ASSEMBLED & TESTED **£16.10.0**



HIRE PURCHASE. Deposit **£3.6.6** and 12 monthly payments of **£1.4.2**. A very high-quality Amplifier based on the very successful TYPE "A" design completed in the MULLARD LABORATORIES. ONLY NEW HIGH-GRADE COMPONENTS are incorporated including MULLARD VALVES and a GILSON OUTPUT TRANSFORMER. Other features are—Magic Eye Recording hand indicator—Ineffective Tone Control—Monitoring and Extension Speaker Sockets—has own Power Supply and can be used as independent Amplifier for direct reproduction of Gram Records or from Radio Tuner. Overall size 11 x 6 x 8in. Can be supplied for use with Truvox—Collaro—Lange—Erenco or Mook Dees. Please specify which. Send S.A.E. for leaflet or 2/6 for complete Assembly Manual.

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

STERN'S MULLARD DESIGNS

Designed by MULLARD—presented by STERNS strictly to specification

COMPLETE KIT OF PARTS—

MULLARD "5-10" MAIN AMPLIFIER

For use with the MULLARD 2-stage pre-amplifier with which an undistorted power output of up to 10 watts is obtained. We supply SPECIFIED COMPONENTS AND NEW MULLARD VALVES, including PARMEKO MAINS TRANSFORMER and choice of the latest Ultra-Linear PARMEKO or the PARTRIDGE Output Transformer. PRICE COMPLETE KIT (PARMEKO Output Trans.)

Alternatively we supply ASSEMBLED and TESTED. **£10.00**

£11.10.0

ABOVE INCORPORATING PARTRIDGE OUTPUT TRANSFORMER. £1.6.0 EXTRA



MULLARD'S PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves, and designed to operate with the MULLARD MAIN AMPLIFIERS, but also perfectly suitable for other makes.

PRICE COMPLETE KIT OF PARTS **£6.6.0**

Alternatively we supply ASSEMBLED AND TESTED **£8.0.0**

Supplied strictly to MULLARD'S SPECIFICATION and incorporating:

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



COMPLETE MULLARD "5-10"

The popular and very successful complete "5-10" incorporating Control Unit providing up to 10 watts high quality reproduction. Specified Components and new MULLARD VALVES are supplied including PARMEKO MAINS TRANSFORMERS and choice of the latest PARMEKO or PARTRIDGE ULTRA-Linear Output Transformers.

KIT OF PARTS **£11.10.0** OR ASSEMBLED and TESTED **£13.10.0**

HERE PURCHASE (Assembled Amp. only). DEPOSIT £2.14.0. 12 months at 19/10.



ABOVE INCORPORATING PARTRIDGE OUTPUT TRANS. £1.6.0 extra.

COMPLETE MULLARD "3-3"

THE IDEAL AMPLIFIER FOR A SMALL HIGH QUALITY INSTALLATION PROVIDING EXCELLENT REPRODUCTION OF UP TO 3 WATTS OUTPUT COMPLETE KIT **£7.10.0** OR ASSEMBLED and TESTED **£8.19.6** (plus 6/6 coverage and insurance) H.P. Terms: Deposit £2.0.0 and 8 Months at £1.0.0. Complete to MULLARD'S SPECIFICATION including Mullard valves and a PARMEKO OUTPUT TRANSFORMER.



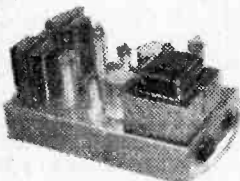
STEREO "3-3" MAIN AMPLIFIER

Comprises two "3-3" MULLARD MAIN AMPLIFIERS on one chassis and is designed to operate with our DUAL CHANNEL PRE-AMPLIFIER for both STEREOPHONIC or MONAURAL operation. Its output power is 6 watts (3 watts per channel).

PRICE: COMPLETE KIT **£10.0.0**

Alternatively ASSEMBLED AND TESTED **£11.15.0**

H.P. Terms: Deposit £2.7.0 and 12 months at 17/4.



!! RECORD PLAYERS !!

THE LATEST MODELS ARE IN STOCK MANY AT REDUCED PRICES

SEND S.A.E. FOR ILLUSTRATED LEAFLET

B.S.R. MONARCH UA8 4-speed mixer Autochanger with Crystal Pick-up.

£6.19.6

The NEW COLLARO MODEL RP24 4-speed Single Record Player, Studio Cartridge.

£9.18.9

The COLLARO "CONQUEST" 4-speed Autochanger Studio Pick-up.

£7.10.0

The COLLARO 4-speed Single Record Player, Studio Pick-up. **£6.9.6**

THE NEW B.S.R. Model UA12 in Stock. A4 "SPEED" MIXER AUTOCHANGER. **£8.7.6**

UA12 also available incorporating the B.S.R. STEREO Pick-up, plays L.P. and 78 Records. **£10.10.0**

GARRARD MODEL TA/Mk.11 4-Speed Player fitted High output Crystal Pick-up. **£8.10.0**

GARRARD MODEL RC210. Autochanger 4-Speeds. High output. Crystal Pick-up. **£10.10.0**

Carriage and Insurance on each above, 5/- extra.



SPECIAL PRICE REDUCTIONS

(e) The KIT OF PARTS to build both the "5-10" Main Amplifier and the 2-valve PRE-AMP CONTROL UNIT. **£15.15.0**

(f) The "5-10" and the 2-stage PRE-AMP both ASSEMBLED and TESTED H.P. Dep. **£3.18.0** and 12 months of £1.7.8. **£18.18.0**

(e) The KIT OF PARTS to build the DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT. **£21.10.0**

(f) The DUAL-CHANNEL "3-3" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED and TESTED. H.P. Terms: Deposit **£5** and 12 months of £1.16.8.

(g) THE KIT OF PARTS to build one "5-10" MAIN CHANNEL and the DUAL-CHANNEL PRE-AMP CONTROL UNIT. **£21.10.0**

(h) One "5-10" AMPLIFIER and the DUAL-CHANNEL PRE-AMPLIFIER both ASSEMBLED and TESTED. H.P. Terms: Deposit **£5**, 12 months of £1.16.8.

(i) KIT OF PARTS to build Two "5-10" MAIN AMPLIFIERS (incorporating Parmeko Output Transformers) and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT. **£31.0.0**

(j) Two "5-10" AMPLIFIERS and the DUAL-CHANNEL PRE-AMPLIFIER CONTROL UNIT BOTH ASSEMBLED & TESTED **£36.0.0**

H.P. Terms: Deposit **£7.4.0**, 12 months of £2.12.0. Carriage and Insurance 7/6 extra. Prices quoted are subject to £1.8.0 extra for Partridge Transformer.

STEREO DUAL CHANNEL PRE-AMPLIFIER

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

COMPLETE KIT **£12.10.0** ASSEMBLED and TESTED **£15.0.0**

Operates equally well for MONAURAL only operation with one "5-10" Main Amplifier can at any time be added, thus very easily provided for both STEREO or MONAURAL reproduction.

THE ASSEMBLY MANUAL is available for 3/-

COMPLETE STEREO AMPLIFIER

A thoroughly recommended Mullard design that very effectively meets the many requests for a low-priced but good quality DUAL CHANNEL STEREOPHONIC AMPLIFIER. Output power is 4 watts from STEREO or MONAURAL gram inputs. PRICE COMPLETE KIT OF PARTS **£8.10.0**

ALTERNATIVELY ASSEMBLED AND TESTED **£10.10.0**



! RADIOGRAM CHASSIS !

and V.H.F. RADIO TUNING UNITS

WE HAVE THE COMPLETE RANGE OF ARMSTRONG and DULCI high quality replacement Chassis IN STOCK. Descriptive leaflets are available—enclose S.A.E.

Please enclose S.A.E. for DESCRIPTIVE LEAFLETS COMPLETE ASSEMBLY MANUALS are available at 1/6 each.

STERN RADIO LTD.



Stern's "fidelity" TAPE RECORDERS

BEFORE YOU BUY
—YOU SHOULD
HEAR THESE

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

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

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

RECORDERS. THEY ARE COMPARABLE TO THE MUCH HIGHER-PRICED MODELS

MODEL CR3/S Incorporates the New COLLARO "STUDIO" TWIN TRACK 3-Speed Deck H.P. Terms: Deposit **£27.18.0** and 12 months of **£23.17.11.**

MODEL CR3/T Incorporates the very popular 3-Speed COLLARO Mk. IV "TRANSCRIPTOR" Deck which has both upper and lower tape tracks. **£47.10.0** H.P. Terms: Deposit **£9.10.0** and 12 months of **£3.9.8.**

MODEL TR3/Mk. VI Incorporates the New TRUVOX Mk. VI TWIN TRACK 2-speed Tape Deck **£49.10.0** H.P. Terms: Deposit **£9.18.0** and 12 months of **£3.12.7.**

Model HF/G2R



and NOW WE INTRODUCE

two units meticulously matched to correctly operate THE NEW GARRARD "MAGAZINE" TAPE DECK

- MODEL HF/G2P TAPE PRE-AMPLIFIER
- MODEL HF/G2A TAPE AMPLIFIER



Based on the very successful MULLARD tape DESIGN'S incorporating only HIGH GRADE COMPONENTS and MULLARD VALVES.

Both Units form an entirely new "Easy to handle" presentation, each is completely self contained with Power Supply (Loudspeaker Amplifier HF/G2A only), and all INPUT and OUTPUT sockets incorporated on the chassis, which itself is constructed to allow for direct attachment to the tape deck. Thus the tape deck with the Amplifier (or Preamplifier fixed to it) form ONE COMPLETELY SELF-CONTAINED WORKING UNIT which requires only screwing into a Cabinet and Connecting to the Mains supply. As is usual with GARRARD products this Tape Deck is a Precision Engineered Unit of Excellent Quality operating two tracks at 3 1/2 in. sec. speed. It is the "Easiest to Handle" Tape Deck, having only two controls and incorporates the new instantaneous Tape Loading Magazine which makes tape loading as simple as putting on a Record.

BOTH UNITS CARRY MESSRS. GARRARD'S FULL RECOMMENDATION

WE OFFER AS FOLLOWS:

- (a) Model HF/G2R P'table TAPE RECORDER. Includes spool of L.P. Tape and Crystal Microp. **£29.15.0** H.P. Terms: Deposit **£6.0.0**, 12 months **£2.3.7**
- (b) Model HF/G2A-D, comp. AMPLIFIER and TAPE DECK. Inc. spool of L.P. Tape and L/S. **£25.0.0** H.P. Terms: Deposit **£5.0.0**, 12 months **£1.16.8**
- (c) ASSEMBLED AND TESTED AMPLIFIER Model HF/G2A **£13.0.0** H.P. Terms: Deposit **£2.12.0**, 12 months **19/1**
- (d) Model HF/G2P PORTABLE PREAMPLIFIER. Complete in Portable Case (like HF/G2R) **£26.0.0** H.P. Terms: Deposit **£5.4.0**, 12 months **£1.18.2**
- (e) Model HF/G2P-D, comp. PREAMPLIFIER and TAPE DECK. Includes spool of L.P. Tape. **£23.15.0** H.P. Terms: Deposit **£4.15.0**, 12 months **£1.14.10**
- (f) ASSEMBLED AND TESTED PREAMPLIFIER Model HF/G2P **£11.15.0** H.P. Terms: Deposit **£2.7.0**, 12 months **17/4**

A SPECIAL CASH ONLY OFFER !!

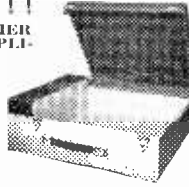
This very attractive PORTABLE AMPLIFIER CASE together with a good quality GRAM AMPLIFIER and a matched P.M. SPEAKER.

ALL FOR ONLY **£8.7.6** (Plus 7/6 Carr. & Ins.)

The Amplifier consists of a 2-stage design incorporating 3 modern B.V.A. valves and has separate BASS and TREBLE CONTROLS. The Portable Case will also accommodate almost any make of Autochanger and is attractively finished in Mushroom Grey Retexine.

WE ALSO SUPPLY SEPARATELY—

- (a) The 2-stage (Plus **£4.7.6** Rectifier) AMPLIFIER
- (b) The PORTABLE CARRYING CASE **£3.17.6**
- (c) 6in. P.M. SPEAKER **18/9** Carriage and Insurance 4/- extra.



THE "ADD-A-DECK" Incorporating the NEW B.S.R. "MONARDECK" and Matched Preamplifier

Carriage and Insurance. 10/-
Deposit **£3.12.0** **£17.17.0.**
12 mths. **£1.6.2**

Designed to operate through the Pick-up Sockets of the standard R.A.D.I.O. RECEIVER through which first-class results are obtained, it consists of a Twin Track Tape Deck, incorporating matched Pre-amplifier and operates at 3 1/2 in. sec. speed.



Supplied fully tested and completely assembled on an attractive wood plinth, and only requires connections to the mains supply and the Pick-up Sockets, for which purposes "floating" leads are incorporated.

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

PRICE **£14.5.0** (Plus 5/- Carr. and Ins.)

HIRE PURCHASE: Deposit **£2.17.0** and 12 Monthly Payments of **£1.0.11**

Incorporates the latest MULLARD PERMEABILITY TUNING HEART and the corresponding MULLARD VALVE LINE-UP. A really first-class Tuner, very attractively presented and comparable to many offered at much higher prices. Power consumption is only 1.5 amps at 6.3 volts and 25 ma at 250 volts.

HOME CONSTRUCTORS! YOU CAN BUILD THIS TUNING UNIT FOR ONLY **£10.10.0** (Plus 5/- Carr. & Ins.) Please send S.A.E. for fully descriptive leaflet, or the Assembly Manual is available for 1/6.



"HI-FI" LOUDSPEAKERS WE HAVE IN STOCK A COMPLETE RANGE BY GOODMANS—WHARFEDALE—W.B. Illustrated and Priced Leaflets on request.

HOME CONSTRUCTOR

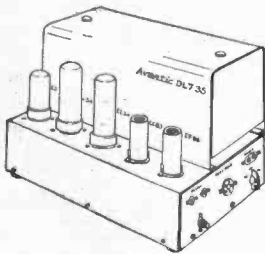
A RANGE OF "EASY TO ASSEMBLE" PREFABRICATED CABINETS. Designed by the W.B. "STENTORIAN" COMPANY for "Hi-Fi" Loudspeaker systems or to accommodate high-quality equipment. The acoustically designed Bass Reflex Cabinets containing the very successful "Stentorian" Speakers give really first-class reproduction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

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

PLEASE ENCLOSE S.A.E. WITH ALL ENQUIRIES.

Avantic

THE BEST IN SOUND— AMAZING AT THE BEST PRICE— OFFER!



DL7-35 POWER AMPLIFIER

£24

List Price 30 gns.
P. & P. 5/-

Power output 54 watts—
dist. 0.7% at 20 watts.
Freq. Res. 5 c/s to 30
Kc/s power in 105 vac-
251 dimension. 14 x 9
x 8 1/2 in. suitable for use
with SP21.

PL6-21 MONAURAL AMPLIFIER

This first-class amp using 7 valves has separate bass, treble
volume and loudness control output 19 gns. P. & P. 5/-
4.8.16 and input 110-251 A.C. volts.

VHF-FM/MW-AM RADIO TUNER BM611

Is a shelf type unit to match in with other Avantic ranges.
It employs 8 valves plus rect. inc cath. £25 P. & P. 5/-
follower output stage range VHF88-108 M.W. 545-1,600 K/cs. List Price £40

FERGUSON VHF/FM TUNER

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This is a combine 2 channel power amp and pre-amp control
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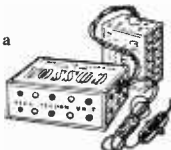
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OBZ	17/6	6C10	9/	7D8	23/3	25Z5	9/6	CL33	19/3	ECH3	26/6	HL3/6	PL36	12/	U329	14/	X81	46/5	
OZ4	5/	6CD6G	36/6	7H7	8/	25Z6G	10/	CV63	10/6	ECH21	23/3	HL23DD	PL38	26/6	U339	16/7	X101	33/2	
IA3	3/	6CH6	9/	7R7	12/6	27SU	19/11	CY1	18/7	ECH35	6/6	HL41	7/6	PL81	10/6	U403	16/7	X109	17/3
IA5	6/	6D3	19/11	757	9/6			CY31	16/7	ECH42	9/	HL41DD	PL82	7/6	U404	8/6	XD(1.5)	6/6	
IA7GT	12/	6D6	6/6	7Y7	8/6	28D7	7/	D1	3/	ECH42	9/		PL82	7/6	U801	29/10	XFG1	18/	
ICS	12/6	6E5	12/6	7Y4	7/6	30C1	8/	D15	10/6	ECH81	9/		PL83	9/	U4020	16/7	XY12	9/6	
ID5	9/	6F1	26/6	7Z4	18/7	30F5	7/	D63	5/	ECH83	13/11	HL42DD	PL84	12/8	UACB80	9/	XYF34	17/6	
ID6	10/6	6F6G	7/	8D2	3/6	30FL1	10/	D77	4/	ECL80	9/		PL820	18/7	UAF42	9/6	XH(1.5)	6/6	
IG6	17/6	6F6GTM	8/	8D3	4/6	30L1	8/	DAC32	10/6	ECL82	10/6	HN309	24/7	PM2B	12/6	UB41	12/	X5G(1.5)	
IHSGT	10/6	6F11	17/3	9BW5	13/6	30L15	11/6	DAF91	6/	ECL83	19/3	HV82	20/	PM12	6/6	UBC41	8/6		6/6
IL4	4/6	6F12	4/6	9D2	4/	30P12	7/6	DAF96	8/6	EF9	23/3	HVR2A	6/	PM12M	6/6	UBC81	11/4	Y63	7/6
ILD5	5/	6F13	11/6	10C1	12/	30P16	7/6	DD41	13/11	EF22	14/	KF35	8/6	PM24M	21/3	UBF80	9/	Z66	7/6
ILN5	5/	6F14	26/6	10C2	26/6	30P11	11/6	DF33	10/6	EF36	4/	KL35	8/6	PX4	10/6	UBF89	9/6	Z66	7/6
INSGT	10/6	6F15	15/3	10D2	12/	30PL13	12/6	DF66	15/	EF37A	8/	KL32	24/7	PX25	59/8	UBL21	23/3	Z77	4/6
IS4	6/6	6F16	9/6	10F1	25/6	33A/158M		DF70	15/	EF39	5/6		Y31		16/7	UCB4	14/7		
IS4	9/	6F17	12/6	10F9	10/6			DF91	4/6	EF40	15/	KT33C	10/	PY32	11/6	UCC85	9/		Transistors and diodes
IS5	6/	6F23	10/6	10LD3	8/6	35A5	21/3	DF96	8/6	EF41	9/	KT36	29/10	PY80	7/6	UCB80	16/7	CG1C	4/
IT4	4/6	6F32	10/6	10LD11		35L6GT	9/6	DF97	9/	EF42	10/6	KT41	12/6	PY81	8/6	UCH21	23/3	CG4E	4/
IW5	6/	6F33	7/6		15/11	35W4	7/6	DH63	6/6	EF50(A)	7/	KT44	12/6	PY82	7/	UCH42	9/6	CG6E	4/
2A3	26/6	6G6	6/6	10P13	15/	35Z3	10/6	DH76	5/	EF50(E)	5/	KT61	12/6	PY83	8/6	UCH81	9/6	CG10E	4/
2A7	10/6	6H6GT	3/	10P14	19/3	35Z4GT	6/	DH77	7/	EF54	5/	KT63	7/	PZ30	19/11	UCL82	11/6	CG12E	4/
2P	26/6	6J5G	5/	11D3	24/7	35Z5GT	9/	DH81	46/5	EF73	10/6	KT66	15/	PQ21	7/	UCL83	19/3	GET103	12/6
2X2	4/6	6J5GTG	5/6	12A6	5/	42	23/3	DH101	28/6	EF80	7/	KT81	46/5	QP25	14/6	UF41	9/	GEX33	4/
3A4	6/	6J5GTM	6/	12AC6	15/3	43	10/	DH107	13/11	EF85	7/	KT88	22/6	QS150/15		UF42	12/6	GEX34	4/
3A5	10/6	6I6	5/6	12AD6	17/3	50C5	10/	DK32	12/	EF86	10/6	KTW61	6/6		10/6	UF80	10/6	GEX35	4/
3B7	12/6	6I7G	6/	12AE6	13/11	50CD6G		DK40	21/3	EF89	9/	KTW62	7/6	R12	9/	UF85	9/	GEX36	10/
3D6	5/	6I7GT	10/6	12AH7	8/		36/6	DK91	16/6	EF91	4/6	KTW63	6/6	R18	14/	UF86	17/11	GEX45/1	6/6
3Q4	7/6	6K7G	5/	12AH8	12/6	50L6GT	9/6	DK92	9/	EF92	4/6	KTZ41	8/	R19	19/11	UF89	9/	GEX64	11/6
3Q5GT	9/6	6K7GT	6/	12AT6	7/6	53KU	19/11	DK96	8/6	EF97	13/3	KTZ63	7/6	S130	15/	UL41	9/	GEX66	13/6
354	7/	6K8GT	10/6	12AT7	6/	72	4/6	DL33	9/6	EF98	13/3	L63	6/	SD6	12/	UL44	26/6	OA2	4/
3V4	7/6	6K8G	6/6	12AU6	23/3	75	24/7	DL66	17/6	EF183	17/6	MH(4C)	7/	SP4(7)	14/6	UL46	14/6	OA5	4/
5R4GY	17/6	6K25	19/11	12AU7	6/6	77	8/	DL68	15/	EK32	8/6	MH4	7/6	SP41	3/6	UL84	8/6	OA70	4/
5U4G	6/6	6L1	23/3	12AV6	12/8	78	6/6	DL82	46/5	EL32	5/	MHL66	12/6	SP42	12/6	UM4	17/3	OA79	4/
5V4G	10/	6L6G	8/	12AX7	7/6	80	9/	DL92	7/	EL33	12/6	ML4	8/6	SP61	3/6	UM80	15/3	OA81	4/
5Y3G	8/	6LM6	9/	12BA6	8/	83	15/	DL94	7/6	EL34	15/	MU12/14	8/	SU25	26/6	UR1C	9/	OA91	5/
5Y3GT	6/6	6L7GT	7/6	12BE6	9/	83V	12/6	DL96	8/6	EL38	26/6	MX40	15/	SU61	9/	UU6	19/11	OA95	5/
5Z3	12/6	6L18	13/	12BH7	21/3	85A2	15/	DM70	7/6	EL41	9/	N37	19/11	T41	23/3	UU7	16/7	OA210	25/
5Z4G	9/	6L19	23/3	12E1	30/	150B2	15/	EAS0	2/	EL42	10/6	N78	19/11	TDD4	12/6	UU8	26/6	OA211	40/
5Z4GT	10/	6D3	8/6	12J5GT	4/6	161	10/6	EABC80	9/	EL81	12/6	N108	19/11	TH48	15/	UU9	7/6	OC16	54/
6A7	10/6	6LD20	15/11	12J7GT	9/6	185BT	33/2	EAC91	4/6	EL84	7/6	N308	20/7	TH41	26/6	UY1N	18/	OC19	54/
6A8G	9/	6N17	8/	12K5	17/11	185BTA	33/2	EAF42	9/	EL85	13/11	N339	15/	TH333	33/2	UY21	13/11	OC26	24/
6A87	8/	6P1	19/3	12K7GT	5/6	30/6	10/6	EB34	2/6	EL91	5/	P61	3/6	TH2321	20/	UY41	7/6	OC28	20/
6A88	9/	6P25	12/6	12K8GT	14/	305	10/6	EB41	8/6	EL95	10/6	PABC80		TP22	15/	UY85	7/	OC35	20/
6AC7	4/	6P28	26/6	12Q7GT	5/	807	7/6	EB91	4/	EM34	9/6		13/11	TP25	15/	VM54B	15/	OC44	26/
6AG5	5/6	6Q7G	6/6	12SA7	8/6	956	3/	EB3C	23/3	EM71	23/3	PCC84	8/	TP2620	33/2	VP2(7)	12/6	OC45	23/
6AK5	8/	6Q7GT	11/	12SC7	8/6	1821	16/7	EB33	5/	EM80	9/	PCC85	9/6	TY6F	13/3	VP4	15/	OC65	23/
6AL5	4/	6R7G	10/	12SG7	7/	5763	12/6	EB41	8/6	EM81	9/	PCC88	21/11	U12/14	8/6	VP2B	14/6	OC66	25/
6AM6	4/6	6SA7GT	8/6	12SH7	8/6	7475	7/6	EB4C	8/	EM84	10/6	PCC89	11/6	U16	10/	VP4B	23/3	OC70	14/
6AQ5	7/6	6SCT	7/6	12SJ7	8/	9002	5/6	EBF80	9/	EN31	37/	PCF80	8/	U18/20	8/6	VP13C	7/	OC71	14/
6AT6	7/	6SG7GT	8/	12SK7	6/	AC/PEN		EFB83	13/11	EY51	9/	PCF82	10/6	U22	8/	VP23	6/6	OC72	17/
6AU6	10/	6SH7GT	8/	12SQ7	11/6	5-pin 23/3		EBF89	9/6	EY83	16/7	PCL82	10/	U24	29/10	VP41	6/	OC73	20/
6AV6	12/8	6S17GT	8/	12SR7	8/6	7-pin 15/		EBL21	23/3	EY84	14/	PCL83	11/6	U25	17/11	VR105	8/	OC75	20/
6B7	10/6	6SK7GT	6/	12Y4	10/6	AC2PEN/		EBL31	23/3	EY86	9/	PCL84	12/6	U26	10/	VR150	7/6	OC77	20/
6BBG	4/6	6SL7GT	6/6	12Y7	27/10	DD 12/6		EC52	5/6	EZ35	6/	PENA4	12/6	U31	9/6	VT61A	5/	OC78	17/
6BBGT	5/	6SN7GT	5/6	18	23/3	ACSPEN		EC54	6/	EZ40	7/	PENB4	26/6	U33	26/6	VT501	5/	OC81	18/
6BA6	7/6	6SQ7GT	9/	19A05	10/6			EC70	12/6	EZ41	7/	PEN4DD	U35	26/6	W61M	26/6	OC170	35/	
6BE6	6/	6SS7GT	8/	19B6G6		AC6PEN	7/6	EC92	13/3	EZ80	7/		26/6	U37	26/6	W76	5/	OC200	54/
6BG6G	23/3	6U4GT	12/6		23/3	AC/SG	23/3	EC32	5/6	EZ81	7/	PEN25	4/6	U43	9/	W81M	6/	OC203	58/
6BH6	8/	6U5G	7/6	19H1	10/	AC/TP	33/2	EC33	8/6	FC2A	24/7			U45	9/	W107	15/3	XA101	23/
6BJ6	6/	6U7G	8/6	20D1	15/3	ATP4	5/	EC34	24/7	FC4	15/		25/	U50	6/6	W729	18/7	XA102	26/
6BQ7A	15/	6V6G	7/	20F2	26/6	AZ1	18/7	EC35	8/6	FC13	26/6	PEN44	26/6	U52	6/6	X24M	24/7	XA103	15/
6BR7	15/	6V6GTG	8/	20L1	26/6	AZ31	10/	EC40	23/3	FC13C	26/6	PEN45	19/6	U54	19/11	X31	26/6	XA104	18/
6BS7	25/	6X4	5/	20P1	26/6	AZ41	13/11	EC81	6/	FW4/500		PEN45DD	U76	6/	X41	15/	XB102	10/	
6BV6	8/6	6X5GT	6/	20P3	23/3	B36	15/	EC82	6/6				26/6	U78	5/	X61(C)	12/6	XB103	14/
6BW7	7/	630L2	10/	20P5	23/3	BL63	7/6	EC83	7/6			PEN46	7/6	U107	16/7	X61M	26/6	XB104	10/
6BX6	7/	7A7	12/6	25A6G	10/6	C1	12/6	EC84	9/					U191	16/7	X65	12/6	XC101	16/
6C4	5/	7B6	21/3	25L6GT	10/	C1C	12/6	EC85	8/6	GZ30	8/6	PEN43	33/2	U201	16/7	X66	12/6	Surplus	
6C5G	6/6	7B7	8/6	25U4GT	16/7	CBL1	26/6	EC88	23/11	GZ32	10/			U251	14/	X66	12/6	Transistors	
6C6	6/6	7C5	8/	25Y5	10/	CBL31	23/3	EC91	5/6	GZ34	14/	PEN/DD	U281	19/11	X66M	14/	H.F. & L.F.		
6C8	12/6	7C6	8/	25Y5G	10/	CCH35	23/3	ECF80	10/6	H63	12/6		4020	33/2					

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19 Gns. CASH OR terms over 20 weeks (no interest charged). Initial payment £1.07 and 19 weekly payments of 19/11. Carr. and Ins. 30/-.
ITV/BBC. Beautifully styled polished cabinets. These are table models with the option of contemporary legs fitted (2 gns. extra). 17in. rectangular tube guaranteed for 12 months. Valves and Chassis guaranteed for 3 months (chassis salvaged but reconditioned). Where possible personal collection is advised.

**RECORD
PLAYER
CABINET**



Balance at 2/11 a week or 19 weeks. Made by a famous manufacturer. In polka dot cloth with clipped lid and carrying handle. Size 16 x 14½ x 8½in. deep. Carr. & Ins. 4/6. Will take B.S.R. Monarch 4-speed Auto-changer, 7in. x 4in. Elliptical speaker and our Mk. D.2 Portable Amplifier.

59/6
CASH OR
4/1
INITIAL PAYMENT

**TV CHASSIS FOR SPARES
ALL THIS FOR ONLY 9/6**

56 resistances including 7 variable controls. 54 condensers, including electrolytics. Coils: 7 I.F. and R.F. transformers. 13 valve holders (8-BBA, 2-B7G and 3 octal), 4 transformers: Mains, Output, Line, Frame. Chokes 250 mA. Metal Rectifiers: 300 volts at 250 mA. Fuse panel, scanning coils, focus magnets. Plugs, sockets, switch, chassis screws, tag strips, etc. I.F. strip can be separated. Power pack can be used without dismantling. The chassis has been used but were working when stored. 6-page circuit and instructions showing position of each component. Carriage 7/6 or two for 10/6.

SEND FOR FREE CATALOGUE

AMPLIFIERS

**ALL PORTABLE
12 MONTHS' GUARANTEE**

MK. D.1 59/6
Brand new. Latest design with printed circuit. Dimensions 7 x 2½ x 5in. A.C. only. Mains isolated 3 watts output. Incorporating EL84 as high gain output valve. Volume and tone controls. Knobs 2/6 extra. P. & P. 3/6.

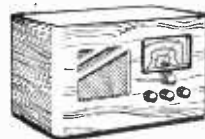
MK. D.3 89/6
As above but with 3 controls, incorporating a special tone correction circuit for extra base and top boost, giving a tone of reproduction seldom heard on a very expensive amplifier. Must be heard to be appreciated. Knobs 3/6 extra. P. & P. 3/6.

TAPE RECORDER AMPLIFIER 47.19.6
Compact, well designed 5-valve amplifier. Output 3.5 watts. Valve line up—ECC83. Double triode first audio amplifiers. ECL82 Triode pentode further audio amplifier and output valve. 6BY6 Dias and erase oscillator. EM84 Record level indicator. EZ80 H.T. rectifier. Input for mike, radio and gram. Controls: Record Playback volume and On/Off Playback tone. Dia.: 8½ x 3 x 4½in. Ins. and carr., 4/6. Terms. Knobs, 2/6 per set. Beautiful perspex dial plate, 3/6. Completed with sockets for Mike. Radio and superimpose switch. B.S.R. MONARCH, 4-speed

Autochanger £6.19.6
T.U.9 B.S.R., 4-speed single player 99/6
COLLARO CONQUEST, 4-speed Autochanger £6.19.6
COLLARO CONQUEST, Stereo Autochanger 9 gns.

A.C. OR UNIVERSAL

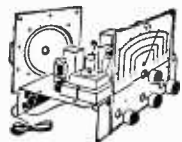
A.C. or Universal Mains. Five valve octal superhet. 3 waveband receiver. In attractive wooden cabinet. 9½ x 18½ x 11½in. Carr. and Ins. 4/6.



**HOME
RADIO
79/6**

SUPER CHASSIS 3/11 PER WEEK

On the initial payment of 5/1, plus carriage of 5/6, this chassis will be despatched. Balance at 3/11 for 19 weeks. 5-valve superhet chassis including 8in. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four wavebands with position for gram p.u. and extension speaker, A.C. Ins. & Carr. 5/6. Cash price 79/6

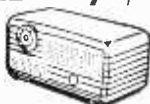


SOLO SOLDERING TOOL 12/6

110 v., 6 v., 12 v. (special adaptor for 200/250 v., 10/- extra). Automatic solder feed including a 20ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 3/6.

BAKELITE CABINET only 5/9

Brand new. Colour brown. Attractive design. Size 12 x 7 x 5½in. Ideal for small receivers, converters, etc. P. & P. 3/9.



DUKE & CO.

(LONDON) LTD.
621/3 ROMFORD ROAD
MANOR PARK E.12
ILF 6001/3

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

REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN HALF AN HOUR
 The Recorder incorporates the Latest Collaro Studio Tape Transcriber. The Linear LT45X High Quality Tape Amplifier listed £12.120 High Flux P.M. Speaker listed 30/- empty Tape Spool, a Reel of Best Quality Tape listed 22/6, and a Handsome Portable carrying Cabinet finished in Two-tone covering, size 18 x 13 x 9 in. high, listed £4.10.0. and circuit. Total cost if purchased individually approximately £50. Performance equal

to units in the £60-£80 class. Send S.A.E. for leaflet.

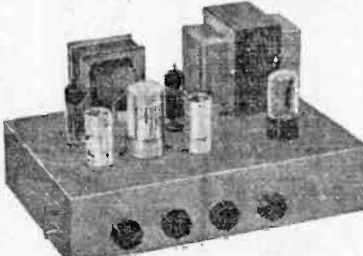
25 1 GNS. H.P. TERMS. Deposit £5.76 and 12 monthly payments of 2 gns. Cash price if settled in 3 mths. Carr. 17/6

TELEVISION RECTIFIERS. 250v. 200mA. small size. Only 6/9 ea.
RE-ENTRANT SPEAKERS. Tannoy, 6 watt, 7.5 ohms. Only 25/6 each. Parmeko Horn Type, 10 watt, 15 and 200 ohm matching. 59/6. R.C.A. 20 watt, 15 ohms or 200 ohms. 6 gns.

HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP STAGES

Two input sockets with associated controls allow mixing of "mike" and gram, as in A10. High sensitivity. Includes 5 valves, ECC83, ECC93, EL84, EL94, 5Y3. High Quality specially wound output transformer sectionally designed for Ultra Linear operation, and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut." Frequency response ± 3 D.B. 30-30,000 c/c/s. Six negative feedback loops. Hum level 60 D.B. down. ONLY 22 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs. For STANDARD or LONG PLAYING RECORDS. For MUSICAL INSTRUMENTS, such as STRING BASS, GUITARS, etc. OUTPUT SOCKET with plug provides 200 v. 30 mA. and 23 v. 1.5 a. For supply of a RADIO FEEDER UNIT. Size approx. 12-9-7in. For A.C. mains 200-250 v. 60 c/c/s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 gns.** Carr. 10/- (Or factory built 45/- extra). If required louvered metal cover with 2 carrying handles can be supplied for 18/9. TERMS ON ASSEMBLED UNITS. DEPOSIT 24/3, and 9 monthly payments of 24/3. Send S.A.E. for illustrated leaflet detailing Ready-to-assemble Cabinets, Speakers, Microphones, etc., with cash and credit terms.



STAAR GALAXY 4-SPEED MIXER AUTO-CHANGERS
 Brand new, cartoned. Turnover sapphire styl. Many exclusive features. Unique design motor virtually free from rumble. For 2-250 v. A.C. mains. Only £5.19.6.

SPECIAL OFFER. Two tone Portable cabinet. Gram amplifier. Stair Changer and 7 x 4 in. P.M. Speaker. 10 Gns. Carr. 10/- or with B.S.R. UA8 or Conquest. 12 gns.

THE SKYFOUR T.R.F. RECEIVER. Design of a 3-valve Long and Medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion detector. Power pentode output. Valve line-up 6K7, SP61, 6Y6G. Selectivity and quality excellent. Simple to construct. Point-to-point wiring diagrams, instructions and parts list. 1/9. maximum building costs £4.19.6. inc. attractive Walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

REPANCO TWIN-TUBE TRANSISTOR PORTABLE RADIO DESIGN. An efficient battery radio with 7 x 4 in. elliptical speaker and built-in ferrite aerial. size approx. 7 x 4 x 2 1/2 in. Plans and instructions 1/3. Total cost of all parts 5 gns. Covers long and medium waves.

BUILD A BATTERY OPERATED RECORD PLAYER. Total cost of all parts £5.19.6. Includes Garrard 45 r.p.m. motor turntable and pick-up. Two tone portable cabinet, speaker and amplifier kit. Operation on 4.5 batteries.

D.C. SUPPLY KIT. 12 v. 1 a. consisting of a partially drilled metal case, mains trans., F.W. Bridge Rectifier, 2 fuseholders and fuses. Change Direction switch, variable speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains. Limited number available at 33/9.

R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER

A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts, suitable for all crystal stereo heads. Ganged Bass and Treble Controls give equal variation of "Lift" and "Cut." Provision is made for use as straight (monaural) 10 watt amplifier. Valve line-up ECC93, ECC83, EL84, EL94, EZ81. Outputs for 2-3 ohm speakers. Point-to-point wiring diagrams and instructions supplied. Send S.A.E. for leaflet.

8 Gns. Carr. 10/-

R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250 v., 50 ccs. Guaranteed 12 months.

ASSEMBLED CHARGERS

- 6 v. 1 amp. 19/9
 - 6 v. or 12 v. 2 amp. 28/9
 - 6 v. 2 amps. 29/9
 - 6 v. or 12 v. 2 amps. 38/9
 - 6 v. or 12 v. 3 amps. with ammeter. 59/9
- Above ready for use. With mains and output leads. Carr. 3/6.



Assembled 6 v. or 12 v. 4 amps.

Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with sloved blue hammer finish. Fused and ready for use with Carr. 5/- mains and output leads. Terms: Deposit 13/3 and 5 monthly payments 13/3.

BATTERY CHARGER KITS

- Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case, Fuses, Fuse-holders, Grommets, panels and circuit. Carr. 3/6 extra.
 - 6 v. or 12 v. 1 amp. 24/9
 - As above, with Ammeter. 32/9
 - 6 v. 2 amps. 25/9
 - 6 v. or 12 v. 2 amps. 31/6
 - 6 v. or 12 v. 2 amps. including sleeve of Ammeter. 49/9
 - 6 v. or 12 v. 4 amps. 53/9
 - 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector. 58/9
- CHARGER AMMETERS.** 0-1.5 a., 0-3 a., 0-4 a., 0-7 a., 0-2.5 a., 0-60 a. 8/9.

R.S.C. MAINS TRANSFORMERS

FULLY GUARANTEED We can quote for special types singly or in any quantity

- Intereaved and Impregnated. Primaries 200-250-250 v. 50 c/c/s. Screened
- TOP SHROUDED DROP THROUGH**
- 250-0-250 v. 70 mA. 6.3 v. 2 a. 5 v. 2 a. 17/9
- 350-0-350 v. 80 mA. 6.3 v. 2 a. 5 v. 2 a. 18/9
- 250-0-250 v. 100 mA. 6.3 v. 2 a. 6.3 v. 1 a. 19/9
- 250-0-250 v. 100 mA. 6.3 v. 3.5 a. C.T.P. 22/9
- 250-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
- 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
- 300-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 25/9
- 350-0-350 v. 100 mA. 6.3 v. 4 a. 4 a. C.T. 25/9
- 0-4-5 v. 3 a. 25/9
- 350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 29/9
- FULLY SHROUDED UPRIGHT**
- 250-250 v. 60 mA. 6.3 v. 2 a. 5 v. 2 a. 17/11
- Midjet type 2l-3-3in. 17/11
- 50-0-250 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
- 300-0-300 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
- 350-0-350 v. 100 mA. 6.3 v. 4 a. 5 v. 3 a. 26/9
- 300-0-300 v. 130 mA. 6.3 v. 4 a. 6.3 v. 1 a. 35/9
- For Mullard 510 Amplifier. 35/9
- 350-0-350 v. 150 mA. 6.3 v. 4 a. 5 v. 3 a. 35/9
- 425-0-425 v. 200 mA. 6.3 v. 4 a. C.T. 6.3 v. 4 a. C.T. 5 v. 3 a. 49/9

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

- OUTPUT TRANSFORMERS**
- Midjet Battery Pentode 66:1 for 3S4, etc. 3/9
- Small Pentode. 5000 Ω to 3 Ω 3/9
- Small Pentode 78,000 Ω to 3 Ω 3/9
- Standard Pentode 5,000 Ω to 3 Ω 5/6
- Standard Pentode 78,000 Ω to 3 Ω 5/6
- 10,000 Ω to 3 Ω 5/6
- Push-Pull 10-12 watts 6V6 to 3 Ω or 15 Ω 18/9
- Push-Pull 10-12 watts to match 6V6 to 3-5-3 or 15 Ω 19/9
- Push-Pull EL84 to 3 Ω or 15 Ω 18/9
- Push-Pull 15-18 watts. 6L6, KT66 22/9
- Push-Pull for Mullard 510 Ultra Linear. 29/9
- Push-Pull 20 watts. sectionally wound 6L6, KT66, etc. to 3 to 15 Ω 47/9

ELIMINATOR TRANSFORMERS

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

SMOOTHING CHOKES

- 150 mA. 7-10 H 250 ohms. 11/9
- 100 mA. 10 H 200 ohms 8/9
- 80 mA. 10 H 350 ohms 5/9
- 60 mA. 10 H 400 ohms 4/11

CHARGER TRANSFORMERS

All with 200-250 v. 50 c/c/s. Primaries: 0-9-15 v. 1 a. 11/9; 0-9-15 v. 2 a. 14/9; 0-9-15 v. 3 a. 16/9; 0-9-15 v. 5 a. 19/6; 0-9-15 v. 6 a. 23/9.

AUTO (Step up/Step down) TRANS.

- 0-110-120-200/250 v. 50-80 watts, 13/9;
- 0-110-120-200/230/250 v. 150 watts 27/9.

MICROPHONE TRANSFORMERS

120:1 high grade clamped 8/9; 120:1 Potted. Mu-metal screened, 9/9.

R.S.C. A12 STEREOPHONIC AMPLIFIER KIT

A complete set of parts to construct a Stereo amplifier with an undistorted output total 6 watts. For A.C. mains input of 200-250 v. 50 c/s. Outputs for matched 2-3 ohm speakers. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and Point-to-point wiring diagrams supplied. Only good quality Carr. and pkg. 5/- components and latest high grade valves used. Exceptionally realistic reproduction can be obtained at ample volume for the home, as can be demonstrated in typical surroundings at our County Arcade premises. A really sensational offer.

4 Gns.

STEREO EQUIPMENT OFFER.
Comprising A12 Kit, 2 matched 8in. L'Speakers, and Acos T10 Stereo head. **£6.17.6**
Carr. 7/9 with sapphire stylus suitable most pick-ups.

PICK-UP ARMS complete with Hi-Fi turnover crystal head. Acos GP54. Limited number brand new, perfect, at approx. half price. Only 29/11.

ACOS CRYSTAL MICROPHONES. Mic40 stand or desk. Listed 45/-. Only 27/9. 38-1 Stick types. Listed 5 gns. Only 39/6.

R.S.C. 30 WATT ULTRA LINEAR HIGH FIDELITY AMPLIFIER A10

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 db. down. Frequency response -3 db. 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF96, ECC83, 807, 807, GZ33. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and 'Mike' can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and Point-to-point wiring diagrams and instructions. If required cover as for A8 can be supplied for 18/9. The amplifier can be supplied, factory built with 12 months guarantee, for £13.19.6. TERMS: DEPOSIT 3/9 and 9 monthly payments of 31/9.

11 gns.
Carr. 10/-
The amplifier can be supplied, factory built with 12 months guarantee, for £13.19.6. TERMS: DEPOSIT 3/9 and 9 monthly payments of 31/9.

FULL RANGE OF LINEAR AMPLIFIERS ALWAYS IN STOCK.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. approx. Completely replaces battery supply, operating on 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery operated receivers requiring 1.4 v. and 90 v. This includes latest low consumption types.



Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. 90 v. and 60 v., 40 mA. and 2 v. 0.4 a. to 1 amp. fully smoothed. Thereby completely replacing both batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s

Complete kit with diagrams, 39/9, or ready to use, 46/9.

SUITABLE FOR ALL BATTERY RECEIVERS normally using 2 v. accumulator. Complete kit of parts with diagrams and instructions. 49/9, or ready to use, 58/6.

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

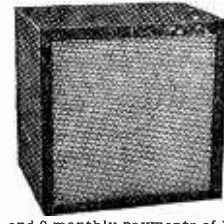
For 200/250 v. 50 c/s. Mains input. Appearance and Specification, with exception of output wattage, as A3 amplifier. Complete kit with diagrams, £3.15.0. Carr. 3/6.

COLLARO JUNIOR 4-speed single player units and Hi-Fi crystal pick-up with turnover head, £3.19.6.
B.S.R. U.A.S. 4-SPEED AUTO-CHANGERS with Stereo/Monaural pick-up head, 27.19.6. Carr. 5/-.

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

TERMS: C.W.O. or C.O.D. No C.O.D. under £1 Post 1/9 extra under £2. 2/9 extra under £8. Open 9 to 6. Weds. until 1 p.m. Trade supplied S.A.E. with all enquiries. Mail Orders to 29-31 Moorfield Rd., Leeds 12. Callers to 5 and 7 County (Mecca) Arcade, Briggate, Leeds 1, and 8-10 Brown St. (Market St.), Manchester 2, or 56 Morley Street (next to Majestic Ballroom), Bradford.

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



Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. **£4.19.6** Carr. 5/-
Terms: Deposit 11/3

and 9 monthly payments of 11/3.
LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 18in. Finish as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 8/6.

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



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads. In addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. down. 15db. of Negative feedback is used. H.T. or 300 v. 25 mA. and L.T. of 4.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not available. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and Point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use £5/- extra, plus 3/6 carr.: or Deposit 2/6 and 5 monthly payments of 2/6 for assembled unit.

A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads. In addition to all other types of pick-ups and practically all 'mikes'. Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71db. down. 15db. of Negative feedback is used. H.T. or 300 v. 25 mA. and L.T. of 4.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not available. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue hammer finish and Point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use £5/- extra, plus 3/6 carr.: or Deposit 2/6 and 5 monthly payments of 2/6 for assembled unit.

R.S.C. PORTABLE GUITAR AMPLIFIERS

Junior 5 watts High Quality output. Separate Bass and Treble 'Cut' and 'Boost' controls. Sensitivity 15 m.v. Twin inputs. High Flux 8in. Loudspeaker 'built-in'. Handsome, strongly made Cabinet (size approx. 14 x 14 x 7in.) finished in satin walnut, and fitted carrying handle. H.P. Terms. Deposit £1 and 9 monthly payments of £1.
Senior 10 watts High Fidelity output. Separate Bass and Treble 'Cut' and 'Boost' controls. Twin separately controlled high gain inputs so that two instruments such as Guitar and String Bass can be used at the same time. Two loudspeakers are incorporated, a high Flux 12in. for Bass notes and a 7 x 4 in. elliptical for Treble. Cabinet is well made and finished satin walnut. Size approx. 18 x 18 x 18in. H.P. Terms. Deposit 34/9 and 15 Gns. 9 monthly payments of 34/9. Both models for 200-250 v. Carr. 10/- A.C. mains.

£8-19-6
Carr. 7/6

PLESSEY DUAL CONCENTRIC 12in. 15 ohms HIGH FIDELITY SPEAKER (12,000 lines) with built-in tweeter (completely separate elliptical speaker with choke, condensers, etc.) providing extraordinarily realistic reproduction when used with our A8 or similar amplifier. Rates 10 watts. Price only £5.17.6.

HI-FI CRYSTAL PICK-UP HEADS. (Turnover type with sapphire stylus). HGP59. Standard replacement for Garrard and B.S.R. B.S.R. Ful-9, Garrard GC2, 19/9. B.S.R. Stereo/Monaural, 39/11.

BUILD A BATTERY OPERATED PORTABLE RECORD PLAYER For Consisting of Garrard 45 T.P.M. motor and suitable **£6.19.6** Two-tone case, speaker, parts for transistor, amplifier, and circuit. All parts sold separately.

P.M. SPEAKERS. 2-3 ohm, 21in. Perdio 21/9. 5in., 17/9. 6in. 16/9. 8in., 19/9. 8 x 5in. 25/6. 10in. 26/9. 10 x 6in. 29/9. 12in. 29/11. 10in. W.C. 'Stereo' 12in. or 15 ohms type HF1012 10 watts. Fidelity type. Recommended for use with our A8 Amplifier, £4.10.9. 12in. Plessey 3 ohms 10 watts (12,000 lines), 59/6. TWETTERS. Plessey 3 1/2 19/9, 15 25/9.

GLJA MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. 50 c.p.s. A.C. mains. Over-all size 1 1/2 x 2 1/2 x 2 1/2 in. Controls: Vol. and Tone with switch. Guaranteed 12 months. Only 58/6.

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner Unit (specially suitable for use with any of our 'Aman' 3's). Delayed A.V.C. employed. The W.Ch. Sw. incorporates Gram position. Controls are Tuning, W.Ch. and Vol. only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size (height approx. 9-6-7in. high. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and priced parts list with illustration, 2/6. Total building cost £4.15.0. For descriptive leaflet send S.A.E.

COLLARO CONQUEST 4-SPEED AUTO-CHANGER with high fidelity Studio pick-up. Latest model. For 200-250 v. 50 o.p.s. A.C. mains. Our price 26.19.6. Carr. 5/6.

READ THIS ADVERT CAREFULLY

LOOK AT THESE PRICES! TUBES DIRECT FROM OUR FACTORY

Due to the increasing demand for our wide range of C.R.T.S. and our efficient handling methods we offer unbeatable value.

REGUNNED TUBES have new Cuns, Getters, Aquadac Coatings, Bases, etc.

TOP QUALITY GUARANTEED

	6 MONTHS REVAUCUUMED	12 MONTHS REGUNNED	12 MONTHS BRAND NEW TYPES
Carriage and Insurance 18/6			
CRM92, MW22-7, MW22-14, MW22-14C, MW22-17, MW22-18	£1-10	£3	
18KPA, 18IK, C12B, CRM121, CRM121A, CRM121B, CRM122, CRM122, MW31-14C, MW31-16, MW31-18, MW31-7/4	£2	£4	MW31-74
141K, 7201A, C14FM, CRM141, CRM142, CRM143, MW36-24, MW36-44 17ASP4, 171K, AW36/21, C17FM, CRM171, CRM172, MW42-54, MW42-59	£2-10	£4-10	MW36 24
7401A, AW43-30, C14BM, C17BM, CRM151, CRM152A, CRM152B, CRM153, CRM170, MW43-30, MW41-1	£3	£5-5	MW43/64
AW53-30, CRM212, MW53-20, MW53-30	£4	£6-10	£6-15

PLEASE NOTE: Many other types not listed available. S.A.E. enquiries.

FINEST

13 CHANNEL TV's

TABLE MODELS. FAMOUS MAKERS. Complete with all valves and tubes. These sets are unequalled in value due to huge purchase direct from source. They are untested and are not guaranteed to be in working order.

AMAZINGLY POPULAR-IDEAL SECOND SETS

- 12" — £3.19. (p. & p. 12/6)
- 14" — £6.19. (p. & p. 15/-)
- 17" — £9.19. (p. & p. 15/-)
- 12" 5 CHANNEL TV's 45/- (p. & p. 12/6)
- 14" 5 CHANNEL TV's 85/- (p. & p. 12/6)

12in. TV's 5 channel table models including speaker, line trais. cabinet. Top makes requiring only valves and tube to complete your choice if available (carr. 4/-). (Or 88 per dozen, carr. free.) **15/-**

14in. TV's 5 channel as above (carr. 4/-) **35/-**

★ TAPE DECKS ★

B.S.R. "MONARDEC". Latest type, 32 l.p.s., takes 5 1/2in. spools, Simple controls. **£9.15.0**
LATEST COLLARO STUDIO TAPE TRANSCRIPTOR. Three motors, three speed, 10, 33, 84 l.p.s., takes 7in. spools, super quality finish. Push button controls. **£14.10.0**

Stereo Outfit

Consisting of two 3 valve (10F3, 10P14, UU9) 3 watt mains amplifier, each complete with 8 in. loudspeaker, in two tone bakelite cases with independent controls, together with UAS stereo changer and screened leads, unrepeatable. **£11.10.0**
 Amplifiers only 49/- each.

UAS Stereo Changers

B.S.R. famous Monarch autochangers, fitted with quality stereo cartridge. **£6.19.0**
 Truly amazing value.

★ Record Players Carriage 4/- ★

COLLARO 4-speed 4/54d 25 19 0
 EMI 4-speed Stereo 26 19 0
 GARRARD 4-speed 4HF 17 15 0
 B.S.R. (UAS) AUTOCHANGERS 26 15 0
 GARRARD RC1200 MKII 29 7 0

★ Starr Galaxy Spares ★

We hold the most comprehensive range of spares in the country, send 6d. stamp for Service Sheet and Spares Price List.

★ Pick-up Arms ★

The well-known Starr "Galaxy" lightweight pickup arm, dual sapphire turnover single hole fixing, adjustable needle pressure, can be used with any 3 and 4 speed turntable. Supplied complete with famous cartridges above listed at **19/6** approximately £2.

★ Cossor D.B. Scopes ★

Fortunate purchase enables us to offer these excellent instruments at an unusually low price complete and in good order. **£19**

★ Test Sets Type 74A ★

A service scope easily convertible for standard use, 200/250 v.a.c., all valves, E.C.R.30 tube, excellent case worth £10. Our price. **£4.10**

SPECIAL OFFERS

Sagatone Tape Recorders

Few only reduced from 39 gns., incorporating latest Collaro studio tape transcripior, 5 valves, "superimpose" speaker, mike, two inputs, excellent portable case, sup. **29 gns.**

UA14 B.S.R. Changers

Very latest super finish, superseding the UA5 and UA12 amazing value at **£7.19.0**

ALL DRY PORTABLES

A fortunate purchase enables us to offer you these Brand New Stella, shoulder strap, lightweight models, in makers' sealed cartons, with guarantees and instructions. Economy valves. Superior finish. Listed at £13.2.6. amazing value **£7.15.0** (carr. 4/-).

4-SPD. RECORD PLAYERS

Latest B.S.R. TU9 Turntable, together with lightweight Starr Galaxy dual sapphire crystal turnover pickup head. Truly amazing value **£3.10.0** Carr. 3/- at

CO-AXIAL CABLE

Semi-Air-Spaced low loss, 1-19 yds. 7d. per yd., p. & p. 1/3. 20-39 yds. 6d. per yd., p. & p. 1/9. 50 YD. DRUMS. 24/-.

VALVES ALL GUARANTEED 3 MONTHS.

PL81 SOLED, AMAZING VALUE! AT ONLY **4/6**

EY51 SHORT ENDS **4/6** U25 SHORT ENDS **8/6**

100 RESISTORS 6/6

100 CONDENSERS 10/-

Due to huge purchase we can offer a wide, well balanced range of mainly the latest miniature Ceramic and Silver Mica Condensers, 3 pF to 10,000 pF. LIST VALUE OVER £3. A must for your spares box. Only 10/-.

PM SPEAKERS Surplus 3 ohm

Tested, top makes, performance guaranteed. 6 1/2in. **7/-** 8in. **11/-** 10in. **13/-**

Stereo

Special Offer, matched pairs of speakers, 6 1/2in. or 8in. 14/- pr. 7 x 4 22/- pr. Special quotations for quantities of the above speakers of any other goods listed.

★ CHASSIS BARGAINS ★

Top quality, undrilled, lowest possible prices due to large quantities handled.

PACK FLAT CHASSIS

Consisting of flat top plates with separate sides and ends, in stout "easy to solder" tin plate.
 7in. x 3in. x 2in. 4/2; 10in. x 7in. x 2in. 5/-;
 10in. x 3in. x 2in. 4/6; 14in. x 5in. x 2in. 6/2;
 14in. x 10in. x 2in. 7/9.

TIN PLATE-BOX FORM

Complete with sides and ends in "easy solder" tin plate. 4in. x 2in. x 1 1/2in. 2/2; 6in. x 4in. x 2in. 3/2; 8in. x 6in. x 2in. 4/-.

ALUMINIUM BOX FORM

OPEN ENDED. In heavy gauge bright sheet. 6in. x 4in. x 2in. 3/5; 8in. x 6in. x 2in. 4/6; 10in. x 7in. x 2in. 5/2; 12in. x 6in. x 2in. 5/6; 12in. x 8in. x 2in. 6/-; 16in. x 8in. x 3in. 7/9.

ALUMINIUM BOX FORM

Heavy gauge sides and ends. 6in. x 4in. x 2in. 4/-; 8in. x 6in. x 2in. 5/2; 10in. x 7in. x 2in. 5/9; 12in. x 6in. x 2in. 6/3; 12in. x 8in. x 2in. 6/9; 14in. x 10in. x 2in. 9/9.

★ TRANSISTORS ★

REDSHOT Now Only 3/6.
 WHITE SPOT 4/6.
 Still the same high quality.

DIODES

General purpose, famous make. 6d. 8/- doz. GEX44 type, 3/9.

4 Transistor Amplifiers

ONE WATT—From a single 6v. all-dry battery. Latest GET15 Power Transistors. In PUSH-PULL Two-Transistor High Gain pre-amplifier stages. Output 3 ohms. **£3.19.0.**

1 Watt Transistor Stage

To the purchaser of each manufacturer matched pair of GET15 Power 1 watt Power Transistors (listed 50/-) we give the correct Push-Pull INPUT AND OUTPUT TRANSFORMERS of High Grade construction and a complete 4 Transistor Amplifier circuit. Will transform your existing receiver or amplifier into a truly "Mains 45/- Volume" outfit for a total price of ONLY **45/-**

★ Rectifiers ★

For Chargers, selenium, full wave bridge, 12 volt 3-4 amps 9/6. (Carr. 1/-) 25 per doz. 250 v. 8n 4in. 3/- RM1, 6/6; RM2, 8/-; RM3, 9/-; R14, 15/6; RM5, 21/-; 14AS, 17/-; 14A97, 23/-; 14A100, 25/-; 10RC1-1-16-1, 7/9; 10RA1-1-16-1, 7/9; 18RD2-2-8-1, 14/-; 14RA1-2-8-2, 17/-; 14RA1-2-8-3, 20/-.

★ Loudspeakers ★

TOP MAKES—MANUFACTURER FRESH
 2 1/2in. 18/-; 3in. 18/-; 3 1/2in. 18/-; 4in. 18/-; 5in. 18/-; 6in. 18/-; 8in. 19/-; 10in. 22/6; 12in. 25/6; 7 x 4in. elliptical, 18/-; 9 x 6in. elliptical, 22/6; 10 x 6in. elliptical, 23/6; 8in. Sinteron 15 ohms HF310, 70/-; 10in. Sinteron 3-7-15 ohms HF1012, 99/9; 12in. Closed Field, 27/6.

STOP PRESS—Just out! 5 x 13in. Hi-Fi speakers built-in tweeters, 49/-.

TECHNICAL TRADING CO.

Postage must be added unless otherwise stated

IT MAY SAVE YOU £ £ £'s

VALUE

INSTRUMENTS C.R.T.'s.

Table listing various C.R.T. instrument models and their prices, including CV320, CV601, CV718, etc.



VALVES BY RETURN OF POST



10% DISCOUNT SPECIAL OFFER TO PURCHASERS OF NEW LOW PRICES GUARANTEED 3 MONTHS FREE TRANSIT INSURANCE. All valves are new or of fully guaranteed ex-Government or ex-military origin.

Main table of vacuum tube valves with columns for model number, price, and other specifications. Includes models like 6X2, 6X4, 6X5, etc.

OBsolete INDUSTRIAL AND TRANSMITTING VALVES GUARANTEED FOR THREE MONTHS

Table listing obsolete industrial and transmitting valves, including models like 6C4, 6D6, 6E6, etc.

Table listing various electronic components and parts, including diodes, capacitors, and other tubes, with model numbers and prices.

ALL ITEMS LESS 5% & POST FREE IN DOZENS No C.O.D. (Callers always welcome). LIST OF 1000 SNIPS, 6d. Post: 2 lbs. 1/6, 4 lbs. 2/1, 7 lbs. 2/9, 15 lbs. 3/6 etc. 350-352 Fratton Road, PORTSMOUTH

SUMMER SALE

STOCK OFFERED AT SENSATIONAL REDUCTIONS THIS MONTH

Filament Transformer, 6.3 v. 3-4 amps. tapped primary. Sale price 8/6, plus 2/- post and ins.

Output Transformer, Parmeko, Massive (weight approx. 8lb.), primary 4,000 ohm centre tapped, secondary 15 ohm. Sale price 12/6.

Brayhead TV Turret Tuner, for 33/38 Mc/s. I.F., normally 79/6. Sale price 69/6, plus 3/6 post and ins.

Ditto, but for 18/19 Mc/s. I.F., normally 79/6. Sale price 69/6, plus 3/6 post and ins.

Output Transformer, fixed ratio for pentode, normally 6/6. Sale price 4/6, plus 1/-.

Valves, old types FC4-DDT4, etc. Sale price half current list price.

14in. TV Mask, grey plastic, normally 10/-. Sale price 7/6, plus 1/6 post and ins.

17in. TV Mask, grey plastic, normally 12/-. Sale price 9/-, plus 1/6 post and ins.

L2V 5 amp. Car Battery Charger, variable charge rate, in stove enamelled case, with meter, normally 85/-. Sale price 55/-. plus 4/6 post and ins.

250-6-250 60/80 mA. Mains Transformer, with 6.3 v. filament winding, half-shrouded droptrough, standard replacement in many receivers, made to sell at 19/6. Sale price 12/6, plus 2/6 post and ins.

Ditto, but with additional 5 v. winding for separate rectifiers, made to sell at 21/-. Sale price 13/6, plus 2/6.

Transistor A.F. Transformer or driver, made to sell at 15/-. Sale price 8/6.

Sub-miniature electrolytic Condensers, for transistor sets: 1 mfd., 18 v.; 1.5 mfd., 6 v.; 2.5 mfd., 6 v.; 6 mfd., 6 v.; 8 mfd., 6 v.; 5 mfd., 12 v.; 8 mfd., 6 v.; 10 mfd., 6 v.; 16 mfd., 12 v.; 25 mfd., 6 v.; 25 mfd., 25 v.; 30 mfd., 3 v. All normally 3/- each. Sale price 1/6.

Transistor Ferrite Rod Aerial, with medium and long wave coils with circuit, normally 12/6. Sale price 7/6.

Oscillator Coil and set of 3 I.F. transformers for transistor set, with circuit, normally 35/-. Sale price 23/6.

TV Rectifier, RMS equivalent, normally 26/-. Sale price 12/6.

Auto Transformer, totally enclosed primary 200-250, secondary 110-120 v., 150 w., normally 27/6. Sale price 17/6.

I.F. Coils, standard size by Weymouth 465KC, dust cores, normally 12/6. Sale price 6/6 per pair.

Breakdown Unit, Over 20 lbs. of useful spares including metal rectifiers, transformers, pot meters, switches, valve holders, resistors, coils, coil formers, knobs, pyc plugs, sockets, slow-motion drives, trimmers, etc., etc. Must have cost £100 each. Slightly soiled but most parts usable, 15/- plus 7/6 carriage.

P.M. Speaker, 6in. with output transformer. Normally 30/-. Sale price 17/6.

Miniature Microphone, Dynamic American. Beautifully made. Sale price 2/-.

Pilot Bulb, 3-5 volt, 0.3 amp. 3/6 a box of 25.

Transistor Set Case with chrome handle, tuner knob and scale. Sale price 7/6.

Transistor Set 2-gang, the Jackson 00. Tapped spindle for above case. Sale price 7/6.

Connecting Wire, 24 gauge, tuned copper. P.V.C. insulated. Four 100 ft. coils, different colours. Sale price 8/-.

125 watt Choke for fluorescent tube, 22/- Sperry Gyro, brand new, 15/-, plus 2/-.

Geiger Counter Tube, 20th Century, No. G25 with geiger counter. Sale price 27/6.

Twin-twisted Lighting Flex equivalent 1436, 12/6 per 100 yd. coil. Carriage 1/6.

3029 Twin T.R.S. 37/6 per 100 yd. coil. Carriage 8/6.

3029 Single T.R.S. 20/- per 100 yd. coil. Carriage 2/6.

Transistor A.F. equivalent to red spot. Sale price 4/6.

14in. TV Cabinet, Sale price 9/6. Carriage 3/6. Plywood worth more.

Pocket 6 Transistor Set Parcel, as recently advertised, 20/6. Sale price 22/6, with full instructions, or instructions only 1/6.

Filament and mains auto transformer. Stepped mains voltage up to 75 with tappings at 200 and 220. Also 6.3 v. at 3 amps and 90 v. at 1 amp. Sale price 7/6 each.

Acos Pickup Cartridge Turnover 78 and L.P. Sale price 17/6. Ditto stereo 37/6.

Regret we cannot send further details of items advertised but any may be had on approval if you agree to pay carriage.

Mains Lead, 6 ft. of unbreakable wire, as fitted to electric razors, makes fine lead for test meters, etc. Sale price 1/6 for three.

50 Assorted 1 watt Resistors, our assortment, well mixed, useful values. Sale price 5/-.

Ditto, but 1/2 watt. Sale price 4/-.

Electrolytic Condensers, standard types 4 mfd., 150 v., 1/-; 3 mfd., 150 v., 1/-; 3 mfd., 350 v., 1/6; 15 mfd., 200 v., 1/-; 8+8 mfd., 350 v., 2/6; 8+16 mfd., 350 v., 3/-; 32+32 mfd., 275 v., +50 mfd., 50 v., 3/6; 50+50 mfd., 350 v., 3/6; 100+100 mfd., 200 v., 2/6; 25 mfd., 25 v., 1/-; 50 mfd., 12 v., 1/6; 50 mfd., 25 v., 2/-; 100 mfd., 12 v., 2/-.

THIS MONTH'S SNIP

Pocket Transistor Loudspeaker 3. A 2 transistor plus 1 crystal diode receiver for medium and long waves Easy to carry about, as size is only approx. 5 x 4 x 1in. All parts including cream plastic case and miniature loudspeaker. In fact everything needed down to last nut and bolt, only 22/6, plus 1/6 p. & p. Batteries 10d. extra. Full constructional data included in above price or separately 1/6. Money refunded if not fully up to your expectations.

Mains Dropper, vitreous, covering 0.3 amp. 500 ohms, with voltage tapping Sale price 3/6.

Ditto, 15 amp. Sale price 2/6.

BTG Holder, with skirt for screening can, normally 10d. Sale price 6d. or 5/6 doz.

Phillips Trimmer, 0-30 p.F., normally 1/8. Sale price 8d. or 7/6 dozen.

Pot Meters, carbon 5 K., 10 K., 25 K., 50 K., 100 K., 250 K., 1 M., 2 M., with 2 1/2in. spindles. Sale price, less switch, 2/6, with switch 4/-.

Ditto, with 1in. spindles. Sale price, less switch 1/-, with switch 2/6.

Transistor OCT2 (output), normally 20/-. Sale price 14/-, or matched pair 30/-.

Push-Pull Output Transformer, for transistors OV72, etc., made to sell at 15/-. Sale price 8/6, plus 1/- post.

Ditto, but single ended. Sale price 7/6, plus 1/- post.

F.M. Tuner (Radio Constructor Circuit), normally £12.10.0. Sale price 26.19.6. Note: These are made up but may need attention. Plus 3/6 post and ins.

Ardenre Hearing Aid, normally bargain at £7.10.0. Sale price 25.19.6, plus 3/6 post and ins. Needs attention.

Portable Receiver Cabinet, takes our Crispian chassis, cost 25/- to make. Sale price 12/6, plus 3/6, post and ins.

Window Cabinet and Chassis, comprises a veneered and polished cabinet, size 14 x 17 x 6in., and prepared metal chassis with glass dial to fit, normally £3.15.0. Sale price 29/6, plus 5/-.

Fluorescent Lighting kit of parts including choke, starter, 2 lamp holders, starter holder, 40 w., normally 22/6. Sale price 19/6, plus 2/6 p., 80 w., normally 26/6. Sale price 22/6, plus 2/6.

Resistance Substitution Box, will give infinite variability over range 100 ohm to 2 Meg.. Sale price 8/6, plus 2/- post.

Morganite Pots, standard size, single and 2-gang types available. Single types normally 1/- each, Sale price 1/-, Ganged types normally 3/- each. Sale price 3/-.

Switching Outfit, 2-way, comprises 30 yd. multicore cable, two 2-way switches, two wood blocks, full instructions, normal price 9/6. Sale price 7/6, plus 2/6 post.

Crystal Microphone, miniature, suitable for all purposes, tape recorders, amplifiers, etc., normal price 4/9. Sale price 3/-.

Glass Panels, unbreakable, 101 x 9in., parcel of 5, normally 7/6. Sale price 5/6, carriage 3/6.

14in. TV Cabinet, modern design. Cost £4 to make. Sale price 9/6, plus 3/6 carriage.

Stick Microphone, Cosmocord 39/1, normally £3.3.0. Sale price 35/-.

Set of Four TV Parts, scan coil, line E.H.T. frame output and width control, normally 57/6. Sale price 39/6, plus 2/6.

200 Service Sheets, for modern TV sets, normally 40/-. Sale price 30/-.

Canadian Telephone Sets, although originally intended for use with transmitters, these make excellent telephones for calling over long distances in noisy situations. Distances up to 3 or 4 miles (using our versatile wire, 6/6 for 1 mile) can be covered using these sets, which contain hand generator, telephone bell, hand microphone, Morse key, indicator lamp, buzzer, relay, etc. Sets complete 27/6, with full instructions, complete in carrying case.

Superhet 7 v. 5 Waveband Chassis. Unused. Less valves and power pack. Slightly soiled 75/-. Coil pack with twice as much. Carriage and insurance 7/6.

Rectifier Unit, for working D.C. instruments, motorised equipment, etc. from A.C. mains. Input 200/240 v. Output 200/240 v. 300 m amp. 35/- carriage 7/6.

10 v. Superhet 41 Metre. Ex. Govt. but unused. Complete with valves. Easily converted for Band 111. 29/6. carriage and packing 7/6.

Iron Dust Aerial Rod, 8 x 5/16in. dia., 2/6 each.

Westinghouse Rectifiers, type H4, 2/9 each.

Switch for Blanket, double pole three position, 5/-.

Charging Switchboard, offered at about 1/20th of original cost. Ex government, contains three reverse current relays, one voltmeter, one mains ammeter, two secondary ammeters and three variable resistors. In original cases. Sale price £2.15.0 1,250 watt. £2.15.0 550 watt, carriage 10/-.

SUMMER SALE

STOCK OFFERED AT SENSATIONAL REDUCTIONS THIS MONTH

Packard Bell Pre-Amp, complete with 6SL7 and 28D7 valves, relay, leads, jack, input and output transformers, etc., etc. 7/6, plus 2/- post. Less case.

Centre zero meter 3 1/2 in. movement, flush mounting, 500-0-500 micro Amp. Sale price 30/-, plus 1/6 post.

Headphone Adaptor, changes high resistance to low or low resistance to high by altering connections. Sale price 2/6, plus 1/- post.

Push-Pull Transformers, input and output, midget, potted. Sale price 5/- pair, plus 1/6.

P.O. Type 3000 Relays, 2,000 ohm coil, 6 contacts 7/6, 4 contacts 6/6, 2 contacts 5/6, plus postage 1/-.

5 amp. 12 v. full-wave Charger Rectifier, normal price 17/6. Sale price 10/-, plus 1/6 post and ins.

Westinghouse Meters, 0-500 mA., 0-250 mA., 0-100 mA., 0-50 mA., D.C. 0-15 v. A.C. All 15/- each, plus 2/- postage.

Moving Coil Meter, 3 1/2 in. movement, 0-750 micro Amp. Sale price 19/6. 0-30 mA., 15/-, plus 2/-.

Low Resistance Headphones, good British make. Sale price 6/-, plus 1/6.

Chest Microphone, excellent American make, with adjustable mouthpiece. 6/6, plus 1/6.

Throat Microphone, excellent American make. 6/6, plus 1/6 post.

American Lightweight Headphones, Type HS30. Sale price 17/6, plus 1/6 post.

Regulator Resistors, slider type, 11 ohm, 15/-, 3 ohm 12/6, 1 ohm. 2/6, plus 2/- post.

Converter 12, 24 v. D.C. Sale price 32/6.

E.H.T. Transformer, standard mains input, 3 secondaries, heavy duty potted transformer in cast case, normal price 20/-, Sale price 15/-, plus 3/6 post.

Suppressor Condenser, stops drills, etc. interfering with radio or television, simple instructions included, normal price 1/6 each. Sale price 1/- each.

Bi-Metal Contact Strip for making thermostat. 1/9.

250 v. 1 amp. Rectifier, 7/6.

3-Phase Contactor, 17/6.

Filament Transformer, 6.3 v. 1 1/2 amps., normally 8/6. Sale price 6/6, plus 1/- post.

Filament Transformer, 6.3 v. 2 amp., normally 10/6. Sale price 8/6, plus 1/- post.

80 ohm Coax, low loss expanded polythene, normally 9d. per yard. Sale price 6d. yd.

Midget 3in. P.M. Loudspeaker, for transistor set, 3 ohm coil, normally 22/6. Sale price 15/-, plus 1/6 post.

Midget 208 pF two-tang Tuning Condenser, for transistor set, normally 15/-, Sale price 9/-, plus 1/- post.

Transistor OC44 (H.F. or oscillator), normally 30/-. Sale price 20/-.

Transistor OC45 (I.F.), normally 25/-, Sale price 17/6.

Transistor OC78D (A.F.), normally 10/-, Sale price 7/6.

1 ohm Precision Resistor, high voltage, 2/- each.

Pyrax Aerial Insulator. Complete with metal fixing flange. 1/6.

Perspex Escutcheon, for 12in. tube, embodies mask for tube, suits our 12in. cabinet. 9/6, post and insurance 2/6.

Toggle Switch, standard metal body, round dolly, fixing ring and on/off indicating plate. Sale price 1/- each, or 10/- per doz.

Transmitter RI154. Unused but slightly soiled and not tested. Covers 200/500 Kcs., 3-5 Mc/s and 5-10 Mc/s. Complete with valves. Sale price 19/6, plus 10/- carriage.

Vacuum Pump, rotary vane type, spline drive shaft, threaded inlet and outlet, also makes good compressor. Sale price 19/6, plus 2/6.

Variable Rheostats, heavy duty slider resistor rated at 25 amps. ideal for dimmer circuits, etc. Sale price 7/6, plus 6d. postage.

Versatile Wire, single strand 18 gauge, with p.v.c. covering. New 1/2-mile on drum. Sale price 6/6, plus 3/6 carriage.

Where the value of your order for small articles exceeds 22 these are post free. Under 22 add sufficient to cover and where carriage or postage specifically mentioned, add this in any case.

Wire Jointer (welder for 28 gauge or thinner). In bakelite case with trigger switch, works off step-down transformer. Sale price 2/6, plus 9d. postage.

Sniperscope, "Cats Eye", for seeing in the dark. Will work burglar alarms, containing circuits, etc. Sale price 4/-, plus 1/- post.

Telephone Handset, sound powered. Just join two together with a pair of wires and you have telephonic communication. Sale price 25/-, plus 3/- post and ins.

Ex R.N. Sound-powered Telephone, complete with sounder. Sale price 49/6 each.

12-24 v. D.C. Converter. Sale price 32/6.

R.F. 25 Tuner Unit, complete, new condition. Sale price 8/6, plus 2/6 post.

Stud Switch, heavy duty, 30 amp. contacts, for dimmer, charger, regulator, etc. Sale price 7/6.

6.0005 Twin Gang tuning condensers, 5/9, post free.

Midget Coils (I.F.), dust cored, size 1 1/2 x 1in. 465 Kcs, 5/6 per doz.

Powerful Blower, with motor, 24 v. D.C., but can be operated off mains with rectifier. 15/-, post and packing 2/-.

200 watt Step Down Transformer, 230 v. to 125 v. or vice versa. 15/-, carriage 3/6.

Cathode Ray Tube, V.C.R. 517 replaces V.C.R. 97. 8/6 each, carriage 2/6.

10-core Flexible Cable, 230 v. insulation. Price 1/6 per yard.

7-core Flexible Cable, 230 v. insulation. Price 10d. per yard.

Bakelite 5 amp Electric Wall Switch, "Hicraft", 9d. each or 8/- per dozen.

As above, but two way. Price 11d. each, or 10/- per dozen.

Series, parallel and off-electric wall switch made by Crabtree. Price 1/3 each or 13/6 per dozen.

5 amp. 3 pin, plus socket, "Hicraft". 1/- each or 10/- per doz.

Many more bargains at all branches. Please telephone before calling to pick up something special in case stocks have been cleared.

Electrical Brake, disc type for stopping lathes, coil winders, etc., operates on approx 100 mA. Sale price 15/-.

Connection strip, bakelite 16-way. Sale price 2/6.

Cine Camera, 18 mm., motorised (24 v. A.C.) for 15 frames per sec. Sale price 25-10.0, plus 3/6 carriage.

Dinghy Mast, tubular aluminium, extends from 15in. to 9ft. Sale price 4/6, plus 1/6 p.

Insulated Terminal Heads, always useful, bargain at our normal price of 2/- dozen. Sale price 1/6 dozen, plus 1/- post.

Magneto Generator (hand), as used in telephones. Sale price 7/6, plus 1/6 postage.

Metrosila, Type APW 5746, sensitive in the mains voltage range. Sale price 2/-.

Multi-speed Motor with gearbox, works on A.C./D.C. mains, gives any speed from 1 r.p.m. Sale price 17/6, plus 2/6 postage.

Navigation Compass, in carrying case but less fluid, may be slightly damaged. Sale price 5/9, plus 2/6 postage.

THIS MONTH'S SNIP
Pocket Transistor Loudspeaker 3.
 A 2 transistor plus 1 crystal diode rectifier for medium and long waves. Easy to carry about, as size is only approx. 5 x 4 x 1in. All parts including cream plastic case and miniature loudspeaker. In fact everything needed down to post, but a battery, only 22/6, plus 1/6 p. & p. Batteries 10d. extra. Full constructional data included in above price or separately 1/6. Money refunded if not fully up to your expectations.

Overcurrent Relay, surface mounting, through panel type with a clear Pyrex glass cover. Type A for currents between 0.1 and 0.4 amps. Type B for currents between 0.5 and 2 amps. Unused and perfect. Sale price 22.17.6 each.

Metal Rectifiers, 250 v. 60-80 mA., ideal for mains set or instrument, or to replace that expensive valve. Sale price 3/6.

Rectifier Bargain, selenium rectifier 35 v. 9 amp., easily rebuilt into 6 full-wave charger rectifiers, suitable 6 or 12 v. battery at 3 amps. Sale price 15/-, plus 1/6 post.

Rectifier Bargain, selenium rectifier 500 v. 1 amp., 1 wave, easily rebuilt into full wave or multiple type. Normal price 8/6. Sale price 6/6, plus 1/6 post.

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Brand new original spare parts for AR88 Receivers. Please write your requirements.

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

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Transmitter Cabinet with door at back. 77in. high, 29in. wide, rack fitting type, £17.10.0. Carriage £1.

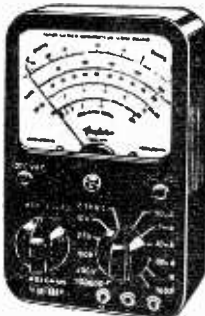
No. 62 Transmitter-Receiver. 1.6-12 Mc/s. in two ranges, ideal for mobile use. Total 11 valves. Rx-A super with separate mixer and local oscillator. Tx uses QV04-7 as power amplifier VFO or switched selected crystals. CW, phone (grid modulation) metered for operation and valve testing. Pi network to match rod aerials or long wire. "Press to send" operation from mike. Size 8 1/2in x 17 1/2in x 13 1/2in., weighs only 29 lbs. Completely self contained with internal power unit for 12 v. operation. Power consumption 4.4 amps. on send, 3.4 amps on receive. As new condition, tested, complete with operation instructions. Price £27.10.0 Delivery included.

Variometers for W/S No. 19. Fully tested and working, 12/6. P. & P. 2/6.

Ferranti Transformer. Oil cooled, 20/19.5 K.V.A., 3 phase, 50 cycles. Primary 360/380/400/420/440 v. Secondary 2,700/2,900/3,100/3,300/3,500 v., 2.1 amp. Voltage regulation by simple switches on primary and secondary. Weight 1,150 lbs. Price £125.0.0. Carriage at cost.

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Model 127A Pocket size meter. Sensitivity 2 0, 0 0 0 o.p.v. D.C. 1,000 o.p.v., A.C. 2 0 ranges. D.C. current 50µA to 1 amp. D.C. volts D. 3 v — 1, 0 0 0 v. (2.5 kV by probe). A.C. volts 1 0 v — 1,000 v. 3 resistance ranges from 0-20 megohms (self contained). Meter 40µA 3 1/2in. arc. Accuracy D.C. 3% A.C. 4%, ohms 5%. Dimensions 5 1/2in. x 3 1/2in. x 1 1/2in. weight 14 ozs. Price £10 complete with instruction manual, test plots and clips. Leather case £11.2.0 extra. Filament Transformers. Primary 0-190-210-230-250 v. 50 C. Sec. 1 2.5 v. C.T. at 10 amps.; 2 2.5 v. C.T. at 10 amps.; 3 10.5 v. C.T. at 11 amps., 4,000 v. insulation. Price £2.19.0. P. & P. 5/-. Primary 0-190-210-230-250 v., 50 C. Sec. 1 10 v. C.T. at 4.5 amps.; 2 10 v. C.T. at 4.5 amps., 4,000 v. insulation £11.6.0. P. & P. 5/-. Primary 230 v. 50/60 c. 67 v. amp. Sec. 1 6.3 v. 1.6 amps.; 2 6.3 v. C.T. 3 amps.; 3 6.3 v. C.T. 3 amps.; 4 6.3 v. C.T. 3 amps. £11.2.0. P. & P. 5/-.



Driver Transformers. Primary 500 ohms imp. Sec. to match two 805 in push-pull. £1.7.6. P. & P. 5/-.

Rotary Transformer. 171 W 12 v. input, 1,600 v. 100 mA output, 30/- P. & P. 7/6.

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Cosor Double Beam Oscilloscopes 339A. Fully tested and working £15. Carriage 10/-.

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Complete Set of Strong Aerial Rods (American). Screw-in type MP49, 50, 41, 52, 53, total length 15ft. 10in., top diameter 0.615in., bottom diameter 0.185in., together with matched aerial base. MP37 with ceramic insulator, ideal for car or roof insulator, £2.10.0, post free. AR88D and L.F. Receivers, completely overhauled and tuned, £60 and £57.10.0 respectively. Completely rebuilt with P.V.C. wiring, £85.

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Avominors. Leather case. With leads, fully tested and guaranteed. With batteries 2,000 volt. D.C. £2.19.6. P. & P. 2/6. Output Transformer in screening can giving 9 different ratios 10 : 1 up to 120 : 1 for battery receivers or any high resistance pentodes used as output valves, 6/6. P. & P. 1/6.

P. C. RADIO LTD.
 170 GOLDHAWK RD., W.12
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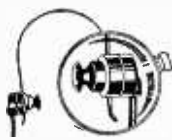


COSSOR OSCILLOSCOPE

A truly magnificent first grade L.F. oscilloscope incorporating a hard valve time base, speeds 1.5-40 milliseconds, easily extended for a few shillings to 3 c.p.s. to 30 kc/s. speeds. Has high-class amplifier with fine and coarse gain controls. Brightness and focus controls, X & Y shifts. 115 v. & 230 v. Mains power pack full fuse protected. Employs 2½ in. tube ACR 10 size 19 in x 7 in. x 12 in. Only 20 in stock so first come first served. Generally cost £59 each, our price **£12.10.0** Carr. 15/-.

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These H.S. 30 phones are the smallest used by the U.S. Air Force 2500 Imp.



using soft rubber miniature ear moulds for maximum music and voice reproduction of the finest quality. Supplied free is a small transformer unit with cord and plug which steps impedance up to 4,000 Ω. ONLY 15/- P. & P. 2/6.

PORTABLE TRANS/RECEIVER No. 18-A self-contained Trans/Receiver for Telephone and C.W. Range approx. 10 miles. Freq.: 6-9 Mc/s. (50-33.3 metres). Valve line-up: 3 AFP-12, 2 AR-8, 1 ATP-F. Complete with aerial, H.T. and L.T. meter and all accessories. Weight 20 lbs. Size 8 x 10 x 17 in. Only 80/- Carr. 10/-.

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T.C.S. RECEIVER. 1.5 to 12 Mc/s. 7-valve superhet, built like a dream. 12SK7-RF, 12SA7 Mixer, 12AG Oscillator, 12Q7 Detector, AVC - BFO - 1st AF 12SK7-I.F.s. The 12AG final puts 1.4 watts into 500 ohms with an input modulated only 30%. Panel controls: R.F. Gain, A.F. Gain, C.W. Pitch, band-switch, mod.-C.W. switch, power switch, control and aerial posts, M.O. or crystal frequency switch, speaker jack, card holder to log 30 stations, hand vernier tuning knob turning a large etched calibrated plate behind hair lined window, anti-backlash gears used. Used condition. **£5.10.0.** Carriage 15/-.

HOOPER ROTARY TRANSFORMERS

12 v. input, 500 v. output at 65 mA, or 6 v. input, 250 output at 75 mA. Only



10/6 EACH
P. & P. 2/-.

PORTABLE RADIOPHONES MODEL MK II

We are proud to offer these Brand New British Army Portable Transmitter/Receivers. The improved model MK II (not to be confused with earlier models) is sold exclusively by us!

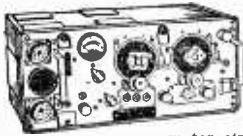
TWO TRANSISTOR POCKET RADIO with Miniature Speaker

Reception on the full medium and long wavebands. Complete with all parts including plastic case, 2 transistors, germanium diode, medium and long wave coil, speaker, wiring diagram and full instructions less batteries. Size 3½ x 4½ x 1¼ in. Batteries 10d. per set.



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meter, circuit and instruction book. In used condition. **65/-.** Carr. 10/-.

POCKET MULTIMETER BRAND NEW

2,500 o.p.v. Multi range 6/30/120/300/1,200 v. A.C., ditto D.C. 0-1K., 0-1 megohm, 400 Micro-A., 12 mA., 300 mA., -0 to +64 db 5 ranges; 3½ in. x 4¼ in. x 1¼ in. Large clear dial. Leads supplied.



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Batteries 20/- per Set.



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All controls are mounted on the front panel of the set and are clearly marked. Operates from standard 3v. L.T. and 120v. H.T. dry batteries.

All sets are fully tested and supplied complete with all accessories, comprising: Dynamic Sound Powered Headphones, Electro Magnetic Super Sensitive Microphone, 4ft. Aerial, Junction box, battery connection details and full circuit diagram.

TWO FOR **£6** Post Free

ACCUMULATORS. 2 volts 16 A.H. (unspillable). Ideal for 6 and 12 volts supply, etc. Brand new: Original cartons. Size 4½ in. x 7½ in. x 2½ in. 5/6 each. P. & P. 1/6. 3 for 15/- P. & P. 3/6. 6 for 27/6. P. & P. 5/-.



PRINTED CIRCUIT KIT. Easily and quickly you can make miniature professional printed circuits. Complete with illustrated manual, 19/6. P. & P. 1/6.

EAGLE VALVE FILAMENT TESTER MODEL VTH. Gives instant test of valves, fuses, continuity, etc. (as described in May issue, page 70). Supplied complete. 30/- P. & P. 2/6.

D.M.34. America's finest little dynamotor offering 12 v. in with 220 v. out of 80 mA. With suppression and smoothing mounting base. Size 4½ x 2½ x 2½ in. Original packing. ONLY 35/- P. & P. 3/6.

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A must for every Constructor and "Ham", consists of moving coil, padded headphones and "press to talk" microphone. 10/- P. & P. 3/6.

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Tuning range 88-108 Mc/s. For your convenience this is available in two units sold separately as follows: Tuner Unit (FMT-4U) with 10.7 Mc/s I.F. output (£32.0, inc. P.T.). I.F. Amplifier (FMA-4U) complete with cabinet and valves (£10.10.6).
Total £13.12.6



F.M. TUNER

HI-FI 16W. STEREO AMPLIFIER Model S-88

10mV. basic sensitivity (2 mV. available, £1 extra). Ganged controls. Stereo/Monaural gram. radio and tape recorder input. Push-button selection. Two-tone grey metal cabinet. £25.5.6



S-33

6-TRANSISTOR PORTABLE Model UXR-1

Pre-aligned I.F. transformers, printed circuit, 7 x 4in. high-flux speaker. Real hide case. £15.18.6



S-88

DUAL-WAVE TRANSISTOR RADIO UJR-1

This sensitive headphone set is a fine introduction to electronics for any youngster. £2.16.6

RES.-CAP. BRIDGE Model C-3U

Measures capacity 10pF to 1,000µF. resistance 100Ω to 5MΩ and power factor. 5-450 v. test voltages. With safety switch. £7.19.6



DX-40

AUDIO SIGNAL GENERATOR Model AG-9U

10c/s to 100 kc/s. switch selected. Distortion less than 0.1%. 10v. sine wave output metered in volts and dB's. £19.3.0



DX-100U

VALVE VOLTMETER Model V-7A

Measures volts to 1,500 (D.C. and R.M.S.) and 4,000 pk. to pk. Res 0.1Ω to 1,000 MΩ. D.C. input imped. 11MΩ. Complete with test prods, leads and standardising battery. £13.0.0



OS-1

Portable 2 3/4" SERVICE SCOPE Model OS-1

Compact portable scope ideal for servicing and general work. Y amplifier sensitivity 10 mV/cm; response ± 3 dB 10 c/s-2.5 Mc/s. Time base 15 c/s-150 kc/s. Printed circuit. Case 7 1/2 x 4 1/2 x 12 1/2 in. long. Wt. only 10 1/2 lb. £18.19.6



UXR-1

5in. OSCILLOSCOPE Model O-12U

Has wide-band amplifiers, essential for TV servicing, F.M. alignment, etc. Vertical freq. response 3 c/s. to over 5 Mc/s. without extra switching. T/B covers 10 c/s. to 500 kc/s. in 5 ranges. £34.15.0



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THE "GLOUCESTER"
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6-W STEREO AMPLIFIER Model S-33

3 watts per channel, 0.3% distortion at 2.5 w/chnl. 20dB N.F.B. Inputs for Radio (or Tape) and Gram. Stereo or Monaural, ganged controls. £11.8.0
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4-speed A.C. motor. Ronette Stereo/Mono pick-up. Complete with plinth. £12.10.0

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Ducted-port bass reflex cabinet "in the white". Twin speakers. With legs £11.12.6 £10.5.6

"HAM" TRANSMITTER Model DX-40U

from 80-10 m. Power input 75 w. C.W., 60 w. peak C.C. phone. Output 40 w. to aerial. Compact and self-contained. Prov. for V.F.O. £29.10.0

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Covers all amateur bands from 160-10 metres. Self-contained including Power Supply. £78.10.0
Modulator and V.F.O.

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Practical Wireless

VOL. XXXVI, No. 642, AUGUST 1960

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The Editor will be pleased to consider articles of a practical nature. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Owing to the rapid progress in the designs of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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NOMS DE PLUME

THE daily press has recently been criticising the use of pen-names in newspapers and magazines. The use of pseudonyms in the field of journalism is a long established practice, as indeed it is in many professions. The main argument against their use is that the writer is afraid to sign his work with his own name in case his writing prove unpopular. Whilst this may be true in several instances, it is generally untrue in technical journalism; often, the nature of the author's employment forbids him from using his name or, perhaps, other professional reasons may be involved. It may not be appreciated that many of those writers who employ pen-names would rather write their articles under their own and are prevented by circumstances from doing so. It has been suggested in the daily press that pen-names should only be employed if the correct name of the author is known to the reader. Surely this would defeat the purpose of the use of pseudonyms? In this magazine it is our editorial policy to publish articles under authors' true names wherever possible but if for good reason the writer does not wish his name to appear, a pseudonym may be used. A notable contributor to this journal is of course "Thermion" who has always written under that name, never under his own. Some readers complain about this regular use of a pen-name but there is good reason for it. As "Thermion" himself has stated in his articles in the past, the name is associated with an address and the articles written have the authority of the Editor and publishers behind them. It is certainly not true to say that writers in this journal not using their own names write anonymously.

CONTRIBUTIONS

THOSE of our readers who wish to submit articles should send them direct to the Editor at the address given on this page. Manuscripts should be typewritten with double spacing although legible hand-written articles are also acceptable. Articles should be between 1,000 and 2,000 words in length, be written on one side of the paper only, and deal with the home construction of items of radio and electronic equipment. We do not require articles of a theoretical nature unless these are written expressly for the amateur constructor. Clear drawings of the apparatus should be included with the article and need only be sufficient for our draughtsmen to prepare suitable illustrations. We also like to include with articles photographic illustrations. Large clear prints, or preferably negatives, should be sent if possible but we are prepared to take the necessary photographs ourselves if the apparatus can be sent to us for inspection. An illustrated article is always of more appeal as the methods of construction are shown more clearly.

Our Next Issue, dated September, will be published on August 5th.

Round the World of Wireless

POTENTIAL AND CURRENT NEWS

Broadcast Receiving Licences

THE following statement shows the approximate number of Broadcast Receiving Licences in force at the end of April 1960, in respect of wireless receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland. The numbers include Licences issued to blind persons without payment.

Region	Total
London Postal	786,552
Home Counties	738,688
Midland	545,371
North Eastern	601,211
North Western	514,438
South Western	442,986
Wales and Border Counties	288,004
Total England and Wales	3,897,240
Scotland	453,843
Northern Ireland	132,980
Grand Total	4,484,063

Air Traffic Control

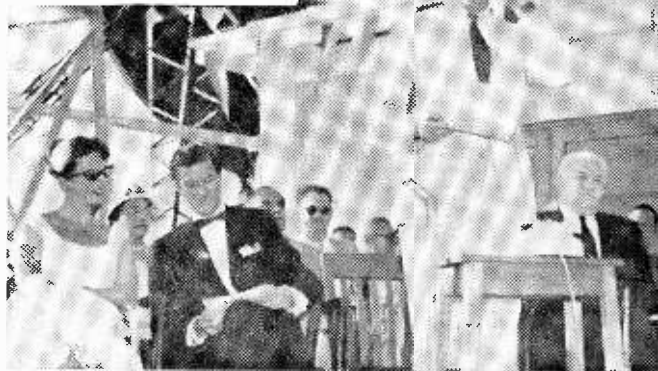
IT is announced by Ferranti Ltd. that their Apollo computer, the first of its type ever to be used for air traffic control experiments in this country, will go into operation at the Scottish air traffic control centre at Redbrae, Prestwick, early in the spring of next year.

Aircraft flying the North Atlantic are subject to rigid traffic regulations. Whether flying eastbound or westbound, each aircraft must conform to agreed separation standards, which are 30 minutes longitudinal flying time between aircraft, 2 deg of latitude and 1000 or 2000ft in height, according to the flight level.

The whole process of sorting out information, amending flight progress strips and guarding against infringements of the regulations is carried out manually by the controller.

4-Million Volt Linear Accelerator

A DEVELOPMENT contract for a mobile linear accelerator designed to take X-ray photographs of the welds in the pressure vessel of a nuclear



The new 186-mile radio communications link between the United States and the Bahamas was formally opened by His Excellency the Governor of the Bahamas, Sir Raynor Arthur, K.C.M.G., C.V.O., early this year. This link provides additional telephone and other communication facilities between Nassau and Florida City, Florida.

power station has been placed by the U.K. Atomic Energy Authority with Mullard Equipment Ltd. The contract results from investigations, commissioned by the Authority, into the suitability of such machines for making radiographic inspections of welds in thick materials.

The accelerator will have an energy rating of 4.3 million electron volts and will give an X-ray output of over 600 Röntgens a minute in air at 1m focus film distance.

The accelerator is specially designed for use on site during the building of a nuclear power station with a minimum of disturbance to the constructional work. It is compact, easily controllable and has comprehensive positioning facilities for easy and accurate location on the specimen.

Temperatures in Outer Space

NEWS of further research into the conditions obtaining in outer space comes from Bonn University Observatory which is shortly to begin an intensive investigation into the temperatures prevailing in interstellar gas.

To this end, special amplifying equipment employing travelling wave tubes has been manu-

factured for the University by Marconi's. This consists of a dual channel amplifying system incorporating two travelling wave tubes in cascade in each channel. The outputs from the two amplifying channels are detected, integrated and compared and the effective cosmic temperature determined; from this data contour maps are prepared. So accurate has the system proved in initial tests that a discrimination of 0.1 deg K has been achieved.

The research programme at Bonn University Observatory is being carried out under the direction of Professor Becker, who is assisted by Herr Heinz G. Müller.

Computer for Admiralty

AN order for an Emidec 1100 all-transistor computer has been placed with E.M.I. Electronics by Her Majesty's Stationery Office, for the Admiralty. The installation, which is expected to be delivered within two years, will include magnetic tape units. On magnetic tape will be recorded up-to-date stock records of the 90,000 or so different patterns of stores held in the Depot, and the computer will also maintain lists of components for each of some 1,500 different types of radio and

asdic sets to be fitted in ships. The computer will work out complete lists of components needed — which may run to several hundred items for a single set—look up the stock record and confirm availability, debit the stock record and prepare printed invoices for the items to be dispatched to the ships.

Sound Equipment for Margarine Works

A LARGE installation of Philips sound reproduction equipment at the Stork Margarine Works of Van den Burghs and Jurgens Ltd., Bromborough, Cheshire, is believed to be one of the most comprehensive of its kind in Britain. The centre of the main installation is in a small studio adjoining the private telephone exchange. It comprises a desk-type console into which the following basic equipment is built; two radio receivers for AM and FM reception—one being a standby — to provide "Music While You Work" programmes; two pre-amplifiers; two auto record changers; six 120W power amplifiers; and the main control, switching and monitor panel with its many relays, power supplies and ancillary apparatus — much of it specially designed.

The record changers which are used to supply music programmes to the factory and canteen are so wired that they will play alternate records without any pause between the end of one and the start of the next.

British Exhibition goes to Moscow

AT 4 o'clock on Monday, 30th May, 1960, the m.v. "Bardic Ferry" of the Transport Ferry Service, cast off from Berth 4 at Tilbury Docks bound for Antwerp carrying over 650 scientific instruments worth £250,000 in five trailers for the forty exhibitors taking part in the first ever collective private enterprise exhibition to be held in Moscow from the 18th to 29th June, 1960, and organised by the Scientific Instrument Manufacturers' Association of Great Britain, 20, Queen Anne Street, London, W.1. LEP Transport Ltd. acted as the exhibition contractors and forwarding agents.

The ferry arrived at 5 a.m. B.S.T. on 31st May. The trailers were disembarked and attached to the trucks of the König Transport, Rotterdam, associates of the

Continental Ferry Services Ltd. who organised the transport services. The 1652-mile journey from Antwerp to Moscow was completed by 8th June. The exhibition was opened on 8th June at the Moscow Polytechnic by Sir Patrick Reilly, K.C.M.G., O.B.E., H.M. Ambassador to the U.S.S.R.

Reverberation System

A NEW system that generates sound reverberations electrically for greater realism in the home reproduction of gramophone records, AM/FM radio broadcasts, and magnetic tapes, has been announced by the Philco Corporation of the U.S.A.

In an advance preview to the national consumer and trade press, Leslie J. Woods, Philco's vice president of research and engineering, states that Philco "Reverbaphonic Sound" presages a new area of realism in the reproduction of recorded sound never before achieved in the gramophone industry.

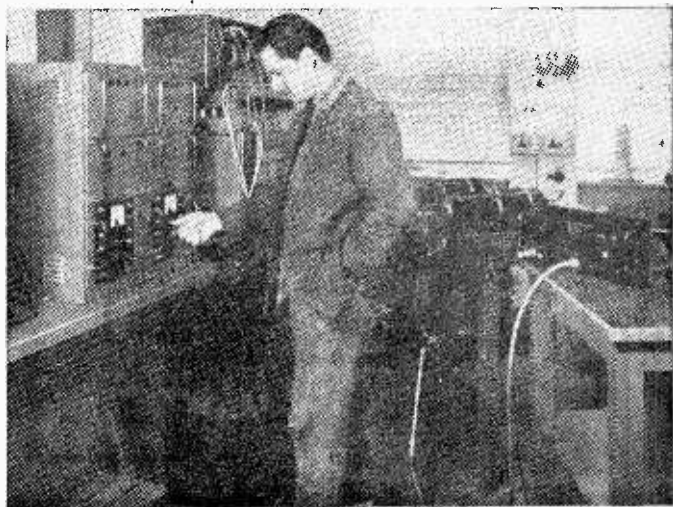
A variety of instrumental, choral and solo recordings, both monaural and binaural (stereo), were demonstrated to show the ability of the reverbaphonic system to bring concert hall realism into the average living room.

In the sound amplification system, the "Reverbaphone"—a device with two spring-like delay lines—generates the re-echo or reverberant component from the signal source. This energy is fed to two stereo amplifiers within the gramophone. The loudspeakers are connected in such a manner that both the primary signal and its reverberant component are reproduced, imparting a spatial naturalness to the sound output. The net result of this technique is that the sound reproduction closely approximates the original performance including the natural acoustic properties of the concert hall.

Multisignals Limited

THE Board of Multisignals Ltd. announce that at their last Board Meeting the authorised capital was raised by £450,000 to £500,000.

Multisignals Ltd. was incorporated on the 15th July, 1959, after negotiations between the Radio and Television Retailers' Association and radio and television set manufacturers. The present shareholders of Multisignals Ltd. are Thorn Electrical Industries, E.K. Cole Ltd., Ultra Electric Ltd. and Anglia Television Ltd.



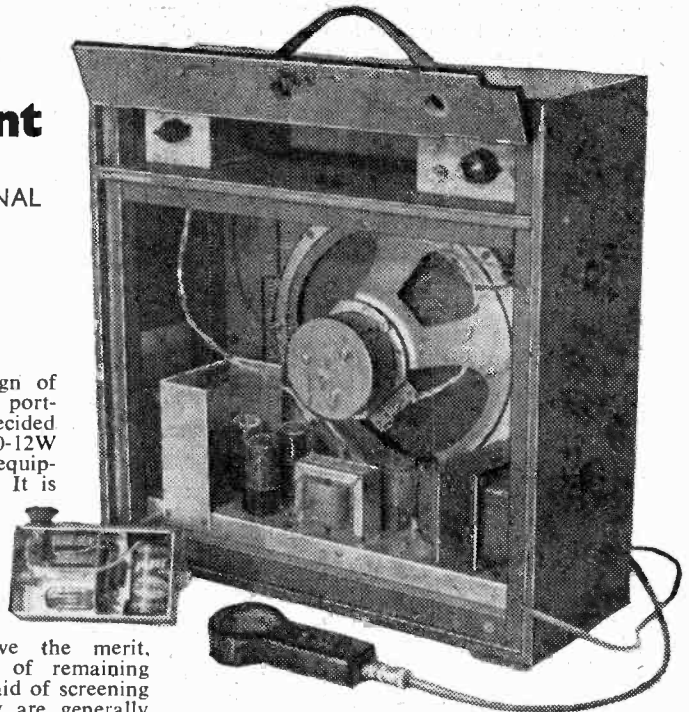
Using equipment specially manufactured by Marconi's, the Observatory at Bonn University is shortly to begin an intensive investigation into the temperatures prevailing in outer space. The illustration shows Herr Heinz G. Müller examining the control rack by means of which the operating conditions of the travelling wave tubes may be adjusted.

Inexpensive P.A. Equipment

COMPLETE CONSTRUCTIONAL INFORMATION

By V. E. Holley

THE considerations in the design of this amplifier were reliability, portability and economy. It was decided that the power output should be 10-12W since this is easily obtainable from equipment of modest cost and weight. It is sufficient, moreover, if the speaker system is properly matched, to provide music for dancing in a medium size hall, and in the open air, with suitable speakers, will carry speech intelligibly to 500yd or so. Octal-based valves were decided upon because they have the merit, desirable in portable equipment, of remaining firmly in their sockets without the aid of screening cans or other devices. Also, they are generally cheaper than their glass-based counterparts.



The completed equipment in its case.

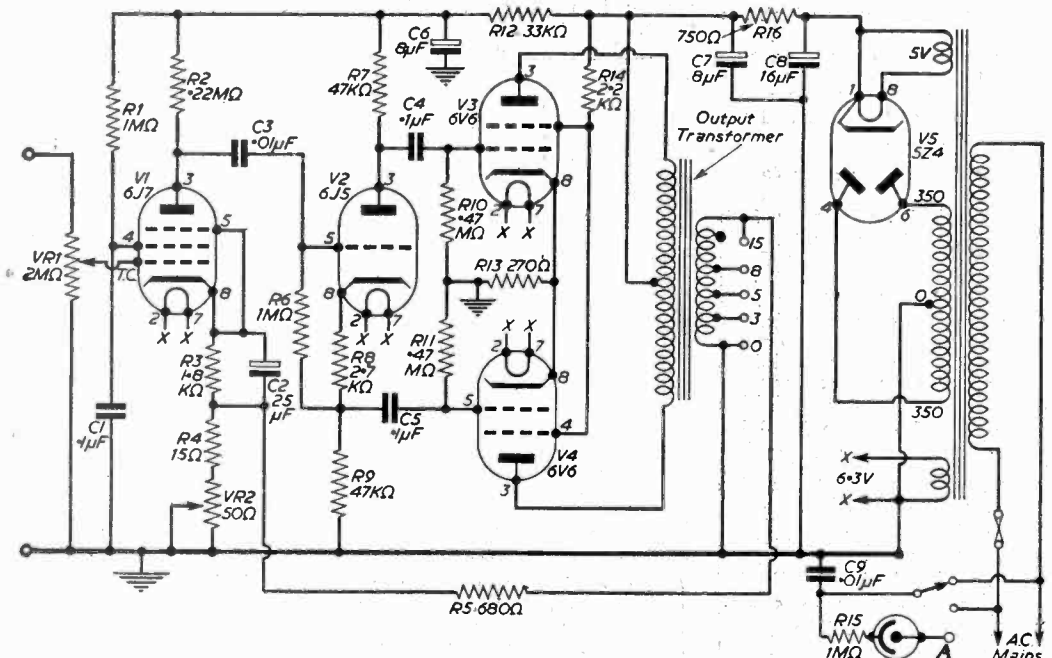


Fig. 1.—Circuit of the amplifier (terminal A, is a 4BA bolt which is touched to determine by the lighting of the neon correct mains connection).

Circuit

A pair of 6V6's is employed in the circuit given in Fig. 1, with 285V on anodes and screens. They share a common bias resistor and should therefore be reasonably well, though not necessarily, accurately, matched. The resistor need not be bypassed since the signal currents will cancel out at the cathodes. The 2.2k resistor R14 ensures that the screen voltage does not rise above that of the

36/1.8 or 20V peak. There is no over-loading with this large input since most of it goes to counteract the effect of negative feedback in the cathode load. A 6J5 is the natural choice for V2 but practically any octal triode or triode-connected pentode will serve equally well. The prototype uses one half of a 6SL7, the unused electrodes being grounded.

The input to the phase inverter is derived from V1 which is a 6J7 arranged as a resistance coupled amplifier with anode and screen resistors of 0.22M and 1M respectively and a bias resistor of 1.8k. No separate decoupling is necessary for this stage. The gain is 150 times so that the required input for full power is 20/150 or about 0.13V peak. In the grid circuit is a 2M volume control and although the makers state that the grid circuit resistance of the 6J7 should not exceed 1M it is quite satisfactory to double this when the valve is employed as a resistance coupled amplifier. The reason for using this high value will appear later.

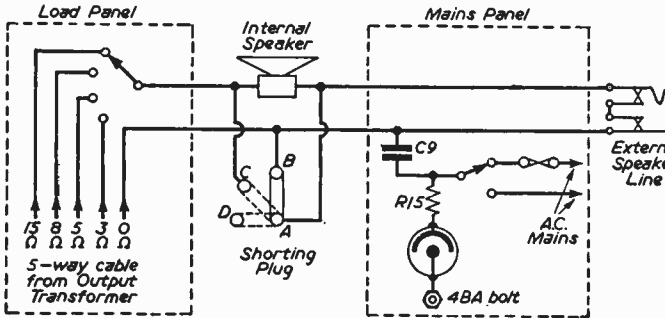


Fig. 2.—Speaker system, mains and load panels.

anodes; it should not be omitted or the maximum permissible screen dissipation may be exceeded.

The signal required by the output stage for full load is 36V peak grid to grid and this is provided by V2 arranged as a conventional phase inverter with equal anode and cathode loads of 47k. These load resistors and the 0.47M grid resistors in the output stage should be matched as accurately as possible or alternatively, may be 5 per cent tolerance components. Decoupling and additional smoothing is provided by R12 and C6 and the stage is completed with a 1M grid resistor returned to the junction of the bias resistor and the cathode load. As the input is between grid and earth, there is heavy negative current feedback which provides excellent linearity. The gain is 0.9 each side or 1.8 times overall and the input must therefore be

Negative Feedback

Negative feedback is taken from the secondary of the output transformer to the cathode circuit of V1 and it will be noticed that the percentage of feedback, and consequently the gain of the amplifier, is variable according to the setting of VR2 which is arranged for screwdriver control. The advantages of feedback are thus available at times when maximum gain is not required as will often be the case. With the prototype, it was found that the correct gain for a particular purpose was obtained when the feedback resistance in V1 cathode circuit was 15 ohms and R4 was inserted so that this condition could be found easily. R4 serves no other purpose and may be omitted if not required.

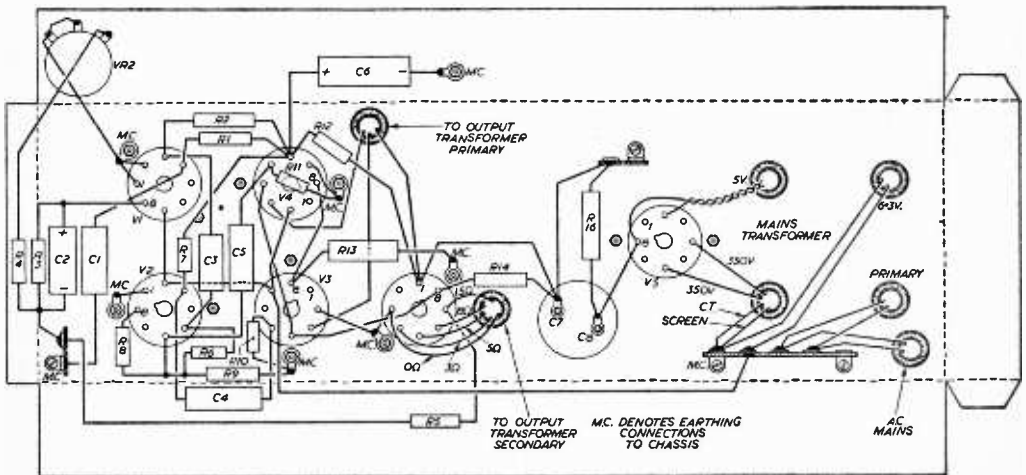


Fig. 3.—Main amplifier wiring.

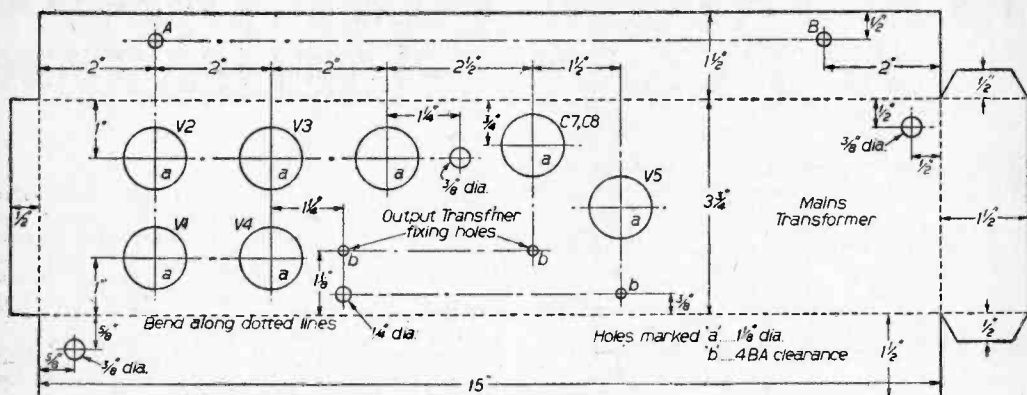


Fig. 4a.—Main amplifier chassis.

Reliability

For maximum reliability, the number of components has been reduced to the minimum necessary for adequate performance; a good margin has been allowed in the wattage rating of all resistors and all capacitors except C2 have a working voltage of not less than 500. The omission of a mains switch is intentional. Many of the faults to which electronic apparatus is liable are precipitated by surges when switching on and off and it is therefore good practice, once the power is on, to leave it so until the equipment is dismantled and removed from the site of operations. The amplifier has not been designed for high fidelity but it has a good frequency response and can be used for reproduction of radio programmes or gramophone records with very acceptable results. Some circuits for use with pickups will be given later in the series.

Power Pack

The mains transformer should be a rugged component capable of secure attachment to the chassis to survive the hazards of transport. The H.T. secondary should be not less than 325V-0-325V and it is preferable to have a 5V rectifier winding so that the octal based 5Z4 can be used. If as in the prototype, only a 6V winding is available, an EZ80 is suitable. The H.T. current is less than 80mA but as the amplifier will be operated continuously for long periods in an enclosed cabinet, it is well to select a transformer capable of 100mA to reduce heat generation.

Resistor R16 with C7 and C8 form the main smoothing circuit. The value of R16 must be such that the correct voltage appears at the anodes of the output valves and for a 350V transformer, 750Ω will be about right. This should, however, be checked by measurement.

Fuse

A 500mA fuse is fitted in the mains supply. In order that it may be immediately replaceable in event of failure, it takes the form of a 6V, 0.5A screw bulb and a spare is carried. It should glow when the amplifier has warmed up.

Earthing

When an amplifier is used with a high impedance input it is necessary to avoid electrostatic hum pick-up that the chassis should be earthed. With portable equipment this is frequently difficult or impossible to arrange, as for instance when supply has to be taken from a 2-pin socket of a lamp-holder. This difficulty is overcome by tying the chassis to the neutral main by means of the capacitor C9 which should be either a ceramic of the type used for suppression of electrical appliances or a 1000VW paper component. The neutral side of the mains is never much above earth potential and this arrangement will be found just as effective as a direct earth.

(To be continued)

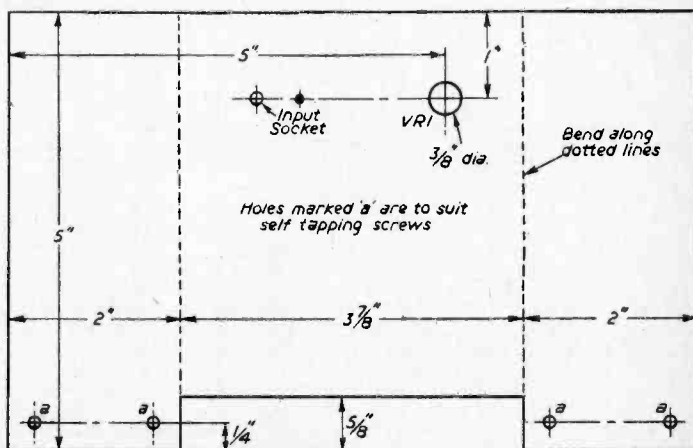


Fig. 4b.—Main amplifier volume control bracket.

ELECTRONIC COMPARISON OHMMETER

A ONE-VALVE CIRCUIT GIVING A LINEAR SCALE

By A. R. Bidwell

THE constructor wishing to construct an ohmmeter (or multimeter) and equipped with the relatively inexpensive 1mA full scale deflection meter soon finds that the normal battery operated ohmmeter suffers from serious disadvantages if a really useful wide range meter is required.

For low range using a 1.5V cell it is found that the 100Ω mark occurs barely 1/4 in. from the zero point and measurement of resistance under this value becomes largely a matter of guesswork.

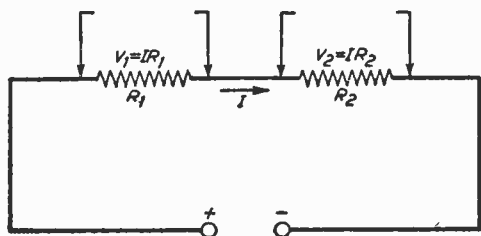


Fig. 1.—Application of Ohm's Law.

For high ranges and even allowing for an increased voltage it is discovered that readings much above 20k have disappeared into a rapidly narrowing series of markings—calling for even more involved guesswork.

Linear Scale

The electronic unit to be described overcomes these difficulties and provides a completely linear "forward" reading scale of constant accuracy. Full scale ranges can be arranged exactly as required between the limits 1Ω to 50M and the original meter scale can be utilised without laborious hand calibration. Layout is not critical and components can be arranged as convenient.

Principle of Operation

The ohmmeter makes use of a simple valve voltmeter to measure the volt drop across a known and unknown resistance when connected in series with a low voltage D.C. supply.

From Fig. 1 Ohm's Law gives:—

$$V_1 = IR_1 \text{ and } V_2 = IR_2$$

$$I = V_1/R_1 \text{ and } I = V_2/R_2$$

Therefore— $V_1/R_1 = V_2/R_2$ (I being common)

Cross multiplication and division gives:—

$$R_2/R_1 = V_2/V_1$$

Therefore, if we compare the two voltages V_1 and V_2 it is similar to comparing the two resistances R_1 and R_2 . From this if we arrange for the known voltage V_2 to give full scale deflection on the meter and then compare the unknown voltage V_1 , on the same scale, we can obtain one as a percentage of the other very conveniently. The scale can then be marked in ohms directly.

The diagram, Fig. 2, illustrates this principle.

Circuit

The full circuit is as shown in Fig. 3. The valve voltmeter is built around the EF50 valve but almost any other valve of similar characteristics will be satisfactory. The mains transformer is required to supply 15mA at 300V D.C. and approx. 2A at 6.3V. If possible, a separate 6.3V tapping should be used for the heater supply. The A.C. mains should not be used direct for obtaining H.T. for this circuit as the resistor terminals and chassis may be at full mains potential. The most suitable value A.C. for the low voltage D.C. source depends upon the type of rectifier and the lowest range of ohms required. To this end it is useful to obtain the voltage/current curve of the rectifier to be used (by experiment or from technical data) and to bear in mind that approximately 1 volt is required to be dropped across the known and unknown resistances to permit full scale deflection of the meter. In Fig. 4 XR is adjusted during calibration to 'drop' X volts.

Then $X = (Y - 2)$.

The value of Y will be determined by the voltage/current characteristics of the low voltage metal rectifier used.

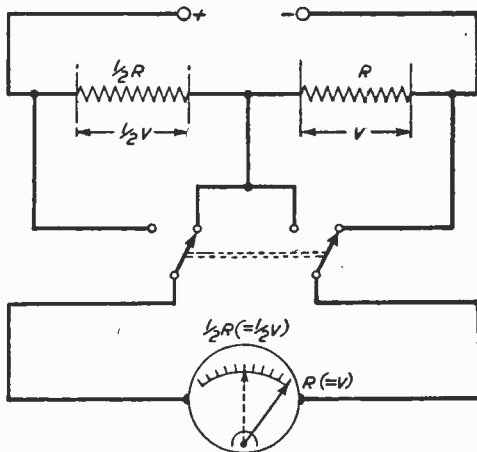


Fig. 2.—The principle of the ohmmeter derived from Fig. 1.

For normal ranges the 6.3V 2A A.C. supply will handle a low range of 1Ω f.s.d. and a high range of 10M f.s.d. For this latter range, XR in Fig. 4 will require to be 70M (fixed resistors to this value will suffice). A much higher range (50M or more) can be obtained more easily by artificially loading the 9V D.C. source so that XR can be reduced or eliminated. In this case, however, extra contacts will have to be provided on the range switch to handle the additional circuitry.

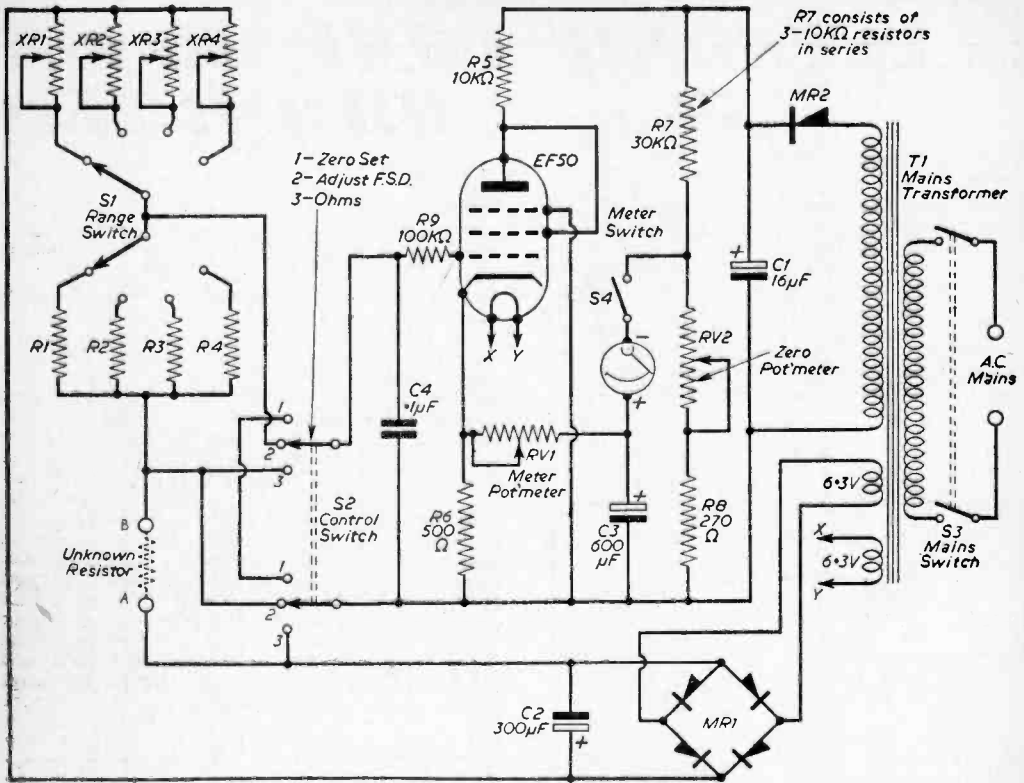


Fig. 3.—The complete circuit diagram of the instrument.

It is to be noted that the low voltage D.C. supply is not returned to chassis except via the S2 contacts. This is to avoid short circuiting the unknown resistance when switched to "Full Scale".

Good low voltage D.C. smoothing is important. A full wave metal rectifier is to be preferred and a high capacity (300μF) condenser should be used.

The H.T. smoothing is not critical and, to save expense, the usual smoothing choke has been omitted and half wave rectification adopted.

Biasing

The EF50 is connected as a triode and is biased with a 500Ω

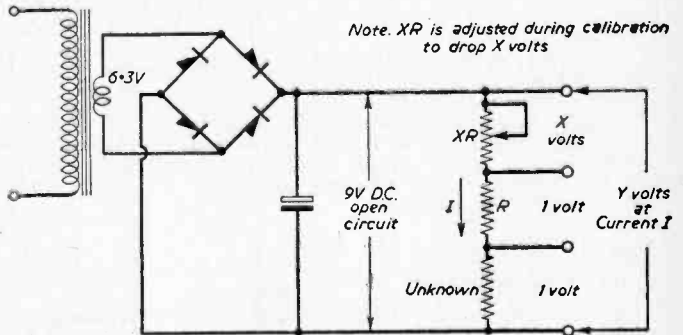


Fig. 4.—Initial calibration.

COMPONENTS LIST

- RV1—5k.
- RV2—150Ω.
- XR1-4
- R1-4
- According to required ranges.
- R5—10k ½W.
- R6—500Ω ½W.
- R7—30k 5W.
- S1—2-pole, ways as required.
- S2—2-pole, 3-way.
- S3—2-pole, 2-way, toggle type.
- S4—1-pole, 1-way toggle type.
- V1—EF50 (or similar).

- R8—1k ¼W.
- R9—100k ¼W.
- C1—16μF 400VW.
- C2—300μF 12VW.
- C3—600μF 12VW.
- C4—0.1μF 350VW.
- MR1—12V 2A (full-wave).
- MR2—300V 20mA (half-wave).

- T1—250V at 20mA, 6.3V at 2A, 6.3V at 0.3A.
- Meter—1mA, 90mV f.s.d.
- Sundries — Valveholder, chassis, knobs, wire, nuts, screws, etc.

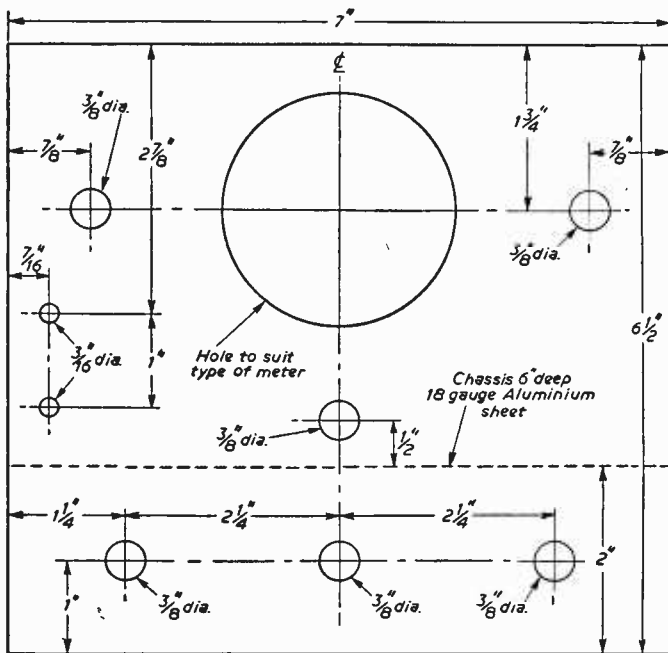


Fig. 5.—Front panel measurements.

resistor (470+27) which develops approximately 2.8V volts with zero signal. The meter is connected between this bias voltage and an equal voltage at the junction of the bridge circuit R7 and RV2, giving a zero reading at zero grid signal. Resistor RV1 converts the 1mA 90mV f.s.d. milliammeter into a variable range voltmeter.

The lower limit of range is governed by the D.C. rating of the unknown resistance under test and the known standard resistance, and by the ability of the D.C. source to provide the current. On the 1Ω range, the maximum D.C. required will be about 1.5A and the minimum 1A. For most purposes, a low range of 10Ω or even 100Ω full scale will suffice and for these ranges the maximum D.C. will be 125mA and 12mA respectively.

Meter Damping

A high capacity condenser is included in circuit between the positive terminal of the meter and chassis. This helps to limit violent swings of the needle when switching S2 but, even so, S2 should be operated cleanly. The value of capacitance can be varied to suit requirements although 600μF gives a reasonable performance. Owing to the inclusion of this condenser, the meter switch should be broken

before switching the mains supply on initially. This avoids a hard "back" deflection via R7 and C3, before the bias voltage rises to its operating value.

On megohm ranges some oscillation appears but can be cured by the insertion of C4 (0.1μF). This has a side effect of extra meter damping caused by the charging of C4 via the known resistance. This is tolerable up to a range of 50M which will suffice for most purposes.

Calibration

To calibrate the instrument for use, proceed as follows:—Set the Meter Potentiometer (RV1) to maximum resistance, the Zero-set potentiometer (RV2) to mid-position, the Calibration potentiometer (XR1) to maximum resistance, the Range Switch (S1) to range 1, the Control Switch (S2) to set the zero reading. Insert a test resistance between the input terminals, approximately equal to, but not more than, the maximum of the particular range to be calibrated. Switch on the mains supply (with meter switch off) and allow time to warm up. Switch on the meter switch and adjust RV2 to obtain zero reading on the milliammeter. Switch S2 to "Full Scale" and adjust RV1 to obtain full scale deflection or the (Continued on page 321)

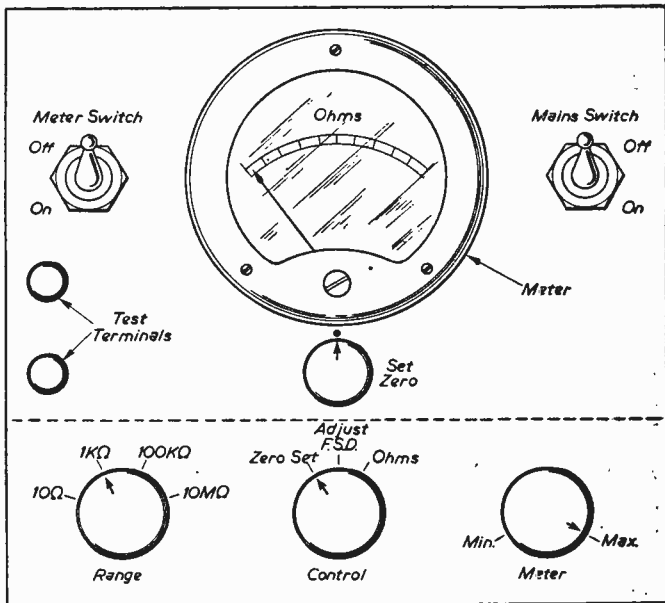


Fig. 6.—Front panel layout.

Pocket Transistor

THE REMAINING CONSTRUCTIONAL INFORMATION

T.R.F.

By W. Cleland

(Continued from page 246 of the July issue)

SOLDERING of Litz wire is difficult as it consists of many insulated strands twisted together with a covering of silk. However, a suitable method appears to be first to remove the silk by using superfine abrasive paper, with the wire held on a flat surface. The enamel can then be softened on the ends of the Litz wires by immersing them in a paint remover for perhaps a quarter of an hour. Then if the wire is wiped repeatedly with a piece of clean cotton wool very slightly dampened with paint remover the copper will begin to show. The Litz wire should be wiped carefully to free it from all enamel.

Tinning

The Litz wire can be tinned with the soldering iron using very little solder. It is sufficient to bare and tin about $\frac{1}{16}$ in. of each lead. The lead is then drawn gently into its spill which is at the same time heated with the soldering iron to melt the solder. It may be advisable to separate the base plate from the polystyrene former to ensure that excessive heat is not transmitted to it, causing distortion which would prevent the core from screwing freely. The excess length of the leads can be folded against the pot core and gives no trouble.

If a former is loose in its base plate it may have to be cemented in place. Durofix is suitable, but it should be kept from the inside of the former. Some may also be applied to anchor the pot core.

A 350pF sub-miniature tubular polystyrene capacitor is wired between the two spills belonging



The completed receiver.

to the 80-turn winding. A $\frac{1}{16}$ in. of each lead separating the capacitor from the soldering spill will help to prevent too much heat from reaching it.

The inexpensive forceps sold for extracting splinters are very useful in this work, both for holding miniature components, and for wrapping their leads around tags.

The coils are mounted by passing an "axle" through the unused spill on the side of the base plate to which the five-turn windings are connected. This "axle" consists of a straight 20s.w.g. tinned copper wire, and is soldered at intervals to brass

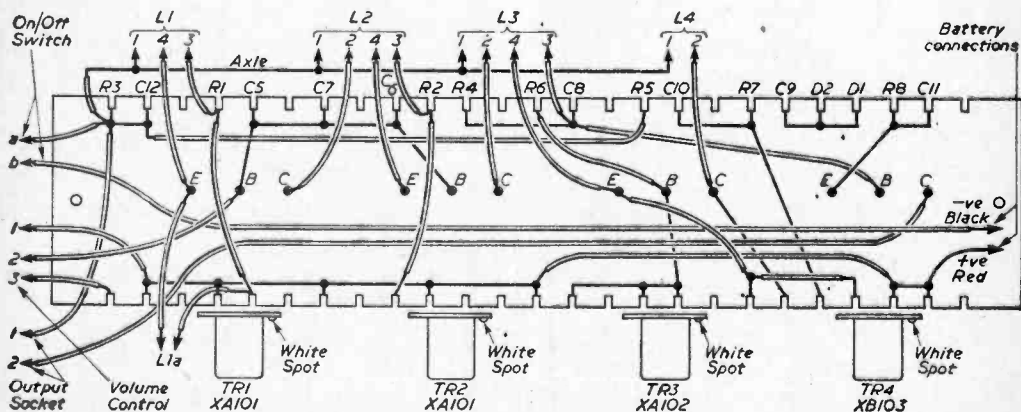


Fig. 6.—Wiring under the component strip (the transistor leads run direct from the transistors to their respective soldering spills marked E, B and C).

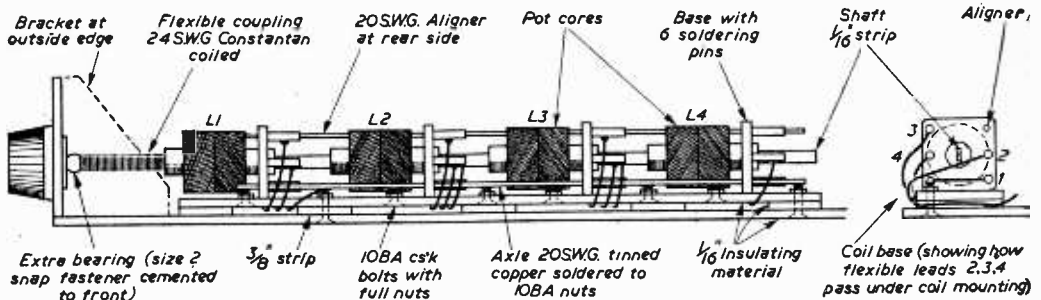


Fig. 7.—The inductive tuner.

studs on the mounting strip, consisting of 10B.A. nuts and countersunk bolts. Care has to be taken not to let the solder flow on to the soldering spill, as it would not then be able to turn on the "axle".

The purpose of this construction is to enable the coils to be swung over and tuned individually during the initial adjustments. When they have all been brought into tune with each other, another removable 20s.w.g. wire is passed through the series of spills diagonally opposite those serving as hinges, and a flat metal strip is passed through the four cores to gang them together. This strip is made by hammering a 20s.w.g. tinned copper wire on a steel block, keeping it as straight as possible. The strip should have a length of 4½ in. and slip easily through the cores.

Flexible Drive

One end of the strip is soldered into a flexible drive consisting of a coil of 24s.w.g. bare Constantan wire. This is made by closely winding it on the shank of a 1/16 in. drill for a length of ¼ in. The coil has to grip firmly on the 1/16 in. rivet used

be necessary if it is not a tight fit on the shaft.

The flexible drive is wound like a left-hand screw thread. This is important because it allows the coupling to slip on the rivet if the cores are screwed too far towards the front panel, so avoiding breaking them. If they are screwed too far in the opposite direction, the cores will fall out of the coils, although it is unlikely that either extreme will be reached in normal use.

The tuning knob is easily fitted by inserting its shaft (the copper rivet) through the 1/16 in. hole in the front panel, and screwing it counter-clockwise into the flexible coupling held with pliers.

Wiring

The tuning coils are connected to the rest of the receiver by thin flexible plastic-covered wire, easily obtainable in a variety of colours, and the connecting wires must pass close to the axle, to enable the coils to hinge easily.

The leads from the spills marked (1) are soldered to the axle, which serves as a "bus-bar" for the negative line. Those from (3) and (4) are led down at the side; those from (2) under the axle, and then pass through the spaces under the coil mounting strip. The leads are connected first at the components panel end, and subsequently to the coils.

"Chassis"

The components panel is of a very simple type with notches along the edge. These are made first with a fine fretshaw blade, then widened to ½ in. with a hacksaw blade. Component leads are bent over the notches to secure the components, and small hooks are formed on the other side, or the wire is engaged on the hooks of other leads as required. Solder applied to the linked hooks results in a reliable joint, and this method of mounting components could be widely used as it is neat and effective, assuming the necessary skill in soldering.

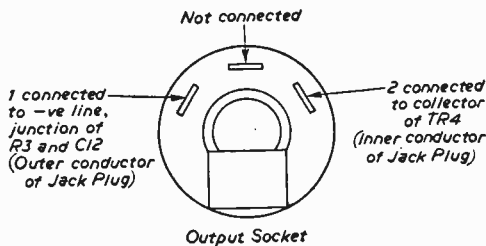


Fig. 8a.—Connections to the output socket.

as a shaft from the tuning knob. Some rivets appear to depart slightly from their nominal thickness, and some adjustment of the coil diameter may

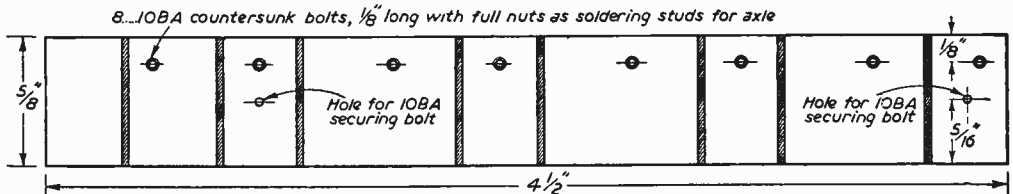


Fig. 8b.—The coil mounting strip—1/8 in. insulating material. (Pieces of 1/8 in. material are cemented to the underside as shown, leaving gaps for the flexible leads to pass beneath the coils.)

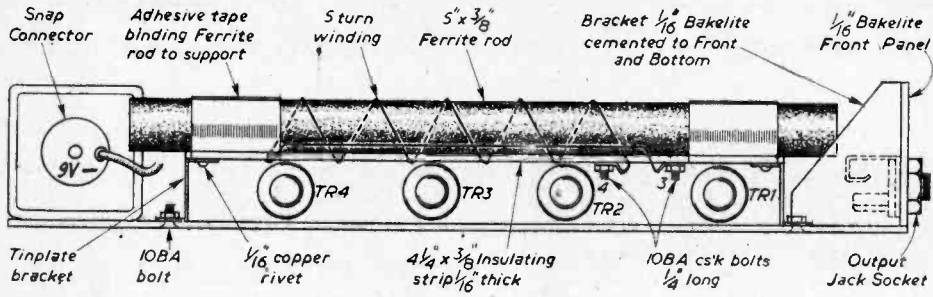


Fig. 9.—The ferrite aerial.

The soldering of the transistors to their soldering tags (10B.A. screws projecting on the underside of the components panel) is not very difficult, but the soldering iron should not be applied for more than a second or two, and if the transistor leads in their sleeving are gripped with pliers until the soldered joints have cooled. If there is any difficulty in producing a good soldered joint in such a short time, it should be allowed to cool before a further attempt.

partly accounts for its length. If redesigned, the receiver could probably be made at least an inch shorter.

A strip of bakelite on two supports is used to mount the ferrite aerial in order to clear the transistors. The rod is fastened on it with a binding of tape. A pair of soldering spills in the form of 10B.A. bolts project below the mounting strip and are used as terminals for the five-turn aerial winding. For this, thick Litz wire may be used or if preferred, ordinary enamelled wire.

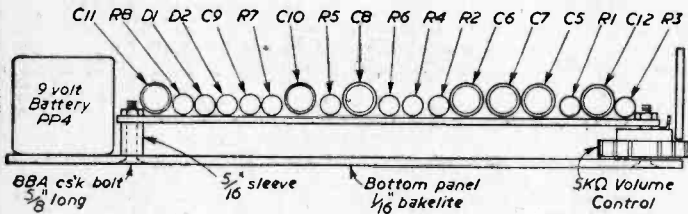


Fig. 10.—Side view of the component strip.

Battery

As the current taken by the receiver is about 6mA, it was necessary to include a PP4 battery rather than a PP3, and it appears reasonable to expect a service life of some 40 to 50 hours from this battery. The pair of snap connectors to fit those on the PP4 were taken from a used battery. The inclusion of the battery at the rear of the receiver

Ferrite Rod

The 5in. x 3/8in. ferrite rod was snapped from a 7in. rod. This is done by placing it on a steel block, applying the edge of a metal-cutting chisel at the point required, and giving it a sharp tap. A clean fracture is produced by this method.

The edge-type volume control is one of the supports of the components panel. An indentation in its rim can be filled with white paint to mark the off-position of the switch. It should be on the left of the aperture when the receiver is switched off, and will move to the middle on switching on. With further rotation to the point of audibility, the paint mark will move out of sight.

(Continued on page 323)

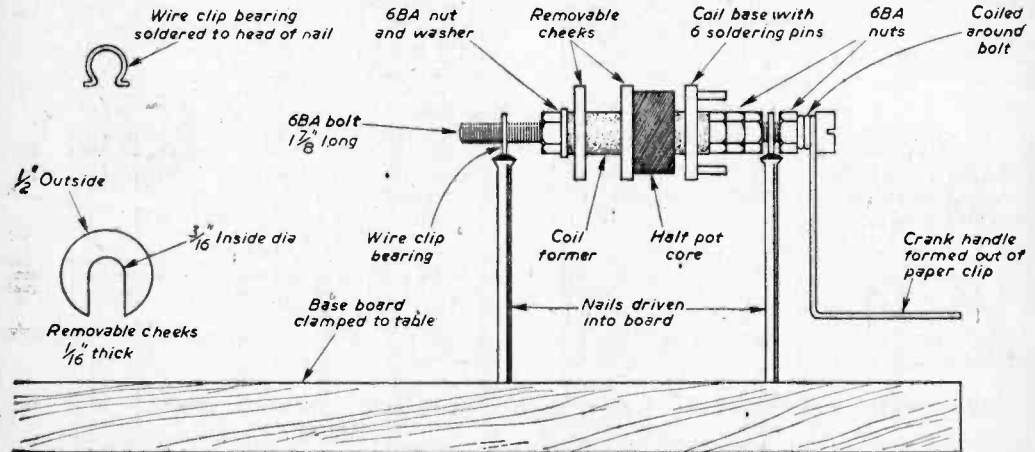
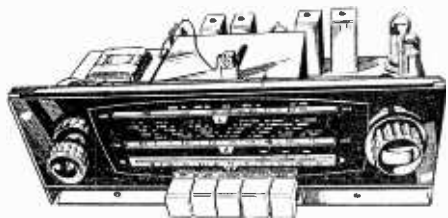


Fig. 11.—Improvised coil winder.

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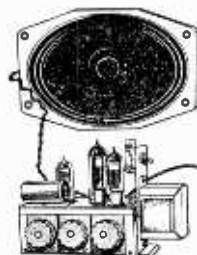
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(Page 835 February Issue).
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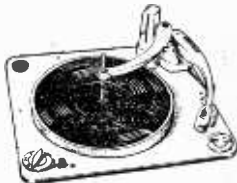
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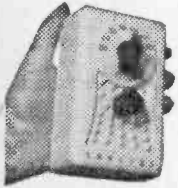
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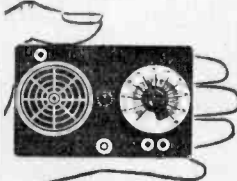
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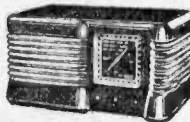
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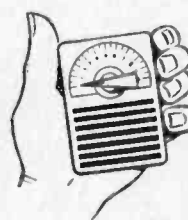
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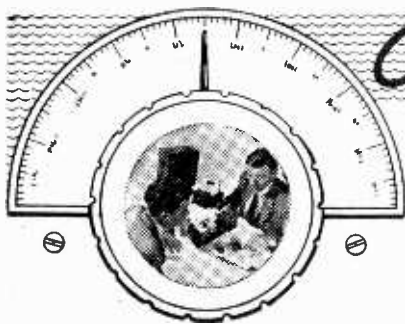
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On Your Wavelength

BY THERMION

The Old Days

REGULAR readers of this page will remember my discussion of the changes in the world of amateur radio which have taken place in recent years. The Editor has received a great deal of correspondence on the subject and many letters have been published in the "Letters to the Editor" columns. Some of the old hands who remember the early days of radio wish that those days were still with us—with all the teak cabinets and ebonite panels with polished brass terminals. Whilst I remember clearly the thrills of early radio experiments, I do realise that those days are gone; as the Americans put it, "All equipment must be functional". Another letter on the subject was recently received by the Editor who passed it over to me. It was from Mr. A. A. Jones of Bingley and reads:

"Sir,—I have followed recent correspondence on the subject of "The Old Days" with great interest. I well remember the early 1920's when we wound wonderful plug-in honeycomb coils on fearsome spiked formers—and very efficient and sharp in tuning they were. The modern resistors and capacitors are certainly better than the old ones, the coils are more compact, but why must we have these polystyrene formers which melt away like tallow candles at the mere thought of a soldering iron and have no apparent effect on performance? If the bodies must be polystyrene, then, for goodness sake, let us have paxolin tag rings fitted.

"Also can we have good deep slots cut into the iron-dust slugs, or better still, have the slugs fitted with threaded brass rod inserts (as one maker does) and will the coil makers please produce a trimming tool which does not need filing down after lining up one waveband?"

"As for valve holders, the makers of the old B4 and B5 and B7 holders provided us with excellent spring sockets in and out of which the valve pins slid like well oiled pistons, so perhaps their successors could contrive to produce holders which neither require a hydraulic ram to insert the valve nor result in the bases being shattered when the valves are removed! It has come to something when a leading components supplier

catalogues "a valve removing pin straightening tool"—A. A. Jones (Bingley).

With some of Mr. Jones's remarks I must agree. Now that component manufacturers no longer make their goods mainly for home constructors but almost solely for mass production, it seems that less attention is paid to making components which are easy to employ and do not result in accidental damage to other parts. When components are employed on a "run" in a factory, the best techniques are soon found for ensuring that few parts are wasted. By the time the home constructor has found the correct method of using the expensive components he has bought, he may have damaged them beyond repair; it is time that more information was given with expensive parts or that they were made more robust. Perhaps a manufacturer would like to give his views.

Valve and Tube Factory

THE illustration below shows a manufacturing process in the manufacture of glass at the Simonstone plant of Mullard Ltd. This plant produces over 1½ million television tubes in a year—a large part of the Mullard Group's total output. It has been described as the most modern of its kind in Europe and was built under the Distribution of Industry Act. Work on the site began in 1954 and pilot production started in 1955. Since then the plant has expanded and now employs some 1,700 people.

Mullard also have a factory at Blackburn which was established some twenty years ago. This plant employs nearly 5,000 people and most of the Group's production of radio and television valves is made there.

Our Editor recently visited these works and returned very impressed with the working of the plant and quoted to me the figures given above.

Glass tubing being made into necks for the television tubes made at Mullard's Simonstone plant.



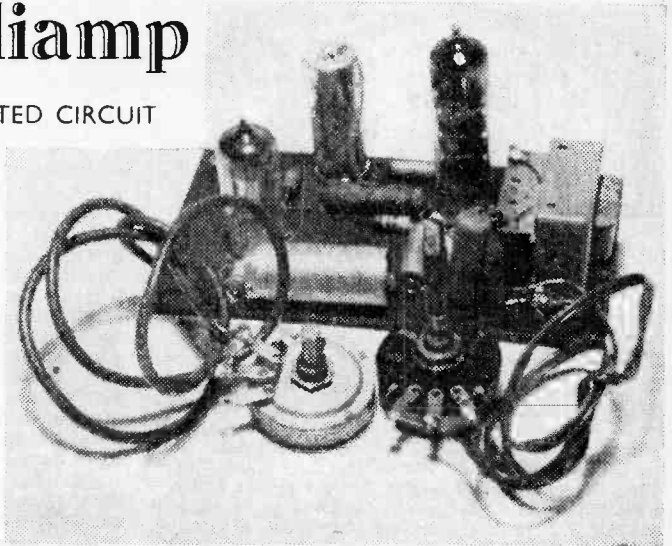
The Simpliamp

TWO VALVES AND A PRINTED CIRCUIT

By J. G. Ransome

IN presenting this small amplifier no claim is made to originality—the opposite is true, in fact, and since well-tried circuitry is employed the beginner may tackle this unit with confidence. The prototype was to be used in a comprehensive testing unit for F.M. tuners and had to be versatile. Printed circuitry was chosen for two reasons—(a) the amplifier had to be fairly shallow, (b) the writer wanted some experience in making his own printed circuits. The amplifier could, of course, be made much smaller than shown, but this was not really necessary in the original unit and it is better for the beginner to try conventional layouts before attempting miniature circuitry.

The template for the printed circuit is shown in Fig. 2. The printed board must be made up from this. The panel may be made from one of the commercial "Etch-It-Yourself" kits or prepared from home-assembled apparatus. If the commer-



The completed amplifier.

cial kit is used full instructions are enclosed, if the reader chooses to make up his own kit then the following will be required:

- (a) a copper-clad laminate board, 6in. x 3in.;
- (b) a 20 per cent solution of ferric chloride in water (any chemist will make this up at a cost of about 2s. 6d. per ¼-pint—we shall need about this quantity):

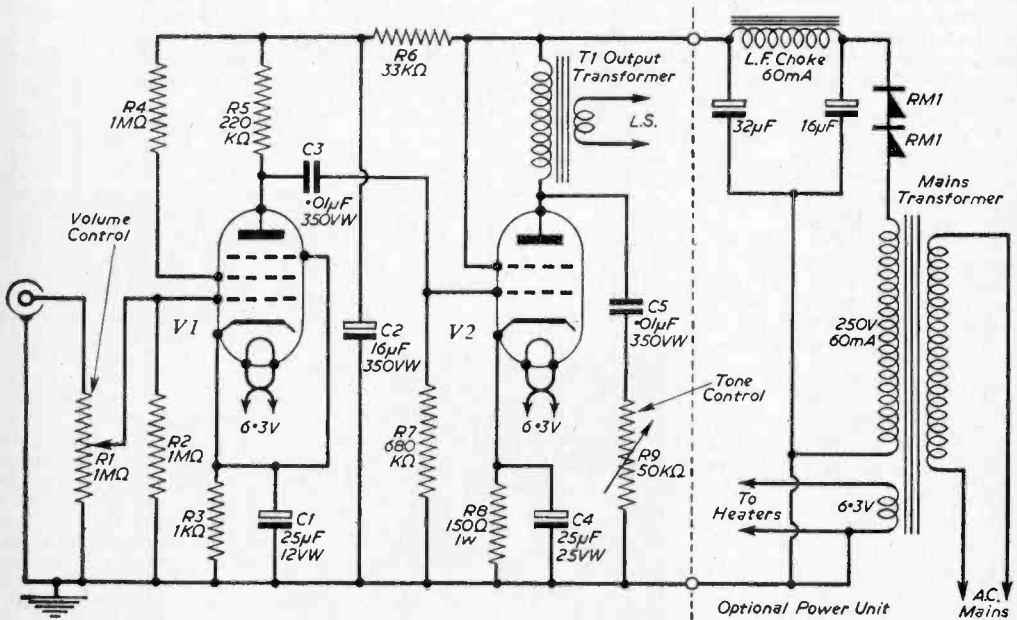


Fig. 1.—The circuit diagram (V1 is an EF86, V2 an EL84).

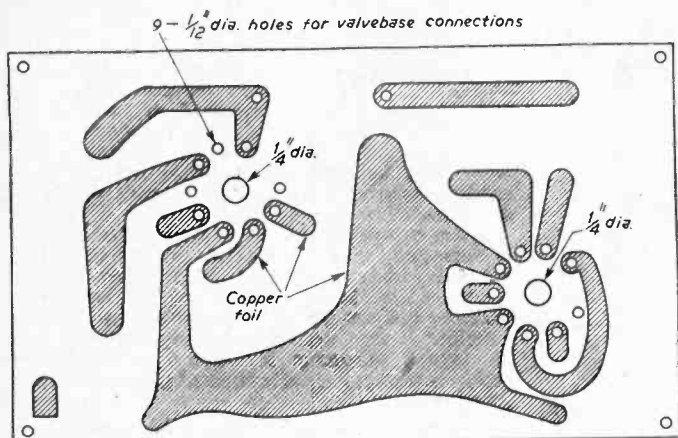


Fig. 2.—The printed wiring (the board is approximately 6in. x 3in.).

been fully etched it should be removed from the bath and washed with warm water. The paint should then be removed by applying thinners and scrubbing with a fine grade of emery powder or paper. The copper conductor should now be brightly polished and the finished result should look like Fig. 2.

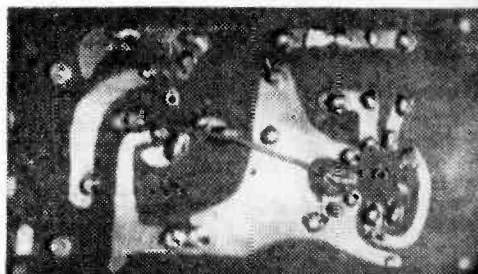
Mounting the Main Components

Having prepared the circuit board, the printed circuit valveholders are fitted. Nine small holes are drilled for each valveholder in the positions shown in Fig. 2. Next, drill a hole for the decoupling condenser and then drill the board to accommodate the output transformer. The board should then be drilled to accommodate the other components, taking care to see

- (c) a plastic dish or container—an old photographic developer dish is useful here (the dimensions of the dish should be greater than 6in. x 3in.);
- (d) paint, paint thinners and an artist's small brush.

Preparation of the Board

The board may now be prepared in the following way. Trace the outline of the conductors on to the copper surface of the laminated board, using Fig. 2 as a guide. When this has been done, paint in the areas of copper which are to remain with the paint (any oil or cellulose paint is satisfactory) and allow this to dry. When the paint is dry place the board in the plastic dish and pour on the etching fluid (ferric chloride solution) and agitate the dish frequently. The etching will be completed in 20-30 minutes. When the panel has



The printed wiring.

that they do not foul one another. Standardized resistors and condensers were used in the original version and no difficulty with component placing should be encountered. A suggested layout is given in Fig. 3 and, although the exact position of the components is not critical, each one should be made off correctly to the right conductor on the circuit board. When all of the holes have been drilled, the components may be mounted in place. When making solder connections to a printed circuit two things have to be borne in mind. Too much heat should not be applied to the copper conductor or it will lift and come away from the rest of the board, and, secondly, a good solder contact should be made. These two requirements may be met by well tinning the components before mounting and using a good hot iron with plenty of solder for the final mounting (too much solder should, however, be avoided as it may tend to flow on to other parts of the board and cause shorts).

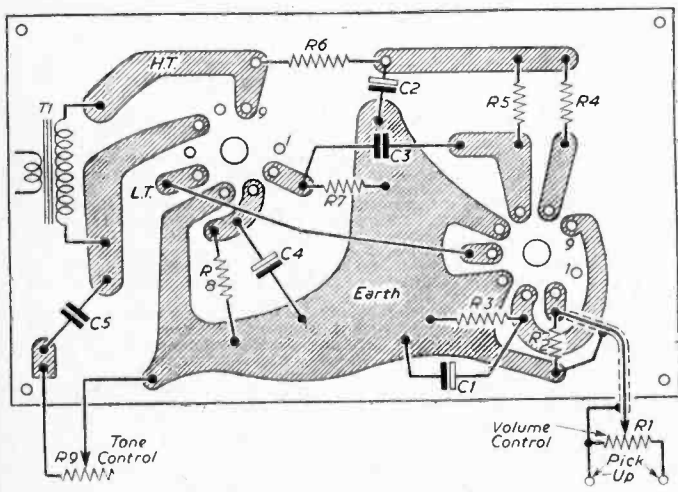
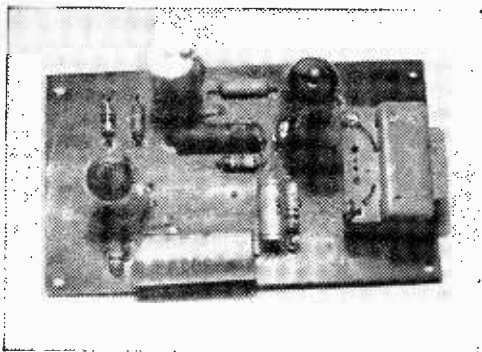


Fig. 3.—Positions of the components (on the reverse side of the board to the wiring). V2 is inserted in the left-hand holder and V1 in the right-hand holder.



Top view of the amplifier.

The last components to be wired in are the tone and volume controls. A short length of screened wire should be used to make off the connection between the board and the volume control. Some constructors may wonder why R2 is included in the circuit when we already have the variable resistor in circuit. It is included as a safety measure which affords some protection to the valve should R1 become disconnected.

Testing

When the wiring has been completed, the whole circuit should be examined for shorts and blobs of solder in wrong positions. The main H.T. line can be checked with an ohmmeter for shorts. When everything appears to be satisfactory plug in the valves and connect up the board to a suitable

power-pack. (No power unit was constructed in the original unit as these supplies were available elsewhere—a simple circuit for a suitable power unit is given (Fig. 1) for those not possessing suitable supplies.) The power requirement of this amplifier are some 60-70mA H.T. at 200 to 250V D.C. and 6.3V at 1A A.C. On applying power and allowing the valves to warm up a very low-level 50c/s buzz should be heard from a loud-speaker connected across the secondary of the output transformer.

When everything proves to be satisfactory, the unconnected tag of the volume control should be touched with a screwdriver blade when a loud rasping noise should come from the loudspeaker at about half-setting on the volume control. The amplifier is then set up and ready for operation. A layout diagram is shown (Fig. 2) to facilitate the easy identification of components and functions.

COMPONENTS LIST

R1—1M variable.	R8—150Ω 1W.
R2—1M ½W.	R9—50k variable.
R3—1k ½W.	C1—25μF 12VW.
R4—1M ½W.	C2—16μF350VW.
R5—220k ½W.	C3—0.01μF 350VW.
R6—33k ½W.	C4—25μF 25VW.
R7—680k ½W.	C5—0.01μF 350VW.
T. Output transformer 5k to 3Ω (or whatever speaker impedance may be used).	
2 B9A printed circuit valveholders. About 1ft screened wire, connecting wire, and either an "Etch-it-Yourself" kit or the apparatus outlined above.	

AVC FOR TAPE-RECORDERS

MANY readers have constructed the "AVC circuit for Tape-recorders" given in the May issue, but some have found a form of low frequency oscillation in the circuit. This low frequency oscillation or motor-boating can probably be explained as follows:

The attenuation provided by the simple filter following the rectifier stage of the AVC circuit is not sufficient to reject low frequency signals. At 2c/s in fact the attenuation is negligible.

Further, in the amplifier, the coupling network between stages can introduce an appreciable phase shift at low frequencies whilst still leaving an amplifier gain well in excess of unity.

These two effects—inadequate gain and phase margins to suit all contingencies—combined with a possible third effect of inadequate decoupling between stages, can give rise to oscillation under certain circumstances.

The "delay" biasing control should have some stabilising effect on this trouble if it is due to this cause.

Though the use of a stabilised supply of H.T. can provide some insurance against this defect it is appreciated that few domestic recorders possess this refinement and the recommended treatment involves modifying the values of those components principally responsible for introducing the phase shift.

As a first step the 100K resistor and the 0.1μF capacitor of the filter circuit can be increased to

1M and 0.5μF respectively, or alternatively a second filter element comprising 1M and 0.1μF can be incorporated.

As a further precaution the low frequency cut-off of the amplifier can be raised by decreasing the value of the interstage coupling capacitors though in some instances this may merely raise the frequency of the motor-boating.

BOOKS RECEIVED

"Basic Electricity" (five volumes: 12/6 nett per volume or 55/- nett per complete set of five volumes).

"Basic Electronics" (six volumes: 12/6 nett per volume or 66/- nett per complete set of six parts). Published by the Technical Press Ltd., 7 Justice Walk, Lawrence Street, London, S.W.3.

These eleven volumes form a complete course in electricity and electronics. "Basic Electricity" was published in January 1959 and is an adaptation to British usage at R.E.M.E. Training H.Q., Arborfield, from a course originally devised for training technicians in the United States Navy. "Basic Electronics" was published in December 1959 and like "Basic Electricity" is a British adaptation of an American course.

The chief features of these volumes are a basic approach from first principles, clear language and expression and a large number of illustrations. Style does not follow the usual form to be found in conventional textbooks, rather does it savour of the American method of "learning through pictures and personality". In the first part, electronics are pictured with smiles on their faces and similar personification is adopted throughout the book. To many British readers this method of presentation will be a source of prejudice against this course, as readers may feel that the authors are "talking down" to them.

On the whole, it is difficult for technical readers to judge the quality of the books and it should be pointed out that non-technical members of our staff have derived some elementary knowledge of the subjects covered merely by reading through the first two or three chapters.

Distributed Load Phase Reverser

(Subject of Patent 813669/1959)

ELIMINATING THE PHASE SPLITTER

By C. J. White

FOR many years the writer has been concerned with designing all types of audio frequency amplifiers at lower and lower cost with better and better specifications. With the help of the valve manufacturers and much midnight oil this has always been possible, until about three years ago, when it seemed that a state of armed truce had been reached where it was not possible to reduce the cost of the audio amplifier further without the equivalent reduction in specification.

Improvements

So far, with very little exception, the only reaction to stereo has been to throw away all the hard-won standards of low distortion and wide-band response, together with high wattage output stages (which were capable of taking the large amount of bass lift so much in use today) and revert to the single ended low output pentode/tetrode. The writer strenuously objects to this going back to the "dark ages", and puts forward one way of reducing the cost of the amplifying chain which will, he hopes, encourage others to seek out better ways of reducing the overall cost and still keep high standards.

In any "main" amplifier the stages consist of a voltage amplifier, a phase splitter, and a push-pull output pair (Fig. 1), and the question now arises, is this the minimum in our "quality" amplifier? The voltage amplifier cannot go, the output pair cannot go; can anything be done with the phase splitter? At best it adds little to the amplifying chain, at worst it reduces the gain. If it can be discarded, it will save one double triode

valve, one valveholder, four resistances, one electrolytic, two 0.25 μ F paper condensers, wire, heater current, H.T. current, bolts, tag strips, space and labour. At manufacturers' cost this is about 17/6d.—at retail about £2 10s., at minimum about £2. This represents a reduction of approximately 20 per cent in the price of the cheaper "main" amplifiers, and can be said to be a worthwhile reduction in cost. It is a problem that has been the concern of many designers ever since the push-pull output stage appeared, and there have been many attempts to resolve it.

Here now is the way the writer tackled the problem, and in doing so puts forward a prototype amplifier using two ECL82 valves, giving an output of 8W maximum, 4W at 0.2 per cent total distortion, 9dB bass and treble lift, 13dB negative feedback, in which the tone controls are not included, all for an input of 130mV for maximum output, and this is correct for most of the inexpensive stereo pickups.

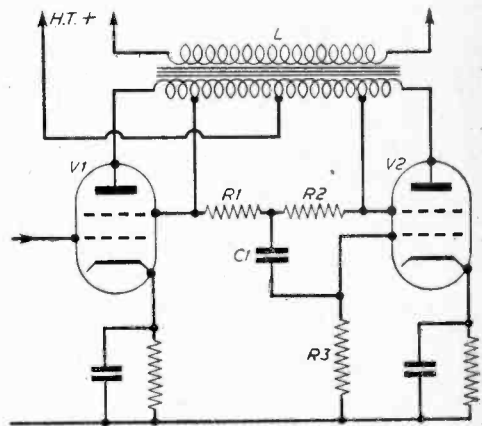


Fig. 2.—Using an ultra-linear transformer.

Design Details

Taking the output pair of pentodes as they are in the normal push-pull circuit (Fig.1) what has to be done is to feed V4, which is really an additional similar output valve to the single ended output valve V3, with a signal equal to, but 180° out of phase, with the input to V3. This can be done

- (1) with a resistive potential divider connected between the anode and the earth of V3.
- (2) with a resistive potential divider connected as an anode follower between the anodes of V3 and V4. (see Fig. 2).
- (3) as (1) and (2) with the screens being used instead of the anodes, but with a screen "load" resistance in series with the screen and H.T.

These four methods suffer from one major fault, apart from others, in that the potential divider arms must be adjusted for each individual amplifier. This is quite impractical in commercial practice, and even if it were accepted there will one day be the necessity to replace V3 and V4 at which the potential divider would have to be re-set.

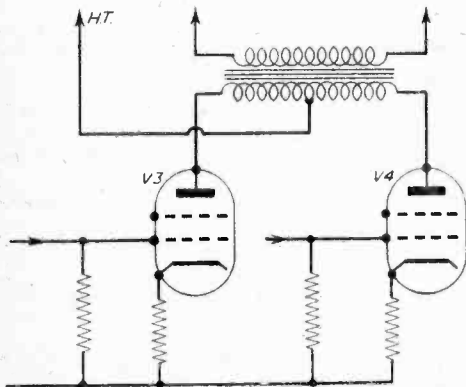


Fig. 1.—Conventional push-pull output circuitry.

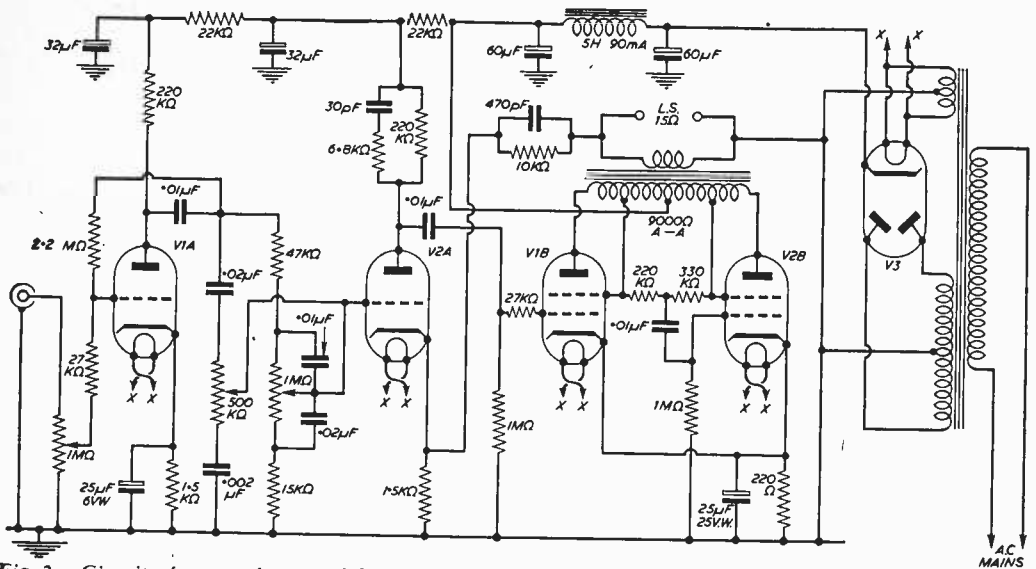


Fig. 3.—Circuit of a complete amplifier using the principle described (V1 and V2 : ECL82; V3 : EZ81).

Permanent Balance

What is needed is some method of stabilising the stage gain of V3 and V4 so that within reasonably practical limits, once the relationship of the potential divider is worked out V3 and V4 can be changed and the balance will remain the same. With this in mind we could avoid the necessity of using screen "load" resistances by utilising the method commonly known as "ultra linear", but better known as "distributed load", and in addition use the anode follower connection, not between the anodes but between the screens; this, to quite a large extent, stabilises the stage gain and in addition reduces the distortion (Fig. 2).

In the final circuit (Fig. 3), excellent balance is preserved at all audio frequencies and two ECL82 valves are used (plus rectifier). Current consumption is 90mA, using a mains transformer giving 280-0-280V plus 6.3V C.T. at 3A. As there are only three valveholders, the amplifier can easily be accommodated on a chassis 9in. x 7in. x 2½in. In this particular amplifier it will be noted that R1 and R2 (see Fig. 2) are 220k and 330k. These were quickly available and were the right relationship, and were tried with eminently satisfactory results, demonstrating that the system is without difficulties. A better relationship would be R1 30k, R2 45k, or R1 45k and R2 66k, or R1 60k and R2 91k. In this particular circuit, it is recommended that (R1 + R2) should not be more than about 150k.

Layout is eased very considerably as V2 follows V1 in the circuit and can do so physically. The condensers and resistors in the feedback circuit are to correct for overshoot on square wave, the output transformer being a comparatively inexpensive one.

In conclusion, one minor point may be mentioned, in that the circuit lends itself admirably to converting a single ended stage quickly and cheaply to a push-pull output stage where there is sufficient H.T. and L.T. supply available.

BRITISH GOVERNMENT EXHIBIT IN NEW YORK

A GOVERNMENT exhibit which projected Britain as a leading contributor to scientific advancement formed the introductory feature to the British Exhibition which opened in New York on June 10th.

The official exhibit occupied 18,000sq ft and was the largest in the exhibition. All visitors passed through it to reach the remainder of the exhibition.

The emphasis of the official exhibit was on contemporary achievement and it used probably a wider variety of the latest display techniques than had ever been brought together before for a single event. These included the use of wide screen cinema projection, stereophonic sound, animated displays and changing lighting displays.

The main feature of the exhibit was the scientific display which focused attention on four major recent achievements by British scientists: the hovercraft; Jodrell Bank radio telescope; the Melrose machine—the live-saving invention which takes over the work of the heart and lungs during an operation; and the break-through in biochemical research in nucleic acids by two British scientists at Cambridge University. This last theme was illustrated by a model of a molecule of deoxyribonucleic acid (DNA), the biochemical found in the heart of the living cell.

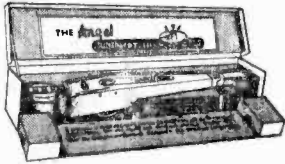
Controlling the scientific display was a team of demonstrators who operated the sequence of exhibit animations, rear projections films and synchronised sound and provided a live commentary.

Designed by James Gardner, C.B.E., who was responsible for the official British display at the 1958 Brussels Exhibition, the official British exhibit was sponsored by the Board of Trade and organised by the Central Office of Information.

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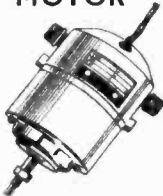
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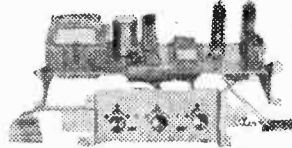
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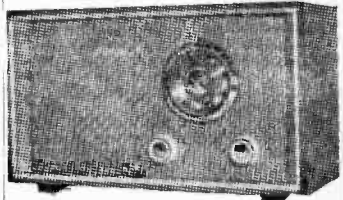


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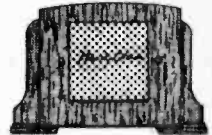
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Grid Dip Oscillator

By K. Smith
(G3JIX)

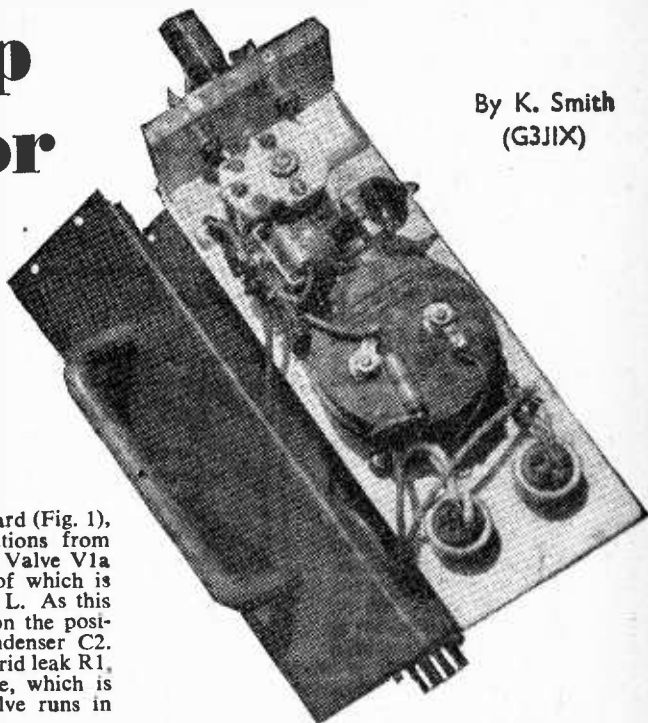
A USEFUL TEST INSTRUMENT

IN its simplest form, the grid dip oscillator is no more than the simple one valve receiver with reaction that we all made at the beginning of our amateur radio career, with perhaps a milliammeter of reasonably low f.s.d.

The Circuit

The circuit is simple and straightforward (Fig. 1), and no particular revolutionary deviations from the standard arrangement are claimed. Valve V1a is a Colpitts oscillator the frequency of which is determined by C1 and the plug-in coils L. As this stage oscillates, grid current will flow on the positive grid peaks, charging the grid condenser C2. This condenser discharges through the grid leak R1, building up the self bias for the valve, which is quite large and usually means the valve runs in Class C.

If we now couple a tuned circuit to L which is at the same frequency as the oscillator, then this external circuit will absorb some of the energy in the oscillating circuit L/C1. This will change the amplitude of the oscillations—and therefore the grid current through the grid leak R1. If we were to wire a meter in series with the grid leak, we would be able to see the change in current as the two circuits were coupled together. In fact, this is what is done in the simplest grid dip oscillators. In the instrument described, however, an amplifier is added to improve the sensitivity.



The completed oscillator.

Considering the external tuned circuit coupled to L again, the frequency may not be known, but, if the dial on C1 is calibrated in terms of frequency, then as C1 is rotated, which of course varies the frequency of the oscillator, eventually, this frequency reaches that of the external tuned circuit. When this happens the meter in the grid circuit will "dip" as before. We can thus find the resonant frequency of the external tuned circuit (which may be a coil or I.F. transformer in a receiver) by read-

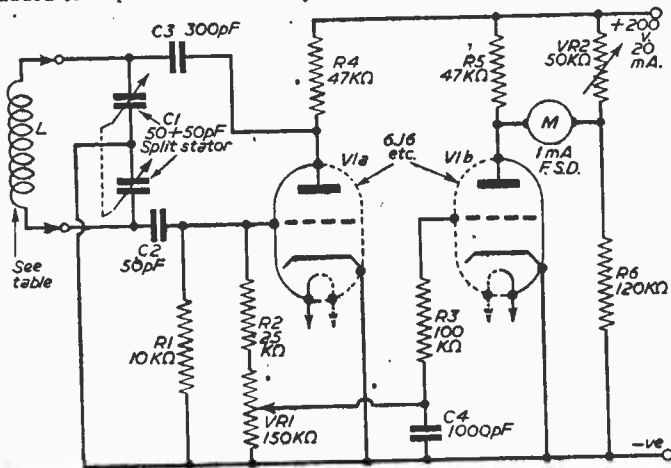


Fig. 1.—The circuit diagram.

COMPONENTS LIST

- C1—50 + 50pF split stator.
 - C2—50pF mica.
 - C3—300pF mica.
 - C4—1000pF ceramic.
 - R1—10k ½W.
 - R2—25k ½W.
 - R3—100k ½W.
 - R4—47k ½W.
 - R5—47k ½W.
 - R6—120k ½W.
 - VR1—150k min. pot.
 - VR2—50k min. preset pot.
 - M. 1mA 2½in.
 - V1a V1b 6J6.
 - 1 PTFE or ceramic B7G valve holder.
 - 1 miniature Jones plug and socket (4 way).
- Power requirements:
200V at 20mA 6.3V at 0.5A.

ing the dial on the GDO. If no dip is forthcoming, then a change in the plug-in coils L is required, until eventually a dip is obtained.

Now let us consider the amplifier V1b. This is really a simple valve voltmeter reading the voltage change across the grid leak R1. The meter is in a bridge circuit in the anode and this arrangement gives a considerable increase in the sensitivity of the instrument. If the grid of V1b received the maximum voltage developed across R1, then the valve would be cut off because of the Class C bias conditions, so a potential divider is used.

The value of the voltage across R1 changes considerably from range to range, and even on single ranges, due to differences in oscillator amplitude. The normal way to adjust the meter to zero to compensate for these variations is to vary the point on the network VR2, R6 to which the meter is taken, but it appears that the most sensitive condition of the amplifier is when the ratio of VR2, R6 is small. Zero adjustment is therefore accomplished by varying the amount of voltage taken off R1, by using VR1.

Construction

This can be carried out according to the wishes

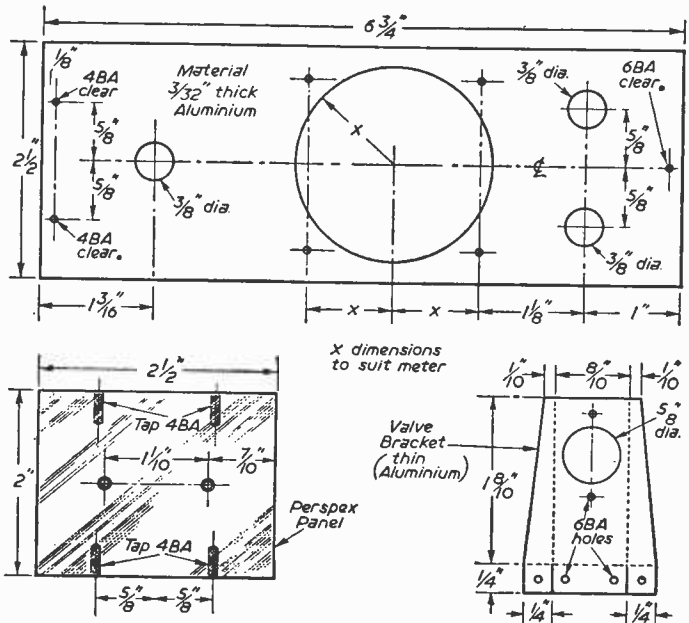
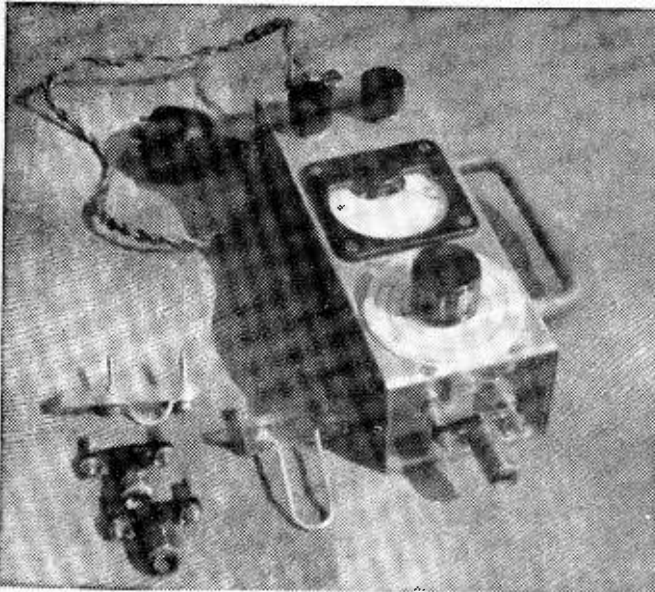


Fig. 2.—Details of the panel and valve bracket.

of the constructor, if desired, but the following description may be useful to those wishing to follow a similar pattern to that of the writer's instrument.

The whole instrument is built on to the front panel, which consists of a piece of aluminium $2\frac{1}{2}$ in. by $6\frac{3}{4}$ in. and $\frac{3}{32}$ in. thick. Across one end is screwed a piece of plastic $2\frac{1}{2}$ in. by 2 in. on which



The finished oscillator and coils.

COIL DETAILS

Range 1: 7-17.5Mc/s; 55t 30s.w.g. enam.

Range 2: 17-31Mc/s; 26t 22s.w.g. enam.

Range 3: 30-52Mc/s; 12t 22s.w.g. enam.

Range 4: 52-90Mc/s; 5t 22s.w.g. enam. spaced wire diam.

Range 5: 20-17Mc/s; hairpin loop 16s.w.g. wire (see Fig. 4).

Additional ranges:

a. 160-80 metres approx. 110 turns 2 layers 30s.w.g. enam.

b. Top limit loop (nearly short circuit across plugs).

the coil sockets are mounted. On a bracket made of thin aluminium is mounted the valve, horizontally, just behind the tuning condenser. The meter fits closely behind the valve, followed by the potentiometers. The measurements and layout can be seen in Fig. 2 and the illustrations. The case is made of copper and contrasts with the aluminium, but copper was only used because it was at hand, and is not essential. The case is cut out and bent up as shown in Fig. 3. An instrument handle is screwed to the case, and helps in the manipulation of the GDO.

The coils are wound on the formers as shown and small plugs are bolted through the fixing holes of the formers (Fig. 4). Table 1 gives the number of turns for each range.

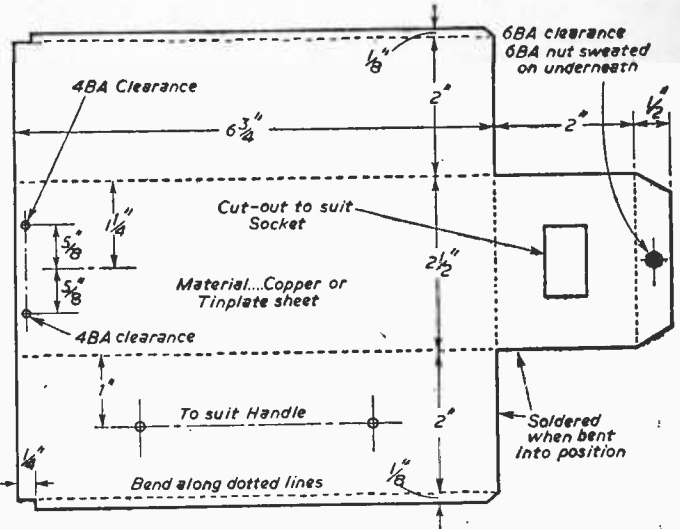
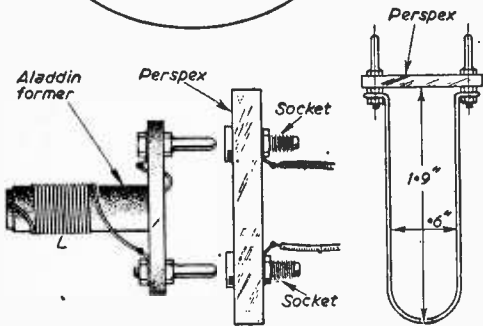
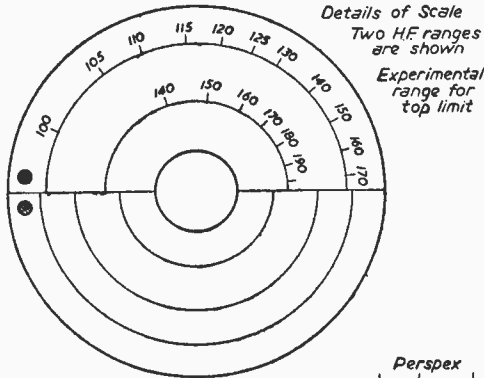
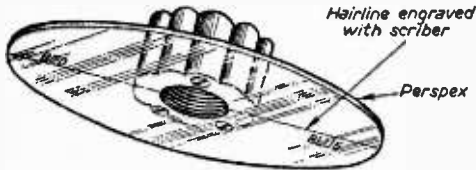


Fig. 3.—Dimensions of the chassis.



Details of Coil Unit

V.H.F. Range Loop

Fig. 4.—Dial and coil details.

Calibration and Use

The calibration of the lower frequencies can be carried out by listening for the GDO on a receiver, and marking the dial accordingly. If a crystal calibrator is available so much the better. For this last operation, a local radio amateur might be approached. At a frequency of around 45Mc/s, a television set will respond—be warned. Similarly at 90Mc/s (F.M.), and at the ITV frequency.

The uses of the instrument are manifold, and new ones occur every day. Apart from the obvious use of the instrument to align tuned circuits, it can of course be used as a signal generator of a simple type—aerials can be tuned, or cut to resonance for instance.

ELECTRONIC COMPARISON OHMMETER

(Continued from page 305)

maximum deflection possible. If f.s.d. is not obtainable reduce XR1, so that slightly over f.s.d. is obtained and re-adjust RV1 to exactly f.s.d. Switch to Ohms and the value of the test resistance will be indicated.

Repeat this process for the other ranges. The potentiometers XR1-4 can be replaced by fixed resistances when once adjusted. This completes the calibration apart from marking the meter scale as required.

Measuring a Resistance

The following conditions are assumed:—Unit warmed up and set to zero; meter potentiometer to maximum; range switch as required; resistance in circuit; meter switch "on".

1. Switch to "Full Scale" and adjust Meter Potentiometer to give f.s.d.
2. Switch to ohms and read off.
3. Switch to Zero-set before removing resistance and return meter potentiometer to maximum.

(To be continued)

Transistor Superhet Circuits

CIRCUITS OF VARYING SENSITIVITY

By J. Gray

(Continued from page 224 of the July issue)

THE circuit given in Fig. 7 on page 224 of the previous issue was intended for use with a speaker of about 35Ω impedance. The elimination of the output transformer from the circuitry of the receiver removes one of the largest components involved in its construction and where it is desired to build a receiver as small in size as possible then the use of a high impedance loudspeaker gives definite advantages. When space is available for a transformer, there is no advantage in using this type of circuit, unless the required speaker chances to be to hand.

A further push-pull circuit is shown in Fig. 8, and uses input and output transformers, so that a 3Ω speaker can be matched. A 2-pole switch to

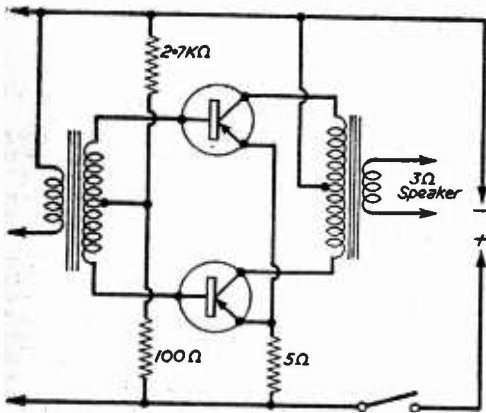


Fig. 8.—A transformer output circuit.

break each side of the battery circuit, as used in Fig. 7, is no longer necessary, and the full battery voltage is available for each transistor. A 6V or $7\frac{1}{2}$ V supply will thus be satisfactory with the circuit in Fig. 8.

Numerous input and output transformers are available for transistor circuits, and the correct type of transformer must be used. The ratio employed with valve receiver output transformers makes these unsatisfactory.

In miniature receivers, a tapped battery supply from two batteries may be impossible, and condenser coupling to a 75Ω speaker may then be employed with a pair of OC72 transistors, as shown in Fig. 7. With Yellow-Green spot audio frequency transistors, the speaker impedance may be reduced to 30Ω . This circuit has the advantage that no output transformer is required, but only half the battery voltage is available for each transistor. The current consumption is low, being some 7mA or so with no signal, and rising to 15mA or so with average volume.

To improve reproduction, negative feedback may be used, and this is particularly necessary with

some miniature driver transformers. A typical feedback circuit is shown in Fig. 10, being from speaker to driver emitter. Some reduction in gain arises, as is usual with amplifiers provided with feedback, but in reasonably favourable circumstances an A.F. amplifier consisting of driver and push-pull output can be sufficient.

When additional volume is required, an extra A.F. Stage may be introduced between diode and driver, as shown in Fig. 10. Adequate output can then be expected even in unfavourable circumstances.

Aerial Efficiency

If a small frame aerial can be used, instead of the ferrite rod type of aerial, an increase in signal pick-up can be expected. In these circumstances, adequate volume may be obtained with the number of transistors reduced. This will simplify construction, as one I.F. stage, with all its associated components, can be omitted.

If a reasonably large ferrite rod or slab can be accommodated signal pick-up can be sufficient, especially if the aerial is well clear of speaker, etc. If the rod is small, or near other parts, it will probably be necessary to consider increasing the

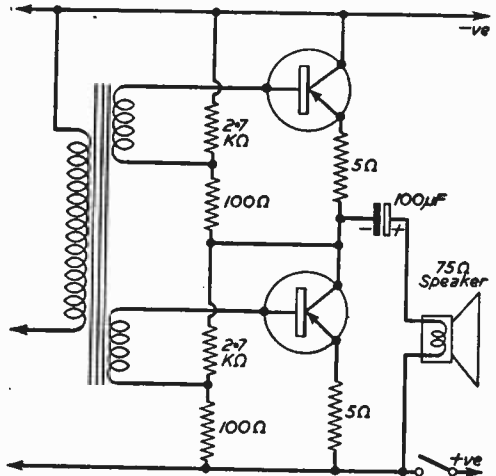


Fig. 9.—Push-pull with condenser coupling.

number of transistors in the circuit, to compensate for the small signal pick-up of the aerial. With such an aerial, two I.F. stages will be essential.

Coil Details

For a M.W. frame aerial, 22 turns of 26s.w.g. wire, with turns slightly spaced, may be used, if the case is roughly 5in. x 7in. For coupling, 2 turns will suffice. For long waves 80 turns of 32s.w.g. enamelled wire, turns side by side, with 8 turns for coupling, can be used. Adjustment of the number

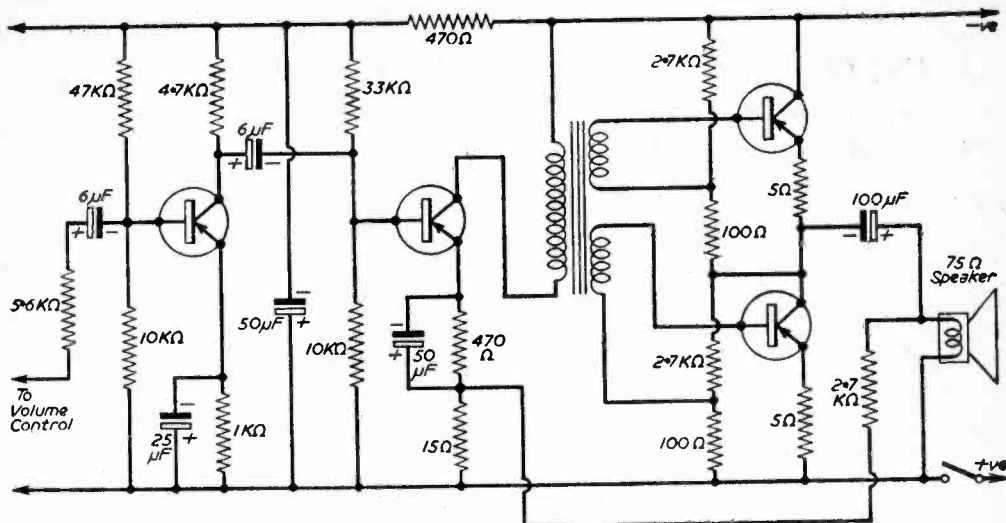


Fig. 10.—Three-stage A.F. amplifier with feedback.

POCKET TRANSISTOR T.R.F.

(Continued from page 308)

of turns, or a panel trimmer, may be required to obtain correct ganging with the oscillator circuit.

If a 3½ in. to 5 in. speaker of good quality and sensitivity type can be accommodated, adequate sound output can be obtained with a single transistor in the output stage. If a push-pull circuit is employed with such a speaker, really good volume can be obtained. The small speakers used with many battery operated valve receivers, with an appropriate transformer, will give excellent results in these circumstances.

When a miniature speaker is used, it is necessary to accept the reduced volume which will be achieved, with a given amplifier output, or to increase the number of stages. A push-pull output circuit is then almost essential, unless rather reduced volume is sufficient. A very small cabinet or case will further curtail sound output and frequency response.

Complete Circuit

The circuits given may be combined or used together, as already explained. A few notes on the results to expect may, however, be helpful, so that a suitable circuit can be chosen.

If a frame aerial or large rod aerial can be used, the circuit in Fig. 1, with single output stage added, will provide a 4-transistor receiver capable of giving sufficient speaker volume in favourable circumstances. When greater range or sensitivity is required, a 2-stage I.F. amplifier, such as that in Fig. 4, will be satisfactory. With a fairly large speaker, the 5-transistor circuit thus obtained will give a useful performance.

When size is reduced, so that the aerial signal is small, and the speaker much less effective, a 6-transistor circuit, consisting of frequency changer, two I.F. stages, diode, driver, and push-pull output, will give reasonable volume from the more powerful stations. If, however, the aerial is extremely small, or surplus transistors of reduced gain are fitted, an extra A.F. stage will probably be required. In all, a 7-transistor circuit would then be necessary, and may be obtained by combining Figs. 3, 4 and 10.

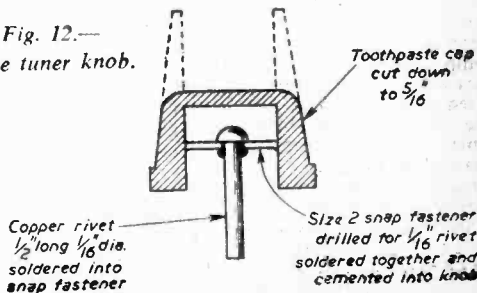
Alignment

A signal generator is not required for aligning the coils (which are swung over during the initial adjustments). The cores are first brought flush with the rear ends of the formers. The metal strip is then inserted through the cores. This is a little tricky but need not take more than a few seconds turning it half a turn or less as required to enter each successive core slot. When the strip is through all the cores, it can be rotated with the aid of the tuning knob until a station is heard, and the set can then be turned to the best position for reception. The strip is then withdrawn, and the coils tuned individually, after which the strip is re-inserted. If possible this alignment should be carried out on a station near the high-frequency end of the medium waveband.

When the alignment is complete, the coils can be swung back into place, with the other 20s.w.g. passed through the inner top series of spills, and the tuning knob screwed into the flexible coupling.

The receiver is retained in its case by an 8B.A. bolt passing through the case and a side bracket (on the tuner side of the receiver). A hole is drilled ¼ in. from the front for this bolt—through case and bracket—and an 8B.A. nut is fixed to the inside of the bracket.

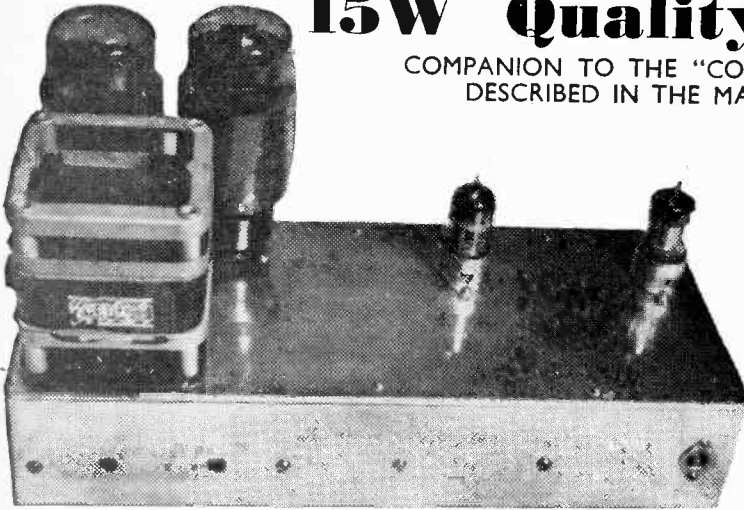
Fig. 12.—
The tuner knob.



15W Quality Amplifier

COMPANION TO THE "COMPREHENSIVE PRE-AMP" DESCRIBED IN THE MARCH AND APRIL ISSUES

By R. Taylor



speaker of average efficiency. However, it is also necessary to ensure a linear frequency response at maximum output within the frequency range of at least 10c/s-20kc/s, with negligible non-linear distortion. Other desirable features include good transient response, negligible phase shift within the audible range, and low output resistance. All these factors imply the use of a push-pull connected output stage, with its advantages of reduced second harmonic distortion, and greater output power from given valves. Where considerations of restricted anode voltage supply, or the utmost

THE realistic reproduction of orchestral music in the average room requires a peak power output of the order of 10-15W from an audio amplifier, using a baffle mounted moving coil loud-

speaker of average efficiency. However, it is also necessary to ensure a linear frequency response at maximum output within the frequency range of at least 10c/s-20kc/s, with negligible non-linear distortion. Other desirable features include good transient response, negligible phase shift within the audible range, and low output resistance. All these factors imply the use of a push-pull connected output stage, with its advantages of reduced second harmonic distortion, and greater output power from given valves. Where considerations of restricted anode voltage supply, or the utmost

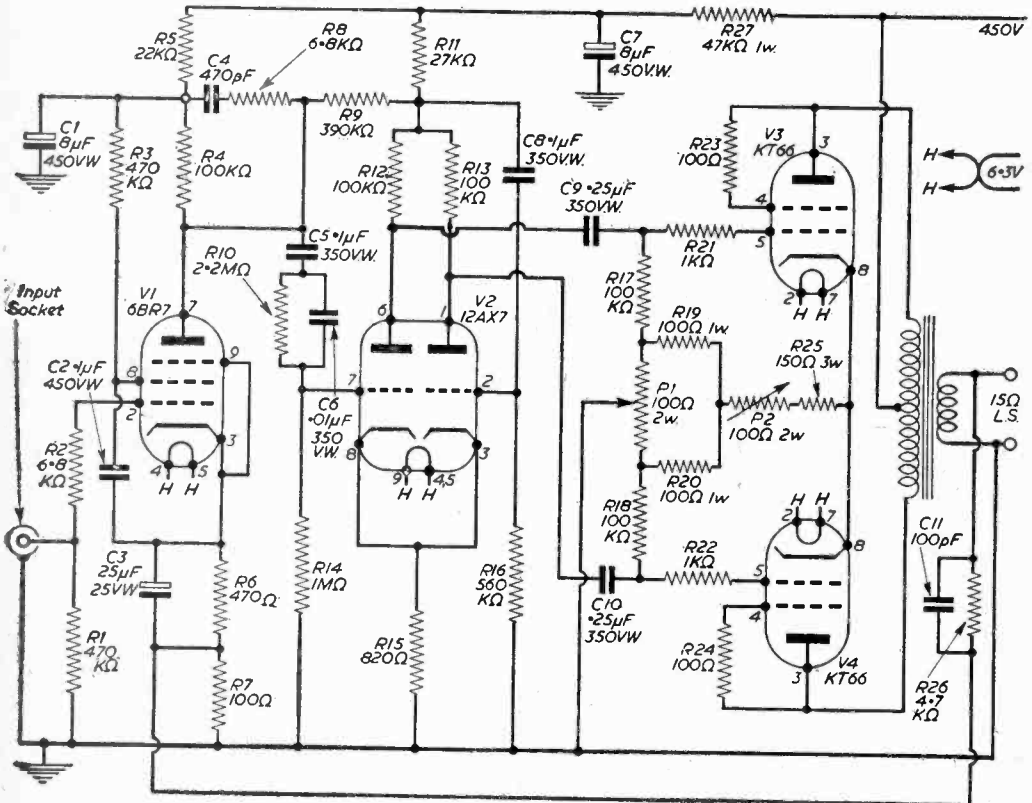


Fig. 1.—The circuit diagram.

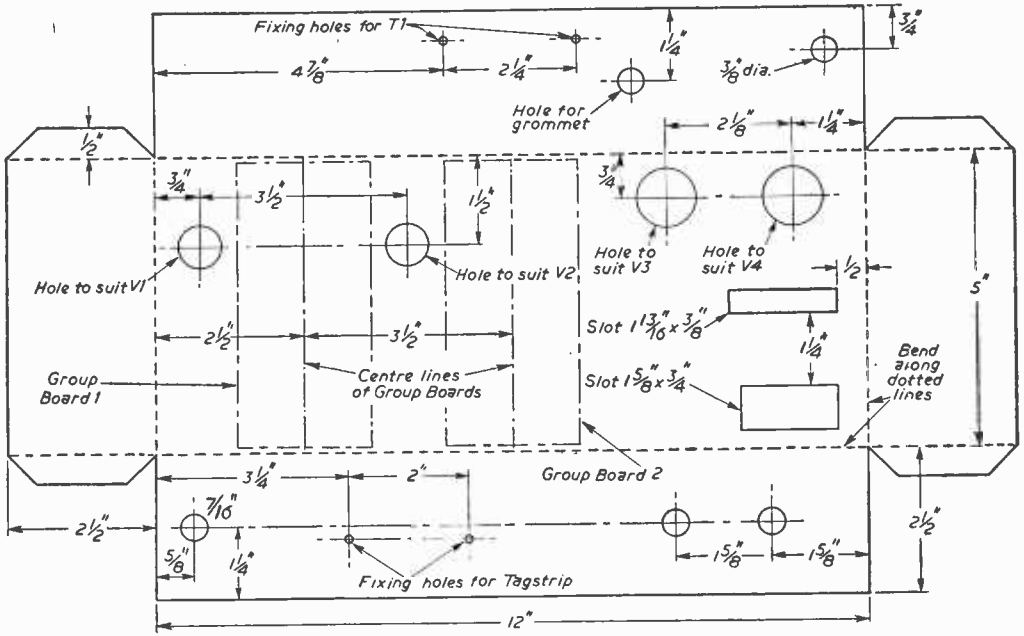


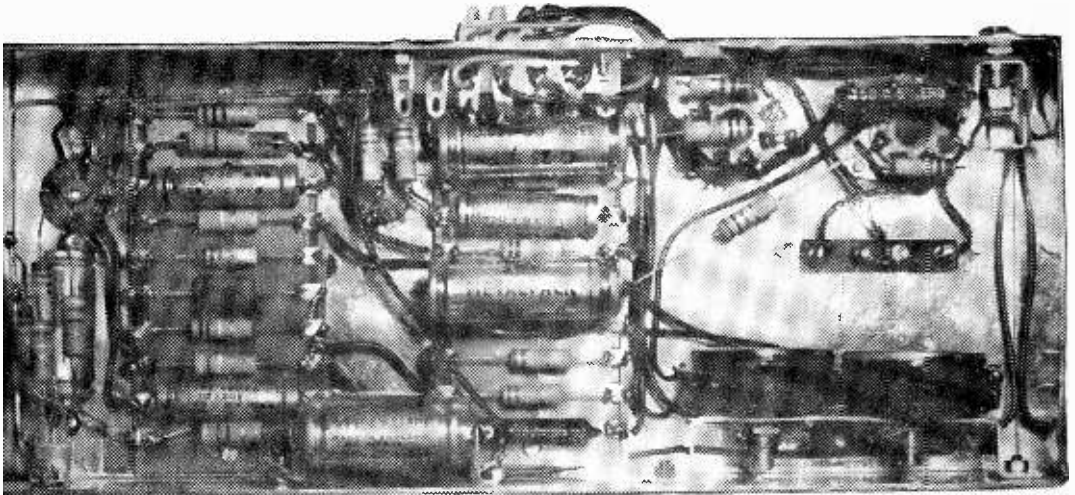
Fig. 2.—Chassis drilling details.

economy must be taken into account, a tetrode or pentode is the only choice, but otherwise the use of triodes, or triode-connected pentodes or tetrodes is generally to be preferred in apparatus designed for the highest quality reproduction. If negative feedback is applied to push-pull triodes, not only does it largely remove the intermodulation distortion which is present in such stages without feedback, but it also improves the characteristics of the output transformer, assuming that the feedback is applied over several stages from the secondary of the output transformer

Specification

This amplifier (Fig. 1) has been designed to work in conjunction with the pre-amplifier described in the March and April issues of this journal, and therefore has a sensitivity of 0.5V at the input terminals for full output of 15W. Entirely satisfactory results will, of course, also be obtained from any other high quality pre-amplifier capable of supplying 0.5V at its output terminals.

The first stage (6BR7) is designed as a voltage amplifier, which feeds into a cathode coupled



The underchassis wiring.

phase splitter (12AX7), commonly known as one variant of "a long tailed pair", which also contributes some further voltage amplification. This second stage supplies a balanced signal of opposite phase to each of the two KT66 valves, which are connected as triodes working in push-pull. Provision has been made for altering the grid bias of each output valve by means of a network in

from a sheet of aluminium of 3/32in. thickness. (Fig. 2).

Cut all the holes necessary to accommodate valveholders, etc., taking care to ensure that the slots made to allow the passage of the output transformer terminals through the chassis provide adequate clearance. The output transformer need not be mounted on the chassis until the latter stages of construction, but the valveholders, coaxial socket, output jack socket, etc., may now be bolted in place. A bracket should be made from a strip of aluminium (Fig. 3), to which the two potentiometers P1 and P2 are attached, but this is set on one side, after checking that the adjustment shafts of the potentiometers can be located through the holes in the chassis.

Commence wiring the valve heaters by taking a tightly twisted pair of insulated wires from V1 to V2, along the fold of the chassis, and from there to the tag strip (T1). Run a second twisted pair of wires to V3 and then V4 from the same tag strip.

Group Boards

Most of the resistors and capacitors are soldered to terminals on group boards (Fig. 4), a task which can be performed before mounting the completed assembly in the chassis. Reference to the list of components will show that there are two close tolerance resistors R12 and R13 (100k ± 2 per cent) as distinct from R17 and R18, which are also 100k resistors but of 20 per cent tolerance. Note that R12 must be attached to tags 5 and 5, and R13 to tags 3 and 3, on group board 2. The 100Ω resistors across tags 1 and 1, and 7 and 7, are of 1W rating, and the 47k resistor across tags 10 and 10, is also of 1W rating. In the wiring diagram the two 100k resistors R17 and R18 are shown dotted as they

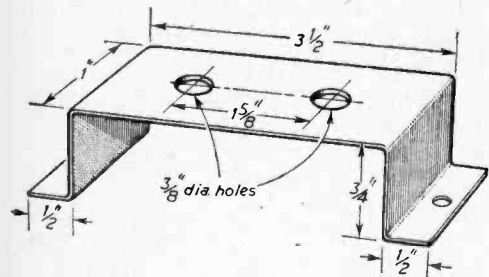


Fig. 3.—Bracket for potentiometers P1 and P2.

the cathode circuits, which gives complete control of the static conditions of the stage. The valves operate with a common unbypassed cathode bias resistor, thereby assisting in preserving the balance of this stage. Two loops of negative feedback are used, the main one feeding back some 30dB from the output transformer secondary to the cathode circuit of the first stage.

Construction

The chassis is of similar dimensions to the pre-amplifier, i.e. 12in. x 5in. x 2 1/2in. and is formed

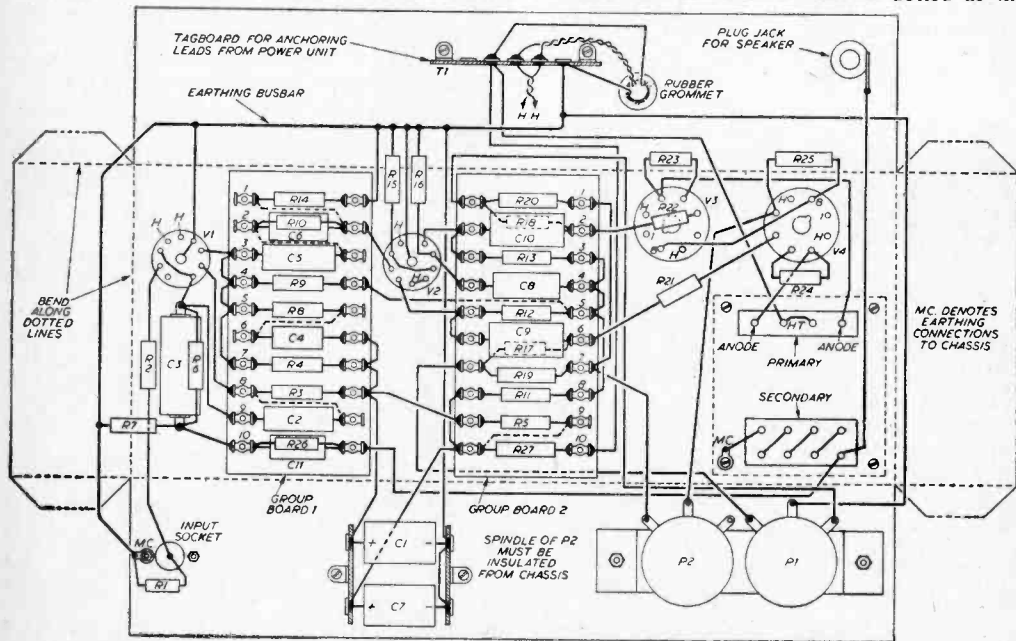


Fig. 4.—Underchassis wiring diagram.

COMPONENTS LIST

Resistors:

R1—470k.	R15—820 Ω .
R2—6.8k.	R16—560k.
R3—470k.	R17—100k.
R4—100k.	R18—100k.
R5—22k.	R19—100 Ω .
R6—470 Ω .	R20—100 Ω .
R7—100 Ω .	R21—1k.
R8—6.8k.	R22—1k.
R9—390k.	R23—100 Ω .
R10—2.2M.	R24—100 Ω .
R11—27k.	R25—150 Ω 3W
R12—100k	wire-wound.
R13—100k	R26—4.7k.
R14—1M.	R27—47k 1W.

All resistors to be $\frac{1}{2}W \pm 20$ per cent except R12 and R13 which are ± 2 per cent and R19 and R20 which are 1W.

Sundries:

2 B9A valve bases.
2 Octal valve bases.
Coaxial socket.
Jack plug and jack (Bulgin J2 Bulgin P.38).
Group boards, Bulgin C114.
Tag strips Bulgin T19 and T25 (2 and 1).
P1 and P2 100 Ω 2W wire-wound variable potentiometers.

Capacitors:

C1—8 μ F electrolytic 450VW.
C2—0.1 μ F paper 350VW.
C3—25 μ F electrolytic 25VW.
C4—470pF mica or ceramic.
C5—0.1 μ F paper 350 V.W.
C6—0.01 μ F paper 350VW.
C7—8 μ F electrolytic 450VW.
C8—0.1 μ F paper 350VW.
C9—0.25 μ F paper 350VW.
C10—0.25 μ F paper 350VW.
C11—100pF mica or ceramic.

(Screw driver slot adjustment).
Output transformer Type P.3064 (Partridge).
(10,000 Ω a-a load C.T.).

Valves:

V1—6BR7.
V2—12AX7.
V3 and V4—KT66.

will be mainly obscured by the capacitors C9 and C10. They are, however, mounted on top of the group board, but dotted lines in other instances signify the passage of insulated wiring *beneath* the group board.

When the group boards are assembled, they may be bolted into place, with a spacer nut located between the board and chassis, to allow for the wiring beneath. All earthing connections, with two exceptions, are terminated at a bus bar of heavy gauge copper wire, which is earthed to chassis by a soldering tag at the co-ax input

Final Wiring

To finish the construction of the amplifier, coloured insulated wiring (e.g. green for heaters, black for earth, and red for H.T.), should be taken from the tag strip T1, through the grommet, to a junction block on the outside of the chassis. On completion of assembly, check all wiring, and then plug in the loudspeaker. Connect up to a power pack supplying 450V D.C. at 150mA, and 6.3V A.C. at 3A centre-tapped to earth.

Feedback

It will be appreciated that with any amplifier the output secondary winding must be correctly phased relative to the input circuit, for negative feedback to take place. Reversing the secondary winding connections will cause the amplifier to oscillate violently, which could cause damage to a loud-speaker suspension. Should positive feedback occur, switch off the power supply immediately, and reverse the connections from the KT66 anodes to the output transformer primary.

The output stage may now be balanced by means of P1 and P2. The procedure is identical with that employed with the Williamson amplifier.

1. A milliammeter with a full scale deflection of greater than 150mA is inserted in the lead from the centre tap of the output transformer *primary*. (This will necessitate unsoldering the lead.)

2. Adjust P2 until the total current passed is 125mA.

3. Disconnect the milliammeter and replace the soldered connection.

4. Connect a voltmeter of approximately 10V f.s.d. across the whole of the output primary, and adjust P1 until the reading is zero, indicating balance. Ignore random fluctuations of the meter needle, these are due to both mains and valve fluctuations.

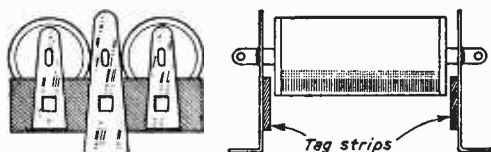


Fig. 5.—Mounting condensers C1 and C2.

socket, the further end being insulated from earth at tag strip T1. The two separately earthed components are the loudspeaker output jack, which is automatically earthed on one pole by its fixing nut, and the secondary of the output transformer, which is earthed via a soldering tag to chassis. Mount the 8 μ F electrolytic capacitors on tag strips, as shown in Fig. 5, bolt to chassis, and solder on the appropriate connections to the circuit. When the latter stages of wiring are nearing completion, bolt the output transformer in place. Solder leads from the anodes of the valveholders (KT66) to the primary, and join the centre tap to H.T. (on T1). Connections of the secondary are shown for a 15 Ω termination, but it is possible to obtain four alternative output impedances.

A Precision Pick-up Arm

AN INEXPENSIVE, LOW-WEAR UNIT FOR THE HIGH-FIDELITY ENTHUSIAST

By N. A. BARGER

THE advent of the stereo disc has underlined the fact that excellent reproduction and negligible record and stylus wear can be achieved only at stylus pressures of, at the most, $2\frac{1}{2}$ grammes.

Tracking

The satisfactory tracking of discs at such low pressures demands (a) a pick-up stylus of low mass; (b) great compliance in lateral and vertical

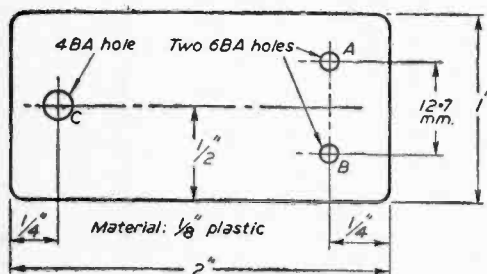
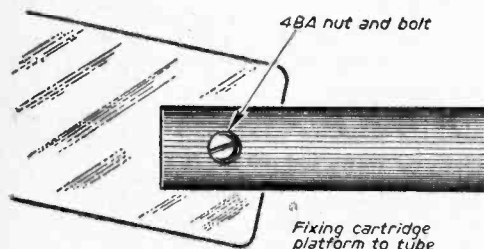


Fig. 2.—The cartridge platform.

fields (especially for stereo) of the stylus; (c) a pick-up arm with no friction to horizontal and vertical pivoting.

Recently these requirements have been met in the production of several superb pick-ups, each of which, unfortunately, costs about £20. These prices are beyond most amateurs' pockets. However, I have constructed, for less than £4, an arm which goes an extremely long way towards fulfilling requirements for low wear and high quality reproduction. Of course, it is *not* intended as a showpiece! Embellishments are left to the constructor, e.g. such things as finishing of pedestal mount, plating used on nuts and bolts, etc.

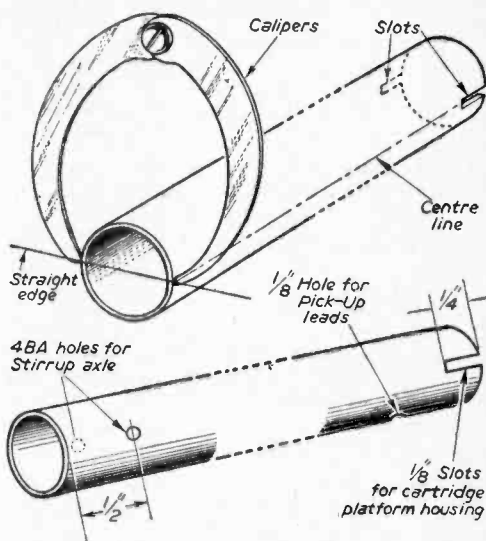


Fig. 1.—Marking out the arm.

Offset

The first thing to realise is that the arm must be "offset" for correct tracking. Now, for a 9in. arm, certain dimensions of linear offset and overlap of stylus and spindle have been calculated to give minimum tracking error. The distance from back pivot to stylus is 9in. and trigonometry enables us to calculate the angle of offset to be approximately $24^{\circ} 30'$.

Materials required for the arm are:—

- (1) 8 $\frac{1}{16}$ in. length 5/16in. o.s. diameter aluminium tube.
- (2) 2in. length $\frac{1}{4}$ in. inside diameter aluminium tube.
- (3) 1 steel knitting needle.
- (4) 1 nylon ball-bearing curtain runner.
- (5) $\frac{1}{4}$ in. thick plastic (1in. and 1 $\frac{1}{2}$ in. square pieces).
- (6) Nuts and bolts—odd piece $\frac{1}{4}$ in. plastic, etc.
- (7) 1 Acos 71 or 73 stereo cartridge, or 1 Col-laro TX88 mono cartridge.
- (8) Lengths of shielded wire, etc.

Nylon curtain runner wheel

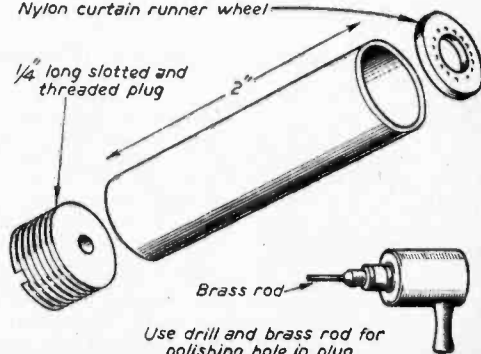


Fig. 3.—The pivot tube.

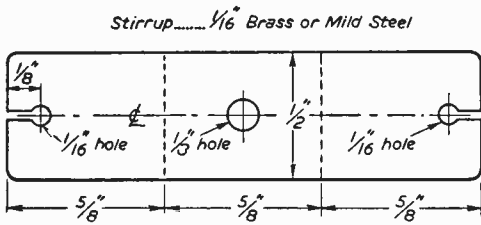


Fig. 4.—Dimensions of the pick-up stirrup.

The cartridges specified will track records at just over 2 grammes in my arm, and may be obtained with diamond styli. The TX88 is a monaural cartridge. The Acos 71 is for stereo or mono LP only, the 73 is a turnover cartridge for stereo, mono LP, and the older 78 rev/min discs. The constructor will have to choose which cartridge he wishes to use.

Construction

The first step is to take the 8 1/4 in. length of tube, and by means of calipers and a straight edge, mark two lines down the tube, diametrically opposite (see Fig. 1). Take great care with this operation.

These lines will give you the guide to where to cut the holes for the back short axle location, and slots for the cartridge platform housing (Fig. 1).

The holes should now be cut, also the slots for the housing. Next, from a piece of 1/4 in. thick, hard plastic cut the shape shown in Fig. 3. This is the cartridge platform housing. No side protection is given to the cartridge—this, the writer feels, is adding a complication and not improving the actual performance.

The housing is secured to the tube by a 4B.A. bolt, as shown in Fig. 2. The angle of offset can be given to it by lining it up on a paper template on which the angle of 155° 30' has been drawn. Secure the nut tight on the bolt when the angle has been made. Use locking washers on the nut.

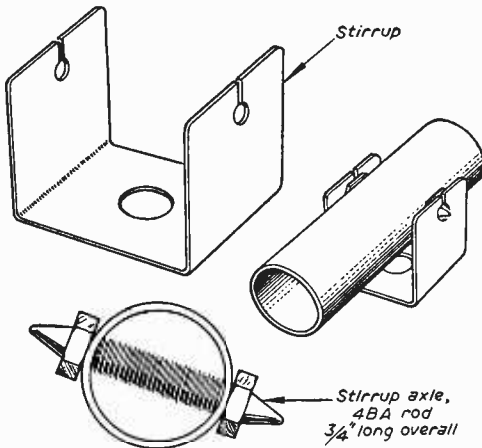


Fig. 5.—Construction of the pivoting arrangements.

Pivoting

Next we come to the pivoting arrangements (Fig. 3). The long vertical axle housing is primarily a 2 in. long aluminium tube, with a small ball-bearing on the top and a pitted plug at the bottom end. The pitted plug takes the rounded end of the axle, which is a smooth push fit in the ball-bearing. The ball-bearing is a nylon curtain runner, as sold at most ironmongers. Choose one which runs easily but not loosely (they vary)—they cost only a copper or two each. The outside diameter of these bearings is 3/4 in. so it should fit in the tube nicely; if it is too large for the tube, enlarge the tube slightly; if too small, enlarge the bearing with a narrow band of sticky tape. After all, the bearing does not need to take any thrust in use, so an extremely tight fitting is not called for.

The plug is a short length of steel bolt, slotted with a hacksaw, and a 1/16 in. hole drilled in the centre of the other face. It must be dead centre. The hole need only be about 1/16 in. depth, but

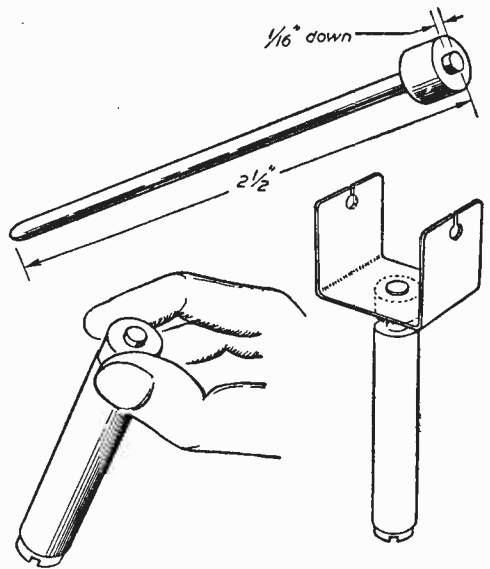


Fig. 6.—Testing the pivot.

polish it with fine grinding paste and metal polish. The bolt should screw into the tube, as the tube is of soft metal.

Stirrup

Fig. 4 shows the dimension for the stirrup, in which the arm pivots up and down. It is made of 1/8 in metal. Be very careful in marking and cutting it. The pivot holes are 1/8 in. diameter, leading into vertical slots also 1/8 in. wide (Fig. 5). Fig. 5 also shows the way in which the short axle is fitted to the pick-up tube. This axle is made from a 3/4 in. length of steel bolt (4B.A.) carefully pointed at the ends, and fixed to the tube as shown in Fig. 5. It pivots in the stirrup by sliding the points down the vertical slots, and then they sit in the holes (a very friction-free method of pivoting).

Fig. 6 shows the long axle, a $2\frac{1}{2}$ in. length of steel knitting needle ground down to a push fit inside the nylon bearing and with a polished point at the end. A $\frac{1}{4}$ in. bush is soldered on to the other end, on which the stirrup sits and is fixed. When the axle has been ground down to the correct size, and the end polished, the bush can be fitted, also the stirrup (by soldering), and the whole assembled. Test for efficiency by holding the assembly upside down, thumb and forefinger grasping the stirrup. The axle tube should rotate most freely and smoothly (a little light machine oil may help).

Pedestal

When satisfied with the efficiency of the bearing, the next step is to make the pedestal out of $\frac{1}{4}$ in. plastic (Fig. 7). Two squares are fixed together with a suitable adhesive. Do not forget the grub screw hole—and the fixing holes. When the pedestal stand has been made the tube may now be fitted in and the grub screw tightened. It must be absolutely vertical.

Fig. 7 gives details of the boring of the holes for the conductor wires, and I advise that a length of strong thread be run through, because this will make wire threading a lot easier later on.

(To be continued)

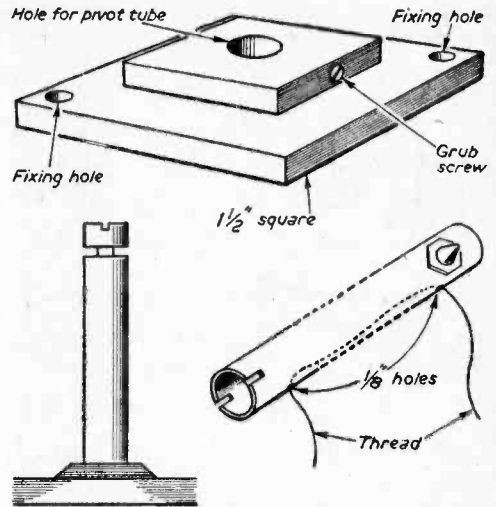


Fig. 7.—The mounting pedestal and a method of inserting the pick-up wiring.

NEW BBC STATIONS

THE BBC welcomes the announcement by the Postmaster-General that he has approved, in principle, the second stage of the BBC's plans for extending and improving the coverage of the television service and of the three sound services on VHF by building additional low-power satellite stations in various parts of the country. The stations in this second group are to be in the following areas:—

Satellite stations for both Television and VHF Sound

Forfar, Angus
Grantown-on-Spey
Lewis
Pitlochry/Aberfeldy
Shetland
Skye

Satellite stations for VHF sound

East Lincolnshire
Enniskillen (for which a television station is being provided under Stage 1)
Pembroke/Milford Haven (for which a television station is being provided under Stage 1)
Sheffield (for which a television station is being provided under Stage 1)
South-West Scotland.

Until sites have been chosen and surveys made it is not possible to say what will be the precise range of each of these stations; some of them will serve only the town where they are to be built, but others will have somewhat wider coverage.

The coverage of the twenty existing VHF sound stations is about 97.3 per cent of the population, and this will be increased by some 90,000 people when the station at Dover is completed, and by about a further 640,000 people under Stage 1 of

the satellite scheme, which will also give improved service to nearly 400,000 additional people. Stage 2 will increase the coverage by about 350,000 people and improve reception for nearly 800,000 others.

Work on Stage 1 is already in hand; some of the stations will come into service this year, and others in 1961 and the early part of 1962. The construction of the stations in Stage 2 will proceed as soon as the sites have been chosen, after technical tests have been made, and the necessary consents obtained. This process necessarily takes some time, but the work will proceed concurrently with that of Stage 1, and although completion of Stage 2 is scheduled for March 1964, it is expected that most of the stations will be completed by the end of 1963. There are, however, considerable difficulties in finding suitable sites and channels, particularly for television stations, and in carrying the programmes to places remote from the present network. Since all the television stations have to be fitted into the five channels in Band 1, which are the only channels so far available to the BBC, the power of the stations will have to be limited in order to avoid as far as possible the risk of interference to other existing stations. Nevertheless, the present scheme should extend the coverage to a substantial number of people and should provide improved reception in several areas where it is now unsatisfactory.

The BBC has very much in mind the needs of the areas that will still be without a satisfactory service; tentative plans are being considered for a considerable number of additional TV "translator" stations of very low power, both for television and for VHF sound, in many such places over the next few years.

HOME RADIO OF MITCHAM

(Dept. P), 187 LONDON ROAD, MITCHAM, SURREY. MIT 3282

Shop Hours: 9 a.m.—6.30 p.m. Wednesday 9 a.m.—1 p.m.

DON'T MISS THIS BARGAIN OFFER

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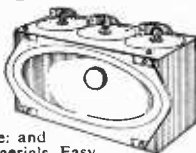
HIWAYMAN 4-VALVE PORTABLE

A well tried all-dry battery portable using high efficiency ferrite rod aerial, superhet circuit, medium and long waves. Full constructional data and detailed price list 1/9 post paid.

Total building cost **£7.10.0**.

"TWINETTE" PORTABLE

Inexpensive local station two transistor portable with speaker and ferrite rod aerials. Easy to build and economical to run. Latest reflex circuit. Ideal for camping, etc. Constructional data 1/6 post paid. Cost of parts **£5.10.0**. All sold separately.

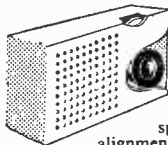


Headphones



Lightweight high resistance (4000 ohms) new boxed, 15/-. Siemens-Ediswan type, usually 45/-. our price **22/6**. Brown's popular type "F", 37/6. Ericsons High Grade, **£2.15.0**.

Midget Radio Cabinets



MINI-3 POCKET PORTABLE

A new reflex circuit using three transistors in a pocket portable with ferrite rod aerials and 2 1/2 in. speaker. Simple to build and no alignment troubles. Constructional data 1/6 post paid. Cost of parts **£6.19.6**. All sold separately. Mini-7 Superhet. For the more experienced constructor the Mini-7 is a full range pocket portable in same cabinet and equal to any commercial set. Constructional data 1/9 post paid. Parts cost **£11.19.6**.

TEST METER

A few more of the special moving coil test sets at well below cost price. Specially designed for all battery equipment. Ranges 6 volts D.C., 150 volts D.C., 30mA D.C., and ohms. Do not confuse with cheap moving iron meters, this is a genuine moving coil 5mA movement. Leaflet on request. Price **19/6**, post 1/-.



White plastic cabinet for midget radio or portable. Size 6 1/2 x 4 x 2 1/2 in. Complete with back and speaker grill. Price **10/6**, post 1/-.

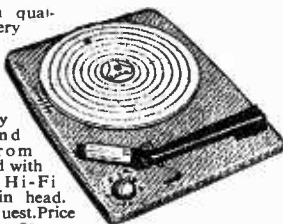
LABGEAR OUTPUT METER

An essential for every engineer. Hi-Fi enthusiast and constructor. An accurate audio power output meter. Two ranges—25 milliwatts to 1 watt, 1 watt to 10 watts. Accuracy 5% and matched for 3, 15 and 600 ohms. Kit of parts with data **£3.15.0**. Ready built and tested **£4.10.0**. Both post 1/-.



AG2009 PHILIPS RECORD PLAYER UNIT

Transcription quality at a very competitive price. Heavy machined turntable ensures steady running and freedom from wow. 4-speed with variation. Hi-Fi crystal plug-in head. Leaflet on request. Price **£10.10.0** plus 2/- post. Additional plug-in head for stereo **30/-**.

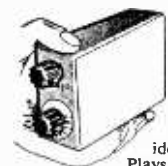


MORSE TRANSMITTERS

Self-contained morse transmitters and practice sets. Bakelite base, adjustable buzzer, morse key, 4 1/2 v. battery. Operates over hundreds of yards of wire with headphones. Brand new boxed **10/6**, post 1/-.

Circuits for Audio Amplifiers

Exciting Mullard book on all aspects of audio design. Includes constructional data on 12 amplifiers, preamps, tape amplifiers, mixers, stereo units, etc. Book **8/6**, post 1/-.. All components stocked for these designs including chassis, panels, switches, etc. Lists on request with 6d. stamp.



The "TRANSETTE"

A new two transistor pocket portable measuring only 4 1/2 x 3 x 1 1/2 in. in sturdy moulded case. Amazing results and ideal for the beginner. Plays indoors and out with self-contained ferrite rod aerial using headphones or personal earpiece. Wiring and assembly simplicity itself. S.A.E. for price list. Cost of parts **£3.2.6**.

NEW AMERICAN RECORDING TAPES

"Ferrodynamic" Brand Five Standard tapes, 5 in., 600ft., 16 1/2 in., 1,200ft., 25 in., Long Play tapes, 5 in., 900ft., 18 1/2 in., 1,200ft., 23 1/2 in., 5 1/2 in., 1,800ft., 35 in.. Also all sizes and types of Emitape, Scotch Boy, Basf, Grundig, tapes. Please add 1/- postage to your order.



"PERSONAL TWO" PORTABLE

Two valve dry battery headphone set. Rod aerial, ideal for bedroom, holidays, camping, etc. Smart metal case, easy to build, excellent results. Data sheets 2/- post paid. Parts for set cost **41/-**.

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6X5G 12/6	DK96 11/6	ECC84 11/-	EM80 11/6
12AT6 9/6	DL95 10/-	ECC85 11/-	EM81 11/6
12A7 11/-	DM70 7/6	ECF80 12/6	EY51 10/-
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25Z4G 12/6	EB41 9/-	ECL80 10/6	EZ81 7/-
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RADIOGRAM CHASSIS

NEW ARMSTRONG

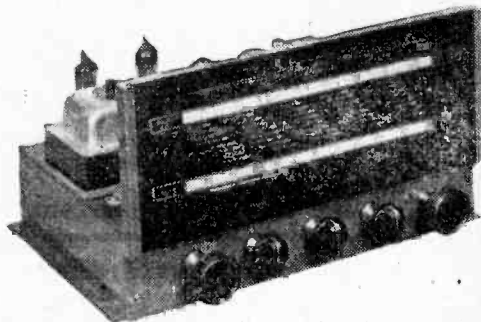


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AF 208 (illustrated) 22 GNS.

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FOR £19.19.6 Carr. 7/6

6-volt operation. For all L.P. and standard records.

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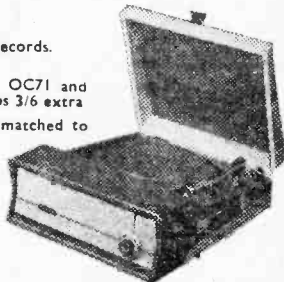
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A Two-Valve T.R.F.

AN UNCONVENTIONAL CIRCUIT

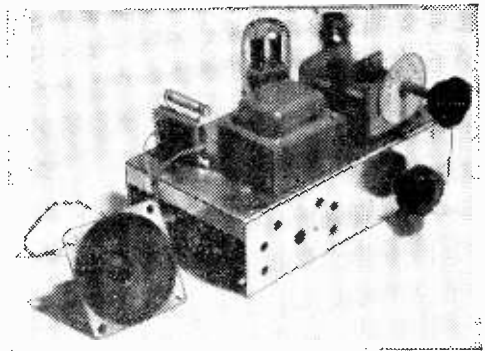
By G. Bobker

THIS set is an inexpensive T.R.F. receiver which, when tested in the Wiltshire area, gave really excellent results. The tuning range is 200-500m. If desired, long wave coils may be used. The circuit is as shown in Fig. 1.

Circuit Development

In the original circuit the aerial was connected conventionally, bias was used for the EF91 (160Ω cathode resistance), the anode and screen of the EF91 was decoupled (3.3k and 0.1μF). Also an R.F. filter circuit with a D.C. blocking condenser was used after the diode D1 (see Fig. 2), and bias was used on the A.F. amplifier.

By experiment, shorting or removal of the bias components of the EF91 and 6SN7 made no difference in the volume, quality or stability of the receiver. Neither did the removal of the R.F. amplifier decoupling components, or the removal



The completed receiver.

of the detector R.F. filter circuit and D.C. blocker affect results. The aerial terminal being connected to earth (via a 0.1μF condenser) serves two purposes: (a) prevents instability in R.F. amplifier, (b) does away with the necessity of an aerial. A conventional aerial may, however, be used if desired.

Although this set was designed to be inexpensive, it is felt that the extra few shillings for a midget mains transformer is well worth while in the interest of safety.

Construction and Wiring

Here, a ready made chassis is recommended. The original set was built on a drilled superhet chassis 7in. x 4in. x 2in. Having drilled the chassis (and

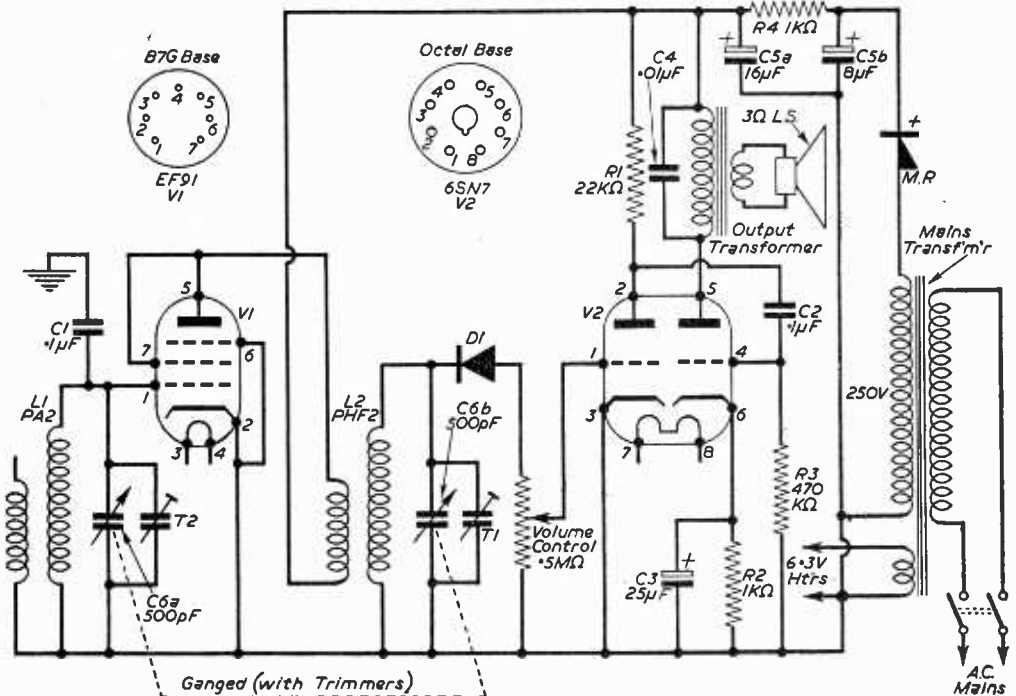


Fig. 1.—The circuit diagram.

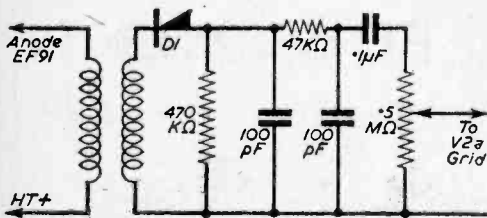


Fig. 2.—Alternative detector circuit (C6b is wired across the coil as in Fig. 1).

COMPONENTS LIST

Resistors:

- R1—22k $\frac{1}{2}$ W.
 R2—1k $\frac{1}{2}$ W.
 R3—470k $\frac{1}{2}$ W.
 R4—1k 2W.

Volume Control 0.5M (with double-pole switch).

Condensers:

- C1, C2—0.1 μ F 350VW.
 C3—25 μ F 25VW.
 C4—0.01 μ F 350VW.
 C5a and b—16 plus 8 μ F 450VW.
 C6a and b—2 x 500pF ganged condenser with trimmers.

Coils:

- L1—PA2 (Wearite).
 L2—PHF2 (Wearite).

Valves:

- V1—EF91.
 V2—6SN7.
 D1 crystal diode.

Sundries:

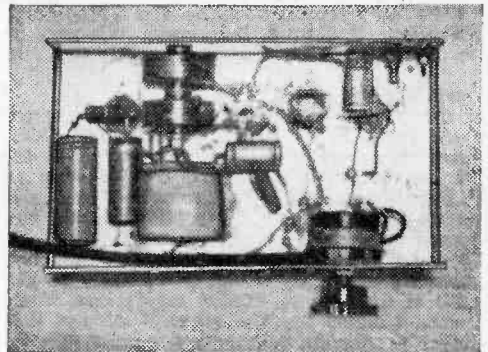
MR metal rectifier 250V 60mA. Output transformers (about 60:1). Small mains transformer (mains primary) 250V 40mA and 6.3V 1A secondaries).

bent it as necessary), mount all the components with reference to the circuit diagrams and illustrations. Place rubber grommets under tuning capacitor. Commence wiring, starting with the

power supplies. Twist L.T. wires together and keep them close to the chassis. Next wire up the 6SN7 valve base, ensuring that grid lead (pin.1) to the volume control is screened, and that the screening is earthed. Solder in the crystal diode, holding the wire end with a pair of pliers. The pliers will act as thermal shunt and prevent damage to the diode from excessive heat. Proceed with the rest of the circuit in the following order: coil PHF2, EF91 valve base, coil PA2 and finally connect the loudspeaker to the secondary of the output transformer.

Setting-Up

Like the circuit the setting-up is quite simple, but first check that all wiring is correct. Set T1 and T2 half open. Tune in a station at the high frequency



Underchassis view.

end of the scale, that is with the tuning capacitor vanes nearly fully opened. Adjust T1 for maximum volume. Turn tuning capacitor slightly and, if the volume increases, adjust T2 again. Finally adjust T2 for maximum volume.

Note

It the tuning capacitor does not have trimmers, two 50pF trimmers must be purchased and connected in parallel with C6a and C6b as shown on the circuit diagram (T1 and T2).

SIMA EXHIBITION AND DEMONSTRATION AT MOSCOW

AN exhibition of British Instruments organised on behalf of the British Instruments Industry by the Scientific Instruments Manufacturers' Association of Great Britain, Sima House, 20, Queen Anne Street, W.1, was opened at the Polytechnical Museum of Moscow on 18th June by H.M. Ambassador, Sir Patrick Reilly, K.C.M.G., O.B.E.

Modern measurement techniques call for great fertility of imagination of instrument designers. It is not enough today to merely exploit one technique alone in developing a successful range of instruments. Optics must be combined with electronics, pneumatic systems with mechanical engineering and so on. The skill of the British craftsman and ingenuity of the designer and a cross fertilisation from one industry to another has led British instruments to take on a freshness of design which is seldom met with elsewhere.

Throughout the period of the Exhibition there

were a series of lectures by members of the Association. They were divided into sessions covering similar topics which included Digital Techniques, Spectro-photometry, Non-Destructive Testing and Pressure Measurement, Ultra-pure Water and Ultra-sonic Cleaning, Noise and Vibration, Electronic Instruments, Medical Instruments, Analysis of Food Stuffs, and Analytical Instrumentation of various types, including Gas Chromatography, Spectro-Chemical Analysis, Flame Photometry, X-Ray Fluorescent Analysis, Measurement of pH and Conductivity, etc.

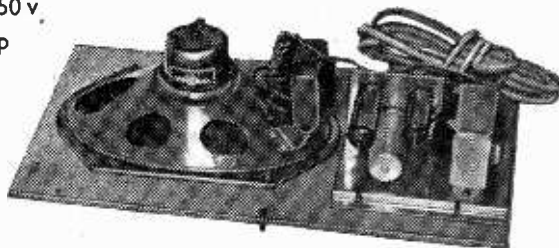
Two special lectures were given by eminent British scientists on visits to Moscow during the Exhibition. Professor R. V. Jones, of Aberdeen University, spoke on "Some Developments of the Optical Lever" on 22nd June; and Professor J. C. Tatlow, of Birmingham University, on "Recent Developments in the Field of Organic Fluorine Chemistry" on 24th June.

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ECL82, EZ80. Separate Bass and
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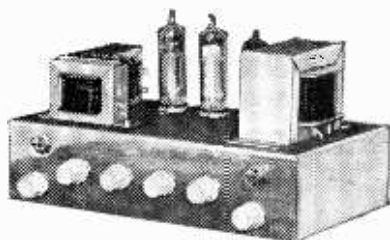


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Output transformers 3 ohms incorporated.
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NEWMARKET: V15/10P, 15/-; V15/20P, 30/-; V15/201P, 25/-; V30/30P, 57/-.

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TRANSISTOR CIRCUITS: MINI 3, 1/3; Mini 7, 1/6; Major 7, 1/6; Teletron Transidyne, 11d. (Full Kit, 10gms.); Three Dee, 11d. (Full Kit, 67d.). The NEW 300-500 mW Amplifier and Feeder Units (6 circuits and plans), 1/8. Twinette 2-transistor Loud-speaker Portable Radio, 1/3. Kit £5.10.0.

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SUB MINIATURE: 32 mfd., 25 mfd., 16 mfd., 8 mfd., 4 mfd., 2 mfd. All 3/6; 100 mfd., 2/9; 0.1 mfd., 7/6d.

TUNING CONDENSERS: Solid, dielectric, 500pF (0.0005 mfd.), 4/-; 300 pF, 3/9; 100 pF, 3/-; Miniature, 500 pF, 5/-.

RESISTORS: All values 10% ± w., 6d.; 1 watt, 9/-.

COILS: Repanco DRR2, 4/-; DRX1, 2/6; Teletron HAX, 3/-; All complete with circuits.

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ROTARY SWITCHES: 1 Pole, 12 way; 3 P, 4 W; 4 P, 3 W; 3 P, 3 W; 4 P, 2 W; 2 P, 4 W; 2 P, 2 W; 1 P, 4 W. All 3/6 each.

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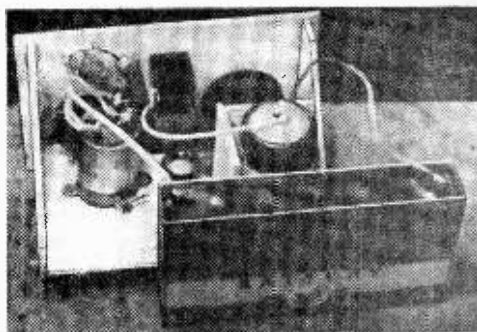
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An Audio Oscillator

SIMPLE, ONE-VALVE CIRCUIT

By M. Lord

SOME time ago I was experimenting with the idea of producing a small, simple audio oscillator for use as a morse code practice oscillator. After some time I hit upon the circuit shown in Fig. 1. More experimenting proved this circuit to be completely reliable, and with some additions, it has now been built into a permanent unit which has been found to be very useful around the "den".



Rear view of the unit.

was used in the prototype, and so a single U2 cell was used for L.T. As will be seen from the illustration, a 9V grid-bias battery was used for the H.T., this being ample H.T. as the author has even had an oscillator of this type running off just a single U2 cell for both H.T. and L.T. Keying, however, was very poor with this very low "H.T." In practice, the 9V supplied by the grid bias battery is ample. Keying in both circuits is accomplished by putting the key in series with the phones, which should be of the 4,000Ω impedance type.

The circuit as finally adopted is shown in Fig. 2, and incorporates two modifications. First, SW1, C1 and C2 provide a means of altering the pitch of the note produced. The actual values of C1 and C2 depends on the transformer used for T1, but

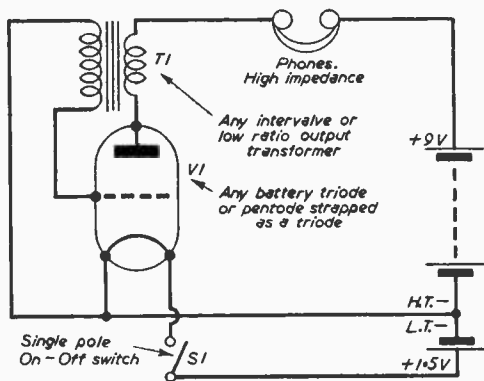


Fig. 1.—The basic circuit.

The Circuit

The circuit of Fig. 1 is basic, and though it is the simplest possible, certain points may need some elucidation. The first item of interest is the transformer T1; this can be any component having a ratio of less than 25 : 1. (The side having the most turns is connected to the grid of V1.) Next, V1, this can be any battery triode, pentode, or tetrode, triode-connected. A DF91, with the screen grid connected to the anode,

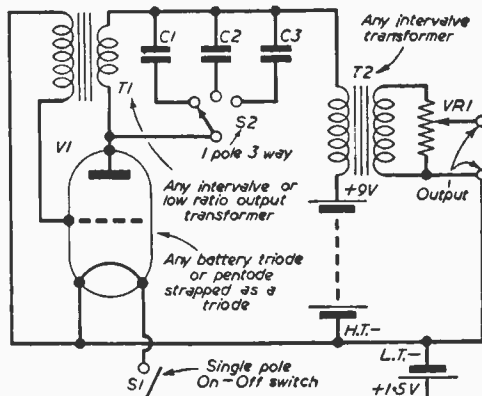


Fig. 2.—The final circuit.

values of 0.005μF and 0.01μF respectively will do for a starting point for experiment. Resistor VR1 is the output control, and works by progressively shorting out the headphones.

Unfortunately, this also alters the pitch of the note to a slight extent, and so, to avoid this occurrence, the output circuit shown in Fig. 3 (page 342) should be adopted. This output circuit should also be used when the oscillator is to be used as a signal source for checking amplifiers, etc., as a D.C. voltage is developed across the output terminals,

(Continued on page 342)

COMPONENTS LIST

- C1 0.005μF.
- C2 0.01μF.
- C3 0.05μF.
- V1 Any battery triode, or pentode strapped as a triode.
- T1 Any intervalve transformer or low ratio output transformer.
- T2 Any intervalve transformer.
- Phones High impedance headphones.
- SW1 Single-pole, on/off switch.
- SW2 One-pole, three-way switch.
- VR1 5k potentiometer.

Club News

REPORTS OF CURRENT ACTIVITIES

BRIDLINGTON AND DISTRICT RADIO SOCIETY

Hon. Sec.: H. Mills (G3AJB), 55 Helredale Road, Whitby, Yorks. This is a newly formed club which meets at 7.30 p.m. every Monday evening at the British Railways Social Clubroom, Station Approach, Bridlington. Col. A. Dunn (G2ACD) is President of the club and the following officers have been elected: Chairman, J. H. Jones (G3GBH), Secretary, H. Mills (G3AJB), Treasurer, J. Wilson (G3MCF). A programme of lectures, discussions and surplus gear sales is now in progress and classes in Morse and instruction for those taking the R.A.E. will start early in September.

CRAY VALLEY RADIO CLUB

Hon. Sec.: H. W. Miles (G2NK), 59 Amherst Drive, St. Mary Cray, Kent. At the June meeting G3ISX gave a demonstration on aerial design and operation.

Future Event:
July 26th.—At the Station Hotel, Sidcup, at 8 p.m. A practical talk on Transmitter Design by the Club Chairman, W. Green (G3FBA).

FLINTSHIRE RADIO SOCIETY

Hon. Sec.: J. Thoroton Lawrence (GW3JGA), Perran Porth, East Avenue, Prestatyn.

The club now meets at the Ffrith Hotel, Ffrith, Prestatyn, and not at the Railway Hotel. To encourage the construction of new gear and modification of ex-WD gear, etc., it has been decided to hold a competition. All members are entitled to enter—radio gear may be entirely home constructed, ex-WD modified, home assembled kit, etc., etc., so long as actual constructional work has been carried out by the entrant. Entries will be judged on technical design, mechanical layout, construction, finish and originality of the work. The entry fee is 1/- per item and the final date of entry is November 7th, 1960. The prize is the latest handbook of the A.R.R.L.

Future Events:
Monday, July 25th, at 7.30 p.m.—160m D. F. Hunt (GW2CCU/M).
Sunday, August 14th at 2.30 p.m.—Picnic at the central beach, Prestatyn.
Saturday, September 3rd and Sunday, September 4th.—European 2m and 70cm contest.
Monday, September 5th at 7.30 p.m.—Talk by J. Goldberg (G3ETH) on "Coaxial Cable".
Monday, October 3rd at 7.30 p.m.—Junk sale and auction.
Monday, November 7th at 7.30 p.m.—Film Show.
Monday, December 5th at 7.30 p.m.—Judging of home constructed gear.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson (G3MDW), Candy Cabin, Ogden, Halifax. As from September 1960 meetings will be held on the first and third Tuesday of each month. A lecture on workshop practice was given on June 14th and June 28th was an informal evening. Meetings are held at the Sportsman Inn, Ogden, Halifax, at 7.30 p.m.

KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: R. S. Babbs (G3GVU), 28 Grove Lane, Kingston-upon-Thames. Meetings are held fortnightly on Thursday evenings at the Y.M.C.A., Eden Street, Kingston.
Future Events:
On July 14th and 28th discussions will be held on R.A.E.N., propagation, Heathkits, SSB and mobile operation. Morse classes are held weekly.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

Gladston Hall, Queen's Drive, Liverpool. On June 6th the Prescott Carnival was held using the club call sign GB2LS and a talk was given on using the mobile station, G3H11. On June 28th a direction finding course was held.

PLYMOUTH RADIO CLUB

Hon. Sec.: R. Hooper, 2 Chestnut Road, Peverell, Plymouth. At the annual general meeting held in May the following officers were elected: President, Harold Jones (G3ZT); Vice-President, Ellis Higgle (G3LSD); Chairman, Cyril Teall (G3JYB); Vice-Chairman and Secretary, Ron Hooper; Treasurer, Ted Fallon. During the meeting, both the G3ZT trophy and the Ernie Hillyard trophy were presented to John Fallon.

ROYAL NAVAL AMATEUR RADIO SOCIETY

H.M.S. Mercury, Leydene House, near Petersfield, Hants. The inaugural meeting of this society was held at the Royal Naval Signal School, H.M.S. Mercury, on June 25th at 5.30 p.m. All Royal Naval or ex Royal Naval personnel are eligible as members and those interested in joining should write to the Hon. Secretary at the above address.

WANSTEAD AND WOODFORD RADIO SOCIETY

Hon. Sec.: K. Smith, 82 Granville Road, Walthamstow, E.17. The club meets every Wednesday evening at 8 p.m. at the Wanstead Community Association, Wanstead House, Wanstead. R.A.E. and Morse lectures are held according to demand. At a recent fete at a local school the club represented Amateur Radio. Future events include an elementary introduction to SSB by G3AMF and the design of oscilloscopes.

WEST KENT AMATEUR RADIO SOCIETY

Hon. Sec.: H. R. Richards. Meetings are held at Culverden House, St. John's, Tunbridge Wells, commencing at 7.30 p.m.
Future Events:
July 8th.—Hi-fi evening.
July 22nd.—"Getting going on 2m", part II. Transmitter by G2UJ.

"GRAND PRIX"

The various Amateur Radio Clubs and Societies in the South of England are organising jointly a Grand Prix of Amateur Radio Mobile Rally. The Southern Counties Mobile Rally 1960 will be held on July 17th at Beaujeu Motor Museum, near Southampton. Control stations G31VP/A on 1980kc/s and G2HIF/A on 144.13Mc/s will be operating from 10.30 a.m. and visiting Mobiles are asked to avoid 144.85Mc/s. Attractions include reduced admission to the Motor Museum, Mobile treasure hunt, boat trips on the river, etc. All S.A.E. and monies should be sent by July 9th to Ron Bassett, 42 Northam Avenue, Shirley, Southampton.

COURSES OF INSTRUCTION, ETC.

BRENTFORD EVENING INSTITUTE

Clifden Road, Brentford. Classes for radio amateurs are held on Wednesday evenings and on Tuesday and Thursday for radio servicing. Morse transmission, instruction and practice are held on Tuesday. The classes commence on September 20th from 7 p.m. to 9 p.m. and the fee is 10/- per term or 30/- for the full session.

NORTHWOOD EVENING INSTITUTE

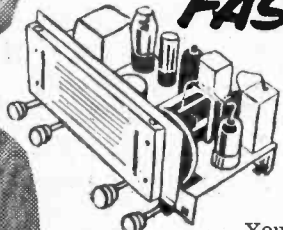
Potter Street, Northwood. Classes for the R.A.E., G.P.O. Morse Test, Elementary Radio Theory and a more advanced course will again be held at Northwood, as from September 19th. Enrolments will be held on Monday, September 12th to Wednesday, September 14th, 6.30 p.m. to 8.30 p.m. Inquiries should be made to G2QY.

RADIO AND TELEVISION COURSES

Wesley Evening Institute, Wesley Road, N.W.10. The 1960-1961 session will begin on Monday, September 19th. Classes will be held on Mondays and Wednesday, 7 p.m. to 9 p.m. The fees for this session will be 30/- per session for one evening and 37/6 for two evenings. The session ends on July 5th, 1961. You may enrol by post to "Jeanville", Brighton Road, Addlestone, Weybridge, Surrey.

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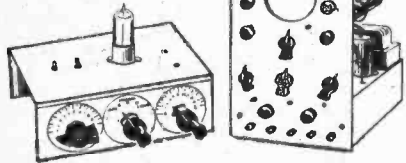
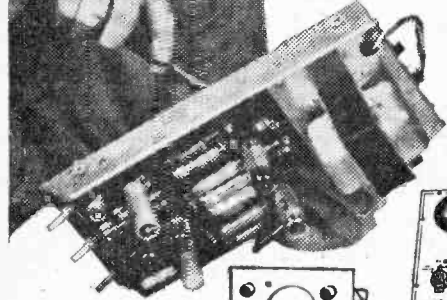
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A Battery Superhet Tuner

A COMPREHENSIVE FIVE-VALVE CIRCUIT

By F. Neville Hart

THIS battery short wave set for use in a caravan works off the 6V car accumulator, and derives H.T. from a transistor converter kept under the car bonnet, which is switched on by a relay in the filament circuit.

Coils

This radio may be of especial interest to readers, being out of the usual run of battery superhet portables. Owing to the fact that coil makers seem to have mains valves more in mind when designing short-wave coils, a considerable amount of experiment had to be carried out with coils, condensers and resistors, before constant oscillation and efficient tracking could be achieved. Finally, air-cored coils proved most suitable, having no "slugs" to tune, only trimmers. In order to reduce noise and to lessen second channel effects, an R.F. valve is used. This, with one of the I.F. valves is a 1L4, as these are very cheap on the surplus market, and are suitable, there being no AVC in the set.

The aerial input is via a 100pF condenser, which is optional, but seems to increase volume on 16m and on the 19m band, without affecting tuning elsewhere.

R.F. Circuit

The circuit of the R.F. valve is a choke-fed tuned grid, and although the coil is actually an R.F. transformer, only the secondary is used. A 50pF condenser from the anode of the R.F. valve feeds the amplified signal to the control grid of the frequency changer. In such a circuit, one should use the smallest value of coupling that is

possible, consistent with adequate volume, in order to ensure that tracking is not affected.

This way of coupling the valves was found to be much more effective than an R.F. transformer circuit, for with the latter, tuning on the short waves was too sharp and trimming was difficult. A good R.F. choke is essential. Using this circuit, the writer finds that the use of an R.F. valve is well worthwhile and signals are definitely stronger. A low screen grid current is possible here, as no material difference was found by halving or even quartering the value of the screen resistor, which is 100k.

Frequency Changer

The frequency changer is a 1R5 and the oscillator anode is controlled by a 25Ω variable resistance, as the voltage has to be increased at the lowest frequencies, yet on the other hand, the lowest current sufficient to keep the valve in oscillation brings in the best volume on weak stations on the higher frequencies.

As recommended by the coil makers, a 100Ω resistor is inserted in the oscillator grid circuit, and indeed, without it, a slight "howl" appeared when tuning the set above 40m.

Owing to the fact that the car has a positive earth, for safety, the chassis, with the tuning condensers, have also to be positive so that, where necessary, grid leads are taken to a negative bus bar, in order to avoid the risk of a "short" across the plates.

Only a two gang bandspread condenser is used, on the R.F. and oscillator coils. A separate 100pF variable condenser across the aerial coil serves to even out tracking.

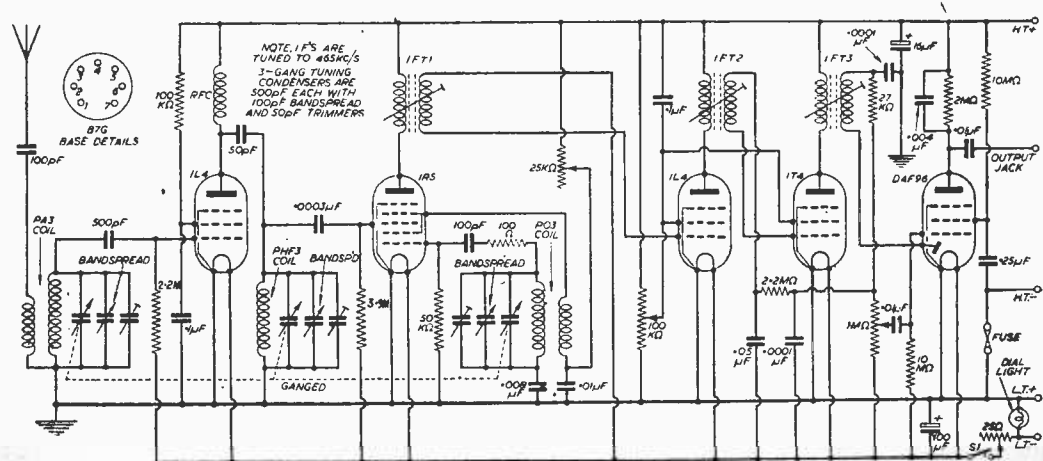


Fig. 1.—The complete circuit diagram of the tuner (Wearite coils are used).

I.F. Amplification

The two I.F. stages are quite normal, though the screened grids are taken to a 100k variable potentiometer, so that any regeneration can be controlled, and incidentally used to bring up a weak station.

One of the I.F. valves and miniature transformer complete, were obtained as a unit, being a surplus item. This is very neat and compact, and has also some useful miniature condensers and resistors, which came in useful in other parts of the set. The I.F. is 465kc/s.

The second detector, a DAF96, follows normal practice. The dial light and filaments of the valves derive their current through the coil of the relay, and this, at 10Ω, is almost enough to cut the voltage to the required 1.4, but an additional 25Ω variable resistor is used to enable valves of different consumption to be tried.

AN AUDIO OSCILLATOR

(Continued from page 337)

and if a blocking condenser was used to prevent this voltage from interfering with the working of the amplifier under test, the output control (VR1) would not work properly.

Transformer T2 is a small intervalve type with a ratio of between 1 and 5:1. The winding with the largest number of turns is connected to the anode of V1.

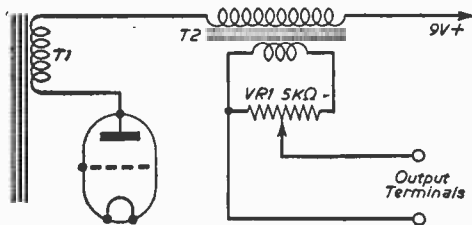
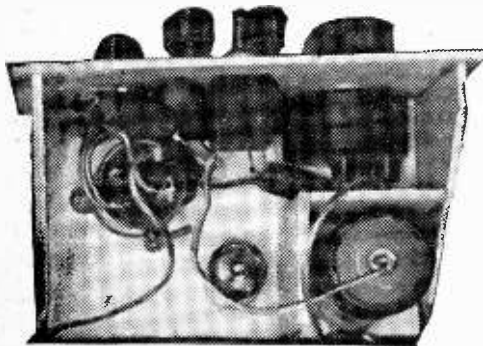


Fig. 3.—Alternative output circuit.

Front Panel, Chassis and Case

These are made from 1/16in. ply-wood to the dimensions shown in Fig. 4. They are glued together with a good impact adhesive to produce



Another view of the unit.

Output

As the H.T. converter only gives 10mA at 90V, being intended for a straight battery portable, there is not enough current to spare to drive an output valve in addition to the R.F. and extra I.F. valves. So the output is fed by a jack into the L.F. portion of a six transistor superhet, which was built for normal long and medium band listening.

The aerial is an 8ft. "whip" which is swung into the vertical on arrival at a stopping place, being attached to the side of the caravan permanently, on an insulator.

In addition to the 20m and 40m amateurs, a good many more broadcasting stations can be heard at good strength. The range of the set could be extended by the use of plug-in coils, but as the 19 and 25m bands seem to provide the best reception, the writer finds the present arrangement very satisfactory.

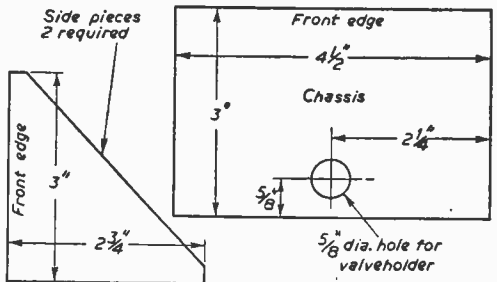
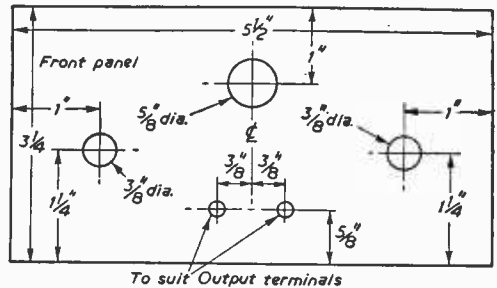


Fig. 4.—Details of the chassis.

an instrument as shown in the illustrations. Of course, if larger components are used for V1, or T1, or if the output circuit of Fig. 3 is used, the oscillator will have to be made larger.

Two pieces of plywood, each 1 1/2in. by 1 1/2in., are used to form a compartment for the U2 cell. It should be noted here that the wires are soldered on to the terminals of the grid-bias battery. This is to enable it to fit into the case.

Setting Up

A pair of headphones are connected across the output terminals, the unit switched on and VR1 slowly rotated. If no audio note is heard, the oscillator switched off, and the connections to the grid side of T1 are reversed. The oscillator should then function correctly.

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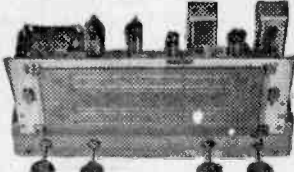
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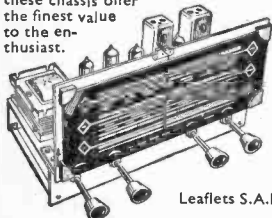
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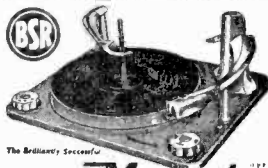


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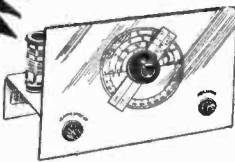
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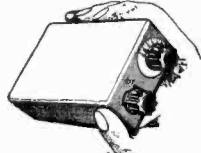
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Bronze-finished case. Ideal for the beach, the bedroom, the office—in fact, anywhere.
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Simple Tuning Meter

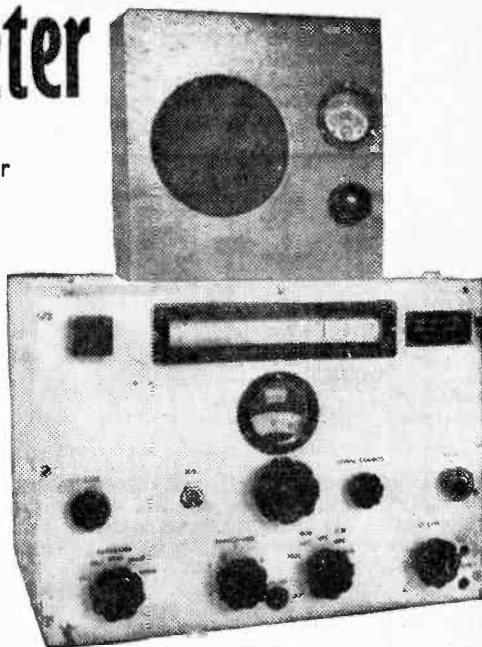
THE METER IS HOUSED IN
THE LOUDSPEAKER CABINET By F. G. Rayer

MANY receivers, including some of communications type, have no tuning meter or signal strength meter, and it would often be very difficult to fix such a meter anywhere on the receiver panel. As receivers of this kind usually require a separate speaker, the problem can be solved by mounting the tuning meter in the speaker cabinet. This system is adopted in the unit described here.

Some communications receivers have a jack for phones, but there is not always any means of silencing the loudspeaker, when using phones. For this reason, a silencing switch is also fitted in the speaker cabinet. If there is no provision for phones, these may be connected to the switch, as explained later.

Circuit

The size of the cabinet is of little importance, provided it is large enough for the speaker and other items. The circuit is in two separate sections—one for the meter, and one for the speaker. If



The unit in position.

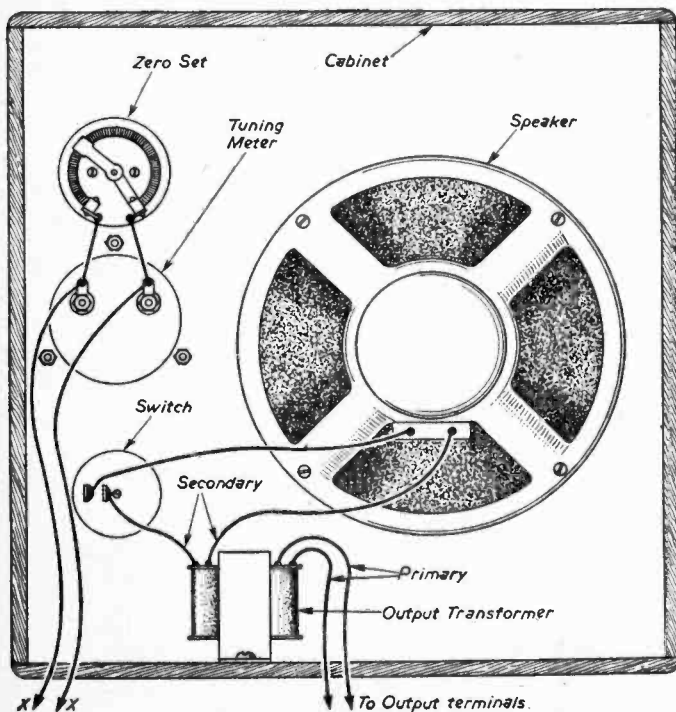


Fig. 1.—Tuning meter and speaker unit wiring diagram.

the speaker is already fitted in the receiver, it is thus possible to add the tuning meter alone, in a small case which can be placed conveniently by the receiver.

The connections inside the cabinet are shown in Fig. 1. The switch can be on the side if more convenient. The output transformer may not be required with some receivers (as described later).

Tuning Meter

The H.T. current of one or more stages which are controlled by the AVC circuit of the receiver passes through the tuning meter. As signal strength increases, current drops. Correct tuning is therefore the lowest point to which the meter pointer falls, and relative signal strength is shown by comparison of the readings. During normal tuning, the meter thus acts as a sensitive indicating device, so that a station can easily be tuned in correctly. It allows aerial trimming or any other trimming adjustment in the receiver to be checked at once, because trimmers can be peaked for minimum meter reading. It

also shows the efficiency of the aerial system, because if the aerial or earth are modified, the change in signal strength which arises as a result will at once be indicated by the meter.

When logging stations, or preparing reports for amateur transmitters, the meter gives a definite

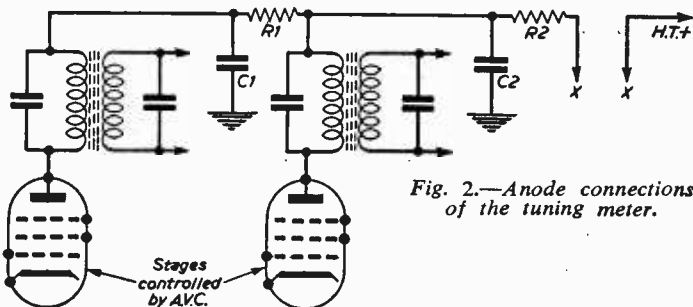


Fig. 2.—Anode connections of the tuning meter.

indication of signal strength. If this is noted, reference to it later will show whether work at the amateur station has increased signal strength. This is much more accurate than trying to estimate signal strength by ear. For such purposes, the meter can be calibrated as follows: 1 Faint signals, barely perceptible. 2 Very weak signals. 3 Weak signals. 4 Fair signals. 5 Fairly good signals. 6 Good signals. 7 Moderately strong signals. 8 Strong signals. 9 Extremely strong signals.

Wiring

The H.T. circuit to one or more R.F. or I.F. stages which receive AVC is broken, to join in the meter as in Fig. 2. When there are several stages, some will usually be decoupled, and C_1 and R_1 are the components used for this purpose (already present). Decoupling must also be used to keep frequencies which could cause instability out of the meter circuit. C_2 and R_2 are for this purpose. A condenser of about $0.05\mu\text{F}$, with a 1k resistor, wired at the I.F. transformer, will usually suffice. A condenser in the position shown for C_2 may already be present, and in some circuits the resistor R_2 will not be needed.

The usual mains R.F. pentodes will take about 6mA to 10mA each, according to H.T. voltage, etc. Anode current is at maximum with no signal tuned in, and the variable resistor shunt in Fig. 1 is then adjusted so that the pointer rests on the full-scale mark. Any meter with a full-scale reading less than the H.T. current will therefore be satisfactory. A 1mA meter can be used, but 5mA or 10mA instruments are cheaper. A test meter can be connected in at the points marked X, to obtain an idea of the likely deflection. The variable resistor in Fig. 1 will usually need to be about 25 to 100Ω . Wire-wound fixed resistors can be added in series to parallel, if necessary, to make the meter adjustable to full-scale deflection with no signal.

Cathode Meter

If it is more convenient to reach the cathode circuits, the meter can be wired in series with the bias resistor R_1 , as shown in Fig. 3. C_1 is the usual by-pass condenser, already present. As the current is that of a single valve, a 1mA or 5mA meter will be suitable. The valve should not be operated with a manual cathode gain control.

To mark the meter scale, stations are tuned in, and the numbers positioned in accordance with the list given. The AVC must be in, but the BFO out, to avoid rectification of the BFO signal producing AVC bias. R.F. gain, or similar controls, can be at any position when the meter is used for tuning, but must be always at maximum for signal strength readings. As the receiver warms up, the pointer will move to full-scale if no signal is tuned in. This is zero on the signal strength scale. The pointer moves back, as signal strength increases. In practice, this is quite satisfactory. If it is desired that the pointer move to the right, as signal strength increases, with this type of meter and circuit, the simplest method is to mount the meter upside-down, with the signal strength scale marked to suit.

Output Circuit

If the receiver has a high impedance output (with or without H.T. isolating transformer) then a transformer is required as in Fig. 1. But if the set has a 3Ω output, leads can be taken directly to the speaker, with the silencing switch in circuit. When a transformer is used, the switch must be in the secondary circuit, as shown.

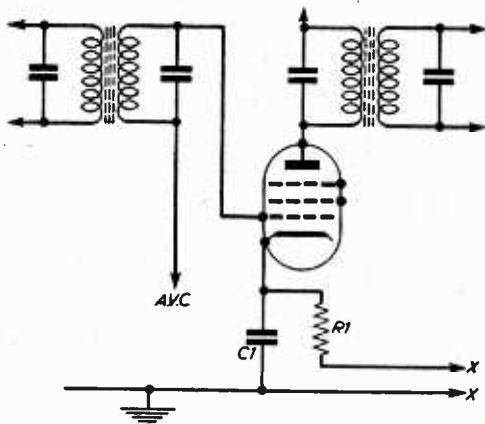
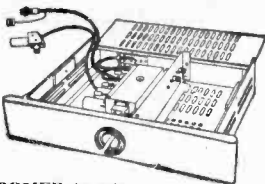


Fig. 3.—Connecting the meter into the cathode circuit.

Phones are simply plugged into the receiver phone jack, when provided. If there is no jack, one can be mounted on the speaker cabinet, and wired to the primary of the output transformer. If there is no isolating transformer in the receiver, add reliable isolating condensers of about $0.05\mu\text{F}$ in each lead to the jack. This will suit high impedance phones. A resistor of a few thousand ohms is occasionally permanently included in circuit, to reduce volume when using phones. With low impedance phones, connections may sometimes be taken from the transformer secondary with success. If a rotary switch with extra contacts is fitted, this can bring the phones into operation, instead of using a jack.

CHANNEL TUNER

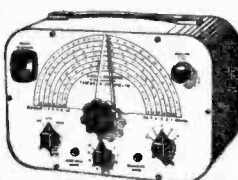
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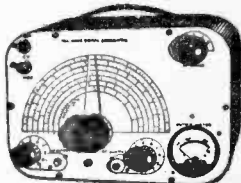


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unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch, variable A.F. output. Incorporating magic eye as output indicator. Accuracy plus or minus 2%.

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

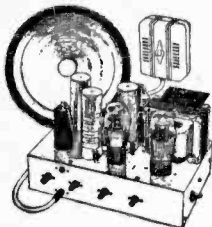


Coverage 120 Kcs-84 Mc/s. Metal case 10 1/2 in. x 6 1/2 in. x 4 1/2 in. Size of scale, 6 1/2 in. x 3 1/2 in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30%. modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch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

8-WATT PUSH-PULL AMPLIFIER

COMPLETE WITH CRYSTAL MIKE AND 8in. LOUDSPEAKER

A.C. mains 200-250 v. Size 10 1/2 in. x 8 1/2 in. x 2 1/2 in. Incorporating 6 valves. H.F. pen., 2 triodes, 2 output pens and rectifier. For use with all makes and types of pick-up and mike. Negative feedback. Two inputs, mike and gram, and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 Kcs.. ±2db; down to 20 Kcs. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as **£4.19.6** Plus 7/6. Guitars, etc. P. & P. 7/6. Or 20/- deposit Plus P. & P. 7/6, and 4 monthly payments of 23/-.



±2db; down to 20 Kcs. Output 8 watts at 5% total distortion. Noise level 40 db down all hum. Output transformer tapped for 3 and 15 ohm speech coils. For use with Std. or L.P. records, musical instruments such as **£4.19.6** Plus 7/6. Guitars, etc. P. & P. 7/6. Or 20/- deposit Plus P. & P. 7/6, and 4 monthly payments of 23/-.

3-TRANSISTOR POCKET RADIO

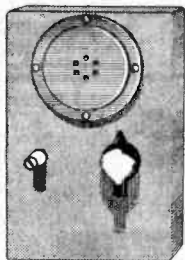
Plus Germanium Diode on PRINTED CIRCUIT

Size 3 1/2 in. x 4 in. x 1 in. Incorporating Ferrite Rod Aerial. Tuneable over medium and long waves.

Kit of parts

39/6 Plus 1/6 P. & P.

Circuit diagram 1/6, free with kit.

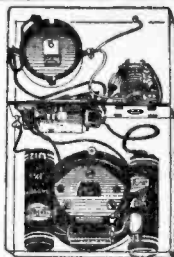


2-TRANSISTOR POCKET RADIO

Plus Germanium diode, fully tuneable over medium and long waves. Size 3 1/2 in. x 4 1/2 in. x 1 in. Complete set of components including case, 2 transistors and earpiece (less batteries obtainable anywhere at 10d.).

19/6 Plus P. & P. 1/6.

Point to point wiring diagram 1/6, free with kit.



PUSH-PULL OUTPUT STAGE

Inclusive of transistors with input and output transformers to match 3 ohms speech coil, suitable for use with the above kit. Complete kit of parts including transistors.

19/6 Plus Post and Packing 1/6.

Point to point wiring diagram 1/6 free with kit.

TRANSISTOR TESTER

For both P.N.P. and N.P.N. transistors incorporating moving coil meter. In metal case size 4 1/2 in. x 3 1/2 in. x 1 1/2 in. Scale marked in/gain and leakage. Complete and ready for use.

19/6 Plus 2/6 P. & P.

MAINS TRANSFORMERS

All tapped with primaries 200-250 volts, 0-180, 180, 200 v., 60 ma., 6.3 v. 2 amps, 10/6, 280-0-280 v. 80 ma. 6.3 v., 2 amp., 6.3 v., 1 amp., 10/6, 350-0-350 v. 70 ma. 6.3 v., 1 amp., 6.3 v., 2 amp., 10/6, 250-0-250 v. 70 ma. 6.3 v. 2 a., 10/6. Postage and packing on the above 3/-.

PORTABLE AMPLIFIER

On printed circuit for A.C. Mains 200/250 v. Size 4 in x 3 in. with tone and volume control. Valves: ECL82 and E230.

39/6 P. & P. 2/6

BUILT POWER SUPPLY UNIT

A.C. Mains 200-250 v. **21/-** Plus 3/6 P. & P.
D.C. Output 250 v. at 75 ma.
Also 6.3 v., 2 amp. heater winding.

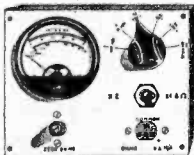
WOLVESY 3-ELEMENT FOLDED DIPOLE

I.T.V. Aerial less mounting bracket for External use, complete with 12 yds. of coaxial cable, 15/-; 4 element, 17/6. P. & P. on above, 3/6.

BATTERY RECORD PLAYER & AMPLIFIER

Incorporating 45 r.p.m. "Starr" motor "Acos" crystal pick-up, 3 transistor push-pull amplifier complete with transistors. Output 500 milliwatts. 49/6, Plus 3/6 P. & P.

A.C./D.C. POCKET MULTI-METER KIT



Comprising 2 in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel range switch, wire-wound pot (for ohms zero setting), toggle switch, resistor and rectifier. In grey hammer finish case.

19/6 Plus P. & P. 1/6.

Point to point wiring diagram 1/-, free with kit.

F.M. TUNER UNIT

By famous German Manufacturer. Coverage 88-100 Mc/s. Complete with ECC85. Size 4 in. x 2 in. x 2 in. **25/-** Plus P. & P. 1/6
Circuit diagram 1/-, free with unit.
10.7 Mc/s I.F. and Discriminator Coil, 4/- pair.

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

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CIRCUITS FOR AUDIO AMPLIFIERS

-a book every enthusiast will want!



This new Mullard publication is a practical manual for every audio enthusiast. In addition to describing twelve of the most popular Mullard circuits, it has introductory chapters on many of the theoretical and practical aspects of high quality sound reproduction.

Whether you are interested in disc or tape, monaural or stereo, you will find that "Circuits for Audio Amplifiers" gives just the sort of information you need.

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MAXI-Q

REGD.

COIL PACKS

CP.3/370 pF and **CP.3/500 pF**. These 3 waveband Coil Packs are available for use with either 370 pF or 500 pF tuning condensers. The coverages are: Long Wave 800-2,000 metres. Med. Wave 200-250 metres, Short Wave 16-50 metres. Designed for use with "MAXI-Q" glass scale type S2. Retail price of each unit: 32/- plus 10/8 P.T.—total 42/8.

CP.3/G. As above but with Gram. position, suitable for use with 500 pF tuning condenser: 39/- plus 13/- P.T.—total 52/-.

CP.3/F. This Coil Pack is for use with a 500 pF tuning condenser and covers the standard, Long, Med. and Short wavebands with the addition of the band 50/160 metres. This covers the Trawler band, Aeronautical and the 80 and 160 metre Amateur bands: 49/- plus 16/4 P.T.—total 65/4.

CP.3F/G. As CP.3/F but with Gram. position: 57/- plus 19/- P.T.—total 76/-.

CP.4/L and **CP.4/M**. These compact 4-station Coil Packs are available for either 1 Long Wave and 3 Medium Wave Stations (CP.4/L) or 4 Medium Wave Stations (CP.4/M.). They are fully wired and require only four connections for use with any standard frequency changer valve. 25/- plus 8/4 P.T.—total 33/4.

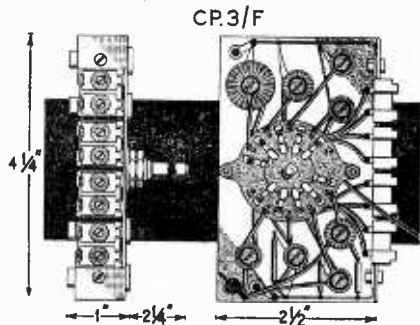
CP.4L/G and **CP.4M/G**. As CP.4/L and CP.4/M but with provision for Gram. position. 31/- plus 10/4 P.T.—total 41/4.

See Technical Bulletin DTB.9 for details of all Coil Packs, 1/6.

GENERAL CATALOGUE covering full range of components, send 1/4 in stamps or P.O. PLEASE SEND S.A.E. WITH ALL OTHER ENQUIRIES.

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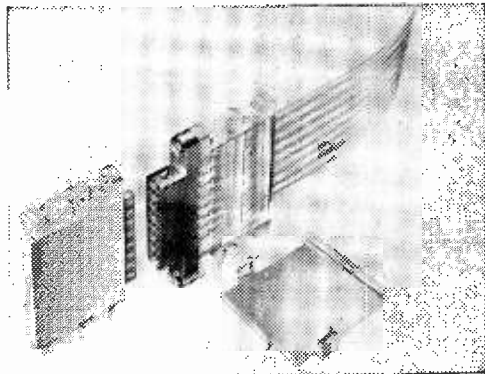


Trade News

NEW PRODUCTS AND DEVELOPMENTS

"AUTO PORTABLE"

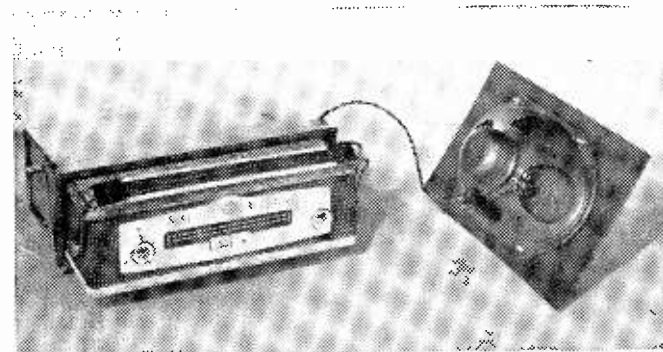
THE latest product of Berec Radio Ltd., a subsidiary of the Ever Ready Co. (Gt. Britain) Ltd., is the Berec "Auto Portable" transistor set. This is a dual purpose radio which fulfils two separate functions. Firstly, as a car radio, it operates by sliding into a metal container fitted in the car, automatically connecting to car battery and speakers as this operation is carried out, and disconnecting the internal battery, aerial and speaker of the radio. Secondly, by removing the receiver from the container the Portable operates on its own battery, speaker, and self-contained aerial. The Berec "Auto Portable" is fully transistorised and is powered by the Ever Ready "Power Pack" PP9 battery which gives a life of approximately 200 hours. The output is 1W as a car radio and 400mW as a portable. It is covered in red-white polka dot Storoflex and mottled light grey Vynair. The size is 9½in. x 7½in. x 3¼in. and is a six transistor superhet operating on long and medium wavebands and has push button wave change. The "Auto Portable" retails at £27 12s. 3d. Further information may be obtained from Berec Radio Ltd., Hercules Place, Holloway, London, N.7.



Flexistrip cable and connectors.

NEW RECORDING LEAD

A NEW recording lead, to be known as the SL142R, with built-in resistive attenuator, has been specially designed by Grundig for use with their portable battery operated tape recorder, the Cub. The lead, which improves recordings made from the extension speaker sockets of a radio, is being issued with all new Cubs, in addition to the existing lead the SL154. The price if bought separately remains 12s. The lead is made by Grundig (Great Britain) Ltd., 39/41 New Oxford Street, London, W.C. 1.



The Berec "Auto Portable" transistor set. This dual-purpose radio can be used either as a car radio or as a conventional portable receiver powered by its own internal batteries.

"FLEXISTRIP" CONNECTORS

THE newest range of connectors from Belling and Lee were recently shown at the I.E.A. Exhibition. These are for use with the "Flexistrip" cable manufactured by the Telegraph Condenser Co. Ltd. This is made in the form of a flat, flexible, insulated ribbon containing a number of parallel copper foil strip conductors. The new connectors are for an 8-way cable with the conductors distributed on a 0.15in. module. This is the spacing most commonly employed in this country in printed circuitry. These new connectors are not yet in production but this is being planned for the autumn of this year by the manufacturers Belling and Lee Ltd., Great Cambridge Road, Enfield, Middlesex.

"SCOTCH" BRAND No. 300-17

THE makers of "Scotch" Brand magnetic tapes have increased their range of No. 200 double play tensilised polyester recording tape. The new 5½in. reel holds 1,700ft of tape and will be sold at 57s. 6d. The reel will be especially useful with recorders having a maximum full size of 5½in. It

is manufactured by the Minnesota Mining and Manufacturing Company Ltd., 3M House, Wigmore Street, London, W.1.

S.T.C. TUNNEL DIODES

AN extension has been added to the range of tunnel diodes which are manufactured by Standard Telephones and Cables Ltd. Since January the range of codes has been extended from two to six. All essential parameters for the devices are now quoted, including typical resistive cut-off frequencies which extend up to 130Mc/s and a tolerance limit for the peak current. Standard Telephones and Cables Ltd., Connaught House, Aldwych, London, W.C.2.

"CHELSEA" TAPE RECORDER

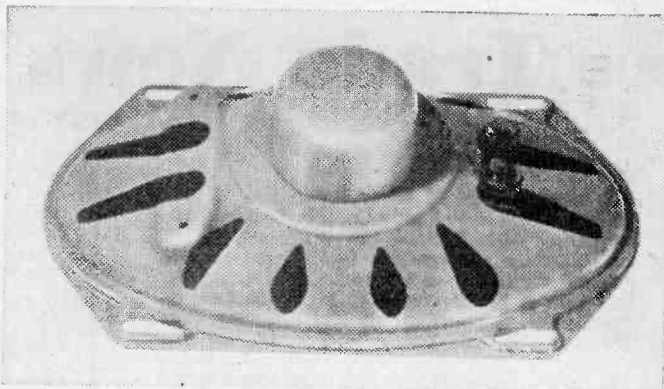
A TAPE recorder to be known as the "Chelsea" has been introduced by Beulah Electronics. The cabinet is attractively styled in contrasting woodgrain grey with blue or red. Twin track recording gives playing times of 240, 120 or 60 minutes per standard 1200ft reel. The tape deck amplifier and power supply can be removed from the cabinet as one chassis. The power supply and amplifier have been constructed on separate screened sub-chassis, thus reducing the residual hum level to negligible proportions. The "Chelsea" retails at 42 guineas and all retail inquiries should be addressed to *Direct TV Replacements Ltd., 138, Lewisham Way, New Cross, London, S.E.14.*

LOUDSPEAKERS

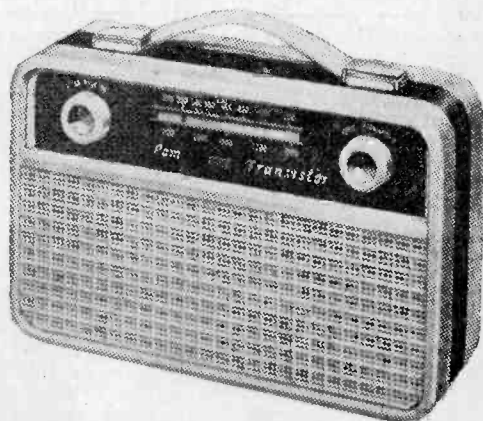
A NEW range of loudspeakers for radios and televisions, tape recorders and car radios has been introduced by the Plessey Company Ltd. The models range in size from the 4in. to the narrow 8in. x 2½in. These are dustproofed and tropicalised, slotted fixing holes on the 7in. x 4in. and 8in. x 2½in. loudspeaker give positional latitude in mounting, making the loudspeaker easier to fit in restricted cabinet conditions. A choice of cones is available which ensures excellent reproduction under a variety of acoustic conditions. This new range is a product of *The Plessey Co. Ltd., Ilford, Essex.*



The "Chelsea" twin-track tape recorder.



One of the new range of loudspeakers for use in radio and television introduced by the Plessey Company Ltd.



The Pam transistor portable radio, Model TB60.

TRANSISTOR PORTABLE RADIO

A TRANSISTOR portable radio receiver, Model TB60, has been added to the range of Pam receivers. This has a six transistor printed circuit chassis and is powered by one 9V battery, offering full long and medium waveband coverage. Provision is also made for a car aerial input. The cabinet is finished in cream rexine with a royal blue suedette surround and a blue and gold scale. The price is 17 guineas (tax paid) and the manufacturers are *Pam (Radio and Television) Ltd., 295 Regent Street, London, W.1.*

INSTRUMENT PANELS

A NEW leaflet describing the various processes, material and manufacturing facilities available for the fabrication of panel for all types of instruments, has been published by *Millett, Levens (Engravers) Ltd.* The leaflet is fully illustrated in colour and will be of considerable interest to design engineers. Full details of these instrument panels may be obtained from *Millett, Levens (Engravers) Ltd., Stirling Corner, Barnet By-Pass, Borehamwood, Herts.*



PORTABLE TRANSISTOR Record Player BARGAIN OFFER

- ★ 6v. operation (2 E/R Type 800 Batts.)
- ★ 1 watt Push Pull Output
- ★ 4 Latest G.E.C. Transistors
- ★ Garrard Fidelity Gram. Unit



Size: 11 x 8 1/2 x 5 in.
Colour: 2 Tone Red/White with Polka Dot relief. Alternative Blue/Fawn with Polka Dot relief.

CABINET incl. Motor Board and 7 x 4 in. Speaker, £1.19.6. Carr. 2/6.

GARRARD BAI Gram. Unit, 45 r.p.m., £2.19.6. Carr. 2/6.

Send for full details now

Complete RECORD PLAYER KIT

3 UNITS

Bargain Price
£7.19.6
Carr. 4/-

I WATT

4-TRANSISTOR AMPLIFIER

High Quality Unit with Neg. feedback giving 1 watt Audio output into standard 3 ohms Speaker.

AMPLIFIER KIT—ONLY £3.19.6. Carr. 1/6. Ready Built and Tested, 17/6 extra. Circuit diagram, full technical spec. and construction details (free with Kit) 2/6 post free.

LIMITED BARGAIN OFFER

Record Player 'Bargains

All brand new latest 4-speed Models—fully guaranteed.

SINGLE PLAYERS—B.S.R. (TU49) with 'FUL-FI', P.U. 90/-; Collaro Junior with latest (P 67-12 Xtal. 90/-; Garrard TA Mk.2 with GCS Head, £7.19.6; Garrard 4HF Transcription Unit, £18, carr. 3/6.

AUTO CHANGERS—B.S.R. (UA8), £6.19.6 UA8 Stereo, £7.19.6; UA14, £7.19.6; Collaro Conquest, £7.19.6; Garrard RC121/4D Mk.2, 9/- gns., carr. 4/6.

GARRARD RC210 4-speed Autochanger Model with latest features and GCS Plug-in Head only 10 gns., carr. 4/6.

E.M.I. 4-speed Single Player with Auto Stop-Start Dual Turnover Cartridge for Stereo and Monaural L.P. and 78—Bargain Buy at £6.19.6, carr. 3/6.

RECORD PLAYER CABINETS

Contemporary styled, rexine covered cabinet in two-tone fawn and brown, or mottled red with white polka dot. Size 18 1/2 x 13 1/2 x 8 1/2 in., fitted with all accessories, including baffle board and anodised metal fret. Space available for all modern amplifiers and autochangers, as above, etc. Urgent record player mounting board 14 x 13 in. supplied. Cabinet Price £3.3.0. Carr and Ins. 3/6.



2 VALVE, 2 WATT AMPLIFIER

Twin stage ECL82 with vol. and neg. feedback. Tone controls A.C. 200/250 v. with double-wound mains trans. Complete with knobs, etc., ready wired to fit above cabinet, £2.17.6. P. & P. 1/- 6in. Speaker and matching trans., 22/-, P. & P. 1/6.

CRT. HTR. ISOLATION TRANSFORMERS

New improved types, low capacity, small size and lag terminated, A.C. 200/250 v. Secondaries N11, +25%, +50%; BOOST, for 2 v., 4 v., 6.3 v., 12.6 v. and 13 v. Tubes. EA Type 12/6 each. P. & P. 1/6.

NEW VALVES ALL GUARANTEED

1T4	6/-	ECH42	10/6	EZ80	7/6
1R5, 155	7/6	ECL80	10/6	EZ81	7/6
3Z4, 3V4	7/6	ECL82	10/6	MU14	9/-
5Z4	9/6	EF80	8/-	PCC84	9/6
DAF96	9/-	EF86	12/6	PCF80	9/6
DF96	9/-	EP91	7/6	PCL83	12/6
DK96	9/-	EL41	8/6	PLA1	12/6
DL86	9/-	EL84	8/6	PL82	9/6
EABC80	8/6	EY51	9/6	PL83	10/6
ECF80	9/6	EY86	10/-		

TRANSISTORS

BVA 1st Grade—ex Mfrs.
Mazda XA102, 16/6; XA101, 14/6; XC101, 10/6; CX70, 8/6; XB102, 10/-; XA103, 15/-; XA104, 18/- OA70, 2/9, etc.

RE-GUNNED TV TUBES New Reduced Prices

New Heater, Cathode and Gun Assembly fitted to all tubes. Reconditioned virtually as new. Now 12 months' guarantee to highest standards—as used by our own Service Dept.
12in. £5. 14in. £5.10.0. 17in. £6.
Mullard and Mazda types ex-stock Carr. and Ins. 10/- 10/- Part Exchange allowance on your old tube.

JASON FM TUNER UNIT KITS (87-105 Mc/s)

STANDARD MODEL (FMT1) as previously extensively advertised. Complete Kit 5 gns. Set of 4 spec. valves, 30/-.

MODEL (FMT2). Attractively presented shelf mounting unit in enclosed Metal Cabinet with Built-in Power Supply. Complete Kit £7. Set of 5 spec. valves, 39/6.

LATEST MODEL—JTV2. Switched Band 1-2-3 AM/FM Unit with AFC. Kit £12.19.6.

NEW JASON COMPREHENSIVE FM HANDBOOK. 2/6 post free. 48 hr. Alignment Service, 7/6; P. & P. 2/6.

COX 80 ohm CABLE

Now only 6d. yard.

High grade low loss Cellular Air Spaced Polythene—1/2 in. diam.—Famous Mfr.

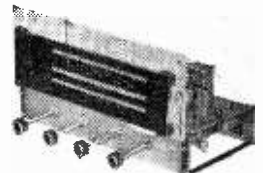
BARGAIN PRICES— SPECIAL LENGTHS

20 yds. 9/- P. & P. 1/6
40 yds. 17/6 P. & P. 2/-
60 yds. 25/- P. & P. 3/-
Cox Plugs, 1/-; Cox Sockets, 1/-; Couplers, 1/3;
Cable End Sockets, 1/6; Outlet Boxes, 4/6.

Manufacturer's Surplus Bargain 7 VALVE AM/FM RADIOGRAM CHASSIS

Valve Line-up: ECC85 ECH81, EF89, EABC80, EL84, EM81, EX80.

Three Waveband and Switched Gram positions. Med. 200-500 m. Long 1,900-2,000 m. VHF/FM 88-95 Mc/s. Philip's Continental Tuning insert with permeability tuning on FM and combined AM/FM IF transformers. 400 Kc/s and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction of a very high standard. Chassis size 13 1/2 x 6 1/2 in. Height 7 in. Edge illuminated glass dial 11 1/2 x 3 1/2 in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation.



Aligned and tested ready for use **£13.10.0** Carr. & ins. 5/-

Complete with 4 Knobs—walnut or ivory to choice.
Three ohm P.M. speaker only required. Recommended quality speakers.
8in. Goodmans special cone.....21/6 10in. Roia (Heavy Duty).....30/- Post & Pkg. 1/6.

ONLY A FEW ITEMS ARE LISTED FROM OUR COMPREHENSIVE STOCK
WRITE NOW FOR FULL BARGAIN LISTS, 3d.

RADIO COMPONENT SPECIALISTS

70 Brigstock Road, Thornton-
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Phone: THO 2188. Hours 9 a.m.—6 p.m. 1 p.m. Wed.
Open all day Saturday. By Thornton Heath Station.

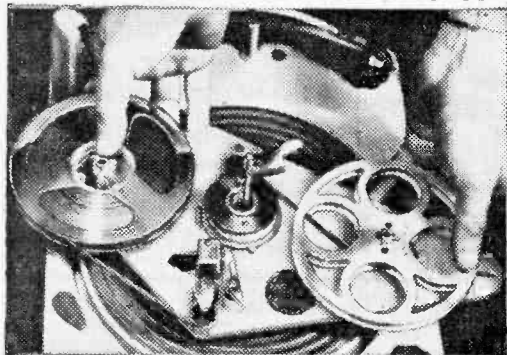
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to 1/2 lb. 7d.; 1lb.
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BRITISH INVENTION!**

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GRAMOPHONE TAPE RECORDER



**Turns any gramophone into
a superb TAPE RECORDER!
and back into a record-player in a moment!**

- ★ Plays at 7 $\frac{1}{2}$ per sec. or 3 other speeds.
- ★ Records direct from radio or microphone.

**Ready to record.
Complete with
600 ft. of twin-
track tape.**

11 Gns.

Special moving coil microphone extra.

EASY TERMS

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GRAMDECK TURNS A TURNTABLE INTO A TAPE-RECORDER

Gramdeck is an ingenious invention that instantly turns your gramophone into a tape-recorder and back into a gramophone at will! You simply slip it on to your turntable and you are ready to record direct-from-radio or microphone... the voices of your family... radio programmes... your favourite music—and you can instantly play it back through your own gramophone or radio with *Lifelike Fidelity*. Made by the people who make radar instruments for Viscounts and Britannias; the amazing Gramdeck now brings full tape-recording facilities to every gramophone owner at little extra cost.

As easy as putting on a Record

"Real hi-fi results." "Better than many so-called hi-fi recorders." These are typical comments of famous technical journals. Gramdeck enables any gramophone owner to add superbly good tape-recording facilities to existing equipment, at a fraction of the usual cost. Full details, photos, specifications, Easy Terms, etc., are given in the Gramdeck Book. Send for your FREE copy today.

UNIVERSAL AVOMETER MODEL D

Just released by the Air Ministry, these famous AC/DC Test Meters are a "snip" for anyone requiring a First Grade General Purpose Instrument, Normal Avometer size, 7 $\frac{1}{4}$ in. x 6 $\frac{1}{2}$ in. x 3 $\frac{1}{2}$ in., with carrying strap, indication being given on a 5in. Mirror Scale. Thoroughly overhauled and complete with batteries and instructions. Provides 34 ranges of current, voltage and resistance, as follows:

D.C. Voltage	A.C. Voltage	D.C. Current	A.C. Current
150 mv.	7.5 v.	15 ma.	75 ma.
300 mv.	15 v.	30 ma.	150 ma.
1.5 v.	75 v.	150 ma.	750 ma.
3 v.	150 v.	300 ma.	1.5 amp.
15 v.	300 v.	1.5 amp.	7.5 amps.
30 v.	600 v.	3 amps.	15 amps.
150 v.	750 v.	15 amps.	
300 v.	1,500 v.	30 amps.	
750 v.			Resistance
1,500 v.			1,000 ohms.
			10,000 ohms.

ONLY £8.19.8 (carriage 3/6)

SELECTEST TESTMETER D111. Manufactured by General Electric Co. and has exactly the same ranges as the Avometer Model D above, but has an even larger Mirror Scale. Size 9 x 7 x 5 $\frac{1}{2}$ ins., with carrying strap. Thoroughly overhauled and in perfect order, with batteries and instructions. A real "snip" while they last, at ONLY £7.10.0 (carriage 3/6).

RECEIVER R 107. A few more of these fine receivers. 9 valves, 3 wavebands, covering 1.2-17.0 Mc/s (18-250 metres), incorporating built-in speaker and 2 power packs for use on 100-250 volts A.C. and 12 volts D.C. In magnificent condition, the finest we have yet had. ONLY £15 (carriage £1).

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10- CONSTRUCTION PARCEL. 10 yards each of 6 colours wiring wire, solder, 24 each assorted Resistors and Condensers.

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Letters to the Editor

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

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of cover.

R1155

SIR,—Recently, I decided to fit an "S" meter on my R1155 as described in PRACTICAL WIRELESS. Instead of inserting it in the space vacated by the "magic-eye," I removed the two Jones plugs to the left of the power plug and found that the meter fitted perfectly. If one attempts to fit an "S" meter in this position, one should be careful not to sever the green L.T. lead to the "magic-eye" as this is a very short wire connecting the two 8-pin plugs. The 1k pot. for meter zeroing fitted in the space previously occupied by the "meter deflection" switch.

After reading the letter by J. M. Chesworth, of Cheshire (June issue), I think he summarises the advancement made in the design of radio parts very well indeed. I thought "magnificent probably meaning that they weighed about five pounds" was very amusing.

I should like to hear from any reader who has fitted a crash limiter stage to his R1155.—FRANK WOOD (S.W.L.) (5, Tonsway Avenue, Blackpool).

STEREOPHONIC SOUND

SIR,—I have just read the editorial comments in the June issue on the subject of stereophonic sound, and find that I am in complete agreement with them.

Recently I changed to stereo and the entire cost of conversion (my record player was a "portable" auto-changer type) was about £5. This figure includes the cost of the stereo cartridge and all components, with the exception of the mains transformer and a few others which were to hand.

The loudspeakers I use are both 7in. x 4in. types. One was in the record player and the other was bought for about 10/- from an advertiser in your journal. This second loudspeaker is fitted in an old portable radio cabinet and is placed on a chair when in use. Vibration was noticed here on some classical recordings, but some metal weights in the base of the cabinet cured the trouble at once.

The amplifier is the design published in the March, 1959, PRACTICAL WIRELESS with a simple tone control circuit added to each channel. This gives ample volume for an average room and the tone is most pleasing.

Balance control setting is by no means difficult and the position of the listener can be varied about a foot on each side of the correct position without noticeable change in stereo effect.

Finally, why trouble to build expensive hi-fi equipment when the acoustics of most rooms in a small house are really ghastly?—E. J. HILL (Coventry).

SIR,—I read your editorial, "The Rise and Fall of Stereo," with interest, as I have thought for a long time that stereo would never catch on with the general public. It can only be heard to advantage (over ordinary sound) by well-installed apparatus that may be "in the way" in the average home. Another point is that in this age of TV and "pop" tunes, music from records or radio is largely used as background sound—probably while doing jobs around the house. Under these conditions, stereo would be a waste of money. No, I'm afraid the only people who will miss stereo will be the manufacturers.—NOEL E. RICHINS (Derby).

ONE-VALVE CIRCUIT

SIR,—May I take this opportunity to inform Mr. W. H. M. Goodwin (May issue) that his one-valve circuit is not a "find". One similar to it, only using a 1T4 instead of 1L4, was described in an American magazine in 1954. Although very sensitive, it is prone to instability and "drift". It has been discarded now because equal results may be obtained with two or more valves, with much greater stability. I believe, however that it is still used in radio-controlled model aircraft, because it is sensitive and can be made small and light. However, as valves are becoming cheaper and better nowadays, it is just as easy to employ two valves, with the additional stability.—S. R. MALLISON (Nottingham).

SIR,—Seeing W. H. M. Goodwin's letter in the May issue, and having in my possession such a set as he describes, I would like to offer my views on the subject. I found this design in an old magazine and built it to see how it worked. I was really surprised by the results I obtained. The set was battery worked with a 2V triode and from the set I obtained from several stations clear loudspeaker results at good volume. I have for some time been interested in old circuits (owing to perhaps lack of money and therefore having to use old parts—mostly pre-war).

I think the main attraction of old equipment is purely psychological. The attraction in ebonite

panels, festooned with dials, brass terminals, switches, knobs, etc., is that you have plenty to twiddle, the more trouble you have in obtaining the station the better, the larger and more shiny the set the happier the owner, for we are all like magpies in some ways. The modern set is dull in comparison, you turn a knob and the station is there. Now there are no brass terminals, no ebonite dials, just a cabinet with a speaker grill and two knobs. How dull radio has become. I would like to thank the editor for producing such an excellent magazine packed with interesting articles.—M. HOLDEN (Horam).

CURING RADIO INTERFERENCE

SIR—With reference to Mr. A. E. Irwin's article, "Curing Radio Interference" (PRACTICAL WIRELESS, May, 1960), may I add a few comments?

From my experience, and also that of a G.P.O. Interference Investigation Officer, capacitor suppression of thermostats and household apparatus may well be effective at the lower broadcast frequencies but almost entirely ineffective at the higher frequencies of TV Bands I and III.

I have found that the fitting of the proper TV suppressor chokes to the offending equipment gives almost entire relief over both the broadcast bands and the TV bands. These chokes are cheap, easily obtained, and small enough to be fitted inside even the most compact equipment. They can be wired direct to motor brush terminals in series with the supply leads and insulated entirely, joint and all, inside a short length of Hüllerman sleeving. Admittedly, Mr. Irwin's article deals only with A.M. broadcast reception, but why not go the whole hog and keep both listeners and viewers happy? In addition, capacitors, even of the most reliable makes, can blow out and make a nasty mess of the innards of the equipment to which they are fitted.

Lastly, line whistle interference on 200kc/s can often be reduced, if not entirely eliminated, by re-orientating both the aerial and the down-lead to the radio.—K. J. WARREN (Kingsbridge).

DUAL-BAND T.R.F. TUNER UNIT

SIR—I constructed this unit recently, but substituted an EF80 valve for the 6BA6 recommended. With a B9A valve-base, a pair of short-wave coils, a 1k wire-wound potentiometer in place of the 30k potentiometer recommended, and an ex-Government crystal diode, the unit gave startling results.

Coupled to my 8W amplifier, several Dx stations were received; with medium and long wave coils in, the BBC transmissions gave very good reception with only a moderate aerial.

I should like to thank the author for such a satisfactory circuit.—R. HOUSE (Reading).

SINE WAVE OSCILLATOR

SIR—It seems that where transistors are concerned, everyone is aiming for higher and higher frequencies and there is never a mention of the very low frequencies.

I have been trying to obtain a sine or near sine wave oscillator operating at about 5c/s to 20c/s, but have not met with much luck in obtaining a good wave.

I would like to know if anyone has any ideas for such an oscillator, either valve or transistor, but preferably transistor.—C. F. BASHFORD (25, Hill Street, St. Albans, Herts.).

TRANSISTOR APPLICATIONS

SIR—Much seems to be made nowadays of the transistor and most of the shops and firms seem to specialise in the pocket type of set using these components. Whilst it is feasible to adapt them to small receivers I feel that there is a very much wider field available to us. Why cannot attention be turned to the design of power packs or power units to drive conventional receivers? Size is immaterial here, but the power section generates much heat and in many cases renders a really good receiver a rather awkward piece of furniture. If the boffins could make a unit which would deliver satisfactorily up to 300V at 90mA or so I am sure it would go a long way to reduce overall cabinet size and result in very much neater domestic receivers and I am sure would popularise the transistor, which now seems to be overplayed.—H. R. T. URWIN (Northampton).

LOUDSPEAKER DESIGN

SIR—Many complaints are made today about the stagnation which has set in in radio, and looking back through the years it appears that the main component which has not received any attention for some years is the loudspeaker. At one time every year saw some new idea applied to the loudspeaker. First it was the permanent magnet, then the cone design, and at one time there was introduced, I remember, a flat cone and a pleated paper cone. But today, apart from moulded fabric cones, no changes appear to have been introduced. Does this mean that we have reached finality in design? Can nothing be done to improve performance? This seems to me to be a confession of failure, for surely the movement of a cone cannot give us all frequencies, etc., and as most readers know, endeavours to improve the results are today directed to the enclosure in the speaker which has to be housed. In a modern hi-fi outfit this means a massive cabinet with three speakers taking up half a room, and a receiver with elaborate tone networks. What is the answer? — H. PICKERING (Torquay).

INFORMATION WANTED

SIR—My son, aged 14 years, has bought an A1134 two-valve amplifier unit, and has procured a circuit diagram, but has been unable to get any conversion data. Would some reader be kind enough to help? Any expenses will be met.—A. J. HOBBS (13, Elgin Road, East Croydon, Surrey).

SIR—I recently acquired a Hallicrafters "S20R" Sky Champion, but, unfortunately, it came without an instruction manual. Could any person who has this manual, or has any details concerning an "S" meter for the "S20R" lend it, or sell it to me, writing to the above address (postage will be paid).

Also I would like to correspond with any amateur of my age (16), who intends to take the R.A.E. in October.—R. LESTER (10, Southwood Avenue, Highgate, London, N.6).

RETURN-OF-POST SERVICE

GRAMOPHONE EQUIPMENT

ALL LATEST MODELS	Cash Price		Hire Purchase	
		Deposit	Mthly/Pmts.	
RECORD CHANGERS				
COLLARO Conquest (Studio O PU) ..	£7.18. 6	£1.12. 0	6	of £1.4.7
GARRARD RC210 (GC8 PU) ..	£9.18. 6	£1.18. 6	12	of 15/-
GARRARD RC88 (GC8 PU) ..	£16. 8. 0	£3. 6. 0	12	of £1.4.0
GARRARD RC96 (GC8 PU) ..	£18.12. 8	£3.15. 8	12	of £1.7.3
B.S.R. UA8 Monarch (TC8 PU) ..	£7. 5. 0	£1. 9. 0	6	of £1.2.8
B.S.R. UA14 Monarch (TC8 PU) ..	£8.18. 0	£1.15. 0	12	of 13/7
B.S.R. UA14 Monarch (TC8S Stereo/LP78) ..	£9.18. 0	£1.18. 0	12	of 15/-
SINGLE RECORD PLAYERS				
GARRARD TA (GC8 PU) ..	£8.10. 0	£1.14. 0	12	of 13/-
B.S.R. TU8 (TC8 PU) ..	£4.10. 0	£1. 5. 0	3	of £1.5.0
COLLARO RP584 (O, P or T PU) ..	£8.18.11	£1.15.11	12	of 13/7
COLLARO RP584 (O, P or T PU) ..	£9.18. 9	£1.18. 9	12	of 15/-
E.M.I. (Acos Stereo PU) ..	£6.15. 0	£1. 7. 0	12	of 10/8

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

AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 2 and 3 valve Pre-Amplifiers, GEC 912 Plus. Fully detailed list on any of these sent upon request. Instruction Manuals, Mullard, A. Mullard Audio Circuits in "Circuits for Audio Amplifiers", 9/5. GEC 912, 4/6. All post free.

ILLUSTRATED LISTS

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, RECORDING TAPES, GRAMOPHONE EQUIPMENT. Any will be sent free upon request.

JASON FM TUNER KITS

Three Jason F.M. Tuner kits with variable tuning are now available to the home constructor. Brief details are given here and our illustrated list is available free. **MOST IMPORTANT.** We take great pains to see that every item needed is included in our kits and also that all items are entirely suitable in every way. This should be borne in mind when comparing prices. Hire Purchase Terms are available on any kit. **INSTRUCTION MANUALS.** All our kits include the instruction manual, but this can be supplied separately if required. Data Publications booklet describing FMT1, 2, and 3. 2/10; J.T.V.2 3/10; Mercury 2, 3/10. All post free.

STANDARD TUNERS

FMT1. Supplied complete with a chassis-panel assembly fitted with a gold hammer finished panel and glass dial. Four EF91 valves are used and an external power supply is required. Complete kit £8.18.6. Power Pack Kit £2.1.0.

FMT2. This is a new version of the FMT1 and is supplied with a complete cabinet-chassis assembly which can be mounted in a cabinet or stood on a shelf. The circuit employs four EF90 valves and the power supply can be built into the cabinet if desired. Complete Kit less power supply £7.17.6. Kit with power supply £9.16.0.

FRINGE TUNER

FMT3. This is a fringe tuner using the same cabinet assembly as the FMT2 described above. The tuner is fitted with variable AFC and uses five EF90 and one EC81 valves. Kit less power supply £9.10.6. Kit with power supply £11.18.0.

F.M./TV SWITCHED TUNERS

Kits for two new Jason F.M./TV Sound switched tuners are now available. Both incorporate the latest "Fireball" Turret Tuner which gives switch positions for the three BBC Programmes as well as BBC and ITA TV Sound. A.F.C. is fitted to ensure freedom from drift. **JTV2.** This tuner is complete with power supply in a cabinet which can be used either for shelf or cabinet mounting. Complete kit £14.14.0.

MERCURY 2. This is similar to the JTV2 but has no provision for a power supply. It is mounted on a small chassis with printed front panel and is intended for cabinet fixing. Complete kit £10.10.0.

IMPORTANT. When ordering JTV2 and Mercury 2 kits it is essential to give the TV channels and F.M. stations required on the tuner.

COMPONENTS

List of component bargains free upon request.
COIL FORMERS. With screening cans. TV1: 14in high (Aladdin PP598, Neosid 5000A.). Can 44., Former 44d. TV2: 21in. high (Aladdin PP597, Neosid 5000B.). Can 54., Former 54d. Paroxin top plates for either former 14d. each. Dust cores 3d. each.
CONDENSERS. Silver mica. Latest manufacture. All 5%. 5pF, 15pF, 18pF, 22pF, 33pF, 39pF, 47pF, 56pF, 68pF, 82pF, 100pF, 120pF, 150pF, 180pF, 220pF, 270pF, 330pF, 390pF. All 9d. each. 7/6 doz. assorted.
 470pF, 500pF, 680pF, 820pF, 1,000pF, 1,200pF, 1,500pF. All 1/- each. 10/6 doz. assorted.
 1,800pF, 2,200pF, 3,300pF. All 1/3 each. 13/6 doz. assorted. 8,200pF, 2/6.
GROUP BOARDS. Bulgin. Miniature: C120 5 way, 1/3; C126 10 way, 2/3. Standard: C109 5 way, 2/3; C114 10 way, 4/-.
MAINS TRANSFORMERS. Elstone: MT912, 44/-. MT610 42/-. MT/MU, 45/-. Gilson: W0741AB, 83/-. Partridge: E300/110, 72/-.
OUTPUT TRANSFORMERS. Gilson: W0696A, W0696B, 50/6; W0710, W0710B, 55/6; W0692, 62/6; W0767, 27/-. Partridge: P0687, 52/6; P4014, 95/6; P4131, 60/-; P522, P5203, 95/-; P381A, 99/-. Parmeko: P2641, 27/-. Elstone: OT3, 25/-; OT/ML, 45/-; Ellison: OPT64, 20 watt push-pull multi-ratio, 31/6.
POTENTIOMETERS. Morganite: Small size, 50k, 100k, 250k, 500k, 1 meg., 2 meg. All LoF Law. All less switch, 5/- each. Radio spares: Standard size, 250k, 500k, 1 meg., 2 meg. All 1/6 each. All less switch, 3/6 each.
PLUGS AND SOCKETS. Bulgin: Mains connectors, 3 way, P73, 4/6; 2 way P74, 4/-. Standard Jack Plugs, P08, 3/-. Miniature Jack Plugs and Sockets, P523 Plug, 1/3; Socket J33, 9d.; P519 Plug, 2/6; Socket J30, 3/-. Igranite Jack Sockets, P71 Open circuit, 3/4; P72 Closed circuit, 3/10. Bellini-Lee Co.-s. L735 Plug socket, 1/-; L604S Surface socket, 1/2; L734P Plug X, 1/2.
SIGNAL LAMPS. Bulgin D180 Red, 2/-; 6.3v. lamps, 9d. STYL. ACPS for GP15, GP27, HGP35, HGP39, HGP41, HGP45, HGP57, HGP65, HGP68, HGP37, GP19, GP61. List price 6/8 each. Our price 4/- each. State LF or 7B when ordering.
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TAPE COMPONENTS. Denco WF1388 Oscillator Coil for Mullard Circuit, 22/6. Denco WF816 Treble inductor for Mullard Circuit, 29/6. Denco TD02 Coil for Collaro and Brenell decks, 5/-.
TRIMMERS. Mica 50pF, 1/-; 750pF, 2/-. Ceramic 2-10pF, 6d. each, 4/6 doz.
VALVE HOLDERS. B9A Moulded, without skirt, BM9/U, 9d. B9A Skirted, nylon loaded XM9/UCL, 1/6; 2in. Can, 9d. B9A Ceramic, 1/3 2in. Can, 9d. B9A Nylon loaded, flexible mounting, XM9/XUG1, 2/3. B9A Moulded, printed circuit type, 10d. each. B7G Moulded with 2in. can, 1/6 each.

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AVO Model 7 ..	£19.10. 0	£3.18. 0	12	of £1. 8. 8
AVO Model 7 with ..				
leather carrying case ..	£23. 8. 0	£4.12. 0	12	of £1.14. 6
AVO Multimeter with ..	£9.10. 0	£1.18. 0	12	of 14/4
AVO Multimeter with ..				
leather carrying case ..	£11. 9. 0	£2. 5. 0	12	of 17/-
TAYLOR Model 127A ..	£10. 0. 0	£2. 0. 0	12	of 15/-
CARY A-10 ..	£4.17. 6	£1. 7. 6	3	of £1. 6. 8
CARY B-20 ..	£6.10. 0	£2. 0. 0	3	of £1.13. 4

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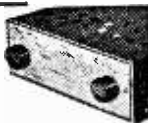
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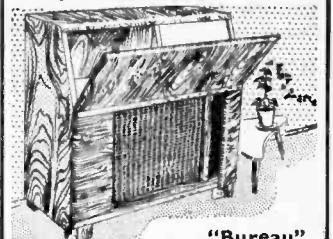
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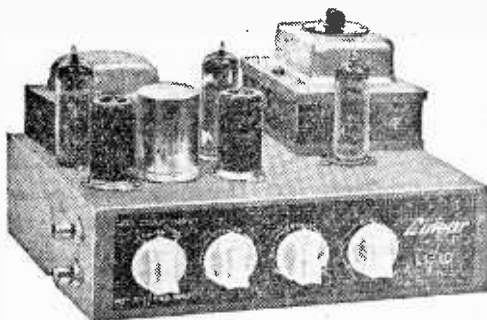
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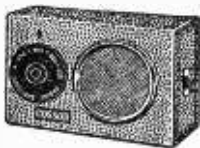
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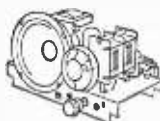
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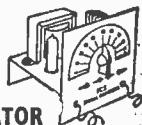
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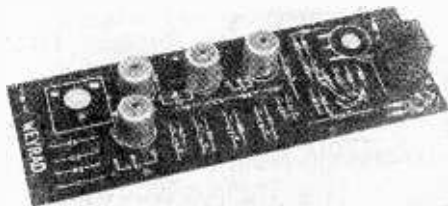
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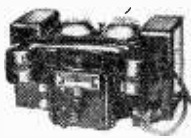
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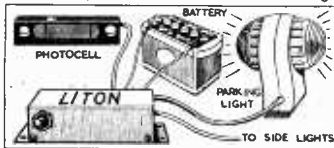
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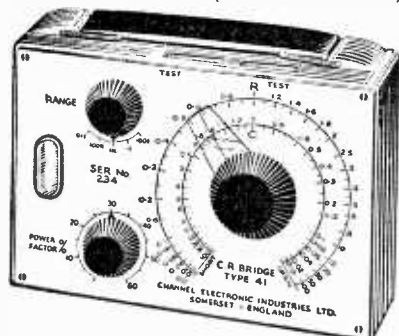
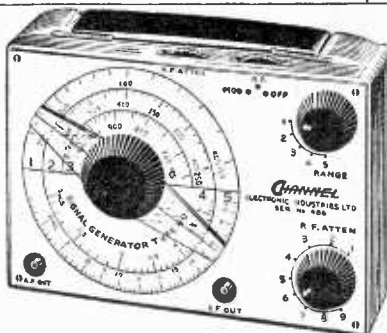
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TX1154 Model M complete with valves and meters, four wave band model. Clean condition, 16/-. Carr. 12/- B.R.S.

U.S.A. Tube Unit with a five inch 6CP1 tube short P. 10/-. Less valves. Carr. 8/6 B.R.S.

Tube Unit Type 116. Complete with VCR67 Seven EF50 valves in very good condition 25/- Carr. 7/6 B.R.S.

Special TV offer, fifty only. Ultra 14in. BBC—ITV, Models 815 and 915. Supplied in perfect working order. New regunned tube twelve months guarantee. Set and valves have a three months guarantee. Only £12.0.0. Carr. and Insurance 17/6. New tube is packed separate in its manufacturer's carton.

New Valves. All post free, three months guarantee. EF50 Red, 2/3; Standard, 1/9; EF91, 3/-; ELG1, 3/-; EB91, 3/-; 6J6, 3/6; 6C4, 2/6; 6AC7M, 2/9; 6AG5, 2/6; 6AK5, 3/-; 6H6, 1/6; 6K8, 4/-; 955, 2/6; 954, 1/9; VR130/30 4/6; U50, 5/-; KT63, 5/-; 12A6M, 4/-; U12, 5/-.

New Co-Axial Cable. Multi-strand, best make, 8d. per yd; 50 yds., 20/-; 100 yds. 37/- All post free.

P.M. 3 ohm Speakers. Rola, Celestian, Goodman, etc. Removed from TV sets. 7 x 4in., 10/-; 6in., 6/6. Post 2/6.

Yellow Spot Transistors, 2/9. Crystal diodes, 9d. Post 3d. each. Doz lots less 10 per cent. post free.

Valves Removed from TV Sets. All tested and are 100 per cent as new. 3 months guarantee and post free. U25, 5/-; U31, 5/-; V281, 5/-; UL41, 5/-; V52, 5/-; 6P25, 5/-; 6F15, 5/-; 6F13, 5/-; 6L18, 5/-; 6LD20, 5/-; 20P3, 5/-; 20L1, 5/-; 20P1, 5/-; 20P4, 5/-; 20D1, 5/-; 10P14, 5/-; 6SN7, 2/6; 6SL7, 3/3; P230, 5/4 and 5/6 at 5/- each. Many more types, send S.A.F. for list.

FREE LISTS
BY RETURN OF POST

VALVES, TUBES, MAINS TRANSFORMERS, QUARTZ CRYSTALS, METERS, TEST UNITS, TRANSISTORS, CHOKES, MINIATURE COMPONENTS, RECTIFIERS, CONTROLS, ETC.

UNBEATABLE VALVE PRICES!

ALL GUARANTEED: SEND FOR FREE COMPLETE LIST OF OVER 600 TYPES. INCLUDES TX, TUBES AND INDUSTRIAL UNITS

0A2 10/-	3V4 7/6	6C5 5/-	6SQ7 6/-	12SC7 6/-	83 10/-	DK92 7/6	KT66 12/6
0B2 10/-	5V4 10/-	6F6 7/6	6SR7 6/-	12SG7 6/-	807USA 7/6	DL91 7/-	KTW61 6/6
0Z4 5/-	5X4G 10/-	6F8 7/6	6SS7 6/-	12SH7 6/-	ACJSG 10/-	DL94 7/6	KTW63 5/-
1A5 5/-	5T4 10/-	6F12 5/-	6U4 12/6	12SI7 6/-	AC2PENDD 12/6	DM70 8/6	MVS PEN
1A7 12/6	5Y4G 10/-	6F32 7/6	6U7 5/-	12SK7 6/-	AC/PEN 10/-	EB91 5/-	MS PEN 10/-
1C5 10/-	5Z3 10/-	6F33 5/-	6V6G 8/6	12SQ7 8/6	AC/VP1 10/-	EB33 6/6	MU14 7/6
1H5 10/-	5Z4G 8/6	6J5M 5/-	6V6GT 7/6	14S7 14/-	AC/VP2 10/-	EF50 4/6	MX40 10/-
1L4 5/-	5Z4M 10/-	6J7M 7/6	6V6M 10/-	25A6 10/-	AR8 5/-	EL32 5/-	N14 10/-
1LD5 5/-	6A7 9/-	6K7G 5/-	6X4 6/-	25L6 10/-	AZ31 10/-	EL33 12/6	PEN4VA 10/-
1LN 5/-	6A88 10/-	6K7M 7/6	6X5GT 5/-	25Z4 9/-	CL33 12/6	EM34 7/6	PEN25 5/-
1N5 10/-	6AC7 5/-	6K8M 10/-	7A7 9/-	25Z5 9/-	CY1C 10/-	EM80 10/-	PEN46 5/-
1R5 7/-	6AG5 5/-	6L6M 10/-	7D5 10/-	25Z6GT 10/-	DAC32 10/-	EM81 10/-	PP36 10/-
1S4 7/-	6AK5 6/-	6Q7G 7/6	7D6 10/-	28D7 4/-	DF91 7/-	EM35 11/-	PX25 12/6
1S5 6/6	6AL5 5/-	6R7 6/-	7S7 9/-	35Z5 8/6	DCC90 9/-	FC4 10/-	QP21 5/-
1T4 6/-	6AM5 5/-	6SA7 6/-	7Y4 7/-	42 7/6	DHF1 7/-	FW4/800	QP25 6/6
3A4 7/-	6AM6 5/-	6SC7GT 7/6	9D6 5/-	43 10/-	DH63 7/6	GZ34 11/-	SP4 10/-
3A5 9/-	6BBG 4/6	6SG7 6/6	12AH7 6/-	50B5 10/-	DK32 12/6	HL23/DD	TD4 10/-
3D6 4/6	6BR7 12/6	6SH7 5/-	12AU6 9/-	50C5 10/-	DK40 10/-	KT33C 8/6	US0 6/-
3C4 7/6	6BW6 8/6	6SJ7 6/-	12BE6 9/-	75 10/-	DK91 7/-		UCH42 10/-
3Q5 9/-	6C4 5/-	6SK7 6/-	12J7 10/-	80 8/6			
3S4 7/-	6D6 6/6	6SL7 6/-	12K8 10/-	83V 10/-			

Special reductions for sets of valves. Send for free lists. P.P. 6d. per valve. Orders above £3 post free. C.O.D. or C.W.O.

TRANSISTORS

FREE COMPLETE LIST AND DATA ON REQUEST. FULLY GUARANTEED.

EDISWAN

XA131 250 Mc/s. Ideal for F.M.	35/- ea.
XC131 400mW Push-Pull Pairs	34/- pr.
XC101 325mW in Push-Pull	32/- pr.
XA104 6 Mc/s osc/mixer, R.F.	18/- ea.
XA103 4 Mc/s R.F., I.F. amp.	15/- ea.
XB102 Audio Output Driver	10/- ea.
XB102 Pairs, 250mW Output	20/- pr.
XA102 9 Mc/s osc/mixer, R.F.	26/- ea.
XA101 5 Mc/s, R.F., I.F., amp.	23/- ea.
XC131 Matched prs., 500mW	34/- pr.
XC141 Pair. Up to 12 watts P.P	30/- pr.
XC141 Power Output, 5 watt	30/- ea.

(Direct replacement for OC16)

SEMICONDUCTORS

SB078 20 Mc/s Short Wave, R.F.	10/- ea.
SB305 25 Mc/s Radio Control	15/- ea.
SB231 30 Mc/s Radio Control	22/6 ea.
SB231R 35 Mc/s, H.F. osc/mixer	30/- ea.

Above are direct equivalents of SB344; SB100; SB101, etc.

MULLARD

OC72 Power Driver	16/- ea.
OC45 6 Mc/s, R.F., I.F.	18/6 ea.
OC71 Audio Driver	10/- ea.
OC72 400mW Push-Pull Pairs	30/- pr.
OC170 70 Mc/s Short Wave	35/- ea.
OC139 N.P.N. 4 Mc/s	66/- ea.
OC140 N.P.N. 6 Mc/s	72/- ea.
OC16 Power Output 5 watt	54/- ea.
OC76 R.C. Switching	15/- ea.

SURPLUS

Red Spot Audio Driver	5/- ea.
White Spot R.F., I.F., amp.	7/6 ea.
Photo-Transistor (General)	10/- ea.

NEWMARKET

V15/10P Power Output, 2 watt	15/- ea.
V15/20P High Gain Power	39/- ea.
V15/10P Up to 10 watt pairs	30/- pr.
V15/201P Intermediate Power	25/- ea.
V30/30P High Gain Power	57/- ea.

Largest Range in the Country

WE ARE ABLE TO SUPPLY MOST OF THE COMPONENTS USED ON CIRCUITS PUBLISHED IN THIS AND OTHER MAGAZINES AND BOOKLETS. WHERE THE EXACT ITEM IS NOT AVAILABLE WE CAN RECOMMEND A SUITABLE SUBSTITUTE.

NEW—THE "BABY-SITTER"



All transistor baby alarm. A must for children of all ages. Highly sensitive, complete with microphone, battery, washable cabinet, with 5in. speaker. Built and ready for use. £5.10.0. P.P. 2/-.

Send for illustrated descriptive leaflet.

CRYSTAL MICROPHONES

ACOS 39-1, Stick microphone. Brand new. Unused. Includes detachable Stand and screened lead. 39/6, P.P. 1/6

ACOS 40, Hand or Desk microphone. Fold away Stand and screened lead, 25/-, P.P. 1/6.

SPECIAL OFFER— LIMITED PERIOD

THE TELETRON "TRANSIDYNE" 6-TRANSISTOR SUPERHET

- ★ Medium and Long Waves.
- ★ 2 1/2 in. Rola Speaker.
- ★ All Ediswan transistors.
- ★ Marked printed circuit.
- ★ Illustrated instructions.

Includes cabinet, batter, transistors, etc. FREE LEAFLET, BOOKLET 1/- Post Free NOW ONLY **£9.10.0** P.P. 2/-

TYPE 38 TRANSMITTER/RECEIVER

Complete with 5 valves. In new condition. These sets are sold without guarantee, but are serviceable.

7 to 9 Mc/s **22/6** P.P. 2/6

Headphones 7/6 pair. Junction Box 2/6. Throat Mike 4/6. Aerial Rod 2/6.

NEW! STEREO AMPLIFIER

- ★ 2 watts per Channel.
 - ★ ECC83: 2 x ECL82.
 - ★ Tone, balance and volume control.
 - ★ Mains operated, 110/250v. A.C.
- Can be used for Stereo or Ordinary Records at all speeds. Complete with all necessary items.

BUILT UP AND TESTED, £5.7.6 P.P. 2/6.

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14 Circuits for the Home Constructor, including date, prices and information. 1st Edition, 2/-, post free

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Complete with Valves, High Resistance Headphones Handmike and Instruction Book and circuit. Frequency Range 44.0 to 61 Mc/s. Range approximately 3 to 8 miles. Power requirements: Standard 120v. H.T. and 2v. L.T. Ideal for Civil Defence and communications.

BRAND NEW 45/- P.P. 5/-

44-61 Mc/s. Calibrated Wavemeter for same, 10/- extra. P.P. 2/-.

SPECIAL OFFER

MATCHED SET OF MULLARD, DRIVER AND OUTPUT TRANSISTORS

OC78D AND 2-OC78 37/6 P.P. 9d.

(WORTH £2.10.0)

HENRY'S (RADIO) LTD.

Opposite Edgware Road Tube Station, PADdington 1008/9.

5 HARROW ROAD, EDGWARE ROAD, PADDINGTON, LONDON W.2
OPEN MONDAY to SAT. 9-6. THURS. 1 o'clock.

SEE BACK PAGE

Practical Wireless

BLUEPRINT

SERVICE

ALL OF these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, an asterisk in the list below 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 appeared. Thus PW refers to PRACTICAL WIRELESS; AW to *Amateur Wireless* and WM 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.

SPECIAL NOTE

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Title	Number	Price	Title	Number	Price
CRYSTAL SETS					
Junior Crystal Set	PW94*	2/-	A.C. Fury Four	PW20*	2/6
Dual-wave Crystal Diode	PW95*	2/6	Experimenter's Short Wave	PW30a*	2/6
STRAIGHT SETS					
Battery Operated					
Modern One-valver	PW96*	2/6	Midget Short Wave Two	PW38a*	2/6
All-dry Three	PW97*	3/6	Band-Spread Three (Battery)	PW68*	2/6
Modern Two-valver	PW98*	3/6	Crystal Receiver	PW71*	2/-
SUPERHETS					
Mains Operated					
A.C. Band-pass Three	PW99*	4/-	Signet Two (Battery)	PW76*	2/6
A.C. Coronet-4	PW100*	4/-	Simple S.W. One-valver	PW88*	2/6
A.C./D.C. Coronet	PW101*	4/-	Pyramid One-valver	PW93*	2/6
MISCELLANEOUS					
The PW 3-speed Autogram	—*	8/-	BBC Special One-valver	AW387*	2/6
The PW Monophonic Electronic Organ	—	8/-	Short-Wave Two	AW429*	2/6
TELEVISION					
The PT Band III Converter	—*	1/6	Short-Wave World Beater	AW436*	3/6
TELEVISION					
			Standard Four Valve S.W.	WM383*	3/6
			Enthusiast's Power Amplifier	WM387*	3/6
			Standard Four Valve	WM391*	3/6
			Listener's 5-Watt Amplifier	WM392*	3/6
TELEVISION					
			Argus Television Receiver	—*	3/-
			Simplex Television Receiver	—*	3/6

QUERY COUPON

This coupon is available until 7th August, 1960 and must accompany all queries in accordance with the notice on our "Open to Discussion" page.

PRACTICAL WIRELESS, AUGUST, 1960

"CONTINENTAL-6" — Just right for a day's outing

COMBINED PORTABLE/CAR RADIO

- Medium and Long Wave Full Tuning
 Plessey Printed Circuit
 6 "TOP GRADE" EDISWAN TRANSISTORS
 ★ Sin. High Fidelity Speaker
 ★ 400mW Push-Pull Output
 ★ Internal Ferrite Aerial
 ★ Slow Motion Tuning
 ★ Full Instructions
 ★ Printed Circuit marked out
 ★ Car Radio aerial socket and A.V.C.
 ★ ALL COMPONENTS GUARANTEED
 ★ Double Tuned IFs
 ★ Size 9½ x 7 x 3½ ins. Weight 4lb.

SEND FOR NEW FREE ILLUSTRATED LEAFLET AND PRICES

CALL FOR DEMONSTRATION

Total Cost of all Components

£11.10.0 P.P. 3/6

including Cabinet, Battery, Transistors, Car Radio, AVC and all necessary items.

A highly sensitive and selective portable fully tunable on medium and long waves. Performs equally well as a car radio. Low running costs, good looks and ease of construction combine to produce a radio equal to commercial receivers in the 20 gns. class.

ALL COMPONENTS AVAILABLE SEPARATELY

Wherever you are

"First Class in every way"



CONTINENTAL AND LOCAL STATIONS AT YOUR FINGERTIPS

★ NO EXTERNAL AERIAL OR EARTH—NO REACTION CONTROLS ★

—EASY AS A B C TO BUILD AND A THRILL TO USE—

MAJOR—2 (Two-Transistor Pocket Radio)

IDEAL FOR BEGINNERS



All components sold separately

TOTAL COST **69/9** P.P. 1/6. NEW BOOKLET FREE

RECEPTION GUARANTEED ANYWHERE!

- ★ 4-stage reflex
- ★ Medium wave; tunable
- ★ Very sensitive
- ★ No aerial or earth
- ★ Complete layout
- ★ Over 6 months on one battery
- ★ 4½ x 3 x 1½ in.
- ★ Weight only 4 oz
- ★ Personal phone included

MAJOR—3 (Three-Transistor Pocket Radio)



(As described in R.C., Sept. '59)

TOTAL COST **87/6** P.P. 1/6. NEW BOOKLET FREE

FANTASTIC OUTPUT, TERRIFIC RECEPTION GUARANTEED ANYWHERE

- ★ 5-stage Reflex Circuit
- ★ No Aerial or Earth
- ★ Miniature Volume Control
- ★ 3 Ediswan Transistors
- ★ Medium Wave Tuning
- ★ Size 4½ x 3 x 1½ in.
- ★ Personal Phone included

★ ★ NOT TOYS BUT REAL WORKING RADIOS! ★ ★

Mercury Batteries

1.3 volt, 500 mA/H. Size ½ x ¾ in. 1/3 each, P.P. 3d. each, or 12/- dozen. P.P. 9d.

Crystal Microphones

ACOS 39-1 Stick Microphone with Stand (List 5 gns.). 39/6. P.P. 1/6.
 ACOS 40 Desk Microphone with built-in stand (List 50/-). 25/- P.P. 1/6.

PRICES DOWN

RED-SPOT TRANSISTORS

3/6 each

WHITE SPOT

5/- each

LATEST FREE LIST ON REQUEST

Fully Guaranteed

Telescopic Chrome Aerial

7-Sections, 3ft. 6in. open; 6in. closed. Ideal for Portable Receivers, Walkie-talkies, Radio Control, etc. With Clips 12/6. P.P. 1/-.
 New Type 64 inches open 15/- P.P. 1/-

Crystal Microphone Inserts

Latest ACOS 19-4, 2in. Round Hi-Fi Insert. 14/- P.P. 6d. ALSO: ACOS 6-9, 2in. round. 12/6 each. P.P. 6d. 2in. square (ex-units) 3/6 each. P.P. 6d.

3-TRANSISTOR HEARING AID

High-gain circuit with built-in crystal microphone and battery. Includes miniature earphone. Size 3 x 2 x ¾ in. All components. 89/6. P.P. 1/-.

2 WATT OUTPUT TRANSISTOR AMPLIFIER

For connection to any battery portable to give up to 2W output. Works from 12V battery. Ideal for car radio use. Size 4½ x 3 x 2½ in. uses power transistor. All components (less speaker), 52/6. P.P. 2/-.

TRANSISTOR TRANSMITTER

1.8 to 2 Mc/s coverage. 3 transistors unit size 4½ x 3 x 1½ in. Range of 3-section rod aerial up to 300 yards. Includes built-in microphone, battery and 3-section rod aerial. All components. 57/6. P.P. 1/6.

RF, IF AND AUDIO SIGNAL TRACER

Ideal signal peaker or quick fault-finder for receivers, amplifiers, etc. Size 4½ x 3 x 1½ in. All components, with 'phones, 37/6. P.P. 1/6. Less 'phones, 32/6. P.P. 1/6.

250mW PUSH-PULL OUTPUT AMPLIFIER

For use with any 2, 3 or 4 transistor, earpiece or headphone radio to give room-filling volume on 3in. speaker. All components including 2 Ediswan transistors, speaker, battery, special input socket to take earpiece plug, cabinet, etc., 59/6. P.P. 1/6. Ideal for use with Major-2 or Major-3.

27 Mc/s RADIO CONTROL RECEIVER

3-Transistor regen. circuit. Size 2 x 1½ x 1½ in. Weight with batteries. 1½ oz. Uses SB305 transistor. Multi-channel reed operated. All components (less reed) 50/- P.P. 1/-.

SEE OTHER ADVT. INSIDE

HENRY'S (RADIO) LTD.

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

← Opposite Edgware Road Tube Station. PADDington 1008/9 OPEN MON. to SAT. 9-6. THURSDAY 1 o'clock