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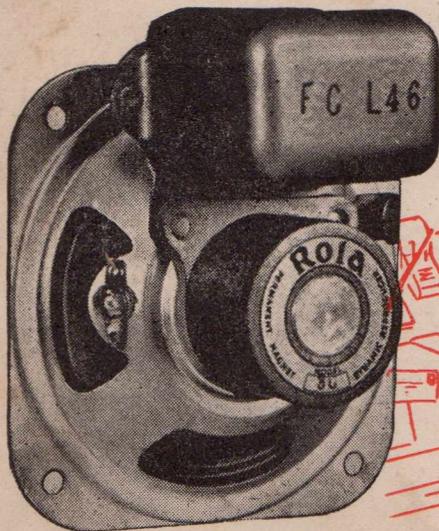
VOL. 11 . . . . . NO. 8

JANUARY 15, 1947

1/-

# ANISOTROPIC ALNICO

## OPENS UP ANOTHER NEW FIELD IN RADIO



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Cone housing	3 9/16 in.
Baffle opening	2 1/2 in.
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Voice coil impedance	3.7 ohms

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VOL. 11

JANUARY, 1947

No. 8

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## EDITORIAL

This issue and the last one must surely rank as two of the weakest issues we have ever published. We admit it quite frankly.

Instead of wasting time explaining the whys and wherefores of the many factors which have conspired to bring about such a sad state of affairs we want to again reassure readers that there are brighter issues "just around the corner."

Our postwar plan for improvement is still to open, but it won't be long now. Already the features of the plan have been brought into alignment, but there are still one or two points to be straightened out.

First and foremost, we need an editorial representative in Sydney.

For preference the representative should be an enthusiastic young fellow, with at least a fair idea of technical radio and the ability to build up a set or two, who will keep in touch with the Sydney radio trade, find out all the new components that are being prepared for release, and generally make sure that we don't miss any of the Sydney goings-on because of our decentralisation plan. For a start it might be possible for the job to be part time, or even done by someone who spends lunchtime in town, but it should soon develop into a full-time job with the establishment of a city office when such luxuries again become available.

Next thing we want is a larger team of contributors of technical articles. We never seem to get enough of the type which are suitable.

If you have any ideas or propositions to help us in these matters or any other suggestions, you will find that we are especially receptive at this moment.

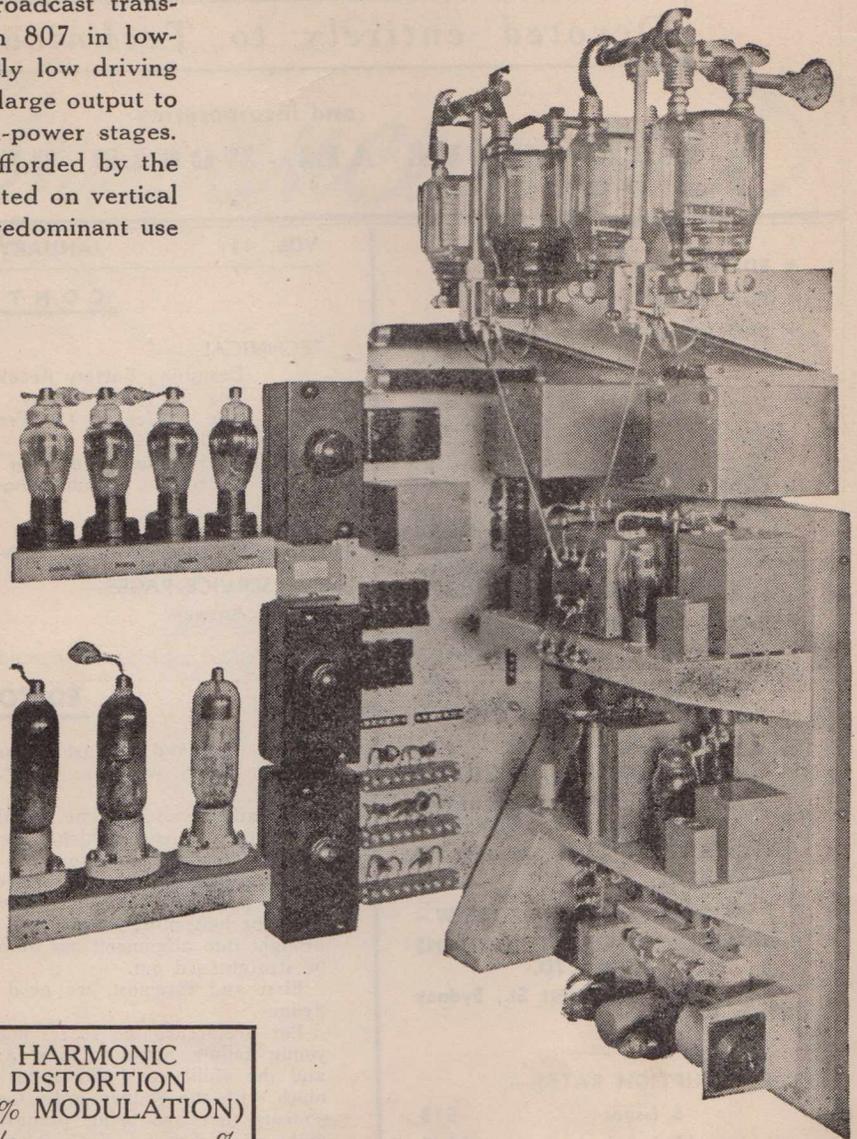
—A. G. HULL

# 2000 WATT BROADCAST TRANSMITTER

THE design of A.W.A. broadcast transmitters features Radiotron 807 in low-power stages needing extremely low driving power to produce a relatively large output to feed to the input of the high-power stages. Apart from the accessibility afforded by the respective sections being mounted on vertical chassis, A.W.A. feature the predominant use of 807's in a-f circuits.

Because the cathode follower circuit precedes the modulator and approximately 16-18 db of negative feedback is used, an extremely low noise level has been achieved. Negative feedback is applied from the anode circuit of the modulator stage to the grid circuit of the No. 1 speech amplifier. The 807 cathode follower valves are operated as pentodes, with screens at the same a-f potential as the cathodes through the use of a unity radio transformer and large screen-cathode capacitances. A further two Radiotron 807 valves are used in the Crystal Unit.

During acceptance tests of a recently completed transmitter, the following figures were realised:



FREQUENCY RESPONSE (50% MODULATION)		HARMONIC DISTORTION (95% MODULATION)	
c/s	db	c/s	%
30	-1	50	2.4
50	-0.3	100	1
100	0	400	0.9
500	0	1,000	1
1,000	0	5,000	2.7
2,000	+0.2	7,500	3.1
4,000	+0.5	NOISE LEVEL (BELOW 100% MODULATION)	
6,000	+0.3	..... -68 db	
8,000	-0.2		
10,000	-1.3		

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**THE WORLD'S STANDARD VALVE**

*Radiotron*  
**MADE IN AUSTRALIA**

# DESIGNING BATTERY RECEIVERS

A GREAT many of our subscribers live in the wayback. They have to depend on batteries to power their radio sets. They are an unhappy lot because their battery sets do not give them performance comparable with that obtained by their city cousins with their a.c.-powered sets, yet they cost more to run. Knowing that I have had so many years ex-

By  
**A. G. HULL**

perience with battery sets and recalling the success of the battery sets which I designed ten and fifteen years ago it is perhaps natural that they complain that I do not show sufficient interest in the problems of the countryman. They think that I should have a solution to all their problems. Frankly, I haven't.

## THE PROBLEMS

The problems to be faced by the countryman who lives beyond the reach of the a.c. power lines are many and varied. Much better all-round performance is desirable, but is always tangled with the economic problem. Batteries run down according to the amount of current drawn from them, and not in straight-line proportion. In other words, if you

double the drain from the battery you will probably run it down in one quarter the time. Batteries are so expensive in themselves, so bulky in size and weight, so expensive in regard to freight charges, that it becomes an economic essential to keep the current drain down to about ten or fifteen milliamperes.

In the face of this limitation on battery drain, the country set needs to have extreme sensitivity with low noise level in order to drag through the far-distant stations in daylight, also extreme selectivity, for at night time there will be from seventy to a hundred stations scattered across the dial.

## REQUIREMENTS

Dealing with the requirements step by step we must first consider the matter of extreme sensitivity. With modern superhets it is easiest to get gain in the intermediate stage or stages, for a single stage at 465 Kc., with battery-type valves is seldom likely to have terrific gain. The sort of gain which gives a set real "kick" is obtained by having two stages of i.f. and stability is no problem if the intermediate transformers are of the right type, designed and matched for use as two stages. But high gain in the intermediate stages is not enough in itself, for it also brings up the noise

level. For increasing the gain without increasing the noise, we need amplification ahead of the converter. So one or two r.f. stages are desirable. Two r.f. stages are a wonderful asset when you are in search of effective long range in any set, but it is seldom possible to have them. Apart from the way they add up the battery drain, the r.f. stages call for a gang section each, so for two r.f. stages you need a four gang condenser. It is possible to overcome this problem by using two two-gangs, as is done with the Kingsley communications-type receivers, coupling them together or driving them from both sides of a drum dial.

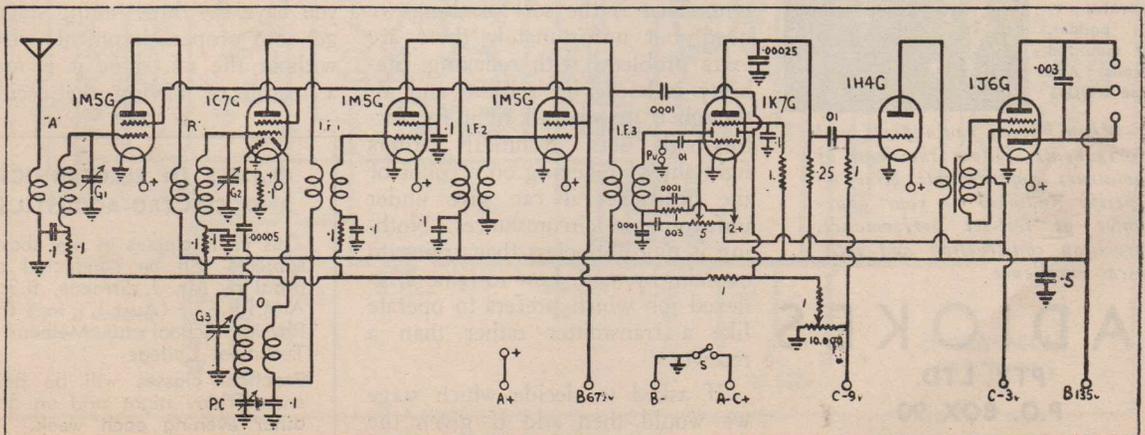
It is also possible to increase gain in the audio end of a battery set, even to an extent which would not be considered desirable in an a.c.-operated set. Hum is not a problem.

So we can breezily state that we want two r.f. stages, two i.f. stages and two audio stages, but unfortunately each extra stage means an extra valve, and every extra valve means heavier filament current as well as heavier plate current.

So we come down to practicalities.

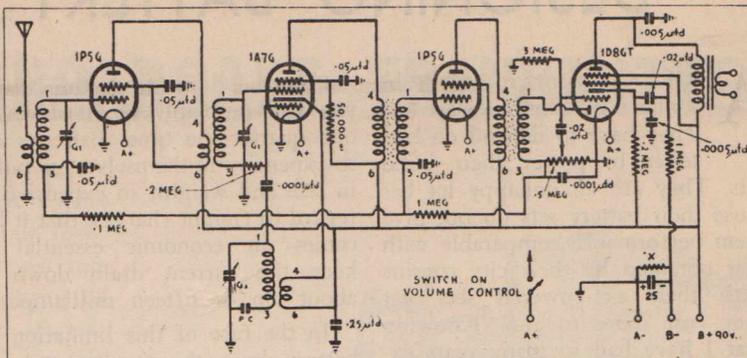
Good all-round performance can

*(Continued on next page)*



A powerfully battery-operated receiver with two i.f. stages and Class B audio. Although heavy on both filament and high tension current a set of this type gives splendid performance.

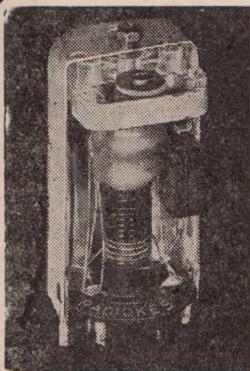
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R-56

**BATTERY SETS**  
(Continued)

be obtained from a four-valve superhet, consisting of a converter stage, intermediate stage, detector-audio. and power output. Using the 1D8GT to combine the last two stages you can still get fair performance from an arrangement which is then only three valves in all. As with all multi-purpose valves, however, you have to watch the ratings as some of them take just as much plate and filament current as would two separate valves. When the price is also high it becomes a doubtful economy to cut down on the number of valves used. On the other hand reflexing would be fine if it were not quite so tricky. With effective reflexing you can make a single valve amplify at both radio and audio frequencies at the same time, getting double performance without increasing either filament or plate current. That is the sort of thing we need, but unfortunately there are extra problems with reflexing. Stability is harder to achieve and although it may be all right for factory-built sets, technical writers fight shy of reflexing on account of the headaches it can give under unfavourable circumstances. Nothing is more hopeless than trying to explain, by mail, how to tame a reflexed job which prefers to operate like a transmitter rather than a receiver.

If asked to decide which stage we would then add if given the choice of adding an extra valve to the four-valve job we would again be torn by practical considerations.

Originally described as a battery-operated portable, this circuit also lends itself for domestic use, having high gain on account of the r.f. stage, together with low noise level.

Undoubtedly from a performance point of view the extra valve should be an r.f. stage ahead of the converter, giving improved range without extra noise level, and improving the effective selectivity, image ratio and so on. But it is so much easier to add an extra i.f. stage. This only calls for an extra i.f. transformer, but the r.f. stage calls for a three-gang condenser, and an extra coil. The extra coil is not so difficult if you are dealing with a broadcast set, but when you want a dual-wave set then you are right up against it when you ask for an r.f. stage. Even if you can find a kit with r.f. stage to suit battery valves you will probably find that it is priced two or three times the price of an ordinary dual-wave bracket. Alignment is also more difficult as you have the three tuning stages to get into proper alignment, whereas without the r.f. stage it is mainly a matter of having the oscillator

**CLASSES IN ELECTRONICS AND ELECTRO-ACOUSTICS**

This year, classes in the above subjects will be conducted as usual by Mr. J. Straede, B.Sc., A.M.I.R.E. (Aust.) in the Physics School of Melbourne Technical College

Practical classes will be held each Friday night and on one other evening each week.

A correspondence course will also be made available.

tuning correct and the aerial coil tuning is not sharp enough to be critical.

### POWER AND TONE

Few battery sets can offer anything exceptional in the way of tone, for tone is largely governed by power. It takes real watts of undistorted output to reproduce the music of a large orchestra or an organ.

But we have already agreed that we must limit our total battery current drain to about 12 or 15 milliamperes.

This amount of current has to be divided between the output valve and the amplifying valves. To get a power output of one-third of a watt, little enough for even the most modest loudspeaker results requires about 8 or 9 milliamperes at 135 volts, so that to keep within the reasonable limits of battery power supply we must arrange to have the rest of the set draw not more than about four or five milliamperes, which rules out all the things we might like to do, such as use two stages of radio frequency ahead of the converter and so on. It simply can't be done so long as the battery prices are what they are today.

## MORE EXCUSES

Owing to circumstances beyond our control (which is the nice way of covering over mismanagement, faulty organisation and sheer laziness) we have not been able to give the third article of the "F.F.R. Amplifier" series, which was scheduled for this issue.

Likewise the Ferrotuned battery circuit has been held over to a future issue. With a bit of luck both articles will be ready for the February issue, together with a full description of a most powerful type of a.c. receiver which is ideal for DX reception.

The amount of actual noise (or music) from the loudspeaker will depend on two main factors, for any given battery current drain, the efficiency of output valve or valves and the efficiency of the loudspeaker.

Dealing first with the output stage you will find that the most efficient from the point of view of maximum undistorted output for a given electrical power input will be the Class B twin triodes. With these practically every bit of current is actually working to give audio power output. How well I recall the first Class B battery set

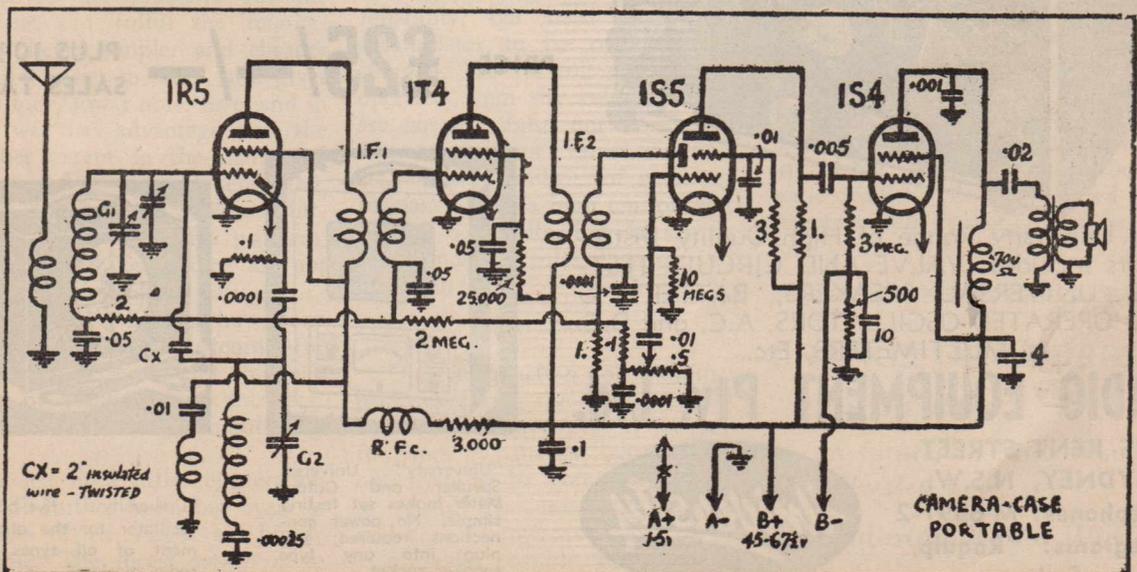
to be described in Australia, one which I developed for "Wireless Weekly" about 1931, working from data received via ham radio from brother Ross in America.

Next in line for efficiency is the pentodex and pentodes in push-pull, but the latter are inclined to run up your filament current.

Triodes, which were so popular in the early days of battery sets, run a very bad last in the race for efficiency.

Of great importance in the matter of getting so much actual sound

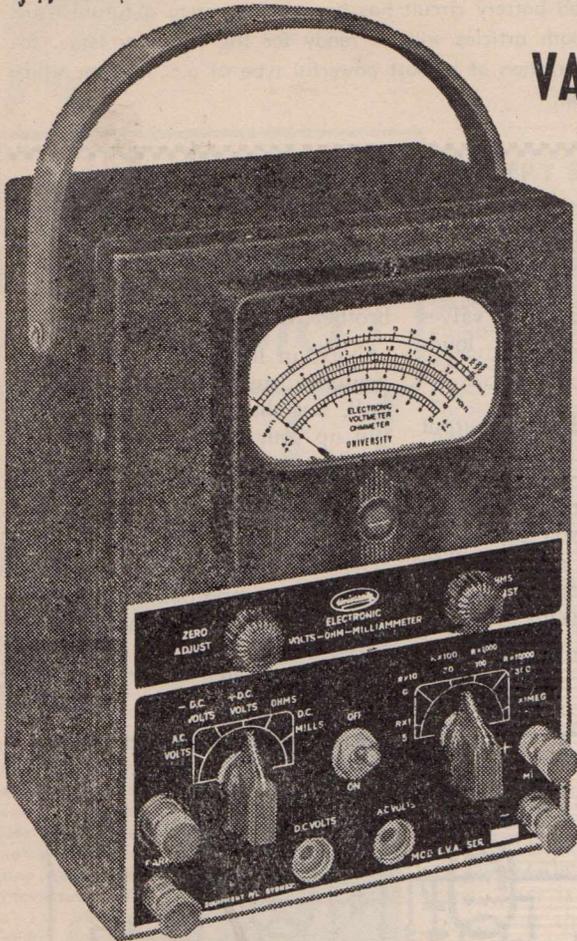
(Continued on page 9)



When they become available the new peanut-type valves are expected to have a far-reaching effect upon battery set design. Here is a typical circuit for these valves, as published originally in our issue of September 1945.

# REMARKABLE NEW

## "University" VACUUM TUBE VOLTMETER



The new University Vacuum Tube Voltmeter is an instrument designed specially for the radio serviceman and experimenter. It covers D.C./-A.C. output volts and milliamps to 1,000 and ohms to 1,000 megohms. Bridge circuit with inverse feed-back assures stability. Input resistance on all D.C. ranges, 11 megohm, and on all A.C. ranges 1 megohm.

The instrument operates from 240 volts A.C.—write today for descriptive literature.

PRICE **£25/-/-** PLUS 10% SALES TAX

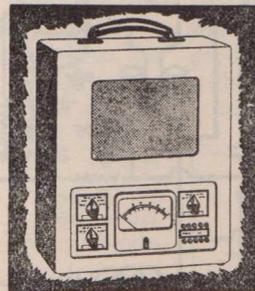
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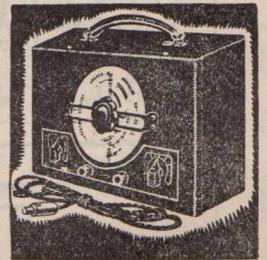
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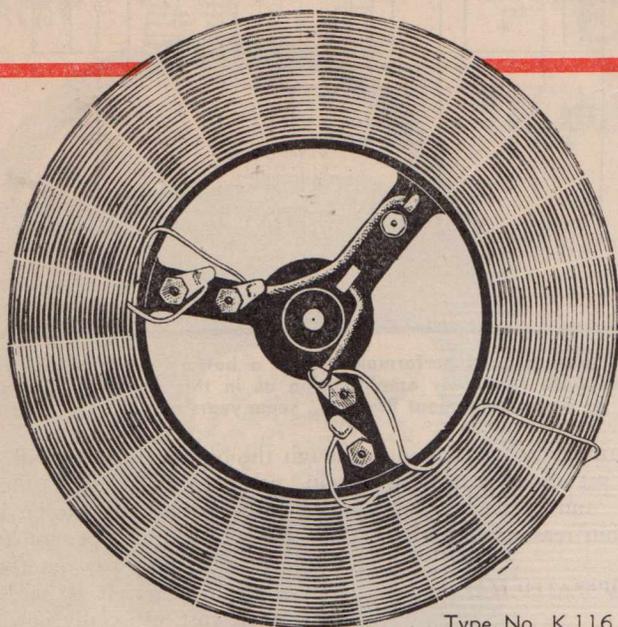
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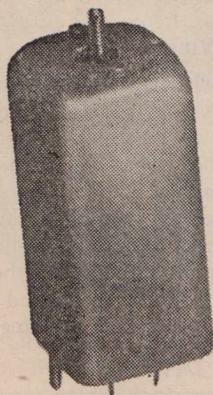
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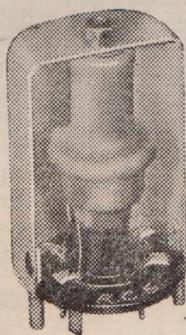
Type No. K.116

● This Special R.C.S. "LOOP AERIAL KIT" has been carefully engineered to give high performance with excellent stability, each component being designed to work efficiently in the complete kit, ensuring the elimination of alignment and tracking problems. This kit is prematched and tracked as a unit at the factory, on precision "Q" meters.



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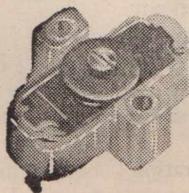


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## FURTHER RESTRICTION FOR HAMS

**S**TILL another example of how the freedom of the ham radio experimenter is being whittled away from him is revealed by the latest pronouncement from the P.M.G.'s department that ham call signs and the names and addresses of hams are covered by crown copyright and cannot be published in any radio journal. No reason is offered for this extraordinary encroachment, and doubtless none will be offered. With that glorious omnipotence which is possessed by so many so-called servants of the public, a regulation is passed, or even without any regulation being passed, and that is That (with a capital T). Apparently no one is consulted, it is not debated by the representatives of the public; what a ghastly derision of democracy.

### NOT IMPORTANT?

At first thought many hams will, as usual, shrug their shoulders and take the attitude that it is a matter of no great importance. They are becoming accustomed to being pushed around. Many of them feel that they are lucky to be allowed to pursue their hobby at all; the only hobby in the world which has a licence as a requirement. Apparently there is no way around a crown copyright, no method by which a publisher may appeal against the restriction, yet we cannot see how the copyright can be enforced, especially in regard to overseas magazines.

Take, for example, the American Radio Call Sign magazine, which was published before the war. Doubtless new issues are now being prepared. Will Australia be the only country in the world not represented in the Call Book? Or will its publishers simply snap their fingers at Australian tin-pot despotism?

From previous experience with departmental rulings we wouldn't be at all surprised if the P.M.G.

gave ready assent to overseas magazines to allow them to publish the VK call signs, to the detriment of the locals.

Apparently one of the reasons for the withdrawal of permission for the publishing of call signs is one of ordinary money-grab greed. This is hard to understand with a department which already has an annual surplus of millions, but we also have the other classic example, the continuance of the wartime tax of  $\frac{1}{2}$ d. extra on letter postage. It makes you laugh when you read the naive way in which this tax is mentioned in the front pages of the Post Office Directory. Or does it make you cry? It all depends on how well your sense of humour has been developed.

It would seem that it is the intention of the Department to go into the publication business, selling call sign lists for 2/- each. Apparently the departmental conscience is too sensitive to allow the use of any such vulgar word as selling or price and so the list bears the dilettante announcement "Subscription 2/-."

Before the war the lists were given away free of charge with publications such as "Australasian Radio World." We would gladly give our readers the same free service again, but for this new P.M.G. snatch.

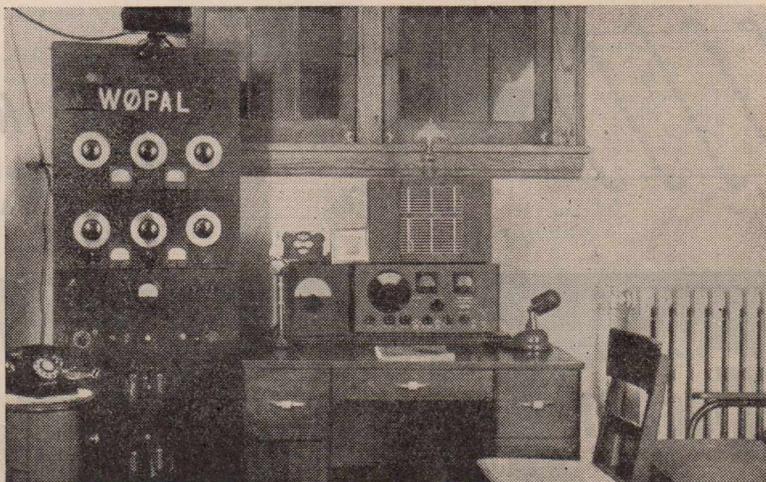
### WHO PAYS?

Who will pay the amount? This is easy to answer. The hams themselves, their friends, supporters and all interested in ham radio. They will pay. The 2/- slug will be just another yoke around the neck of ham radio, just another stranglehold with which the P.M.G. will try to throttle ham radio.

Why should the P.M.G. want to strangle ham radio?

You've got me there.

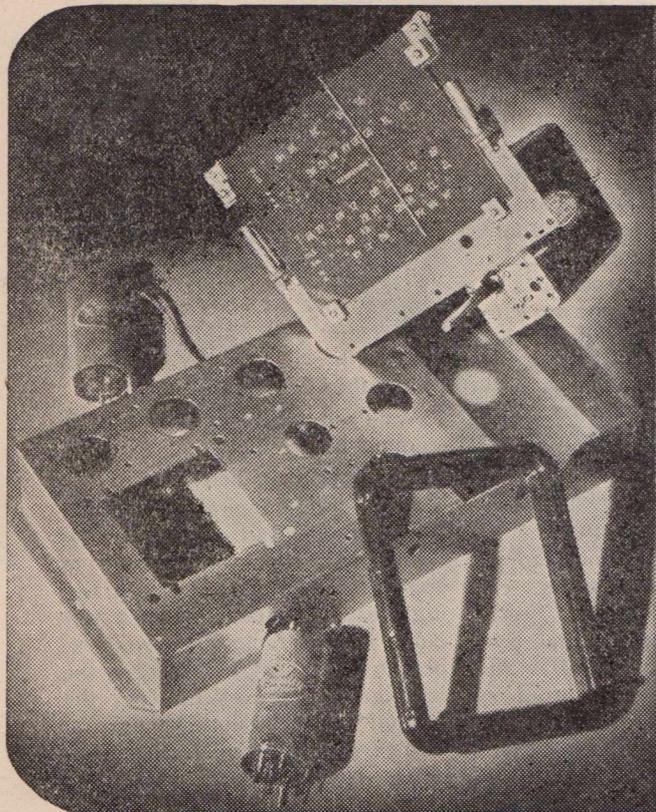
Any sensible, logical, clear thinking person: in fact anyone in their right mind would be expected to appreciate what ham radio training meant to Australia when war came. In ham radio you would expect to find an ideal hobby for the intelligent citizen. Why does the P.M.G. want to strangle ham radio? You've got me there. I can't think of any sane reason.



A typical postwar amateur station in U.S.A. where the authorities are sympathetic to the ham and encourage the hobby of amateur transmitting.

KKI

# THIS IS THE FAMOUS FERROTUNE FOUNDATION KIT

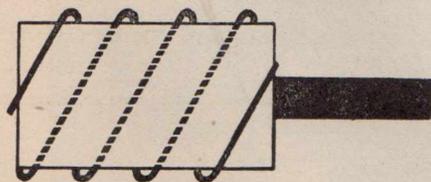


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# KINGSLEY RADIO

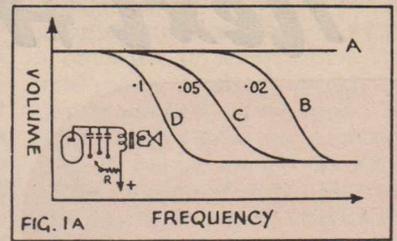
K I N G S L E Y R A D I O P T Y . L T D .

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# THE CONTROL OF TONE

BEFORE the invention of radio, humanity had to depend on real life music for entertainment. In those days the more or less agreeable noises of the various instruments were taken as a matter of course. If you liked it, all right; if not, plug your ears or go home. With the development of radio,

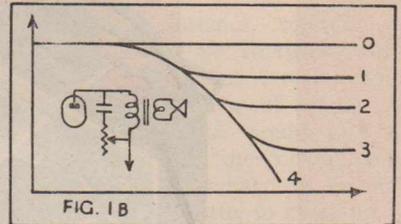
can only thank the Lord over and over again to have made the human ear so tolerant to distortions of all kind, to the point, where it even substitutes "from experience" sounds it does not hear at all. Otherwise, we could hardly stand listening to the radios and amplifiers of our days.



By  
**PAUL STEVENS**  
21 FLETCHERS AVENUE  
BONDI, N.S.W.

## TRUE TO LIFE?

There are so many sources of distortion in the long chain between microphone or pickup at the broadcasting station to the speaker at our home that we'd better give up the idea of "true to life" radio for many years to come, and concentrate on the second school of thought: to make the tone as pleasing as possible. The device to achieve this is our tone control. It functions by introducing frequency distortion of an agreeable nature to minimise harmonic and frequency distortion of a kind unpleasant to the human ear. It should be pointed out, however, that even the most elaborate tone control is not a cure-all and that the audio amplifier and tuner, also speaker and baffling, must still be of the highest possible standard. A roomy cabinet, or buzzing speaker, side band cutting or reaction in the tuner, wrong bias values of the audio valves, etc., will cause distortions which not the best inverse feedback tone control can eliminate. There is one fundamen-



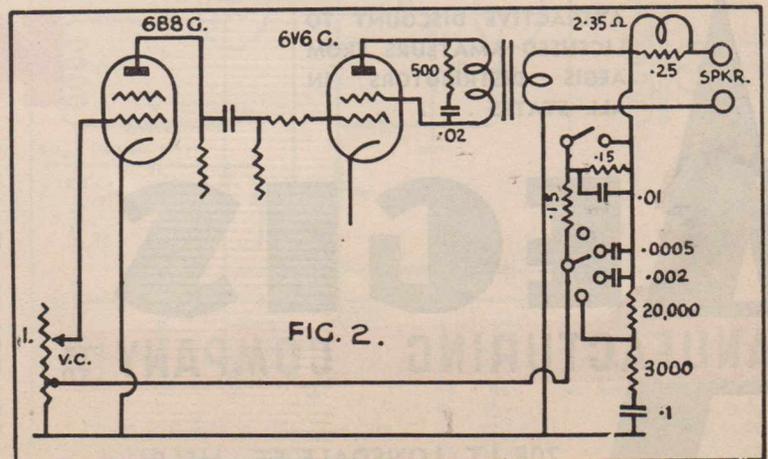
however, a new era for music has started. One was suddenly able to listen to the programme at any desired volume level, and soon devices were installed to alter the tone from "high pitched" to "mellow." And it was then when the two schools of thought forked apart, the one which endeavours to create the most natural, the other the most pleasing tone in radio.

I would like to point out right here that, in my opinion, in some future date they are going to meet again.

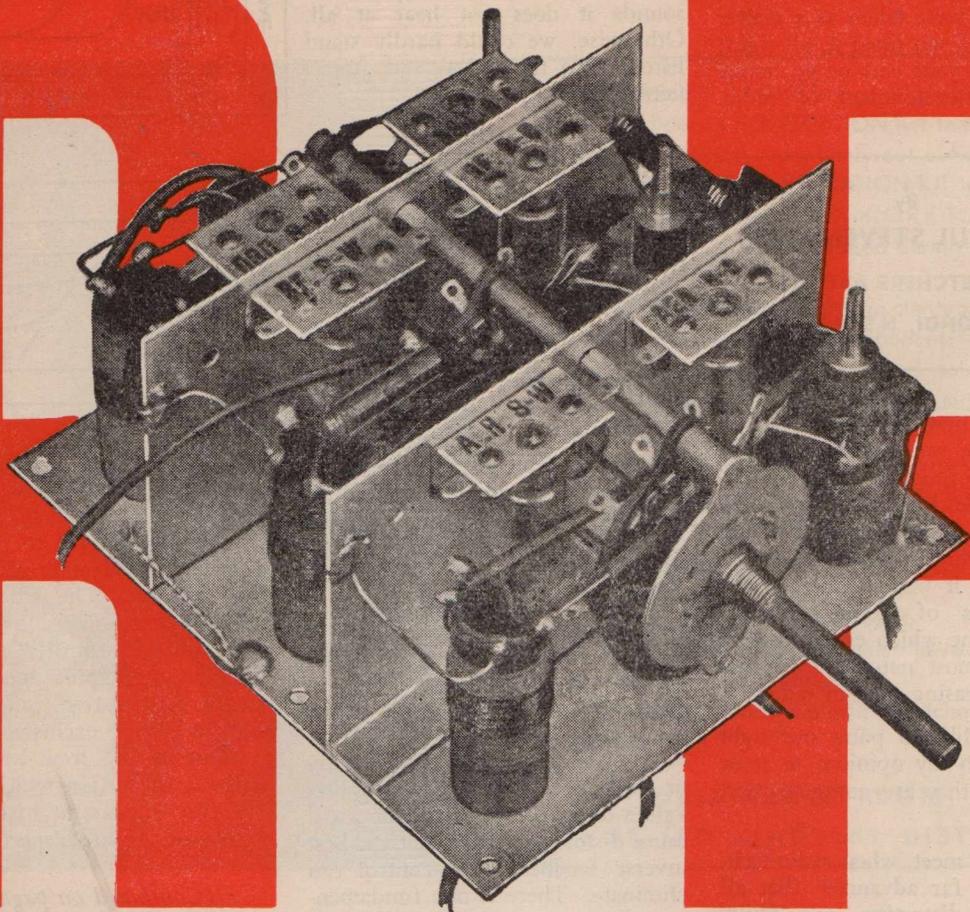
They will meet, when radio technique is so far advanced, that all sources of distortion and faulty sound radiation are eliminated and our radios and amplifiers will reproduce speech and music in the exact way they really sound. There won't be any necessity to set the tone control to "mellow" for music or to high pitch for our serial stories. The perfect radio of the future will produce the full basses of music together with the high frequencies of female voices and the still higher harmonics of the violin faultlessly without the unpleasantness of frequency and harmonic distortion. A tone control will then be only an optional device to "improve on nature." But the way things are at present we

tal rule which is just applied logic: The better the set is without tone control, the less artificial frequency distortion will have to be applied to make it perfect to our present-day standards. The "pleasant frequency distortion" introduced by tone controls consists mainly of high or high plus medium frequency attenuation. Treble cut alone is almost exclusively applied to improve the tone by reducing harmonic distortion which becomes especially unpleasant in the higher regions of the audio spectrum, mak-

(Continued on page 14)



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# tone control

(Continued)

ing the set sound tinny and harsh. It is, however, seldom designed as a variable control but rather as a fixed condenser or condenser-resistor shunt somewhere in the audio amplifier, usually across the speaker transformer. Voltage inverse feedback makes this unnecessary, as it not only reduces distortion but also causes a certain amount of treble cut. The high-and-medium cut tune control is the type we generally find in our household receivers. It starts attenuating in the lower medium region, giving the impression of a resounding bass and almost non-existent treble when full on. This is the typical "music" position for a majority of listeners, and here I have to remind the frowning amplifier enthusiasts that radios are made for the public and therefore have to conform to public taste. The "discriminating music lovers"—this cliché word embracing all those selected few that like 10,000 c.p.s. hisses and screeches in their amplifiers (even if they don't know the difference between Beethoven and Fats Waller), our amplifier enthusiasts themselves will have to cater for. But, anyhow, we don't have to start fighting over the "right" tone quality—the tone control is here to be used and everybody can set it to his own liking. When I talked about a full bass, it is understood that I had a big table or console model in mind. No tone control in the world can make a smaller mantel or mid-get set reproduce low notes properly, although one can cheat the easily-tricked human ear into believing to hear them by "balancing" the tone. If the lowest and highest note reproduced multiplied make about 500,000, we get the impression of a very natural tone, with just the right amount of bass and treble. A simple bypass condenser across the speaker can achieve this. As there are no basses here to boost, the installation of a tone control will only make the set sound hollow and unpleasant. Mid-

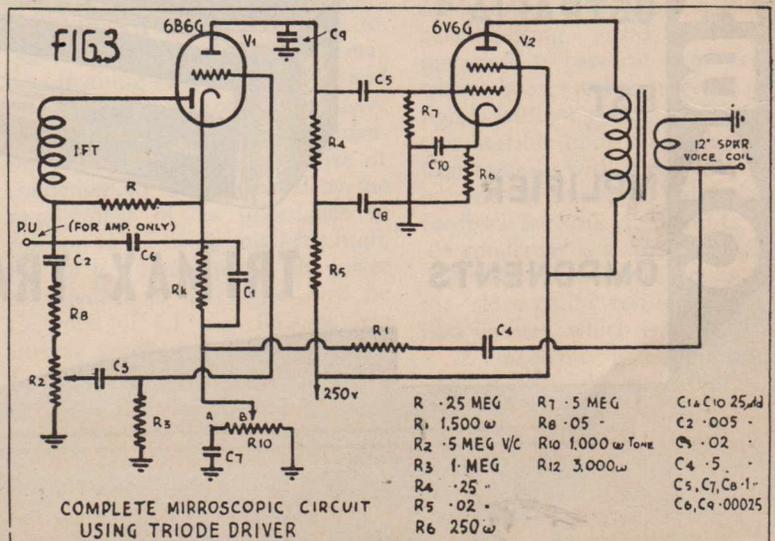
gets, therefore, better be left without tone control.

And now to the design of the tone control. First of all, we have to realise the fact that a tone compensation, with the exception of certain complicated resonance circuits, always constitutes a loss of volume. There is no such thing as bass boosting. It really means, as mentioned before, attenuation of all frequencies but the bass. Whether it is achieved by a simple shunt circuit or frequency discriminating inverse feedback does not make any difference. First condition is, therefore, to have the necessary power reserves in our set, which is nearly always fulfilled, even in a "driver-less" four-valve set. Then we have to decide between condenser-shunt or inverse feedback control. Ordinary inverse feedback's first purpose is the reduction of harmonic and frequency distortion; in other words, to flatten out the amplifier's characteristic.

The shunt condenser is the simple tone control. By shunting a .01 condenser across the primary of the speaker transformer, we can take care of most of the harshness caused by harmonic distortion for normal home-listening volumes. As mantel sets are not built for full-blast performance, inverse feedback does not give any worthwhile advantage here, but is rather a draw-

back if we consider the big loss of gain connected with it, especially in four-valve sets. So, if we consider our mantel set big and good enough to warrant the installation of an effective tone control, we put a condenser in series with a variable resistor across its speaker terminals and have all we need. The same thing applies to a cheaper table or console model. As simple as the function of such a tone control may be, it is quite unbelievable what funny ideas there exist about its theory, even amongst otherwise experienced servicemen. A certain chap, for instance, replaced the broken-down .05 condensers of a tone control with a .1 type, because he did not have a .05 handy. He remarked that it would give the same tone, only the control potentiometer would have to be kept turned back a little to make up for the extra capacity (!) Fig. 1A and B show the influence of resistance and capacity on the tone characteristic. 1A shows three different capacities with a certain resistor in series. A is the hypothetical straight characteristic of the amplifier without tone control. B, C, D show the curves for .02, .05 and .1 condenser plus resistor. These diagrams make the functions of both resistance and capacity in series quite clear. The bigger the capacity, the lower will be the fre-

(continued on next page)



## TONE CONTROL

(Continued)

quency at which attenuation becomes noticeable. The resistor, however, just limits the attenuation. 1B shows one capacity with decreasing values of resistance (1, 2, 3) to zero (4) in series. There the attenuation diagram remains the same, but the limiting influence of the resistor flattens the curve out at any desired level. Thus a certain range of low notes can be boosted by various degrees, which in the first case (1A) various frequency ranges are boosted by the same degree. (When I say "boosted," I mean, of course, that these frequencies stay at their normal level, while all the others are attenuated.) It seems quite clear that these facts open up a variety of possibilities for the practical designer. A three or four-position switch can put various condenser-resistor combinations into circuit

for all sorts of fancied tone curves. But all curves will show an attenuation of higher notes against lower ones. There is no way to accentuate both bass and treble in this case, but as treble boost without inverse feedback is undesirable, this can hardly be called a drawback.

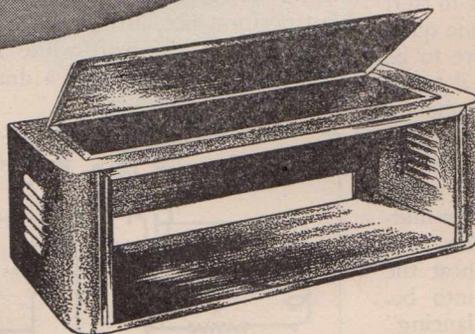
The advent of inverse feedback opened quite new tone controlling possibilities. By introducing series and shunt condensers into the inverse feedback network, we are able to lift or reduce both bass and treble response, if necessary at the same time and by comparatively simple means. This does not exclude the fact that some commercial designers use almost as many resistors and condensers in their feedback circuit as in the rest of the receiver. The most effective inverse feedback as such is one feeding the signal from the speaker voice coil back to the audio drivers' input, as it reduces distortions

created in the whole of the amplifier. But phases have a queer way of rotating in all directions, and the same network may spell negative feedback for one range of frequencies and positive for the other. This can be overcome by careful designing, but the values of resistors and condensers and the qualities of the output transformer are rather critical, especially when strong degeneration is used. A resistor changing its value, a replacement winding for the speaker which is not exactly the same as the original may upset the apple-cart quite thoroughly. This is the reason why two-stage voice coil feedback is not generally used, and the favourite still is the well-known single-stage type embracing only the output valve, which supplies most of the distortion anyhow. Fig. 2 shows the circuit of a well-known make famous for its quality

(Continued on next page)

**A**  
**B**  
**A**  
**C**

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## TONE CONTROL

(Continued)

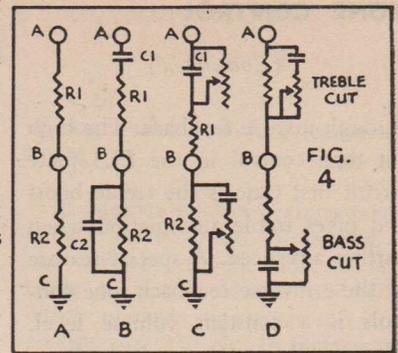
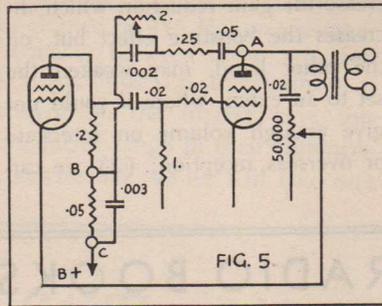
of tone, a two-stage voice coil feedback with tapped volume control. A total of five resistors and four condensers is used, giving four different combinations of bass, resp. treble boost or cut, worked by a four-step switch. Against this highly-efficient and well-designed circuit stands another far simpler and—on paper—just as good one, which the "Radio World" described very thoroughly in the February and March issue of 1941. Fig. 3 shows this circuit. It depends for its functioning as bass accentuator on phase rotation, which makes the feedback in this region positive. To achieve this, every component in the entire audio circuit has to be exactly right. We have to use the required type of output transformer and even the brand of the speaker makes a difference to the result! Under these circumstances it is understandable that many times, when I had to service one of the sets using this particular circuit, mostly table models, I met the typical question: "... and, by the way, could you tell me what this knob is for? It does not seem to make any difference when you turn it?" I investigated and found that there was a slight alteration of the tone noticeable when turning the knob, but it was almost negligible. The other extreme, which I struck very seldom, was a deep, rumbling oscillation, when this tone control was advanced, and in between various stages of more or less proper functioning. It should give normal reception in the off position, then, when slowly advanced first bass boost due to phase shift, then bass and treble boost. I men-

That electric shock may have a damaging effect on memory and ability to re-learn is indicated by results of shock treatment experiments for the mentally ill. The experiments, made on rats, were conducted independently by Dr. Carl P. Duncan of Brown University, and Dr. Elliott M. McGinnies, Jr., of Harvard University.—"Q.S.T."

tioned this circuit only because it is the most touchy one of the lot, created by theory running riot and without regard to practical reliability under all sorts of circumstances.

### INVERSE FEEDBACK

The simple principle of normal inverse feedback tone controlling is illustrated in Fig. 4. Point A is the starting point of the feedback network in the plate of the output valve or the secondary of the speaker transformer. B is the point the signal is fed back to. It is in the plate circuit of the driver valve, its cathode or a tapping of the volume control. C is a chassis potential for audio frequencies either directly connected to chassis or



ance between B and C will rapidly decrease and with it the gain reduction through inverse feedback, thus giving treble accentuation. 4C shows how variable resistors of appropriate size allow us to control the influence of these capacities to form two continuous, independent bass and treble controls. 4D finally indicates the principle of cutting bass, resp. treble also by the simple installation of condensers with two variable resistors for controlling purposes. In this case the inverse feedback is increased in the required regions and reduces the gain. In both cases a three or four position switch with condenser-resistor combinations attached to it can replace the variable resistors (potentiometers) as in Fig. 2.

### SUGGESTED CIRCUIT

Fig. 5 shows the single stage feedback-tone control I am using on my radiogram. It provides for independent treble boost or cut and bass boosting. I did not find the inclusion of bass cut necessary, as treble boost makes speech intelligible without giving your receiver that horrible tinny midget set tone. Conforming with Fig. 4, I have marked the respective points in the feedback network A, B and C. The .05 condenser is a wire D.C. block. The .002 capacity in series with the .25 megohm resistor serves as bass booster, which is regulated by a 2 megohm potentiometer in parallel with the condenser. The .003 condenser shunting the .05 resistor between B and C is a fixed treble boost, which over-compensates for the loss of high notes

(Continued on page 18)

## TONE CONTROL

(Continued)

through inverse feedback. The high cut tone control in the EL3 plate circuit first cancels the treble boost and gives treble attenuation when further advanced. A special feature of these inverse feedback tone controls is a constant volume level. The middle register, which determines the general volume, remains constant, while only bass or treble are boosted or cut. This is not a contradiction of what I have said early in this article (that every tone control constitutes a loss in volume), as an amplifier with inverse feedback already works with strongly reduced gain. A disadvantage of this arrangement is its limitation by the gain reduction factor. The usual gain reduction is about

5 : 1, which means that any part of the audio spectrum can only be increased five times to reach the normal amplification of the set. Considering the logarithmic characteristic of our ear, this maximum is not too high. For sets or amplifiers with an inherent good bass reproduction, such as big consoles with 12-inch speakers, it is far more than sufficient. For smaller sets it may be just right on normal volume levels, but with volume turned down it is quite inadequate and we get this well-known tinny, "spineless" tone of softly playing radios. There are three ways out of this calamity: (1) We can increase the gain reduction which increases the boosting effect but, on the other hand, may weaken the set to an extent where it could not give enough volume on interstate or overseas reception; (2) we can

leave the receiver without inverse feedback for normal listening and only put in feedback for tone control. Simple condensers between plate and grid of the output valve will do the trick in connection with a switch or variable resistor, and the effect will be much the same as that of the ordinary condenser control across the speaker terminals; (3) Making use of tapped volume controls, we can arrange things so that feedback and, with it, bass-boosting increases when the volume is turned down towards the tapping. These are mostly very "simple" circuits, using "only" about a dozen resistors and condensers, apart from the tapped volume control and the selector switch, but they certainly do the job, even making mantel sets sound like consoles—at least according to their makers.

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# THE CHOICE OF I.F. FREQUENCIES

It has become fairly general practice to refer to our present intermediate frequency as 465 Kc. This may not be truly correct, and is really only an indication as to the band. In the very old days it was customary to use 110 Kcs., then

By

J. J. WALKER

In many cases the manufacturers use different frequencies for different states. For example, it may be found that in Melbourne 455 Kc. is preferred, but in Brisbane this may tend to put a whistle on some local station, due to interference between some second spot and a harmonic, or on a station operating on twice the frequency of the intermediate channel. So the sets which go on the Brisbane market may have a different i.f. frequency from those which go to Melbourne, even in the same model of the same brand.

Likewise the home-built set may be aligned to 455 Kc. or any other frequency between about 440 and 475 Kc. Most i.f. transformers at present on the market have this amount of range in their trimmers. Likewise the padder will take care

of the tracking within reasonable limits.

In Melbourne the preferred frequency seems to be 455 and it is not advisable to use 465, as this tends to put a whistle on 3UZ, which operates on twice this frequency, viz. 930 Kc. In Sydney the frequency to avoid is 475 as this may put a whistle on 2UE. Up Rockhampton way they dodge 455 Kc. because 4RK operates on 910 Kc.

When working on a commercial receiver and you are not sure of the correct i.f. frequency it is well to use the dial calibrations as a guide. If the padder peak puts the dial calibration out at the low frequency end of the dial it is a fair indication that you have not aligned the i.f.'s to their correct frequency.

came the "modern" superhets of 1932 with their intermediate somewhere around 175 Kc. A few years later there was a drift towards the use of higher intermediate frequencies, and the popular band became the 465 Kc. band, not necessarily exactly 465, but somewhere around that mark, generally between 425 and 500 Kc. anyway. The use of the term 465 seems to have lead to considerable confusion in certain circles, and quite recently there has been an attempt by coil makers to get people into the habit of calling it the 455 Kc. band, since that is more generally used.

Recently there appeared in the "Queensland Electrical and Radio World" a list of the intermediate frequencies being used by various radio set manufacturers for their 1946 models, and it reveals how much variation in thought still exists in regard to the best i.f. channel to use.

Several big manufacturers, including Astor, Radiola, Kriesler, S.T.C. and others use 455 Kc., exactly, but there is plenty of variety with some of the others.

Breville use an intermediate frequency of 252 in many of their models, also 452 and 446. H.M.V. use mostly 457.5 Kc. Philips pin their faith to 472.5 Kc. for most models, but they also list some at 468, 469.5, 467.8 and so on.

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# PIMPERNAL RADIOS

As we have read in the overseas despatches of the last few years, the audacity of fiction's "Scarlet Pimpernel" in outwitting the enemy was many times surpassed by the cool bravery of ordinary men and women in the occupied countries of Europe.

One chink in the armour of the Axis' so-called "Fortress Europe" was the method by which the people secretly listened to the B.B.C.'s broadcasts of the true news. For a while, concealment of radio receivers seemed to be sufficient, but eventually more and more ingenuity was required to outwit the Gestapo.

The first day that members of the B.B.C. staff arrived in Holland after the liberation they made an inspection of Philips' electrical factories at Eindhoven. Knowing the pre-war extent of the Philips organisation on the Continent, they were anxious to see for themselves what had been happening in the radio world during the war period.

The most interesting part of the inspection was the display of a collection of ingeniously-made midget radio sets, which told at a glance how the B.B.C. news was received, even in places where the Gestapo had checked most intensely, and where there was no normal electricity supply.

News received on the tiny receivers was soon relayed throughout the underground resistance groups. The designs of many of the sets were devised and made by Philips factory employees at great personal risk under the noses of the Nazis.

Receivers were built into the most innocent-looking containers—cigarette tins, candy boxes, a tin of bath cleanser, a hollowed-out book, a reading lamp, and even a talcum powder shaker.

On the exterior, the reading lamp appeared to be quite ordinary, but a receiver—tuned in on the B.B.C.—had been mounted in the base.

When switched on, only the lamp lit, but after a contact pin was inserted at a certain point the news came through. The set in the baby talcum powder tin was a very deceptive little masquerader. Flex and plugs were hidden in the woven cord of the mother's dressing gown, and the headphones nestled in the knitted bag which ostensibly held baby's rattle. Perhaps the radio which appealed most to Sir William Haley, the B.B.C.'s General Director, and his associates was the one fitted into the hollowed-out prayer book. Placed opposite Psalm No. 8, in which appears the phrase, "To still the enemy," its ironic ingenuity was not overlooked by Englishmen with a flair for dry humour.

It is strange to think that through these tiny radio receivers, exemplifying as they do the stubborn resistance of ordinary folk all over Europe, links were formed one by one to unite these peoples and prepare them for the day of liberation which so inevitably came.

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## CALLING CQ!

By Don Knock, VK2NO

Found myself t'other day in CW QSO on "Twenty" with VK4VR, who turned out to be a very old friend in a new era. L. D. Rickaby and myself met first in 1926, when A2NO, located then at Cremorne, Sydney, was requested by the Navy to permit traffic to go through the Ham station under the call VKQ. Reason was that the Navy outfit of those times couldn't raise a peep in reply from BYC (Pompey) but they could hear A2NO working the G's and what not. The W/T op. they sent over to pound the key (and how) was friend Rickaby, and methinks the virus Hammicus must have infected him thence. "Rick" has been out of navy blue for years now and in the broadcasting business, but having itchy feet he is off now as a brass-pounder with KNILM in the NEI. What's the betting that we don't hear him hamming from there under a PK6 call before long?

\* \* \*

I can't imagine whether there is any green tinge in my make-up or

whether or not maybe a benevolent mien is misconstrued, but I do wish that "Service trained" know-alls wouldn't try to put over their airily "superior" knowledge. Had a phone call from a laddie the other day who started off by asking me my name and callsign! . . . a preliminary "brick" that made me mightily suspicious. Somebody had given him my number and suggested he discuss VHF with me. He gave me an Interstate callsign that isn't listed and that locals in his quoted area haven't heard of (nor him) and started off by telling me that he had "worked more than 250 miles many a time on Six from his QTH." Venturing a query as to what gear he used I was blandly informed it was "a back-to-back pulsing oscillator with a pair of 833's!" Imagine an SE job at a Ham station in this country on any band with a pair of such bottles and then reflect upon lots of things. I am still wondering what in creation a "back-to-back pulsing" outfit really implies. Sounds like a

vicious brand of diathermy to me! Incidentally I don't thank the Ham who passed the phone-caller on to me. Helpful advice to new Hams I am only too pleased to proffer, but I draw the line at the kind of thing quoted.

\* \* \*

Some readers may think I am prejudiced against "Ten" for the reason that there has been little reference lately in these notes, but such is not the case. "Ten" is a welcome relief to the QRM-weary VK who has struggled of late through hours of din on "20", and so far as DX is concerned, "Ten" is certainly a shining light just now. On most evenings G's are workable on phone, sometimes at strong signal levels, and if predictions are borne out this kind of thing will be happening on "Ten" up to somewhat past 1948, when the sun-spot maxima of the present cycle is reached. Unusual conditions are in evidence on "Ten" in the early evening hours in Eastern Australia just now, G's, ZL's, J's, XZ's, etc., all being heard together. It is noticed that when these conditions prevail, beam arrays are likely to do queer things regarding direction of reception from distant points. Signals will often arrive from a totally different direction to the great circle route, due no doubt to ionised cloud layers doing a bit of reflecting somewhere.

\* \* \*

The "40" metre band is more like its old pre-war self now with the extra breathing space extending from 7000 to 7200 kcs., but there is still a feeling of being "sold

(Continued on next page)

### FINE ENGLISH "HAM" MAGAZINE

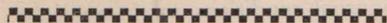
Heard a very old friend and old timer to boot on the 28 mcs. band with R7 phone t'other evening in the shape of L. H. Thomas (G6QB). G6QB is one of the original G6 Hams who started up in the 1923 era along with yours truly (who was in those post World War I days G6XG). In this second upheaval he came out of it with R.A.F. honours in the shape of an MBE. Now he is assistant editor on that "super" G Ham publication "Shortwave Magazine," edited in fine style by Austin Forsyth

(G6FO), who is also ex-R.A.F. and a recipient of the OBE. Between them, these two Ham scribes will give, and are giving, the G boys something well worth reading each month, and I make a serious suggestion that interested VK's can't do better than send a subscription along to 49 Victoria St., London, SW1, especially if you want the "low-down" on VHF doings in Britain and the Continent. Incidentally, what G6QB doesn't know about QRP DX rigs isn't worth knowing!

short" by the broadcasting authorities who still keep their programmes on the go in the region extending to 7300 kcs. Why? Opinion of this writer is that very few overseas SWL's take much notice of broadcasters around 7 mcs. . . . the natural thing is to look for them on "30" or "25" metres. When one considers that originally the Hams had the "30 metre" region (G2-NM started the first Empire Broadcasting Service there) and then lost it to the BC people; having to move to "40" . . . it goes vastly against the grain to find the BC people hogging things everywhere. Broadcasting is important . . . Ham radio can be equally important . . . in the interests of world Peace.

\* \* \*

As for "Twenty," that Mecca of hopeful DX aspirants! The poor old band seems to be the objective of all and sundry with a flair for "Handles." "Kay Someone Please," "Take it away" and "Okay about my sigs being okay over there." until the wraith of QST's OM must stir uneasily and mutter dark things about the degeneracy of microphone technique in general. Things are back where they were in 1938 so far as inanities into mikes are concerned, but the position seems to be amplified weekly, almost daily. It isn't doing Ham radio any good



### HAMS ON THE A.B.C.

That A.B.C. broadcast on the evening of November 11 last, entitled "The Ham," was something with a genuinely "ham" flavour about it, so different to the usual run of BC fare. As a rule, the only thing the professional BC people know about amateur radio is that other brand known as the "Amateur Hour," but in this A.B.C. play, the influence of an Australian oldtimer ran strongly through the whole thing. The part of A3BM was played by Howard Kingsley Love himself (now VK3KU), and included scenes from the early days of the R.A.A.F.W.R. "HK" is no mean mike performer, incidentally, and has quite a flair for the dramatic.

## FIRST INTERSTATE QSO ON "SIX"

After a week or so of increasingly unusual ionospheric conditions, the long awaited DX breakthrough on the 50-54 Mcs. band in Australia came with a rush on the evening of Thursday, December 5. At 6.35 p.m. VK3MJ in Melbourne and VK2NO in Sydney made the first contact between Victoria and New South Wales. This was followed rapidly by others as the tempo increased and the Six Metre gang took swift advantage of the conditions offering. Signal strength in most cases was up around the R9 level and the band remained more or less open until 9 p.m. Sydney time. Before the VK3's faded from the receivers at the Sydney end, they could be heard calling VK4's. No doubt contacts between Victoria and Queensland have since eventuated. Sydney stations actively engaged in piling up the DX

QSO's were VK's 2NO, 2WJ, 2AZ, and 2AHF. These got through on that historic evening, whilst Sydney was battered by a terrific electrical storm, so severe that it required a firm will to stay near the antenna systems. Up in the Blue Mountains VK2LZ took part in the fun and glimpses were caught of him in Sydney, calling VK4HR, Brisbane. One listener in Sydney reported hearing a VK7A? on the band. It was all an epic beginning and now the leaders of 50 Mcs. work are expecting the inevitable . . . contact with New Zealand and America through the coming year.

Owing to a typographical error in Stop Press column of last month's issue we credited the QSO to VK-2ND instead of VK2NO. Sorry, Don.—Editor.

among people in Administrative Radio circles who really count either; I, who have always risen to the defence of Amateur Radio in general, have been stumped for a counter recently when certain really important people have gone off pop about the way the average phone hound uses his mike. There are lots of contentious matters that I could delve into in this aspect of the hobby, but for the once I'll skip it. It is always liable, however, to be explosive material for future combustion. Meanwhile the 14 mcs. band is battered around and bewildered by the increasing mass of QRM extant there. It's understood that many ZL's have forsaken the region because of continual and excessive QRM from VK phones. That may be so, but it cuts both ways Om's. You should just hear the wallop from the average ZL CW sig over here at a time the VK CW man would like to get a leg in on the European DX. I do agree, however, at this stage with the Maorilanders about VK phones mixed up with the CW men. It is a state of affairs that can only be straight-

ened out Internationally, and again I say that WIDER BANDS are the only sane and certain answer in future years. Is it asking for the moon to suggest that Amateur Radio should have a band, say from 14 to 15 mcs. (or more), subdivided for telegraphy and speech? Such will never be the case without voluble leaders who will fight; leaders *who can handle a key as well as a mike*, and who are not one-sided about the outlook. Meanwhile, blink the fact as you may, "Twenty" is a first class bedlam and nobody likes to throw in the towel and admit that the QRM situation is too fierce. I have met comparatively news Hams of late who tell me plaintively that they have called for hours with no reply from anybody. To which I answer: "Take heart . . . *that* can happen to the oldest of oldtimers as well as the fledglings."

\* \* \*

Ray Atkinson, of VK6WZ passes on a little "Gen" from his Geraldton QTH. "Work with 6GE keeps me pretty busy and occupied during a long spread of hours, including

## WORKING WITH EX-ARMY GEAR

week-ends, so I don't get a lot of time for Ham radio, but who does? Nevertheless I've been on 28 mcs. with 8 watts to a 807 from 220(?) volt DC mains. I run the receiver from batteries and the same 6 volt accumulator is used for receiver and transmitter heaters. Best I've done so far is to work VU in one direction and ZL in the other. I hear 'em but can't always work 'em. (How true that is of Ten.—D.B.K.) Antenna is but a half-wave doublet fed with pre-war Belling-Lee cable and is barely 26 feet above ground, and in a hollow at that. Ground level at the "top" of the plot is almost level with the rear verandah roof, the neighbour's BCL aerials, trees, takstands and sundry other anti-Ham paraphernalia littered about the landscape."

Now a little from Cliff Gold, VK4CG, about the RX he uses for seeking DX. "It is known as the 4CG Super . . . not that it is anything special, or that it is an outstanding design. It is an improvement on the 1934 Jones Super-Gainer. The RF stage is separately tuned and uses a 6D6. Mixer is a 6L7 with potentiometer-controlled regeneration and 6D6 oscillator cathode injection to the Mixer. There is a crystal filter stage at 465 kcs., using an 1853 and 2nd

### DENMARK CALLING

Here's a request for SWL and Ham co-operation by the Danish Shortwave Club, Pilestraede 35 Copenhagen. This Club will be pleased to arrange with any reader willing to undertake the service of the monthly airmailing of a shortwave report dealing with broadcasting, and also Ham activity on "20," "40" and "80" metres in the respective countries. The request comes from Mr. Lund-Johansen at the address quoted and anybody responding should supply a list of addresses of Sw clubs in this country (also N.Z.). A list of members interested in corresponding with Danish observers would also be appropriate.

Many of the gang have acquired FS6 ex-Army transceivers (4 to 6 mcs.) and are using them, with a little tinkering around, mainly on "40". For the benefit of those interested, here is a little "gen" from Mr. A. Keightley, of Wickopin, Westralia. First the receiver . . . the oscillator slug is screwed out 2 turns and the aerial slug three turns. This brings "40" in comfortably at the high end of the tuning range. A 7 inch length of wire is soldered to the plate lug of the first I.F. valve and run straight up and anchored to a spacing stud. This wire introduces a degree of feedback and improves receiver performance 20 per cent without instability. In the transmitter there are three fixed trimmer condensers in shunt, mounted across the VFO tuning condenser. These three are removed and the "40 metre" band centred at "5.8 plus 2" mcs. on the dial. Thanks, Westralia, undoubtedly the tips will be handy for some of the boys.

IF with a 6D6. Contrary to usual practice the second detector is a grid leak affair for high sensitivity followed by the usual 6V6 audio and 76 Beat Oscillator. To the expert eye it may look a haywire layout, but I have never handled a better receiver, including certain American commercials. What's more, this receiver really performs at 6 metres as VK's 4AW and 4RY will vouch. My frequency on "Six" for those interested, is 51,600 kcs." Alright, OM, I hope we shall be hearing from you in N.S.W.!

\* \* \*  
VK4GZ, Mr. E. M. Waddle, of Charters Towers, Queensland, sends along comment on his experiences with home-constructed RX's. "The RX I use was made in the days when 1600 kcs. IFT's weren't available, and, desiring image-free operation at 28 mcs., a converter

Another tip about ex-army gear. Dr. T. G. Hewitt, of Lismore, N.S.W., passes on some suggestions about the Class C Wavemeter. Two have been built up for VFO's, one using a 6V6GT as a buffer with RFC in the plate lead, and it works well at any frequency covered by the Meter. Another has the 6J8G changed for a triode and this works into a 6V6GT from "160" to "80." A 6L6G follows to take care of "80," "40," "20," and "10" by switching, and the coil is tapped for correct adjustments so that there is no need to touch the plate tuning condenser when changing bands. There is sufficient output to drive an 807 buffer before an 809 on "Ten."

In our November issue, Bob Richardson (VK3ZP) offered assistance to those re-building the FS6. He has been overcome by letters and cannot handle them all, but is preparing an article on the subject, which we hope to publish shortly.—Editor.

had to be made for use with a BC RX. I started off with an RF stage, Det., and Osc., using 6K7, 6J8, and 6K7, but this was a poor performer at 28 mcs., although fair at 14 mcs. A Converter was tried with two RF stages using 1852's, and EK2 mixer with 6J5 osc., but due to my ignorance of the way to use 1852's, the job was scrapped. What influenced the scrapping was the acquisition of some 9003 tubes. These were used in all four stages and they were certainly "the goods" on 28 mcs. Sockets were not procurable (they still aren't—D.B.K.), so I made my own from scrap Perspex. Coil Q was not too good, as the coils were too long for the diameter, being on 5/8-inch formers. With decoupling resistors in all plate and screen leads there was no

*(Continued on next page)*

instability with the RF stages. At last I had the ideal Ham RX, but alas, not for long. Two of the 9003's developed internal shorts, possibly because I had mounted them horizontally (doubtful cause —D.B.K.), and by now I was fed up with Ham radio and ready to give it away. Then I was able to buy some "acorns", and this meant another rebuild for the Converter. Line-up now is 954 RF (full gain) 956 variable gain RF, 954 mixer, 954 osc., and conversion to 1600 kcs. into a receiver using 6K7 RF, ECH35 Mixer/osc., 2 low gain 6K7 I.F. stages, 1 high gain 6K7 I.F. stage, 6H6 detector/noise silencer, 6SJ7 audio driving 6L6 output to speaker, and the BFO is a 6J5. (Quite a combination — D.B.K.) The noise silencer is fairly effective and renders reception possible in this main street location where without it car QRM is solid. Two power packs are used, one for the converter and one for the receiver. You might consider that

## BWARE -- CO-AXIAL CONNECTORS

Beware coaxial cable connectors! Are *you* by any chance one of the harrassed hams who for weeks past has wondered why his carefully installed coaxial feedline doesn't seem to give consistent performance? Listen, then to a tale of woe, and the solution of a problem. For some time a length of coaxial 52 ohm cable has been used to feed the 50 mcs. ground-plane antenna at VK2NO, and on many occasions stations in good optical range have reported that the signal level appeared to be down. Only visual indication of possible trouble appeared to be a slight difference in loading on the P-P 800 final stage, and that the fieldmeter revealed a slight drop in antenna output. After a lot of pate-scratching, the trouble was traced to the nice looking silver-plated screw-in coaxial connec-

tor and socket, and was detected by a just audible sizzling noise inside the socket. Disconnecting both socket and connector from line and transmitter, a test showed a DC resistance of 1500 ohms between inner and outer. No brother . . . the insulation material is not (ostensibly) moulded "goo", but if it isn't one of the polystyrene family, it certainly *looks* like it. It is a clear plastic moulding centring the inner conductor, but just what on earth it is made of is your guess as much as mine! I had this kind of thing happen before with connectors fitted with a yellowish insulation material. Sufficient to say that, from now on, these ex-Disposals connectors have no place in the shack at VK2NO. What impresses me is how much loss there must have been in Radar applications, with kilowatts of megacyclic energy being pulsed along the cable. Or perhaps it wouldn't matter . . . with power to spare?

### MAST AVAILABLE

In these days of scarce timber, acquisition of a sturdy "stick" is a bit of a problem, especially for those (and they are numerous) who have plans for rotaries. It's a case of first come first served where bargains are concerned, so the reader of these lines with a want for the item referred to who gets in first, will be the winner. An oldtime Ham on the Northern side of Sydney's harbour paid, some years ago, £100 for the erection of an 80-footer in sections, starting off with a 6 by 6 inch base. The years have progressed, and this O.T. has no use for the mast, which is well coated with layers of white paint, and provided with all the necessary steel guys, insulators, halyards, etc. it has been taken down and now lies awaiting removal from his garden. No reasonable offer will be refused by Ray Allsop (VK2AYG), whose QTH is 30 Trafalgar Ave., Roseville, N.S.W. Purchaser will need to make his own arrangements for removal.

with this tube line-up noise level is high, but such is not the case. All weak signals are received on speaker with volume just "On." On 14 mcs. I use a doublet antenna with a 3 stage rig and under 50 watts to the 809 final. The rig is keyed by relays, simultaneously opening the cathodes of the "acorns," and switching the twisted pair from RX to TX.

Thanks, VK4GZ . . . any other Hams with similar comment of interest?

\* \* \*

I am surprised to note that the B.B.C. report on FM as published in overseas magazines, contains a statement that in one important respect, the wrong thing has been done, but that it is too late to rectify it. The question concerns that of vertical versus horizontal antenna polarisation at 90 mcs.; the new channel to be used for FM broadcasting. Comparisons were made with the pre-war Television

service around 43 mcs., which have always been via vertically polarised all-round radiating systems from Alexandra Palace, London. Simplicity of receiver aerial installation is one advantage of the vertical consideration, but the serious snag is that of increased electrical interference from home appliances and particularly car ignition systems. The tests made recently on FM with horizontal polarisation show many advantages, but the report says in effect that vertical polarisation will of necessity have to be retained and that all that can be done about the QRM situation is to suppress it at the source. Seems to me that erection of alternative radiating systems shouldn't be such a vast obstacle as all that. There is a good point about it that the result may be legislation to compel the suppression of vehicle QRM. That should be easy enough . . . it was done in most, if not all, Service vehicles in wartime.

## HAM NOTES

(Continued)

VK2OC at Wyong, N.S.W., has now worked with quite a few Sydney stations, including VK's 2WJ, 2AZ and 2NO with the Wyong replies cross-band on "80." He has heard VK's 2AFO, 2LZ, 2ABC and 2AHF, so things are looking up. The Sydney men all look forward to the time when Owen gets going on his planned 834's in PP on "Six."

\* \* \*

In October QST there is a small reference in Ed Tilton's "The World Above 50 mcs.", to an occurrence which might be the harbinger of things to come. It says that W5LIU at Fort Worth, Texas, has been hearing the Sydney Airport Beacon SY on 34 mcs. Many W's are on the lookout for the Australian air Beacons as a possible guide to the MUF conditions. Will some W please supply us in VK with a list of American beacon call-signs, especially on the Pacific Coast and in the Hawaiian Islands?

As this is written there is a possibility that VK's 2WJ and 2AZ have been hearing one or two Brisbane 6 metre men on phone, but times have yet to be checked. 2AZ says he positively heard the "VK4" part of a call sign.

\* \* \*

That staunch adherent of the 28 mcs. band from times immemorial, "Arch" Cox of VK2GU, Canberra, A.C.T., has, of all things, gone almost to the other extreme and appeared on "Forty." His phone in Sydney is usually R Max with the typical 2GU quality. VK2GU gives his reasons for the appearance on this band as the satisfaction of a yen to have a word with the gang nearer home. Naturally he seldom if ever hears VK's on "Ten." No, VK2GU is NOT using QRO on "Forty" . . . merely a pair of 807's in the final with 30 watts thereon. Nobody has done more since the guns ceased bellowing and the atom

bombs busting to get the VK back on at least his pre-war bands than VK2GU. Being a keen Ham and moving in Parliamentary circles in his daily life, it was inevitable that somebody, sooner or later, would hear his expressed views in the places where it does most good.

\* \* \*

A point about EF50 sockets. Those ex-Admiralty types are the "berries", but there is a slight snag with a locally manufactured wafer type. It is necessary to file out slightly the locator key-way in the centre-hole, so that the valve may be "snicked" into contact clockwise after insertion. It's easily done with a small warding file. Reason is because some EF50 valves have no piece cut from the key to take the "locktal" feature into consideration and that is important with the sockets referred to. The Admiralty (and ceramic) types are OK to just *push* the valve into position.

After looking at that picture of "A.G.H." doing a spot of roofing on the new QTH for "A.R.W.", I have arrived at the conclusion that he chose that pip of a location with an objective in mind that he hasn't yet mentioned. Looks to me a cinch for V-H-F working with places in and around Yarraside! If Melbourne V-H-F men don't hear a Signal-plus on 50 and 166 mcs. some day from that QTH, I'm a poor guesser!

Anyway, V-H-F really runs in the blood of the family and time will tell.

\* \* \*

Most excited man in Sydney VHF circles on Sunday November 24 last was Bill Bardin, VK2ABZ of Dundas, N.S.W., who unexpectedly made a 100 per cent contact on 166 mcs. with mobile VK-2KI, at the time in the vicinity of Bowral. 2ABZ is a "sticker", and has a collection of antennae for 166 mcs. that varies from cocky little ground-planes to folded dipoles and "Yagi's." I'm not sure that he has

## NEWCASTLE STATIONS

### REACH VK2OC ON

### "SIX"

Following on the success of the 50 mcs. channel to VK-2OC (Wyong) from VK-2NO and 2WJ (Sydney) some definite results are now being obtained as a result of efforts by two stations in the other direction.

Owen Chapman is now able to hear VK2KQ (Toronto) and VK2BZ (Newcastle) at good strength. Both positions are screened from the Wyong location, particularly in the case of VK2BZ. An interesting point is that it is since ground-plane type antenna have been installed at all these stations that signals have appeared on the dials. It cannot be long now before Newcastle and Sydney are able to work with each other on "Six", as was done on "Five" in pre-war times.

—VK2NO.

not got a four element "Bruce" tucked away somewhere. For months he could be heard struggling to get his signal "out" to the distant points, and his efforts certainly deserved success.

There have been a few weird signals audible at odd nights on "Six" in Sydney, and in two instances a station, obviously "self-excited" and with a badly FM'd carrier, replied to calls from VK-2WJ. Beyond the fact that John could tell that the station was answering him, nothing could be made out as to who it could be. Appeals to the station to identify itself by MCW brought no action, so if this has been "DX" it has passed unconfirmed. There should be more use of MCW and CW by stations. It's easy enough to key the carrier with the call sign at intervals, even whilst indulging in a phone QSO.

—D.B.K.

# AUSTRALIAN BROADCASTING STATIONS

(Arranged in order of frequency)

The following is the latest complete list of all the Australian broadcasting stations, including all commercial, national and relay stations.

2CR	550	545	Cumnock	4VL	920	326	Charleville	4AK	1220	246	Oakey
6WA	560	536	Wagin	3UZ	930	323	Melbourne	2NC	1230	244	Hunter River
3WV	580	517	Dooen	4QR	940	319	Brisbane	3TR	1240	242	Sale
7ZL	600	500	Hobart	2UE	950	316	Sydney	6IX	1240	242	Perth
2FC	610	492	Sydney	5DN	960	313	Adelaide	3SR	1260	238	Shepparton
3AR	620	484	Melbourne	3BO	970	309	Bendigo	2SM	1270	236	Sydney
4QN	630	476	Clevedon	4AY	970	309	Ayr	3AW	1280	234	Melbourne
5CK	640	469	Crystal Brook	2KM	980	306	Kempsey	4BK	1290	233	Brisbane
2DU	660	455	Dubbo	6AM	990	306	Northam	2TM	1300	231	Tamworth
7BU	660	455	Burnie	2GZ	990	303	Orange	5AD	1310	229	Adelaide
2CO	670	448	Corowa	4MB	1000	300	Maryborough	3BA	1320	227	Ballarat
2HR	680	441	Lochinvar	4CA	1000	300	Cairns	6KY	1320	227	Perth
4AT	680	441	Atherton	7EX	1000	300	Launceston	3SH	1330	226	Swan Hill
7QT	680	441	Queenstown	3HA	1010	297	Hamilton	4BU	1330	226	Bundaberg
6WF	690	435	Perth	2KY	1020	294	Sydney	2LF	1340	224	Young
2NR	700	429	Lawrence	3DB	1030	291	Melbourne	6TZ	1340	224	Dardanup
7NT	710	423	Kelso	5PI	1040	288	Crystal Brook	3GL	1350	222	Geelong
6GF	720	417	Kalgoorlie	2CA	1050	286	Canberra	4GY	1350	222	Gympie
5CL	730	411	Adelaide	4SB	1060	283	Kingaroy	3MA	1360	221	Mildura
2BL	740	405	Sydney	2RG	1070	280	Griffiths	2MO	1370	219	Gunnedah
4QS	760	395	Dalby	6WB	1070	280	Katanning	5SE	1370	219	Mt. Gambier
3LO	770	390	Me'bourne	2LT	1080	278	Lithgow	6GE	1370	219	Geraldton
2KA	780	305	Katoomba	4RO	1080	278	Rockhampton	4BH	1380	217	Brisbane
4TO	780	305	Townsville	7HT	1080	278	Hobart	2GN	1390	216	Goulburn
6WN	790	380	Perth	3LK	1090	275	Lubeck	4MK	1390	216	Mackay
2BH	790	380	Broken Hill	4LG	1100	273	Longreach	2PK	1400	214	Parkes
4QG	800	375	Brisbane	7LA	1100	273	Launceston	5AU	1400	214	Port Augusta
5RM	810	370	Renmark	6MD	1100	273	Merredin	2KO	1410	213	Newcastle
2NA	820	366	Newcastle	2UW	1110	270	Sydney	3XY	1420	211	Melbourne
6GN	820	366	Geraldton	4BC	1120	268	Brisbane	2WL	1430	210	Wollongong
3GI	830	361	Sale	2AD	1130	265	Armidale	2QN	1440	208	Deniliquin
2CY	850	353	Canberra	3CS	1130	265	Colac	4IP	1440	208	Ipswich
4GR	860	349	Toowoomba	6PM	1130	265	Perth	2MG	1450	207	Mudgee
7HQ	860	349	Hobart	2HD	1140	263	Newcastle	7DY	1450	207	Derby
2GB	870	345	Sydney	2WG	1150	261	Wagga	2CK	1460	205	Cessnock
3UL	880	341	Warragul	7ZR	1160	259	Hobart	5MU	1460	205	Murray Bge
4WK	880	341	Warwick	2NZ	1170	256	Inverell	2MW	1470	204	Murwillumbah
6PR	880	341	Perth	3KZ	1180	254	Melbourne	3CV	1470	204	Maryborough
5AN	890	337	Adelaide	2CH	1190	252	Sydney	2AY	1480	203	A'bury
2LM	900	333	Lismore	5KA	1200	250	Adelaide	2BE	1490	201	Bega
7AD	900	333	Devonport	2GF	1210	248	Grafton	4ZR	1490	201	Roma
4RK	910	330	Rockhampton	3YB	1210	248	Warrnambool	2BS	1500	200	Bathurst
2XL	920	326	Cooma	6KG	1210	248	Kalgoorlie	3AK	1500	200	Melbourne

It will be noticed that in several cases the same frequency is shared by two or three stations.

# Ham Bands Almost Completely Restored

To the accompaniment of a certain amount of confusion and uncertainty, the week ending Saturday, November 16th, was ushered in as a turning point for Australian Amateur Radio. The popular bands "came back" . . . not in their entirety, as "Forty" still has 100 Kc/s lopped off it, but "Twenty" is now where it was in pre-1939 days. First indication of the news came on the Saturday night (in Sydney) when on "Forty" a VK3, VK3QC, was heard well outside the hitherto restricted 50 Kc/s region, using phone and broadcasting what purported to be an official message to the effect that as from midnight on the Friday, the bands were 7000 to 7200 Kc/s and 14,000 to 14,400 Kc/s. This broadcast was repeated several times with a request that it be forwarded to all States.

In ones and twos the boys began to shift out of that sardine-tin in the middle of "Forty," some with confidence (especially the VK3's) and others with trepidation that all might not be well. Eventually the feeling arose . . . "one in all in" . . . and nobody could really be blamed if there had been an error.

The following morning in Sydney was noteworthy for a still persistent atmosphere of uncertainty and it wasn't helped any when the official VK2WI broadcast at 1100 hours virtually threw cold water on the news. NSW division of WIA

had tried by every means to get some official news from VK3, but at that time nothing was to hand. After the broadcast, comments from country (and town) VK's were wide and varied, but the tension was finally relieved at 1153 hours when VK2WI again appeared on the air on "Forty" and this time cleared it.

It seems that in the meantime official news had been received by telephone. The whole thing arose from the fact that after certain questions asked of the PMG in Parliament on the Friday, decisions had been made; the Director-General of P and T had affixed his signature, but, of course, public servants are entitled to a week-end's rest as well

as Hams. So silence descended.

The story has it that a well-known Canberra Ham went and looked up Hansard, and started the balloon rising. He told a VK3 who rang the PMG monitoring station there, and they said, "OK. Go ahead" . . . or words to that effect. Then it was "on" with a vengeance, and to try to keep the gang from putting those unused crystals to work on both bands would have been a sheer futility. Thus the bands "came back" and it is believed that the questions and answers business between the probing Member and the PMG were most illuminating.

—D.B.K.

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## DX Working on 166 Mc.

The number of stations now using the 166-170 mcs. allocation in and around Sydney is considerable, in fact, it is such that "Six" has suffered as a result. After the events of Sunday, November 24, 1946, there are likely to be still more stations on this higher band. As a result of a mobile test undertaken by Gil Miles (VK2KI) the band, from 1000 hrs. Sydney time sounded more like "twenty" or "forty". All across the dials of receivers could be heard MCW and phone signals calling VK2KI on

scheduled transmissions. At the time, VK2KI was known to be well down the south coast of N.S.W. in the vicinity of Kiama, and it was not until just after 1100 hrs. that VK2WJ (Maroubra) hooked up with him. VK2KI was then on the Saddleback range, some distance south of Kiama, and reported 2WJ's signal strong and clear at R7. The 1½-watt signal from VK-2KI could be heard at Maroubra around R3. No sign was heard of him at VK2NO, but VK2KI heard VK2NO at R7 for a brief period. Later in the day, 2KI started back toward Sydney and from Bowral held an excellent QSO with VK-2ABZ, of Dundas, Sydney. Stations active on the band during these tests were VK's 2WJ, 2ABZ, 2YE, 2LZ, 2AFO, 2MQ, and 2NO. VK-2MQ is a new arrival in the shape of an old hand with lots of 56 mcs. experience in pre-war days. Distance covered during these South Coast tests was about 65 miles air-line. VK2KI had intended to make for the lighthouse at Pt. Perpendicular (85 miles) but unfortunately broke a car spring on the bad track en route.

—D.B.K.

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## A Test for Valve Stamina

We don't advise anyone to put this story to the test—at least, not until stocks increase—but its authenticity is vouched for by Philips Electrical Industries of Sydney.

Some time ago, off the coast of Holland, the S.S. "Meerkerk" ran foul of a mine and sank. About six weeks after the disaster portion of the cargo was washed ashore, and among the cases was one containing Philips metal-sprayed radio valves.

Eventually, thorough tests showed that although the outside lacquer had suffered from immersion

in sea water, the valves still functioned perfectly.

The incident calls to mind the story of another Philips valve washed up at Maroubra after the wreck of the "Belbowrie" in 1938. After merciless battering among the rocks and the surf, the valve was dried, tested, and came through with an A1 pass.

Although Philips assure us that they're not in the habit of shipwrecking valves to test their strength, they are rather proud of these examples of durability and robust construction.



# Sentinels OF BETTER RADIO

Whether you build radios by the thousand, service them by the hundred, or make sets as a hobby, Better Radio is very much your business. As a manufacturer, you are helping yourself to goodwill by fitting Philips valves in your sets. As a service man with an eye on the future, you find that Philips valves are your finest possible introductions to satisfied customers. If you are a "ham," you need Philips valves just as much as the factory executive or the dealer just around the corner.

There is a Philips Valve for every socket of any receiver.



## PHILIPS VALVES

PHILIPS ELECTRICAL INDUSTRIES OF AUSTRALIA PTY. LTD.  
SYDNEY — MELBOURNE — ADELAIDE — PERTH — BRISBANE

# Short-Wave Listening

There are SWL's with a flair for meticulous and careful observation of amateur transmissions, and from whom detailed reports are welcomed by the Ham worth his salt. It's a safe bet that when an SWL with plenty of experience, like Ted Buchester, Q'ld, puts his pen to paper, something of interest results. Of my remarks recently about VK's who scorn SWL reports, he writes at length:

"I can recall sending a report to a VK7, a most helpful bit of gen. by the way, and he told me to let it be known he *did not* QSL to listeners. He was playing recordings (now I am aware how you chaps hated these guys), and the modulation was 100 p.c. and honestly 5 and 9. If I hear a 'Ham' calling C.Q., and his sig. is, say, R8 or 9 at this location and he eventually has a contact, and the other man gives him a poor report, and the said 'Ham' talks of dragging the antenna down or something like that, it annoys me not to be able to give him a buzz. I do the next best thing and drop him a line, not asking for a card, but a reply, and I have not missed on that yet. I am using an ordinary 6-tube Super, 1-stage R.F., and have tried a few antennas, but am doing quite well with one of those V types as in ARRL Handbook, 1945. Have not concentrated on normal short-wave stations, but like the 'Hams' best as yet. I have only two verifications from overseas amateurs, namely W11CY and XE-2FC. These were pre-war. My oldest veris are from KSL and KGU, 1935, and I can recall three very outstanding signals heard here pre-war, i.e., W6CQS, W5BKY and K6BNR. I seem to hear more VK3's and 5's here. VK3TW puts in a fine signal most consistently. PK-6AW comes through here quite well, also a few South Americans, but G's are very scarce. I am learning C.W. now, and am definitely going on the air in the near future. Am just out of the R.A.A.F. (served by "sentence" of 5 years 4 months) and me and quite a few

'Hams' in same. It appeared the 'Hams' and the Air Force did not hit it too well re ideas, but the 'Ham' won in the end. Would like very much to purchase a Call Book."

Mr. Buchester's log of amateur stations for August last is shown here for the benefit of overseas readers. Re the VK call book: It is understood that 2/6 to the P.M.G.'s Dept., Wireless Branch, Treasury Gardens, Melbourne, will bring the complete list to the present period. —D.B.K.

Date	Time Rec'd	Station	QRA	WKD	QSA	R
26/8/46	1730	J2ABB	Japan	J9AAR	4	6
"	1742	W6LY	Glendale, Calif.	K6	5	6.8
"	1810	W6MOY	California	W7HOL	5	6.7
"	2110	VK7AB	Tasmania	VK4KS	5	9
"	2112	W3POZ	New Jersey	J9AAB	4	6
"	2114	PK6AW	Biak Is., New Guinea	W2BXA	5	8
"	2119	VP9F	Bermuda	G	5	5.6
"	2130	W1CCZ	South Australia	W5KWM	5	8
"	2140	VK5BF	Hamilton, Vic.	CQ	5	9+
"	2146	VK3TW	Missouri	W1CCZ	5	9+
27/8/46	1510	WOTQK	Eagle Rock	W7FPY	5	R.6
"	1645	W6PDB	San Jose	VK2AGM	5	9
"	1700	W6MOV	Hawaiian Islands	KH6CC	5	7
"	1725	K86VX	Vancouver	K6RVO	5	6
"	1729	VE7OT	Guam Is.	VK4JU	5	8
"	1800	(called only)	Suva, Fiji	W7ABQ	5	7
"	1807	W6UDF	Elmsford, N.Y.	J9LG	5	7.8
"	1835	VR2JI	Guam Is.	VR2JI	5	6-8
"	1852	W2AQK	Marshall Is.	W6RUL	5	7-8
"	1856	W8WHW	(14280kc)	CQ	5	5-6
"	1859	J9LG	Suva, Fiji.	W6AH	5	7-8
"	1904	VR2JI	California	J9LG	5	6-8
"	1910	W6AH	Costa Rica	W6AH	5	6-7
"	1917	T12OA	Portable K2, Japan	W6BTD	5	6-8
"	2010	W4FGW	Rochester, N.Y.	PK6AW	5	6-7
"	2014	W2QCP	—	CISU	4	5-6
"	2017	W9WJN	—	W5RDE	5	6
"	2020	W3HKY	Philadelphia	VK4KW	5	7
"	2025	W3TH	Hamburg, New York	VK2MG	5	6-8
"	2025	W2RM	Kentucky	CQ	5	7
"	2015	W4GAQ	(J9), Marshall Is.	W3GKJ	4	6-7
28/8/46	1713	W9OTK	Hawaiian Is.	W5SKE	5	8
"	1718	K6BHL	Melbourne	Testing	5	*9+
"	1720	VK3YH	Lima, Peru	W6OCA	5	8-9
"	1735	OA4BE	San Diego	J9LG	5	7
29/8/46	1530	W6FGU	British Columbia	KA1AB	5	8
18/8/46	1700	VE7ZM	Singapore	VK2DP	5	9
16/8/46	1940	VS1BV	Nebraska	KA6BX	4	5-6
21/8/46	1600	W2OWQ	Marshall Is.	W6ANN	5	7-8
"	1605	J9LG	Costa Rica	VK3ZL	5	9
"	1900	T12OA	West. Australia	VS1BV	4	6
"	1912	VK6RU	Athens, Greece	WOFN1	5	7
23/8/46	1510	XAAP	Lima, Peru	W5YF	5	8
"	1512	OA4M	Germany	W4	4	5-6
"	1540	D4NAX	Cambridge	W6ANN	5	6
"	1543	G2PU	Washington	G2PU	5	5-6
"	1548	W7EHQ	California	VK2ABD	5	7
"	1610	W6UNA	Iceland	W1BCR	5	8
"	1705	W9CAC	San Pedro	W9CAC	5	7
"	1716	W6ANN	Winnipeg	VK3	4	5-6
"	1835	VE4AC	Tokio (14295kc)	Test. only	5	8
"	1850	J2SJB	Aleutian Is.	CQ	5	7-8
"	1854	W7ELJ	Marshall Is. (P.J9)	W6UYV	5	7
"	1857	W9OTK	Manila	J2AAF	5	8
"	1900	KA1AK	Tokio, Japan	W6UYV	5	6-7
"	1912	J2SJB	Biak Is., Dutch N.G.	XE1AP	5	7-8
"	2105	PK6AW	—, Mass.	PK6AW	5	6
"	2110	W11AS	Biak Is., Dutch N.G.	W4AIT	5	8
"	2130	PK6AW	Norway	Called CQ	5	7
24/8/46	1505	LAIF	Frankfurt, G.	W3	4	5
"	1512	D4ANL	San Antonia	W3LAC	5	8-9
25/8/46	1615	W5PTL	Mass.	W6	4	5-6
			North Texas	VK4JP	5	8-9

## NOTES FROM MY DIARY

1947 . . . WHAT HAVE YOU?

First of all let me say my good wishes for the Festive Season were frozen out of December issue on account of pressure on space, but I hasten now to say "thank you very much" to all those fine reporters who, during the year, have rushed along the results of their loggings, thus enabling those indulging in this great hobby of DX-ing to reap the benefit of their finds. And amongst the reporters referred to I include and thank Miss Sanderson for her splendid contributions. This lady has shown that she can "bat" with the rest and her carefully and correctly typed lists are a treat to read. But there must be many readers of these columns who hear changes of frequencies or schedules that may be given at the very time the Gilletts, Cushens, Gadens, Edels, Suffolks, Whitings, Halletts, Legges, Boords, Sandersons and the many other regulars are not on that particular station, and I would like those readers to send in some reports. Please do not hesitate . . . don't be frightened . . . SEND THEM IN. Let this be one of the things 1947 has for us. What the technical side has I do not know, but I'll wager our good friends Mr. Hull and Don Knock will be watching. However, even at the risk of being considered "catty," I must tell our friends in the other states, we have the first television receiving set in Australia on display in Sydney.

Well, here's wishing all readers of these pages the very best and whatever you hope 1947 may have for you may it happen.

## WITH THE BBC TWENTY-FOUR YEARS AGO

Yes, it is just over 24 years since the first BBC programme went on the air. On November 14, 1922, British broadcasting under the control of the Broadcasting Committee began—the declaration of the polls in the General Election was the first broadcast—and the initials BBC began to penetrate the national consciousness. On December 15, the British Broadcasting Company Limited was formally registered with a Board of Directors drawn from the General Electric Company, Marconi's, the Radio Communication Company, Metropolitan Vickers, British Thomson-Houston, and Western Electric, and the late Lord Gainsford was appointed the first chairman.

## HERE'S HOPING

The Bob Hope family increased 50 per cent recently with the adoption of William Francis (Kelly) Hope and Honora (Nora) Hope, both less than one year old, from the Cradle at Evanston, Ill. The Hopes have two other Cradle babies—Linda, age 7, and Anthony, age 6. Well, that's a very fine gesture, and we wish them all the best of luck.

## KEEPING COUNTRY AFOOT

Red Skelton says, "It's the radio comedians that keep the nation on its feet—every time they tell an old joke, thousands of people get up and turn the radio off."

## THE SIX PIPS

The man who originated that famous feature of the BBC programmes, the six-pip time signal, has received the Gold Medal of the British Horological Institute. The medal is open to world competition. He is Mr. Frank Hope-Jones, a man who came from the North of England to London five years ago. The signal has been adopted by many foreign countries.

The award seems not to have been made with undue haste, for the BBC time signal has been regularly used for over twenty years. It is, of course, an electrical device, but on one occasion years ago the apparatus was mislaid, and an engineer improvised the "pips" with a hammer and a piece of wire. No one noticed anything wrong.

—"London Calling"

## SAYS WHO?

Miss Sanderson, of Malvern, Victoria, writes:

I have been hearing the AFRS station at Amoy. It was 8.15 p.m. and the programme was very easily copied, the noise level is very high, so together with morse it is very hard to hear what is going on at times. I have heard another Chinese station, XOPD, in the 31m. band, at a very good level, the freq. was 9.55 mcs. and the programme typically Chinese, and the time was 10 p.m. Call sign was given in English. 41 metres is improving in strength and some quite good signals are heard as early as 9 p.m., when Hanoi on 7.26 mcs. or 41.32 m. gives news in English and a commentary, prior to this time the broadcast is in French. VUM and VUB2 are heard in English news and local news on the respective frequencies of 41.25 m. or 7.27 mcs and 41.44 m or 7.24 mcs.

With regard to early morning listening, this has been very good. I have heard quite a number of stations from Europe and Allied countries. Captown No. 3 is heard at 6.30 a.m. in a programme of news and music at quite a fair signal for this part of the band. Bulgaria, Brazil, in 31 m. and 30 m. with good signals, and Sweden heard on Sundays at 5 p.m. with its English lesson and later a church service at 8 p.m. I have recently heard from a DX-er in Sweden, and he has sent on two very in-

teresting magazines which contain the broadcast and shortwave schedules. I have sent on some of our magazines (Radio) for his perusal. This young man is a student and writes very good English.

I have had a verification from Radio Andorra, and CBFZ and schedules from Burma Broadcasting Service. These are very useful and I am very pleased to receive them. I am still finding Universalite very handy, and have sent off a report to Mr. Howe and also to Mr. Boord. I trust that these gentlemen will find them of interest.

\* \* \*

Arthur Cushen, of Invercargill, sends another most interesting budget:

Two interesting veries received yesterday: KOFA, Salzburg, Austria, a station of the Armed Forces Radio Service, uses 750 watts on 7220 kcs., and heard to 8.15 a.m. last May, signed off at that time. They have a new card, shows map of Austria, mats from Salzburg, and is signed by Martin S. Bloom, Station Engineer. The other was a card from XTPA, Canton, China, operated by Canton Broadcasting Station, has nice white card, with green bands, calls in green on big letters in background, with details of veri. information in both Chinese and English, signed by S. S. Lee, Director. XTPA is very good every night on 11650 kcs.

I'm at present trying to get some details on a very interesting station, French operated on 6010 kcs., heard as early as 4 p.m., has news in French at 4.30 p.m. sometimes relays Paris, and other times news from own studio, news on German happening) then goes into modern dance numbers, French and German vocal, yodel numbers, etc., gives call at 5 p.m., as "Radio Ruhr" in German, no location mentioned, station fades out at 6 p.m. Signal peaks at 4.30 p.m. Berlin or Russian operated station in Germany, terrific signal here, heard at 4 p.m. and later, sometimes relays LBIPZIG (9720), XEOI,

6018, Mexico City, heard between these two, the latter signs off at 4.30 p.m. with "Sunrise Serenade."

Some other written include EPB, Teheran, 15100 kcs., news 9.30 p.m.; Bandoeng, 9.30 p.m., Eng. announcements, 7995 kcs.; RADIO SOFIA, 7660 kcs., heard poorly at 5.30 a.m. Veri. received two weeks ago from "RADIO RODINA", Sofia, Bulgaria, using 5000 watts on 9315 kcs., the outlet on 7660 kcs. has 500 watts: sent 7 pages of information and two photos of the station, building, and concert hall. Letter stated mine was first report from New Zealand and expressed the hope that they would not be abusing my kindness by hoping that this would be the beginning of a fruitful collaboration.

\* \* \*

A long and interesting letter from an old DX-er who has just returned to civil life, our friend H. A. Callander, of Tasmania, who at present is in Victoria but expects to be back on the Apple Isle soon after the New Year. With a grand array of aerials and no less than five receivers, it is no wonder Mr. Callander can send in a good log. His report comes from Richmond and he says 10 m. is gradually showing some improvement. 20 m. band is getting up to peak around 4 p.m. The 40 m. is, he says, rather noisy. (His loggings on these bands I have sent to Don Knock.)

On 31 m. PCJ was heard at excellent strength last Tuesday in an English programme from 5.30 p.m. until closing with the Dutch National Anthem. At 7.30 p.m. they announced that they would be on three days weekly: Tuesday, Wednesday and Thursday. Another good station on this band is KN-BI (Voice of America) on 9.49 mcs. — heard in evening at 11.25 when giving the Hits programme. I have been mostly concentrating on 10 and 20 m. bands, but will put in the next couple of weeks on the Commercials DX side, so

will forward you a more detailed programme next report.

\* \* \*

Dr. Gaden has left the "Hams" for a while apparently, as I have from him some notes as follows: RNB 17.77 mc. 16.88 m. heard around 7.30 a.m. at good strength; not heard at night lately. SEAC, Ceylon, 15.12 mcs. 19.84 m. very good night station. Switzerland on about 9.53 mcs. 31.46 m. is a nice signal in afternoons; no English heard. HCJB 25 and 31 m. very good; 19 not so loud. The Panama station, XOYA, is not as good as the 19 m. HCJB alongside it. Maroc 9.08 mcs. 33.03 m. at 7.30 a.m., quite good signals; no English heard from this one. XEWW the best Mexican as usual; XEQQ reasonably good. Radio Sofia 9.35 mcs. 32.09 m. is better than Belgrade on 6.15 mcs. which is usually good enough, as are many 48/49 m. in a.m.

\* \* \*

FZI, Brazzaville, 31 and 30 m. in a.m., 25 m. in afternoon, and 19 m. at night, are all good signals.

All the 'Frisco Yanks are good at any time and of the W's old WGEO, 9.53 mcs., 31.48 m. at breakfast time takes some beating.

\* \* \*

Rex Gillett of Adelaide, says Radio Club of Mozambique is now back on their old frequency of 6.135 mcs., 48.90 m. They have an English session at 5.55 a.m. and close at 6.30. CR7AA is in relay with CR7BJ on 9.65 m.c. 31.09 m.

Referring to Belgian Congo he says although Radio Nationale Belge is interfered with by PCJ and Radio Paris they can be followed at 11 p.m. on 17.77 mcs., 16.88 m.

Another station that is spoilt by someone on the same frequency, believed to be Russia, is Berlin on 6.07 mc., 49.42 m. This occurs at 6.30 a.m., but at 7 o'clock Berlin is identified by piano notes. (According to my records, Berlin is on 6.072 mcs., whilst a Russian, Kamchatka Petropavlovsk is

on 6.07 mcs., as also GRR—L.J.K.)

Mr. Gillett as usual catches the unusual and reports DTCY, the American shortwave station in Munich as testing on Mondays, Wednesdays and Fridays at 1—1.30 a.m. on 5.302.5 mcs., 56.58 m. Should you desire to report same send to The Military Government Station, DTCY, APO, 170.

\* \* \*

Ern. Suffolk, of Lobethal, advises XORA, Shanghai is easily heard from opening at 6.30 p.m. on 11.70 mcs., 25.64 m. (For the benefit of those who may be calibrating their dials, this Chinese is generally on a measured frequency of 11.705 mcs., but is liable to fluctuate.—L.J.K.)

XGOY, Chungking, is now on 6.14 mcs., 48.86 m. from 12.30 a.m. This is a special broadcast in English to the U.S.A. Signal is better than when on 41 m.

OLR2A, Prague, 6.01 mcs., 49.92 m. can be heard at 6.30 a.m. Several clarion notes serve as an identification signal.

\* \* \*

Desmond A. Hickey, writing from Petone, N.Z., admits that in the Shaky Isles they seem to hear the Latin Americans better than us, and to substantiate this claim forwards some fine information regarding his loggings.

"I get excellent reception from South America during the winter,

and this winter from June 1 to the end of September I logged forty new Latin stations. So far eleven verifications have arrived. Here, now, is some information on these and other verifications that I have recently received from Latin America.

HC4EB, Manta, Ecuador, "Radio Manta." This station operates on 6.87 mcs. and their schedule is 11 a.m. to 2 p.m. Power is 375 watts. Address, Apartado 69, (verified by air mail Spanish from the Director, Emilio Bowen.)

CXA3, Montevideo, "Radio Ariel." This station operates on 6.075 mcs. relays CXIO. Power is 1,000 watts. Address, Avenida 18 De Julio 1275. Heard here opening at 8 p.m. (Verified by air mail, Spanish letter from R. M. Borde, Tech. Division.)

H12A, Santiago De Los Caballeros, Dominican Republic. "La Voz De La Reeleccion." This station operates on 6.52 mcs. Schedule is 2—5 and 8—11 a.m. Power 250 watts. Address, El Cafe Del Yaque. (Verified by card.)

H12T, Monsenor Nouel, Dominican Republic. "La Voz Del Yuna". This station operates on 6.485 mcs. 8 a.m. to 3 p.m. Power 250 watts. (Verified by card.)

HCIAC, Quito, Ecuador. "La Voz De La Democracia." This station operates on 6.21 mcs., relaying medium-wave station on

1280 kcs. Schedule 9 a.m. to 2 p.m. Power is 200 watts. Address: Apartado 288. (Verified by card with picture of transmitters.)

OAX4M, Lima, Peru. "Radio Miraflores La Voz De La Democracia". This station operates on 6.22 mcs. 9 a.m. to 3 p.m. relays OAX4L. Address: Jesus Nazareno 113. (Verified by picture post-card.)

OAX4H, Lima, Peru, "Radio Mundial." This station operates on 6.368 mcs. Power is 1,000 watts. Address: Apartado 1098. Relays OAX4F, 1080 kcs. This station is off the air at present. (Verified by letter from chief engineer, Amador Salazar.)

YVIRX, Maracaibo, Venezuela. "Ondas Del Lago." This station operates on 4.80 mcs. Power is 1,500 watts, will increase to 10,000 watts soon. Relays YVIRF, 1120 kcs. Address: Apartado Postal 261. (Verified by letter from Francisco Artinano, chief engineer.)

CE960, Santiago, Chile. "Radio La Americana." This station operates on 9.59 mcs. moved from 9.60 mcs. Power is 1,000 watts, relays CB130. Schedule 10 a.m. to 3 p.m. Address: Casilla 13155, Correo 15.

HJDE, Medellin, Colombia, "La Voz De Antioquia." This station operates on 6.145 mcs., relaying

# ULTIMATE

*Champion Radio*

Sole Australian Concessionaires:

**GEORGE BROWN & CO. PTY. LTD.**  
267 Clurence Street, Sydney

Victorian Distributors: J. H. MAGRATH PTY. LTD., 208 Little Lonsdale Street  
Melbourne

The Ultimate factory has made the changeover from wartime production. Designs for the new models are now completed and production is about to commence.

These models should be available soon — they will be worth waiting for. Watch for further announcements.

SERVICE: Servicing of all kinds of radio sets, amplifiers and Rola speakers will continue to be available.

HJDK, 1250 kcs. Power is 5,000 watts. Schedule 6 a.m. to 2 p.m.

Here now are some of my recent loggings:

6.145 mcs., LRR, Rosario, Radio Ovidio Lagos, heard Sundays to 3 p.m.

6.025 mcs., HCITR, Ibarra, "Radio Equinoccial." Sundays to 5 p.m.

4.960 mcs. HC5HC, Riobamba, "Ondas Del Chimborazo." Now, noon—2 p.m.

7.876 mcs. HCICG, Quito, "Radio Ecuador Amazonico." Opens 9.30 p.m.

7.660 mcs. YNDG, Leon, "Estacion Gilfillan." Sundays to 4 p.m. and later.

9.925 mcs., XDY, Mexico City. Sometimes heard to 4 p.m. and later relaying XEDP, political speeches, etc., very irregular. Usual sign off is 1.15 p.m.

8.700 mcs., COCO, Havana, "Radio America," heard daily till 3.50 p.m.

6.117 mcs., HIIG, Ciudad Trujillo, "Radio La Opinion." Sun-

days till 4 p.m. with H12G on 9.21 mcs.

6.275 mcs. YSR, San Salvador daily sign off is 3 p.m. "La Vox Del Salvador."

6.010 mcs. XEOI, Mexico City, "Radio Mil" heard till 4 p.m.

Well, that's a fine list and should be of great help to our readers.—L.J.K.

\* \* \*

### LATEST SCHEDULES FROM CROSLY CORPORATION, CINCINNATI

WLWK—6.08 mcs. 49.34 m: 8.30 a.m.—4.00 p.m. To Latin America.

WLWO—11.79 mcs., 25.45 m.: 9.00 a.m.—1.00 p.m. To Latin America.

WLWS—15.20 mcs., 19.73 m: 7.45 a.m.—4.00 p.m. To Latin America.

WLWS—11.71 mcs., 25.62 m.: 7.45 a.m.—4.00 p.m. To Latin America.

WLWK—17.80 mcs., 16.85 m.: 9.45 p.m.—7.30 a.m. To Europe.

WLWK—9.59 mcs., 31.30 m.: 8.00 a.m.—9.15 a.m. To Europe.

WLWO—11.71 mcs., 25.52 m.: 9.45 p.m.—1.30 a.m. T. Europe.

WLWO, 15.35 mcs., 19.54 m.: 2.00 a.m.—7.30 a.m. To Europe.

WLWR—15.25 mcs., 19.67 m.: 9.45 p.m.—7.30 a.m. To Europe.

WLWS—21.65 mcs. 13.85 m.: 9.45 p.m.—5.00 a.m. to North Africa.

WLWS—11.71 mcs., 25.62 m.: 5.15 a.m.—7.30 a.m. To Europe.

WLWS—21.65 mcs. 13.85 m.: 9.45 p.m.—5.00 a.m. To Europe.

WLWS—11.71 mcs., 25.62 m.: 5.15 a.m.—7.30 a.m.—To North Africa.

WLWL—17.955 mcs., 16.70 m.: 9.45 p.m.—4.30 a.m. To Europe.

WLWL—17.955 mcs., 16.70 m.: 9.45 p.m.—4.30 a.m. To North Africa.

WLWL—9.70 mcs., 30.93 m.: 5.00 a.m.—7.45 a.m. To Europe.

WLWL—9.70 mcs., 30.93 m.: 5.00 a.m.—7.45 a.m. To North Africa.

## A.B.C. NATIONAL SHORTWAVE STATIONS

VLR, Melbourne, 2 Kilowatts; VLH, Lyndhurst, 10 kilowatts; VLG, Melbourne, 10 Kilowatts; VLQ, Brisbane; VLW, Perth

SUNDAYS	Metres	Mcs.
<b>VLR CALL SIGNS:</b>		
VLR2 ..... 6.45am—9.00am	48.78	6.15
VLR ..... 9.15am—6.15pm	31.45	9.54
VLR2 ..... 6.28pm—M/N	48.78	6.15

### WEEKDAYS

Mondays to Saturdays		
VLR2 ..... 6.00am—9.00am	48.78	6.15
VLR ..... 9.15am—6.15pm	31.45	9.54
VLR2 ..... 6.28pm—M/N	48.78	6.15

### Fridays

VLR2 ..... 6.00am—8.55am		
VLR ..... 9.15am—6.15pm		

### VLH CALL SIGNS—

SUNDAYS	Metres	Mcs.
VLH4 ..... 6.45am—8.15am	25.25	11.88
VLH5 ..... 8.30am—6.30pm	19.69	15.24
VLH3 ..... 6.45pm—M/N	31.32	9.58

### WEEKDAYS

#### Monday to Saturday

VLH4 ..... 6.00am—8.15am	25.25	11.88
VLH5 ..... 8.30am—6.30pm	19.69	15.24
VLH3 ..... 6.45pm—M/N	31.32	9.58

#### VLG CALL SIGN

VLG7 ..... 6.00am—8.00am	19.79	15.16
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#### SUNDAYS

6.45am—8.15

#### VLQ CALL SIGNS

##### SUNDAYS

VLQ ..... 6.45am—10.30am	41.44	7.24
VLQ3 ..... 10.50am—6.15pm	31.06	9.66
VLQ2 ..... 6.28pm—MN	41.58	7.215

#### WEEKDAYS

VLQ ..... 6.00am—9.55am	41.44	7.24
VLQ3 ..... 10.00am—6.15pm	31.06	9.66
VLQ2 ..... 5.20pm—11.30pm	41.58	7.215
	6.28pm—M/N	

#### VLW CALL SIGNS

##### DAILY

VLW7 ..... 8.00am—11.45am	31.51	9.52
	8.30pm—1.30am	31.51
VLW-3 ..... 1.30pm—8.15pm	25.36	11.83

# Speedy Query Service

**S.D.G. (Camberwell) complains of late delivery.**

A.—Yes, we know. Things are anything but normal yet, even in the printing and publishing business. Owing to our greatly increased circulation (about three times as great as 1939) we have considerable difficulty in getting enough of the right kind of paper and getting it through the printing machines on time. The other periodical you mention as being more punctual is backed by a huge newspaper organisation and is printed on a rotary machine which is much faster, but also much rougher. Doubtless things will improve over the next six or twelve months, but in the meantime the issue may run a week, or even two, later than normal publication date.

\* \* \*

**G.K. (Clifton Hill) asks whether subscribers can arrange to have change of address taken care of.**

A.—Yes, it is quite normal for subscribers to change their addresses, sometimes more than once. We can easily handle this, and you need have no hesitation in sending in your subscription even if you are likely to be moving in the near future.

## HEADPHONES

**Brand New! Just Released!**

**S.T.C. &  
STROMBERG CARLSON**

Original cost, £2/10/- pr.

**130 Ohms, 10/- pair  
2,000 Ohms, 25/- pair**

(Postage 1/6 pr. extra)

Can supply in quantity.

**DEITCH BROS.  
210A GEORGE STREET  
SYDNEY  
Phone BW7687**

**C.G.M. (Bentleigh) was unable to obtain an October issue.**

A.—The railway strike in Victoria rather upset our delivery and distribution arrangements, but eventually we got some through by road transport, when the Albury transfer was still congested. We now have ample issues at our head office and you can obtain one, post free, by sending stamps to the value of 1/-. Address is Balcombe Street, Mornington, Victoria.

\* \* \*

**S.H. (Heidelberg) built up an amplifier with 807 type output valves, but the output transformer broke down without apparent reason.**

A.—Possibly you attempted to run the amplifier with the voice coil or 500-ohm line open-circuited. Under such circumstances it is possible for thousands of volts to be developed across the plate circuit. Even with everything in order and an output of 60 watts, it is possible for the peak plate voltage to reach over 1500 volts.

\* \* \*

**T.L.P. (Orange) wants to get better results on ten meters.**

A.—It is rather difficult to get r.f. gain on "ten" unless you are using acorn-type tubes. Often it is better to use a converter for "ten," using your receiver as the i.f. channel. Equal to an extra stage of r.f. under certain circumstances is the use of a really efficient aerial of the beam array type. Details of an ideal one were given in the June, 1946, issue. If you haven't a copy you can get one from our back dates department, price 1/- post free.

\* \* \*

**P.R. (Eltham) asks about direct-coupled circuits.**

A.—Yes, the same old tale crops up again and again, and there are still hundreds of direct-coupled enthusiasts who never fail to lament the passing of the old direct-couplers. Of course the direct-coupler has not really passed, as we ran the latest version in our July issue. If you haven't already seen that copy you can get one from our back dates department, price 1/-, post free.

**C.M. (Vaucluse) has in mind to use twin speakers.**

A.—It is quite O.K. to match an 8-42 with a G12 as these speakers have about the same comparative acoustic efficiency. It is not much use toying with the other idea as the small speaker will never be able to handle sufficient power to make its acoustic output apparent against the thunder which would come from the G12 at a similar power input. Possibly you could have independent volume controls at the speakers, but this must work on the losing principle, so that it cannot be considered as efficient.

## PHILIPS' TRANSMITTING VALVES AND COMPONENTS PRICE LIST

Although there are some of the valve types that are not only applicable to experimenters, and are of interest only to designers of higher powered equipment, many of those listed here are of direct interest to "hams."

	£	s	d	
B00 .....	6	1	6	plus 2/- duty
805 .....	7	0	0	" " "
807 .....	1	9	5	" " "
809 .....	2	9	6	" " "
813 .....	13	1	9	" " "
833A .....	45	0	0	" " "
846 .....	7	7	7	" " "
866A .....	1	5	3	" " "
872A .....	5	6	6	" " "
NF100 .....	7	2	6	" " "
HF200 .....	13	13	7	" " "
HF300 .....	21	6	1	" " "
ZB120 .....	5	19	6	" " "
JCG2.5/1000G .....	2	0	0	" " "
TAW12/15A .....	127	0	0	" " "
HZ3/250 .....	28	10	0	" " "
PE04/15A .....	1	5	0	" " "
PE05/15 .....	4	11	0	" " "
PE06/40 .....	1	10	0	" " "
TA4/1300K .....				Price on Application
TA4/2000K .....				Price on Application

The following are available at short notice:

810 .....	10	0	0	" " "
802 .....	2	17	6	" " "
804 .....	9	2	0	" " "

In addition the following types have been imported from Eindhoven and are now available.

MC1/50 .....	8	7	5	" " "
PC1/50 .....	8	19	5	" " "
DCG5/2500 .....	13	0	11	" " "
DCG5/5000 .....	11	7	2	" " "
DCG5/7500 .....	55	8	6	" " "

Quartz crystals are available in either AT or BT cuts for various frequencies at the following prices:

Crystals for  
Amateurs ... 2 10 0 plus tax  
Mounted in either "A" or "J" type holders.  
"A" for frequencies up to 5 Mcs. and  
"J" for higher frequencies.

Crystals of closer tolerances (.02 per cent) for "Spot" Frequencies.

BT cut between:				
2 and 7 mcs. ....	3	15	0	each plus tax
7 and 8 mcs. ....	4	7	6	" " "
8 and 9 mcs. ....	5	0	0	" " "
9 and 10 mcs. ....	5	2	6	" " "
10 and 14 mcs. ....	6	5	0	" " "

For AT cuts between 2 and 9 mcs. add 12/6 in each case.

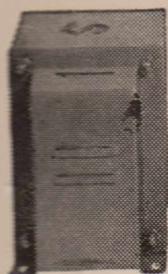
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# RED LINE

## TRANSFORMERS and CHOKES

### PRECISION IN DESIGN

Type No. AR2



Type No.  
5176



Type No.  
50825



Type No.  
102512



Type No.  
A.W.5



### PRECISION IN CRAFTSMANSHIP

# SWALES & SWANN

Your Transformer problem will be transformed from a headache to that craftsman-built component which you desire but cannot quite figure out. Swales and Swann specialise in Audio Frequency Transformers up to Frequency Modulation Standards; Power Transformers up to 2 K.W. rating;

### BUT

See Swales and Swann for Transformers of ANY specification, whether they are required for Industrial Applications, Electronic Controls, Broadcasting, Amateur Transmitting or Public Address Systems.

Technical Service, Wholesale  
and Manufacturers

A. T. SWALES. Central 4773  
2 Coates Lane, Melbourne



Trade Sales: Allen SWANN

MU 6895 (3 lines)  
157 Elizabeth St., Melbourne

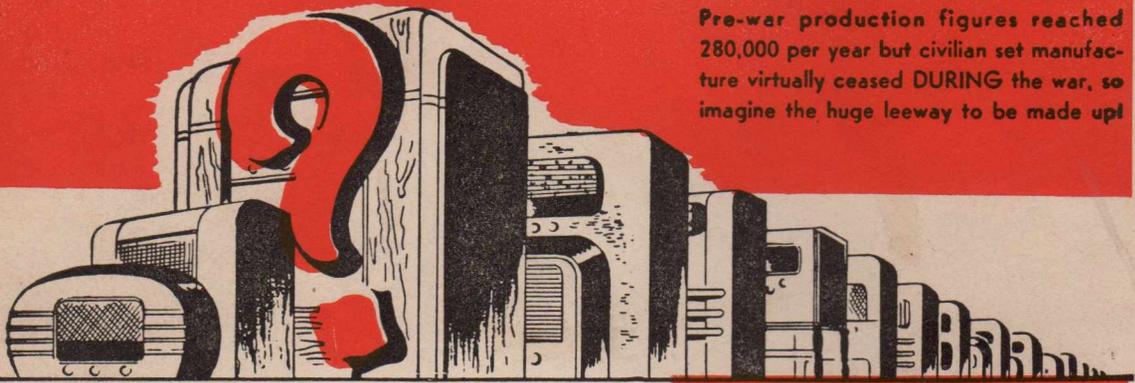
A GUARANTEE

OF DEPENDABILITY

# MORE THAN A QUARTER MILLION NEW RADIOS NEEDED YEARLY

## ...and not enough men to make them

Pre-war production figures reached 280,000 per year but civilian set manufacture virtually ceased DURING the war, so imagine the huge leeway to be made up!



### RADIO needs YOU—Now is the time to act!

Every branch of the Radio industry is looking ahead to an unprecedented wave of prosperity. Electronics and the civil adaptation of Radar are now being developed with great speed, but the cry is for more and more skilled men!

We are entering now a Radio age, an Age which has a place for YOU. Radio, a young industry which has made remarkable progress in the past few years urgently wants men to train for vital positions. If you want security, prosperity, and a recognised status in the community, start training NOW.

#### TRAIN AT HOME, OR AT OUR BENCHES

A.R.C. offers ambitious men a sound proven course in Radio Engineering. Sound because it is the result of many years' successful operation, proven because hundreds of ex-students owe their present success to the College. You can learn with equal facility at home (by means of our correspondence course).

#### EARN GOOD MONEY WHILE LEARNING

You don't have to wait a year, or even six months, before you are ready to begin "cashing in." We will show you how to earn extra money almost from the word "go." Many students make £4, and up to £8, per week in their spare time whilst studying.

#### PREVIOUS KNOWLEDGE UNNECESSARY

You don't need a knowledge of Radio or Electricity—we'll give you all you need of both, in a simple, practical manner, that makes learning easy, presented, too, in such a way that you can remember what you're taught and how to put that knowledge to practical use.

#### COSTS LITTLE

Think of this—for a few pence per day—actually less than many fellows spend on tobacco—you can prepare yourself for a man-sized job in Radio NOW.

#### NOW IS THE TIME TO ACT!

Send in today for my free book, "Careers in Radio and Television." It's a book no man can afford to miss. It shows you the steps you can take to get into Radio immediately!

### RADIO IS STILL A NEW INDUSTRY GROWING FAST!



£8,000,000 was estimated prewar sales of radio receivers and Parts. The next few years should see these figures doubled.

Pre-war Radio Set output reached an estimated 280,000. All records are expected to be broken in near future.

Even a 25 per cent. increase in set sales will mean openings for perhaps 1,000 more Radio dealers—

Over 130 Australian Radio Stations employ a vast number of skilled personnel—a team of specialists which would probably be tripled with the advent of F.M. transmission.

### GET THIS BIG FREE BOOK NOW!

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Broadway, Sydney. Phone M 6391-2

Dear Sir—I am interested in Radio. Please send me, without obligation on my part, the free book, "Careers In Radio and Television."

NAME .....

ADDRESS .....