

THE
AUSTRALASIAN

DECEMBER 1, 1937
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Radio World

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—See Page 8

- AMATEUR COMMUNICATIONS BATTERY SUPERHET: MAKING A REISS
- MICROPHONE: MORE ABOUT THE "DE LUXE FIDELITY EIGHT":
- 15 AND 25-WATT P.A. AMPLIFIERS: LATEST WORLD SHORTWAVE NEWS.



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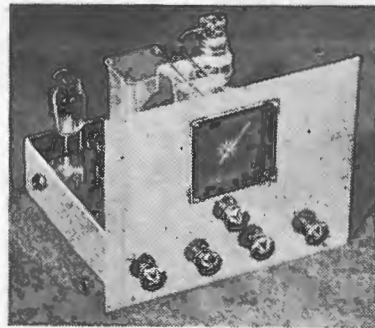
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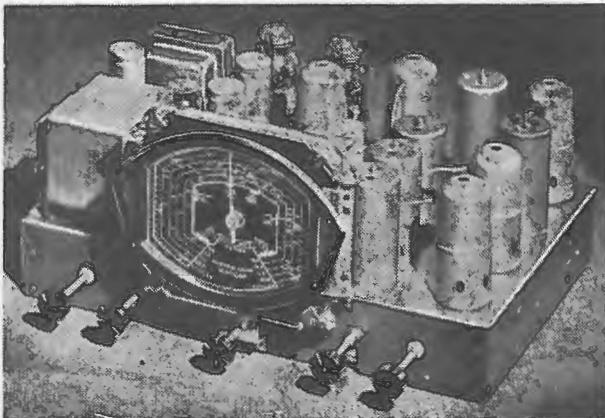
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has again been selected by the designer of the Outdoor Portable Four as the most reliable and economical source of power . . . this type, which is but one of many, is typical of the outstanding qualities of Clyde radio batteries . . . Clyde Batteries are used for gun and fire control on the ships of the Royal Australian Navy, and by Federal and State Governments, yet another tribute to the outstanding efficiency of these famous batteries.

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6CR13	6 volt	130 amp. hrs.
6CR15	6 volt	150 amp. hrs.

For extra Power, Reliability and Endurance

SPECIFY CLYDE

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throughout Australasia.

THE AUSTRALASIAN RADIO WORLD

Incorporating the
ALL-WAVE ALL-WORLD DX NEWS.

Managing Editor:
A. EARL READ, B.Sc.

Vol. 2.

DECEMBER, 1937.

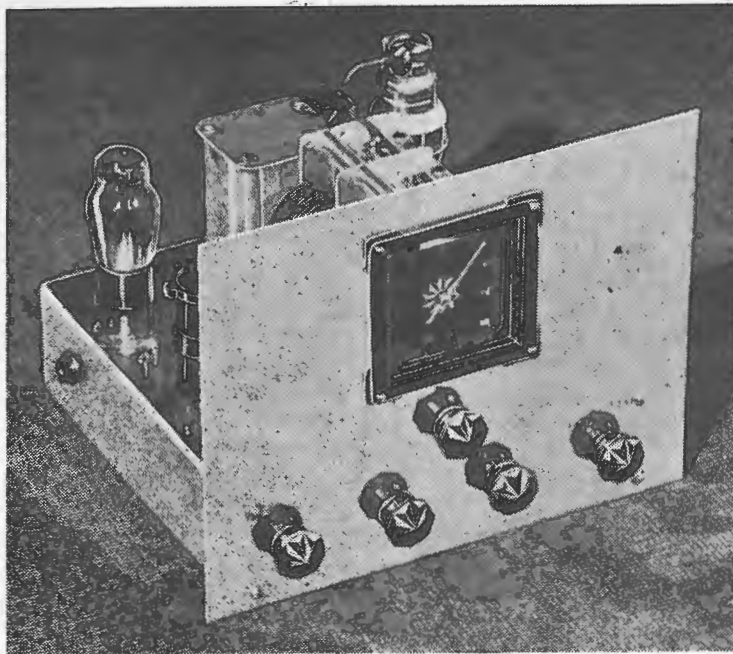
No. 8.

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The 1937 EMPIRE All-Wave Three (A.C. Version)

A three-valve all-wave a.c. receiver, using a 6D6 r.f. amplifier, 6C6 detector with E.C. regeneration, and 76 output. Combination power pack and amplifier is built as separate unit.

THE receiver shown above has been designed in response to many requests for an a.c. version of the widely popular "1937 Empire All-Wave Three," described in the "Radio World" for May and June last.

Simple to build and operate, this latest "1937 Empire" will nevertheless bring in on 'phones everything, if not more, that a much larger and far more expensive receiver can pick up. Also, if the combination amplifier and power pack designed for the set is used, full speaker volume can be obtained from most stations. In addition, the wave-band coverage is far wider than that of the usual dual and triple-wave receiver, extending as it does continuously from 12.5 to 600 metres.

Alternative Power Supplies

With regard to power supply for the a.c. model, there are plenty of alternatives available. It can be powered from any commercial receiver using 6.3-volt valves, from a vibrator, from an ordinary power pack of the type that most short-wave experimenters have on hand, or, lastly, from the special combination power supply and amplifier, with built-in speaker, that has been designed for this set. Its construction will be described next month.

This unit has been built on a chassis with front panel similar to the receiver, the built-in speaker and tone control being mounted on the

The circuit of the a.c. "Empire All-Wave Three," which uses a 6D6 r.f. stage, 6C6 regenerative detector, and 76 audio stage.

panel. It incorporates a single pentode output stage using a 42. It will be noticed that a closed circuit output jack is connected in the plate circuit of the 76 (in the receiver), in such a way that when the 'phone plug is inserted, the speaker is automatically cut off. Conversely, to cut in the speaker all that is necessary is to pull out the 'phone plug.

Thus the A.C. "Empire" is particularly flexible in its applications, and this, combined with its exceptionally fine performance on all wave-bands, is more than enough to ensure its popularity among set-builders.

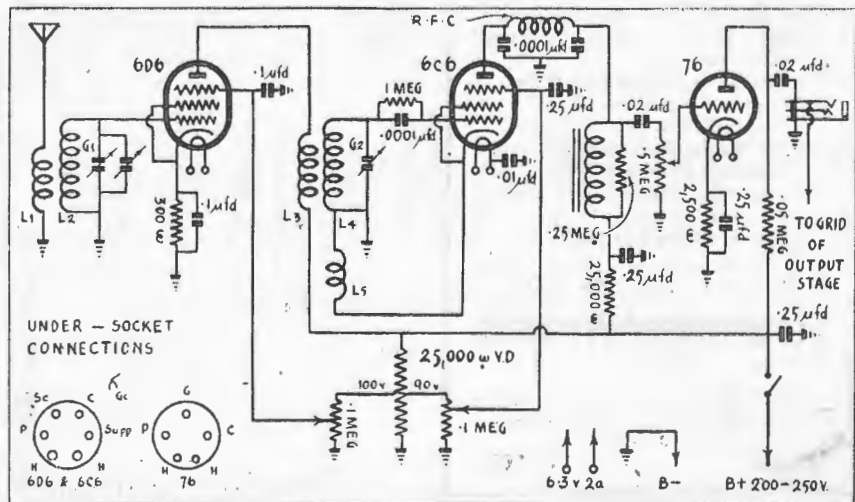
Main Circuit Modifications

The circuit of the battery version has been amended slightly in the a.c. model. Two gain controls are provided, an r.f. and audio. The first

operates on the screen of the 6D6 r.f. stage, while the second, which takes the form of a .5 megohm potentiometer substituted for the 76 grid leak, provides a control of the audio input to that valve.

As the 6C6 detector is an indirectly-heated valve, a single instead of a double-winding cathode coil is all that is required. As in the battery model, regeneration is controlled by varying the screen voltage, a method which is both velvet-smooth and ensures minimum detuning effect.

As a precaution against hum, a .01 mfd. condenser has been connected from one side of the 6C6 heater to earth, the best side being found by experiment. As well, the plate circuit of the 6C6 has been de-coupled, using a 25,000 ohm resistor and a



The Secret Is In The COILS!

You cannot expect 100 per cent. peak performance using coils that are only 40 per cent. efficient. Crudely-wound coils on "moulded mud" formers MUST bring disappointing results, particularly on the short waves, where one indifferent component can mean tremendous loss in signal strength. Wire gauge, turns, spacing, connections, former material . . . every detail must be scientifically planned if the last ounce of DX is to be obtained.

That is why, when building any "Radio World" receiver using plug-in coils, you should INSIST on the special RAYWAY coils as specified and used by the Editor. Follow the designer's lead and ensure that you will duplicate his results.



Illustrated above is the RAYWAY coil kit used in the original A.C. "Empire All-Wave Three." Comprises four pairs of coils, guaranteed wound exactly to specifications . . . £1/17/6

A special kit of coils is also available for the "Battery Amateur Communications Superhet" described this month. Wound exactly to specifications, £3/15/-

Complete coil kits are available for any of the following "Radio World" shortwave and all-wave receivers:—

- "All-Wave All-World Two"
- "Eaglet Shortwave Two"
- "Empire Shortwave Three"
- "All-Wave Bandspread Two"
- "Empire All-Wave Three"
- "Amateur Communications Eight"
- "Jones' Super-Gainer"

If unobtainable from your local dealer, write direct to:—

Standardised Products

Note new address:—

629 PARRAMATTA ROAD,
LEICHHARDT, SYDNEY.
N.S.W.

'Phone - - - LM 5057

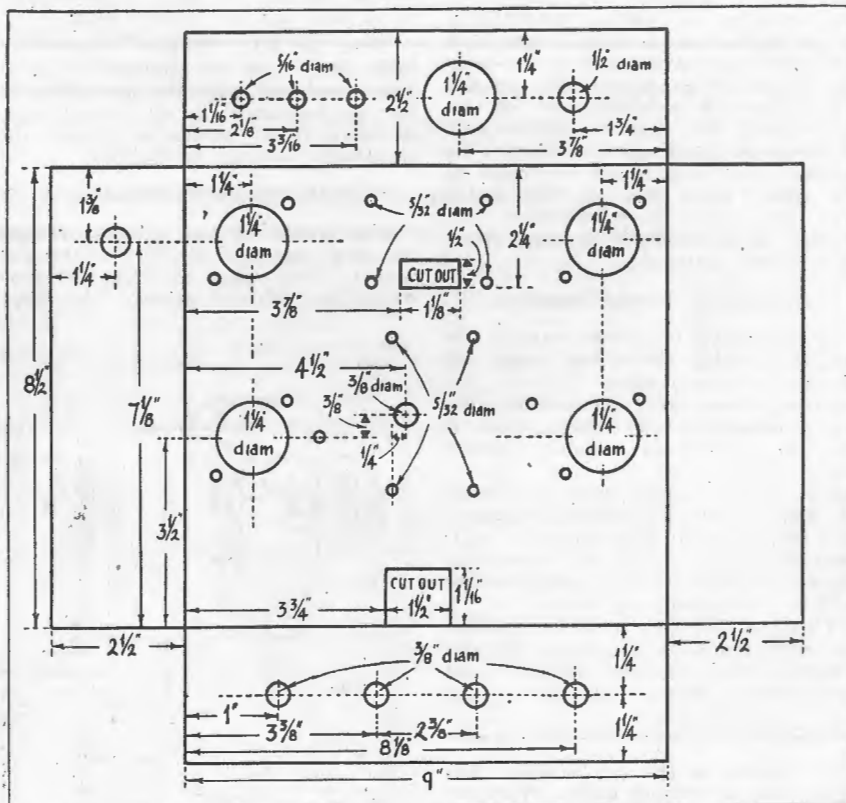
"1937 A.C. Empire All-Wave Three" — List of Parts

- | | |
|--|--|
| 1—chassis, panel and bracket to specifications. | 1—25,000 ohm 1-watt carbon (E.T.C., Bifrost). |
| 1—two-gang condenser (Stromberg-Carlson). | 1—50,000 ohm 1-watt carbon (E.T.C., Bifrost). |
| 1—7-plate midget variable condenser (Raymart, Radiokes). | 1—.25 megohm 1-watt carbon (E.T.C., Bifrost). |
| 5—wafer sockets, 3—6, 1—5, 1—4-pin (Stromberg-Carlson). | 1—1 megohm 1-watt carbon (E.T.C., Bifrost). |
| 1—5-pin socket and plug (Dalton). | |
| 1—high impedance audio choke (Radiokes). | FIXED CONDENSERS: |
| 1—full vision dial (Efco). | 3—.0001 mfd. mica (Simplex, Solar). |
| 2—.1 meg. potentiometers (E.T.C.). | 1—.01 mfd. mica (Simplex, Solar). |
| 1—.5 meg. potentiometer (E.T.C.). | 2—.02 mfd. tubular (Solar). |
| 1—closed circuit output jack (Igranic) and plug. | 2—.1 mfd. tubular (Solar). |
| 1—shortwave r.f. choke (Radiokes). | 4—.25 mfd. tubular (Solar). |
| 2—Goat valve shields. | VALVES: |
| 5—small knobs. | 1—6D6, 1—6C6, 1—76 (Ken-Rad, Raytheon, Radiotron, Mullard, Philips). |
| 1—pair of headphones. | |
| 1—25,000 ohm voltage divider (Radiokes). | MISCELLANEOUS: |
| 1—coil kit wound to specifications (Rayway). | 3 terminals, 2 red, 1 black; 2 grid clips; 2—6.3v. dial lamps; 8in. bolts and nuts; push-back; 2 yards 16-gauge tinned copper wire; solder tags; 4—3in. bakelite bushes, and 4—3in. bolts and nuts (for mounting front panel); 2—3 lug bakelite strips; 5—8in. brass spacers, and 4—lin. bolts and nuts. |
| 1—single-pole double-throw toggle switch. | |
| 1—6in. length 1in. extension rod, with bush and coupler. | |
| FIXED RESISTORS: | |
| 1—300 ohm 1-watt carbon (E.T.C., Bifrost). | |
| 1—2,500 ohm 1-watt carbon (E.T.C., Bifrost). | |

.25 mfd., by-pass condenser. These precautions, combined with the elaborate smoothing that has been provided in the separate power pack, have resulted in a hum level so low that it is difficult to detect in the 'phones whether the receiver is on or not.

A further refinement is the pro-

vision of a "B+" switch, which is mounted on the rear wall of the chassis. This obviates the need of turning off the power supply when any adjustments are being made to the set, and as well enables the latter to be switched off when coils are being changed. Provision is also made for the use of a doublet aerial



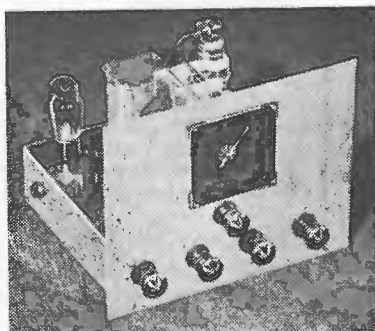
Dimensions for preparing the chassis are given in this sketch.

Everything
you need
to make
this great
receiver

15 Watt P.A.
Amplifier

Featuring exceptionally high output, with low distortion and negligible hum, the 15-watt P.A. Amplifier described this month is ideal for all public address work. Get our quote for the complete kit.

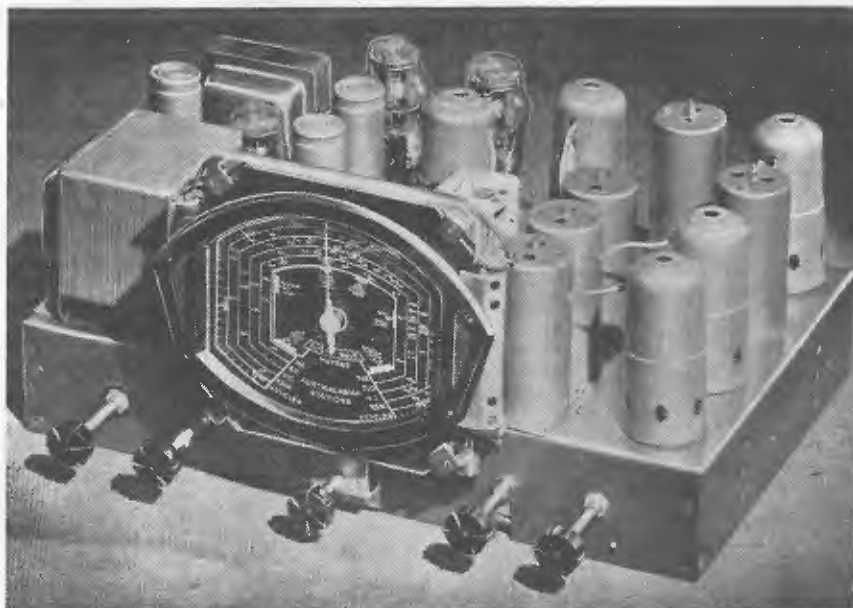
The "Empire
All-Wave
Three"
A.C. Operated.



Many DXers have been waiting for this A.C. version of the now famous "Empire All - Wave Three."

This amazing three-valver tunes from 12-600 metres using a standard two-gang condenser, and is extremely simple to build and operate. We can supply everything necessary to build the complete chassis, including Coil Kit, wound ready for use, Efco Dial, Western Electric Phones, Radiotron, Mullard, Philips, Kenrad Valves.

Call in and hear it for yourself



"The De Luxe Fidelity Eight"

Here is one of the finest Dual Wave performers yet designed in this country . . . a high fidelity receiver which you can build up easily and successfully using the special FOXRADIO Coil Kit specified by the designer.

Call in or write for our quote and list of parts for the complete kit or completed receiver, assembled and tested.

FOXRADIO COIL KIT

Comprising Aerial, R.F. and Oscillator Coils with switch, and two 465 K.C. Iron-cored Intermediates, the FOXRADIO Coil Kit greatly simplifies construction and ensures excellent results.

COMPLETE COIL KIT £5/10/-.

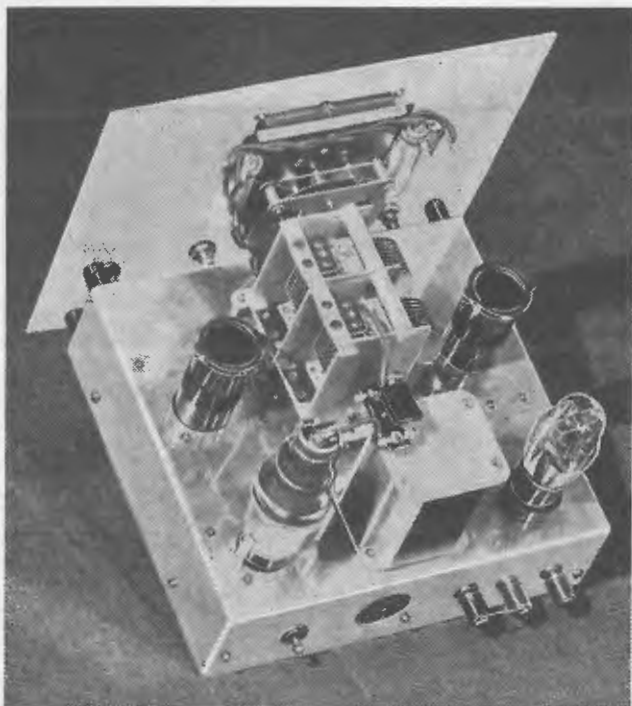
FOXRADIO

FOX & MacGILLYCUDDY Pty. Ltd.

MERINO HOUSE,- 57 YORK STREET, SYDNEY.

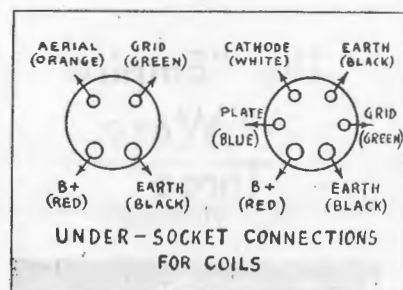
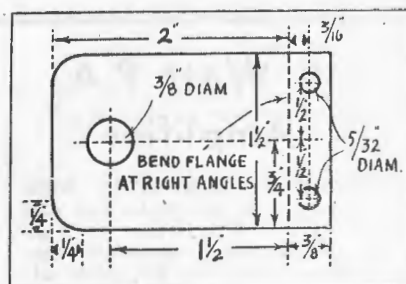
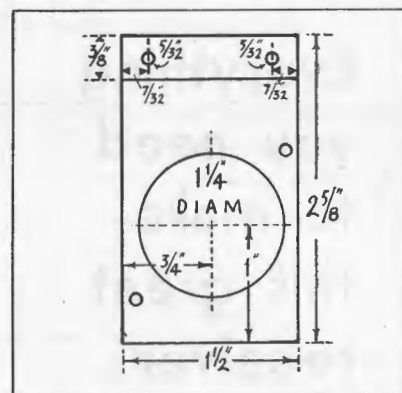
Telephone: B 2409-19

Telegrams: Foxradio



Left: A rear view of the a.c. "Empire." Note the method used for mounting the grid leak and condenser on one corner of the audio choke.

The two top sketches on the right give dimensions for preparing the steel brackets needed for mounting the 6D6 socket and the audio gain control. The bottom sketch shows the under-socket connections, with colour-code, used for the coils.



with transposed lead-in, if required.

About The Controls

The four lower controls shown in the front view of the receiver are (left to right) audio gain control, trimmer (across the r.f. section of the gang), r.f. gain control, and regeneration control. The r.f. coil is mounted to the left of the gang, with the 76 audio valve behind it. On the right of the gang is the detector coil, with the detector valve to the rear, the audio choke being located behind the gang. The grid leak and condenser are mounted on a bakelite strip on one corner of the choke.

As in the battery model, the r.f.

valve has been mounted horizontally underneath the chassis, parallel to the front and in line with the aerial and detector coil sockets. This avoids long grid and plate leads, which are undesirable in any receiver—particularly in one that is to operate on the short waves. With this arrangement, the grid lead to the aerial coil and the plate lead from the detector coil are only about an inch or so long. A small steel bracket stamped to take the r.f. valve socket is all that is required for the mounting.

Tunes From 12.5 To 600 Metres

As with the battery version, four pairs of plug-in coils, tuning from

approximately 12.5 to 600 metres, are needed. Turns details and approximate coverage for each pair are given in a separate panel elsewhere. The 7-plate midget variable condenser, which is parallel across the r.f. section of the gang, ensures accurate tracking over all wave-bands.

The parts required to build the "1937 Empire All-Waver," together with full details for preparing the 16-gauge aluminium front panel and chassis, are given elsewhere. As well, sketches are shown giving details of the two mounting brackets required. A sketch showing the coil connections is also given, with the colour code that has been adopted for the special Rayway coil kit that has been made available for this receiver.

Further Details Next Month

Next month, the assembly of the receiver will be outlined and a sketch published showing the under-chassis wiring. As well, full constructional details of the combination power pack and amplifier will be given.

COIL-WINDING DETAILS

AERIAL COIL.		DETECTOR COIL.			Waveband.
L1 pri.	L2 sec.	L3 pri.	L4 sec.	L5 react.	
25 (a)	144 (b)	40 (a)	114 (b)	12 (c)	470—1,440 k.c.
18 (a)	55 (b)	30 (a)	55 (b)	10 (c)	770—2,800 k.c.
7 (e)	20 (d)	15 (e)	19 (d)	5 (c)	2,450—9,020 k.c.
3 1/2 (e)	7 (d)	5 (e)	6 (d)	4 (c)	7,100—24,000 k.c.

- 32 S.W.G. enamel, close-wound over earthed end of secondary with Empire cloth insulation between layers.
- 32 S.W.G. enamel, close-wound.
- Put on in same direction as grid winding with 26 gauge enamelled, 1/8" below grid winding.
- Space-wound 20 g. S.W.G. enamel.
- Interwound in L4, 32 S.W.G. enamel.

Wind coils L1 and L2 on 4-pin 1 1/4" former.
Wind coils L3, L4 and L5 on 6-pin 1 1/4" former.

Tasman Crossed on 'Five'

VK2NO Establishes Further World Record In U.H.F. DX

Following on the outstanding achievement of having his 5-metre telephony logged in North Wales recently, Mr. D. B. Knock (VK2NO) has gone a step further by reaching New Zealand on 5 metres.

His C.W. telegraphy signals were received in Wellington by Mr. P. A. Morrison, of 7 Essex St., on October 23 last, at Q4, R5. Mr. Morrison's report checks with the log and activity at Mr. Knock's station.

VK2NO has been in continuous action during the week-ends with automatic C.W. transmissions, and at the time of reception in Wellington, between 3.30 and 5 p.m. N.Z. time, was using a W8JK type beam aerial, aimed north-west and south-east. The directional radiation from the south-eastern side of this bi-directional array was responsible for the signal reaching Wellington.

Mr. Morrison is a S.W.L. with 21 years' experience in receiver design and use, and takes a keen interest in ultra shorts. His re-

(Continued overleaf)



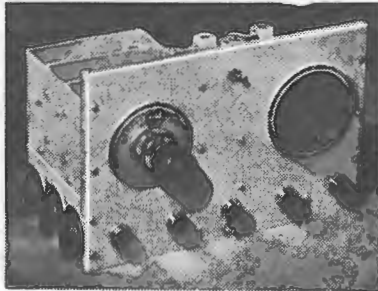
This group comprises many of the famous radio stars who helped to make such a success of the World Jubilee Broadcast, staged by Philips short-wave station PCJ on November 16. Those seated in the front row are Greta Keller, Edward Startz (chief announcer, PCJ), Fientje de la Mar, Ilomay Bailey, and Lee Sims, while Carroll Gibbons and his Savoy Orpheans are depicted in the background.

COUNTRY HAMS!!

Here is the Receiver that you have been waiting for.

RADIOTRON BATTERY AMATEUR RECEIVER

- ★ Regenerative R.F. Stage.
- ★ Separate H.F. Oscillator.
- ★ High Gain I.F. Stage.
- ★ Separate Beat Oscillator.



- ★ R.F. Gain Control.
- ★ A.F. Gain Control.
- ★ Tone Control.
- ★ B.F.O. Pitch Control.

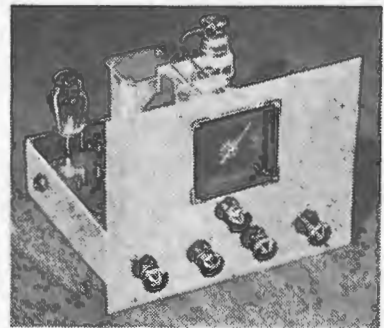
The RADIOTRON BATTERY AMATEUR RECEIVER, described in this issue of the "Radio World," is very similar in general design to the tried and well-proven Radiotron Amateur Communications Eight. This is definite proof that the results of this new battery machine will be all that could be desired.

WE ARE ABLE TO SUPPLY EVERY COMPONENT FOR THIS RECEIVER

Or we can supply one thoroughly tested and ready to use.

WRITE FOR DETAILED LIST OF PARTS.

The A.C. "Empire All-Wave" 3



The battery model of the "EMPIRE ALL WAVE 3" is an excellent set. but the new A.C. version is a real knockout.

Write for detailed Price List.

Interested In AMPLIFIERS?

Let us know the purpose that you require an amplifier for and we will gladly advise and quote on a suitable type.

PRICE'S RADIO SERVICE

(D. G. McINTYRE)

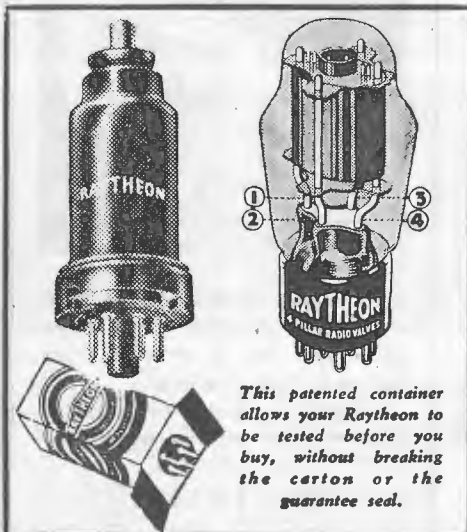
5 & 6 ANGEL PLACE, SYDNEY.

A goodly
apple
rotten at
the
core



TO-DAY many people seem to have the same trouble with radio valves that Shakespeare associates with apples. Looks have never been a safe indication of the goodness of the core. You cannot see through the apple skin—but you can look inside a valve and see how many pillars it has to preserve its vital accuracy. That's the core

of a valve. Unless the elements have four pillars for perfect balance and rigidity, how can they hope to resist the jolts of use and the vibration of dynamic speakers and stay "good" valves? Raytheon are the only 4-pillar valves you can get. All others have only two pillars. But the price is the same. You'll find it worth while to say "Raytheon," or "Four-pillar valves, please!"



This patented container allows your Raytheon to be tested before you buy, without breaking the carton or the guarantee seal.

If unobtainable from your local dealer write to Standard Telephones & Cables Pty. Limited, 258-274 Botany Rd., Alexandria

RAYTHEON
THE MAKERS OF
4-PILLAR VALVES

The Editor and Staff join in wishing every reader the Compliments of the Season . .

ceiver is a "straight" T.R.F. three-valve type, a Reinartz circular aerial being used for reception on 5 and 10 metres. Thus the Reinartz aerial again comes into DX prominence, as VK2NO was using this type for transmission when heard in North Wales. Mr. Knock considers that the Reinartz aerial may, by its circular shape, take advantage of favourable angles for DX.

In both cases these DX reports come from shortwave listeners, and afford examples of just how useful the S.W.L. can be in making observations on ultra-shorts. If S.W.L.'s can do this, what about the "hams"? VK2NO considers that two-way contacts should certainly result if the right kind of equipment is in use at both ends, and he urges amateurs to get together and tackle the 5-metre band seriously while the favourable conditions exist. Elsewhere in this issue will be found an announcement concerning a special W.I.A. 5-metre test on Dec. 19, the co-operation of all amateurs being invited.

The Front Cover

This month's front cover photograph shows a typical amateur week-end camp, complete with broadcast and short-wave receivers, and transmitter.

The occasion of the Australian National Field Day organised by the Wireless Institute of Australia for December 4 and 5 will see many of these camps scattered throughout the Australian bush, each party striving to gain the highest number of points in the contest.

In the photograph are Messrs. Taylor, O'Donnell and Phelps, operating from a bush location near Glenorie, N.S.W., on the occasion of a recent holiday camp.

THE
RADIO
PIONEERS

Fear's Radio News

F. J. W. FEAR & CO. - - - - 31 Willis Street, Wellington
New Zealand :: Telegrams: "FEAR"

FEAR'S
FOR
EVERYTHING
IN RADIO

An Advertisement inserted by F. J. W. FEAR & CO., New Zealand.

Special Portable Kit Makes Record Sales!

Phenomenal Performance Of "1937 Outdoor" Amazes Set-Builders

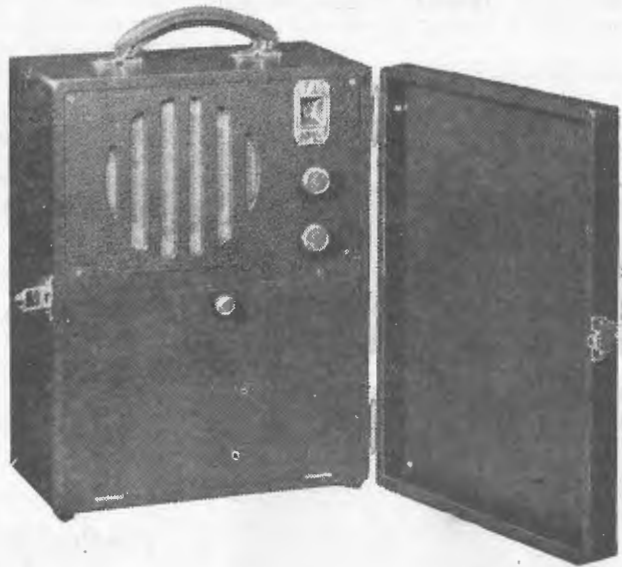
We have sold many thousands of kit-sets in the past few years, but never before have our customers been so enthusiastic about the performance of any set as those who have bought our special "1937 Outdoor" kit. Guaranteed under similar operating conditions to have more pulling power than many "sixes," it is a remarkable distance-getter—AND the ideal companion for all occasions. Anywhere, at any time, it will bring you, at the flick of a switch, news and entertainment, dance music for holiday parties, sporting results it will double ANYONE'S holiday enjoyment.

Get YOUR kit now, supplied exactly as specified in the October and November "Radio World," complete with small aeroplane dial and crackle-finished panel.

Price with valves, batteries, carrying case, everything required **£12/10/-**

Also supplied completely assembled, aligned, tested and fully guaranteed, **£14/10/-**

(Note: Usual trade discounts do not apply to above prices)



"1937 Empire All-Wave Three" (A.C. Version)

Here's the set that you have been waiting for—the A.C. version of the famous "Empire All-Wave Three." A wonderful distance-getter, it tunes from 12 to 600 metres using a standard two-gang condenser.

Uses 6D6 r.f. stage; 6C6 screen-grid detector with electron-coupled regeneration, choke-coupled to a 76 audio stage. Incorporates r.f. and audio gain controls. Can be powered from any standard receiver using 6.3 volt valves, from a separate power pack, or by using the special combination power pack and amplifier to be featured next month. World-wide reception guaranteed.

The ideal DX receiver for both shortwave and broadcast, this latest "Empire" gives you more stations per £1 outlay than any other.

WRITE FOR OUR DETAILED QUOTE.

Every part guaranteed as specified.

15-Watt Public Address Amplifier

Practically all p.a. requirements can be fulfilled with this compact, reasonably-priced amplifier, which delivers 15 watts of high quality output—ideal for dances, sport gatherings, political meetings, etc. (See description this issue).

WRITE FOR OUR DETAILED QUOTE.

"De Luxe Fidelity Eight"

Seven watts of high fidelity output are obtainable from the world-range "De Luxe Fidelity Eight," which for sensitivity, selectivity and volume, but above all for sheer tonal beauty, is unrivalled. The ideal receiver for the discriminating set-builder. (See description in this and last month's issue).

WRITE FOR OUR DETAILED QUOTE.

"De Luxe Metal Miracle Ten"

Uses 6L6 beam power valves with inverse feedback, giving 25 watts output. Frequency-compensated tone control—all-wave coverage from 15 to 550 metres—large oval accurately-calibrated dial—metal valves. 100 per cent. results are assured with the Micromatic factory-adjusted and guaranteed coil unit.

Complete kit, with valves and power supply £33/15/-

With valves, power supply and Magnavox Model 305 speaker £40/-/-

WRITE FOR FURTHER DETAILS—SENT FREE BY RETURN POST.

Reiss Microphone

We will shortly be able to supply a complete kit of parts for the Reiss Microphone described this month. Complete details sent free by return mail.

Radio Ramblings

A page for letters from readers. A prize of 2/6 will be awarded for every technical contribution published.

"1936 Empire" And 7-Watt Amplifier Give Good Results

I am enclosing three snaps of my sets and workshop (reproduced below.—Ed.). The shortwave receiver shown in all three photographs is a revised version of the "1936 Empire Shortwave Three." It uses ganged bandsread tuning condensers — 5-

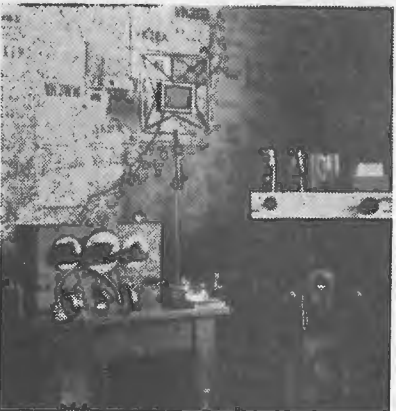
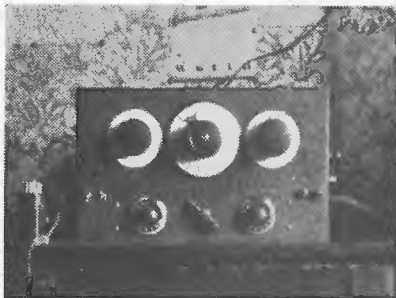


plate Radiokes isolantite midgets being employed. This arrangement improves the ease of operation over the amateur bands—particularly on the 20-metre American "ham" 'phone band.

I have also completed the 7-watt high fidelity amplifier featured in the "Radio World" for last August, and it is an excellent job. By coupling the shortwave receiver to it, using a 50,000 ohm resistor and .1 mfd. paper condenser, I can bring in London with 5 to 7 watts output with excellent tone, the noise level being particularly low. For pick-up and microphone work the amplifier is also ideal.

The two double-pole double-throw toggle switches appearing on the receiving panel in the top photograph are used to switch over from 'phones to speaker.

The bottom photograph shows (left to right) the "1936 Empire," P.M.G. key, Reiss microphone and a 5-valve a.c. Stromberg-Carlson D.W. superhet, with the 7-watt amplifier on top.—Eliot A. Glenie (AW21DX), Melbourne, Vic.



Starting Nuts In Awkward Positions

When constructing radios it is sometimes desired to place a nut in a position inaccessible to the fingers. By taking a piece of resin-cored solder, placing it over the nut, and tapping with a hammer, it may be placed anywhere by bending solder to desired shape. The solder will hold the nut until the bolt gets a grip.—J. W. White, Arncliffe, N.S.W.



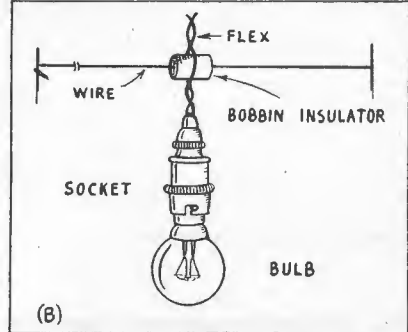
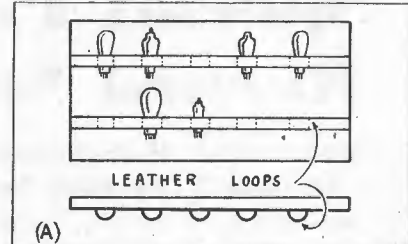
Locating Chokes For Least Hum

When building power packs, hum can be greatly reduced by first mounting the power transformer in the desired position and connecting it to the mains. Next, a pair of 'phones are connected across a filter choke and the transformer power switched on. The choke is then twisted around until least hum is heard in the 'phones.

Mount it permanently, and then proceed with the rest of the construction. Filament transformers separate to the main transformer can be positioned in the same way.—C. Friedwald, Glebe, N.S.W.

Two Useful Workshop Tips

The first sketch below illustrates a very effective way of storing valves, which if left lying around on the



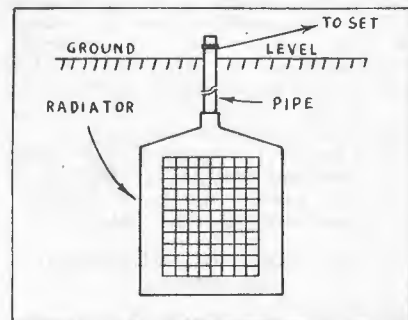
bench are very likely to be broken. All that is needed is a piece of board, a few tacks, and a strip of leather, which is looped as shown to the board.

The second sketch gives details of an adjustable bench lamp. By sliding the bobbin insulator along the supporting wire, the light can be supported directly over the position required on the bench.—George Brown, Hamilton, N.Z.



Radiator Makes Ideal Earth

For those who cannot use a water pipe or other suitable earth without long leads, an excellent earth can be



made by obtaining a leaky old car radiator.

It is buried in the ground as deep as possible, with a piece of water pipe leading to the top. When filled with water it makes a very low resistance earth.

If the pipe is soldered or welded to the radiator, the lead may be taken direct from the top of the pipe.—L. N. Taylor, Hurstville, Sydney.



Stabilised Oscillator Circuit

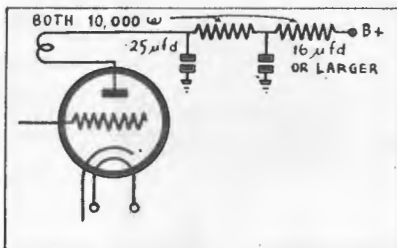
I am writing to show my appreciation of your magazine, which I have taken since the first number. It certainly caters fully for the set-builder, amateur and dxer.

Now for some dope about my gear. I have three receivers, the main job being a nine-valve all-waver. It uses a 6D6 r.f. stage, 6A7 mixer oscillator, 6D6 i.f. amplifier, 6C6 b.f. oscillator, 6B7 second detector, two 42's in class AB in the output, driven by a 76, with a 5Z3 rectifier. The other two receivers are the "Pentagrid Four" and the "Eaglet Two." The sets are all home-made, and give excellent results.

I am enclosing the circuit of a stabilised oscillator, which stops sig-

nals from wavering on shortwave. This is caused by the a.v.c. system changing the plate current of the receiver, and therefore the plate voltage, thus causing the oscillator frequency to shift.

Now for details of the aerial and earth system, location, etc. The aerial consists of a single wire flat top aer-



ial 40' high and 100' long, running N.W. We live about 500' above sea level, on the hills above Wellington Harbour. For an earth I use a couple of old globe type radiators buried about six feet in the ground. The Australian broadcast stations have been coming in very well this winter, but I have not had much luck with the American broadcasters. Shortwave has been quite good here; recent veries back are PCJ Holland,

COCQ Cuba, W2XAD Schenectady, N.Y., VK2DL Canterbury, N.S.W.—W. E. Carton (AW308DX), Wellington, N.Z.

Brief Appreciations From Readers

I am very pleased to see the "Radio World" still going strong; it's certainly the goods—has been from the very first issue... Personally, I appreciate the list of "ham" QRA's, which is kept up to date; and feel sure other "hams" do, too.

Best of luck to the magazine, and long may it live.—E. K. Webb (AW-14DX, VK3EX), Mischam, Vic.

"Radio World" Caters For Everyone

I am confirming the receipt of my certificate and badge, and assure you they are very nice. The "Radio World" is the best radio magazine I have ever read; it caters for every type of listener. The monthly "Short-wave Review" by Mr. A. H. Graham is certainly 100 per cent.

I will be very pleased to exchange QSL cards with other members.—C. W. Bryant (AW318DX), Logan Rd., Holland Park, South Brisbane, Q'land.

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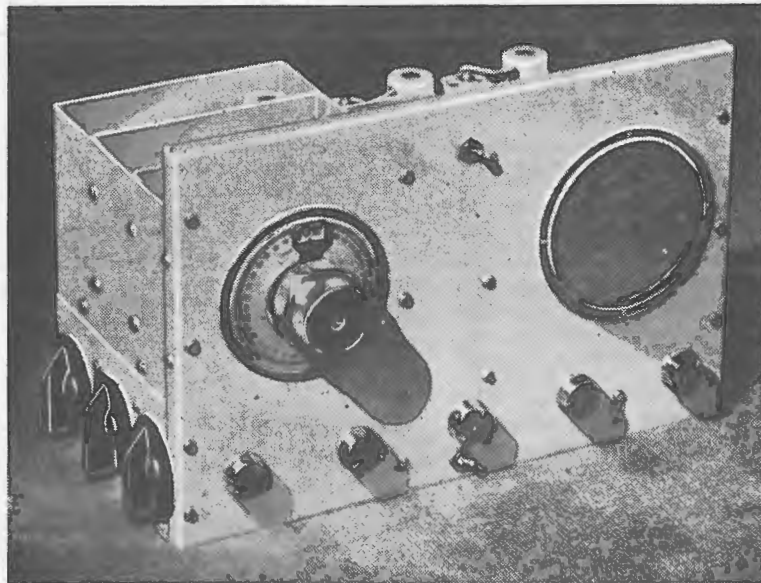
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Battery Amateur Communications

Superhet

A seven-valve battery version of the "Amateur Communications Eight" featured in the June and July issues of "Radio World" is described in the article below.



Left: A front view of the completed receiver, of which full constructional details will be given next month.

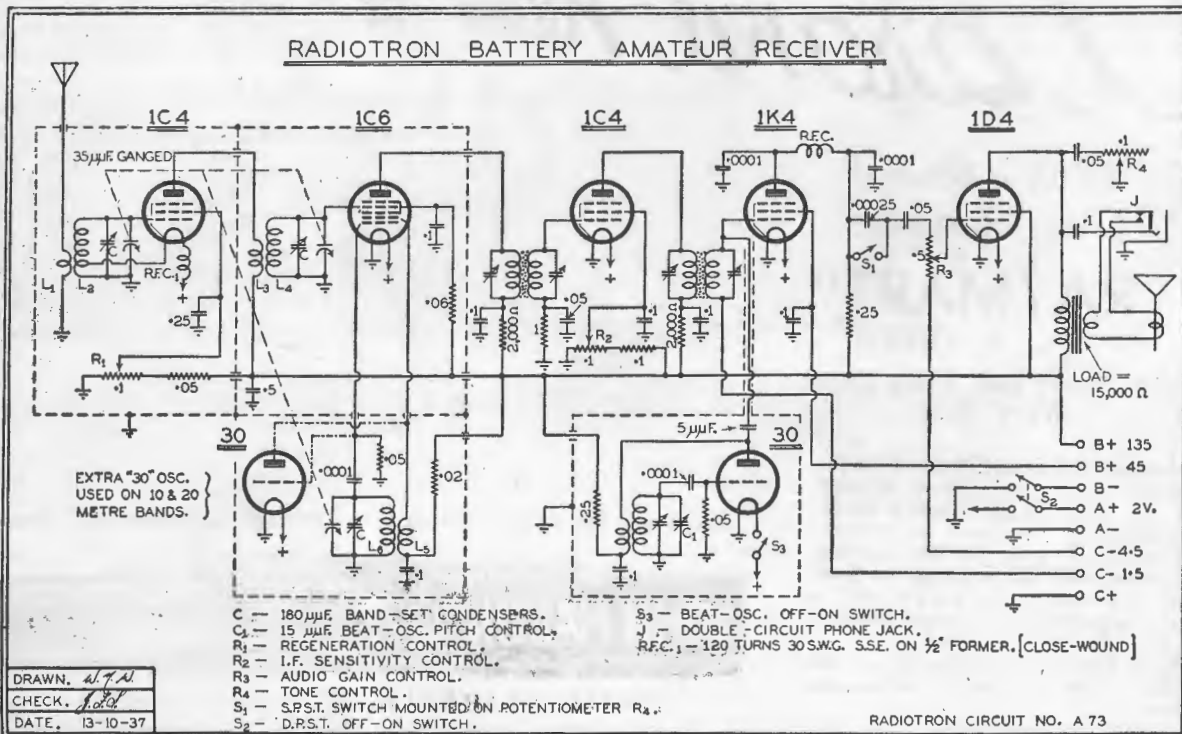
THE success following the description of the Radiotron Senior and Junior amateur receivers described in Radiotronics 75 has encouraged a version for battery users (states "Radiotronics" No. 81). The battery circuit here described is similar in many respects to the Junior receiver, and its performance is so good that the battery user will not find that he is handicapped by lack of a power supply. The circuit incor-

porates five amplifying valves, using types 1C4 (r.f.), 1C6 (converter), 1C4 (i.f.), 1K5 (second detector), and 1D4 (output pentode). Two additional valves are also used, both being type 30, the first being a beat oscillator for c.w. reception and the second an additional oscillator used on the 10 and 20-metre bands only.

These valves may be replaced by the new G series if so desired, and the types would then be 1M5G (r.f.),

1C7G (converter), 1M5G (i.f.), 1K5G (second detector), 1L5G (power pentode), 1H4G (beat oscillator), and 1H4G (extra oscillator).

It is rather unusual that a receiver of this kind, with a single i.f. stage, is capable of giving such high gain, but a closer examination will disclose that precautions have been taken which will give a high overall gain, together with extremely sharp selectivity.



The circuit of the "Battery Communications Seven," which incorporates band-spread, a regenerative r.f. stage, and a beat frequency oscillator.

Coil Winding Details

Band.	Aerial.			R.F.	Oscillator.		
	L1	L2	Tap.		L3	L4	L5
1	9 (a)	33 (b)	1 (f)	25 (a)	33 (b)	10 (a)	36 (b)
2	5½ (a)	15¼ (c)	¾ (f)	11 (a)	15 (c)	5 (a)	15½ (c)
3	2½ (a)	5¾ (d)	⅝ (f)	4½ (a)	5½ (d)	4 (a)	5 (d)
4	7 (a)	8 (e)	1½ (f)	7 (a)	8 (e)	4½ (a)	6 (e)

- (a) 30 S.W.G. D.S.C. wire, interwound in secondary starting from bottom.
- (b) 28 S.W.G. Enam. wire, wound 32 T.P.I. on 1¼" former.
- (c) 20 S.W.G. Tinned Copper wire, wound 10 T.P.I. on 1¼" former.
- (d) 18 S.W.G. Tinned Copper Wire, wound 6 T.P.I. on 1¼" former.
- (e) 20 S.W.G. Tinned Copper wire, wound 10 T.P.I. on ½" former.
- (f) Tap on Secondary, counted from bottom.

Regenerative R.F. Stage

The r.f. stage is arranged with filament circuit regeneration, which is controllable by means of a screen potentiometer. A choke is used in one leg of the filament, the other end of the filament being returned to earth through the tapping on the coil. By careful adjustment of this regeneration control, it has been found possible to obtain gains between the aerial and the grid of the 1C6 of 125 times on the 80-metre band, 96 times on the 40-metre band, and 80 times on the 20-metre band. It was not found possible to obtain full regeneration on the 10-metre band, and the gain from the aerial to the 1C6 grid was consequently considerably lower.

The 1C6 or 1C7G converter is operated under standard conditions, as recommended for shortwave band, but on the 10 and 20-metre bands an additional oscillator (30 or 1H4G) is connected in parallel with the oscillator section. This does not affect the operation of the 1C6 except that it increases the strength of the oscillations in the oscillator circuit.

Anode Bend Detection Used

Iron core i.f. transformers are

used in order to increase the gain and the selectivity. In most conventional broadcast receivers the secondary of the i.f. transformer is seriously loaded by the diode current, and the selectivity and gain suffer as a consequence.

In this circuit, anode bend detection has been used, with the result that a high input impedance is obtained in the second detector, and the remarkably good selectivity figure (for the i.f. channel alone) of 29 k.c. band width at 1,000 times has been obtained in the set. This selectivity is assisted by the very high plate resistance of the 1C4.

A.V.C. Not Included

No a.v.c. is used in this circuit, since it would not be practicable to apply this without increasing the damping on the second i.f. transformer, and thereby giving a very much poorer all-round performance. If a second i.f. stage had been used, it would have been possible to apply a.v.c., but this addition was not thought to be justified in view of the very limited use of a.v.c., which in any case would not be used on c.w.

An i.f. gain control is used on the

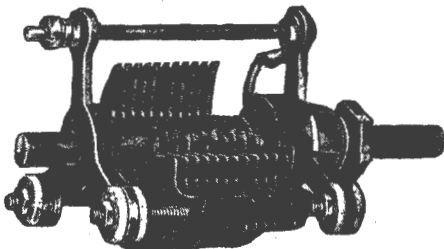
screen of the i.f. valve, and this should be used intelligently in conjunction with the control on the r.f. and audio stages. In general, it will be found desirable to use the maximum convenient setting on the r.f. stage and to reduce the settings of the i.f. and audio controls except for very weak signals. It will be noticed that de-coupling resistors and condensers are used in the plate supply circuits of the converter and i.f. stages.

The 1K4 or 1K5G second detector operates at a bias of -1.5 volts and a screen voltage of 45. An r.f. choke and suitable r.f. by-pass condensers are used to prevent r.f. getting into the audio amplifier.

A very small grid coupling condenser (.00025 mfd.) is used for the purpose of reducing the bass response to assist in c.w. reception. This is switched in at the bass end of the tone control. A tone control to cut off the higher audio frequencies is also useful in aiding c.w. reception. An audio volume control is arranged in the grid circuit of the 1D4 or 1L5G valve.

The loudspeaker should preferably be mounted away from the chassis in

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R. H. Cunningham (VK3ML),

1449 High St., Glen Iris, Vic.

order to avoid microphonic effects, which are inclined to be troublesome on the shorter wave-bands. Provision is made for another loud-speaker or a pair of headphones to be plugged in if desired.

B.F.O. Coupling To Second Detector

The beat oscillator is connected to the grid of the second detector through a very small condenser, having a capacitance of 5 mmfd., which, if not obtainable as a fixed condenser, may be arranged by means of twisted leads.

The coils in the beat frequency oscillator may be from a standard 465 k.c. i.f. transformer. The trimming condenser across the primary should be removed, and an additional condenser C1 added in parallel across the secondary. This condenser C1 forms a pitch control, and it should therefore be mounted on the panel, so as to be readily controllable. A switch is arranged in the filament circuit of the beat oscillator valve so that it may be switched out of service when not required.

Coil data is shown in the table, and no further description should be required. The total current drain with gain controls at maximum is:—

1C4 r.f.	3.0 m.a.
1C6 converter	4.8 "
30 high frequency oscillator	1.0 "

1C4 i.f.	2.5 "
1K5 second detector	0.2 "
30 beat frequency oscillator	0.5 "
1D4 output	7.5 "
Total	19.5 m.a.

This current drain will hardly ever be reached in practice, since it only occurs when all volume controls are at maximum, and with the additional h.f. oscillator and the beat frequency oscillator both in operation.

High Sensitivity And Low Noise Level

The overall sensitivity (absolute measurement) from the aerial terminal is:—

2 micro-volts on the 80-metre band.
2.6 micro-volts on the 40-metre band.
3.5 micro-volts on the 20-metre band.
Approximately 50 micro-volts on the 10-metre band.

The equivalent noise-level voltage, that is, the noise voltage which produces in the presence of a 30 per cent. modulated signal a noise output equal to the signal output, is approximately 0.7 micro-volt on all bands. With c.w. reception, the equivalent noise-level voltage may be calculated on the basis of 100 per cent. modulation, and is therefore $0.3 \times 0.7 = 0.21$ micro-volt.

Image ratios on the 80, 40, 20 and


10 metre bands are 250, 200, 150 and 30 respectively.

There are no points of difficulty in this circuit, and it may be built by anyone reasonably experienced in receiver construction. Two points will be found of special importance, these being firstly the mechanical strength and rigidity of the chassis and all components, and secondly, the layout with respect to length of wiring and the position of components with respect to one another. Attention paid to these two points will ensure excellent results.

Adjusting Band-Setters On 10-Metre Band

The method of adjusting the band-set condensers on the ten-metre band, where there is a tendency to interlocking in the converter stage, is as follows:—Adjust the setting of the oscillator band-set condenser by tuning a "marker" station to approximately the desired point on the tuning dial. Then adjust the r.f. band-set condenser. This will often result in slight detuning of the signal, in which case the r.f. band-set condenser should be readjusted to peak the noise level. The "marker" station may then be correctly retuned with the main tuning gang, and tracking will be satisfactory over the band.

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CONTENTS: Chapter 1—THE ELEMENTS OF A SYSTEM OF RADIO COMMUNICATION; Chapter 2—CIRCUIT CONSTANTS; Chapter 3—PROPERTIES OF RESONANT CIRCUITS; Chapter 4—FUNDAMENTAL PROPERTIES OF VACUUM TUBES; Chapter 5—VACUUM-TUBE AMPLIFIERS; Chapter 6—VACUUM-TUBE AMPLIFIERS—Continued; Chapter 7—POWER AMPLIFIERS; Chapter 8—VACUUM-TUBE OSCILLATORS; Chapter 9—MODULATION; Chapter 10—VACUUM-TUBE DETECTORS; Chapter 11—SOURCES OF POWER FOR OPERATING VACUUM TUBES; Chapter 12—RADIO TRANSMITTERS; Chapter 13—RADIO RECEIVERS; Chapter 14—PROPAGATION OF WAVES; Chapter 15—ANTENNAS; Chapter 16—RADIO AIDS TO NAVIGATION; Chapter 17—TELEVISION; Chapter 18—SOUND AND SOUND EQUIPMENT; APPENDIX A; INDEX.

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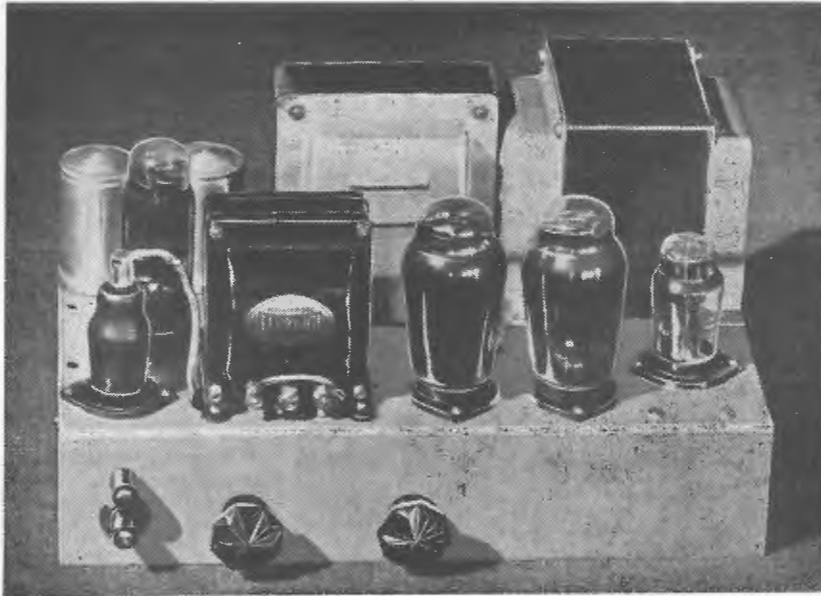
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ADDRESS

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OCCUPATION R.W 12-37

A 15-Watt Public Address Amplifier



Using a pair of Philips EL5's in class A/B in the output, the p.a. amplifier described below can deliver a full 15 watts of high quality output.

Left: This view of the completed amplifier shows the compact layout adopted. The steel chassis measures only 13" x 7½" x 2½".

ELSEWHERE in this issue will be found an article, complete with circuits and general information, describing 15 and 25-watt public address amplifiers using Philips valves throughout. The construction of the 15-watt model is outlined below.

Using standard parts throughout, the amplifier is reasonable in cost and will deliver a full 15 watts of output with low distortion, making it ideal for general use. It is particularly flexible in its applications, as no speaker field excitation is provided for. This can be obtained from a separate power supply, or alternatively a bank of per-magnetic speakers could be used.

As shown in the photographs, the amplifier is particularly compact, being built on a steel chassis measuring only 13" x 7½" x 2½".

About The Parts

The parts required are listed in a panel elsewhere. The audio transformer used in the original model is a Ferranti AF5C. Though rather costly, it ensures excellent tonal quality, and so its use more than justifies the expense. If this make of transformer is used, the 50,000 ohm resistors across each half of the secondary can be dispensed with.

The bias resistors for the EL3 and pair of EL5's are specified as 800 and 160 ohms respectively. However, standard values of 750 and 150 ohms can be used here without affecting

the performance or life of the valves in any way.

More Thorough De-coupling

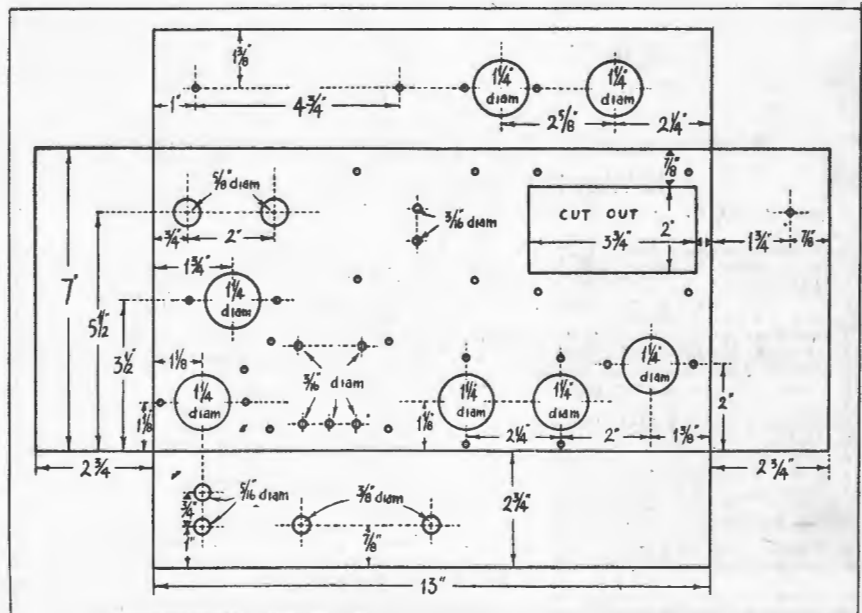
A further slight alteration to the circuit constants that experience has proved to be well worth while as an added protection against instability is the substitution of 8 mfd. dry electrolytic condensers for the .5 mfd. paper types specified as screen and plate supply de-coupling condensers for the EF6 and EL3 respectively (C3 and C7).

Providing the specifications for the

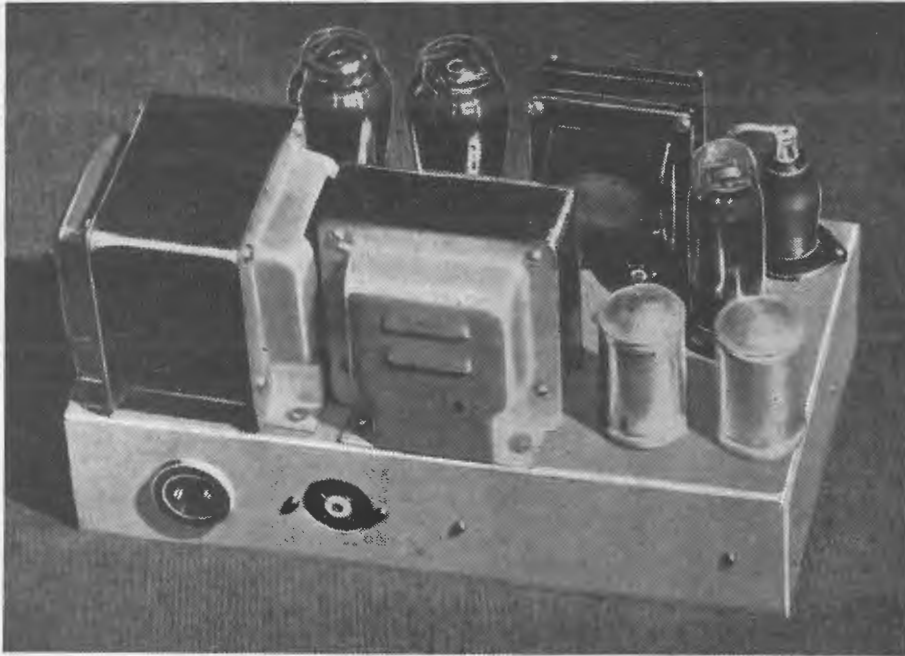
power transformer and smoothing chokes are followed, the voltage on the output side of the smoothing filter will be correct. In the original model, however, a transformer wound to deliver 350 volts either side of the centre tap was used, and so a 300 ohm 200 m.a. wirewound resistor was included on the input side of the filter in order to reduce the "B+" voltage to that required.

The Construction Outlined

The valve sockets are mounted first of all, and the heaters wired.



This sketch gives full dimensions for stamping and drilling the chassis.



Then the input terminals, volume and tone controls, power and speaker sockets can be bolted in position. Next follow the power transformer and smoothing choke. The power transformer lugs are then wired, and then the smoothing filter (to complete this it will be necessary to mount the two 8 mfd. wet electrolytics).

Then, starting from the input terminals, each valve can be wired in turn until the amplifier is complete. If the suggestion made earlier in the article concerning the use of two 8 mfd. dry electrolytics is followed, these can be purchased in a single container and bolted to the rear wall of the chassis.

Wiring Should Be Rigid

The wiring should be made as rigid

as possible, particularly if the completed amplifier is to be used for public address work, and will thus be carried around from place to place. Wherever necessary, terminal strips should be used to support wiring and pigtail components. These strips are mounted either by passing a single bolt through the centre, or in the case of long strips, by using a bolt at each end. The strips are supported clear of the chassis by means of $\frac{3}{8}$ " brass spacers.

Care should be taken when wiring in the dry electrolytics to make sure that the red lead is connected to the more positive of the two points across which the condenser is placed. For example, in the case of the dry electrolytics by-passing cathode bias resistors, the red lead in each case should go to the cathode.

When the wiring is completed, it should be checked over thoroughly to make sure that no errors have been made.

Ample Reserve Of Power

This amplifier will be found to give excellent all-round results. The quality of reproduction is first-class, while the output is more than sufficient for most general purposes. Actually, the full 15 watts of output power as delivered by this amplifier represents tremendous volume, and only on rare occasions would more be required.

This rear view of the completed amplifier shows the arrangement of the smoothing filter components, and the location of the power and speaker sockets.

Australian Trained Radio Servicemen's Institute— Queensland Division.

By W. J. HUDSON.

The last monthly meeting of the Australian Trained Radio Servicemen's Institute was held at Commerce House, Adelaide Street, Brisbane, on November 17, 45 members being present. The chairman was Mr. A. G. Brayne.

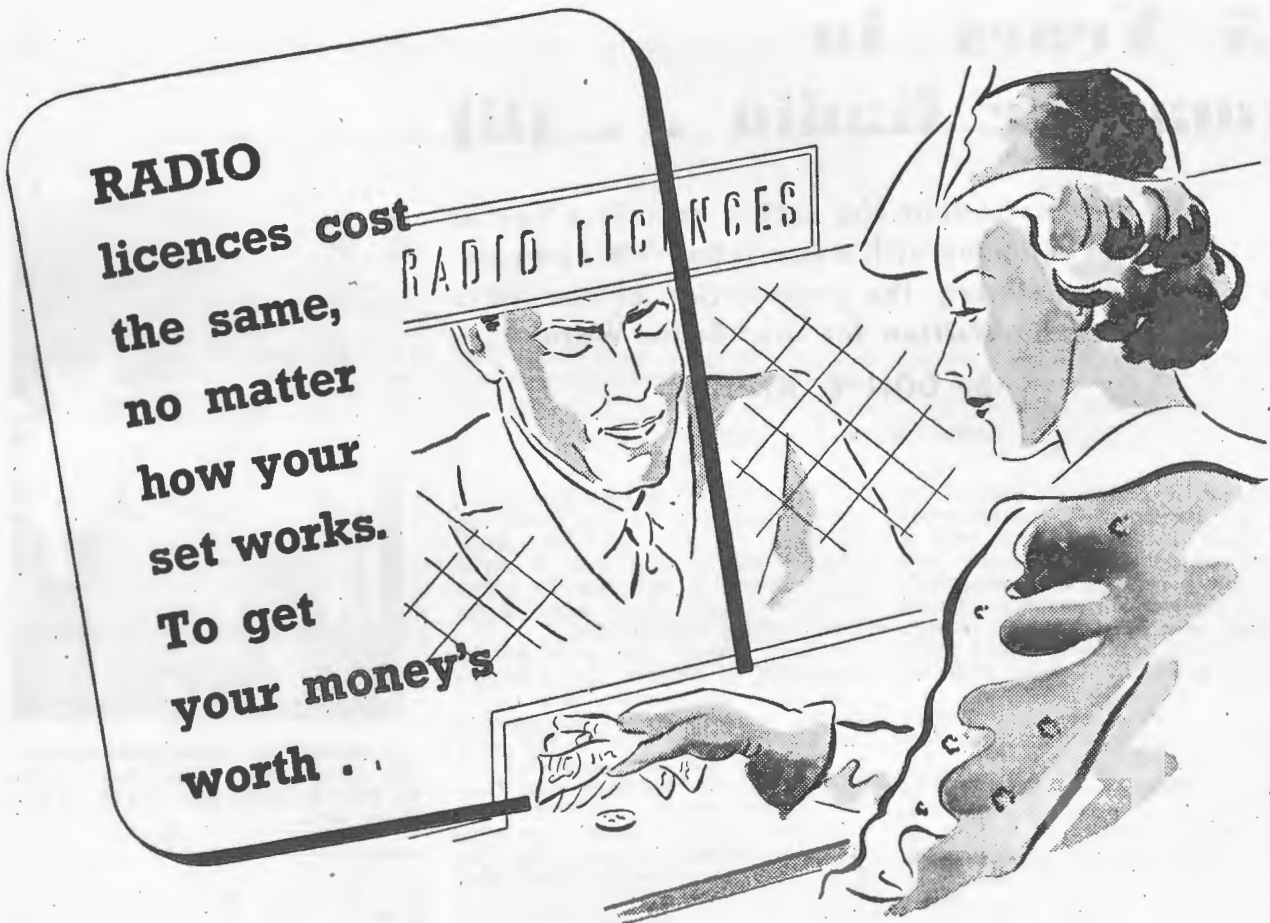
The usual routine business was followed with a lecture by a member. The choice fell on the vice-president, Mr. R. Littner, who has recently returned from U.S.A. The speaker dealt with his travels in Hollywood, and also explained the latest ideas in television, the Philco system, inter-leaved scanning and the technical and commercial possibilities of the art in U.S.A.

At 10.30 p.m., when the meeting closed, the speaker had not completely covered his very interesting account of his impressions and experiences in the States, and so it was unanimously decided to conscript Mr. Littner to continue his lecture at next meeting night, December 2.

The Institute is making good progress, the Brisbane radio servicemen being both very sociable and technically efficient. I have seen radio clubs and societies come and go over a period of years—amateurs are often dilettantes—but this Brisbane Institute is composed of people very actively engaged in getting a living out of radio.

15-Watt P.A. Amplifier — List of Parts

- | | |
|--|---|
| 1—steel chassis to specifications, 13in. x 7½in. x 2½in. | 2—5,000 ohm 1-watt (E.T.C.). |
| 1—power transformer (300v. C.T. 300v. 200 m.a.; 6.3v. 4 amps.; 6.3v. 1.0 amp.) (Radiokes). | 1—100 ohm 1-watt (E.T.C.). |
| 1—30 henry 200-ohm smoothing choke, to pass 150 ma. (Radiokes). | 1—800 ohm 1-watt (E.T.C.). |
| 1—audio transformer (Ferranti Type AF5C). | 1—160 ohm 150 m.a. wirewound. |
| 1—1 meg. potentiometer (Yaxley). | FIXED CONDENSERS: |
| 1—50,000 ohm potentiometer (Yaxley). | 2—.005 mfd. mica (Solar). |
| 5—valve sockets, type "P" (Philips). | 1—.04 mfd. tubular (Solar). |
| 1—4-pin wafer socket. | 1—.1 mfd. tubular (Solar). |
| 2—terminals, red and black (Dalton). | 3—.5 mfd. tubular (Solar). |
| 2—knobs. | 1—.1 mfd. tubular (Solar). |
| 1—grid clip. | 3—.25 mfd. dry electrolytics, 40v. working (Solar). |
| 1—power socket and plug. | 2—.32 mfd. wet electrolytics, 350 p.v. (Solar). |
| 1—length power flex and plug. | VALVES: |
| FIXED RESISTORS: | 1—EF6, 1—EL3, 2—EL5's, 1—EZA (Philips). |
| 1—1 meg. 1-watt (E.T.C.). | SPEAKER: |
| 1—250,000 ohm 1-watt (E.T.C.). | Dynamic speaker to suit, input transformer to match push-pull EL5's with speaker cord and 4-pin plug (Amplion, Rola). |
| 4—50,000 ohm 1-watt (E.T.C.). | MISCELLANEOUS: |
| 1—30,000 ohm 1-watt (E.T.C.). | Solder tags, bolts and nuts, push-back, shielding (for EF6 grid lead). |
| 1—16,000 ohm 1-watt (E.T.C.). | |



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(Advertisement of Amalgamated Wireless Valve Co. Pty. Ltd.)

25 Years In Amateur Radio . . (8)

In this instalment the author describes how in 1932, in company with a few fellow-VK's he commenced exploring the possibilities of the ultra short waves. Written for the "Radio World" . .

By **DON B. KNOCK**

Radio Editor, "The Bulletin."

AFTER a period of radio sales and service work, experimental work was carried out with a limited amount of equipment, and using low power, from Bronte, Sydney. This location could be classed as about one of the world's worst. The residence was below road level, being reached by a long flight of steps, and the consequence was that an aerial system, even on 50-foot masts, was only two or three feet above road level.

Despite this severe handicap, a fair amount of excellent communication was obtained on 40 and 20 metres with overseas stations, and some satisfactory 10-metre work was also done with interstate stations. The aerial was efficient, which explained the results. It was a centred 135-foot top running North and South, and despite the heavy screening, reached out very well.

The experiences with the station in this undoubtedly poor location brought home the realisation that there can never be a totally impossible location for shortwave communication. It was well demonstrated by reason of the fact that some very useful pioneering work was done on five metres, and for such work one can only comment that the location was well-nigh disheartening.

Early Ultra Shortwave Experiments

At this period, a few of the older hands were turning to five metres for other fields to explore, and among these with the writer were VK2SA (Sgt. Salmon of the N.S.W. police radio service) and Syd. Maguire (VK2XY). These two stations were situated over two ranges of hills in a northerly direction, about three miles distant. With what may now be considered as the most elementary of ultra-shortwave transmitters and receivers, very little trouble was encountered in obtaining good two-way and duplex telephony working.

The transmitters were unstable modulated oscillators, receivers were

battery-operated super-regenerators, and the aerials of various kinds, but all plain radiators and not directional. The Pickard type of aerial was favoured at this time, and this is fundamentally about equal to the usual twisted pair doublet.

It was known that over on the other side of Sydney the Lakemba Club had a few members keen on five metres, and engaged in experiments, but Lakemba was then looked upon as excessive DX, and somewhat unlikely as a communication goal from the Eastern suburbs. Nothing was ever heard of the stations over there from the writer's location, but VK-2SA, who was more favourably placed, once thought he heard a weak station. In view of subsequent work and achievements in recent years, we can now look pityingly on our former modest hopes!

Back To Radio Journalism

In 1933, the writer returned to the sphere of radio journalism by an appointment as Technical Editor of "Australian Radio News," then published by "The Bulletin," and during the period until this weekly was absorbed in "The Bulletin," a considerable amount of 5-metre investigational work was done. The foundations were laid for an influx of enthusiasm for this previously-scorned communication channel, and more Sydney amateurs were attracted to its possibilities as a very useful cross-city medium.

Following on the initial tests at the home location, with its serious handicaps, possible high elevations were sought with the object of determining just how far signals could travel with the apparatus available. A portable station was made up on a camera tripod. The transmitter had two 71A's in unity-push-pull with two similar valves as modulators in parallel, while the receiver was a separately interrupted super-regenerator with 2-volt battery valves and a magnetic speaker.

This station was taken to the tower on top of "The Bulletin" of-



A question of aerial feeder design? The author (left) being shown round by 2XO at Bellingen, N.S.W., a few years ago.

fices in George Street, Sydney, where a Pickard type aerial was rigged on a wooden support. At once the advantages of an unscreened location became apparent. It was possible to work with the 5-metre gang in all directions around Sydney, as far afield as Mascot aerodrome.

Special duplex tests were run between this station and a police outfit operated by VK2SA from police H.Q. in Philip Street, and a new and interesting era began to dawn in experimental 5-metre radio in N.S.W. Tests were also run about this time in conjunction with Syd. Colville at Mascot aerodrome, and considerable success was had in working over distances up to 20 miles between ground station and 'plane.

Much interest was aroused by the demonstration of 5-metre duplex communication between the "Australian Radio News" and Ever Ready Battery Co.'s stands at the 1934 Radio and Electrical Exhibition in Sydney Town Hall. All this time, transmitters and receivers had been crude, and aerials an inefficient means to an end.

DX With Directional Aerials

With the coming of the directional aerial era on 5 metres in Sydney, this once short-range band began to take on a different aspect. Up in the Blue Mountains, at Hazelbrook, N.S.W., was located a keen experi-

menter in E. B. Ferguson (VK2BP). Ferguson had dabbled with 5-metre apparatus in the hope of hearing something of the Sydney stations, but after meeting repeatedly with a wall of silence, had more or less given up the quest in disgust.

Late in 1934, a new type of 5-metre aerial was erected at the writer's station (where the previous location had been changed for a more elevated position), this being of the four radiator-four reflector type with the radiators fed in phase, and giving beaming in one direction. It was a bulky affair on a wooden framework, and was perforce so slung between two poles that it gave direction due west.

The transmitter was a T.N.T. oscillator using 45's, modulated in Class B by a 53, driven by a 56. Two keen co-operating experimenters at this time were Harry Chinner (VK2CG) and Will Dukes (VK2WD). It was arranged to run a distance test on this aerial, and on 2/2/35 these two left Sydney by car, carrying a small super-regen. receiver, to make observations on a constant modulated tone signal from VK2NO.

They couldn't lose the signal anywhere along the Mountains Road route, and at Hazelbrook, outside VK2BP's shack, the signal was at maximum. Ferguson was away from home, but a note was left notifying him of the test and the result. To cut a long story short, in a few days' time VK2BP was on the air with a similar beam array, and perfect two-way telephony was established on 5 metres between Sydney and the Blue Mountains.

Active stations using beam arrays following this period were VK's 2BP, 2NO, 2CG, 2WD, 2MW and 2OD. It was attempted to get through to Newcastle, 70 miles air-line distance, but that objective was not to be attained until much later, in mid-1937.

Severe QRM Hampers Progress

Several more stations began to be attracted to 5 metres, and the band actually took on a severe QRM aspect. It began to be realised that "squegger" receivers were worse than atrocious in causing severe interference for miles around, and the heavily-modulated self-excited transmitters were guilty of greediness.

Several transmitters were modified by the use of stable grid and plate circuits using the "long lines" principle, and the cleaner signal was at once apparent. Super-regenerative receivers also came in for attention, and separate interrupter valves and an r.f. stage were incorporated in many instances.

It was possible to fit more stations into the band without overlap, but things were by no means perfect. Several misguided people made up simple one-valve transceivers. One of these on the air, with its "squegging" detection and propensity for hopping about all over the band, was sufficient to wreck communication between several stations. It is safe to assume that the "transceiver" as popularised in U.S.A. by several publications did more to hold back progress on five metres than anything. One can imagine the terrific QRM these contraptions must cause in populated districts in the States.

Mobile Tests On "Five"

In 1935, a mobile 5-metre test period predominated around Sydney, and several amateurs co-operated in tests far afield. Those test days were full of the most intense interest for those out with the car stations and those at the home locations, and it is a great pity that at the time of writing, this phase of 5-metre activity has suffered from neglect.

The car station for VK2NU (VK-2NO's portable) used a unity push-pull oscillator with two 89's, plate-modulated by a 42. The aerial was a half-wave twisted pair doublet projecting vertically from the front bumper. Power was taken from the car 6-volt accumulator via a 300-volt Carter genemotor, and the receiver had a 955 "acorn" self-interruptor detector and 38 audio.

Many interesting results were obtained with this mobile station, one of which was the fact that a really good place for 5-metre transmission and reception around Sydney is in the centre of the Harbour Bridge. In view of the great mass of steel, this seems hardly likely, but it is so. On one occasion this car station communicated with a similar outfit in a car on Kurrajong Heights, when located near the top of Bull Pass. These stations were used for lengthy periods when on the move at high speed as well as when "on location."

(Continued on page 29)

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In a review of the latest PALEC Multitester Model "CM," a well-known Radio Authority described this versatile multitester as an EXTREMELY COMPREHENSIVE INSTRUMENT . . . in fact, almost a "portable laboratory."

He drew particular attention to a new, advanced feature of this model—the ability to read D.C. potentials up to 25 volts WITHOUT DRAWING ANY CURRENT from the local resistor. This is essential for the accurate checking of A.V.C.

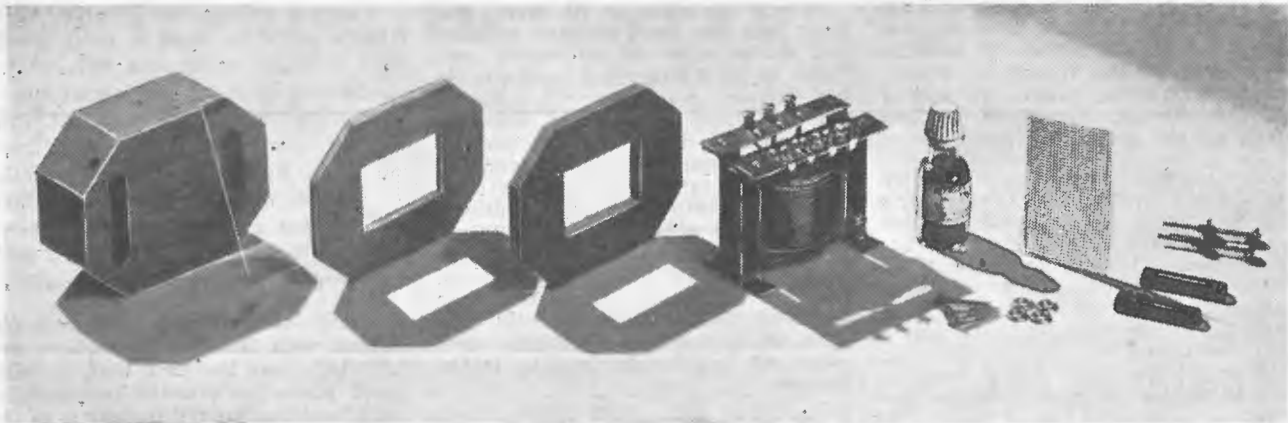
Another noteworthy refinement, is a SINGLE LINEAR EASY READING SCALE for both D.C. and A.C. measurements, also an extra range of OHMS, making five in all (0 to 10 meg.). The above, in addition to its former wide range, plus the accuracy of the Sin. type Meter, places this instrument in a class of its own. Has Multi Ranges of D.C., A.C., and Output Volts, MA'S, OHMS, Decibels, Capacity Inductance, Impedance. Will test insulation, also leakage of Electrolytics and Capacity of same.

Price Model "CM", £13/10/- (plus tax), or complete with Analyser-Selector unit in same case (as illustrated), £16/10/- (plus tax).

Write for particulars of Model M5, price £5/17/6. . . . TERMS AVAILABLE

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Making A Reiss Microphone

This photograph shows the component parts comprising the microphone kit. The assembly, which is particularly simple, is outlined in the article below.

Full instructions for assembling from a complete kit of parts a low-cost, high-quality transverse current microphone are given in the accompanying article.

passing through the centres of the latter through to the back of the block serve the dual purpose of locking the rods in place and of providing connections to the microphone.

Leaning against this block can be seen the mica diaphragm, measuring only one-thousandth of an inch in thickness. This is very delicate, and must be handled carefully.

MANY new types of microphones, including the crystal, condenser and velocity types, have been developed in recent years, but the carbon or Reiss is still a firm favourite among amateur transmitters, set-builders and public address technicians. The two main reasons for its popularity are no doubt its cheapness, coupled with its very good all-round performance.

A complete kit of parts for the microphone described here, including a multi-ratio matching transformer, is available for 29/6. The completed instrument can be relied upon to give first-class results. The frequency response is very good, while the output obtainable is comparable with that given by the average gramophone pickup. Thus there is no ne-

cessity for a pre-amplifier — the microphone can be connected direct to the pick-up terminals of any receiver, and will give adequate volume.

How The Reiss Microphone Works

The principle on which the carbon or transverse current microphone operates depends on the fact that the resistance of a layer of carbon granules changes with variation of pressure upon it. Hence, if a current is flowing through the layer, and if the resistance of the latter is constantly varying in accordance with the sound impulses applied to it, then by Ohm's Law the current will vary in sympathy. In this way an electrical replica of the sound waves impinging on the diaphragm is obtained.

Assembling The Parts

The photograph at the head of this page shows the component parts supplied with the kit. On the extreme left is a teak block, which forms the basis of the instrument. In one side of this a rectangular recess about $\frac{1}{16}$ " deep has been made, with an elongated slot $\frac{1}{2}$ " deep at each end to accommodate the carbon rods. Bolts

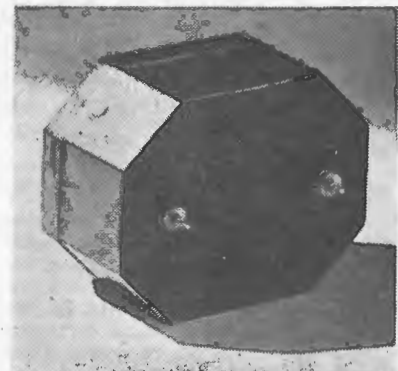
Mounting The Diaphragm

The first task is to mount the diaphragm on the face of the block with glue. When in position it should cover the recess and slots, and should be securely fixed down all round. Seccotine is an ideal adhesive for this purpose, particularly if it is slightly warmed before using by placing the tube in warm water. It will then flow more easily, and can be thinly smeared on the face of the main block. It is essential that the diaphragm lies perfectly flat, without any sagging in the centre.

When the glue is hard, the centre frame (see photograph) is placed on top of the diaphragm. Then the gauze is placed in position, and finally the front cover is put on and screwed down. A small improvement would be to rebate the back of the front cover a sixteenth of an inch so that the gauze fits into it. This will



Front and rear views of the completed microphone. The wooden case is cut from solid teak, finished in preparation for polishing or varnishing.



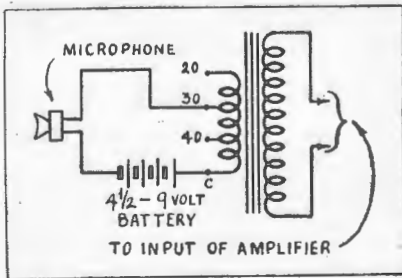
permit the front cover to lie flat on the centre frame.

It will be noticed that the main block, centre frame and front cover are keyed on one side, to indicate the correct way of mounting them.

Pouring In The Granules

When the four wood screws in the front, with the washers supplied, have been put in and tightened, the microphone is ready for filling with carbon granules. Those supplied are of particularly high quality, being almost as fine as dust, and yet with a polish on each grain which provides an insurance against packing.

To fill the microphone, a small funnel is improvised from a piece of stout paper. As the granules are poured in, the microphone is tapped gently and tilted so that the carbon will evenly and completely fill the rectangular recess behind the diaphragm, as well as the remaining space in the slots not occupied by



This circuit shows the way the microphone, battery and matching transformer are connected.

carbon rods. Two filling holes are provided, and these can be used alternately until the filling is complete. Finally, the two filling holes are plugged with small corks cut to shape with a razor blade.

The Multi-Ratio Matching Transformer

For excitation, this microphone needs from 4 1/2 to 9 volts, current taken by it varying between approximately 10 and 30 m.a. at the voltages given. The instrument has an impedance of about 300 ohms, requiring a step-up matching transformer with a ratio of about 1:30. The transformer provided has a tapped primary giving ratios of 20:30: and 40:1, as well as a centre tapped secondary. However, under normal circumstances this centre tap will not be needed.

Above is given a sketch illustrating the way in which the microphone is connected up. The ratio used is that generally required, i.e., 30:1.

If the microphone is being operated any distance from the amplifier, the primary rather than the secondary leads of the transformer should be extended. This means that the transformer should be located fairly near the input of the amplifier.

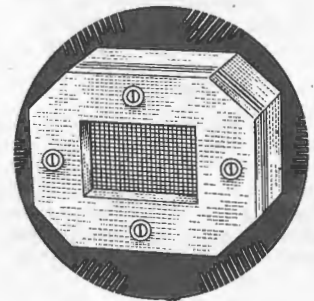
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Microphone Assembly Kit

A transverse current microphone of remarkable fidelity and sensitivity. Supplied in complete kit form, ready for assembly.

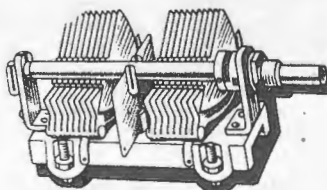
Specifications

- Solid Teak Case, shaped, fitted, drilled (unpolished), 4 1/2 x 3 1/2 x 2 inches.
- Best English Carbon Granules in sealed English packing, 1/2 oz. bottles.
- Special Quality Carbon Electrodes, drilled and flattened.
- Multi-Ratio Transformers, centre tapped output.
- 1 Mil. Selected Mica Diaphragm.
- Copper Bronze Protecting Gauze, Terminals, etc.



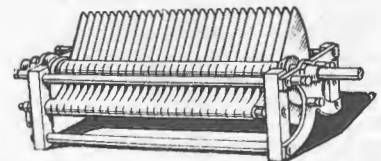
SPECIAL VALUE
Complete 29/6

CONDENSERS - - - Specially Priced



POLAR Double spaced
Twins and Singles
Ceramic Base

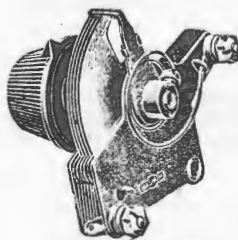
- 30 MMF. twin double spaced condensers 13/6
- 40 MMF. twin double spaced condensers 13/6
- 30 MMF. double spaced single gang 7/6
- 100 MMF. single space twin 13/6



CYLDON Standard
Transmitting

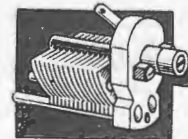
England's best condenser, square law. Tested 2,000 volts A.C. Double spacing. 20 SWG aluminium vanes, rounded and polished. Recommended working voltage, 1,500. Keramot insulation.

- 100 MMF. single gang 27/6
- 100 MMF. twin gang 42/-
- 500 MMF. single gang 49/6



Solid Dielectric

English Condensers with one hole fixings. For tuning or reaction. 2 1/8" wide, 3/8" deep. 300 MMF. (.0003), also 500 MMF. (.0005) 5/6.



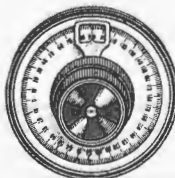
Midget Polar Air Dielectric Trimmer

Ceramic base, soldered brass vanes. Will maintain accuracy of setting. 25 MMF. or 100 MMF. trimmer 4/9

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15 and 25-Watt Public

Address Amplifiers

AMPLIFIER enthusiasts, and servicemen specialising in p.a. work, will be interested in the two accompanying amplifier circuits reproduced from Philips Technical Communications Nos. 63 and 64.

EL5's In Class A-B Push-Pull

The first uses pentodes throughout, with a pair of EL5's in class A/B in the push-pull output stage. An output of 15 watts can be obtained, full loading of the EL5's being accomplished with an input signal of approximately 0.1 volt R.M.S.

According to Philips Technical Communication No. 63, Philips high mu pentodes can be used to advantage in Class A/B amplifiers, and since the valves operate without drawing grid current, the circuit described will be economical to construct.

Standard audio transformers are suitable for the coupling between driver stage and output valves, and under the Class A/B conditions, heavy peak currents are avoided, rendering special rectifiers for the high tension supply unnecessary. The difference in output between fixed bias and self bias does not warrant the extra expense incurred for installing a separate rectifier to provide grid bias. By employing self bias, ample output with low distortion may be readily obtained.

Circuit Arrangements

The circuit shown comprises the following stages:—

Output Stage.—Two high-mu pentodes type EL5 (Class A/B).

Driver Stage.—1 high-mu pentode type EL3 (triode connected).

Input Stage.—1 pentode type EF6.

Power Supply.—1 full-wave rectifier type EZ4.

Practically all p.a. amplifier requirements are covered by the 15 and 25-watt amplifiers described below. Constructional details, with photographs, of the 15-watt model are also given in a separate article elsewhere.

The Output Stage

For this section of the amplifier, the EL5 pentodes have been selected, since they can deliver an output of 15 watts, which was considered sufficient to meet most requirements. The secondary windings of the audio transformer have each been shunted with a 50,000 ohm resistance to even the frequency response characteristic. These resistances will not be necessary if a high quality transformer with a high zero load inductance and low leakage is used.

The plate to cathode by-pass condensers also serve to improve the fidelity, and a variable tone control can be incorporated if required. In view of the relatively high cathode currents, the bias resistor must be proportioned accordingly, and a 3-watt wire-wound type is recommended. The output transformer should be designed to carry relatively heavy current, and the recommended primary impedance is 4,000 ohms plate-to-plate.

The Driver Stage

The EL3 connected as a triode is used for the driver valve in this amplifier. The primary of the match-

ing transformer is shunt fed to avoid d.c. magnetisation, and the plate voltage is applied through a resistance of 30,000 ohms. The screen is tied to the plate through a 100-ohm resistor, which in conjunction with a 50,000-ohm resistor in series with the grid, serves to prevent parasitic oscillations. The plate supply to the EL3 and EF6 has been decoupled to minimise hum.

The Input Stage

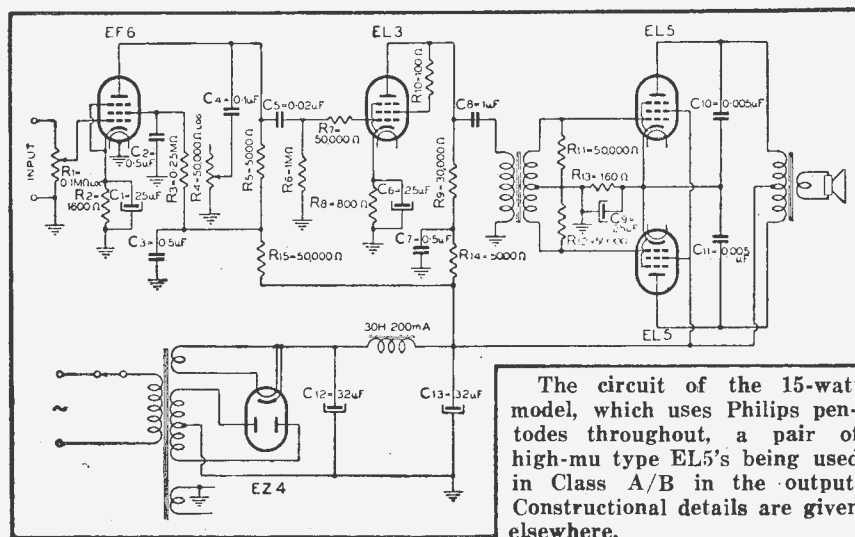
The valve selected for this stage is the EF6 pentode, and the associated circuit has been proportioned so that the stage gain is restricted to approximately 10 times. No additional gain is necessary, since with this amplifier an input signal to the order of 0.1 volt (R.M.S.) will suffice to completely modulate the output stage. It may appear that the EBC3 triode would be the logical valve for this stage.

The table given in Technical Communication No. 54 shows that the gain for this valve is over 20 times, and it would be necessary to reduce this figure by employing a plate resistor below the recommended values. Under such conditions the distortion increases, and to obtain better fidelity, the EF6 has been selected. However, some constructors may wish to use the EBC3, which will operate satisfactorily where the minimum distortion is not required (as, for example, in public address work), and in such cases the plate resistance should be 25,000 ohms, in conjunction with a cathode resistance of 2,500 ohms.

The volume control and the tone control potentiometers are indicated as logarithmic types, but ordinary types can be substituted.

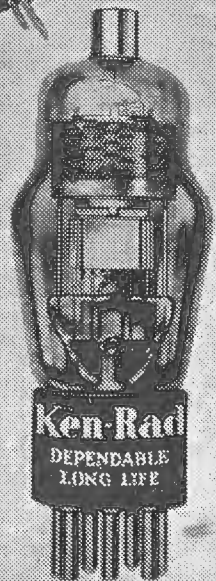
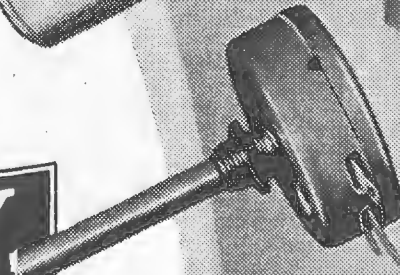
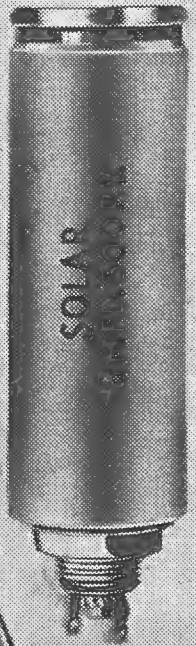
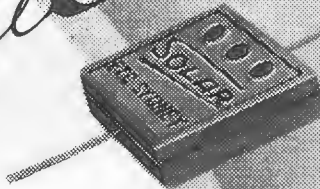
Power Supply

The EZ4 full-wave rectifier is employed, and to ensure adequate filtering, 32 mfd. electrolytic condensers are used in the filter circuit. The filter choke should be designed to pass heavy currents, and should have an inductance of 30 henries and a d.c. resistance not exceeding 200



The circuit of the 15-watt model, which uses Philips pentodes throughout, a pair of high-mu type EL5's being used in Class A/B in the output. Constructional details are given elsewhere.

Reliable Replacements



No matter how good a radio set may be, there comes a time when certain replacements are necessary!

For highest results you can depend upon E.T.C. lines, used and recommended by leading technicians throughout Australia.

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“KEN-RAD,” the fine valves of
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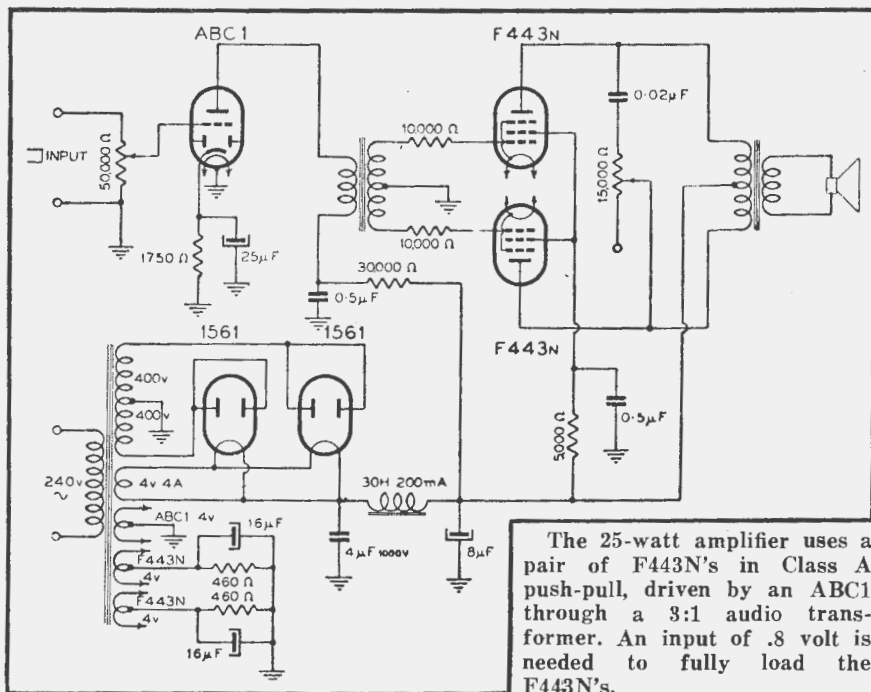
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THE FINE VALVES OF RADIO

E.T.C. SOLAR
PRODUCTS ARE
“RELIABLE IN
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SYDNEY & MELBOURNE



The 25-watt amplifier uses a pair of F443N's in Class A push-pull, driven by an ABC1 through a 3:1 audio transformer. An input of .8 volt is needed to fully load the F443N's.

ohms. The ratings for the power transformer are given elsewhere.

Loud Speakers

The choice of loudspeaker equipment has been left for individual consideration. It is realised that in many cases loudspeakers already on hand will be required for service. The importance of correct matching is emphasised, as it is essential for the EL5 valves as arranged in this amplifier to feed into a plate-to-plate load of 4,000 ohms.

Precautions

In cases where a metal cover is made to enclose the amplifier, provision must be made to provide ventilation by drilling the covering on each side and on the top directly above each valve. Due care must be taken to see that the amplifier is switched off before loudspeakers are disconnected where this action involves breaking the plate circuit. Likewise, the amplifier must not be switched on if the speakers are not connected.

Microphone Work

The Philips 4148/49 microphone and matching transformer can be connected directly to the input terminals without any pre-amplifier. Microphones having extremely low output levels can only be used through an additional microphone amplifier, which preferably should be completely independent of the amplifier described above.

Components

(other than condensers and resistors)
 1—push-pull audio transformer (ratio 1 : 1.5 + 1.5).

- 1—power transformer with windings:
 2 × 300 volts — 200 m.a.
 6.3 volts — 4 amps. (valve fil.),
 6.3 volts — 0.9 amps. (rect. fil.).
- 1—filter choke—30 henries 200 ohms to pass 150 m.a.
- 5—valve sockets type "P" (side contact base).
- 1—chassis.

25-Watt Amplifier Uses F443N's In Push-Pull

The second circuit published illustrates the use of a pair of F443N's in Class A push-pull, to deliver an output of 25-30 watts.

This amplifier circuit is presented as a basis for designing equipment to meet outdoor requirements, which call for an output of 25-30 watts, and this power can be derived from two F443N valves operating under Class A conditions (states Philips Technical Communication No. 64). Operating data and characteristic curves for the F443N pentode were given in T.C. No. 48.

The circuit shows an ABC1 valve as driver, coupled to the output valves by means of a 3:1 audio frequency transformer. An input of the order of .8 volt is required for full output from the F443N valves. For microphone work an independent microphone amplifier is necessary.

The F443N valves are operated with 300 volts on the plate and screen electrodes, and the normal plate current under these conditions is 83 m.a. per valve. Separate filament windings are provided for each valve, so that the plate currents may be balanced by adjusting the independent bias resistors. The output transformer should have a plate-to-plate impedance of 7,000 ohms, and must be designed to carry the relatively heavy currents involved.

The total current drain on the high tension supply is approximately 180 m.a., and this is derived from two 1561 rectifiers.

15-WATT AMPLIFIER—VOLTAGE AND CURRENT RATINGS

INPUT STAGE RATINGS

Voltage between plate and cathode with no signal 170 v.

Voltage between screen grid and cathode with no signal 75 v.

Voltage between cathode and earth with no signal 1.7 v. (app.)

Total plate and screen grid current with no signal 1.4 m.a. (app.)

DRIVER STAGE RATINGS

Voltage between plate and cathode with no signal 100 v.

Voltage between cathode and earth with no signal 4.2 v.

Plate current with no signal 4.0 m.a.

OUTPUT STAGE RATINGS

Voltage between plates and cathode with no signal 245 v.

Voltage between screen grids and cathodes with no signal 250 v.

Voltage between cathode and earth with no signal 18.4 v.

Total current both plates (no signal) 96 m.a.

Total current both plates (full modulation) 105 m.a.

Total current both screens (no signal) 13 m.a.

Total current both screens (full modulation) 21 m.a.

**VALUE
Without
PEER**

1938 PRE-RELEASE



VK4RF is owned and operated by F. J. Lubach, at 90 Prince St., Thompson Estate, South Brisbane, and has been on the air approximately twelve months.

1,100 Contacts In 40 Countries

In this short time VK4RF has contacted over 1,100 amateurs in 40 different countries, and has worked close on 500 "W" stations. Following is a list of the countries worked:—ZL, W, VE, KG, KA, G, LU, OK, GM, XU, J, F, LY, D, K4, ZS, CR, ZT, VQ, VU, PAO, ON, OZ, ES, U, CM, YL, UK, MX, TF, YR, OE, VS, OH, LA, EI.

4RF at present is operating on 4,345 k.c. on 20-metre c.w. The transmitter consists of a pair of 6AG's in a Jones exciter unit, link-coupled to a 45 buffer, link-coupled

4RF is a very keen and active member of the Wireless Institute of Australia and the British Empire Radio Union, and may be heard al-



TO RADIO OPERATORS CONTROLLING OUR QSO

A 5 Valve Con

A 5-valve Broadcast A.C. Receiver. With State Zoning. Particularly sensitive. Full Control. Four controls, including 3 position switch. Eight inch dynamic speaker. Glor and polished. Substantial Zonite escutche exclusive Mullard Airguide. Five Mullard

RF
WAC
WBE
WIA

With Airguide!

THE AIRGUIDE!

This exclusive device isolates for immediate reference the principal stations in each State, so that the operator from a standing position can choose and tune these stations with remarkable rapidity and ease.

Mullard

5 STAGE. CC. 25 WATTS
RX. 3 TUBE. TKS VY FER
CUAGN. 73. *Fred 4RF.*

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One-piece contact does away with possibility of fractured joints and subsequent failure of unit.

Improved methods of heat treatment during moulding ensure permanency of calibration. Triple-tested for greater accuracy.

Type S/M, available in capacities from .000005 microfarads to .01 microfarads.
Type P/T (Pigtails) measuring only 3/8" by 3/8" — capacity range .000005 microfarads to .001 microfarads.
(All Simplex condensers are subjected to a test of at least 1,000 volts A.C. and D.C.)

"Favoured by Famous Factories"

SIMPLEX CONDENSERS

Manufactured by Simplex Products Pty. Ltd., 716 Parramatta Rd., Petersham, N.S.W.

Phone LM 5615.

AGENTS IN ALL STATES.

be mounted last of all. Before fitting the former, solder on each fixed plates' lug a 4" length of 16-gauge tinned copper wire. These leads pass through the chassis and form neat and rigid connections to the coil unit. The directions taken by these leads, as shown in the under-chassis photograph, should be closely followed to avoid inter-action between them. Lastly, the dial is mounted and the pilot lamps wired to the wave-change switch.

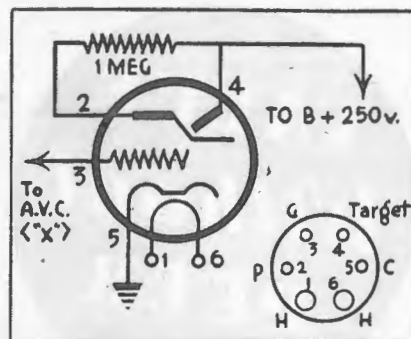
Putting In An Earth Line

All earth returns should be made as short and direct as possible to an earth line of 16-gauge tinned copper wire run around the chassis.

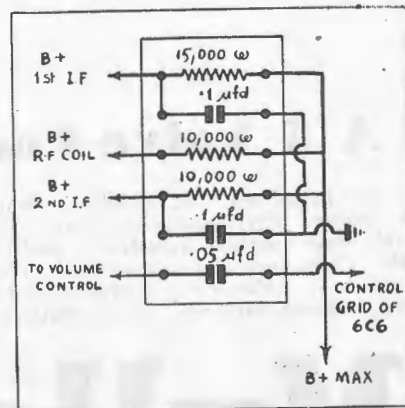
One end is attached to a solder tag placed underneath a nut belonging to one of the power transformer mounting bolts. The earth line is then taken across the chassis to the rear, passing between the 2A3 sockets. It is then bent upwards and taken around the chassis to a bolt located near the slot on the front of the chassis provided for the shaft of the wave-change switch. Where possible, by-pass condensers and resistors that have to be returned to earth should be mounted on end against the walls of the chassis, the earthed side being connected in each case to the busbar.

Magic Eye Tuning Is Optional

The 6U5 Magic Eye tuning indicator is an optional fitting, though it is a decided advantage to include it to ensure accurate tuning. For it a five-wire cable is required, together with a 6-pin wafer socket, a one megohm 1/2 or 1/4 watt resistor, and the special bakelite mount specially designed for the 6U5.



This sketch shows how the 6U5 electron ray tuning indicator is wired in circuit. Under-socket connections of the valve are also shown.



The method of wiring the resistor panel located to the rear of the coil unit is shown in this sketch.

Round The Shacks 5

- VK4RF -



Left: VK4RF (left) and his co-experimenter, VK4EL, making field strength tests while trying out a special type of matched impedance vertical antenna.



Right: The neat layout adopted in VK4RF's shack.

VK4RF is owned and operated by F. J. Lubach, at 90 Prince St., Thompson Estate, South Brisbane, and has been on the air approximately twelve months.

1,100 Contacts In 40 Countries

In this short time VK4RF has contacted over 1,100 amateurs in 40 different countries, and has worked close on 500 "W" stations. Following is a list of the countries worked:—ZL, W, VE, KG, KA, G, LU, OK, GM, XU, J, F, LY, D, K4, ZS, CR, ZT, VQ, VU, PAO, ON, OZ, ES, U, CM, YL, UK, MX, TF, YR, OE, VS, OH, LA, EI.

4RF at present is operating on 14,345 k.c. on 20-metre c.w. The transmitter consists of a pair of 6A6's in a Jones exciter unit, link-coupled to a 45 buffer, link-coupled

to a pair of 45's in parallel in the final stage, which in turn is link-coupled to a 33-foot vertical antenna. The receiver is the usual three-valve using a 58, 57 and a 2A5 with speaker and 'phones.

The photo above shows the neat layout of 4RF's shack, and on the wall may be seen a few of the many hundreds of QSL cards received. The other photo shows VK4RF and his co-experimenter, VK4EL, making field strength tests while trying out a special type of matched impedance vertical antenna.

Member of W.I.A. And B.E.R.U.

4RF is a very keen and active member of the Wireless Institute of Australia and the British Empire Radio Union, and may be heard al-

most any night "lapping up" all the "choice" DX that happens to be on the air.

Twenty-Five Years In Amateur Radio

(Continued from page 19)

One important result arising from all this mobile 5-metre work is the establishment of the fact that an undoubtedly ideal location for an ultra-shortwave television station to serve the whole of Sydney and even farther afield is somewhere in the Blue Mountains. With only a 5-watt 5-metre oscillator, it is easy to put a strong signal over Sydney on 5 metres provided that a beam aerial, even in quite simple form, is used at least at one end. A 10 k.w. station working around 6 or 7 metres for television purposes would assuredly cover a wide area with a strong service signal, even from as far afield as Mt. Victoria.

Television for Australian "view-ers," however, seems to be a long way distant, for justifiable financial reasons, but no doubt that time will come in the end, and when it does, accumulated ultra-shortwave experience will be of value. My advice to the experimenter with other ideas than DX contests is to get in on the ground floor of ultra-shortwave radio, for it will become increasingly important in the wide future of radio communication generally.

VK4RF's attractive QSL card, which in the past twelve months has been sent to over 1,100 amateurs in 40 countries throughout the world.

TO RADIO AUSTRALIAN CONFIRMING OUR QSO
RADIO WORLD
 ON 14 MC AT 17/9/37.
 UR SIGS WERE
 RST. 599
 PSE QSL

VK4RF WAC WBE WIA

RIG 5 STAGE. CC. 25 WATTS
 ANT. VERTICAL I.R.X. 3 TUBE. TKS VY FER
 FB CW QSO ES HPE CUACN. 73. *Fred 4RF.*

Fiftieth Transmitting Member Joins Lakemba



A portable station, powered by a hand-driven generator, in operation from the top of Razorback Mountain, near Picton, N.S.W.

THE meeting of the Lakemba Radio Club on Nov. 9 was the occasion when the fiftieth licensed amateur was admitted as a member of the club. At the conclusion of general business, the President, Mr. E. P. Hodgkins (2EH), requested Mr. C. F. A. Luckman (2JT) to take the chair for the rest of the evening, and, for the benefit of those present, to outline the history of the club, which was formed over seven years ago with Mr. Luckman as first president.

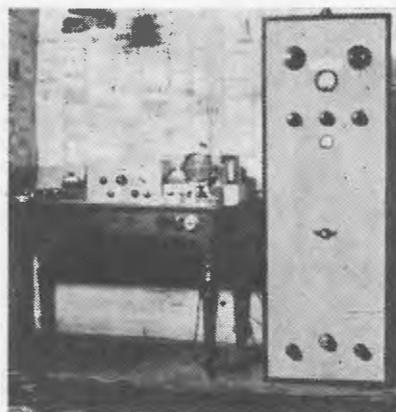
In opening his speech, Mr. Luckman declared that it was highly gratifying to have watched the club grow from a membership of eight to its present strength of about 80. The meetings were originally held at the radio store of Mr. F. Begg, the first secretary, who performed excellent work in assisting the club through the early stages of its existence. As the membership increased, it became necessary to move to various quarters to provide suitable accommodation.

Special mention was made of the work of the foundation members, including 2PX, 2EV, 2VY and 2ACY (then 2CY), of the untiring efforts of Mr. W. G. Picknell, a later secretary, and also of many others who joined in later years and played their part in making the club what it is to-day. Wonderful support had also been extended by the radio trade in the way of donations and cups, and by the radio press in the matter of publicity.

Lakemba differed from other clubs, continued Mr. Luckman, in so much as the fees were extremely low, being only 3d. per week, while the meetings were held fortnightly. More interest was retained in this way, as members did not tire of making a fortnightly visit, as they would weekly, and furthermore, the fee ap-

pealed more to the average pocket, especially with regard to the younger members, whose resources are limited. A fee such as 1/- weekly proved rather unsatisfactory to the member who is unable to attend for a month or so, as his arrears mount up, the final result being that he resigns.

Mr. Luckman's speech was heartily applauded, the evening concluding with the serving of supper, accompanied by appropriate music. On this occasion a donation was received from Slade's Radio Pty., of Croydon, in the form of a thermocoupled ammeter, while a Palec milliammeter was received from the Paton Electrical Instrument Co., of Ashfield. Both of these are very fine instruments, and will be put to good use in the club's new transmitter.



A transmitting station of which any amateur could be proud—VK2KS, owned and operated by Mr. L. Myers, of Marrickville, Sydney.

Club Makes Excellent Progress In Seven Years ★ National Field Day On December 5 ★ 2KS Has Worked 98 Countries . . .

By W.J.P.

2KS Has Worked 98 Countries

VK2KS, owned and operated by Leo Myers, came on the air on January 5, 1935. The first rig was a T.P.T.G. with a 46 valve, while the first DX contact was with K6HLP.

The transmitter shown below consists of a 4-stage crystal with a 53 crystal oscillator and frequency doubler, 46 f.d., 46 buffer, and an 830B power amp. The modulation equipment consists of a 6J7 "mike" amplifier, 79 mixer for speech and music, and a 76 amplifier feeding three 42's in parallel as modulators.

The microphone is a dynamic, constructed from a 6" permagnetic speaker by making slight alterations to the cone. The receiver is an eight-valve S.S.S. Two transmitting antennas are used, one vertical and one horizontal, both being single-wire fed Hertz. W.A.C. and W.B.E. have been obtained, while a total of 98 countries have been worked. Six bands have been utilised, 3.5, 7, 14, 28, 56 m.c. and 209 metres.

In the contests conducted by Lakemba Club, VK2KS won the Chanex-Dulytic Cup (VK-ZL Contest) for 1936, Slade's Radio Cup (DX Contest) for 1936, and Slade's Cup for 1937. During the 1936 VK-ZL DX Contest, W.A.C. was made in 1 hour 55 minutes. A total of 23 countries have been worked on 'phone, while five continents have been worked on 'phone on 40 metres. Also three ships at sea have been QSO-ed.

VK2KS has at present under construction a portable transmitter and receiver which will draw its power from a six-volt battery on a motor bike, using a vibrator power supply. The vibrator supply will deliver under load a voltage of 125 at 40 ma.

The rig consists of a 19 crystal

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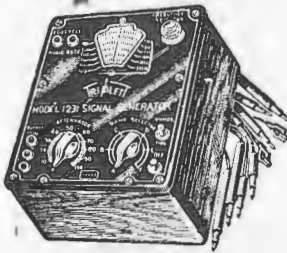
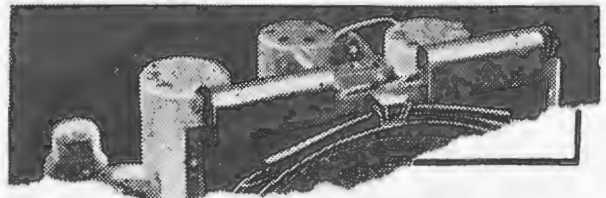
to purchasers of a RADIOKES KIT-SET!

This Valuable
COIL KIT



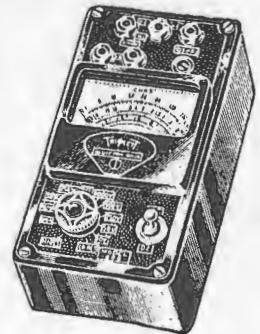
If you hurry you get absolutely FREE with your Radiokes Kit-Set a valuable 485 k.c. Radiokes Coil-Kit, comprising an aerial and oscillator coil, a 7-plate padder, and two intermediate frequency transformers, either in the air-cored or iron-cored type (See below). This offer is open only while stocks last. You must hurry for yours.

You have the choice, too, of this very beautiful glass-fronted Edgell Radiokes Dial—acclaimed radio's most beautiful dial. Velvet-slip, no back-slam. Complete.



TRIPLETT SIGNAL GENERATORS. 1231 Unit (illustrated at left). An All-Wave direct-reading D.C. Signal Generator, having built-in trimmer calibrated coils for an accuracy of 1%. Six wave bands, 100-30,000 k.c., all fundamentals, fully stabilised, 12-in. vernier dial. 400 cycle audio note available. Complete £10/10/-. MODEL 1232 is similar to Model 1231, but for 240 volts, 50 cycles, A.C. operation. Price £10/15/-. MODEL 1230 is an All-Wave Signal Generator supplying a continuously variable signal. Frequencies controlled on six bands from 100 18,000 k.c. Complete £6/10/-.

TRIPLETT VOLT-OHM-MILLIAMMETER (Pocket Size), Model 666 (at right). A.C. and D.C. voltage ranges; D.C. milliamperes, low and high ohms scales. Selector switch for all instrument readings. Slips easily into coat pocket. Complete, including self-contained battery, test leads, and instructions £5/15/-.



TRIPLETT D.C. MOVING COIL INSTRUMENTS are of the D'Arsonval type with an extra light moving coil and reinforced strong parts. Sapphire jewel bearings. Accuracy within 2%. Permanent magnets. Supplied in sizes from 2 3/4 in. diam. to 5 1/2 in. diam. (flange). Model 421 (at left) 4 1/2 in. x 4 in.



Readrite D.C. Pocket Volt-Ohm-Milliammeter employing Triplett D'Arsonval type instrument. Readings are accurate within 2% £4/10/-

For full information of these and other Triplett and Readrite units, fill in coupon below for NEW FREE CATALOGUE.

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(Phone: MX 1278—3 Lines)

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WHILE THEY LAST!

to purchasers of a

RADIOKES KIT-SET!

This Valuable
COIL KIT



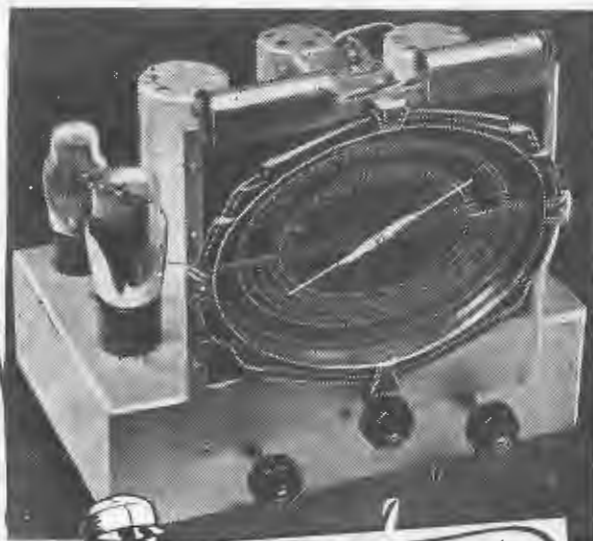
If you hurry you get absolutely FREE with your Radiokes Kit-Set a valuable 465 k.c. Radiokes Coil-Kit, comprising an aerial and oscillator coil, a 7-plate padder, and two Intermediate Frequency transformers, either in the air-cored or iron-cored type. (See below). This offer is open only while stocks last. You must hurry for yours.

You have the choice, too, of this very beautiful glass-fronted Edgell Radiokes Dial—acclaimed radio's most beautiful dial. Veilve-taction, non-slip, no backlash mechanism. Complete with moulded metal es-cutecheon. Read below how you can get it FREE if you hurry!

This Beautiful
EDGELIT DIAL



Hurry for yours while stocks last. Order your Radiokes Kit-Set NOW!



ANY MAN OR BOY CAN BUILD A RADIOKES KIT SET

Radiokes Kit-Sets outsell all other types because they are the easiest of all to assemble and because the results are certain. Radiokes Kit-Sets lead the radio industry in design, because Radiokes are the largest specialising radio component factory in Australia. Accept this free offer now!

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A.R.W., 12/37.

Order a latest model Radiokes Kit-Set now and get absolutely FREE a valuable Radiokes Coil Kit or an equally valuable and beautiful Edgell glass front dial! We're moving soon to our brand-new factory. Our stockrooms MUST BE EMPTY, to keep down moving costs. If you recognise good value when you see it, you'll hustle rightaway to your nearest radio dealer or your usual wholesale house and order one of these popular, low-priced, easy-to-assemble Radiokes Kit-sets:

KPR Broadcast AVC Pentagrid 4 (hat). £6/6/-.

KPD Dual-wave Pentagrid 4 (bat) £8/8/-.

KPA Aircell Pentagrid 4 £6/15/-.

KMS Broadcast "Moneysaver" AC £7/17/6.

KAD Dual-wave "Advance 1937" A.C. £9/9/.

Remember—with these Radiokes Kit-

Sets you get FREE the Radiokes 465 k.c. Coil Kit with air-core I.F.'s. With a Radiokes Dual-wave "Advance" Kit-set you have the choice of either a Radiokes 465 k.c. coil-kit with iron-core I.F.'s, OR a beautiful, glass-fronted Edgell Dial! Just think what a wonderful Xmas-present a Radiokes Kit-Set—whether assembled or not—will be to a friend... your son... a relative... your family! Treat YOURSELF to one. Assemble it in a few minutes in your spare time. It's so easy. You can't go wrong. And you have a fine set that cost you little, yet gives you a performance that's miles ahead of a commercial set. It's for you to decide whether you want this chance to get such a radio "buy." Once the stocks go the offer cannot be repeated. See your radio dealer or distributor NOW. Want more information?

Send this coupon without delay for FREE LITERATURE.

What's New In Radio

A monthly review of latest releases
in sets, kit-sets, and components

New Model 70A Mullard Console Has Exclusive Airguide

Mullard have recently announced the release of a new five-valve a.c. broadcast receiver known as the Model 70A. The circuit design of the 70A is along conventional lines of modern practice, incorporating practically every worth-while and proven feature without any untried "stunts." By this means, and by paying close attention to detail in both design and quality control, a degree of performance has been achieved which it would be difficult to surpass in any but a "de-luxe" receiver, and, above all, maximum reliability is assured.

Airguide A Very Attractive Feature

To the non-technical observer, the most interesting feature, apart from the pleasing general design and fin-



Latest Mullard release—the Model 70A 5-valve broadcast superhet console.

ish of the rather wide modern-style console cabinet, is undoubtedly the "Airguide," a new device for rapid and simple location of the tuning positions for the main Australian stations. The Airguide is supplemen-

tary to the tuning dial itself, and consists of a cylindrical roller, portion of the circumference of which is visible through a window about six inches long in the base of the dial escutcheon.

The Airguide is marked in large letters with the call-signs of the stations in each capital city, in such a way that only the markings of one city (Sydney, Melbourne, etc.) are visible at a time, the others being brought into view when desired by turning the Airguide around by means of a thumb-wheel, the edge of which protrudes through the moulded escutcheon.

The whole device is neat and attractive in appearance, and is a most useful feature where, as in most homes, the majority of radio entertainment. In addition to the Airguide, the tuning dial itself has a large, open scale of the straight line type, in which the call-signs of practically all stations are clearly etched horizontally, for easy and natural reading. The dial is of the edge-lit glass type, the call-signs standing out in pleasing colours against a dark background.

Four Spherical Control Knobs

The controls of the 70A are four in number, comprising tuning, volume and tone controls, and local-distance switch to ensure distortionless reception of the nearby stations. The control knobs are of an unusual spherical shape, and are as pleasing to the touch as to the eye.

The technical specifications include effective automatic volume control, iron-core intermediate frequency transformers, "high-Q" constant-gain aerial coupling, eight-inch electro-dynamic speaker of world-famous make, floating condenser gang and dial assembly, and all the other features one expects to find in a modern receiver of a higher price-class.

Altogether, the new Mullard is remarkably good value for its price of 19 guineas (20 guineas in States other than New South Wales), and for those who are not particularly interested in shortwave reception, can be recommended as a splendid performer.

Clyde Radio Batteries

Listed below is the complete range of Clyde radio batteries of 2, 4 and 6-volt types, together with the ampere hour capacity (at 100 hour rate) and price.

Type.	Volts.	Amp. Hour Capacity.	Price.		
			£	s	d
2VS5	2	25	0	17	6
2VS7	2	40	0	18	9
2VC11	2	110	1	9	6
2VC15	2	150	1	17	0
4SR5	4	25	2	1	9
4SR7	4	40	2	1	9
4CR7	4	70	2	6	6
4CR9	4	90	2	12	0
6CR7	6	70	2	15	0
6CR9	6	90	3	0	0
6CR11	6	110	3	15	0
6CR13	6	130	4	7	6
6CR15	6	150	4	16	6
6CR17	6	170	5	10	6

All Clyde radio batteries are guaranteed for two years, with the exception of the "Super" types, which



The Clyde "Super" Type battery, which carries a three-year guarantee.

are fully guaranteed for three years. The last four 6-volt types listed above are designed for vibrator sets.

★

Rola Company Has New 'Phone Number

The radio trade are advised that the telephone number of the Rola Co. (Aust.) Pty. Ltd., of City Road, South Melbourne, has been changed to MX 1278 (3 lines).

★

"1937 Outdoor Portable" Kits For N.Z. Readers

New Zealand readers planning to build the "1937 Outdoor Portable" will be interested to know that Messrs. F. J. W. Fear & Co., of 31 Willis Street, Wellington, are specialising in supplying complete kits of parts to the designer's specifications. A small aerovision dial has been incorporated, and a crackle-

finished panel is supplied, giving the completed receiver a very attractive appearance.

The complete kit, including carrying case, batteries and valves is priced at £12/10/- or alternatively

New Shortwave Manual

A review copy of the latest "Shortwave Manual" published by the manufacturers of the well-known Eddystone shortwave components has been received from the Australian representative, Mr. R. H. Cunningham (VK3ML), 1449 High St., Glen Iris, Melbourne, S.E.6.

Comprising 44 pages, the "Manual" contains constructional details of battery and a.c.-operated t.r.f. and superhet shortwave receivers, using from two to five valves. Other articles include full constructional details of a modulated oscillator, 4-band transmitter, s.w. converter, two-valve transceiver, and an absorption wavemeter. Among the remaining articles, which are all written from a practical angle, is included one devoted to the design and erection of shortwave aerials.

The Eddystone "Shortwave Manual" is available from the address given above, price 1/6 (postage 1d.).



Latest Radiotron Characteristic Chart

Amalgamated Wireless Valve Co. Pty. Ltd. advise that the latest Radiotron Characteristic Chart will be available on December 1. Designed

on an entirely new principle, the chart measures 23" by 18", and incorporates four sheets. The first gives details of selected equipment types, complete with all operating conditions, the second and third form a summary of all types, while the fourth is a complete socket reference chart. No less than 49 "G" type valves are included, full characteristics with socket connections being given, together with the exact equivalent type in the ordinary glass series. In certain cases approximate equivalents are quoted with remarks defining the points of difference.

This latest Radiotron chart, which readers will find invaluable for reference purposes, may be obtained by writing Amalgamated Wireless Valve Co. Pty. Ltd., G.P.O. Box 2516 BB, Sydney, enclosing 3d. in stamps to cover cost of handling and mailing.



New Text-Book On Automatic Frequency Control

Already widely used in commercial receivers throughout America, automatic frequency control circuits are certain to become equally popular in this country. The principles underlying A.F.C. are exhaustively covered in "Automatic Frequency

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ELECTRIC (FREQUENCY) CLOCKS

A NECESSITY IN EVERY MODERN HOME

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- ★ No Gain
- ★ No Regulating

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MAKERS OF THE FAMOUS AMPLION LOUD SPEAKERS

ll-
or

Control Systems," by John F. Rider, the noted American technical radio author.

In the first part of the book, the basic operation of discriminator and control circuits is explained in great detail, while more than half the book is devoted to the application of the principles covered in the early chapters. The A.F.C. circuits found in commercial American receivers are analysed, and their operation explained. Various types of automatic and semi-automatic tuning systems are also considered, and their relationship to the A.F.C. system clearly demonstrated.

The last two chapters deal with actual servicing problems, the alignment of A.F.C. equipped receivers, and the precautions which must be observed in working on receivers incorporating this modern aid to quick, accurate tuning.

["Automatic Frequency Control Systems," by John F. Rider. Our copy direct from the Publisher, 1440 Broadway, New York City.]

★

Eddystone Components For Amateur Communications Superhets

Among the Eddystone components available in Australia that are ideally suited for use in the a.c. and battery amateur communications superhets featured in the "Radio World" are the 192 mmfd. Scientific s.w. midget condenser (for band-setters), 22 or 45 mmfd. Microdenser (for band-spreaders), and the full vision dual speed dial (20:1 and 100:1 ratios).

Other latest Eddystone products of particular interest to amateurs include the transmitting condensers illustrated below. Three types are available, two being designed for low and one for high voltage working. The low voltage all brass type is of compact dimensions, using frequentite insulation throughout, and is provided with dual mounting for either baseboard or panel. Flash-over voltage is 3,500 volts, minimum capacity being 14 mmfd. and maximum 65 mmfd. The high voltage type is de-

signed for a flash-over voltage of 7,000 volts.

Details of this and all other components comprising a complete range for amateurs and shortwave enthusiasts are given in the latest Eddystone catalogue, available free on request from Mr. R. H. Cunningham (VK3ML), 1449 High Street, Glen Iris, Melbourne, S.E.6.

★

Triple-Purpose De Luxe Hammond Electric Clock

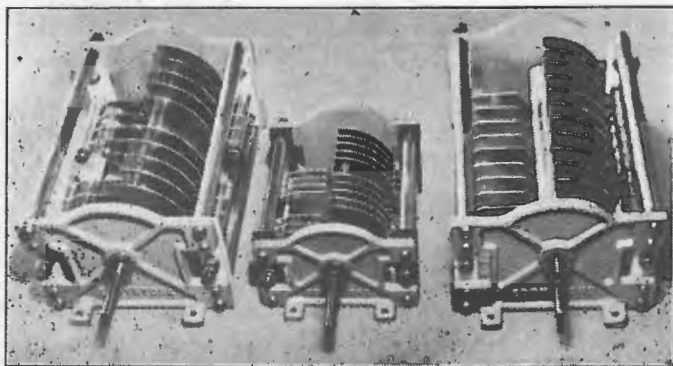
Perhaps the most attractive of the well-known line of Hammond electric clocks is the Firefly De Luxe Model illustrated below. Available in



white, ivory or black mottled case with gold figuring on face and gold besel, this clock is fitted with a small lamp illuminating the face. When not required the light can be cut out by using a small switch located at the back. A buzzer alarm that sounds continuously until shut off is also incorporated.

Even with this triple combination of time-keeper, night light and electric alarm in one, the total current consumption is only 3½ watts. Thus at night the current consumed is not even registered, as the average electric light meter takes 5 watts of energy to operate it.

Further details of this and other Hammond electric clocks, some of which are ideally suited for incor-



Three of the latest Eddystone transmitting condensers, which are certain to make a very strong appeal to Australian amateurs. Flash-over voltage of the two low-voltage types available is 3,500 volts, and of the high-voltage type, 7,000 volts.

another storey, while a basement will be provided for storage of material. Special provision has been made for ventilation and most efficient natural lighting.

A record in rapid construction is likely to be created, for although the foundations were only begun early in November, the new Rola organisation will be in full production in their new home at the beginning of the New Year.



Delta Multi-Meter Is Accurate, Flexible, And Low-Priced

Those who cannot afford to outlay too much on expensive test equipment will find that the Delta multi-meter illustrated below will suit their re-



quirements, both as regards flexibility and low cost.

Incorporating a Triplett 0-1 milliammeter with a legible two-colour scale, the instrument operates on both a.c. and d.c., a.c. ranges being taken care of by a Westinghouse metal rectifier. The ranges provided are 0-15-75-150-750 volts a.c. and d.c.; 0-1.5-15-150-750 mills.; 10-1,500 ohms, and 1,000 ohms-1.5 megohms. There are three controls—"ohms adjustment" (to ensure accuracy in resistance readings), range selector switch, and a.c.-d.c. switch.

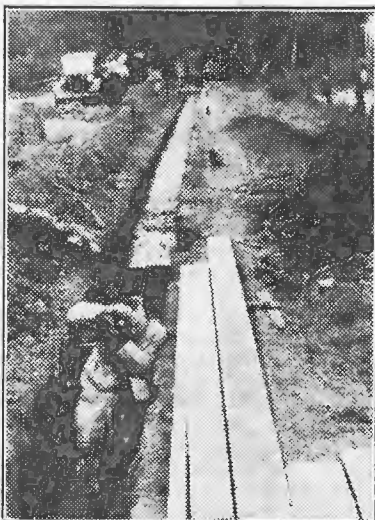
The instrument is supplied in a compact leatherette-covered case measuring 7" x 6¼" x 4½". The right-hand compartment houses the 18-volt battery required for resistance measurements, and the test prods.

The Delta multi-meter is priced at £6/10/-, and is available from Messrs. W. G. Watson & Co. Pty. Ltd., 279 Clarence St., Sydney. Those requiring further details can obtain them free on request by writing this address.

Rola Company Building New Factory

The photograph below, which was taken early in November, shows the foundations of the spacious new factory now being erected at Richmond, Victoria, for the Rola Company (Aust.) Pty. Ltd.

The building, which occupies an ideal site on the new Boulevard, is of steel-framed brick construction, and has been laid out for modern mass production methods, giving economy in handling from raw material to shipment of the finished product. The office will be placed on



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 Antennex (A'sia) Corporation,
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 48-60 Margaret Street, Sydney.

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NAME

ADDRESS

.....

A.R.W. 12/37.

Breaking Into The Amateur G

ULTRA high frequency is the term applied to any work, either receiving or transmitting, that is carried out on frequencies of 56,000 kilocycles (or 56 megacycles) and higher. Amateur activities are up to the present mainly concentrated on the 56 to 60-megacycle band, and in a minority of cases, 112 to 120 m.c. In terms of metres, this represents 5.357 to 5 metres and 2.678 to 2.5 metres respectively.

Specialised Technique Required

For the reason that normal lay-outs, tuning condensers, coupling methods and valve designs are generally unsatisfactory at these high frequencies, transmission and reception practice comes under a somewhat different category. In a previous discussion we dealt with the fundamentals of u.h.f. receiver requirements; it remains for us to turn our attention to transmitters.

As already mentioned, normal valve types and components show very poor performance on 5 metres when used in a way that may be quite satisfactory on lower frequencies. Taking for example an oscillator of the tri-tet variety, operating on say 7 m.c., followed by a series of doublers from 14 m.c. to 28 m.c. in the first doubler and 28 m.c. to 56 m.c. in the second doubler, apparently it is now only necessary to add a straight amplifier on 56 m.c. after the second doubler to arrive at the antenna position with a stable 56 m.c. signal. This all sounds very simple and straightforward on paper, but until lately the scheme was almost hopeless in practice.

Ordinary Valve Types Unsuitable

By this we mean that the types of valves available to the amateur in the past have been designed by the manufacturer primarily for use only on frequencies up to 7 m.c., and were altogether too high in internal capacities to give any efficiency at all on the ultra high frequencies.

Three years ago we all had a try at the above "line up" and eventually discarded the idea in favour of a single self-excited oscillator, either of one valve or two in push-pull, and modulated directly by the modulator.

The main reason for failure to get any output at 56 m.c., as we found out by hard experience, was the high inter-electrode capacities of the valve types on hand (210, 211 and 203A, etc.), which made it increasingly difficult to develop sufficient r.f. voltage in the grid circuits of the successive stages, as the frequency was raised from stage to stage, to obtain enough drive to keep the efficiency up.

For instance, we found that when

In this instalment, the equipment to obtain efficient the ultra high frequencies main problems encountered U.H.F. transmitters are of

**By GEORGE THOM
and IVOR MORC**

orthodox link coupling was used in all stages in a transmitter built on the lines just mentioned, using a 7 m.c. crystal oscillator with a type —10 final amplifier, that the input (or rather output from second doubler) to the 56 m.c. amplifier was greater than the output from the straight amplifier stage.

Eliminating Tuning Circuit Losses

From this somewhat unsuccessful experiment most of the local amateurs turned their attentions to self-excited oscillators for use as straight

QSL Forms, Notepaper, And Stickers

Headed notepaper and QSL forms printed for the use of members of the All Wave All World DX Club are available from the "Radio World," 214 George St., Sydney, N.S.W., price 1/6 for 50 sheets, post free. Enlarged two-colour replicas of the Club badge, in the form of gummed stickers, are also available, price 5 dozen for 1/6, post free.

modulated oscillators. For a short time the main object was considered to be the how and with what, to obtain a reasonable power output for a given d.c. input.

Experimenting along these lines, it was soon found that the usual coils and tuning condensers produced a somewhat limited output of a poor order of stability. Consequently the development of output efficiency and stability improvement went along side by side.

The usual type of tuning condenser, with its masses of metal framework creating resonant closed circuits within itself, was disposed of in favour of a simple capacitor of two aluminium plates supported on stand-

Series-fed Hartley A Popular Circuit

Before going on to these linear oscillators, let us first finish the discussion on the earlier systems. The most efficient of the coil and condenser single-ended systems was a species of series-fed Hartley oscillator.

Two aluminium plates are cut, the corners rounded off, and mounting is arranged on small isolantite insulators. About $\frac{1}{4}$ " air gap is allowed between these two plates. Then a third aluminium plate, slightly smaller, is mounted close to one of the first pair. These latter plates form the tank condenser, and the third, in relation to one of the first two, becomes the grid condenser. This plate joins to valve grid. From the latter a grid leak connects to fil. centre tap and earth (value about 50,000 ohms).

The valve plate is connected by a very short lead—arranged for in the mechanical layout—to the tank condenser plate, away from the grid condenser side. The necessary inductance for the tank coil is then connected across the tank condenser plates. High tension positive is fed through an r.f. choke to the centre of the coil.

Tuning is done mainly by moving the turns of the coil to and from each other rather than by moving the tank condenser plates. The third "plate" or grid condenser is moved to and from the adjacent tank condenser plate to vary the grid excitation. By following this procedure an adjustment can be arrived at where the output is good, with good stability. This position is, roughly

speaking, the point where the output just commences to fall off.

Push-Pull Oscillator Arrangement

Another set-up is the push-pull oscillator, using either one of the twin triodes (53 or 6A6) or two separate triode valves. The main advantage of push-pull oscillators is that the internal capacities of the valves—a big item on 56 m.c.—are in series across the external inductances (grid and plate coils). Thus it is possible to use a greater number of turns in the coils, with attendant higher efficiency.

While on the push-pull coil type of oscillator, we might mention that a one-time popular circuit was the so-called unity-coupled system. This consists essentially of one or two turns of $\frac{1}{8}$ " copper tubing, through the centre of which is placed a piece of rubber-covered flex wire. The copper tubing is used as the plate coil, while the rubber-covered wire inside is the grid coil—the opposite ends of which are crossed over to join to each grid. A condenser tunes the plate coil from plate to plate. "H.T.+" connects to the copper tubing centre, and the grid leak goes from the internal coil centre to filament centre tap.

Linear Rod Oscillators

Turning now to linear rod oscillators, these may be arranged in a variety of ways, the differences being mainly mechanical, since the fundamental circuit principles are similar.

In its simplest form the linear rod oscillator is satisfactory for frequencies even higher than 56-60 m.c., and has been the only reasonable performer on 112 m.c. Two copper tubes $\frac{1}{2}$ " in diameter, spaced one inch (centre to centre), and slightly less than a half-wave long, are the foundation of such an oscillator. On 56 m.c. these rods would be between 6' 6" and 7' in length, depending on the valve capacity. At one end the rods are permanently bridged across, and a sliding bridge is arranged near the other end.

The valve plate is connected to one rod at a point about one-third of the distance along the rod from the permanently bridged end. The grid joins to a corresponding point on the other rod through a .0001 mfd. grid condenser. A grid leak of 100,000 ohms is connected from grid to earth, and for some valves a small variable condenser is required from plate to filament. The lead or antenna feeders join to a point a few inches on the valve side of the sliding bridge.

The movement of this bridge along the rods mainly controls the frequency, while the position of the valve element connections along the rods controls excitation.

Push-Pull Linear Rod Oscillator

And so we come to a brief discussion on a system which is only slightly more stable than the latter hook-up, but more applicable to higher power, namely, the push-pull linear rod oscillator.

A more compact transmitter results when the circuit is of the push-pull variety, since we have two plate rods and a similar pair of grid rods. The length of the grid rods will be about 3' 9"—slightly more or less depending on the valve loading effect. They are mechanically arranged in exactly the same way as the single-ended oscillator, except, of course, that they are only half the length.

A permanent bridge connects the pair at one end, and the valve grids are tapped on at a point about one-third of the distance from this end. The grid leak joins the centre of the bridge to filament. For the plate circuit we have another pair of 3' 6" rods. This time they need only be $\frac{1}{8}$ " diameter, and the spacing will be about 4". A sliding bridge shorts

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the rods near one end (the antenna is coupled near here), high tension is applied at centre of bridge, and the valve plates join one each to the other ends of the rods.

The length of the "resont" grid rods determines the frequency—the position of the grid taps, the excitation. The plate bridge is adjusted for minimum plate current dip, and then the load is connected.

Either of these latter "stabilised" transmitters will stand a fair amount of modulation before serious frequency modulation becomes noticeable, but none of the transmitters described so far will stand 100% modulation and retain any degree of stability of the order necessary for reception on a superheterodyne receiver using a conventional intermediate frequency amplifier.

Thus if we are out to obtain on the ultra high frequencies performance comparable in efficiency with that obtained on lower frequencies, we must use more stable transmitters.

With the aid of modern low internal capacity valves, and knowledge gleaned in earlier experiments, in spite of their unsuccessfulness, we may now enjoy efficiencies of an order whereby a crystal-controlled carrier

may be put on the air in the 56-60 m.c. band.

Typical Modern Valve Line-Up

Taking as an example a valve line-up from a 7 m.c. crystal, we have a 6L6G in a tri-tet circuit with an output of 14 m.c., which is fed via link or capacity coupling to a type RK25 or equivalent pentode to act as doubler to 28 m.c. The type RK25, which has an isolantite base, would be mounted in a socket of similar material, likewise coil formers (if any) are of isolantite.

By keeping all r.f. losses at a minimum, the whole system can be made to have an almost normal output efficiency. The plate tank of the second stage now has an output at 28 m.c., and this is fed by the link method or by direct inductive coupling to a third stage, the input of which is arranged in a push-pull manner and the output in parallel.

This stage utilises two type RK39's, also with isolantite bases. These valves are wired as pentodes with a screen voltage of about 250 volts, and a plate voltage of 550 volts. Working as a "push-pull" doubler, a respectable r.f. output is obtained at 56 m.c.—ample to drive a straight push-pull amplifier on 56 m.c. with say two 50T type valves in a neutralised

amplifier stage with either a low-loss plate tank coil wound "on air" or a pair of plate rods, to which, in either case, the antenna is coupled.

Although these valves are somewhat beyond the reach of a number of the amateur fraternity, the "line up" serves to illustrate the actualities that may be achieved, given an unlimited supply of modern type u.h.f. valves.

It is more or less taken for granted that all the examples of u.h.f. transmitters brought in for discussion in the foregoing paragraphs are to be plate modulated. This method is undoubtedly the most satisfactory, and except in the case of the last-mentioned type of crystal-controlled multi-stage transmitter, where 100% modulation is quite in order, it is not necessary to have available audio power equal to half the d.c. plate input power to the modulated stage, because we do not require more than about 70% modulation to most self-excited oscillators.

Due, no doubt, to the instability of earlier transmitters, very little has been done in the c.w. direction on the u.h.f. bands, but now, with crystal control and superheterodyne receivers, it should be only a matter of time before c.w. DX is an accomplished fact on these bands.

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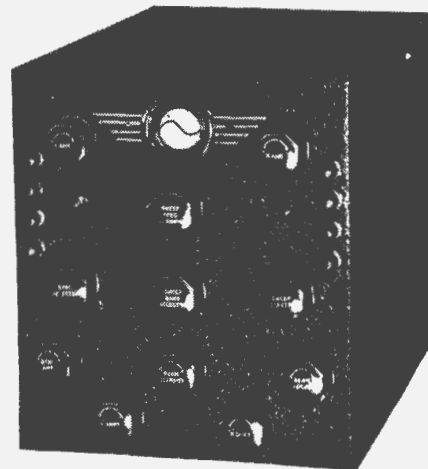
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The All-Wave All-World DX News

Official Organ of the All-Wave All-World DX Club



Closing Date Of Third DX Contest Postponed Till January 1

Owing to the widespread interest aroused by the first two "Radio World" Shortwave DX Contests, and in accordance with several requests from new readers, the closing date for the third "Radio World" Shortwave DX Contest has been postponed from December 1 until January 1, 1938. Entries can be forwarded at any time up to this date. The rules are as follows:—

1. For this Contest a trophy (a Replogle World Globe with time converter, value 59/6) will be awarded to the reader who submits the best individual verification.

2. Verifications from any shortwave station between 5 and 100 metres may be submitted. Thus cards from broadcast, commercial, radio-telephone and amateur transmitters are all eligible.

3. All verifications must bear a date (a post-mark on the card or envelope will suffice where no date is given on the actual verification); and the frequency on which the station has been received must be clearly indicated.

4. Only verifications of reception between January 1 and November 31, 1937, will be eligible.

5. In judging the entries, the judges will take into account the power of the station received, the frequency on which the station was heard, and the type of receiver used.

6. There is no limit to the number of verifications which may be submitted by any entrant.

7. The decision of the judges will be final; and the result of the third competition will be announced in the February, 1938, issue of "A.R.W."

8. All entries should be addressed to the Shortwave Editor, and should be endorsed "DX Competition." All verifications submitted will be returned by registered post as soon as possible after the closing date.

—The Shortwave Editor.

Cuban Shortwave Stations

Contributed by RICARDO F. RUBIO, "Radio World" Cuban Correspondent.

(All times given below are A.E.S.T.)
COCO relays CMCF. Owners: Luis Casas e hijos, San Miguel 86 or P.O. Box 98, Habana, Cuba. 1.5 k.w., 6,010 k.c., 49.92 m. Schedule: 10.55 p.m.-3 p.m. No slogan.

COCD relays CMCD. Owners: La Voz del Aire S.A. Slogan: "La Voz del Aire." Calle 25 y G, Vedado, Habana, Cuba, or P.O. Box 2294, Habana, Cuba. 1.5 k.w., 6,130 k.c., 48.92 m. Schedule: 1 a.m.-2 p.m. daily, Mon. 1 a.m.-1 p.m. Very soon they will be on the air until 4 p.m. daily.

COCH relays CMK. Slogan: "De la General Electric Co. of Cuba." Owners: Zayas Bazan Brothers, Calle B -2-A, Vedado, Habana, Cuba, or P.O. Box 41, Habana, Cuba. 3.5 k.w., 9,428 k.c., 31.80 m. Schedule: From 10.30 p.m.-3 p.m. daily.

COCQ relays CMQ. Slogan: "De la Crema Dental Colgate y el Jabon Palmolive." Owners: Cambo and Gabriel. Calle 25 -445 entre 6 y 8, Vedado, Habana. 4 k.w., 9,750 k.c., 30.76 m. Schedule: 9.55 p.m.-4p.m.

COCX relays CMX. Slogan: "La voz del Radio Philco." Owner: Francisco A. Lavin. Reina -76 altos, or P.O. Box 32, Habana, Cuba. 2 k.w., 11,430 k.c., 26.23 m. Schedule: 9.55 p.m.-4 p.m.

(Continued on page 46)

ALL-WAVE ALL-WORLD DX CLUB Application for Membership

The Secretary,
 All-Wave All-World DX Club,
 214 George Street,
 Sydney, N.S.W.

Dear Sir,

I am very interested in dxing, and am keen to join your Club. The details you require are given below:

Name.....

Address.....

[Please print both plainly.]

My set is a.....

[Give make or type, number of valves, and state whether battery or mains operated.]

I enclose herewith the Life Membership fee of 3/6 [Postal Notes or Money Order], for which I will receive, post free, a Club badge and a Membership Certificate showing my Official Club Number.

(Signed).....

[Note: Readers who do not want to mutilate their copies of the "Radio World" by cutting out this form can write out the details required.]



Short-wave Review

CONDUCTED BY

ALAN H. GRAHAM

Conditions Generally Disappointing, But 20-Metre Amateurs Still Good ★ Interesting Reports From Official Observers

GENERALLY speaking, conditions have shown a definite falling-off during the past month. Reports from all sources indicate that a rising noise-level has seriously interfered with DX work, especially on the lower frequencies. Listeners would do well to concentrate on the 19, 20 and 25-metre bands at present, as these are providing the best reception now available.

On The High-Frequency Bands

Even on the high-frequency bands, conditions have been mediocre. American police transmitters are still very active on 9 metres, but signals are considerably weaker, and QRM is correspondingly more troublesome. Occasionally a louder signal breaks through sufficiently well for a call-sign to be noted. W9XKC, St. Louis, and W6XUL, National City, are the best catches for the month.

The writer has become a real dyed-in-the-wool U.H.F. (ultra high frequency to you!) fan. The logging of stations on 9 and 10 metres seems to have a thrill of its own.

Strangely enough, very few, if any, of the "A.W.A.W." Club members seem to be interested in this phase of DX work. Is it that they are unable to log signals on these bands (and this seems almost incredible in view of the strength of signals logged from W2XEM, Newark, and W5XB, Fort Worth); or is it simply that their receivers will not cover these high-frequency bands?

At all events, to stimulate interest in this field, it has been decided to award a special trophy for the best verification from an American police transmitter submitted before March 1, 1938. Full details of this offer are published elsewhere.

New Stations For 1937

As the year draws to a close, there is a considerable amount of activity among the shortwave stations

of the world. Several have announced changes of frequency, and many will soon operate on new schedules. Full details of these alterations will appear in the revised station list to be published in next month's issue of the "Radio World."

News from overseas indicates that the first Irish shortwave station is now in course of construction. Very few details regarding this transmitter are available, but it is probable that its beam will be directed towards eastern United States and Canada.

Another country to enter the short-wave sphere is Finland. A new station will be erected at Lahti.

Dxers should look out for the new Central American station, YSM, San Salvador, which is now operating on 11,710 k.c., or 25.63 m. (same frequency as SBG). It is believed that tests are also being carried out on 9,510 k.c., or 31.55 m.

Improvements At PCJ

Recent changes to the Philips Radio shortwave transmitter located

OFFICIAL S.W. OBSERVERS

We have pleasure in announcing the following additional appointments:—

NEW SOUTH WALES: Mr. V. D. Kemmis, of Neutral Bay, Sydney.

TASMANIA: Mr. H. A. Callander, of West Hobart.

The only State for which no Official Observer has been appointed is South Australia. Any listeners interested should communicate at once with the Shortwave Editor, setting out the experience they have had in DX work, and also giving brief details of their receiving equipment.

at Eindhoven are of considerable interest.

A complete technical overhaul of PCJ has resulted in the installation of a truly remarkable antenna system.

Instead of an array of directional aerials—Davenport has no less than 23—the PCJ engineers have arranged the new antenna so that it can be swung around to face in any direction whatsoever. This object is attained by mounting the two huge masts on a circular railway track.

In addition to erecting this remarkable antenna, PCJ has increased its power to 60 kilowatts.

Highlights Of The Month

Despite the fact that conditions generally have been definitely disappointing, a number of most interesting loggings have been reported by listeners. These have been summarised below.

The Guatemalan station TGWA appears to be carrying out a further series of test transmissions. Its regular channel is 9,450 k.c., 31.75 m., but it has been recently heard on approximately 9,700 k.c. (30.9 m.) and also on 11,780 k.c. (25.4 m.).

Radio Garata, Sophia, call LZA, is again being heard at good strength during its early morning transmission on Mondays (i.e., 1-7.30 a.m.).

Another more or less "unusual" station reported is FO8AA, Papeete, Tahiti, which transmits on 7,100 k.c. (42.25 m.). Schedule is: Wednesdays and Saturdays, 2-3 p.m.

The French African 'phone station located in Gibouti, French Somaliland, is also being logged on 8,750 k.c. (34.29 m.). It calls Paris in the early evenings. The call-sign is FZE8.

However, the best "catch" of the month is reported by Official Observer La Roche, who forwards details of a new Polish station, SPD, on 26.3 m. SPD relays the better-known SPW (22.0 m.), and is being heard between 9-10.15 a.m. (E.S.T.).

General News

THE EAST

As the result of damage occasioned by aerial bombardments, the Chinese 'phone stations XOJ, XGM, XGW, XTC, etc., ceased transmissions

Special Trophy For Ultra-High-Frequency Reception.

To stimulate interest in ultrahigh-frequency reception, M Alan H. Graham, Shortwave Editor of the "Radio World," is offering a special trophy for competition among readers. Conditions of this competition are as follows:—

1. The trophy will be awarded for the best verification from a 9-metre American police station, submitted to the Shortwave Editor before March 1, 1938.
2. Verifications must be specific, i.e., the frequency on which the station has been received must be clearly indicated.
3. In judging the entries, the judges will take into account the power of the station received, and the type of receiver used.
4. The decision of the judges will be final; the result of the competition will be announced in the April, 1938, issue of the "Radio World."
5. All entries should be addressed to the Shortwave Editor. All verifications submitted will be returned by registered post as soon as possible after the closing date.

some time ago. With the capture of the city by the Japanese troops, XRC1, which was being heard on the 20-metre amateur band, has also disappeared. Even XGOX, located in Nanking, has suspended broadcasting for an indefinite period.

On the other hand, the Japanese stations are becoming more and more active. It appears that the B.C.B. station JFAK, located at Taihokw, Taiwan, has been relaying its news sessions on 9,625 k.c., 31.16 m. Identification is possible from English announcements.

It is reported from one source that JIB, also in Taiwan, also carries the same programme around midnight. JIB is on 10,535 k.c., 28.48 m. Incidentally, JIB usually 'phones Tokio around 9.30 p.m.

From Macao, Portuguese China, comes information that CQN, now on approximately 29.5 m., will soon be changing frequency. It is understood that their new channel will be in the vicinity of 48 m.

Philco Radio, Saigon, Indo-China, is still being logged on 11,730 k.c., 25.75 m., by Observer La Roche in Western Australia. In addition to these regular 25-metre transmissions, this station conducts irregular tests on 5,890 k.c., 50.93 m. The latest available schedule for the station is: Daily, 2-4 p.m.; Saturdays, 7.30 p.m.-12.30 a.m.; Sundays and Wednes-

malar.
several
this station.
been worth wh
COCX, COCO, COCL
still being logged at
strength.

AFRICANS

The Egyptian 'phone stations SUV and SUZ work on daily schedules, usually contacting GBB or one of the other Rugby stations. SUZ comes on the air at about 2 a.m., on 13,820 k.c., 21.71 m., while SUV's usual schedule is from 6.30-8.30 a.m., on 10,055 k.c., 29.84 m.

ZNB, at Mafeking, Bechuanaland, is now operating on 5,900 k.c., 50.84 m., with a power of 300 watts. The station is used mainly for 'phone service; but also broadcasts irregularly around 4 p.m. and 4 a.m.

ZEA and ZEB, the Southern Rhodesian stations in Salisbury and Bulawayo, will verify all correct reports to P.O. Box 792, Salisbury.

Reports From Official Observers

Comprehensive and interesting reports are to hand from the "Radio World" Official Observers throughout Australasia. All but Mr. La Roche, our indefatigable dxer in the West, report very patchy reception, except on the 20-metre amateur band, where outstanding loggings are still quite easy.

Mr. G. O. La Roche (Western Australia), sends an amazing list of stations logged during the past few weeks. Reproduction in full is impossible, but here are some of his outstanding loggings—to arouse the envy of less successful listeners!

Europeans: PHI (16.8 m.), PCJ (19.7 m.); TPA2, TPA3 and TPA4; OLR5A (19.7 m.); I2RO3 (25.4 m.);

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good streng
the Japanese
and the Dutch
mitters (PMN, YD
very good. On 31 m.
ZBW3 are putting in th
nals of the overseas statio
locals, 2ME, 3ME and 6ME, be
cellent. Two interesting statio

New Radio Club For Gladesville

A move is at present afoot in the Gladesville district to establish an amateur radio club to cater for enthusiasts interested in various phases of shortwave radio transmission and reception.

No less than half-a-dozen active amateur transmitting operators in the district have offered their assistance, and in order that it may be ascertained whether or not there will be a sufficient number of enthusiasts to form a club, persons interested are invited to write or call at VK2EW, 126 Pittwater Road, Gladesville.

calling." Interval signal, six played on piano. Closes with selection.
 5J, Panama City, Panama. Slogan: "La Voz de Panama." Dual call: "J y HP6T." Signature tune: "For the Double Eagle."
 60, Santiago, Chile. Slogan: "difuson Pilot." Opens with Vic Herbert's "Babes in Toyland." Closes with Gershwin's "Rhapsody in

WI, Mexico City, Mexico. Slogan: "My Voice to the World from Mexico." Gong struck twice after announcements. Opens and closes with "Angels Guard Thee."
 ER2, Vienna, Austria. "Hier Radio Wien." Uses metronome signal, 60 beats per minute.
 FIQA, Tananarive, Madagascar. All-letters never used. Announces as "Radio Tananarive." Opens with "Ramona"; closes with "Marseillaise."

Shortwave Station Addresses

By ALAN H. GRAHAM

MEXICO

- XEBM—Mazatlan.
- XEBT—Apartado 79-44, Mexico City.
- XECR—Departamento de Publicidad de la Secretaria de Relaciones Exteriores, Mexico City.
- XEDQ—Cia. Radiofonografica, Apartado 197, Guadalajara.
- XEFT—Av. Independencia 28, Vera Cruz.
- XEME—Calle 59 517, Merida, Yucatan.
- XEUW—Av. Independencia 98, Vera Cruz.
- XEPW—Apartado 8403, Mexico City.
- XEWI—Apartado 2874, Mexico City.
- XEXA—Secretaria de Educacion Publica, Mexico City.
- XEYU—National University of Mexico, Mexico City.
- XEUZ—Mexico City.
- XEBR—Apartado 68, Hermosilla.

U.S.A.

- W1XAL—University Club, Boston, Mass.
- W1XK—Hotel Bradford, Boston, Mass.
- W2XAD, W2XAF—1 River Road, Schenectady, N.Y.
- W2XE—485 Madison Ave., New York, N.Y.
- W3XAL, W3XL, W2XG—30 Rockefeller Plaza, New York, N.Y.
- W3XAU—WCAU Building, 1622 Chestnut St., Philadelphia, Pa.
- W4XB—C/- WIOD, News Tower, Miami, Fla.
- W8XAL—Crosley Radio Corp., Cincinnati, Ohio.
- W9XAA—Chicago Federation of Labour, 666 Lake Shore Drive, Chicago, Ill.
- W9XF, W9XBS—National Broadcasting Co., Merchandise Mart, Chicago, Ill.

(continued on page 48)

...GL,
 ...CO2HY,
 ...AA. CO7CX,
 ...Cuba; VP9G. VP9R,
 ...HI5X, HI7G, Domini-
 ...lic.
 ...ERICA: CE1AH, CE1AO, CE-
 ...AC, CE3CO, CE3DW, CE3AI, CE-
 ...3AJ, Chile; CX3BL, Uruguay; HC-
 ...1FG, HC1JB. Ecuador; HK1Z, HK-
 ...3JA, Colombian Republic; LU1HI,
 ...LU6KE, LU9BV, LU9PA, LU4NB,
 ...LU3EV, LU6AB, Argentina; NY2AE,
 ...Canal Zone; TI2FG, TI3AV, Costa
 ...Rica; YV5AA, YV5AE, Venezuela;
 ...XE2AH, XE2FC, XE1DT, XE1RX,
 ...Mexico; PY1EA, PY2FF, PY3AW,
 ...Brazil; VE3OE, VE3CX, VE3ED,
 ...VE5OT, Canada.

...AI, G2PU, G2XV,
 ...G5CZ, G5BW, G5RK,
 ...G6XR, G6WN, G6FS,
 ...8MX, G8AB, G8SB, England;
 ...Scotland; GW2UL, Wales;
 ...Ireland; F3OO, F3JD, F3NF,
 ...F3HL, F3NT, F3KZ, F3LR, F8DC,
 ...F8MG, F8TN, F8GE, F8XT, F8LX,
 ...F8XG, F8KI, F8BV, F8KW, F8QD,
 ...France; ON4VK, ON4AJ, ON4GR,
 ...ON4MD, ON4CH, Belgium; PAOBE,
 ...PAOMQ, PAOEO, Holland; SM7YA,
 ...Sweden; SV1RF, Greece; HA8N,
 ...Hungary; H81AT, Switzerland, OZ-
 ...5BW, Denmark.

AFRICA: CN8AJ, French Moroc-
 co; ZU6P, ZS5AB, South Africa;
 FB8AH, Madagascar.
 ASIA: F18AC, French Indo-China;
 HS1BJ, Siam; XZ2DY, XZ2EZ, Bur-
 ma; VU2BG, VU2CR, India; VS7GJ,
 Ceylon; XU8MC, XU8RB, China;
 VS6AB, VS6AF, Hong Kong; J2MI,
 J2NG, J2KJ, J2OW, J2NF, Japan;
 VS1AF, VS2AR, Malaya; KA1AM,
 KA1AP, KA1BH, KA1ER, KA1HS,
 KA1ME, KA1MH, KA1CS, KA1MX,
 Philippines; KA1YL (portable aboard
 yacht "Latitude" in Manila harbour).
 OCEANIA: K6BNR, K6CGK, K6-
 FKN, K6JLV, K6JUY, K6KMB, K6-

Station Identifications

In an effort to assist listeners to identify those elusive foreign stations, which seem to have a rooted objection to giving their calls in English, a number of station identification signals will be published every month.

LKJ, Oslo, Norway. "Hello, hello,

ROUND THE SHACKS

Amateur operators desirous of having their transmitters and activities featured under this heading are requested to forward details to "Reporter," C/- "Radio World," 214 George St., Sydney. Articles should be similar in style to those already appearing in the series, and should, where possible, be accompanied with photographs of operator and transmitter.

DX News and Views

A page for
letters from
DX readers

Latest Loggings On C.W.

I have received my certificate, badge and report forms safely, and like the badge very much.

Following is a list of some of my latest loggings on C.W.—WQV, WSL, YVR, WTT, KMR, FZR. On 'phone:—KA1YL, ZMBJ, W8LCI, W8BIA, W8BY, FB8AH, LU6KE, ZU6P, ZS-6AM, ZT6TY, W2ZC, XE2BJ, K6-OQE, VE5OG, HC1FS, J2MI, FA8XP, F3HL, G8MG, DJB, PCJ, XU8MC, CO2RA, F18CL, W8CPC, K6JUY, W8MPL, W8NGW, PK1MX, PK1GL, PK1ZZ, NY2AE, PK1GY, K6NRP, K6AGL, VU2HG, VP5NO, CT1AZ, W5FNH. VK's 4RX, 5BF, 5CR, 2YW, 6GB, 2ADV, 3WE, 2VV, 7KQ, 2AT, 4XM, 2AEZ, 3PL, 5WK, 7CM, 2ACO, 4WU, 5LB, 2YX, 3NG, 7AG, 5MF, 2HS, 2JR, 2OG, 2ML, 2HU, 4HA, 2IQ, 4RJ.

Verifications have arrived from the following:—ZMBJ, VK's 7CM, 6ME, 6MU, 6GB, 7AG, 2IQ, 2AP, 2ME, 2ADH, 2GZ, 2ME, 2SV, 5LB, 4RS, 4FB and 3NG.—H. A. Callander, Hobart, Tasmania.

845 Stations In 31 Countries

The following results were obtained on the shortwave bands over the six months ending October 10, 1937, all DX work being done on a two-valve receiver using an electron-coupled 77, choke-coupled to a 38 driving an 8" permagnetic speaker.

AUSTRALIAN 385, made up as follows:—VK2's, 225; VK3's, 70; VK4's, 30; VK5's, 46; VK6's, 5; VK7's, 9.

AMERICAN 273, composed of W1's 16; W2's, 28; W3's, 25; W4's, 23; W5's, 26; W6's, 66; W7's, 5; W8's, 35; W9's, 49.

To this may be added 52 ZL's, 12 PK's, 15 K6's, 11 KAI's. Miscellaneous S.W. amateurs are VS6AB, VS7RP, FQ8SW, FB8AH, VQ8AB, XE2AH, XE2EC, XE2HF, XE2FC, ON4NC, HA1P, OA4RA, OA4AL, J2SK, J2MI, J7CR, K7FST, K4SA, CO2RA, LU1HI, XU8HW, XU8MC, XU8KI, VE3QH, VE5OT, VE4GD, VE5BS, VE5PJ, VE1AH, G5NI, G8MG, ZU6P, ZE1JB, G6DT and G2PU.

These, together with the many commercial s.w. stations, bring the grand total to 845 stations in 31 countries, the receiving being done almost entirely during week-ends. Aerial is an inverted "L" about 70 feet long and 30 feet high, pointing W.N.W. by E.S.E.—M. Norrie (Greenwich), N.S.W.

20 Countries On One-Valver

Since my last report I have heard quite a few stations—dozens of W's and ZL's have come through. Here are some of the others:—KA1MH, KA7EF, K4SA, K4RJ, K6NZQ, K5-AG, HI7G, CO7CX, CE1AO, VS7MB, J2NF, XU8HM, VQ8AS. I have now heard 20 countries on my one-valve receiver.—Bill Plant (AW152DX), Newcastle, N.S.W.

2YA Heard Well In Evening

Please forward me another 50 report forms—I find them very successful in getting verifications. Reception generally here has been quite good, especially from overseas s.w. stations. PCJ's Jubilee Broadcast came in splendidly, and I reported the same night.

This month, 2YA, Wellington, New Zealand, came through better than locals at that time on the broadcast band at 8.30 p.m. I have received a "veri."

Should any Club Members wish to exchange stamps with me, I will be only too pleased to do so, as I have considerable quantities and I am a



This fine collection of QSL's from countries all over the world belongs to Club Member E. J. Bayley (AW-212DX), of Ballarat, Vic.

member of two foreign clubs also.—Gordon Young (AW245DX), Pater-son St., Teneriffe, N.I., Brisbane, Q'land.

Has Logged Russia On B.C. Band

I received my life membership certificate, club badge, and seals, and I am very pleased with them all. I have tacked my certificate on the wall near my set, and so far three of my friends who have seen it are going to join the Club.

As for myself, I have only six verification cards so far, from VK's 4LW, 4RV, 4JN, 2TM, 2BS and 3BO. I have reports out to VK's 2ZO, 2GL, 3AM, 4LD, 4PK, 2MW and 1YA, New Zealand.

All my dxing is on the B.C. band, with a two-valve battery set using 90 volts "B" supply. My logging of RW54 Khabarovsk, Siberia (540 k.c.), has made me feel proud of my set, and I am waiting for another good night, so that I can send a report. The station comes on the air at about 10.30 p.m. (E.S.T.) and is just above 2CR.

The coil I am using tunes from 500 k.c. down to 1,600 k.c., and in case someone would like to try it, here it is. The former is 3" in diameter, and the wire is 24-gauge D.S.C. There are 8 aerial turns, 45 grid, and 20 reaction (1/8" between windings). A .0005 mfd. tuning condenser is used, with a 23-plate midget for reaction. My aerial is 60 feet long, 30 feet high, and runs N.E. and S.W. The lead-in is 30 feet long, runs east and west, and is taken off about 6 feet from the northern end of the aerial.

My log at present is:—N.Z.: 2YA, 1YA, 3YA and 4YA. N.S.W.: 2CR, 2FC, 2DV, 2CO, 2NR, 2BL, 2GB, 2LM, 2UE, 2GZ, 2KY, 2CA, 2AD, 2UW, 2HD, 2WG, 2KO, 2WL, 2QN, 2MW, 2AY, 2BS, 2HR, 2KA; VK2's BQ, GL, UB, ZO, NZ, BR, GF, NC, TM, MO, SM, GN and KD. VIC.: 3WV, 3AR, 3LO, 3GI, 3UZ, 3BO, 3HA, 3DB, 3BR, 3LK, 3SH, 3KZ, 3TA, 3SR, 3AW, 3BA, 3GL, 3XY, 3AK; VK3's AM, LE and HF. Q'LAND: 4QN, 4QG, 4AY, 4RK, 4GR, 4MB, 4LG, 4BC, 4TO, 4AK, 4BK, 4RO, 4WK, 4BH, 4IP, 4ZR, 4BU; VK4's RJ, JN, FW, EA, CP, BB, PK, LW, RV and LD. SOUTH AUST.: 5CK, 5CL, 5RM, 5DN and 5PI. WEST AUST.: 6WA, 6WF, 6GF, 6AM, 6IX. TAS.: 7ZL, 7NT, 7BU, 7HO, 7UV,

and 7VL. I have also logged XGOA, JOUK, JOCG, JFAK (2) and JOFK.—F. Dubbo (AW305DX), Beenleigh, Q'land.

QSL Exchange Corner

The following members have QSL cards they would like to exchange with other dxers:—

Chas. Bell (AW27DX), 18 Kenny Street, Cairns, Q'land.

Fred Bluett (AW167DX), 34 Juliet Street, Stratford, Taranaki, N.Z.

H. A. Callander (AW304DX), 1 Franklin St., West Hobart, Tasmania.

VK2ME, 3ME And 6ME — Transmission Schedules For December.

The following transmission schedules will be observed by shortwave stations VK2ME, VK3ME and VK6ME during December:—

VK2ME (31.28 m., 9590 k.c.)
Sydney Time G.M.T.
Sundays: 4-6 p.m. 0600-0800
8 p.m.-Mdt. 1000-1400
Mondays: Mdt.-2 a.m. 1400-1600

VK3ME (31.5 m., 9510 k.c.)
Melbourne Time G.M.T.
Nightly
Monday to 7 p.m.-10 p.m. 0900-1200
Saturday
(inclusive)

VK6ME, Perth (31.28 m., 9590 k.c.)
Perth Time G.M.T.
Nightly
Monday to 7 p.m.-9 p.m. 0900-1100
Saturday
(inclusive)

Cuban Shortwave Stations

(Continued from page 41)

COBZ relays CMBZ. Slogan: "Radio Salas." Owners: Manuel y Guillermo Salas, San Rafael -14 altos, or P.O. Box 866, Habana, Cuba. 1.5 k.w., 9,030 k.c., 33.32 m. Schedule: 10.42 p.m.-3.10 p.m. daily. Sundays until 5 p.m., Monday to 3 a.m.

COBC relays CMBC. Slogan and owners: "El Progreso Cubano y los Almacenes de Trajes "El Gallo." Monte -139 or P.O. Box 132, Habana, Cuba. 1.5 k.w., 9,363 k.c., 32.04 m. Schedule: 9.55 p.m.-3.30 p.m.

COCW relays CMW. Slogan: "La Voz de las Antillas." Owners: Gil y Troncoso, Prado -105, or P.O. Box 130, Habana, Cuba. .2 k.w., 6,330 k.c., 47 m. Schedule: 9.55 p.m.-4 p.m. daily; Mon. 12.55 p.m.-1 a.m.

COCM relays CMCM. Slogan: "Radio Columbia." Owners: Captains Ponce and Garcia Navarro. Calle 23 -482, Vedado, Habana, Cuba; or P.O. Box 33, Habana, Cuba. 1 k.w., 9,775 k.c., 31 m. Schedule: 11 p.m.-3 p.m.

COGF relays CMGF. No slogan. Owner: Bernabe de la Torre, General Betancourt -51, La Playa, Matanzas, Cuba. 1 k.w., 11,800 k.c., 25.42 m. Schedule: 9 a.m.-2 p.m. daily.

COHB relays CMHB. No slogan. Owners: Weiss, Ramirez & Madrigal. Independencia -33, or P.O. Box 85, Sancti Spiritus, Santa Clara, Cuba. .1 k.w., 6,280 k.c., 47.77 m. Schedule: Midnight-3 a.m.; 7 a.m.-9 a.m.; noon-2 p.m.

COJK relays CMJK. Slogan: "Radio Zenith." Address: Finlay -3 altos, Camaguey, Cuba. 2 k.w., 8,665 k.c. Schedule: 10 p.m.-2 p.m. daily.

COKG relays CMKG. Owners: Hermanos Grau, P.O. Box 137, Santi-

'Radio World' Binding Covers Available

Readers wishing to keep their back copies of the "Radio World" in safe and handy form for reference purposes are advised that special covers for Volumes 1 and 2 are available. Using a strong, durable leather board covered in dark blue book-cloth, they are attractively printed in gold with the title of the magazine, volume number and dates of issue.

Twelve strings are attached along the inside back portion of the cover, so that each issue of the magazine as it is bought can be slipped into place in a few moments. This method of binding is simple, effective, and very convenient, as any issue can be instantly removed if desired.

These covers are now available from the "Radio World," 214 George Street, Sydney, price 3/6 each (or for two covers for Volumes 1 and 2, 6/- post free).

ago de Cuba. 2 k.w., 6,200 k.c., 48.39 m. Schedule: 8 a.m.-9 a.m.; 12.30 p.m.-1.30 p.m. daily. They do not use any slogan, but after Santiago de Cuba they say: "La cuna del Ron Bacardi." Some others say they use: "Del Ron Bacardi y la Cerveceria Hatuey."

Schedule Of New Panama Stations

The new Panama station on the air, broadcasting daily from 1 a.m. to 1.30 p.m. (A.E.S.T.) is HP5A on 11.7 megacycles, which announces as "Radio Teatro Estrella de Panama." A woman announces in English at regular intervals and gives the slogan:—"Entertaining Advertising is Our Theme." Address:—Star & Herald Theatre, P.O. Box 954, Panama City.

LIMA.

The popular OAX4J, on 9.33 megacycles, is on the air till 3 p.m.—sometimes 4 p.m. (A.E.S.T.). Some interesting programmes from this station can be heard—at 1 p.m. each Wednesday, a Spanish operetta; typical Peruvian music from 10.30 to 12 noon daily, and a complete opera every Sunday, 1 p.m. (A.E.S.T.).

A recent veri. from EA9AH gives the schedule:—Broadcasts music and war news on 20 m. daily at 10.30 a.m. and 12.30 p.m. (A.E.S.T.). This is one of the many stations commandeered by the insurgents for the purpose of putting propaganda over the air.—W. T. Choppen (AW61DX), Timaru, N.Z.

Have Your "RADIO WORLD" Posted To You Direct

Readers who want to take the "Radio World" on a subscription basis and have their copies posted to them direct each month are invited to complete the coupon below (annual sub. 10/6). New readers are advised that all back numbers in Volume 1 (May 1936-April 1937) are still available, price 9d each, post free.

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City..... State.....

Country.....

NOTE.—N.Z. subscribers
can remit by Money
Order or Postal Note.

THE AUSTRALASIAN RADIO WORLD,
214 George Street, Sydney,
N.S.W., Australia.

Trans-Tasman DX On 'Five'

**W.I.A. Test Schedule For
Dec. 19**

THE Ultra High-Frequency Section of the Wireless Institute of Australia (N.S.W. Division) wishes to notify amateurs in Australia and New Zealand of a further projected test schedule for 56 m.c. The first took place on November 28, while the second has been arranged for December 19.

Schedule For Sunday, Dec. 19

Starting at 10 a.m. Sydney time, N.S.W. stations will transmit directionally for New Zealand until 10.15 a.m. From 10.15 to 10.30 a.m., N.S.W. stations will be listening for possible replies from New Zealand. At 10.30 to 10.45 a.m., N.S.W. stations will again transmit direction-

ally for New Zealand, listening for possible ZL signals from 10.45 to 11 a.m.

At 11 a.m., N.S.W. stations in the Sydney district will change direction of transmission to N.E. and S.W., and transmit until 11.15 a.m. with the object of putting signals to country and inter-State locations in VK. Between 11.15 and 11.30 a.m., the Sydney stations will be listening for any possible replies from country or inter-State sources.

There will be then no definite test schedules until 2 p.m., and in the intervening period, the time is available for transmission and reception in any individual direction.

From 2 p.m. to 2.15 p.m., Sydney stations will again transmit directionally for New Zealand, and will listen for replies between 2.15 and 2.30 p.m. Sydney stations (also

country VK2's) will repeat this procedure to 3 p.m.

At 3 p.m., Sydney stations will again transmit N.E. and S.W. until 3.15 p.m., and will be listening for any possible country or inter-State signals between 3.15 and 3.30 p.m.

Some Times Suggested For Other States

It is suggested that the transmission times for N.S.W. stations for direction to New Zealand should be used for the same purpose in VK4, VK3, and VK5 and 7. The more stations trying to get across, the better.

As well, right through the summer, several Sydney stations will be operating continuously with c.w. telegraphy on 56 m.c. in various directions, on Saturdays and Sundays. These stations will definitely include VK's 2NO, 2MQ, 2EM, 8AZ, 2VN. Those mentioned have high power

VK AMATEUR STATIONS**Additions**

Call Sign.	Name.	Address.
2AGU	H. Hatton,	18 Irene St., Abbotsford, Sydney.
2AHS	Morse, N. P.,	44 Redan St., Mosman, N.S.W.
5GN	Matthews, K. M.,	77 Cambridge Tce., Malvern, S.A.
5KJ	Connon, G.,	Booloroo Centre, S.A.
2AHT	Sydney Amateur Radio Club,	54 Station St., Newtown, N.S.W.
4PF	Fitzgerald, P. M. A.,	2 Victor St., Rockhampton, Qld.
2AHU	Dent, H. F.,	37 Llewellyn St., Rhodes, N.S.W.
2AHV	Caletti, G.,	51 Hodge St., Hurstville, N.S.W.
5CJ	Ferguson, C. A.,	Mount Gambier, S.A.
4MF	Winterford, D. C.,	Heron St., Sarina, Qld.
3BN	Reddrop, J. W.,	57 Saturn St., Caulfield, S.E.8, Vic.
2AHW	Cook, F. L.,	Fisher Rd., Dee Why, N.S.W.
2AHX	Orvad, F. M.,	17 Myra Road, Dulwich Hill, N.S.W.
3EE	Faulkner, E. A.,	5 Wattle Grove, East Malvern, S.E.5, Vic.
5BN	Barton, G. F.,	Gray St., Mount Gambier, S.A.
4XR	Chippindall, E.K.,	59 Amelia St., Brisbane, Qld.
5SW	Smith, W. H.,	9 Glengyle St., Woodville, S.A.
5AL	Lum, A. D.,	Farina S.A.
3VR	Dexter, J. H.,	46 Edward St., Sandringham, S.8, Vic.

Changes Of Address

3VK	Bowen, M.,	30 Gladstone St., Windsor, S.1, Vic.
4LC	Currie, J. L.,	C/- Power Station, Proserpine, Qld.
6WM	Morris, W. B.,	27 Knutsford St., North Perth, W.A.
6ZZ	Stephens, H.,	339 Suburban Rd., South Perth, W.A.
6KO	Rann, G. W.,	Holland St., Wembley, W.A.
6MS	Sander, J. H.,	38 Arlington Avenue, South Perth, W.A.
4VH	Wooster, H. M.,	144 Mitchell St., Townsville, Qld.
3MV	Coulter, J. M.,	45 Alma Road, Caulfield, S.E.7, Vic.
2SW	Southwell, C. L.,	47 Tunks St., Northbridge, N.S.W.
2QO	Dale T. C.,	7 Botanic Road, Balmoral, N.S.W.
2DX	Blair, K. A. W.,	C/- Commercial Bank of Australia Ltd., Bega, N.S.W.
6FR	Wright, F. H.,	31 Willis St., Mosman Park, W.A.
2KB	Fairhall, A.,	"Segenhoe," Wolfe St., Newcastle, N.S.W.
2VP	Morris, G. W.,	37 Slade St., Naremburn, N.S.W.
5RX	Luxon, G. W.,	8 Elphyn Road, Mitcham, S.A.
3HP	Martin, E. W.,	Weir 5, Balranald, N.S.W. (See also alterations to call signs).

Call Sign Name.**Address.**

2KS	Mevers, L. S.,	9 Vincent St., Hurlstone Park, N.S.W.
6AL	Lathwell, A. G.,	133 Stirling St., Bunbury, W.A.
7LC	Chappell, L. A.,	Winnaleak, Tas.
3DI	Chilver, J. D.,	McCartin St., Leongatha, Vic.
2SI	Scholtz, R. J.,	21 Kellett St., Darlinghurst, N.S.W.
2WH	Stitt, W. H. R.,	"Cumbijowa," Forbes, N.S.W.
3MH	Stuart, M. H.,	Radio Station, Rosewater, S.A. (See also alterations to call signs).
3EO	Duff, D. H. B.,	26 Gertrude St., Arncliffe, N.S.W. (See also alterations to call signs).
2GR	Robinson, A.,	166 Francis St., Richmond, N.S.W.
6RH	Hull, R. A.,	67 The Boulevard, Mt. Hawthorn, W.A.
2RU	Collett, M. E.,	42 Bent St., Gosford, N.S.W.
2IT	Free, G. B.,	29 Ronald Ave., Canterbury, N.S.W.
3KM	McGuire, L. P.,	Corryong, Vic.
3JZ	Lafferty, J. A.,	Union St., Yarram, Vic.
3GK	McLean, S. C.,	692 Sydney Rd., Brunswick, N.10, Vic.
2AEG	East, W. L.,	10 Jubilee Lane, Newcastle, N.S.W.
2NQ	Pieremont, N. S.,	60 Parramatta St., Cronulla, N.S.W.
2QF	G. H. Shelley,	"Hamilton," Foam Crest Avenue, Newport Beach, N.S.W.
2ACW	Welch, C. W.,	1 Dalcassia St., Hurstville, N.S.W.

Alterations To Call Signs

2MG	Amalgamated Wireless (A/asia) Ltd.,	12 Muston St., Mudgee, N.S.W. Now VK20A.
3HP	Martin, E. W.,	Lock 15, Robinvale, Vic. Now VK2AHY. (See also changes of address).
3MH	Stuart, M. H.,	Beam Station, Rockbank, Vic. Now VK5MS. (See also changes of address).
3EO	Duff, D. H. B.,	Crib Point, Vic. Now VK2EO. (See also changes of address).

Cancellations

3ZM	Doble, A. M.,	18 Rosella St., Murrumbidgee, S.E.9, Vic.
2IM	Maclean, J. D.,	Farm 444, Leeton, N.S.W.
2ADA	Wireless Newspapers Ltd.,	60 Gilbert St., Rose Bay, N.S.W.
2ABE	Love, L. G.,	4 Pitt St., Randwick, N.S.W.
4AH	Hadley, A. L. T.,	3 Deighton Road, Dutton Park, Brisbane, Qld.
2ACT	Paton, C. C.,	7 Marshall Ave., North Wollstonecraft, N.S.W.
6JW	Wilmott, J. H.,	6 Gardner St., Como, W.A.
2ABK	Shelley, G. H.,	10 Berry Rd., Crows Nest, N.S.W.

DX Club Report Forms Great Time-Saver For Dxers

Every experienced dxer knows that the simplest and surest way of ensuring a verification from a station is to prepare the report on a form specially designed for the purpose. The Official Report Form of the All-Wave All-World DX Club is ideal. All the information appreciated by stations is given, and all that is necessary to complete a report is to fill in the blanks provided.

By using these forms, dxers can not only be certain of supplying every detail wanted by the station, but also they are identifying themselves with an established Club, and so are far more likely to receive back replies than if an ordinary letter were sent.

These forms are sold to members only at a price of 1/6 for 50, post free.

either crystal-controlled or multi-stage M.O.P.A. transmitters and beam arrays, and there is sure to be other activity from other stations. It is proposed to run very early morning tests on Sundays from VK2NO and other stations if definite co-operation is forthcoming from interstate, ZL, and other DX sources.

Favourable Conditions Anticipated

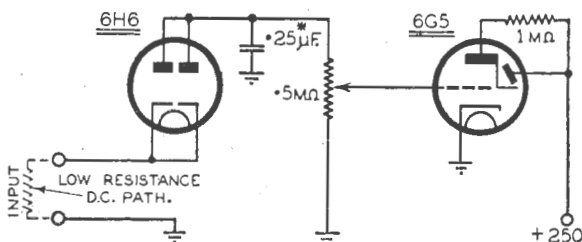
Owing to prevailing conditions on 28 m.c., it is likely that DX conditions on 56 m.c. should be very favourable through the next few months. Those interested are appealed to to make use of stable c.w. telegraphic transmissions with directive arrays, and to concentrate on tuned r.f. receivers or superhets with B.F.O. in preference to super-regenerators.

While it is admitted that "acorn" valves are expensive, metal valves of the 6K7 and 6J7 types give excellent 56 m.c. results in t.r.f. receivers. Please forward details of any 56 m.c. DX signals logged or worked to the Hon. Secretary, U.H.F. Section, W.I.A., N.S.W. Division, Box 1734 JJ, G.P.O., Sydney.

D. B. KNOCK (VK2NO).
M. MEYERS (VK2VN).

Magic Eye Makes Excellent Level Indicator

In public address systems and studio amplifiers, where the output is



* ADJUSTED TO GIVE SUITABLE TIME CONSTANT WITH LOAD RESISTOR USED

not directly audible to the operator, a level indicating device is necessary (states "Radiotronics" No. 80). This usually takes the form of a copper oxide rectifier type voltmeter connected across the output of the amplifier at some suitable point.

A highly satisfactory type of level indicator may be made by using a Radiotron 6G5 Magic Eye. The deflection of the 6G5 follows approximately a logarithmic law, and will thus indicate proportionally to the output level in db. A 6H6 is used as a diode rectifier with a load consisting of a 0.5 megohm potentiometer. This is shunted by a 0.25 mfd. filter condenser, which gives a time constant suitable for most applications, but which may be varied over wide limits while still giving a clear shadow on the target of the 6G5. The voltage required to close the eye is approximately 25 v. r.m.s. input to the 6H6.

The source of audio frequency voltage should have a reasonably low resistance d.c. path compared with 0.5 megohm. If a low impedance line is used to supply the speakers, the indicator may be placed across this line. The 0.5 megohm potentiometer can be calibrated in db. or in any other suitable units, but the potentiometer should preferably be one in which the resistance is proportional to the rotation.

In operation, adjustment is made so that the shadow area on the target becomes zero at a convenient level, which may be the point of overload or of full modulation. When this level is exceeded, there will be overlapping of the 6G5, and a bright line will appear on the target, this being the danger signal.

S.W. Station Addresses

(Continued from page 44)

W8XWJ—C/- Detroit News, Detroit, Mich.

W6XKG—1417 South Figuero St., Los Angeles, Calif.

W9XPD—C/- St. Louis Post-Dispatch, Twelfth and Olive, St. Louis, Missouri.

W9XAZ—Milwaukee, Wisc.

CENTRAL AMERICA

COSTA RICA

TIEP—Apartado 257, San Jose.

TIGPH—Apartado 800, San Jose.

TIPG—Apartado 225, San Jose.

TIX2—Apartado 800, San Jose.

TI4NRH—Apartado 40, Heredia.

TI5HH—San Ramon.

TI8WS—Puntarenas.

TGS—Radio Transmisora de la Casa Presidencial, Guatemala City.

TGW, TGWA, TG2X—Radiodifusora Nacional TGW, Guatemala City.

TGX—El Liberal Progressita, Guatemala City.

HONDURAS

HRD—La Coiba.

HRN—Tegucigalpa.

GUATEMALA

HRP1—San Pedro Sula.

HRW-HRY—Standard Fruit and Steamship Co., Radio Dept., P.O. Box 830, New Orleans, La.

NICARAGUA

YNALT—Apartado 17, Granada.

YNAM—Managua.

YNGU—Apartado 295, Managua.

YNLF—Calle 15 de Septiembre 206, Managua.

YNLG—Managua.

YNOP—Managua.

YNVA—Managua.

YNIGG—Managua.

PANAMA

HP5A, HP5B—Apartado 910, Panama City.

HP5F—Servicio Publico de Radio, Apartado 423, Colon.

HP5J—Apartado 867, Panama City.

HP5K—Apartado 33, Colon.

HP5L—Apartado 129, Chiriqui.

HP5Z—Apartado 1035, Panama City.

SOUTH AMERICA

ARGENTINA

LRU, LRX—Calle Maipu 550, Buenos Aires.

LSX, etc.—San Martin 301-329, Buenos Aires.

LSK, LSL, LSM, etc.—143 Defensa, Buenos Aires.

BOLIVIA

CP5, CP6, CP7—Casilla 637, La Paz.

BRAZIL

PRF5, PSA, etc.—Caixa Postal 709, Rio de Janeiro.

PPM, PPO, etc.—Caixa Postal 500, Rio de Janeiro.

PRA8—Avenida Cruz Cabuga 394, Pernambuco.

BRITISH GUIANA

VP3BG—Mr. J. L. Kerr, 1 Wellington St., Georgetown.

VP3MR—Brit. Guiana Broadcasting Co. Ltd., Luckie's Chambers, Georgetown.

CHILE

CB615—Markoff Hnos. Ltd., Camelias 2860, Santiago.

CB954—Cia. Internacional de Radio, Casilla 16-D, Santiago

CB960—Casilla 1343, Santiago.

CEC, CED—Cia. Internacional de Radio Casilla 16-D, Santiago.

CEB—Luis Desmaras, Casilla 761, Santiago.

This circuit of a useful level indicator for public address systems uses a 6H6 twin diode as rectifier and a 6G5 as indicator.

The VELCO PORTABLE AMPLIFIER

Vealls are Amplifier Experts and are always ready to assist you with your problems. Here is a special portable amplifier designed by Vealls experts and offering a value unobtainable elsewhere in Australia. The illustration at right shows the amplifier closed and measuring only 17" x 17" x 9½". In the illustration below the case has been opened and the two detachable sides are shown. These form self-supporting stands for the speakers, and also provide the necessary baffles. Longer leads can, of course, be fitted to enable the placing of the speakers at either end of the hall, or more distant from the amplifier and microphone.



15 Watts Output



**FOR PUBLIC ADDRESS - - CROONERS - -
DANCE HALLS, BAZAARS AND PARTIES**

Write for FREE FOLDER

Write for free folder fully describing the range of Veeco Amplifiers for Crooners, Bands, Public Address, etc. Your name and address on the margin of this advertisement or on a Post Card will bring a copy by return mail.

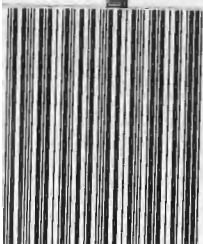
COMPLETE AMPLIFIERS FROM

7½ Watt, Price £16/10/-, up to
30 Watt Types, From £28/10/-.

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EVERYTHING RADIO AND ELECTRICAL
243-249 SWANSTON ST., MELBOURNE, C.I.,
at Prahran and Camberwell. Central 3058 (7 lines).

- ★ Separate inputs are provided for both the Pick-up and Microphone.
- ★ Chassis—Black Crackle finish.
- ★ Case—Leatherette covered and provided with drop flaps for weather protection of the Speakers.
- ★ Speakers—2 Rola K8 Speakers are fitted. Either one or both speakers may be used as desired.
- ★ Cable—50 ft. Speaker Cable is supplied.
- ★ Crystal Type Microphone, not the "Harlie" type illustrated.
- ★ Weight—Only 38 lbs. complete.
- ★ Supply—To operate from 200-240 volts A.C.
- ★ Output—15 watts undistorted. Sufficient for a hall holding 200 couples when dancing.
- ★ Price—£22/15/- complete, ready to plug into lighting socket.
- ★ For Battery operation, Price £32/15/- . Accumulator Extra.



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