

**THE
AUSTRALASIAN**

PRICE, 1/-

Registered at the G.P.O.,
Sydney, for transmission
by post as a periodical.

Radio World

VOL. 5 NO. 12

MAY 1941

**THE S.T.C. STAND AT DAVID JONES' "ROMANCE
OF RADIO EXHIBITION" See page 3**

**24-PAGE SECTION
FOR SERVICEMEN**

**ALL-WORLD TWO
FOR BATTERIES**

**SIMPLE AMPLIFIER
WITH EXPANSION**

**BUILD YOURSELF
A MULTI-METER**



... HOME CONSTRUCTORS

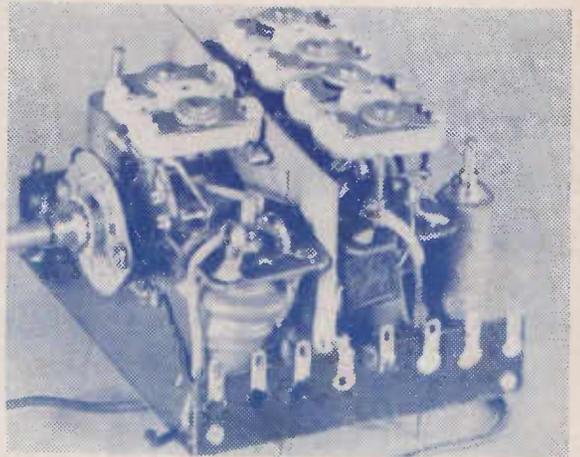
*Choose Crown
Coil Kits!*

- ★ Build the famous C.R.P.6 Receiver described on page 30 of this issue, and insist on "Crown" components. Coil Kit for this outstanding Receiver, "Crown" C.K.4, comprising —

1 x DP3/13-42 Unit	} Price	£4/17/-
1 x T31 Trol. 1 FT—1		
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Dial to suit "Crown"	} Price	£1/4/-
FD3B "H" Gang.		

- ★ Specify "Crown" Trolitul replacement parts for better profits and reliability in service.
- ★ The potential replacement and conversion market is continually increasing as receivers now in use grow older. Replacement of new large dials for old, and conversion to dual-wave tuning are two suggested means by which old customers may be retained and new prospects gained, pending the purchase of a new receiver.

It is confidently predicted that those Dealers and Resellers who familiarise themselves with "CROWN" products now, will be enabled to take full advantage of this trade movement and so enjoy a constant source of revenue the whole year round. If in doubt at any time regarding the suitability or practicability for a given purpose of any of our lines, please write us, when complete and prompt reply to your mail will be made.



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Crown



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The Australasian RADIO WORLD

Incorporating the
ALL-WAVE ALL-WORLD DX NEWS

Vol. 5 MAY, 1941 No. 12

CONTENTS:

CONSTRUCTIONAL —	
"All-World Two"	5
Code Oscillator for A.C.	9
Build a "Servi-Meter"	15
Crown "C.R.P." Six	30
"Porto-Gram" Amplifier	39
TECHNICAL —	
Simple Volume Expansion	10
Correct Field Excitation	36
SHORT-WAVE SECTION —	
Notes by L. J. Keast	42
Loggings of the Month	44
New Stations	44
New Schedules for London	47
SERVICEMEN'S SECTION —	
Build a "Servi-Meter"	15
Systematic Servicing	19
New Oscillograph by Paton	19
Vibrator High-tension Units	24
Valve Chart Available	28
Dealer Proposition	34
Correct Field Excitation	36
Alignment of Permatune Units	37
Trade Parade	49
SPEEDY QUERY SERVICE —	
Answers to Readers' Problems	50

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OUR FRONT COVER

Over 7,000 people visited Radio Hall at David Jones' George Street Store during the "Romance of Radio" Exhibition held last month.

Prominent among the leading radio manufacturers exhibiting was Standard Telephones and Cables Pty. Ltd., with the particularly attractive stand shown on this month's front cover.

The display featured a working display of actual radio component construction.

Many visitors stopped to watch the deft fingers of the girl operating the coil winding machine.

Other portions of the S.T.C. display, not included in our picture, featured a bridal effect, with the suggestion of an S.T.C. radio receiver as a wedding present.

The ULTIMATE in SUPER SENSITIVITY

RAYMART

CRAFT A CREED

SHORT-WAVE
GEAR

Acknowledged by leading engineers as the most efficient short-wave and ultra-short-wave equipment available. Scientific design, precision construction and completeness of range—these are three reasons why you should make RAYMART the standard equipment for your construction. Write for descriptive leaflet and price list.



RAYMART DIALS, TYPE TXD

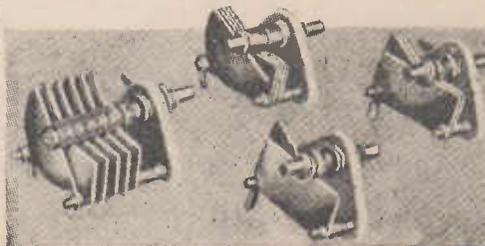
Individually spun, heavy, solid nickel dials with engraved, not etched, divisions and handsome knobs.

TXD, diameter 4 in. 12/9

TXJ, diameter 2½ in. 9/6



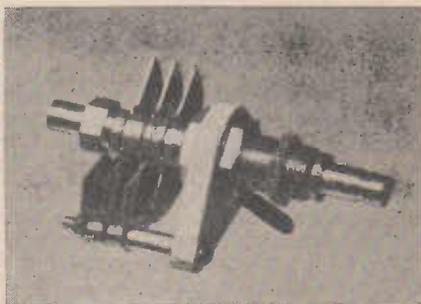
CERAMIC SHORT-WAVE MICRO-VARIABLES



For the "All-World Two" insist on RAYMART Midget Condensers.

"RMX" insulation ensures greatest efficiency at high frequencies, ball races are electrically shorted. COMPLETE RANGE AVAILABLE.

VC15X, 15 mmfd. List Price 6/9
VC40X, 40 mmfd. List Price 7/6



RAYMART TRIMMERS

Single-spaced condenser unit which may be dismantled and re-assembled with double-spaced spacing if required. Basic structure is of the single-ended type, with a triangular plate of "RMX" low-loss high-frequency ceramic as stator support and insulator. Single-hole mounting with the mounting boss acting as rotor spindle bushing.

Telegrams: "Jonmar," Sydney

Telephone: BW 3109 (3 lines)

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116-118 CLARENCE STREET, SYDNEY

**A CALL FROM
YOU BRINGS OUT
THE BEST IN US!**



The job of the stern-looking cove at the left is to make sure that each order to MARTIN DE LAUNAY'S leaves the place with the slickness of greased lightning. For the purpose of this illustration the staff wear anxious looks, although, really, they need not.

Martin de Launay's stock is so comprehensive that the filling of any order is only a matter of minutes. Even more important to you is the keenness of the pricing and the high quality of the products. These are features which only a big, highly-efficient organisation, such as MARTIN DE LAUNAY PTY. LTD., can offer you.

SYDNEY—corner Druiit and Clarence Streets—M 2691 (5 lines)
and at Newcastle and Wollongong

MARTIN DE LAUNAY'S
FOR EVERYTHING ELECTRICAL

PERSONAL

This issue should really be a special birthday issue, as it is just five years since that sunny day in May of 1936 when the first issue of the "Australasian Radio World" appeared.

Instead of putting our quota of paper to the glorification of the success which has been achieved, we offer something a lot more practical. It takes the shape of a special section for servicemen.

We feel, however, that the occasion does call for a little praise for those who have guided the destiny of the paper. Tribute must be paid to the policy which has been so steadfastly maintained. Suggestions for obtaining wider circulation by the introduction of extraneous articles of a "popular" nature have been repeatedly declined. Success is the practical proof that the radio trade and those interested in technical radio are pleased to maintain a magazine devoted exclusively to their interests.

Owing to this somewhat restricted editorial policy, it has taken time to attain our present circulation, but we are now quite confident that we have a complete coverage of radio enthusiasts, set-builders, factory technicians, country dealers and in fact all those interested in the technical side of radio throughout the whole of Australasia.

We also find that our Short-wave Section has a strong following among keen listeners who want authentic information. The number of copies being posted to various consulates and to foreign countries is indicative of the good work done by the original short-wave editor, Alan Graham, who is now abroad with the A.I.F., and our present short-wave editor, L. J. Keast.

It is interesting to note that in strong contrast to the advanced technical features in this issue, we also offer an article on a two-valve headphone set which is based on the design of a similar receiver which was featured in our original issue of May, 1936.

A. G. HULL

The ALL-WORLD TWO

Designed for headphone use and battery operation, this little set can be built either as an all-wave or for short-waves only.

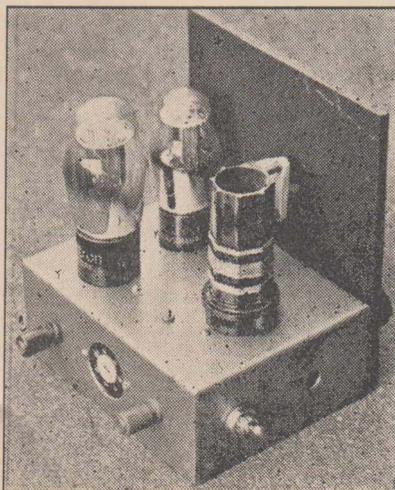
ASKED to name the most popular and successful receiver ever published in "Radio World," Earl Read, the founder of the paper, who has been closely associated with it since its inception, had no hesitation in naming the "All-World All-Wave Four," which was detailed in No. 1 of Volume No. 1, the first issue of "Radio World," published way back in 1936.

Thousands of these little sets have been built and have given wonderful service. We offer no apology for using the circuit as a foundation for a 1941 version.

Construction

It is a mistake to think that all the enjoyment in set-building lies in making elaborate six and seven-valve superheterodynes. The smallest set is just as fascinating to build, and there is always the added thrill of getting the utmost in results from the simplest and cheapest of equipment.

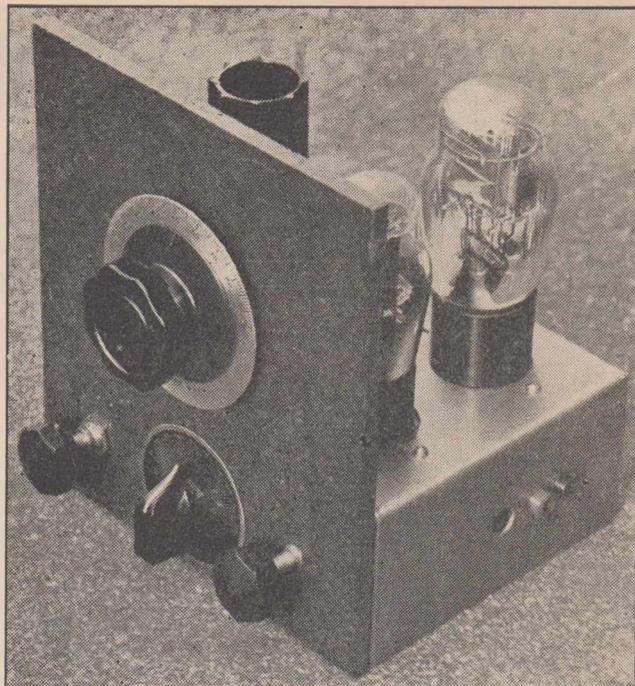
This little two-valver, for example, if built and handled correctly, will give consistent reception of short-wave stations in every continent of the world. New York, London, Paris, Berlin, Moscow — it brings them all in. Though headphones will generally



Rear view, showing layout.

★
A general view of the short-wave model.

★



be used, in good locations there will be enough volume from the powerful shortwave stations to operate a magnetic speaker.

How the Circuit Works

The "All-World Two" is an ideal set for beginners to build.

The circuit shows that a type 1J6G twin class "B" valve is used as combined detector and audio amplifier, a separate triode section being used for each purpose. There are really two separate valves housed inside the glass envelope of the 1J6G; in fact, in this circuit two separate triodes could be used instead.

Used in this way, the 1J6G works splendidly. The reaction control is velvet-smooth in operation — the detector sliding in and out of oscillation without a trace of "ploppiness" — while the amplification given by the second triode section provides a useful step-up to signals, which are still further amplified by the output pentode.

Short-wave Only

The "All-World Two" can be built in either of two versions. Using low-capacity tuning condensers, it makes a neat little job for short-waves only. Fitted with larger condensers, a full-scale dial and using the R.C.S. or Radiokes special coil kit made available for the purpose, it will tune over practically the whole of the short-wave band as well as the broadcast band in full. Our original chassis was built to take advantage of the highly-efficient Raymart short-wave components of which a limited stock

is still available. These imported short-wave components are beautifully finished and are most efficient. As will be seen from the photographs, they make the set look most attractive to the eye of the keen amateur experimenter.

For Broadcast

On the other hand, if coverage of the broadcast band is required, it is

"ALL-WORLD TWO"

Parts List

Short-wave Version

- 1—Steel base, 6" x 4½" x 2" (Areadian).
- 1—Masonite panel, 6½" x 6½" x ¼" (Price's Radio).
- 1—Suitable coil (R.C.S., Radiokes).
- 1—.0001 Band setting condenser (Raymart) (C2).
- 1—.0001 Reaction condenser (Raymart) (C1).
- 1—.000015 Band-spreading condenser (Raymart) (C3).
- 1—1 suitable dial (Raymart).
- 1—Indicator plate (Johnmar).
- 1—20 ohm rheostat (R.C.S., Radiokes).
- 2—.25 megohm 1 watt resistors (I.R.C.).
- 2—.5 megohm 1 watt resistors (I.R.C.).
- 2—.01 mfd. mica condensers (T.C.C.).
- 1—3 megohm 1 watt resistor (I.R.C.).
- 1—.0001 mfd. mica condenser (T.C.C.).
- 1—Radio frequency choke (R.C.S., Radiokes).
- 1—Switch, 2 banana sockets for 'phones, 2 octal sockets, 1 5-pin socket, 1 7-pin socket, 1 7-pin plug for batteries, 2 insulated terminals, knobs, wire, screws, sundry hardware, 1 pair headphones.

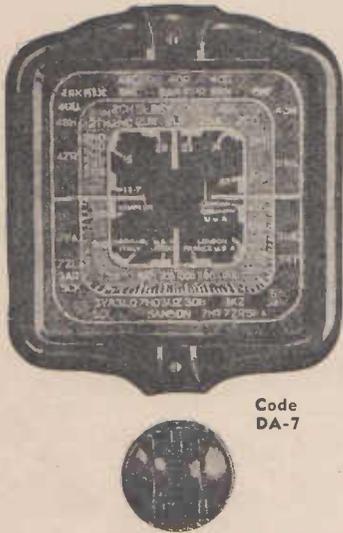
VALVES —

- 1—1J6G (Radiotron, Philips, Brimar, Mullard).
- 1—1L5G (Radiotron, Philips, Brimar, Mullard).

BATTERIES —

- 2—1½-volt "A" cells or 2-volt accumulator (Clyde, Exlde).
- 1—4½-volt "C" battery.
- 3—45-volt "B" batteries.

Insist on R.C.S. COIL KIT for the "ALL WORLD TWO"



Code DA-7

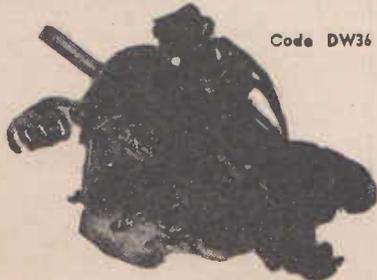
NEW R.C.S. DIAL

The new D.W. Portable Kit Dial, Code DA-7, has all parts supplied ready to assemble, and it has a glass scale with both B.C. and S.W. Bands clearly marked, finished in white with green background. The special walnut escutcheon is easy to fit and requires an aperture of 3" x 3". It is the only portable dial which can be edge-lit. Available for use with "H" type Gang Condenser on 1600 and 550 k.c. and 13.7 to 40 metres S.W. bands. Code DA-7 Price 9/-

R.C.S. D.W. UNIT

Type DW36, as illustrated, consists of Aerial and Oscillator Coils, Wave Change Switch, the necessary B.C. and S.W. Trimmers and Padder mounted together, wired up ready to assemble into a set utilising 465 k.c., the bands being S.W. 16 to 50 metres, and B.C. 1500 to 550 k.c. Code DW36 £17/7/6

Code DW36



R.C.S. Code DW35, as above, with R.F. Stage £37/6

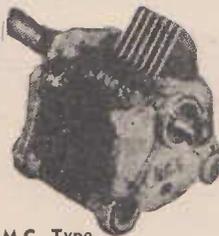
R.C.S. Coil Kit K178 for the set in this issue comprises —

- 1—Broadcast Band Coil
- 1—16 to 20 metre Coil
- 1—40 to 120 metre Coil

Originally developed by R.C.S., these "plug-in" coils have been produced by them to standards of maximum efficiency for several years. Hundreds of sets throughout Australia are operating at peak efficiency because these tried and tested R.C.S. coils are installed.

Specify R.C.S. Coil Kit K178 19/6
R.C.S. CV50 Tuning Condenser 9/-

R.C.S. TROLITUL MIDGET CONDENSERS



M.C. Type

The 14-plate equals old style 23-plate capacity. The M.C. type may be ganged.

R.C.S. Midget Condensers are made in two types, using Trolitul supports, thus guaranteeing practically no loss.

STAR AND M.C. MIDGETS

Max. Cap. mmfd.	Min. Cap. mmfd.	Plates	Star Cat. No.	Retail Price	M.C. Cat. No.	Retail Price
10	3	2	CV34	3/6	CV41	6/9
15	3	3	CV35	3/9	CV42	7/3
25	3.5	4	CV36	4/-	CV43	7/10
35	4	5	CV37	4/3	CV44	8/6
50	4	7	CV38	4/9	CV45	9/-
70	5	9	CV39	5/4	CV46	9/6
100	6	14	CV40	5/11	CV47	10/9

R.C.S. TUNED I.F.'s

The new R.C.S. permeability-tuned I.F.'s are wound on special Trolitul formers into which are inserted the adjustable iron cores. These R.C.S. permeability-tuned I.F.'s are the most dependable and efficient I.F.'s it is possible to produce. They should be used whenever the optimum in results is required.

465 K.C. I.F.'s

When two I.F.'s are used:
IF162 13/9
IF163 13/9

When three I.F.'s are used

IF164 13/9
IF164 13/9
IF163 13/9

Air Core 465 K.C.

IF107, 1st I.F. 7/6
IF108, 2nd I.F. 7/6

Air Core 175 K.C.

1E68, 1st I.F. 7/6
1E69, 2nd I.F. 7/6



IF162

R.C.S. TROLITUL BROADCAST COILS

These coils are available in both Air Core and Permeability-tuned types. The latter are adjusted to ensure maximum efficiency in our laboratories.

AIR CORE "H" GANG
E342 Aerial 6/6
E343 R.F. 6/6
E344 Os. 6/6

PERM. TUNED "H" GANG
E345 Aerial 8/6
E346 R.F. 8/6
E347 Osc. 8/6



T.R.F. TYPE-AIR CORE

T88 Aerial 6/6
T89 R.F. 6/6
T87 R.F. with reaction 6/6

OBTAINABLE FROM YOUR LOCAL DEALER

R. C. S.

RADIO Pty. Ltd.

50 GLEBE STREET, GLEBE

Telephone: MW 2405

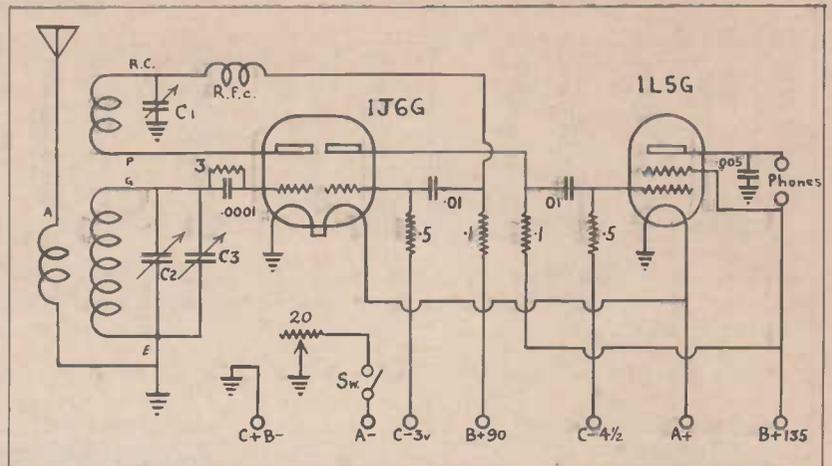
desirable to use a main band-setting condenser of much greater capacity, and a full-sized single-gang tuning condenser becomes necessary. The fundamental circuit remains the same, and the only alteration required is in the matter of the coils and the condenser.

As it happens, this also means a certain amount of alteration to the size of the base to accommodate the larger condenser. Another problem that arises is that the shaft of the bigger condensers is also bigger, so that a different type of dial becomes necessary.

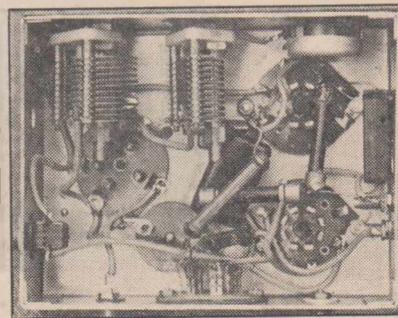
Band-spreading

The grid winding is tuned by two variable condensers in parallel. The two work together to give what is known as band-spread tuning. By its use, each waveband can be split up into small sections by means of the band-setting condenser, and then each section is covered by the small tuning condenser.

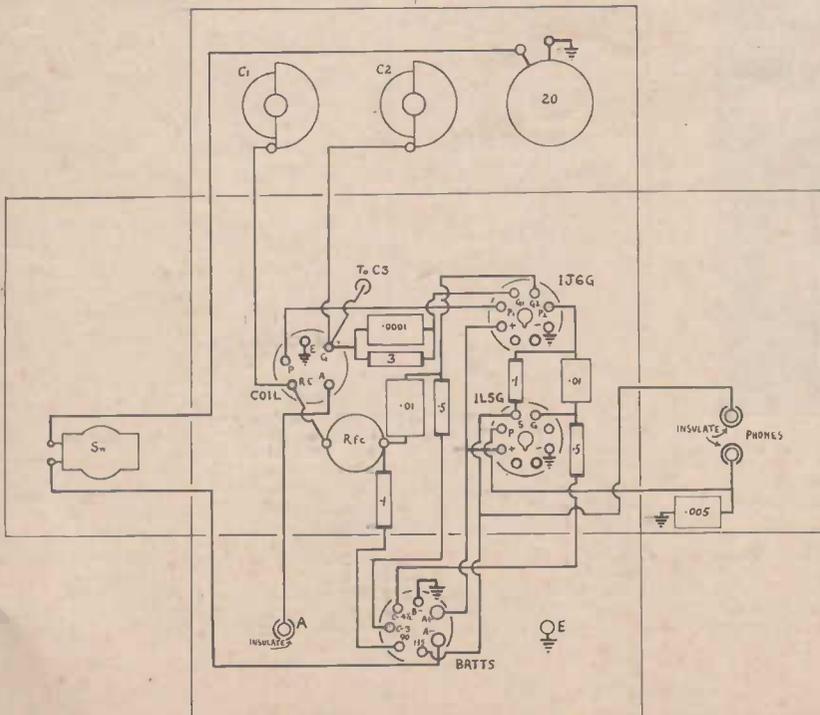
For example, if a station on about 31 metres is required, the band-setting condenser is adjusted to roughly 30 metres. Then the searching is done on the other dial, but, as the capacity of the condenser it controls is very small, only a few metres will be covered in one complete rotation from zero to full capacity. This means that stations that would occupy only a few dial divisions on a set without band-spread, in this receiver are spread nearly all over the dial. In this way tuning is not only made much easier, but more certain,



Circuit diagram, which is identical for both models.



Compare this photograph of the wiring with the picture diagram below.



too, for some bands are very congested, and stations in them are easily missed.

To tune continuously across a band, the band-setting pointer is advanced 20 to 25 degrees at a time, and the main tuning control is rotated from zero to maximum on each occasion.

The amount the band-setting condenser should be advanced each time depends on the capacity of the tuning condenser. To tune to the lowest wavelength given by any coil, both should be set with the moving vanes "full out." Now, to tune across the band, the smaller condenser should be slowly rotated until it is "full in."

To cover the next few metres without a break, the band-setting condenser should be adjusted, the tuning control returned to zero, and then slowly rotated again. The band-setter is now advanced to this capacity, the tuning dial set to zero again, and so on until the whole band is covered. (Actually there is no need to return the tuning dial to zero each time the band-setter is advanced, as searching for stations can be performed when the tuning control is moving in either direction. It should be mentioned also that the process is nothing like as laborious as it sounds. It has been explained in detail only because a full understanding of the tuning procedure is needed before the most can be obtained from any set.)

Leaky-grid Detection

A .0001 mfd. grid condenser and 3 megohm grid leak is used for the detector. The former value should be adhered to, but in some cases it might be found that a higher value of grid leak, up to 5 or 6 megohms, will give better results. A 3 megohm leak will, however, generally give smoothest reaction.

A reaction winding is connected in the plate circuit of the detector to

RADIOKES

Radiokes Coil Kit for the "All World Two" guarantees you best results because Radiokes perfected design and construction is superior to all others. The Radiokes Coil Kit consists of three plug-in coils.

Insist on Radiokes Coil Kit 1036 19/6 Radiokes Tuning Condenser, MCT50 9/-

Radiokes Intermediate Transformer



One-piece mechanically sound Trolitul formers and base—the highest standard I.F.'s available. A special feature is the round base, suitable for round or square cans.

Type	List Price
A.I.F. (Air Core)	7/6
I.I.F. (Iron Core)	11/-
P.I.F. (Perm.)	13/9

RADIOKES B.C. COIL

Trolitul rigid construction, available in air core and permeability types.

Type ACB, Aer., R.F. or Osc.
List Price 6/6

Radiokes Broadcast Coil



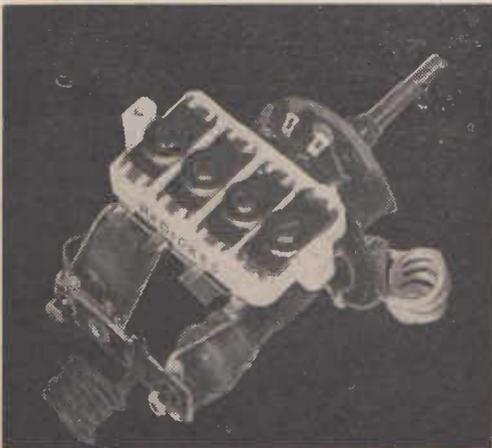
Type DWD-7

RADIOKES
"H" TYPE COILS
WILL TRACK
WITH
RADIOKES
"H" TYPE DIALS
ONLY.

RADIOKES DIAL DWD-7

- Dial shows broadcast and dual-wave stations clearly marked in white on green.
- This dial can be edge-lit!
- Neatly finished walnut escutcheon of attractive design.
- The aperture required for the dial is 3 in. x 3 in.
- For "H" Gang, B.C., 1600 to 550 k.c. and S.W. 13.7 to 40 metres.

Radiokes Dial, Type DWD-7 .. 9/-



RADIOKES D.W. UNIT

Highly-selective unit with exceptionally wide range. To match "H" type gang condenser. Incorporating 4-in-1 padder. Solidly mounted with coils.

List Price
Type DWU-1 27/6

RADIO SUPPLIERS PTY. LTD.
Sole Agents for Radiokes Products,
Wingello House, Angel Place, Sydney. 'Phone B 4586.
Radiokes can give you delivery from stock of any of the following Precision Products—

Audio Transformers	I.F. Transformers	Terminals
Audio Chokes	Line Filters	Trimmers
Bakelite Stampings	Laminations	Volume Controls
Coils of all types	Midget Condensers	"Trolitul" Mouldings
Coil Units	Power Chokes	Farmers, etc.
Dials	Solder Lugs	

If you have difficulty in obtaining immediate delivery of any Radiokes Products, let us have your name and address. We can arrange supplies. Our new Radiokes leaflet is available post free.

NAME
ADDRESS R.W., May

"ALL-WORLD TWO"

Ports List

All-wave Version

- 1—Steel base, 6" x 4½" x 2" (Arcadian).
- 1—Masonite panel, 6" x 6½" x ¾" (Price's Radio).
- 1—Suitable coil kit (R.C.S., Radiokes, type K48).
- 1—Band-setting condenser (R.C.S., type CV50).
- 1—.0001 mfd. reaction condenser (R.C.S., Radiokes).
- 1—.00015 mfd. band-spreading condenser (R.C.S., Radiokes).
- 1—Suitable dial (R.C.S., Radiokes).
- 1—Indicator plate (Johnmar).
- 1—20 ohm rheostat (R.C.S., Radiokes).
- 2—.25 megohm 1 watt resistors (I.R.C.).
- 2—.5 megohm 1 watt resistors (I.R.C.).
- 2—.01 mfd. mica condensers (T.C.C.).
- 1—3 megohm 1 watt resistor (I.R.C.).
- 1—.0001 mfd. mica condenser (T.C.C.).
- 1—Radio frequency choke (R.C.S., Radiokes).
- 1—Switch, 2 banana sockets for 'phones, 2 octal sockets, 1 5-pin socket, 1 7-pin socket, 1 7-pin plug for batteries, 2 insulated terminals, knobs, wire, screws, sundry hardware, 1 pair headphones.

VALVES—

- 1—1J6G (Radiotron, Philips, Brimar, Mullard).
- 1—1L5G (Radiotron, Philips, Brimar, Mullard).

BATTERIES—

- 2—1-volt "A" cells or 2-volt accumulator (Clyde, Exide).
- 1—4½-volt "C" battery.
- 3—45-volt "B" batteries.

feed back to the grid winding a portion of the r.f. energy appearing in the plate circuit. Properly controlled, reaction gives an enormous increase in sensitivity, and improves selectivity, too.

In this set feed-back is controlled by a midget reaction condenser, a very popular method which always gives good results.

About the Batteries

Three different kinds of batteries are required: an "A" battery to supply 2 volts for the valve filaments, "B" batteries to supply the plates, and a "C" battery to put a negative bias on the grids of the audio section and output pentode.

An accumulator is preferable for "A" supply, as it is less expensive in the long run, but instead two 1½-volt dry cells connected in series (or four in series-parallel for more economical operation) can be used.

If an accumulator is chosen, one with a capacity of 60 ampere hours or more should be obtained, to avoid the need for constant re-charging. If dry cells are used, then a resistance must be included in circuit to break down the voltage from three to two. A rheostat has been incorporated for this purpose.

Some Operating Hints

After everything has been given a final check, plug in the valves, coil and the headphones, connect up the aerial and earth leads, and finally the battery plug. Switch on, and ad-

just the rheostat until two volts are applied to the filaments.

Next set the aerial pre-set condenser about half-way out and slowly advance the reaction control. A hissing sound will be heard, followed by a soft "plop," indicating that the set is oscillating. The control should then be slackened off a trifle, and the tuning dial rotated to pick up stations.

The set should never be allowed to oscillate, because in this condition it will create interference with the reception of nearby listeners. Besides, it is never in its most sensitive condition when actually oscillating; for best results, it should be just on the verge of oscillation.

A good idea is to try the set out late at night, or at some time during the day when comparatively few people are listening-in. In this way,

you will get the "feel" of the set without annoying anybody.

A Good Aerial Is Essential

For a small set like this, a good aerial and earth system is essential for best results. The aerial should not be longer than 65 or 70 feet, and if possible should be 30 to 35 feet high, unshielded by trees or buildings, and well insulated from the far end right to the aerial terminal of the set.

The earth lead should be short, direct, of fairly heavy gauge wire, and well soldered to a metal pipe or other metal object driven deep into permanently moist earth.

If a good earth cannot be obtained, then it will probably be found that the set will perform better without an earth at all, particularly on the short waves.

CODE OSCILLATOR FOR A.C.

By L. J. ALEXANDER

I WOULD like to say that I think "Radio World" ranks high among radio magazines, but I think it should do more to encourage set-builders to learn something about radio besides soldering together a kit of components. Surely there is, for instance, no need for the two photographs on page 25 of the March issue; one ought to be quite enough, even for first triers; if it is not, they ought to have sufficient interest in radio to find things out and to think for themselves.

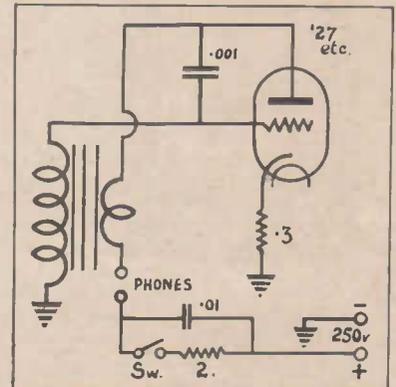
Surely, too, there is no need for a circuit diagram, a picture diagram and an under-chassis photograph. I consider that a picture diagram is quite unnecessary even for a person of normally sub-normal intelligence.

There is to-day far too much "spoon-feeding" being done, which results in so many boys obtaining dead-end jobs in radio factories. Parents are led to believe that their sons are "good at wireless," when actually they are not the least adapted for it and can only look at pictures in a magazine.

Cheap To Build

I am enclosing some data on my code practice oscillator which I think should be of interest to those not able to spend £4/10/- on the job now featured.

The circuit gives a T9 note, with no sign of "key clicks" or chirp, strong enough to drive two pairs of 'phones. This output is easily increased with a .5 meg. potentiometer in the cathode



circuit, but at the same time the pitch of the note drops.

The constants shown allow of 100 microamps plate current.

Valves type 27, 55, 56, 75, 76 were found to perform identically, and, no doubt, other types such as directly-heated triodes will also give satisfactory performance. In view of the cheapness of a 27, the complete unit should easily be built for 15/- at the very outside. Mine, assembled from junk, cost me nothing. It is in a sheet metal case 5½" x 4" x 2½," and is plugged in to our household receiver for its voltages by means of a length of four-way flex. The 2 megohm resistance placed as shown renders it impossible to get a shock off the key or 'phone terminals if plugging them in while voltages are on.

Hoping my letter is of use.—Yours, etc.,

LEN J. ALEXANDER.

21 Cheltenham Road,
Cheltenham, N.S.W.

VOLUME EXPANSION

By C. PARRY, A.M.I.R.E. (Developmental Engineer)

EXPERIMENTS on the audio-acoustic part of radio apparatus is always fascinating, probably because, after all, it is what we ultimately hear that counts.

With all the circuits and data formulated to enable "pleasant hearing" to be possible, attention turns from time to time to volume expansion.

Many circuits have been published on this, but unless such schemes may be simplified they are only likely to appeal to a competent technician.

However, there is a simple and effective method, but, as in common with many "simple" schemes, there are quite a number of complex facts to be considered. Unless this is done, the value is lost, due to inefficiency, and we might as well not start at all.

In order to develop our simple circuit effectively, let us consider very briefly all the facts.

Reason

If we consider the overall characteristics of, say, a recording, to its ultimate presentation at a receiver, we realise that control operators not only cut down large signals to prevent overcutting and the like, but also raise the level of low passages to overcome surface noises. This attenuating is also a variable factor depending on the operator and the conditions of initial presentation.

The output v. input curve will therefore look somewhat like that in Fig. 1A.

Obviously, to give the same volume range as the initial item, we must have a varying amplification in our receiver, with a compensatory curve as in Fig. 1C.

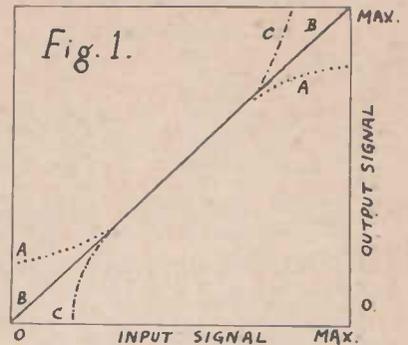
Thus, it is not only necessary to increase strong signals, but also to decrease weak ones — a fact little appreciated in expansion systems, mainly due to technical difficulties.

Also, any electrically automatic expansion has a constant amount of expansion, whereas the amount of compression is a widely varying factor.

It is evident that at best our attempt at expansion will be quite inadequate theoretically. Nevertheless, if we take other factors into account, a false illusion will be created, which has quite a pleasant psychological effect, and, although the expansion may be imperfect, the aural effect will be quite desirable.

Considerations

A few more points must be considered. Firstly, the overall frequency response should be fairly flat. This is because if any frequency obtrudes, then, of course, expansion occurs here before the rest of the spectrum and consequently severe overload or distortion may result over



those frequencies which are amplified more than the rest of the band covered.

This is important in the light of later statements. It does not mean, either, that the response of the audio section of the receiver should be "flat." In order to compensate for various losses and so on, both the low and high frequencies should be "up" several Db. above the level of 400 cycles.

Unless this is done, the full perception of symphonic variation possible with the aid of expansion is quite lost.

The rate of expansion or the delay in action is very important. If we had electrically-controlled transmission we could easily devise suitable expansion. As transmission is, unfortunately, manually controlled, a compromise must be struck.

It is fortunate, too, that the delay in heating of a normal "pilot light" is sufficient to be suitable for use in

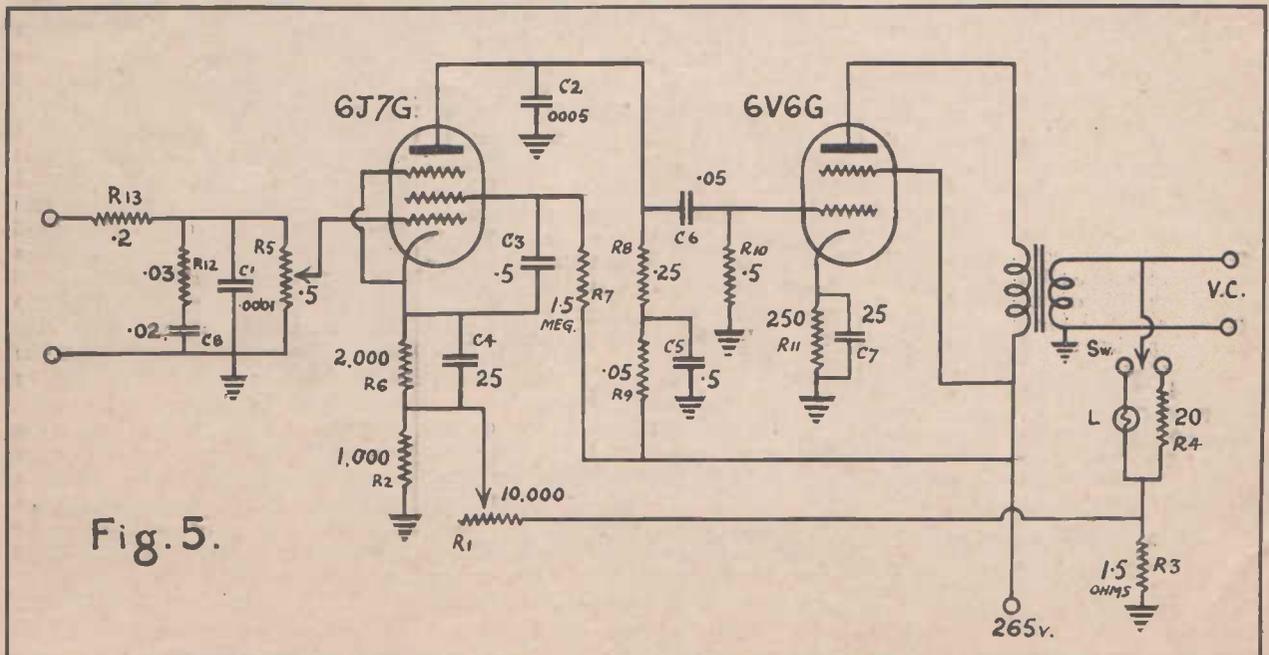


Fig. 5.

such circuits. Space, however, does not permit discussion of this very interesting aspect of expansion.

Balanced Tone

Another important point to consider is that actually the low level passages will be much lower than normal. To create a "balanced" tone it is important that relative frequency levels should not be distorted by the ear. Therefore, we must consider what the level is, to what it would be without expansion, find out the relative sensitivity of the ear at these levels, and produce some type of automatic compensation to work at low levels—otherwise the "silent" passages are faintly, but surely reminiscent of a tin of nails . . .

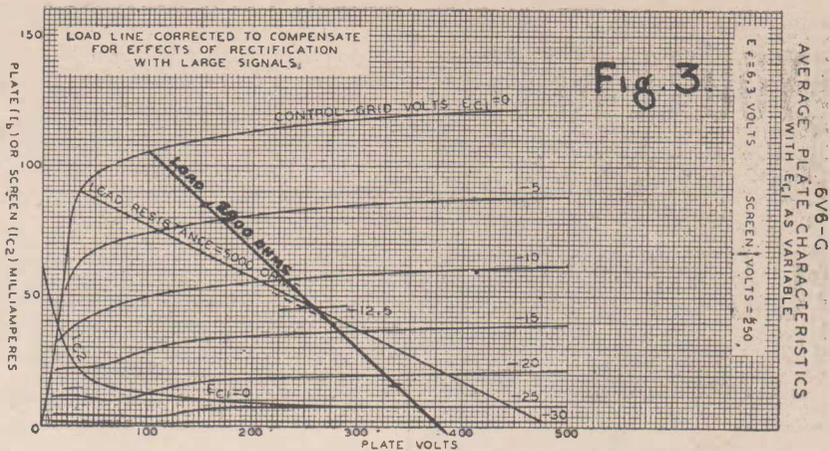
A number of experiments have shown that, to be perceptible, there should be at least 8 Db. expansion with conventional systems.

At full volume, too, the distortion must be low. This is because loud passages are emphasised so much that any distortion is painfully evident. At no time should this be more than about 3% — at least, so it seems from our experiments. Therefore, no simple type of expansion should be used unless possible distortion is minimised by inverse feedback, or other suitable means.

Naturally, a drop in maximum output is likely to result. The more important consideration is that the average level of sound will be considerably lower than normal if distortion on loud passages is to be prevented. Failure to recognise this has killed more than one circuit.

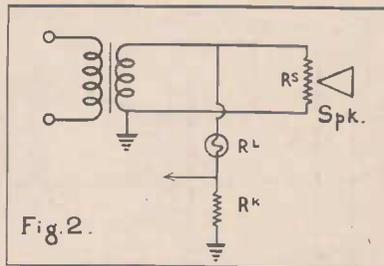
Actually, for proper perception of volume levels, an amplifier having a power capability of about 15 watts or more is necessary.

The fact that the average level is



down also means the ear's discrimination must be studied, so that more low frequency amplification than high is realised. Referring back, it is realised that this may cause unwanted distortion unless this compensation is automatically removed when the volume rises.

This is difficult to achieve practic-



ally, but is important to understand, so that too much will not be expected of the system used.

Now, let us consider these facts and develop the simple circuit of Fig. 2.

To use conventional arrangements, a simple amplifier and the popular 6V6G valve will be used. This has been chosen because of the increasing use of pentode amplifiers. For those with triodes, slightly different calculations would have to be used.

After a number of selections, we obtained a lamp of 1.5 ohms cold resistance and 21 ohms hot resistance. We have taken a 2.8 ohm voice coil, and used a 1.5 ohm resistance in series with the lamp.

Transformer Effects

Now, the primary load should be 5000 ohms under normal conditions. At full output the secondary resistance is:—

$$\frac{(R_L + R_k) R_s}{R_L + R_k + R_s} = 2.40 \text{ ohms}$$

since $R_L = 21$ ohms under these conditions.

Now, if we get a transformer to suit a 2.8 ohm voice coil, obviously

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(since the load is lower) the transformer should suit a higher load. If R_p is the primary load and T the transformation ratio, then:—

$$\frac{R_p}{2.8} = \frac{T^2}{2.8} = \frac{5000}{2.8}$$

But if the transformer is to match 5000 ohms to 2.4 ohms, then the ratio is:—

$$\frac{5000}{2.4}$$

Then this same transformer used on the speaker alone will give a primary load of—

$$\frac{5000}{2.4} = \frac{\text{New primary}}{2.8} = 5600 \text{ ohms}$$

This is our first step. If the normal transformer is used, the reflected load is—

$$T^2 \times 2.4 = \frac{5000 \times 2.4}{2.8} = 4200 \text{ ohms}$$

which means that new operating conditions must be selected for the valve. Now, the cold load given by the

When cold, this becomes $\frac{1.45}{2.8}$
Therefore, the drop in volume causes a loss of power = $\frac{2.4}{1.45}$ times

in the speaker alone.
This is equivalent to a loss in amplification (voltage) of $\left(\frac{2.4}{1.45}\right)^{\frac{1}{2}}$ times.

Now consider the simple feedback arrangement of Fig. 4—

$E_s = a E_g$
where a is the overall amplification of the amplifier. Also:

$$\begin{aligned} E &= E_g + E_k \\ &= E_g + K B E_s \\ &= E_g (1 + K B a) \dots\dots\dots 1 \\ K &= \frac{R_2}{R_1 + R_2} \text{ and } B = \frac{R_L + R_k}{R_L + R_k} \end{aligned}$$

Now, the only factor causing variation is R_L , or the factor B , which is known at its maximum and minimum values.

If B_1 is a "hot" value of (.065) and

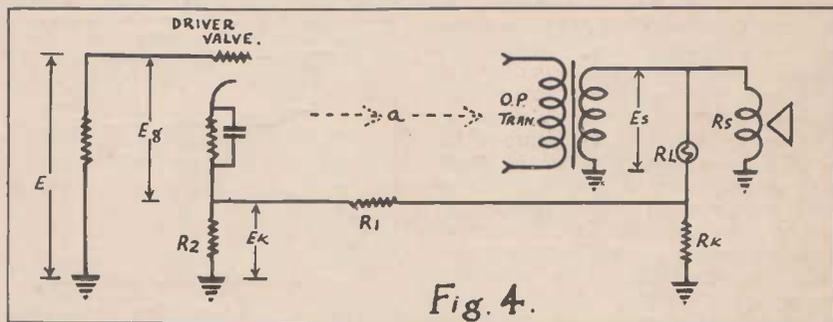


Fig. 4.

above formula is 1.45 ohms, and, using our 5600-ohm transformer, this gives a primary load of 2900 ohms.

This load is drawn on the valve characteristics as shown in Fig. 3. We must now determine the distortion from this load. On using the usual procedure, this is found to be about 12%. In order, then, that distortion at no time be greater than 3%, the feedback factor must be at least 4, when the lamp is cold. This is necessary, because full output may be reached without giving the lamp time to heat up.

Amount of Expansion

Consider a certain power in the secondary transformer circuit. Then the dissipation in the speaker is given by:

$$\text{Power} \times \frac{R_t}{R_s}$$

where R_t is the total parallel resistance.

Thus, when the lamp is hot this is approximately:

$$\frac{2.4}{2.8}$$

B_2 the "cold" value of ($\frac{1}{2}$), then, using the previous formulae, we may show that the ratio of the two output voltages for B_1 and B_2 is given simply by:

$$\frac{1 + K B_2 a}{1 + K B_1 a} = R$$

i.e., $K a (B_2 - B_1) = R - 1$.

Now, R should represent a total variation of at least 4, as already determined. It must also take into account the gain variation due to the varying power absorbed by the speaker; that is, the total value of R is actually greater than the required feedback factor of 4 by the value—

$$\left(\frac{2.4}{1.45}\right)^{\frac{1}{2}}$$

In order to solve for K , however, we may use $R = 4$, so that:

$$K = \frac{3}{a(.5 - .26)} = \frac{3}{12.5} = \frac{3}{a}$$

Using an amplifier system as in Fig. 5, we deduce from normal

YOU DON'T SEE THE BUTCHER for APPENDICITIS

Certainly not. You want the best specialist in town, and in a hurry. In much the same way the radio serviceman who knows refuses to replace worn-out valves in a sick radio with "bargain" valves of unknown make. Expert radio technicians the world over know that the best are no dearer . . . that Brimar British-made valves as used in the radio equipment of the "Queen Mary" and "Queen Elizabeth" are the best possible selection for any radio.



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Victoria: Naves Bros. (Melbourne) Ltd., 597-603 Lonsdale St., Melbourne. Standard Telephones & Cables Pty. Ltd., Baurke Street, Melbourne.

Western Australia: M. J. Bateman Ltd., Milligan Street, Perth.

Tasmania: W. & G. Genders Pty. Ltd., 69 Liverpool Street, Hobart, and 53 Cameron Street, Launceston.

South Australia: Radio Wholesalers Ltd., 31 Rundle Street, Adelaide.

New Zealand: Standard Telephones & Cables Pty. Ltd., Trajan House, Manners Street, Wellington.

methods of computation that $a = 40$,

$$K \text{ then } = \frac{12.5}{40} = .31.$$

An amplifier with fairly high amplification is required to take care of the loss incurred by expansion circuits. Should a type 75 be used as driver valve (or something equivalent), then, naturally, K will be correspondingly larger.

Other Details

We must now consider the "minimum" volume effect should we use a valve combination in which detection and amplification are combined in one tube. This is due to the unbypassed section of the cathode resistor, which should not exceed about 1000 ohms for satisfactory results.

Then, using the formula given for K, we obtain:

$$\frac{R_2 - .31 R_2}{.31} = R_1$$

i.e., $R_1 = 2300$ ohms.
 which may, for practical purposes, be

For details of an amplifier using this circuit for volume expansion, see page 39.

equal to 2000 ohms and which sets a limit to the maximum value of R_1 .

The total gain variation is now:

$$4 \times \left(\frac{2.4}{1.45} \right)^{1/2} = 14 \text{ Db}$$

This may seem too great in actual

practice, but is actually less for the simple reason that the lamp rarely has enough power dissipated in it to light freely, so that the amount of expansion is normally somewhat less.

We must now consider the ear at the volumes encountered. Let us suppose the balance is pleasing at high volumes, between low and high frequencies.

By considering the speaker efficiency at maximum dissipation (about 3 watts) and the loss of amplification at low volumes, we are able to deduce from normal "ear sensitivity" curves that the response (at low frequencies 100 cycles and less), should be twice as great as it is at frequencies above 1000 cycles.

(Continued on page 48)

MULLARD "65" IS GRAND PROPOSITION

A set review by
A. G. HULL

USUALLY it is found that there is a close relation between the price of a receiver, the number of valves used, and the performance achieved.

A most definite exception to this rule recently came to our notice in the form of the new Mullard model 65.

Without mentioning names, a close acquaintance, who is famous for his knowledge of short-wave reception, happened to tell us that this little 3/4 valve mantel model could hold its own with any of the 4/5 models.

Such an extraordinary statement from a conservative source called for closer investigation. So we made a point of obtaining one of these Model 65 Mullards and put it through its paces.

Once over the dial was enough to confirm the opinion that this little set has the most remarkable knack of bringing in distant stations with ease. On the broadcast band the general noise level of atmospherics and man-made static was the only limitation to distance. On the short-waves the weaker overseas stations came through with a clarity which could only be classed as uncanny.

We would hardly go so far as to say that the Model 65 will outperform

SPECIFICATIONS

Brand: Mullard.

Model: No. 65.

Type: Dual-waver for A.C.

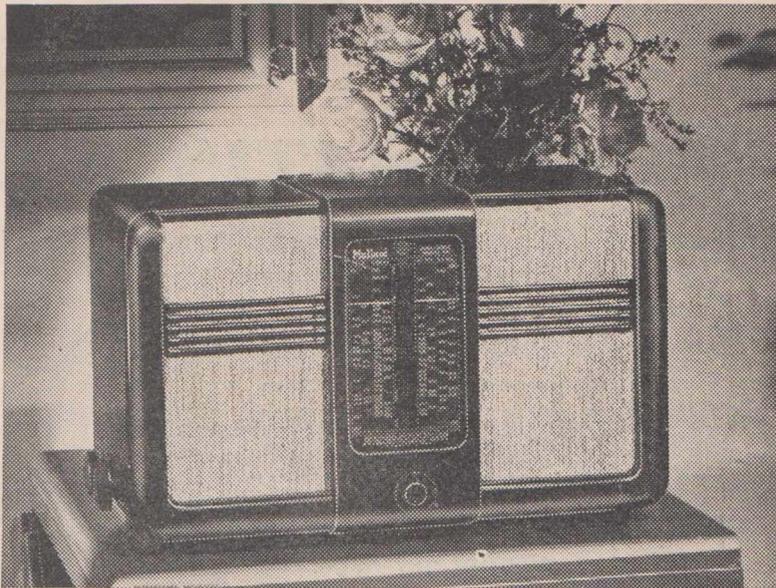
Coverage: S.W., 16-50 metres;
B.C., 540-1600 k.c.

Price: £17/19/6.

A companion model is the model 66 for battery operation, priced at £25/17/6.

each and every 4/5 valve receiver on the market. Certainly the bigger models in the Mullard range have greater power. We would put it, quite definitely, that this Mullard job can hold its own with the average receiver using an extra valve. We would also say that on the short-waves it will play any station which can be played on any ordinary 4/5 valve receiver.

The price of the Mullard Model 65 is in keeping with the modest number of valves used, so that the nett result



A photograph of the Mullard "65," showing the attractive appearance of the moulded cabinet.

is a receiver which gives more stations per pound outlay than any other receiver we have ever reviewed in these columns.

The Reason Why

The exceptional sensitivity of such a small receiver aroused our interest so considerably that we determined to get a full technical explanation of the performance.

A word or two with friend Bob Chilton, radio engineer at Mullard, soon put us on the scent.

Reason Number One is the use of an entirely new type of frequency changer valve in the first socket. Known as type ECH4G, this valve is a triode-heptode produced locally, but not yet released on the open market for general use. So far it has only been produced in limited quantities, and owing to conditions prevailing in the local valve factories there does not appear to be much chance of this valve being made available in large quantities.

The ECH4G is a triode-heptode, similar to the 6J8G, but, as Bob Chilton puts it, "much hotter."

Reason Number Two for the high-gain is the use of another rather unusual valve in the intermediate stage.

Known as type EBF2G, this valve is a diode-pentode which has a pentode portion specifically designed for use as an intermediate amplifier. Most

diode-pentodes were originally intended for audio work, and, although they are often used successfully in intermediate stages, the EBF2G is slightly different in that it was produced for the purpose.

Not all the credit for the extraordinary amplification in the intermediate stage can be attributed to the use of the EBF2G valve. The efficiency of the special intermediate transformers is also quite an important factor. Wound with multi-strand litz wire, they are designed to take every advantage of the high-gain which is possible with the associated valve.

Reason Number Three is the use of an output valve with an extremely high mutual conductance. This valve is so sensitive that it can be fully loaded by the audio output of the diode detector, without any audio amplification being required at all.

As might be expected of an organisation which is actively interested in valves as well as receivers, Mullard have used their latest and most efficient valves in a receiver specifically designed for the purpose. As a result they have produced a receiver to sell at a modest price, but with performance out of all proportion to this price.

Further details can be obtained from Mullard-Australia Pty. Ltd., of 367-371 Kent Street, Sydney.

RADIO SERVICEMEN'S SECTION

Day by day it becomes more and more evident that among our readers we now number practically every radio dealer and serviceman throughout the Commonwealth. In response to insistent demand, we offer a special section devoted exclusively to their interests.

BUILD YOURSELF A SERVI-METER

Compact, accurate and flexible, the "Servi-Meter" offers servicemen and set-builders a cheap and effective way of obtaining an instrument that takes care of all the tests generally made in checking over a receiver chassis.

In "Radio World" for last November appeared complete constructional details of a portable version of a five-band all-wave service oscillator described in the January, 1940, issue.

Designed to combine high accuracy with maximum flexibility and low initial and running costs, the new version found immediate popularity with servicemen all over Australia, to such an extent that Slade's Radio report that sales to date have broken all records.

Features

The reason for this is not hard to realise when the following features, summarised here for the benefit of new readers, are examined.

The oscillator, which is housed in a compact crackle-finished steel carrying case measuring only 6" x 7" x 10½", provides continuous coverage from 150 k.c. to 30 m.c. in five bands; 150 k.c. to 15 m.c. on fundamentals, 16 to 30 m.c. on harmonics.

Coils, band switch and attenuator are wired and sealed in a compact steel case, modulation choke and condenser gang being mounted externally.

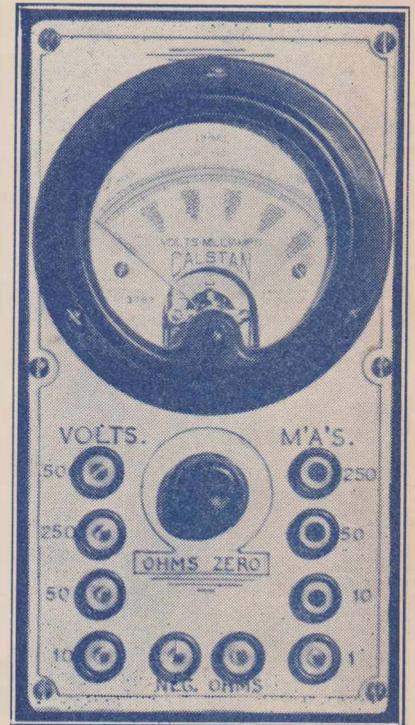
There are only four colour-coded leads to hook up to connect the foundation unit into circuit. Band coverage is accurately pre-adjusted to track with the five-band direct-reading scale. Electron-coupled r.f. oscillator circuit ensures high frequency stability. The five-inch five-band dial, with non-slip planetary drive, is calibrated direct in k.c.'s, m.c.'s and metres.

Provision is made for high and low r.f. output, with a particularly efficient attenuator system (400-cycle modulator note available when required).

The last and one of the most important features as far as the serviceman is concerned is that a complete kit of parts, including valve and batteries, costs only £7/17/6.

"Servi-Meter" Is Latest Instrument

The encouraging reception accorded



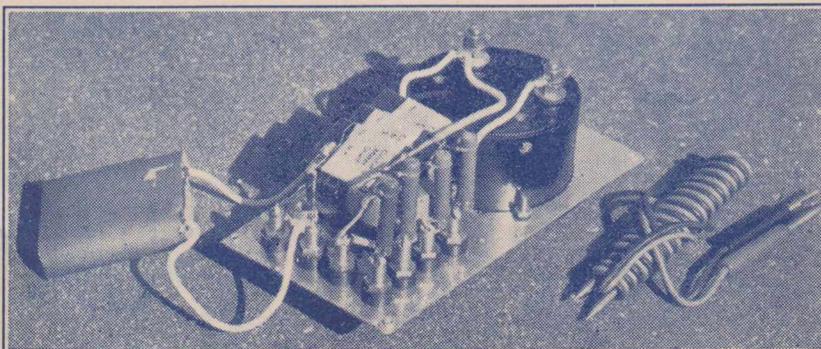
Front panel of the "Servi-Meter"

the "Radio World" oscillator led to the idea of the "Servi-Meter," to be described here.

Briefly, the "Servi-Meter" is that most essential part of any radio technician's kit — the multi-meter. As in the oscillator, simplicity and flexibility are combined with low cost, the final design giving all that the average serviceman wants, at minimum outlay.

As well, the "Servi-Meter" is compact enough to be carried in a pocket or service kit, or to be tucked away unobtrusively in a workshop. While it is one of the smallest instruments of its type to be produced in Australia, both accuracy and appearance are equal to, if not better than, many of the larger and more expensive instruments.

It will be noted that sockets have been used rather than a selector



A view of the internal wiring showing the shunts and multipliers.



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SERVI-METER

(Continued from page 15)

switch. This is because, though switching is perhaps handier in operation, it is more expensive and complicated in wiring, and has the disadvantage of requiring more space.

The "Servi-Meter" is housed in a black - lacquered pocket - size box measuring 2 1/2" x 3 3/8" x 6 1/2". A 2 3/4" Calstan Model 331 0-1 m.a. meter with universal scale is mounted, together with ten sockets and an ohms zero adjuster, on a frosted panel en-



DEEDS AS WELL AS WORDS

At the N.S.W. championships conducted by the Model Aeronautical Association at Easter, first place in the section for petrol-powered models was won by our A. G. Hull.

The prize was a "Silent Knight" refrigerator, valued at £55, donated by E. J. Hallstrom, Esq.

Mr. Hull's best flight, out of sight in 9 minutes 58 seconds, broke the Australasian record for contests held under the present rules, which allow a motor run of only 20 seconds.

Principal factor in the success was the use of one of the latest American competition motors, which was sent to Mr. Hull as a Christmas present by one of his American friends, Mr. David Houghton, circulation manager of the technical radio magazine, "Q.S.T."



graved in black. Red and black flexible test leads are provided.

The d.c. voltage and current ranges were chosen to take care of all tests necessary in the modern receiver. Voltage ranges are 0-10, 50, 250 and 500 volts, and current ranges 0-1, 10, 50, and 250 m.a. A 4 1/2-volt battery with a 5000-ohm "zero adjust" poten-

tiometer in a standard ohm meter circuit enable resistances up to 100,000 ohms to be read off from the scale.

The circuit of the "Servi-Meter" is shown in Fig. 1, while each function of the instrument has been separately analysed in Figs. 2, 3 and 4.

Multipliers

Fig. 2 shows the common arrangement of meter and multipliers, or series resistances of appropriate values, for the measurement of d.c. volts. Fig. 3 shows how three shunts, or resistances in parallel with the meter, are connected to give the four current ranges. (For the 0-1 m.a. range no shunt is required.)

Lastly, Fig. 4 illustrates the conventional series ohms circuit for a range of 0-100,000 ohms.

Both assembly and wiring of the "Servi-Meter" are straightforward, though particular care should be taken with soldering. This applies particularly to the current shunt wiring, as a poor connection here can mean serious error.

Assembly

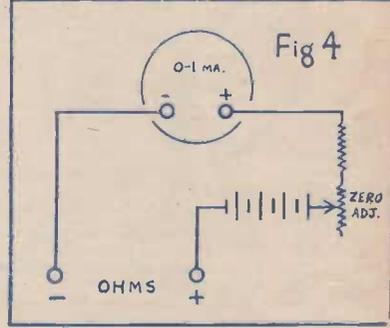
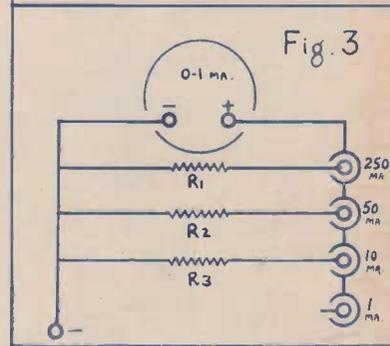
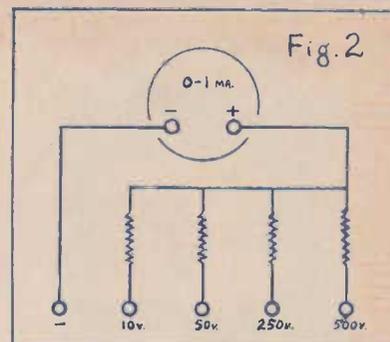
The assembly is commenced by mounting the ten sockets, all being insulated from the metal panel with the erinoid washers provided. Next, the "zero ohms" potentiometer is locked in position, its shaft also being insulated with washers.

The shunts and multipliers can now be wired in, and finally the meter bolted in place and connected up.

Operating Instructions

The operation of the instrument presents no difficulties.

To Measure Volts.—Insert the black lead in the common negative terminal



Diagrams explaining the design.

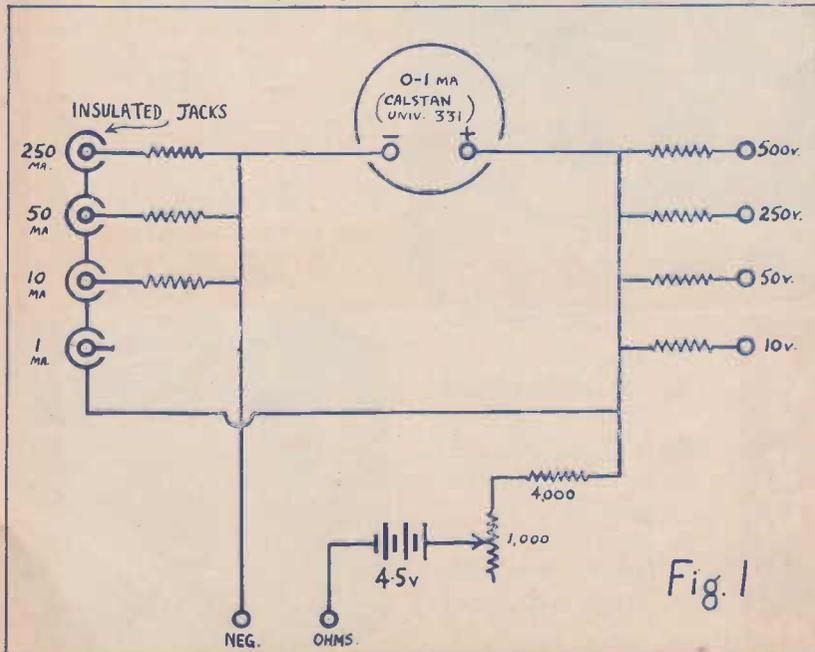
at the bottom of the panel and the red in the desired socket at the left of the instrument.

To measure Milliamps.—Insert negative lead as before and the positive lead in the correct socket at the right of the panel.

(NOTE.—If not certain of the value of the voltage or current to be measured, start at the highest socket and work downwards until a suitable deflection is obtained.)

To Measure Ohms.—Insert black lead in "neg." socket and red in "ohms" socket. Hold test prods together, which will cause meter needle to swing to right of scale. Turn "ohms zero" knob until needle indicates zero ohms. The value of a resistance inserted between the prods can now be read off directly from the scale.

In conclusion, the builder is assured of good results if the diagrams are carefully followed, and the completed instrument will do all that is claimed, proving itself a useful and indispensable adjunct to his present equipment.



Circuit of the complete "Servi-Meter."



MULTIMETERS TO SUIT EVERY REQUIREMENT

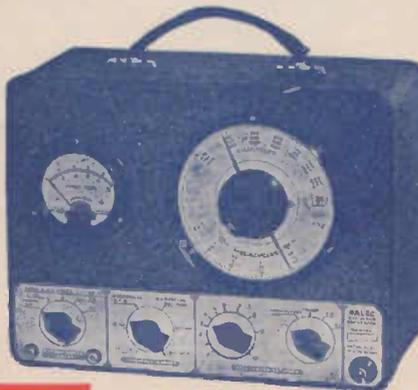
VALVE and CIRCUIT TESTERS for A.C. and A.C./BATTERY OPERATION

Illustrated are four items from the "Palec" range. Top left is the "M" multimeter, a workshop instrument for D.C. or D.C./A.C. measurements with optional sensitivities of 1,000 o/v and 10,000 o/v. Prices range from £4/19/6 to £9/5/6.

Next is the famous "Palec" "VCT," a valve and circuit tester, which is available for either A.C. or A.C./Battery operation. Providing complete circuit testing and "emission" type valve test, the "VCT" lists at £15/10/-, or with built-in vibrator for 6-volt D.C. operation at £17/17/-.

At right is another famous "Palec" product — the "G" series oscillator. Providing six-band coverage with direct-reading calibrations, this instrument offers "signal generator" performance at "test oscillator" cost. Available with or without a built-in output meter, and in types for A.C., A.C./Battery, or Dry Battery operation. List prices range from £12/5/- to £18/12/6.

Last, but not least, comes the "Palec" "acorn diode" type vacuum-tube voltmeter which provides discrimination-free measurements over the range from 50 cps. to 50 MC. Complete with valves, this instrument lists at £13/15/-.



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SYSTEMATIC SERVICING

Some Suggestions for the Radio Mechanic

IN servicing receivers, a definite system of tracking down faults should always be followed. "Hit-or-miss" methods should not be tolerated, as in nine cases out of ten they mean high charges and low profits. A well-equipped and properly-run service department can not only show a good return, but also it is a valuable aid in building goodwill.

The system for service procedure outlined below is perhaps more thorough than that generally used by servicemen, but it certainly gets results.

Suppose, for example, a radio comes in for service and, after a few minutes with the voltmeter, the serviceman finds it has a shorted screen by-pass condenser. Most servicemen would replace that condenser with an equivalent unit and return the receiver as O.K. Methods like this do more to increase the cost of service than anything else, because, while the charge may be low in the first instance, the chances are ten to one that there are more leaky condensers and perhaps weak valves in the set which will necessitate another call a few weeks later. If such a case occurs, the owner not only pays for two calls, but he may also begin to doubt the ability of the serviceman.

The system developed by the writer includes rigid inspection and test of nearly parts of a radio chassis and speaker. For the sake of clarity, each test is numbered, described, and details of the test equipment used are given.

Test No. 1 really includes the service call. It is useless for a serviceman to rush into a home, collect the radio set, and rush it back to the workshop, because the trouble might easily be a faulty aerial wire, a shorted lightning arrester, a blown fuse, a break in the power flex, or a slipping knob or dial. A service call should include a rigid inspection of the aerial and earth system — and of the power circuit if the receiver fails to light up. If it lights but will not work, valves should be tested and replaced if necessary.

If the fault is apparently in the chassis itself, the set should be brought in to the workshop for repair. This procedure applies to sets located within a limited radius. If any great distance has to be covered, it is wise to treat the case as a special one and endeavour to repair the set on the job.

In **Test No. 2** it is assumed that the receiver has been brought in for repair. The best procedure is to remove

it from its cabinet and clean the dust out of cabinet and chassis.

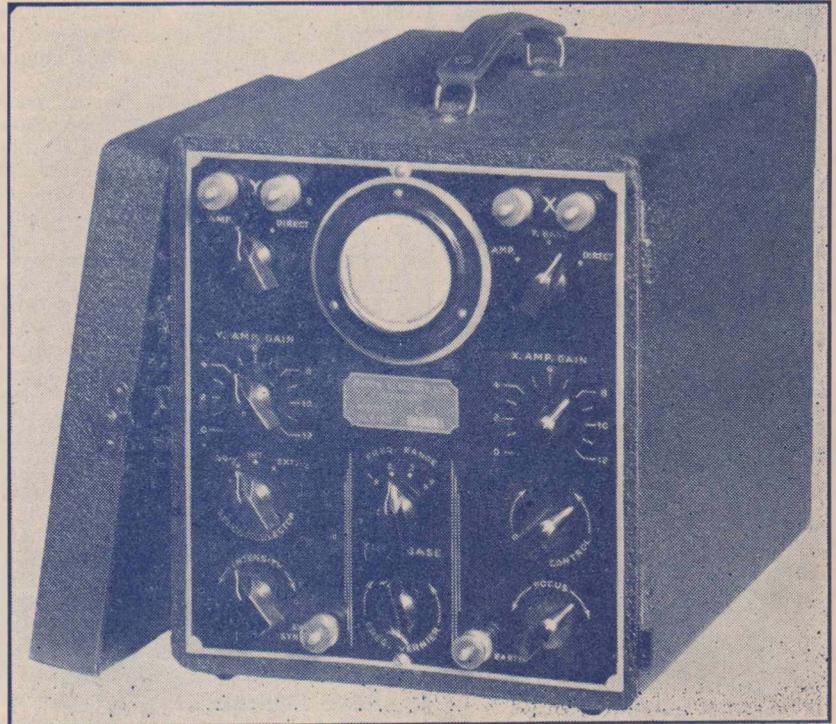
Then connect the receiver to a power outlet and hook up the aerial and earth. If there is still no reception, make a careful test of the valves.

The power transformer may smoke, which indicates a short or a break-

down. The rectifier plates may get red hot, indicating a short, probably in a filter condenser. Of course, in the case of a faulty transformer or condenser, the unit must be replaced before further tests can be made.

Test No. 3 includes the checking of all condensers and resistors. Faulty condensers are among the commonest causes of breakdown. For this test use a good condenser analyser capable of measuring leakage and capacity.

(Continued on next page)



NEW OSCILLOGRAPH RELEASED BY PATON

To-day the cathode ray oscillograph is accepted as an invaluable instrument, both by receiver designers and servicemen, for stage-by-stage analysis of performance characteristics.

For this purpose, one of the most flexible instruments on the market is the new Palec oscillograph released last month. Brief specifications as supplied by the manufacturers, are given below, complete data being available on request from Paton Electrical Pty. Ltd., 90 Victoria Street, Ashfield, N.S.W.

Specifications

Both "X" and "F" amplifiers have a voltage gain of approximately 50 over the frequency range of 10 to 100,000 sinusoidal cycles.

The frequency range of both amplifiers is 10 to 100,000 sinusoidal

cycles up, while the phase difference between each amplifier is zero in respect to each other over the entire frequency range.

The input impedance of both amplifiers at 10,000 cycles is 450,000 ohms, so that its connection to observe the phenomenon occurring in any circuit will in no way affect the characteristics of that circuit to any marked extent.

The input sensitivity of the "Y" plates for full screen deflection is 75 volts, and 90 volts for the "X" plates.

The time base has a frequency range of 20 to 10,000 cycles, which is covered in four steps. A separate buffer amplifier direct-coupled to the 880 relaxation oscillator is used to obtain high impedance matching and freedom from distortion in this part of the circuit.



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TRADE ONLY SUPPLIED

Any doubtful condenser should be discarded, particularly if high voltage is applied across it. Many "call-backs" are eliminated if proper attention is given to the condensers, and it should be remembered that radio owners do not like their sets going out of action about once a month.

Condensers should also be checked for capacity and, while making this test, it is as well to pull gently on the pigtailed to make sure the condenser does not open intermittently. Resistors should be checked with an accurate ohmmeter or bridge, and anything showing a tolerance greater than + or - 10 per cent. should be discarded. Volume and tone controls are included as resistors, and should be checked and replaced if faulty.

Test No. 4 includes an accurate check on all voltages and currents. This is best done with a multi-range meter, with plate break adaptors for measuring plate current. It is of course important, especially with non-a.v.c. sets, to have the volume control full on. This test should take very little time, because by now it is established that valves, condensers and resistors are in perfect order.

Test No. 5 is purely a loudspeaker test. Intermittent faults are sometimes caused by a break in the field coil or a break in the primary of the

matching transformer. For the speaker test, use a 400-volt power supply, with a 0-100 m.a. meter and 10,000-ohm heavy duty potentiometer in series, and pass a heavy current through the field coil and transformer primary. Any intermittent fault should show up immediately.

The speaker should now be tested for rattles, using a good baffle for the purpose. If there is even the slightest rattle, dismantle the speaker,

NEXT MONTH . . .

SPECIAL SET-BUILDERS' SUPPLEMENT

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clean out any dust or dirt, re-assemble it, and re-centre the cone. Elusive rattles may sometimes be cured by applying a thin coat of glue over the voice coil and its assembly. Also inspect voice coil connections for breaks.

The speaker should be in perfect order before it is returned to the cabinet.

(To be concluded next month)

THE SERVICEMAN'S SUPPLY HOUSE

Many "Radio World" readers, especially those who have dealt with them, will know Radio Equipment Pty. Ltd. as an organisation of considerable experience and repute in connection with radio serviceman's requirements.

Radio Equipment Pty. Ltd. are not only radio warehousemen, but they are engineers also. They have designed several fine pieces of test equipment, and quite a number of portable receivers, including a range of portables. All of these receivers have been designed and produced in the laboratory and workshop on Broadway, where Radio Equipment is located.

Servicemen and set-builders are

bound to get what they are looking for at Radio Equipment. Knowing so well and intimately just what is required in radio service and the conditions under which the average serviceman works, this firm is able to visualise immediately the parts or equipment which may be required for any particular job.

One fine feature of the Radio Equipment service is that their customers may contact them at any time for any technical advice. A full staff of radio engineers is maintained by Radio Equipment, and these engineers are only too pleased to give any customers free advice on any type of radio technical matter.



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- ★ **Isocore Transformers**
- ★ **Australian Made Throughout**

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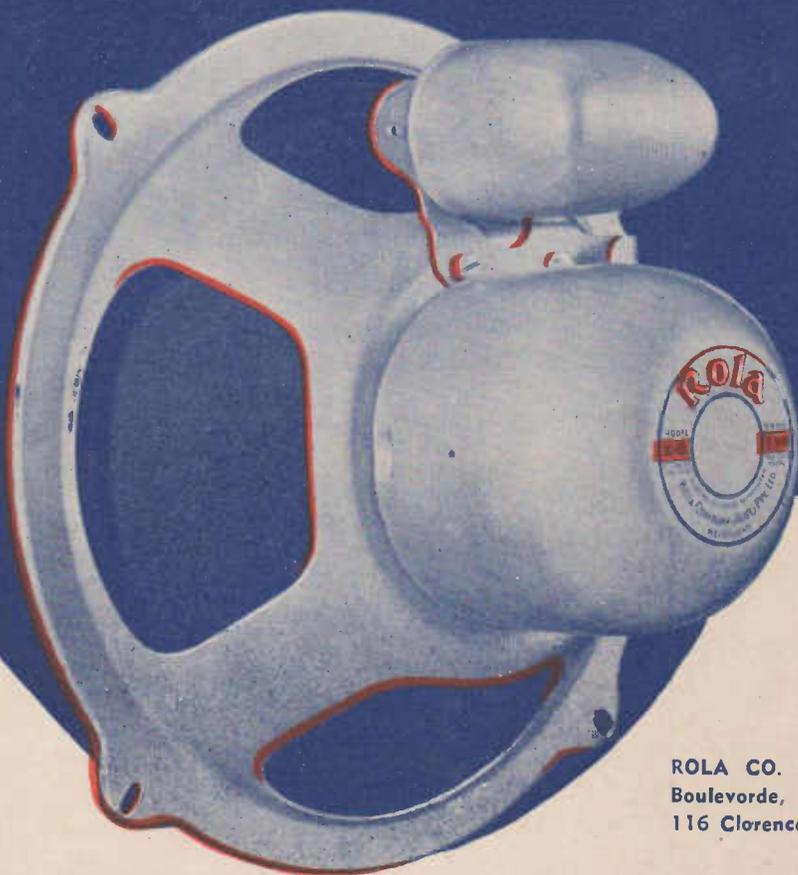
In order to safeguard supplies for the future, Rola undertook the manufacture of magnet winding wires and magnet alloys. Thus is Rola pioneering two new Australian industries.

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Maintenance and Service of VIBRATOR HIGH-TENSION UNITS

A practical article for Servicemen . . . by "Engineer"

THE advent of vibrator type "B" eliminators has caused much discussion among radio engineers, and much uncertainty in the minds of constructors. Much has been said against vibrator type receivers and eliminators, mainly because of the moving parts involved, and the difficulties encountered in filtering the output to secure a smooth, hum-free voltage supply.

It should be remembered here that the vibrator has no more moving parts than the small motor generators available under various trade names, and which are generally accepted as a fairly satisfactory source of "B" supply. In addition, the motor generators have delicate windings, more likely to develop faults than the comparatively simple vibrator, which is quite inexpensive to replace.

Stepping Up D.C.

The idea of utilising a low voltage D.C. source to create a high "B" voltage is comparatively simple. Certainly it is impossible to step-up D.C. voltage by a transformer to high levels, because the magnetic flux lines created by steady D.C. are stationary.

However, if we have a transformer with a six-volt primary and high voltage secondary, and we connect a six-volt battery to the primary, the flux lines, in building up, will induce a voltage in the secondary (remembering, of course, that the primary inductance will cause the current to lag at first and then increase) Likewise, when the battery is disconnected and the flux lines collapse, a voltage will be induced in the secondary again. It appears then that if we connect and disconnect the voltage source at regular intervals, a constant voltage will be induced in the transformer secondary, the exact potential depending upon the design of the transformer itself.

Vibrator Provides Pulsating D.C.

In the vibrator eliminators, the six-volt supply is disconnected and reconnected at very short and regular intervals by means of the vibrator itself. Thus we have the primary flux lines alternately building up and collapsing, and inducing a voltage in the secondary winding.

Perhaps it is as well to mention here that in order to induce a voltage in a coil, the turns of that coil must

be cut by moving flux lines, or alternatively, the coil may be rotated in a field of stationary flux lines. The transformer depends for its operation on the former, while the latter explains the principle of the generator.

Now the principle of the vibrator unit is understood, the next consideration is to decide how to eliminate the various troubles encountered. One important point to keep in mind is that the high voltage supplied by the secondary of the transformer is pulsating D.C., and must be rectified and filtered as in the usual A.C. radio.

Suppressing Vibrator Interference

Radio receivers which depend on mechanical vibrator systems for "B" supply are usually subject to a certain amount of electrical interference,

OH YEAH!

In the "Australian Women's Weekly" this week we note that—

"Constance Moore gets the prize for the oddest gadget in town. She turned up at the Mocambe Night Club with a wrist-watch radio. She dropped it into a glass of water and it played a tune."

unless precautions are taken with the design. There are four main methods in which this interference will affect a radio set.

(1) Direct pick-up by either unshielded coils, exposed grid leads, or the aerial lead itself.

(2) Plate modulation of the radio frequency or detector valves, due to improper filtering of the "B" supply voltage.

(3) Heater or filament modulation of any of the R.F. amplifier or detector valves, due to insufficient filtering or the direct current source to the filaments and power supply.

(4) Voltage pick-up in any of the high frequency circuits (usually grid circuits), due to the chassis base being used as a common carrier of current of the desired frequency and also the interfering frequency.

It appears then that we are likely to encounter trouble in the design of a vibrator type receiver. Before considering further the possible methods of eliminating interference, the design

of a vibrator power supply, with all the necessary filtering to keep interference at a minimum, will be considered.

Synchronous and Non-Synchronous Vibrators

Refer now to Fig. 2, which illustrates the circuit of a vibrator eliminator using a non-synchronous vibrator and a type 84 rectifier, and also to Fig. 1, which shows a synchronous or self-rectifying type of vibrator.

The vibrator is shown inside the dotted lines on the diagrams. This does not mean that the vibrator need be shielded separately from the transformer, etc., when the complete unit is in a metal case. However, when the vibrator is used outside a metal case it must be shielded. Most vibrators are fitted inside a metal case which provides a satisfactory shield.

The resistors R1 and R2 in the diagrams should be 100 ohms each, if the unit is for six-volt operation and fairly high output is desired. For outputs up to about 150 volts at 20 milliamps, as in Fig. 3, R1 and R2 are not necessary. These resistors should be connected as close to the vibrator points as possible, with one end of each resistor connecting directly to the ground lead of the vibrator. A centre-tapped 200-ohm resistor is quite satisfactory, and should be capable of dissipating about 2 watts (100 mills. with a six-volt supply).

A Suitable Smoothing Choke

The choke coils L1 and L2 must necessarily be wound with fairly heavy gauge wire and should be wound so that the distributed capacity is as low as possible. A choke which has proved satisfactory is one consisting of about 80 turns of 16 B. and S. enamelled wire wound in four layers on a $\frac{1}{8}$ in. dowel, with insulating paper between each layer. L2 may not be necessary, but it is as well to make provision for it, to keep interference at an absolute minimum.

The condensers C1 and C2 should be .5 mfd. each. They must have a very low power factor at radio frequencies, and their leads should preferably be very short for them to be effective. A condenser which has proved quite satisfactory for this purpose is a non-inductive paper type, having copper braid leads soldered to

the foil. The earth return for these condensers should be as short as possible, and made direct to the chassis. The ground return for the vibrator should be soldered at the same point as the condenser returns. The choke L2 should be connected as close to the end of C2 as possible.

Refer now to Fig. 3, which shows an alternative method of filtering the primary circuit. This filter is quite satisfactory for most receivers, but naturally the circuits of 1 and 2 are more satisfactory.

The Condensers Required

The condensers C7 and C8 should have a very low power factor at radio frequencies, and for them to be effective in eliminating interference, their leads should not be over a fraction of an inch long. Their capacity will depend on the transformers used, but about .006 mfd. is satisfactory for reasonably low output. Mica type condensers are recommended for this position. In some vibrators, these condensers are included as part of the assembly.

The condenser C6 (see Fig. 1a) is usually .05 mfd. to .1 mfd., depending on the value of L3. This condenser should have low power factor at radio frequencies. L3 should be 500 microhenries to one millihenry, or higher, providing the self capacity is very small. The physical dimensions of L3 should preferably be very small in order to confine its radiated field.

The condenser C3 in Fig. 2 should be about .01 to .03 mfd., but will vary with the transformer. The most suitable value is best found by experiment.

The condensers C4 and C5 may be of the electrolytic type, and 8 mfd's each should be sufficient. To keep hum low, C4 may be 12 mfd. and C5 8 mfd. The power choke L4 may be of the small type, a standard 50 m.a. 30-henry choke being ideal for most requirements.

Regarding the synchronous type vibrators, a feature requiring close attention is the selection of the proper value of condensers across the secondary of the transformer (C7 and C8). Note here that one condenser may be used across the whole of the secondary winding if necessary, as in Fig. 2 and Fig. 3. In Fig. 3 .003 or .004 mfd. is recommended in this position (C3). In general, where the transformer exciting current is low, C7 and C8 need only be of relatively low capacity, about .006 mfd. However, with high primary currents, C7 and C8 may be increased to .02 mfd. for minimum arc at the points.

Special Transformer Required

The transformer can be considered next. The design of a vibrator trans-

former is not simple, in that most vibrators function at different frequencies, and it is difficult to obtain any details on the behaviour of transformer stallo at the higher frequencies. However, excellent transformers are available for all types of vibrators.

In general, it is as well to have a large number of primary turns on the transformer, otherwise primary current may be excessive. On the other hand, a primary with a relatively high D.C. resistance will have poor regulation, and will be unsatisfactory for class "B" circuits.

A typical transformer to deliver 200 volts at 40 m.a., using a core an inch each way, has a primary of 86 turns of 18 B. and S. centre tapped, and 3,500 turns of 32 B. and S. centre-tapped for the secondary. The primary turns may be reduced to as low as 72 if economy of space is essential, but whenever possible the larger number should be used. More than this number may be used, but there seems to be no advantage in using more than about 100 turns on this class of transformer. It has been found best to use more primary turns, even at a sacrifice in wire size, when space is at a premium.

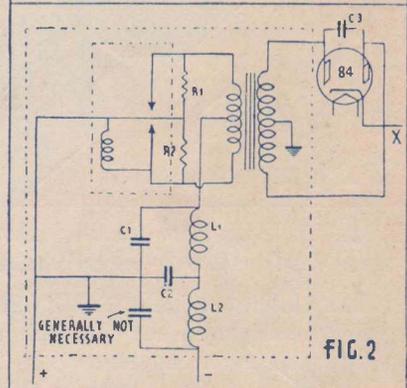
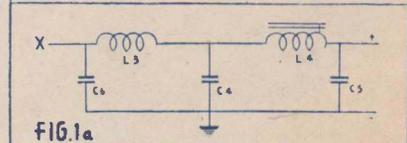
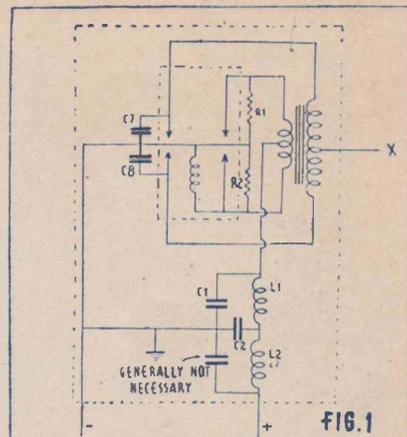
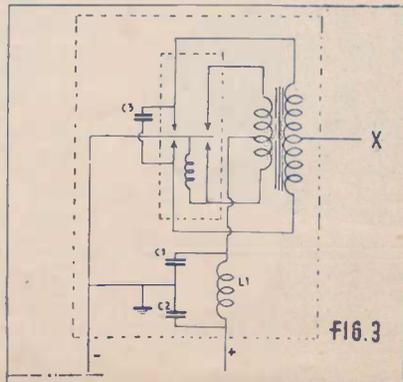
Electrostatic Shield

The above transformer, with a good grade of stallo, should be very satisfactory. It is important to note that an electro-static shield is necessary around windings if noise level is to be kept low.

The transformer just described will have an exciting current of about 2.5 amperes with 6 volts across half of the primary winding. The condensers C7 and C8 in Fig. 1, with this transformer will be approximately .01 mfd.

We have now considered the design of a vibrator unit in detail. Next, the troubles encountered in making a satisfactory vibrator type receiver, and methods of wiring them, can be discussed.

The four ways in which a vibrator-



operated radio receiver picks up interference have already been listed. In order to eliminate direct pick-up, all high-frequency coils should be provided with separate shields. Grid leads should be kept as short as possible. The antenna should be shielded over its entire length, from the point where it enters the receiver to the antenna coil itself. An effort should also be made to make the mechanical design of the receiver such that all the power supply components are grouped together and are as far away from the R.F. end of the receiver as possible.

Steel Box Provides Shielding

Whenever possible, the parts shown inside the dotted lines on the circuit diagram should be enclosed in a steel box. In some cases it will help if the box has its own base, rather than using the chassis for this purpose. This will help to reduce radiation, and also minimise interfering currents set up in the receiver chassis. It is even a good plan to put the complete vibra-

(Continued on page 28)

BUILD THE "R.W." SERVI-M

New Calstan Pocket-size Analyser is Cheap to Build: Tests all D.C. Voltages, Currents, Resistances



- ★ The "Servi-Meter" is housed in a black metal case, measuring only 2-3/8" x 3-3/8" x 1-1/2" and fitted with frosted, black-engraved metal plate.
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- ★ Meter used is the standard 0-1 m.a. Calstan Model 223 universal type moving coil meter (3 1/4" flange diameter) with Sensitivity, 1,000 ohms per volt.
- ★ All shunts and multipliers are triple-checked for accuracy, which is guaranteed to be within plus or minus 5%. Accuracy of ohmmeter circuit is improved by compensating.
- ★ Instrument is supplied complete with robust black test prods, and 4 1/2-volt battery for ohmmeter circuit (mounts inside case).

Complete kit of parts **£4/9/6** Assembled and tested **£4/**

Over 1000 Servicemen Choose CALSTAN 223A Multi-Tester

The Calstan Model 223 combination valve checker and A.C./D.C. multi-meter is the only instrument of its type marketed in Australia embodying all the outstanding advantages listed below.

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A new type meter with a high-grade aluminium face, which will not crack or warp in any climate. . . . It is large, and all ranges can be read with the greatest possible speed and accuracy. It is a really high-grade movement housed in an expensive moulded Bakelite case. Requires only a small mounting space . . . no mounting screws are visible and all threaded portions are brass inserts, firmly moulded into the case during the process of its manufacture.

- New style, permanently etched, finger-proof panel.
- Can be operated from either 6-volt accumulator or A.C. mains.
- Available with internal or external vibrator, as required.
- Tests every valve on the Australian market, including the new 1.4-volt series.
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- Measures A.C. Volts up to 1,250, Output Volts up to 1,250, D.C. Volts up to 1,250, D.C. Milliamps up to 250, Ohms from 1/2 Ohm to 10 Megohms.
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Calstan Model 223A Multi-Tester (A.C. and vibrator) **£17/17/-**
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Makers of Highgrade Radio & Electrical Testing Equipment

VIBRATORS

(Continued from page 25)

tor parts, as shown in the circuit diagrams, inside a steel box.

Interference due to plate modulation is easy to detect, and comparatively easy to cure. The simplest method of detecting this form of interference is to connect a resistive load equal to the load placed on the power supply by the receiver, and then supply plate voltage to the valves from "B" batteries. If there is still interference present with the battery "B" supply, and the vibrator running, then it is apparent that interference is occurring in another part of the circuit.

However, if the interference is reduced when the receiver is operated from batteries, then the R.F. choke shown as L3 in Fig. 1a is either too small or has too high a distributed capacity, or the condenser C6 is either defective or is not of sufficient capacity. Usually a .05 or .1 mfd. condenser is large enough. The choke coil should also be rotated slightly to make sure it is not coupling to either the power choke or transformer. The condenser C6 is quite often unnecessary with the valve type eliminator.

Detecting Heater Modulation

Heater modulation is usually detected by operating the "B" power supply from a separate six-volt battery. When arranging for this, use a shielded cable and ground the shield to the chassis, otherwise the cable may radiate so much that there would be no decrease in the interference.

It has been found that receivers having a high sensitivity will usually require two chokes between the power supply and the heaters. The use of the chassis as a common connection for all the heaters is not recommended, due to the possibility of voltage pick-up in the chassis. The heater line is best grounded at only one point on the chassis.

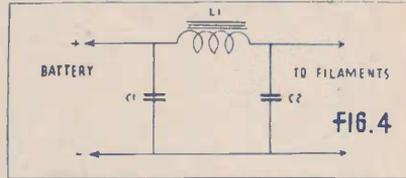
The usual method is to wire the heaters together, then ground one of them to the chassis. The heater to be grounded should be found by experimenting to find the best point, as this may vary considerably. Also, care should be taken to make sure there are no radiating loops formed by the heater wiring, which might couple to some portion of the R.F. amplifier.

Voltage pick-up due to improper grounding of the power supply and R.F. amplifier elements is the most common source of interference and also the most difficult to locate. The simplest method of locating this type of interference is to short the grids of the valves, starting with the out-

put valve, and so determine in which stage the noise is originating.

Common Source of Trouble in Sets Using A.V.C.

A common source of trouble is found in receivers using automatic volume control. In such receivers the tuned circuits are completed through



condensers by-passing the grid return to ground. If these A.V.C. by-pass condensers are grounded directly to the chassis, a voltage which is developed across the common path between the point where the condenser is grounded and the wiper contact of the variable condenser, is picked up and applied to the valve grid.

In order to eliminate this interference, the by-pass condenser should be returned directly to the wiper on the section of the variable condenser tuning that particular coil. The condenser wiper is best bonded to the chassis with a piece of heavy copper braiding. As a rule it is desirable to ground the variable condenser at only one point on the chassis.

In order to check for interference on a completed receiver, the antenna lead-in should be shorted to ground through a .00025 mfd. condenser. If the interference appears with this lead shorted, but does not appear with it open, that would indicate improper grounding of the aerial primary.

In some cases, this type of interference can be eliminated by returning the ground end of the aerial primary to the condenser wiper. In

others, it will be found that there is less interference when the A.V.C. condenser on the aerial primary is grounded to some point on the chassis rather than the condenser wiper. This is apparently due to an out-of-phase voltage being picked up and balancing out the interference.

Interference Arising In Driver Stage

In some cases interference is located in the grid circuit of the audio driver valve. This is generally due to the return of the volume control being grounded at a point remote from the valve's cathode circuit. Also make sure that the first audio grid lead is well shielded, and does not run close to power supply or heater wiring.

No discussion on vibrators would be complete without reference to satisfactory filament filtering for directly heated battery valves, particularly when two-volt valves are connected in series—parallel to use a six-volt "A" supply.

Fig. 4 shows a satisfactory filter arrangement. L1 is an iron core choke, of about 25 milli-henries inductance at 2 amps. C1 and C2 are 500 mfd. 12-volt electrolytic condensers. In some cases, C2 may not be necessary. In cases where an ordinary battery receiver is adapted for use with a vibrator, the filter in Fig. 4 will be very satisfactory. The voltage may be dropped from six volts to two with a suitable resistance, if necessary.

From this discussion so far it should be apparent that a great amount of work has been done on the design of vibrator units and receivers. There is still much more to be done, but from the details given so far it should assist constructors to build vibrator receivers with confidence.

VALVE CHARACTERISTICS CHART

Available Free from the Valve Company

Comprising 20 pages, the new Valve Characteristics Chart, just released by Amalgamated Wireless Valve Company Pty. Ltd. will be found to be particularly valuable. Commencing with three full pages devoted to Australian-made Radiotron Valves, it features the "Standardised Radiotron Equipment Types," and, in its detail, far surpasses other technical references of a similar kind.

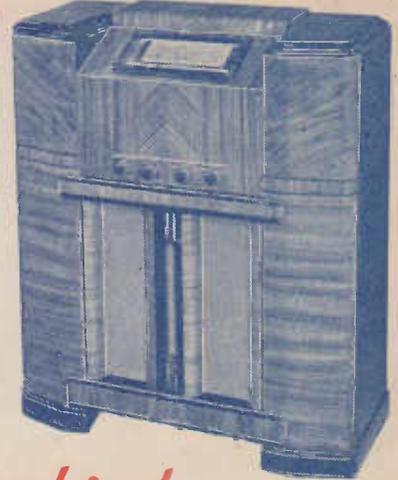
Fourteen pages are occupied with comprehensive characteristics of the complete Radiotron range of valves, whilst valve dimensions, socket designations and connections are fully des-

cribed and illustrated where necessary.

The booklet itself features a much larger page size than previously (the overall dimensions now being 11" x 9" approximately), thus permitting bolder type to be used, with consequently clearer figures throughout.

A study of this new Radiotron release makes apparent the fact it is the result of very careful and thorough investigation, and sets a new standard in characteristics chart production.

Copies may be obtained by personal enquiry at the Valve Company, 47 York Street, Sydney, or by letter enclosing 3d. in stamps.

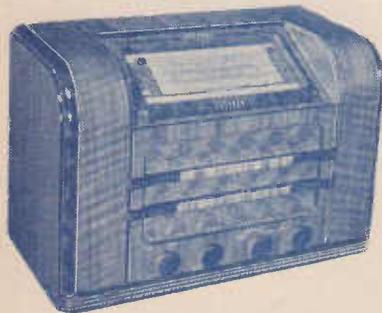


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1941
Leadership!

**MAGNIFICENT RANGE OF
CRAFTSMAN-BUILT CONSOLES**

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Smart, yet dignified, with an easy-to-read sloping straightline dial, the Empire Mantel Cabinet shown below houses a variety of models, including 4, 5 or 6-valve dual-wave receivers for mains, vibrator or battery operation.



Pick-Me-Up . . .

No straggling untidy aerial and earth leads are needed for this Breville "Pick-Me-Up," designed for handy transport from room to room. Even interstate stations can be played on the built-in loop aerial. Note the neat carrying handle cut in the top.



This selection of Radios is from the Breville 1941 Beauty Parade, comprising a magnificent range of receivers of all types. Each is a leader in its field; each represents the last word in modern design, dependability and honest-to-goodness value.

- Breville is known throughout Australasia for the highest standards of quality — and, as always, the first manufacturer to introduce worthwhile Radio improvements.
- Every Breville Radio, regardless of price, is carefully engineered in every detail. There are no useless gadgets, no cheap mechanisms, no inferior parts, no substitution of poor engineering principles.
- Thousands of Breville Radios are in daily use in all parts of the Commonwealth, New Zealand and the Pacific Islands. Hundreds of unsolicited testimonials from enthusiastic Breville owners tell of outstanding performance and never-failing reception under all manner of conditions.
- Every receiver in the 1941 Breville range possesses the tremendous reserve of sensitivity that won for Breville users two of the first three International (DX) long-distance contests conducted by the "Australasian Radio World."

1.4-Volt Portables . . .

Breville leadership in the 1.4-volt portable field is brilliantly maintained by Models 356 and 357, housed in the attractive compact cabinet shown alongside. Features include station-calibrated dial, beam power valve, special headphone sockets, new highly-efficient aerial system, separate on/off switch with coloured indicator, and provision for connecting larger batteries for regular home use.



Write for new free six-page multi-color catalogue. Wholesalers and retailers in all States. RETAILERS ARE INVITED TO WRITE FOR DETAILS OF THE ATTRACTIVE BREVILLE FRANCHISE.

MANUFACTURED AND FULLY GUARANTEED BY —

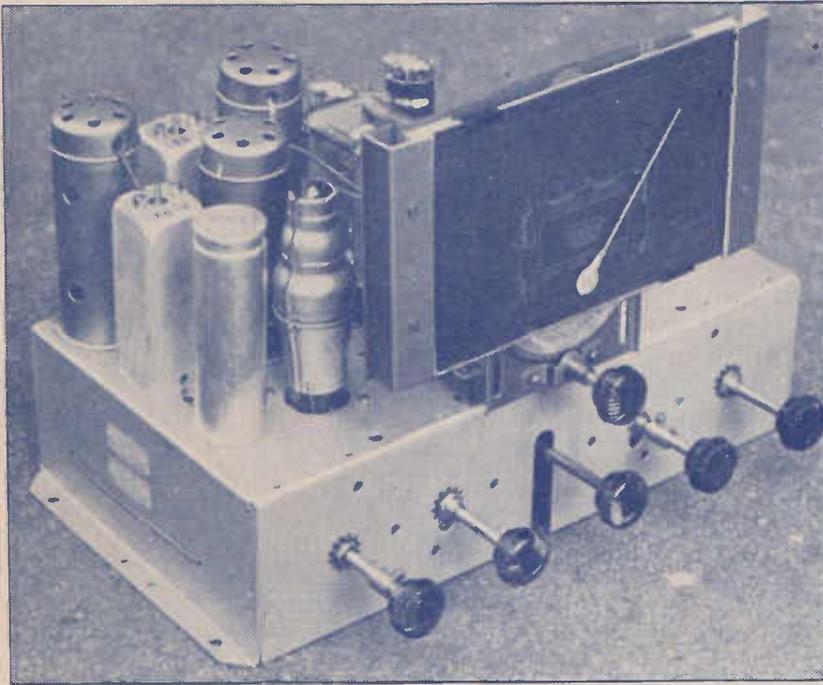
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"C.R.P. 6"

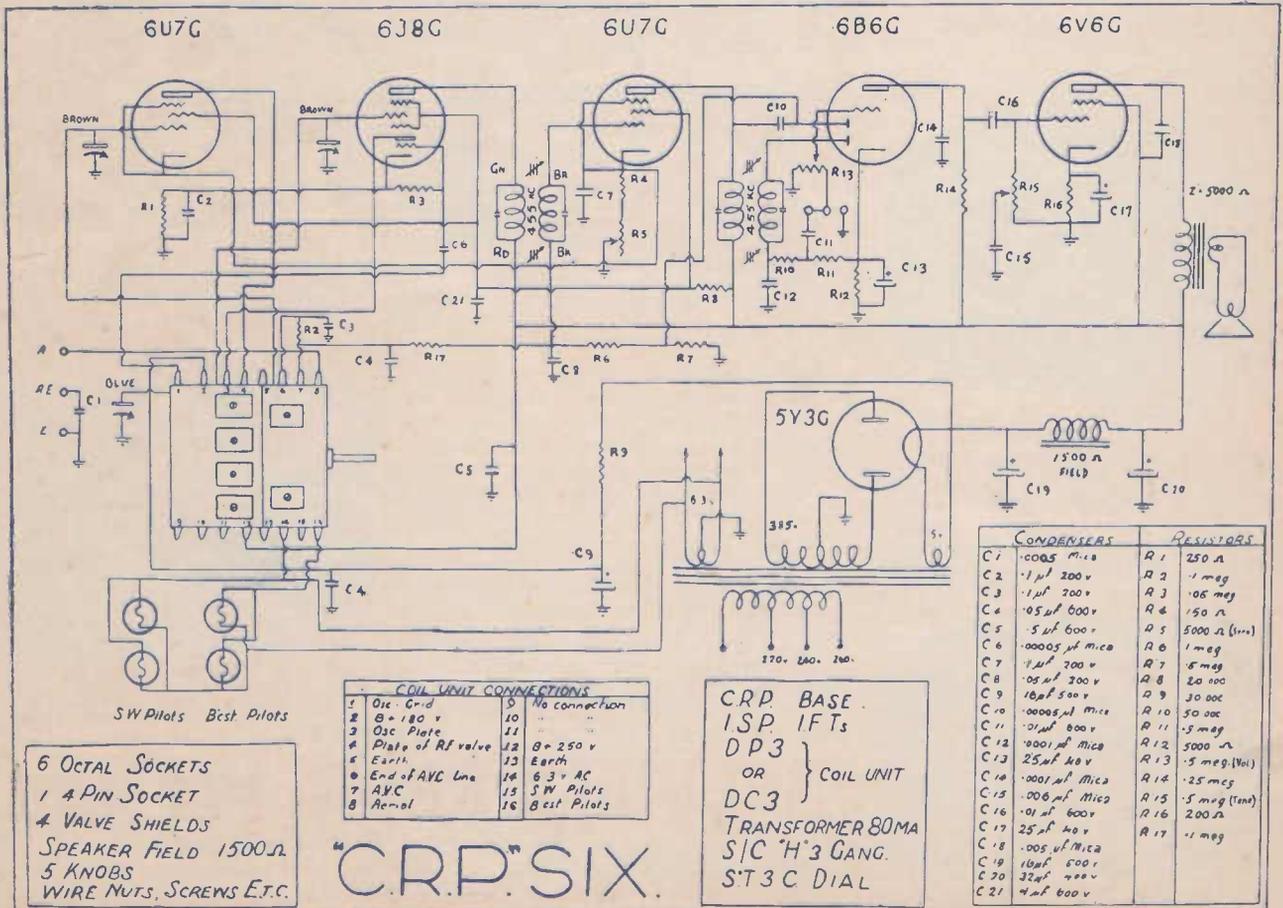
An engineered receiver design from the laboratory of Crown Radio Products Pty. Ltd.

BY COURTESY of Mr. Lay Cranch, managing director of Crown Radio Products Pty. Ltd., we are able to give the full details of a powerful dual-wave receiver which has been designed in their laboratory.

This receiver has been designed for the guidance of constructors using "Crown" components and, for ease of reference has been designated the "CRP6." Complete data on the wiring of this receiver are offered as part of the engineering service behind "Crown" components.

Specifications

The complete "CRP6" assembly, with the exception of the loudspeaker, is made up to a standardised pressed-



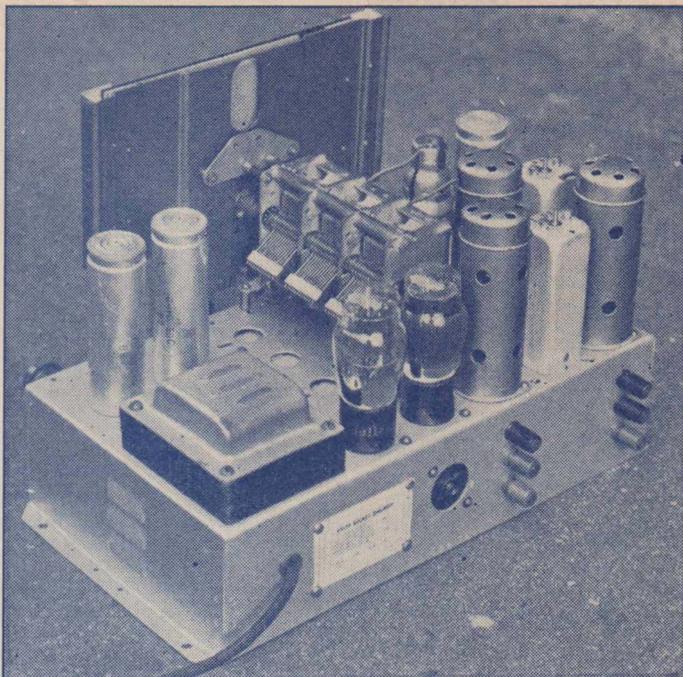
steel chassis measuring 14 in. long, 8 in. wide and 3½ in. deep. This receiver is designed to provide coverage of the broadcast (500-1,600 k.c.) and short-wave (13.5-42m.) bands, and operates from 200-260v. A.C. mains. Six valves are employed, their types and functions being as follows:—One 6U7G, R.F. amplifier; one 6J8G, frequency converter; one 6U7G, 455 k.c. I.F. amplifier; one 6B6G, detector, a.v.c. rectifier and A.F. amplifier; one 6V6G, output tetrode; and one 5Y3G, rectifier.

The Power Supply

Power supply filtering is provided by the loudspeaker field and two high-capacity electrolytic condensers, while oscillator plate supply stability is ensured by feeding the oscillator plate circuit direct from the rectified filament through a resistance-capacitance filter.

Controls

Five controls are fitted, these being for volume, tuning, wave-change, tone (continuous) and sensitivity (continuous). The tuning control is of the "flywheel" type and operated in conjunction with a large "Crown" type "ST3(c)" straight-line, two-colour glass dial. This dial is particularly smooth in action, while its calibrations are both legible and exact. Other dials



★
Another view
of the "C.R.P."
Six chassis.
★

from the 'Crown' range can, of course, be used.

The Tuning Unit

The most outstanding component in

the new "Crown" range is undoubtedly the "DP3" three-circuit "permatune" tuning unit. This "R.F. stage" assembly incorporates several advanced fea-

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MECRAFT'S SPEEDY SERVICE for SERVICEMEN

Under the managernship of Mr. R. Lamplough, late of the Lamplough Radio Coy., Homecraft's new Sydney branch maintains a special Radio Service Supply department.

Run by qualified technicians who will gladly assist with any technical problems, this department guarantees same-day service, with double checking on all orders, lowest prices, highest quality components.

SET-BUILDERS! We maintain special stocks of "Radio World" kit-sets and all leading makes of components. If it's featured in "Radio World," WE CAN SUPPLY IT.



HOMECRAFTS PTY. LTD.,
100-102 Clarence Street,
Sydney. Phone: BW 4271 (3 lines).
Please place my name on your mailing list for all your Technical and Trade Bulletins of special interest to servicemen.

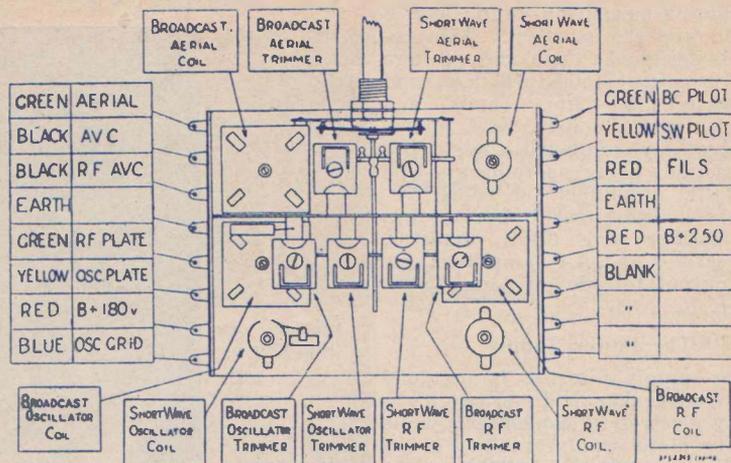
Name.....
Address.....

"C.R.P. SIX" (continued)

tures in design—prominent among them being the elimination of the usual broadcast padder adjustment. The importance of this last will be appreciated by all technicians who have wasted valuable time trying to make dial calibrations correspond with the actual tuning positions of broadcast stations, because with this new system dial and unit matching is merely a matter of adjusting the trimmers to bring one station into line—all others following automatically.

The complete 'DP3' unit is a frame-type assembly with base dimensions of 4½ in. by 4 in., and a depth of barely 3 in. The frame proper is of plated steel and is divided into two sections—one carrying the broadcast and short-wave aerial coils and the other the corresponding R.F. and oscillator coils. Six separate coils are fitted and each is provided with its own inductance adjustment, in the form of a variable high-frequency "iron" plug, and its own trimmer. All adjustments are of the screw driver type and are accessible from the bottom of the chassis when the unit is mounted into a receiver. A special two-position switch assembly is incorporated and provision is made for dial-lamp switching. Connections to the unit are largely effected by means of terminal strips, although connections such as those to the tuning gang sections are brought out in the form of flexible leads.

The electrical design of this unit is particularly efficient. As already mentioned, each coil is provided with an "iron" plug, while highest-grade insulation throughout, multi-section

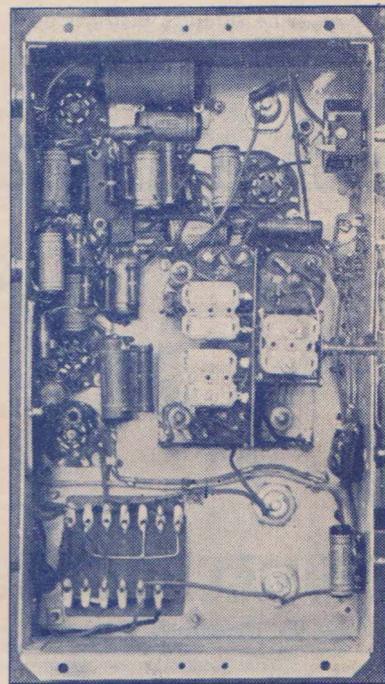


"litz" windings on broadcast and accurately-spaced windings on broadcast and accurately-spaced windings on short-waves ensure optimum efficiency on both wave-bands. This initial efficiency is safeguarded by extremely complete impregnation against the effects of humidity. The coils normally employed in this unit are designed to operate in conjunction with the "H" type of straight-line-frequency tuning gang and with this gang coverage is provided over the 550-1600 k.c. broadcast and 13-42 metres short-wave bands. A variety of fully-calibrated dials of modern design is available to suit this unit.

Tested By Us

On test, this receiver gave a remarkably good account of itself. On both wave-bands, sensitivity was high and noise was negligible, while the stability at all signal levels and under all conditions was beyond criticism. All controls functioned perfectly, and

the A.V.C. action proved to be capable of holding the output sensibly constant over an extremely wide range of signal levels. Added to this, selectivity was excellent and no troubles were encountered due to cross-modulation, spurious responses or image



A photo. of the wiring and (above) the coil connections for the Crown coil unit.

interference, even when the full 100 feet of outside aerial was employed.

Tuning Procedure

The method of aligning the trimmers and adjusting the padder of this receiver is quite different from normal. The full details of the correct tuning procedure are given elsewhere in this issue in the special servicemen's supplement.

INSTRUMENTS FROM RADIO EQUIPMENT

Radio Equipment Pty. Ltd. has produced a range of quality multimeters under their brand name of "University." Readers will be particularly interested in these multimeters, because they may be obtained in kit form ready to build yourself, or completely wired and tested.

Handy for the radio dealer is the D.C. Senior Multimeter. This instrument uses a "University" precision square-type meter with a clear open face, having a total scale length of 3½ inches. The meter has a sensitivity of 1,000 ohms per volt, and has four ranges of D.C. volts and milliamperes. The voltage ranges are 0-10-50, 0-250 and 0-1,000 volts, whilst the current ranges are 0-1, 0-10, 0-50 and 0-250 m.a.

Two ranges of ohms, 0-500 and 0-50,000, are had with an internal battery.

The panel makes provision for an additional switch, which, together with a rectifier, allows the reading of A.C. volts on separate scales. The ranges of A.C. volts are 0-10, 0-50, 0-250 and 0-1,000 volts.

"University" Oscillators

The "University" range of oscillators designed and made by Radio Equipment Pty. Ltd. includes both battery and A.C. types. They are housed in black crackle-finished metal cases, with silver etched indicator plates.

New Oscillator

Radio Equipment's laboratories are at present working on the design of an entirely new oscillator in both battery and A.C. versions. The instrument will be available in a few weeks' time.

For . . .

- ★ Efficiency
- ★ Quality
- ★ Tonal Realism
- ★ Absolute Dependability



**New
5" Type**
(approx. actual size)

Amplion (A/sia) Pty. Ltd. manufacture speakers to handle up to 30 watts output.

Only **AMPLION** *is Electrically Welded!*

- FIRST** with Electrically Welded Speakers, AMPLION, as always, pioneers the way to Better Reproduction.
- FIRST** with insulated core, sealed transformers on 5" type speakers.
- FIRST** with the homogeneous yoke, pole-plate, cone-housing shell, allowing micrometer tolerances which can never become disturbed.
- FIRST** with All-Australian designed loudspeakers.

- FIRST** with super-efficient magnetic design which allows greater undistorted output than any other speaker.
- FIRST** with permanently centred annulus, Amplion leads the way in long-life, trouble-free speaker units.
- FIRST** with over-size cones, the AMPLION 5" type 5E7 has 30% greater active cone area than any other 5" speaker, yet it is still only 5" x 5."
- FIRST** and only Speaker using 64 oz. magnets for permaqs.

**DEMAND THE NEW 1941 AMPLION ELECTRICALLY WELDED SPEAKER
RANGE FOR AUDIO PERFECTION**

Write for descriptive leaflet containing all the essential electrical and physical characteristics of Amplion Speakers and New Diphonic Speaker data.

AMPLION (A/sia) PTY. LTD., 382 Kent Street, Sydney

CHANCE for WIDE-AWAKE RADIO MEN

DEALER PROPOSITION FROM BREVILLE

BREVILLE receivers have long enjoyed a reputation for thoroughly-engineered models of exceptional performance.

It was a Breville receiver which won the "DX" contest sponsored by "Radio World" a couple of years ago.

There was nothing surprising about this win, as all Breville receivers seem to be able to out-perform similar types in other brands.

Breville engineers, believing that often enough the ultimate sale of a set is dependant on a home demonstration have always made a point of getting the last ounce of range, selectivity and tone. They have concentrated on performance rather than the fitting of tricky gadgets and novelties.

The popularity of the Breville brand and the prosperity of the radio dealers handling these sets indicates very clearly that this policy is indeed a sound one.

Range for 1941

Without listing an unwieldy number of different types and models, the Breville range for 1941 offers everything that the live radio dealer can possibly ask for.

There are 19 fundamental chassis types, but also four alternative cabinet types, so the total number of different models available runs to over sixty. In the main range of all-electric models there are eight fine chassis types.

"Pick-Me-Up" Models

First of all there are two mantel models of especial interest.

Listed as "Pick-Me-Up" types, these receivers are compact mantel models with in-built loop aerials. They can be carried about from room to room or house to house, and as soon as connected to the power supply they are ready for immediate operation, no aerial or earth wires being required. One model has four valves in all, and the other is more powerful, with five valves.

All-electric Models

Every taste is catered for in the main a.c. range, with a four-valve dual-waver, a straight five-valve broadcast model, five-valve dual-wave model, a long-range six-valve dual-waver, and an eight-valve super-powered model. Each of these is available in a variety of cabinet styles.

A "universal" type of a.c./d.c.

model is also listed with six valves. It is equipped with a barretter valve for perfect voltage control and a special in-built line filter to reduce interference noises.

Portables

Two self-contained battery-operated portables are listed, one with four valves and the other with five.

Both are listed at attractive prices.

Battery Models

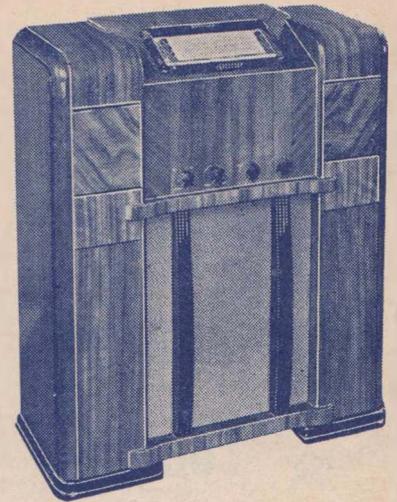
In the battery range there are four models, two straight broadcast models and two powerful dual-wavers. The smaller of the broadcast models, using four valves, gives ample range, selectivity and power for normal use and yet has exceptional economy. A conservative estimate of battery life is 200 hours per charge of the filament accumulator and 1,000 hours from each set of high tension batteries.

Of the other battery models the most interesting is a powerful seven-valve job, with an r.f. stage ahead of the converter and push-pull pentodes in the output.

Driving a ten-inch high-fidelity speaker, this model gives outstanding tone, power and range, yet is reasonably economical, giving 130 hours per charge from the filament accumulator and 600 hours from a set of "B" batteries.

Vibrator-powered Models

Breville engineers have put in a lot of research work on the development of a strong line of vibrator-



Breville "Captain" Console

powered models and these are capable of performance of a high order and are completely reliable in service. These vibrator models range from an economical four-valve broadcast model to a de-luxe dual-waver with push-pull output.

All the vibrator models are equipped with accumulators to give about 110 hours of service from each charge.

Home-lighting Model

Last, but not least, is a five-valve dual-waver which will operate direct from a home-lighting plant, and available in 12, 32 and 50-volt ratings. It is available both as a mantel model and as a console.

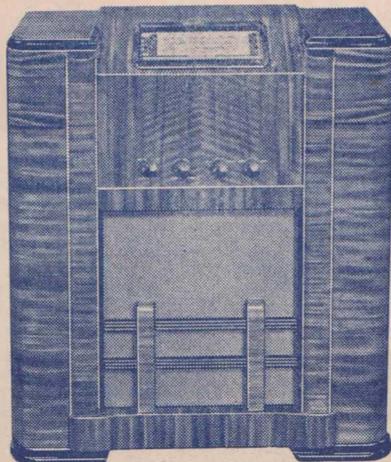
A Full-range Line

We feel sure that every radio dealer will agree with us that Breville have available a model to suit every purpose and the selling agency is a most valuable one to obtain.

Breville want to have representatives in every country town and every suburb, and they are particularly keen about agents who have some technical knowledge so that they appreciate the outstanding performance of all the Breville models. They are making a special appeal to readers of "Radio World" as they know that they will be the right type.

We can strongly advise those interested not to hesitate about getting in touch with us in order to get full details of this dealer proposition.

Address your enquiries to:—The Editor, "Australasian Radio World," 117 Reservoir Street, Sydney.

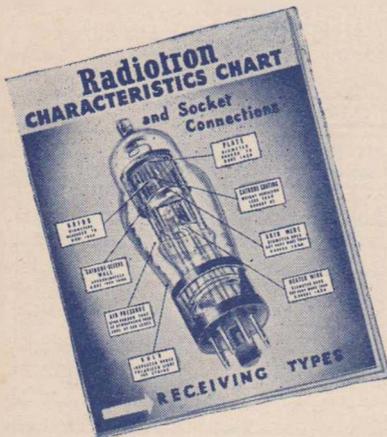


Breville "Major" Console.



Valve Data Sheets
5/- (posted)

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20-page Characteristics Chart
3d. (posted)

EFFICIENT radio service demands modern and accurate testing instruments but . . . without a sound application of valve knowledge, no technician can possibly make full use of them.

The RADIOTRON Technican Library deals with all receiving types and provides comprehensive information on Australian-made Radiotron Valves.



The RADIOTRON Unified Sales-Engineering Service is at your disposal without charge. All enquiries regarding technical problems are invited.



28-page
Equivalent Type Chart
3d. (posted)

AMALGAMATED WIRELESS VALVE CO. PTY. LTD.
47 YORK STREET — G.P.O. Box 2516 BB — SYDNEY

CORRECT FIELD EXCITATION

ESSENTIAL FOR GOOD RESULTS

The correct excitation of dynamic speakers is one which often receives little consideration from service-men and casual set constructors.

In the electro type dynamic speaker the field coil, together with the associated iron yoke and core, comprises an electro magnet. The voice coil attached to the speaker cone lies in the concentrated field of this magnet, and this is the motor mechanism of the speaker.

If the field coil does not produce sufficient magnetic energy in the air gap, the cone will not be driven by speech fluctuations in the voice coil. The amount of magnetism is then firstly proportional to the motor force required in the voice coil. In small speakers with light cones and coil assemblies and relatively unrestricted movement, less power is required than in larger or heavier type speakers. It will be found that the 5" speaker required between 2 and 6 watts of field excitation, while a 12" speaker may require 8 to 14 watts.

The degree of excitation is limited on the upper range by more or less physical factors. Should the field coil wattage be so high that the heat generated is transferred by conduction and the temperature rise of the whole assembly causes mechanical distortion of components, then a limit is placed on the maximum field wattage usable.

If the wattage is not sufficiently great, distortion will arise because of the reduced power-handling capacity of the voice coil, and rectification of

the audio frequency signal will possibly be introduced. It is, therefore, advisable to operate all types of electro. dynamic speakers in accordance with the recommended specifications of the manufacturers; a minimum rating is advised, below which it is not good to venture. The maxi-

By NORMAN HEAD

Engineer, Amplion (A'sio) Pty. Ltd.

mum rating advised is usually that which is liable to introduce conditions which would effect good quality reproduction.

The choice, therefore, of field coil resistances where currents flowing through them are already determined, is a matter which should be given considerable consideration. Or where

field coils are connected across more or less fixed voltages the same also applies.

The table shown herein should be a useful guide in this respect. The central column, reading from top to bottom, indicates the excitation wattage of the field coil between the limits of 2 and 14 watts; on each side will be found columns headed by field coil resistances, the figures in the left-hand column refer to the D.C. current flowing in the field specified, and the figures in the right-hand column, the voltages impressed across the specified fields.

The reader is advised to study, in conjunction with this field excitation chart, the recommended field voltages of the various speakers, which in Amplion units, are as follows:—

Type	Watts Min.	Watts Normal	Watts Max.
5E7 5" Electro	2	4	6
7E12 7" Electro	6	8	10
8E12 8" Electro	5	6	9
12E12 12" Electro	6	8	12
12E22 12" Electro De Luxe	8	10	14

		Field Ohmage						WATTS Excitation	Field Ohmage						Field Voltage
		7500	2500	2000	1500	1000	750		750	1000	1500	2000	2500	7500	
Field Current (ma)	16	28	32	37	45	52	2	39	45	55	63	71	123		
	23	40	45	52	63	73	4	55	63	77	89	100	173		
	26	45	50	58	71	82	5	61	71	87	100	114	194		
	28	49	55	63	77	90	6	67	77	95	110	123	212		
	33	57	63	73	89	103	8	77	89	110	127	141	245		
	35	60	67	77	95	110	9	82	95	116	134	150	260		
	37	63	71	82	100	115	10	87	100	123	142	158	274		
	40	69	77	90	110	126	12	95	110	134	155	173	300		
	43	75	84	97	118	137	14	103	118	145	167	187	324		

For Wattage, current or voltage ratings not shown above, the following equation may be used $W = I^2R$

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MULLARD Service . . .

For more than twenty-five years . . . from the days when wireless was unknown to all but a handful of experimenters . . . the name of Mullard has been synonymous with service . . . service to those who build receivers and those who maintain them.

Following this ideal has enabled Mullard Valve engineers to set a standard of perfection in manufacture and performance that has never been excelled.

THERE NEVER HAS BEEN FOR ANY PURPOSE A BETTER VALVE THAN MULLARD

For over three watts of crystal clear, high-quality audio output, specify and INSIST ON Mullard Valves for the "Porto-Grom Amplifier" described this month. Mullard types required: 1—6J7G, 1—6V6G, 1—5Y3G.

Mullard

Mullard-Australia Pty. Ltd., 367-371 Kent St.,
Sydney, N.S.W.

Telephone - - - - - MJ 4688



ALIGNMENT OF PERMATUNE UNITS

Some Advice for Servicemen

THE new "Crown" DP3 Permatune unit incorporates several advanced features in design, among them being the elimination of the usual broadcast padder adjustment. This particular item, with regard to dial tracking, has always been a source of trouble in adjusting a tuning unit to follow correctly the calibrated call-signs of stations on a modern dial. To this end, "Crown" have developed this new unit, and their engineers have eliminated a potential source of trouble in regard to dial tracking (namely, the broadcast padder adjustment), because with this new system, dial and unit tracking, together with correct alignment over the full band between each circuit, is merely a matter of adjusting the trimmers and the dial pointer to bring a station at each end of the band into line, the others falling automatically in their correct sequences.

As the short-wave calibrations are usually plotted after the broadcast calibration has been made, it is obviously necessary to obtain correct dial tracking on the broadcast band before attempting alignment of short-wave.

Broadcast Band Alignment

(1) Tune to a known station at the high frequency end of the band, and adjust aerial and R.F. trimmers for maximum gain, irrespective of the dial pointer, then loosen grub screws of dial off condenser shaft.

(2) Tune to a known station at the low frequency end of the band on or about 600 k.c. and, while holding the gang in place on this station by hand, rotate dial until the dial needle points to the station being received, then tighten up the grub screws of the dial to the condenser shaft.

(3) Re-tune to a known station at the high frequency end of band, and adjust the oscillator trimmer until dial needle corresponds with the station marking on the scale. (To move pointer down, turn trimmer in or vice versa).

(4) Tune receiver to approximately 1400 k.c. and adjust aerial and R.F. for maximum gain.

(5) Re-tune receiver to the low frequency end of band, preferably to a distant station, with volume control full on, using an aerial of approximately 25 to 30 feet.

(6) At this frequency or station, carefully adjust the iron cores of both the aerial and R.F. coils for maximum gain.

(7) Do not on any account touch the iron core of the oscillator coil.

(8) Re-tune receiver to 1400 k.c., and again adjust aerial and H.F. trimmers for maximum output.

This completes broadcast alignment with correct dial tracking, an absolute dead alignment between aerial and R.F. circuits, plus correct differences of frequencies between aerial, R.F. and oscillator circuits.

Short-wave Alignment

(1) Tune receiver until pointer is on approximately the centre of the 16-metre band, and adjust the aerial and R.F. trimmers for maximum gain at this wave-length.

(2) Re-tune receiver to 31 metres, and carefully adjust the iron cores of the S.W. aerial and R.F. coils for maximum gain at this wave-length.

(3) Repeat Nos. (1) and (2).

(4) Should the needle pointer be required to be moved up or down the scale at the high frequency end of the band (which will only be affected), adjust the oscillator trimmer until the 16 metre falls in approximately the centre of the band.

Synopsis

Having arranged complete coverage, tracking and alignment in this way, trimming at the high frequency end of band to bring all circuits into line on either B.C. or S.W. (as done with the aerial and R.F. trimmers and padding, so to speak, at the low frequency end of the B.C. and S.W. bands), is done, by bending the aerial and R.F. curves to follow that of the oscillator with, of course, the difference of the I.F. frequency between the aerial/R.F. and oscillator curves.

This, as it will probably be noted, assures absolute tracking between the aerial and R.F. coils themselves, and as mentioned previously between the super-imposed aerial and R.F. curves and the oscillator.

This is a complete departure from the conventional system of padding as we know it, and has been used with excellent results, and as the actual padder used is a fixed mica type, frequency drift of the oscillator is brought to an absolute minimum.

We wish to mention also that, when the adjustments to the aerial and R.F. trimmers are made, these trimmers should be kept at their highest capacity rating consistent with obtaining a peak.

Following the above adjustments closely, should ensure absolute tracking and optimum results.

The Circuits of 1937, 1938, 1939 Receivers in three volumes for 27/6



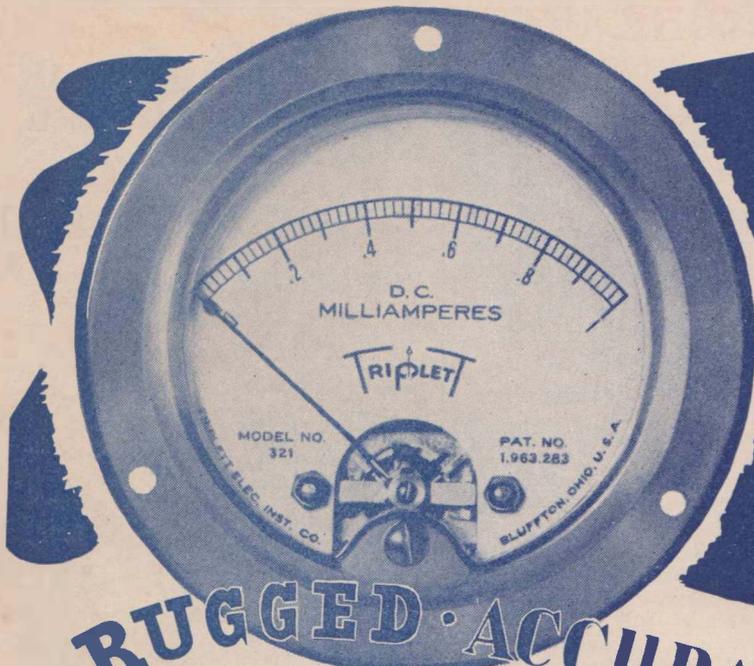
This is Australia's ONLY Standard book of receiver circuits and data covering each year's models. There is NO OTHER WAY of securing complete reference year by year of every national receiver.

Imagine the convenience of being able to refer to the required receiver circuit at a moment's notice and have all the information you require.

A small quantity of Volume I. (1937 circuits) and Volume II. (1938 circuits) is available at special concession prices — 10/- each (stiff covers), 7/6 each (limp covers). Volume III. (1939 circuits) is priced at 15/- and 12/6.

Thus, for 35/- you can secure all Australia's national receiver circuits for 1937, 1938, 1939 in stiff-covered Volumes, or only 27/6 in limp covers.

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Precision Built
INSTRUMENTS

RUGGED · ACCURATE · DURABLE

Model 321 D.C., actual size

... built in many types and sizes!

Triplet instruments have established a new standard of quality in the field. Precision accuracy at low cost, simplicity with extreme ruggedness and bridge type construction are features that evidence the most approved engineering practice.

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Triplet's exclusive method of maintaining absolute uniform pole piece accuracy supplants the more expensive milled soft iron type, and is far superior to those formed of soft iron. Cast magnets of cobalt and other alloys are used in some of the larger and more sensitive Triplet instruments and relays.

D.C. Instruments are the D'Arsonval type with an extra light moving coil and reinforced parts. A.C. instruments are the movable iron repulsion type; are air damped and have light moving parts. Both A.C. and D.C. have selected sapphire jewel bearings and highly polished pivots; white enamelled metal dials and moulded zero adjusters. Accuracy within 2% except rectifier type instruments which carry a 5% guarantee. Instruments supplied with pointer stops.

THERMO AMMETER

High Frequency

Accuracy 2%

Triplet Thermo Ammeters correspond in size, etc., to corresponding D.C. models. All have moulded cases. Have external couples which withstand 50% overload connected to meter with 2-foot leads. Couples are easily replaced when necessary. Internal couples to order. External couples only, for any model.

The Model 321, 3-inch dial, illustrated above, is available in 5 and 2 inch dials designated Models 521 and 221.

Typical "321" ranges are: 0-1, 0-10, 0-50, 0-100, 0-250, 0-500, 0-1000 Milliampers.



529-D.C.



539-A.C. Thermo Ammeter

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PORTO - GRAM

An electric portable gramophone
with volume expansion.

THERE is a great deal of satisfaction in the electrical reproduction of good recordings. By this means it is possible to bring grand music into even the most humble home.

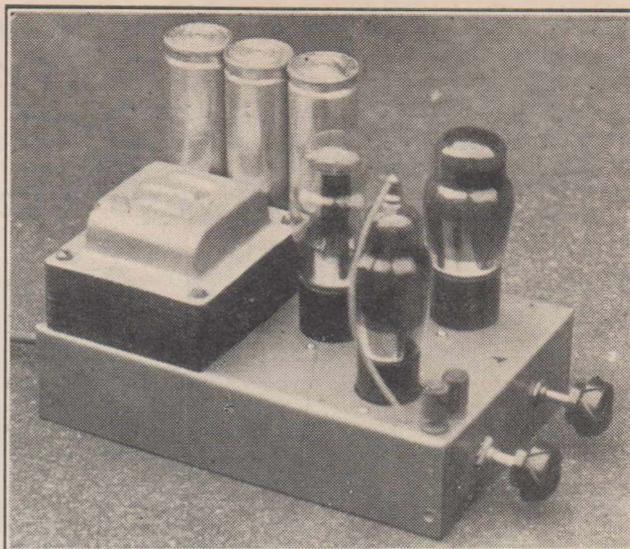
As with most things, however, there are varying degrees of perfection in this matter of reproduction.

If you merely want a little bright music for a parlour dance, then it's quite a good scheme to get hold of a cheap pick-up and apply it to the radio set. You will then obtain quite satisfactory results for your purpose. For example, the Victor Sylvester dance records appear to sound fine, no matter how poor the theoretical quality of the amplifier used.

But then there are people who are musically minded; who want the best possible reproduction; who want a violin to sound like a violin; even want to be able to tell the difference between a piano and a banjo.

Fortunately, a really good gramophone amplifier is neither expensive nor complicated, and can be built by

▲
●
▲
A view of the
amplifier chassis,
which uses three
valves.



any handy man in the course of an evening or two.

Handy and Compact

To get the utmost in fidelity it is nearly always necessary to use an amplifier which is anything but compact. For best results the speaker should be mounted well clear of the amplifier, and for preference on a large baffle board or in a special acoustic labyrinth or other form of box baffle. Such arrangements are un-

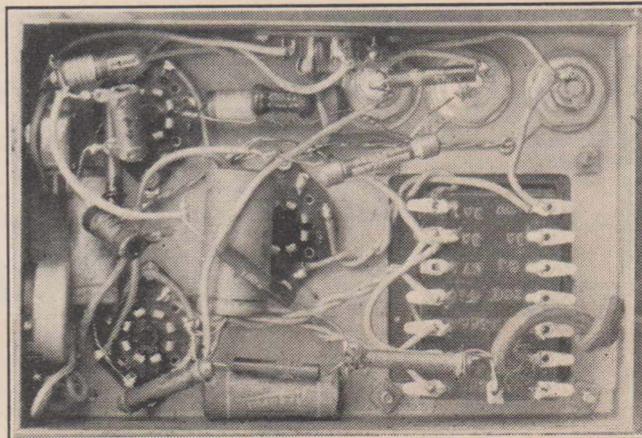
wieldy and unsightly, but up till now there has been no easy way out of this difficulty.

The recent articles on acoustic compensation, however, point to an easy way of getting quite good tonal quality and general performance from a simple and compact form of electric gramophone. Even if the acoustic properties of the cabinet are not the best, they can be compensated for in the amplifier, the control of inverse feedback giving an almost unlimited control over the frequency response of the amplifier.

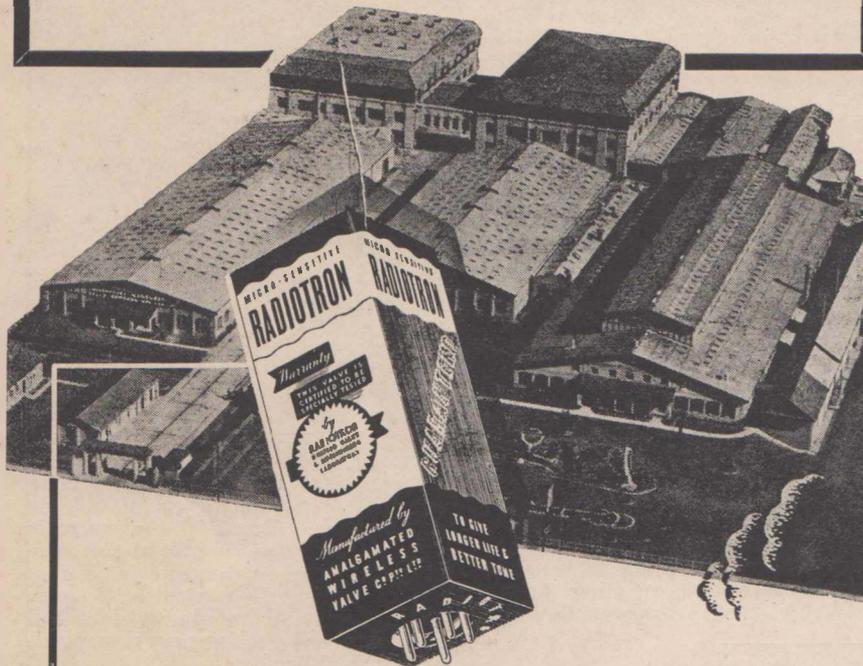
The amplifier is simple in design, and only a handful of components are required, so that it can be built on a small base to fit inside a suitable cabinet. The size of the cabinet is limited mainly by the size of the turntable, the length of the tone arm, and the room necessary for it to swing.

The photograph shows a suitable cabinet, although it is rather on the big side, having been designed as an all-round cabinet to suit an amplifier of this type, but also big enough to

▲
●
▲
At left — the completed "Porto-Gram."
Below — a view of the wiring which shows the placing of the minor components.



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Behind Australian-made Radiotron Valve equipment stands the largest radio valve manufacturing organisation in Australasia — extensive works, modernly equipped — skilled engineers, experienced operatives—production capacity equal to maximum demand.

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Advertisement of Amalgamated Wireless Valve Co. Pty. Ltd.

accommodate a suitable radio tuner, and further amplifiers for microphone work, as with a public address system.

Similar cabinets are readily available from any good radio dealer, being made to order at short notice by the Western cabinet factory.

The Circuit

There are quite a number of different circuits which can be used, and the main thing to be sure about is simply that the amplifier is suited for the purpose for which it is to be used. This applies especially to the amount of power required and the amount of

**ELECTRIC PORTO-GRAM.
 With Volume Expansion**

- 1—Suitable carrying case (Western).
- 1—Base, size 9 x 6 x 2 (Arcadian).
- 3—Electrolytic condensers, 8 mfd. (T.C.C.).
- 1—Power transformer, 385v. 80 m.a.
- 1—5 meg. volume control (I.R.C.).
- 1—1.5 ohm resistor (I.R.C.).
- 1—20 ohm resistor, 1-watt (I.R.C.).
- 1—250 ohm 1-watt resistor (I.R.C.).
- 1—1000 ohm 1-watt resistor (I.R.C.).
- 2—2,000 ohm 1-watt resistor (I.R.C.).
- 1—50,000 ohm 1-watt resistor (I.R.C.).
- 1—250,000 ohm 1-watt resistor (I.R.C.).
- 1—500,000 ohm 1-watt resistor (I.R.C.).
- 1—1.5 meg. 1-watt resistor (I.R.C.).
- 1—1 mfd. tubular condensers (T.C.C.).
- 1—5 mfd. tubular condensers (T.C.C.).
- 2—25 mfd. electrolytics (T.C.C.).
- 3—Octal sockets, 1 6-pin socket, 2-way switch, dial lamp, knobs, sundry hardware, etc.
- 1—Gramophone motor (Collaro, Garrard).
- 1—Pick-up (Collaro, Garrard).
- 1—Speaker, 5,000 ohm loaf, 1,500 ohm field (Amplion, Rola).

gain necessary to obtain this power from the type of pick-up used.

Practical experiments with Parry's latest amplifier, as detailed in this issue, proved that it was ideal for the purpose, and we have every confidence in recommending it as the most highly developed simple amplifier circuit ever offered in any part of the world.

Used under the conditions intended it is a truly wonderful amplifier, bringing out reproduction from records which few people realise is possible.

Bass notes make the crockery rattle, and yet the highest notes of the violin come through with the utmost clarity and not a trace of screechiness.

The acoustic compensation, in conjunction with the volume expansion and the distortion-free output allows truly brilliant reproduction to be obtained, even when the volume is kept to quite a low level. This feature alone is worth considerable emphasis. Usually it is found that all brilliance goes from the reproduction when an amplifier is operating with the volume cut down.

Practical Work

Practical work with the amplifier

Shortwave Review

CONDUCTED BY

L. J. KEAST

NOTES FROM MY DIARY

Recruits Respond

With this issue comes my thirteenth attempt to keep up interest in short waves for those who have already explored this fascinating avenue and an endeavour to get others to use that portion of their set that permits them, as Sir Ernest Fisk said when opening "The Romance of Radio Exhibition," "to open up that magic door which brings the world before you."

The growing number of reporters, the new members of the All-Wave All-World DX Club and the record number of new subscribers suggest that the policy has been approved. The lecturettes I gave at the Royal Empire Agricultural Show and at "The Romance of Radio" Exhibition at David Jones attracted such crowds at all sessions that I am firmly convinced of the ever-increasing interest in overseas listening.

Fully aware of the excellence of the modern receiver, these distant countries now feel they can claim the world as their audience, and the consequent international flavour of the programmes makes listening all the more enjoyable. This combination and the fact "long distance" per radio costs no more is undoubtedly one of the reasons for the converts. I was pleased at the two occasions referred to, to meet so many of our reporters. Quite a number I know only by name, but the general knowledge they had of overseas reception fully confirmed the impression I had gained from their exhaustive reports.

Schedules Go Overboard

The American broadcasting stations, ever mindful of the interest in topical events, throw convention to the winds and schedules and pro-

grammes are sacrificed at a moment's notice when a sudden change in world affairs takes place. An instance of this was the German invasion of Yugoslavia. WRCA, 9670kc, 31.02m, continued long after 4 p.m., their customary hour for closing. Unfortun-

WITH THE REPORTERS

Those helping this month are:—

Wm. Bantow, Edithvale, Vic.
A. Beattie, New Lambton, N.S.W.
John S. Beatty, Kavieng, T.N.G.
P. Byard, Launceston, Tas.
A. T. Cushen, Invercargill, N.Z.
A. Deppeler, Edmonton, Q.
L. Edell, Rose Bay, Sydney.
Dr. K. B. Gaden, Wallumbilla, Q.
N. Gandy, Wellington, N.Z.
Roy Hallett, Enfield, Sydney.
H. I. Johns, Nelson, N.Z.
B. W. Keats, Launceston, Tas.
K. B. Mitchellhill, Muswellbrook, N.S.W.
G. Muller, Newtown, Sydney.
S. I. Nelson, Cairns, Q.
W. H. Pepin, Maylands, W.A.
Hugh Perkins, Malanda, Nth. Q.
M. Rogers, Hunter's Hill, Sydney.
E. E. Seward, Marrickville, Sydney.
R. Taylor, Mosman, Sydney.
T. Whiting, Five Dock.

Gentlemen, I thank you.

South Australian reports wanted, please.

Send in reports as fast as you hear anything unusual; also items for "Help Wanted."

ately, we were unable to benefit from the subject matter, as KGEI, opening at 4 p.m. as usual on exactly the same frequency, figuring their source of information was just as reliable, did their best. Result: Bedlam and,

THE FALL OF GREECE

Naturally anxious to hear the latest news from Greece, I tuned to SVM on 30.196 metres at 5.35 a.m. on Thursday, April 24. When the station did not open as is customary at 5.40, I was uneasy as to its fate. However, at 5.48 I noticed a carrier-wave and, sure enough, Athens was there. But it was not our usual announcer and the news was not the cheerful reference to victorious advances we had become accustomed to. No, it was the statement that the Proclamation of King George II. would be read. It was, and the emotion of the reader could be distinctly

noticed. After it was read, I thought for a while and then tried to picture this poor man in front of a microphone not knowing who would be his audience, but probably hoping the world would hear his sad story. Regrettable as the news was, I felt pleased I knew at least one person was listening.

On Monday, April 28, SVM, Athens, was not on the air. Will this splendid transmitter be used by the Germans as they have done in other conquered territories? I feel glad now that I was one of the audience at the final curtain.

strangely enough, the New York transmitter, if anything was a trifle the louder.

WNBI, 11,890kc, 25.23m., who usually close at 4 p.m., stayed on another hour or so, and the Columbia Broadcasting System outlet in Philadelphia, WCAB, 49.50m, was heard till 7 p.m.

And Still They Come

All India Radio are being heard at terrific strength on 7290kc, 41.15m, from about 10.30 p.m. They may open earlier, but at 10.45 announce in English, "This is Delhi calling. We are also on VUD-4, 25.36m, and VUD-2, 85.84m." They appear to leave the air on 41.15m. at 11.30 after announcement in Hindustani. All attempts to land them on 85.84m failed.

A Familiar Voice

When checking up mid-day reception on April 25, I happened to be tuned to London just as George Ivan Smith spoke in Radio Newsreel. He referred to several towns he had visited and gave a splendid picture of Lisbon with its now more than ever cosmopolitan population. He mentioned the beauties of the English countryside and paid a great tribute to the courage of the Britishers whose one and only thought was, "There's a job to be done."

Antics on 13

I think we can shortly expect some antics from the 13 and 16-metre bands. This is just about the time when one night they will behave splendidly, while on the next their poor showing would almost suggest trouble with the set on that band. Reaching the height of their idiosyncrasy about the middle of May, they will most likely refuse to be friendly until August, when from then on, they will show an eagerness to come into the field or, rather, the air again.

Have noticed on several occasions during the last week, the 19-metre band has been poor between 9 and 10.30 p.m. In fact, on two nights in succession it was impossible to hear anything. At 11 p.m. signals were back to normal.

Welcome

Welcome to Mr. John S. Beatty, of Kavieng, T.N.G., as a member of the All-Wave All-World DX Club. Mr. Beatty sends a list of loggings which shows the variation in signal strengths in his location compared with Sydney.

Listeners are reminded of the changes in Daventry schedules and frequencies, a good many of which will probably have been noticed before this issue arrives. Under "This Month's Loggings" I have shown most of the changes.

Brief Mention

Listeners are reminded that some of the United States of America adopt Daylight Saving as from April 27, so schedules shown under Loggings may be a trifle.

The new A.B.C. transmitter, VLR-8, 25.51m, appears to be generally approved by reporters, affording a much better signal, particularly in Queensland. However, there are times when I wish they were a little farther away from GSD.

Although the remarks heard may not be those of the oldest inhabitant, I am sure we all welcome back to the air, OFE and OFD, Helsinki, Finland. They are both being heard daily in the early mornings and mid-afternoons.

Running over the 25-metre band on March 31, heard Radio Saigon open up at 10 a.m. All talk was in French.

VLQ-3, 15,310kc, 19.59m, is being used in place of VLQ-7 for Transmission X. to North America. If you doubt this statement, sit up till 3.55 a.m., when they are due to commence.

MTCY, Hsinking, 9540kc, 31.43m, opens at 7 a.m. with news in English.

WGEO, Schenectady, 9530kc, 31.48m, is now being heard well, and the session being continued till 3 p.m. meets with general approbation.

Looks as though XMHA, Shanghai, have forsaken 25.24m for their old love, 25.31m. Signal is splendid, and news at 9 p.m. by Carol Olcott can be followed with ease, but when VLQ-2 later on appears things are NOT so good.

That station heard after 2GB closes down is JOAK-2 in Tokyo, one of the broadcast transmitters of Japan on exactly the same wavelength as 2GB, viz.. 345m.

The peculiar language round about 8 a.m. on 31.51m is the Paris station, "Y," using Arabic.

RW-15, Khabarovsk, on 31.36m, appears to have left the air of an evening, with the result our old friend, KZRM, Manila, "The Nation's Station" can again be enjoyed.

Dr. Gaden tells me my favourite musical programme from London, "Hi-Gang," is to finish on May 18. Perhaps that signals the oft talked-of visit to Australia of Bebe Daniels and Ben Lyons.

Roy Hallett tells me the Columbia Broadcasting System are building on Long Island, New York State, two new transmitters of 50 k.w. power, due to go on the air about September.



ULTIMATE "ELITE" MANTEL

8-VALVE TRIPLE WAVE MODEL

The only set of its kind obtainable on the Australian market! Specially designed for critical listeners who want something better, something different, something more exclusive than the average set. It is outstanding in performance and will eclipse anything you've ever heard in the way of reception; tone is magnificent, with full, mellow, deep, rich volume, and sensitivity of response has to be experienced to be appreciated fully. Dependability of operation and general satisfaction is guaranteed by "ULTIMATE" reputation — **there is not a better set made!**

Fitted with exclusive LIGHT RAY TUNING (obtainable only in "ULTIMATE"); Four Controls: Tone, Tuning, Wave Band and Volume; Short-wave band 16-50 metres, medium wave-band 40-123 metres, broadcast band 1600-550 kilocycles; Electric Eye; A.V.C. Spin Tuning; Special 8" Relca Reproducer; illuminated "Sliderule" Pointer Dial, etc., etc. Specially protected against insect invasion and impregnated against humidity. **The ideal set for districts where reception is difficult or uncertain!**

SECRET GERMAN PEACE STATION! "Ultimate" Radio-owners can easily receive this station on 30.76 metres from 5.45 to 6 a.m. (East. Stand. Time). Hear this special English session from the German Christian Peace Secret Station.

Cut out this Coupon and post ta-day.

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Please send me particulars of "ULTIMATE" Radio Receivers as advertised in "Australasian Radio World."

NAME

ADDRESS R.W.



GEORGE BROWN & CO. PTY. LTD., 267 Clarence St., Sydney

The MONTH'S LOGGINGS

ALL TIMES ARE AUSTRALIAN EASTERN STANDARD

Where known, schedules are shown, but listeners must remember overseas stations reserve the right to make alterations without notice. With the rapid improvement in daylight reception, which has not yet reached its peak, more and more stations will be heard for a longer period.

AFRICA

Abyssinia:
12AA, Addis Ababa 9650kc, 31.09m
Schedule unknown, but heard around 5 a.m.

Algeria:
TPZ, Algiers 12,120kc, 24.76m
Schedule: 4 a.m. to 9 a.m.; 5.30 p.m. to 6.15 p.m.
Good both mornings and evenings (Beattie).

TPZ-2, Algiers 896kc, 33.48m
Schedule: 4 a.m. to 9 a.m., 5.30 p.m. to 6.15 p.m.
Fa: 7 a.m. (Nelson, Beattie).

Belgian Congo:
OPM, Leopoldville 10,140kc, 29.59m
Schedule: 4.55 a.m. to 5.45 a.m.
Pcor signal, fades badly (Beatty, N.G.).

Egypt:
SUX, Cairo 7865kc, 38.15m
Schedule: 4.30 a.m. to 6.30 a.m.
R5 at 6.30 a.m. (Nelson, Beattie, Byard).

French Equatorial Africa:
FZI, Brazzaville 11,965kc, 25.06m
Schedule: 6-7 a.m., 4-4.30 p.m.
Weak in mornings (Nelson). Clear and loud in afternoons (Rogers, Beattie).

Gabon:
FHK, Libreville 9320kc, 32.18m
Schedule: 7 to 9.15 a.m.
R5 when closing (Taylor).

French Morocco:
CNR-2, Rabat 11,940kc, 25.13m
Not reported.

French West Africa:
Senegal:
FGA, Dakar 9405kc, 31.90m
Not heard lately (Nelson). (Mr. Nelson was I think, the first to log this station in Australia.—Ed.)

G'd Coast:
British West Africa:
ZOY, Accra 4915kc, 61.04m
Mr. Taylor, Mosman, writes: "After many attempts, I at last heard ZOY on Saturday, April 5. In English session at 4 a.m. they announced as ZOY, Accra, Gold Coast. Signal was R5."

South Africa:
Kenya:
VOTLO, Nairobi 6083kc, 49.31m
Schedule: 2.15 a.m. to 5.15 a.m. News at 2.30 and 4.
Generally an excellent signal.

ZRH, Pretoria 6007kc, 49.94m
Heard around 3.30 a.m.

ZNB, Mafeking 5900kc, 50.95m
Heard at 3.30 a.m. R5 (Taylor).

Rhodesia:
THE POST OFFICE STATION, Salisbury
7317kc, 41m
Schedule: 2 a.m. to 6 a.m. Relays Daventry at 4 a.m. Closes with "God Save the King." R5 at 5 a.m. (Taylor, Nelson).

Portuguese East Africa:
Mozambique:
CR7BE, Lourenco Marques 9710kc, 30.9m
Schedule: 5 to 7 a.m. except Mondays
News 5.55.
R8 at 6 a.m. (Nelson).

CR7AA, Lourenco Marques 6035kc, 49.75m
Weak, but aud'ble just at opening at 5 a.m.

Portuguese West Africa:
Angola:
CR6AA, Lobita 7614kc, 39.39m
Fair signal on Sundays at 5.30 a.m.

Natal:
ZRO, Durban 9750kc, 30.75m
Closes at 7 a.m. after B.B.C. News.

Spanish Morocco:
Radio Faizange, Tangiers 7090kc, 42.31m
Schedule: 6 to 8 a.m. All Spanish.
R6 at 7 a.m. (Taylor).

Madagascar:
RADIO TANANARIVE, Tananarive
6063kc, 49.48m
Heard at 12.15 a.m. Female announcer; fair signal (Whiting).

AMERICA

Central:
Costa Rica:
TIPG, San Jose 9620kc, 31.19m
Loudest of the Central Americans. Stronger when closing at 2.35 p.m., March 24, than I have ever heard him at 10 p.m. (Gaden). Very good after VLQ closes (Nelson).

TIEP, San Jose 6695kc, 44.82m
Opens weakly at 10 p.m. (Nelson).

TILS, San Jose 6165kc, 48.66m
Schedule: Opens at 10 p.m.
Strong nightly (Gandy, Nelson).

TIGPH, San Jose 5910kc, 50.72m
Reported being heard again, so here is schedule: 10 to 11 p.m., 3 to 4 a.m., 9 a.m. to 1 p.m.

Slogan is "Radio Alma Tica." Opens with a march now; one time, was Ted Lewis' "Good-night Medley." Address is: Apartado 800, but you are warned they are slow at verifying.—Ed.

El Salvador:
YSPA, San Salvador 10,400kc, 28.55m
Schedule: 11.10 p.m. to midnight; 4-6 a.m.; 9.30 a.m. to 2.30 p.m.
Signal is now weak (Byard).

Guatemala:
TGWA, Guatemala City 15,170kc, 19.77m
Monday mornings from 5.30 a.m. to 8.15 a.m.
R6 to R7 when closing (Deppeler).

TG5JG, Guatemala City 11,440kc, 26.22m
Has been reported heard in late afternoon.

Azores:
CT2AJ, Ponta Delgada, 4002kc, 75.00m: This is the station I referred to last month. Mr. Taylor, of Mosman, is positive he heard this station. Here is what he says, "I don't blame you for finding it a bit hard to believe the reception of CT2AJ, but, nevertheless, it is true. Here is how it came about. I was listening around 75 metres one night at 10.45 when I heard a station or approximately 75 metres. I listened till 11 o'clock and then I heard "Ponta Delgada, Sao Miguel Azores." I then looked up some American magazines I have and found CT2AJ on 74.95 metres, to be located in Azores. Also the time coincided with the schedule. It has also been heard now at 8 a.m. At both times it is R5." Going through my papers, I find this station is shown and frequency and wavelength. Azores, or Western Isis, Portuguese group in mid-Atlantic, 1500 S.W. of Ireland, and 1700 miles E. of Nova Scotia; area 922 sq. miles; population, 254,000; capital, Angra, on Terceira I.
Ponta Delgada, on Sao Miquel, is the largest town in the Isles, with a population of 16,179.

TGWA, Guatemala City 9685kc, 30.98m
Heard on favourable days till 2.30 p.m. Weak (Nelson).

TGQA, Quezaltenango 6400kc, 46.88m
Excellent Sunday afternoons at 4.30 p.m.

TG-2, Guatemala City 6700kc, 48.39m
Closed at 6.04 p.m., March 23 (Gaden).

British Honduras:
ZIK-2, Belize 10,600kc, 28.30m
Schedule: Wednesday, Friday and Sunday, 4 to 4.30 a.m., 11.30 to 11.50 a.m.
Heard for first time Good Friday at 4.15 a.m. Signal R4 (Taylor).

Panama:
HP5A, Panama City 11,700kc, 25.64m
Schedule: 10 p.m. to midnight.
Good at 10 p.m. (Nelson).

HP5J, Panama City 9607kc, 31.22m
Schedule: 10 p.m. till midnight.
Good at 10 p.m. (Nelson).
Heard distinctly when closing at 3 p.m. (Gaden).

Hawaii:
KHE, Kahuku 17,980kc, 16.69m
Heard one Sunday morning (Seeward). (This is a point-to-point communication and no verification will be sent.—Ed.)

North:
WNBI, Boundbrook 17,780kc, 16.87m
Schedule: Midnight to 10.45 a.m. News 1 a.m.
R7 at 10 a.m. (Cushen).

WRWU, Boston 15,350kc, 19.54m
Schedule: 5 to 8.35 a.m. News at 6.30 and 7.30 a.m.
Poor signal (Beattie). Will probably improve.—Ed.

KGEI, "Frisco" 15,330kc, 19.56m
Schedule: 10.15 a.m. to 3 p.m. News, 0.45 a.m.
Heard from 1.30 p.m. with fair signals (Beattie).

WGEA, Schenectady 15,330kc, 19.56m
Schedule: 2.15 a.m. to 9 a.m. News, 4.45 and 7.55 a.m.

WCBX, New York 15,270kc, 19.63m
Weak at 7.30 a.m.

WLWO, Cincinnati 15,250kc, 19.67m
Schedule: 11 p.m. to 7.45 a.m. News 11 p.m. and 4.45 a.m.

WPIT, Boston 15,210kc, 19.72m
Heard up till 10.15 a.m. (Gaden).
Schedule wanted.—Ed.

WNRI, Boundbrook 11,890kc, 25.23m
R8 when closing at 4 p.m. (Cushen). Heard on April 6 till 5 p.m. Very good signal (Beattie).

WBOS, Boston 11,870kc, 25.26m
Schedule: 7 a.m. to 2 p.m. News, 9 a.m. Weak at 9.30 a.m. (Nelson).

WCBX, New York 11,830kc, 25.36m
Schedule: 7 a.m. to 9 a.m. News, 7 a.m. and 8.45 a.m.

NEW STATIONS

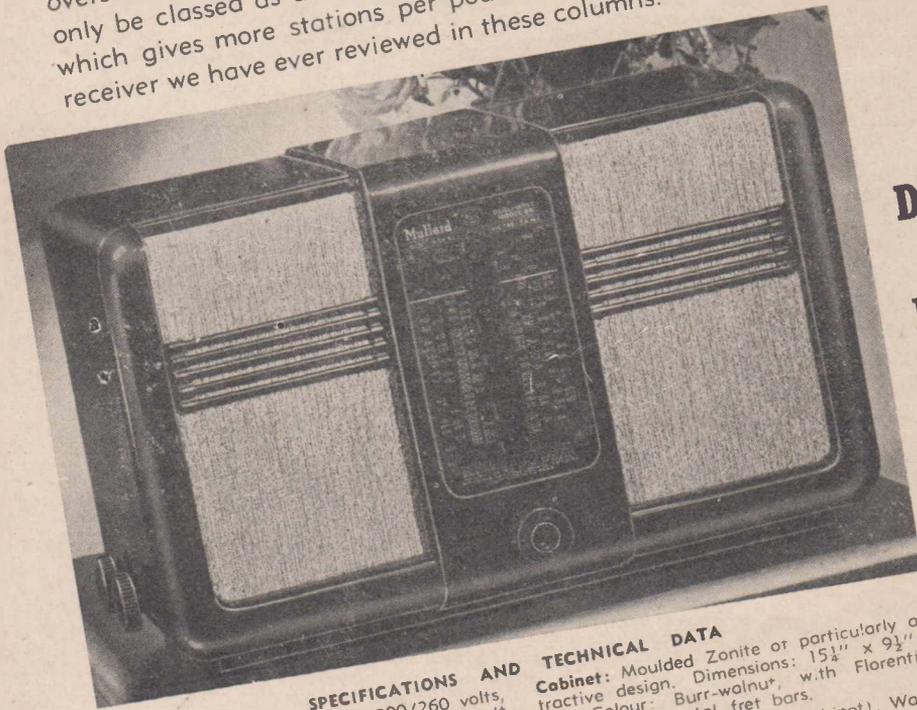
India:
VUD-2, Delhi (7290kc, 41.15m): This is not actually a NEW station, but has only been noticed during the last month as operative. Opens at 9.30 p.m. with same programme as VUD-4, 25.36m. Closes at 11.30. Heard announcing at 10.45, they were on 85.84m and 25.36m. Later frequency is well known to us, but so far have not heard them on the former. The 41.15 signal is probably as loud as any on the air.

Another of the Secret Stations has shown up. Location is unknown, but the language used is, as far as I can make out, "Sender Europaeischer Rundfunk" ("European Radio Station"). Station opens at 7 a.m. sharp in German, and for about ten minutes gives a talk in German. After a brief pause, sometimes talks in French. Announce they are on the air at 9 p.m., 11 p.m., midnight and 2 a.m. It is of course the 9 p.m. session I heard (7 a.m. Sydney), on 9.66 mc, 31.96m. Careful tuning is required, although strength is good, as ZRO-9, on 31.02, is on one side, and WCBX, 31.09, on the other.

"MORE STATIONS PER POUND OUTLAY . . ."

SAYS A. G. HULL,
RADIO AUTHORITY

"Once over the dial was enough to confirm the opinion that this little set has the most remarkable knack of bringing in distant stations with ease. On the short waves the weaker overseas stations came through with a clarity which could only be classed as uncanny . . . the nett result is a receiver which gives more stations per pound outlay than any other receiver we have ever reviewed in these columns."—A.G. Hull



★
4V.
**DUAL WAVE
TABLE
MODELS
65 and 66**
(for A.C., Battery
and Vibrator
Operation)

★
Model 65
£17/19/6

Model 66
£25/17/6
(Complete)

SPECIFICATIONS AND TECHNICAL DATA

Power Operation: MODEL 65, 200/260 volts, A.C. electric mains. MODEL 66, one 2-volt "A" and three 45-volt "B" Batteries (or it adapted for vibrator operation by the addition of Mullard Special Vibrator Converter Unit—one 6-volt "A" Battery).

Wave-bands: 540/1600 K.C.'s (Australasian broadcast) and 16/50 Metres (Short-wave).

Reproduction: Specially designed 6" "ROLA" Electrodynamic Speaker.

Dial: Vertical panel type with horizontal pointer. Australasian stations divided into States zones, with Short-wave scale in central position for tuning ease.

Cabinet: Moulded Zonite or particularly attractive design. Dimensions: 15½" x 9½" x 7." Colour: Burr-walnut, with Florentine bronze-finish metal fret bars.

Controls: Tuning (front of cabinet), Wave-change Switch (right side), Volume (left of Cabinet), with Tone Control to rear. Dial light switch combines with Tone Control in Model 66.

Valves: Special dual and triple-purpose MULLARD Master Valves.

Warranty: Covered by the comprehensive MULLARD guarantee for a period of twelve months.



Mullard

"RADIO FOR THE EMPIRE'S MILLIONS"

MULLARD-AUSTRALIA PTY. LTD., 367-371 KENT STREET, SYDNEY.

Tele.: MJ 4688

WRUL, Boston 11,790kc, 25.45m
 Schedule: 1 a.m. to 3 a.m. (News 2.45 a.m.); 5 a.m. to 8.35 a.m. (News 6.50 and 7.30).
 Appeared to be weak for week or so, but now O.K. Think stays on till 9.30 on Sundays.—Ed.

WRUW, Boston 11,730kc, 25.58m
 Schedule: 9 a.m.-1.50 p.m. News 4.0 a.m. Fair at 10 a.m. with News (Beattie).

WLWO, Cincinnati 11,710kc, 25.62m
 Schedule: 8 a.m. to 10.45 a.m. News, 8.50 and 9.25 a.m.
 Good right through.

KGEL, Frisco 9670kc, 31.02m
 Schedule: 4 p.m. to 6 p.m. (News 4 p.m. and 5.55 p.m.); 10 p.m. to 3.10 a.m. (News 10.30 p.m., 12.30 a.m., 1.30 a.m., 3 a.m.). Like a local late afternoon (Johns). Good at 2 a.m. (Cushen).

WRCA, Boundbrook 9670kc, 31.02m
 Schedule: 7 a.m. to 4 p.m.
 Very good from 3-4 p.m.
 On April 6 stayed on air after 4 p.m.

KGEL, on opening at 4 p.m., interfered, but got the worst of it, although both were spoilt (Beattie).

WCBX, New York 9650kc, 31.09m
 Schedule: 7 to 9 a.m. News at 7 and 8.45.

WLWO, Cincinnati 9590kc, 31.28m
 Schedule: 11 a.m. to 4 p.m.
 Signal improving; now R8 at 4 p.m. (Cushen, Beattie).

WGEA, Schenectady 9550kc, 31.41m
 Schedule: 9.15 a.m. to 12.15 p.m.

WGEO, Schenectady 9530kc, 31.48m
 Schedule: 6 a.m. to 3 p.m. News, 7.55 and 9.25.
 Extended time is excellent, and they are asking for reports.—Ed.

WCBX, New York 6170kc, 48.62m
 Heard late afternoons.

WCAB, Philadelphia 6060kc, 49.5m
 Heard at 4 p.m.

WRUW, Boston 6040kc, 49.65m
 Schedule: 9 a.m. to 1.50 p.m. News 10 a.m. On Sundays and Mondays opens at 8 a.m.

Mexico:

XEQQ, Mexico City 9680kc, 30.99m
 Schedule: 11 p.m. to 2 a.m.
 Good signal. Fair signal at midnight (Nelson).

XEWW, Mexico City 9503kc, 31.57m
 Closed 3 p.m. Saturday, 4 p.m. Sunday. Very fine (Gaden, Nelson).
 Heard between 2 p.m. and 4 p.m. at great strength.—Ed.

XEXA, Mexico City 6160kc, 48.54m
 Opens about 11 p.m. and probable cause of noise on Saigon.

South:

Argentina:

LRX, Buenos Aires 9660kc, 31.06m
 (Quite good at 9.15 p.m. (Edel). Very faint at 10 p.m. (Nelson). Heard closing 2.30 p.m. (Gaden).

Bolivia:

CP-5, La Paz 6200kc, 48.39m
 Heard at 10 p.m. (Gaden).

Ecuador:

HCJB, Quito 12,460kc, 24.08m
 Schedule: 9.55 p.m. to 11 p.m.
 Only weak now from 10 p.m. (Nelson, Gandy).

Chile:

CB-1180, Santiago 11,980kc, 25.04m
 Bugle notes when closing at 3 p.m. Excellent till 3 p.m. on Sundays (Cushen). Weak from 9.30 p.m. (Nelson).

Colombia:

HJCT, Bogota 9630kc, 31.15m
 Closes weakly at 2.30 p.m. (Gaden). (Announces as Rad'o Difusora Nacional de Colombia en Bogota. Often spells out HJCT in perfect English.—Ed.).

Uruguay:

CXA-8, Montevideo 9640kc, 31.12m
 Closes week days 2.30 p.m. (3 p.m. Sundays) with hymn on organ while announcer speaks (Gaden).

THE EAST

Burma:

XYZ, Rangoon 6007kc, 49.94m
 Schedule: 9.45 p.m. to 1 a.m., except Sun-

days. News at 12.30 a.m.
 Heard well from opening.

XZZ, ——— 3490kc, 86.00m
 In parallel with XYZ.

China:

XOZ, Chengtu 15,510kc, 19.34m
 Can be heard some nights from Y p.m.

XGOX, Chungking 15,200kc, 19.14m
 Schedule: 10-11.5 a.m.; 2.50-3.5 p.m. English news at 5.20 p.m.
 Now Turkey has gone, afternoon session good (Gaden).

FFZ, Shanghai 12,090kc, 24.83m
 Schedule: 8 p.m.-1 a.m. News 11 p.m. Fair at 10 p.m.

XGRS, Shanghai 12,015kc, 24.97m
 Schedule: 7 p.m. to 1 a.m.
 "The Voice of Europe." News 10.30 p.m. and 12.15 a.m. Still announces as 11.88 m., 25.25m (Gaden).

XMNA, Shanghai 11,853kc, 25.31m
 Schedule: 6 p.m. to midnight News, 9 p.m. and 11.15 p.m. Children's session, 6 p.m. to 6.15 p.m.
 Strong 9 p.m. (Bantow).
 Note "The Cali of the Orient" has reverted to the old frequency. Too bad when VLQ-2 is on. Daylight saving has brought times an hour earlier.—Ed.

XGOK, Canton 11,605kc, 25.75m
 Strong each night. News at 10.30 p.m.

XOZS, ——— 10,040kc, 29.88m
 Heard at 9.10 p.m. Good signals. Chinese music (H. I. Johns).

XGOA, Chungking 9720kc, 30.85m
 Good from 10 p.m.

XGOY, Chungking 9635kc, 31.14m
 Schedule: Midnight to 12.55 a.m. News at midnight.

XGOY, Chungking 9500kc, 31.58m
 5 a.m. to 7.20 a.m. in Chinese.

XPSA, Kweiyang 8484kc, 35.36m
 Schedule: 8.30 p.m. to 2.10 a.m.
 Excellent signals at 9 p.m. (Cushen, Johns, Pepin).

XGOY, Chungking 9,500kc, 31.58m
 Often heard at 6.30 a.m. (Gaden).

XPSA, Kweiyang 6980kc, 42.98m
 Excellent signals at 9 p.m. (Cushen).

Portuguese China:

CRY-9, Macao 6080kc, 49.34m
 Schedule: 10.30 p.m. to 1 a.m. Mondays only.
 Quality is invariably poor.

Thai:

HSP5, Bangkok 11,715kc, 25.61m
 Schedule: 10.50 p.m. to 1 a.m. except Mondays. News, 11.45 p.m.

Dutch East Indies:

PMA, Bandoeng 19,380kc, 15.48m
 Schedule: 10.15 to 11.15 p.m. News, 10.45.

YDB, Soerabaya 15,315kc, 19.59m
 Schedule: 1.30 to 5 p.m.; Sundays, from 10.30.
 Better than YDC in afternoon (Deppeler).

YDC, Bandoeng 15,150kc, 19.80m
 Schedule: 8.30 to 10.30 a.m., 1.30 to 5 p.m., 7.30 p.m. to 1.30 a.m.

PLJ, Bandoeng 14,630kc, 20.51m
 Schedule: 7.30 p.m. to 3 a.m.

PLP, Bandoeng 11,000kc, 27.27m
 Schedule: Same as YDC.

PMN, Bandoeng 10,260kc, 29.24m
 Schedule: Same as YDC.

YDB, Bandoeng 9550kc, 31.41m
 Schedule: 7.30 p.m. to 1.30 a.m.

YDA, Tandjongpriok 7250kc, 41.38m

YDX, Medan 7220kc, 41.55m
 Excellent from 9 p.m.

PMY, Bandoeng 5145kc, 58.3m
 Schedule: 7.30 p.m. to 1.30 a.m.

YDF, Soerabaya 4960kc, 60.48m
 Good towards midnight (Pepin).

YDE-2, Solo 4810kc, 62.37m
 Good late at night (Pepin).

YDA, Tandjongpriok 3040kc, 98.68m
 Schedule: 7.30 p.m. to 1.30 a.m.
 Good (Pepin).

French Indo-China:

Radio Saigon, Saigon 11,780kc, 25.47m
 Schedule: 8.40 p.m. to 2 a.m. News, 8.45 p.m., 1.45 p.m.
 "The Voice of France in the Far East."

Radio Saigon, Saigon 6160kc, 48.54m
 Schedule: 8.40 p.m. to 2 a.m.
 Very loud signal.

Hong Kong:

ZBW 9525kc, 31.49m
 Schedule: 8 p.m. to 1 a.m. Relays B.B.C. news at 11 p.m.

India:

VUD-3, Delhi 15,290kc, 19.62m
 Schedule: Noon to 3 p.m. (News at 1.20 p.m.); 4.30 p.m. to 6.30 p.m. (News at 6 p.m.).
 10 a.m. (Taylor).

VUD-4, Delhi 11,830kc, 25.36m
 Schedule: 9.30 p.m. to 3.20 a.m.
 News, 10.30 p.m., 1.50 a.m., 3.15 a.m.

VUD-2, Delhi 9590kc, 31.28m
 Schedule: 9.30 to 2 a.m. News, 10.30 p.m., 1.50 a.m.

VUD-2, Delhi 7290kc, 41.15m
 Opens 9.30 p.m. Same programme as VUD-4, 25.36. News 10.30. See article under "New Stations."

VUC, Calcutta 6110kc, 49.1m
 R7 at 2.30 a.m. (Taylor).

VUE, Delhi 6085kc, 49.30m
 Opens at 11.30 p.m. R6 at 11.30 p.m. (Taylor).

VUD-4, Delhi 4960kc, 60.48m
 R6 at 10.30 p.m. (Taylor).

VUM-2, Madras 4919kc, 60.98m
 R5 at 9.30 p.m. (Taylor).

VUB, Bombay 4880kc, 61.48m
 R6 at 10.30 p.m. (Taylor).

VUC-4, Calcutta 4840kc, 61.98m
 R5 at 10.35 p.m. (Taylor).

VUB-2, Bombay 3480kc, 86.20m
 R7 at midnight (Taylor).

VUD, ——— 3450kc, 86.95m
 R1 at midnight (Taylor).

VUM-2, Madras 3430kc, 87.46m
 R7 at midnight (Taylor).

VUB, Bombay 3360kc, 80.28m
 Opens at midnight News at 12.10 a.m. (Cushen).

VUC, Calcutta 3300kc, 90.90m
 Opens at 1.30 a.m. (Cushen).

Japan:

(Tokyo considered source of supply unless otherwise mentioned)

Where schedules are shown they are taken from May issue of "Radio Tokyo" received April 16. The Broadcasting Corporation of Japan reserves the right to alter schedules without notice.

JLU-4 17,795kc, 16.86m
 For Latin America: 9 a.m. to 10.30 a.m. (Japanese, Spanish and Portuguese).
 For Eastern Districts of North America: 11 a.m. to 1 p.m.

JZK 15,160kc, 19.79m
 For South-Western Asia: 1 a.m. to 2.55 a.m. (News, 1.45 a.m.). For Near East: 3 a.m. to 4.30 a.m. (News, 4 a.m.). For Pacific Coast of North America: 1.30 p.m. to 4 p.m. (News, 2.55 p.m.). For Hawaii: 4.30 to 6.30 p.m. (News, 4.35 p.m.).
 News session at 2.55 p.m. very good (Gaden). Has been heard fairly regularly on Sundays from 11 p.m. to 12.30 a.m. (Beatty, N.G.).

JLG-4, ——— 15,105kc, 19.86m
 For Europe: 5 a.m. to 8.30 a.m. (News, 8 a.m.). For Latin America: 9 a.m. to 10.30 a.m. For Eastern Districts of North America: 11 a.m. to 1 p.m. (News, 11.05 a.m.).

JVZ, ——— 11,815kc, 25.39m
 For Japanese soldiers at the front: 7 p.m. to 9 p.m. For China and South Seas: 9 p.m. to 12.30 a.m. (News, 11.25 p.m.).

JZJ 11,800kc, 25.42m
 For South-western Asia: 1 a.m. to 2.55 a.m. (News, 1.45 a.m.). For Near East: 3 a.m. to 4.30 a.m. (News, 4 a.m.). For Europe: 5 a.m. to 8.30 a.m. (News, 8 a.m.). For Pacific Coast of North America: 1.30 p.m. to 4 p.m. (News, 2.55 p.m.). For South America: 7 p.m. to 8 p.m. (Japanese, Spanish and Portuguese). For Australia and New Zealand: 8.30 p.m. to 9.25 p.m. (News, 8.35 p.m.). For South Seas: 9.30 a.m. to 12.30 a.m.

JYW-3 11,720kc, 25.6m
 For the South Seas: 11.05 p.m. to 12.30 a.m.

Malaya:
ZHP-1, Singapore 9700kc, 30.92m
 Schedule: 7.40 p.m. to 12.40 a.m.; News, 9 p.m. and 11 p.m.
ZHP-3, Singapore 7250kc, 41.38m
 Schedule: 7.40 a.m. to 12.40 a.m. French and Malay.
ZHP-2, Singapore 6175kc, 48.62m
 On parallel with ZHP-1. R7 at 8 p.m. (Taylor).
ZHJ, Penang 6090kc, 49.26m
 Fair signal at night; relays B.B.C. at 11. R6 at 9 p.m. (Taylor).

Philippines:
 (Manila, unless otherwise stated)
KZRH 9640kc, 31.12m
 Schedule: 7.30 a.m. to 9.30 a.m. (News 8.15 a.m.); 6 p.m. to 2 a.m. (News 10.30 p.m.).
KZRM 9570kc, 31.35m
 Schedule: 6.45 p.m. to 1.30 a.m. News, 8.35, 10.45 and 11.45 p.m., also 12.45 a.m. Much better now RW-15 off the air (Beattie).
 Can be heard opening at 7.45 a.m.
KZIB 9500kc, 31.58m
 Very poor quality of late.
KZRF 6140kc, 48.86m
 Fairly strong 10.30 p.m. (Bantow).
KZRC, Cebu 6100kc, 49.18m
 Very strong at 11 p.m.
KZIB 6060kc, 49.50m
 Noise spoils this otherwise loud signal.

Vatican City:
HYJ 15,120kc, 19.84m
 Tuesdays: 11.30 to 11.55 p.m. (English). Heard on Friday afternoons (Beattie). Generally weak (Nelson).
HYJ 6190kc, 48.47m
 (English session is: 5.15 to 5.30.—Ed.) Now in the clear, and English session is R8 (Cushen).

Portugal:
CSW-6, Lisbon 11,040kc, 27.17m
 Schedule: 3 a.m. to 6.45 a.m.
 Very good at 5 a.m. Best at 6 a.m.
CSW-7, Lisbon 9740kc, 30.8m
 Schedule: 6.50 to 9 a.m. Talks: On Wednesday, Friday and Sunday from 6.50 a.m. to 7.30 a.m.
CS2WD, Portugal 6200kc, 48.38m
 Schedule: 6 to 9 a.m.
 O.K. till after 7 a.m. (Gaden).

Rumania:
Radio Bucharest 9245kc, 32.45m
 Fair at 5 a.m. Fades (Beatty, N.G.).

Russia:
 ("This is Radio Centre, Moscow, calling")

RW-96 19.47m
 Schedule: 8 p.m. to midnight.
 R7 at 11 p.m. (Byard).

RW-96 15,180kc, 19.76m
 Schedule: 2.50 p.m. to 5.30 p.m.; 7.07 p.m. to 7.50 p.m. (News, 7.7 p.m.); midnight to 3 a.m.

RWG 14,720kc, 20.38m
 Strong when on (Gandy).

RNE 12,000kc, 25.00m
 Schedule: 3.30 p.m. to 11 p.m. Talk: 10.30 p.m.

RAL/RVG 11,645kc, 25.77m
 RVG is heard strongly at 11 p.m. (Gandy, N.Z.).

RW-15, Khabarovsk 9565kc, 31.36m
 Has been missing of a night lately (Beattie).

RW-96 9520kc, 31.51m
 Schedule: 10 p.m. to 8 a.m. News, 4.30 and 6 a.m.

RW-15, Khabarovsk 6115kc, 49.06m
 Good from 6 p.m. and good in morning around 7 a.m.

RW-96 6061kc, 49.5m
 Midnight to 8 a.m. News, 6 a.m.

RV-59 6030kc, 49.75m
 Great signal in morning.

RW-96, Moscow 6000kc, 50.00m
 Very good at 7 a.m. (Gaden).

RV-15, Khabarovsk 4273kc, 70.2m
 R7 at 8.30 p.m. (Taylor).

Spain:
EAQ, Madrid 9860kc, 30.43m
 Good in mornings.
Radio Espagna, San Sebastian, 7210kc. 41.6m
 Fair at 6.30 a.m.
EAJ-9, Malaga 7170kc, 41.75m
 Very good at 6.30 a.m. Tune carefully. Moscow is only a fraction away.
Radio Malaga, Malaga 7120kc, 42.1m
 Heard at fair strength at 6.30 a.m.

Switzerland:
HBH, Geneva 18,480kc, 16.23m
 Schedule: 11.45 p.m. Fridays to 1.10 a.m. Saturdays. Mostly English, little French. News 12.5 a.m., 11.45 p.m. Mondays to 1.10 a.m. Tuesdays, Italian. German and French.
 Good and clear (Nelson).
HBJ, Geneva 14,535kc, 20.65m
 First Sunday in the month. 3.45 p.m. to 5.10 p.m.
HBO, Geneva 11,420kc, 26.31m
 Same remarks as HBJ. Fair signal.
Radio Suisse, Schwarzenburg, 6165kc, 48.56m
 Schedule: 4 to 7.30 a.m.
 Always splendid signal.

NEW SCHEDULES FOR LONDON TRANSMITTERS

As is usual at this time of the year, London makes many changes in frequencies and schedules. They are shown hereunder. E.T., Eastern Transmission; P.T., Pacific Transmission; Am.T., American Transmission; Af.T., African Transmission; Eur., European Transmission; Home, Home Service. News: P.T., 4.15 p.m., 6 p.m.; E.T., 9.00 p.m., 11 p.m., 2 a.m.; Af.T., 4.00 a.m., 6.45 a.m.; Am.T., 8.45 a.m., 10.00 a.m., 10.45 a.m., 2.30 p.m.; Eur.T., 6.00 p.m., 11.30 p.m., 8 a.m.; Home, 3.00 a.m., 6 a.m. Talks: P.T., 4 p.m., 4.30 p.m.; E.T., 9.15 p.m., 2.15 a.m. Newsreel: P.T., 5 p.m., 1.30 p.m.

GSV 17,810kc, 16.84m
 P.T., 5.30 to 6.15 a.m.; E.T., 8.55 p.m. to 2.30 a.m.

GSP 15,310kc, 19.60m
 P.T., 5.30 p.m. to 6.15 p.m.; Af.T., 2.55 a.m. to 4.15 a.m.

GSI 15,260kc, 19.66m
 P.T., 2.57 to 6.15 p.m.; E.T., 8.55 to 11.30 p.m.; Af.T., 2.55 a.m. to 5 a.m.

GSF 15,140kc, 19.82m
 E.T., 8.55 p.m. to 2.30 a.m.; Af.T., 2.55 a.m. to 5.15 a.m., 6.45 a.m. to 8 a.m.; P.T., 5.30 to 6.15 p.m.; 2.55 a.m. to 8 a.m.

GSE 11,860kc, 25.29m
 Eur., 8.55 p.m. to 2.30 a.m.

GSN 11,820kc, 25.38m
 Eur., 8.55 p.m. to 2.30 a.m.

GSD 11,750kc, 25.53m
 P.T., 2.57 p.m. to 6.15 p.m.; E.T., 11 p.m. to 2.30 a.m.; Af.T., 2.55 a.m. to 8 a.m.; Am.T., 8.20 a.m. to 2.35 p.m.

GRX 9690kc, 30.96m
 Eur., 2.55 a.m. to 9 a.m., 6 p.m. to 8 p.m. News, 8 a.m. and 6 p.m.

GRY 9600kc, 31.25m
 P.T., 2.57 p.m. to 5 p.m.; Af.T., 2.55 a.m. to 8 a.m.; Am.T., 8.20 a.m. to 2.35 p.m.

GSC 9580kc, 31.32m
 P.T., 4.15 to 6.15 p.m.; Am.T., 8.25 to 2.35 p.m.

GSB 9510kc, 31.55m
 P.T., 2.57 p.m. to 6.15 p.m.

GRU 9450kc, 31.75m
 E.T., 11.45 p.m. to 2.30 a.m. News, 2 a.m.

GSW 7230kc, 41.49m
 Good at 4 a.m. with News in English for Burma and India (Beatty, N.G.). Fair at 6 p.m. (Beattie).

GRT 7132kc, 42.06m
 (Not sure of schedule that follows, but heard News at 8.45 a.m. 15/4/41.—Ed.)
 R8 at 5 p.m. (Cushen). Very good at 3 a.m. (Beattie).

GRR 6080kc, 49.34m
 Home, 2 a.m. to 9 a.m. News, 3 a.m., 6 a.m. and 8.45 a.m.

GSA 6050kc, 49.59m
 Eur., 3.30 p.m. to 8 p.m., 2.55 a.m. to 9 a.m.
 News, 6 p.m. and 8 a.m.

MURDOCH'S



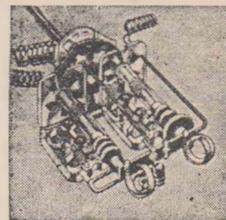
MICROPHONE 39/6

Streamlined, English, in handsome bakelite case, with transformer, battery and volume control. All built in. Also with 20 ft. of twin-shielded wire.



MORSE KEY AND BUZZER

Complete with code. Three terminals allow for two-way working. High-note buzzer fitted. 8/11



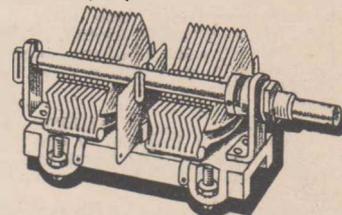
COIL UNITS 16/6

Convert your set to dual-wave or use this unit if building a new one. Dual-wave coil units, mounted with trimmers and padders on

wave-change switch. Short-wave, 13 to 39 metres; broadcasting, 180 to 550 metres.

NEEDLE-SCRATCH FILTER

Complete set of parts to build the filter as described in the "Australasian Radio World" of December, 1940. Panel, potentiometer, condenser, slatted former, wire and sockets, 10/6.



English-make Midget Condensers, for short-wave receivers and band-spread tuning.

.0004 Twin POLAR brand, 13/6.
 .0003 Twin POLAR brand, 13/6.
 .00045 Twin JACKSON brand, 9/6.
 .0001 Twin POLAR brand, 13/6.
 .0003 Single POLAR brand, 17/6.
 .0001 Single JACKSON brand, 9/6.

REISS MICROPHONE ASSEMBLY KIT.
 Built to the original A.R.W. specifications of 1938 and still a best seller. Kit complete with transformer, teak case and English granules. Illustrated in this issue, 29/6

MAGIC-EYE ELECTRON-RAY TUNER. Complete assembly ready to attach to any set with A.N.C. 4/9.
 3 1/2" dial and pointer for front panel fitting, 2/6.

WE PAY FREIGHT

Kindly write to Desk "C52"

MURDOCH'S - - - SYDNEY

Frequency Response

This implies some method of bass boosting at low volume, or else some fixed filter for low volume, and a slight loss of brilliance at high volumes.

For most satisfactory results any fixed filter should be outside the feedback network. This method is preferable, because selective feedback is very difficult owing to the low value of shunt impedance across the voice coil presented by the lamp circuit.

Also, the large feedback factor may cause oscillation at high frequencies due to stray capacities, so both the feedback line and the amplifier should be "deadened" above 10,000 cycles. This is easily accomplished by the condensers C_1 , C_2 .

In some cases it may be even necessary to use a small capacity between the plate A and earth.

A suitable filter circuit for the purpose mentioned above is also shown, but it must be realised that here is another loss of 6 Db in overall gain except at low frequencies.

This may be cut out of circuit by leaving in Fig. 5 resistors R_{13} , R_{12} and condenser C_1 right out of the circuit.

LOGGINGS (Continued)

SCANDINAVIA

Finland:

OFB, Lahti 11,780kc, 25.47m
Schedule: 3.30 a.m. to 5 a.m. (News, 4.15 a.m.); 3.30 p.m. to 5 p.m.
Used in chain with **OFD**. At 4.30 p.m. signal was R9, the best signal this month (Cushen). Good at 5 p.m. (Hallett).

OFD, Lahti 9500kc, 31.58m
Schedule: Same as **OFB**.
Fair at 4.30 p.m., but suffers from interference from **GSB**. Now using 15 kilowatts. Is excellent in English session from 4.15 to 4.30 a.m. (Cushen). Lady reads News at 4.15 a.m. Signal good (Beattie, Hallett).

Norway:

LKQ, Oslo 11,735kc, 25.57m
Schedule: 3 p.m. to 5 p.m., 1 a.m. to 7 a.m.
Heard recently with R7 signal at 2.30 a.m. (Edel). Good at 5 p.m. (Cushen).

Sweden:

SBT, Stockholm 15,150kc, 19.8m
Schedule: 6 p.m. Sundays to 7 a.m. Mondays. Daily: 4 a.m. to 7.19 a.m.; 11 a.m. to noon.

SBP, Stockholm 11,710kc, 25.63m
Schedule: 4 a.m. to 7.30 a.m.; 11 a.m. to noon; 4.45 p.m. to 6 p.m. (Sundays. 6 p.m. to 7 a.m. Mondays).
Often R8 at 8 p.m. on Sundays (Cushen, Johns).

MISCELLANEOUS

Azores:

CT2AJ, Ponta Delgada 4002kc, 75.00m
Schedule is believed to be: Thursdays and Sundays, 11 p.m. to 1 a.m.
Heard call-sign at 11 p.m. (Taylor). (See reference under "New Stations."—Ed.)

Owing to the pressure on our space, a number of loggings have been held over until next issue.

for modifications, working, of course, with due regard to the points mentioned by Parry.

The $1\frac{1}{2}$ ohm resistor for the voice coil circuit may be a little difficult to obtain unless ordered through a radio dealer. The R.C.S. factory put through a special resistor for us in a matter of about half an hour, and, doubtless, similar service is available to our readers through their local dealers. A resistor of the right value is hardly likely to be found as a stock line.

It is not a bad scheme, however, to use a 6, 10 or 20 ohm rheostat instead of this resistor. You then have a variable which can be adjusted by ear to give you the most satisfactory result.

If you use a rheostat in this way you will find that the value of the resistor is not critical and anything up to 20 ohms can be used, a ready comparison being available by switching over from the lamp to the fixed resistors.

The Pick-up

Up till now we have been staunchly supporting the crystal type of pick-up, notwithstanding its unreliability, but this latest development has altered the situation quite a bit.

After working on the amplifier for quite a time, we came to the conclusion that to our way of thinking the magnetic type pick-up is capable of splendid results when used with a compensated amplifier. The particular unit we are using, of Collaro brand, suits our taste to perfection.

The Input Transformer

The input transformer can be mounted on either the amplifier or the speaker. In the case of a radio receiver with comparatively long leads to the speaker it may be better to mount the input transformer on the chassis, as we did with the Acoustic Compensated superhet in the March issue. Speakers with the separate transformer and suitable plug and cord are readily available.

With the short speaker lead used in this particular case, however, we tried the effect of taking leads back from the voice coil of the speaker to the amplifier, fitting a special six-pin plug for the experiment. No ill-effects were noticed and we suggest the idea as the simplest solution to the problem of using an ordinary speaker arrangement with an amplifier or set using this modern form of inverse feedback.

So far, we have not given the amplifier that curved characteristic necessary to compensate for various losses as earlier described. This may be done by selective feedback, but only by rather complicated means, so it will not be discussed here.

Alternatively, we may use a fixed filter. This, however, coupled to the already decreased amplification, would cause so serious a loss that an extra valve stage would be necessary.

At this point I should like to make clear that for full appreciation of expansion such a stage and filter arrangement is really a necessity. However, for simplicity we must be prepared to sacrifice something. If the simple filter mentioned is used, the effect will be pleasing, if not entirely satisfactory from an engineering viewpoint.

Correct Record Selection

Little remains to be said, except, perhaps, that R_k is chosen by considerations of lamp current per cent. feedback.

A number of lamps should be tested for maximum hot to cold resistance ratio. The best we selected was among the 6.3v., .3 amp. class having the values given in this article.

For variable observations, the resistor R_1 may be easily a variable 0-10,000-ohm resistor, this enabling quite a range of expansion to be used. The 1.5-ohm resistor may be quite easily wound up from some discarded rheostat.

A standard power supply and heating arrangement will, of course, be suitable.

Various levels of "brilliance" may be achieved by altering the value of C_2 or using a tone control in place of C_1 .

The complete circuit is seen in Fig. 5, and from the information discussed the principles may be applied to any other simple amplifiers.

Some of the "snags" that beset "simple" circuits will be more appreciated after due consideration of the foregoing, and perhaps that "set up" previously condemned may get a new lease of life.

Best results, of course, will always be obtained by a correct selection of records, and orchestral items are particularly suited to expansion.

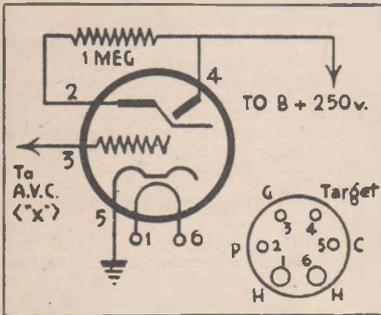
It is advisable that, for ordinary recording, only a small fixed amount of feedback be used, hence the switch in the secondary circuit may be optional, and, if used, serves to introduce only a very small amount of feedback, so allowing greater amplification to be realised for ordinary listening.

TRADE PARADE . . .

Apart from regular stock, Murdoch's Ltd., of Park Street, Sydney, specialise in many radio lines that set-builders in these days will find next to impossible to get elsewhere. Ample stocks are on hand of the lines reviewed below, and all are freight free to any part of Australia.

Add A Magic Eye . . .

Using the new Electron Tuner Unit just released by Murdoch's, set-owners will find it a simple matter to add a "magic eye" tuning indicator to any standard superhet with A.V.C., ensuring dead-centre tuning with consequent elimination of distortion and interference.



The unit comprises an adjustable metal bracket with six-pin socket (for 6U5 valve), fitted with 6-wire cable, and escutcheon. The 1 meg. target resistor is wired in. The sketch above shows under-socket connections of the 6U5, and indicates how the unit is wired in circuit. The lead marked "X" connects to the point where the bottom of the second i.f. transformer grid winding joins the A.V.C. line.

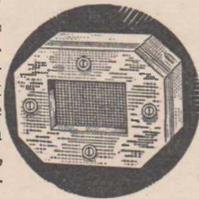
Price of this unit as detailed above is 4/9 (valve, 12/-) post free.

Murdoch's Make-Your-Own Microphone Kit . . .

For those who prefer to make their own, Murdoch's supply a transverse current type microphone in kit form, ready for assembly.

The kit comprises a solid teak case, ½ oz. bottle of best English carbon granules, pair of ready-drilled and flatted carbon electrodes, multi-ratio matching transformer, 1 mil. selected mica diaphragm, protecting gauze, terminals, etc.

The kit, which is supplied with detailed assembly instructions, repre-



sents excellent value at 29/6. Incidentally, the assembly of this kit was featured by "Radio World" a few months ago. Murdoch's report that orders have been arriving regularly ever since.

Streamlined Home Broadcaster . . .

For home entertainment and general public address work this super-sensitive microphone by a well-known English manufacturer will be found ideal.

The instrument is housed, together with battery volume control and matching transformer, in a streamlined black bakelite case, and is supplied complete with 20 feet of special shielded twin line. It is very attractively priced at 39/6.



Mercury Time Delay Switch from McLellan's

Two New Lines From McLellan's

CORAD IRONS

Well-made and thoroughly dependable is the Corad electric soldering iron, which is distributed by Wm. J. McLennan and Co., of Bradbury House, 55 York Street.

There are several types and weights of Corad irons available, with wattages of 60, 75 90 and 100 watts and for voltages of 32, 110 and 240. Bit sizes are three-eighths and half-inch, the heavier size being standard with the 90 and 100-watt models.

Whilst designed for heavy service, the Corad iron is not in any way unwieldy; in fact, it is of most handy dimensions for radio work. It is, however, rated to stand up to hard work and will stand full wattage for an unlimited period without its reliability being affected.

The Corad iron is said to be a worthy addition to the famous lines already handled by Wm. J. McLellan and Co., including T.C.C. condensers and I.R.C. resistors. Can anything

MERCURY TIME DELAY SWITCHES

A new Australian industry recently pioneered by W. J. McLellan and Co., of Sydney, is the manufacture of mercury time delay switches.

The wide variety of light and heavy duty types already in production is designed to operate with time delays of 2, 5, 10, 30 and 60 seconds and 3 minutes.

Available in ratings of from 1 to 50 amps., these switches will find a multitude of applications, not only in radio but industry generally.

If Radio is your business —

THESE PUBLICATIONS WILL INTEREST YOU

RADIO DIAGRAM AND I.F. INDEX: 96 pages, listing over 3,000 brand-line receivers produced in Australia since 1930, with intermediate frequencies, general data and references to the locations of published circuit diagrams. A real time and money saver. Price, only 2/6 per copy, post free.

OFFICIAL TRADE-IN ALLOWANCE HANDBOOK: 64 pages, listing officially authorised trade-in valuations for Australian radio receivers produced since 1933. Now in its third year of publication and accepted as standard throughout the Commonwealth. Price, 1/- per copy, post free.

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SPEEDY QUERY SERVICE

Conducted under the personal supervision of A. G. HULL

T.A. (Glebe) wants circuits of dual-wavers with excellent reproduction of gramophone records.

A.—Several circuits have appeared that would fill your requirements. They range from five valves to eight. We could mention the De Luxe Fidelity job in the issue of November and December, 1937, the later version of the same in the issues of August and September, 1938, the 1940 version in the issue of May, 1940, the Fidelity Six in the issue of June, 1940, and the Acoustic Compensated superhet in the March issue. Any of the above issues are available at 6d., post free.

* * *

P.O. (Gosford) wants a powerful circuit for push-pull 6L6G valves in an amplifier with inverse feedback.

A.—In the June, 1938, issue there was just such a circuit, rated to deliver 32 watts of power output, which is ample for any two commercial speakers. Quality is of a very high order, with ample inverse feedback.

Naturally, there are a considerable number of minor resistors and condensers used in the circuit, but these are not expensive.

This issue is available from our office at 6d., post free.

* * *

A.E.S. (Sarina, Q.) is interested in battery circuits and sends a copy of a circuit he has used with good results.

A.—Many thanks for the circuit, but we regret that we will be unable to use it at the moment. So far as we can see, it follows accepted practice, and there is nothing really outstanding about it. Properly built and aligned with efficient components, it should be a good all-rounder.

* * *

E.Q. (Narromine) wants details of converting an ordinary steel guitar to make it into an electric guitar.

A.—Sorry, but we don't happen to have any data on this subject on hand or any back numbers which deal with this particular problem.

* * *

J.S. (Maroubra) wants coil winding data for the 6K8G for short-waves.

A.—Full data for suitable coil winding data was contained in an article on the subject in our issue of December, 1938. This data still holds good as completely reliable and quite efficient. Copies are still available at 6d. post free.

RADIO PARTS AND KIT-SETS

We supply anything you require in radio. We have stocks of all radio parts—Kit-sets or assembled chassis. All makes of sets supplied.

Our prices are the lowest offering, and we supply only quality goods.

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FIRST FLOOR, WEMBLEY HOUSE
841 GEORGE STREET, SYDNEY

Phone: M 3917

(Open Friday nights till 8.30 p.m.)

Radio Sets Repaired. All Work Guaranteed.

L.W.J. (Portland, S.A.) wants details of a rotary beam antenna.

A.—Sorry, but there is not space in these columns for such a description. Full details of various types of rotary beams are given in the radio handbooks which we reviewed in last month's issue, and we suggest that you look over one of them.

Generally speaking, the rotary beam is far more important for transmitting than for receiving. We doubt if it would be a proposition for ordinary short-wave listening.

CLASSIFIED ADVERTISEMENT

FOR SALE, or will accept superhet. parts in exchange, 33 issues of "Australasian Radio World," from January, 1937, to January, 1940, bar August and September, 1937, and May, 1939. Apply: F. C. Eager, 139 Kooyong Road, Armadale, Vic.

D.F.H. (Canberra) enquires about the licence position and asks whether licensed listeners are increasing or decreasing.

A.—It is a little out of our line, but we are able to give you the figures required.

The licences are still increasing steadily, and the net increase for the month of March was 9,826, bringing the total up to well over a million and a quarter. The increases were general in all States.

* * *

C.L. (Paddington) complains of not seeing answers to queries sent in some time ago.

A.—Sorry, but pressure on our space has been pretty hard lately. At the moment it doesn't look as though there will be space for further details about fitting the magic eye, this subject having been covered at considerable length in several back numbers, which are still available.

With regard to the signal strength meter, this is a real problem, as the meters which were intended for the job are not now available, having been pushed out of production by pressure of defence orders.

The a.v.c. action would account for the slight change in volume noticed. August issues are still available as back numbers at 6d. each, post free.

* * *

L.C.S. (Laxton, S.A.) wants to know if it is possible to obtain a kit of parts for the "Club Special" as a receiver for d.c. operation from his local power mains.

A.—Sorry, but we can only suggest that you will have to modify the original circuit to suit your purpose and then make up a fresh list of parts accordingly.

If you do not feel capable of doing this, we can only suggest you enlist the aid of some local enthusiast who has had experience with d.c. mains sets, as they can be traps for the unwary.

* * *

F.M. (Queenstown, S.A.) wants to know if dials are available with scales of 0 to 100.

A.—Yes, any radio dealer should be able to supply a dial of this type.

* * *

J.S.S. (AW646DX) is keen on aerial efficiency and sends details of the way in which he cleans the aerial wire. Every three months, he says, he takes down the aerial wire, washes it in caustic soda until the copper shows, rinses it in fresh water several times, polishes it with Brasso, re-solders all the joints and then puts it up again.

A.—It seems a lot of work to us, but if your results tend to indicate that the work

HOMECRAFTS CATER FOR RADIO SERVICEMEN

Mr. R. Lamplough, manager of the new Sydney branch of Homecrafts at 102 Clarence Street, Sydney, is making a speciality of catering for radio servicemen's requirements.

Speedy, accurate service, with free technical advice on all radio problems are features of this new department.

Homecraft's also wish to announce that they have been appointed distributors for Eveready batteries of all types.

is worthwhile, then who are we to say otherwise..

With regard to the aerial design, we doubt if it is theoretically sound to earth the supporting wires. We would expect it to be a far more efficient thought to use rope for the supports, instead of wires, thereby leaving the aerial well up in the clear, rather than adjacent to earthed wires.

With modern high-powered receivers it is easy enough to get satisfactory reception with almost any sort of aerial, so that aerial efficiency appears to be often overlooked. It is surprising what a modern receiver can do, even with a piece of aerial wire hanging around a picture rail.

* * *

C.R. (Rockhampton, Q.) wants to know which pentagrid converter is the best for short-waves.

A.—The answer depends on personal opinions. We notice that the designers of the big communications jobs for the R.A.A.F. favor the 6K8G, whereas our local coil manufacturers got together recently and decided that the 6J8G was best. We notice two completely contradictory statements on the subject in a recent issue of an American technical journal, one favoring the 6K8G and the other the 6J8G. Still other authorities prefer other types, such as the 6SA7.

So far as we know there are no code teaching machines available in Australia. It would appear to offer unlimited scope for profit-making by any wide-awake business, as thousands of people are at present struggling to learn the morse code, mostly by manual instruction. We have not studied the construction of one of the tape type of machines, but we imagine that the tape is cut by purely mechanical means, and not necessarily by a dual hand sending.

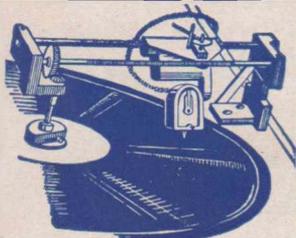
* * *

B.P.H. (Enoggera, Q.) wants to know if a "Tip-Top" would still be tip-top if he used a 385-volt transformer, an eight-inch Amplan speaker, etc.

A.—Yes, it should still be an excellent set, in fact even better than the original, especially as regards power. It would be desirable, however, to have the set in a console cabinet, not a mantel model, as there will be a considerable amount of heat to be dissipated. The speaker may get fairly hot, too, as the field will be fully energised.

It will be highly desirable to use the best of electrolytic condensers, with a 600-volt rating for preference, as the no-load voltage may rise considerably while the valves are warming up.

We do not advise the use of the aerial change suggested and strongly advise you to stick to the original circuit in this regard.



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MAKE YOUR OWN RECORDINGS. Cutting head and overhead cutting unit complete, £6/6/-
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 "Re-juv" Razor Blade Sharpener
 7/6. NOW 2/6.

Pick-up Heads. Fit and suit all tone arms and gramophones. For operating gramophone through radio.
 15/-, 19/6 each.

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 Everyman's Radio Book, 5/6
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AMPLION British built Gramo-Radio Pick-up with volume control. Moulded bakelite tone arm. List Price 37/6 Now 32/6. Dealers write for wholesale price.

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Cosmocord Crystal Pickup British manufacture
 84/-
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58	10/6	6D6
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2A5	10/6	1D8-Gt
2B7	14/-	42
27	11/9	2A7
6E5	5/-	71A
19	13/6	47
5K3	8/9	75
6J7	11/3	1A7G
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6H6	12/9	80

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New 227 Valves, 5/9; used, 3/6.
 New 4XP, 5/-; S215, 5/-; MH4, 2/6.
 38, 78, used 5/6.
 Raytheon B.H. Rectifier, new, 15/-;
 DU10, 5/-; 2A6, 35, used, 5/6.
 Used 224, 5/6. 610RC, 610XP, new, 6/6. Used 42, 5/6.
 New 41MRC, ML4, 3/-.
 445U Rectifier, 5/-.
 PM22, new, 7/6. Used 1C6, 6A7, 6A8, 6B7, 6U7, 6F6, 6F7, 6L7, 6/6.
 Used 57, 58, 59, 6/6; 201A, 3/6; A409, 6/6; A615, E406; E452, 6/6.
 Used PM6, PM5B, A609, 6/6.
 Used 6J7, 6J8, AL2, EK2, 2B7, 226, 5/6.
 New PM12, PM2A, 18/-.
 Let's know your valve wants.

Cane Speaker Units. Leading makes. Were up to 35/-.
 Now 7/6 and 10/6.

No. 1.—Adjustable Morse Code Key, with long or short tapper arms, splendidly made and finished. Strong reliable heavy plated fittings mounted on bakelite moulded base, 12/6.
 P.M.G. Type Sounders 35/-.

No. 2.—P.M.G. Type adjustable Morse Code Key, strong and reliable; will last a lifetime. Heavy plated fittings on a thick solid wooden base. Perfect action. 19/6

42/6
 Na. 3.—Set comprising Na. 2 Morse Code Key P.M.G. Type, with light. Professional De Luxe Buzzer Battery. Throw-over Switch for buzzer or light. Use as required. Mounted on baseboard. Complete.



Listen in comfort. Rubber HEAD-PHONE PADS give a new thrill to listening. Priced 2/6 per pair.

27/6
 Na. 5.—Outfit comprises the P.M.G. No. 2 Morse Code Key, with adjustable buzzer and battery all mounted on a stained baseboard, ready for immediate operation. Battery included.

22/6
 Na. 6.—A real good little outfit which incorporates the No. 1 adjustable Morse Code Key, in moulded bakelite base, with a smart little adjustable buzzer all complete to operate. Junior model, 12/6.

4/6
 Na. 102 — "Like-a-Flash" adjustable Buzzer. 4/6. Bakelite Case High Pitched.

8/6
 Ormond Slow Motion Front Panel 2-action Vernier Dial, 8/6.
 Model Electric MOTORS. Wark off small wet or dry batteries. 5/9, 10/6, 12/6.

Special price trade lots.
 At left: PYREX TYPE INSULATOR. 3" barrel type, 1/-.
 Pyrex, 4", 3/6; 5", 6/6; 7 1/2", 30/-.



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 Rough-cast Ashtray, with mounting standard; diameter 4" 3/9
 Rough-cast tear-drop shaped Ashtray, with mounting standard; length, 6" 3/6
 Rough-cast Circular Concave Ashtray, with mounting standard, diameter 4 1/2" 3/9
 Rough-cast standard for mounting Plane Models; height, 2 1/2" 9d.
 Rough-cast Eagle; wing-span, 3 1/2" 1/3
 Chromed Ribbed Spun Metal Ashtry with standard (curved or straight) for mounting Plane Model; diameter, 6"; height, 1 1/2" 6/-
 Chromed Hurricane, Lockheed, Spitfire or Wirraway Plane Model mounted on tear-drop shaped Ashtray 22/6

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Police Patrol Multi-Strand Rubber-covered Aerial. Needs no separate lead - in. 50ft., 2/6; 100ft., 5/-.
 Man-a-war Heavy Duty Insulated Aerial, multi-strand wires, 50 ft., 5/-; 100 ft., 10/-.

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More and More Technical Tradesmen are needed in Australia . . .

This war of machines, of the output of factories. The destiny of our Empire lies as much in the skilled hands of our craftsmen as it does in the efforts of the fighting men. You can play a worthy part therefore not only in the current struggle but in the post-war reconstruction by embarking on a **SOUND COURSE OF TECHNICAL TRAINING!**

YOU CAN START NOW

Of the many industries crying out for skilled men, none is more important to the nation than the **RADIO and COMMUNICATIONS** business. We offer you the opportunity to enter this vital industry now.

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The Australian Radio College offers ambitious men a sound proven course in Radio Engineering. Sound because it is the result of many years' successful operation; proven because hundreds of ex-students owe their present jobs and success to the College. You can learn with equal facility in your own home (by means of our correspondence course) or attend night classes at the modernly-equipped College workshops.

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